AECOM

Former Bay Ridge Holder Stations A & B Site
Operable Unit 2

Brooklyn, Kings County, New York

Interim Site Management Plan

New York State Department of Environmental Conservation

Site Number: 224058

Prepared for:

National Grid
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Revisions to Final Approved Interim Site Management Plan:

Revision #	Submitted Date	Summary of Revision	DEC Approval Date

May 2015

Certification Page

I, Michael Spera, certify that I am currently a NYS registered Professional Engineer (#073731) and that this Interim Site Management Plan was prepared in accordance with all applicable statues and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.

Michael Spera, PE

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ASP	Analytical Services Protocol
AWQSGV	Ambient Water Quality Standards and Guidelines Values
bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
BUG	Brooklyn Union Gas
CAMP	Community Air Monitoring Plan
CCS	Composite Cover System
C&D	Construction and Demolition
COC	Certificate of Completion
DNAPL	Dense Non Aqueous Phase Liquid
DER-10	NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation
DUSR	Data Usability Summary Report
EC	Engineering Controls
ECL	Environmental Conservation Law
EDR	Environmental Data Resources
ELAP	Environmental Laboratory Approval Program
EWP	Excavation Work Plan
HASP	Health and Safety Plan
IC	Institutional Controls
NYC	New York City
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
OCAS	Order on Consent and Administrative Settlement
OASIS	Open Accessible Space Information System Cooperative
OU	Operable Unit
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
SC	Site Characterization
SCG	Standards, Criteria, and Guidance
SCO	Soil Cleanup Objectives
SIR	Site Investigation and Remediation
Site	Former Bay Ridge Holder Stations A&B Operable Unit 2
ISMP	Interim Site Management Plan
SVI	Soil Vapor Intrusion
SVOCs	Semi Volatile Organic Compounds
USEPA	United Stated Environmental Protection Agency
USGS	United States Geological Survey
VHB	Vanasse Hangen Brustlin, Inc.
VOCs	Volatile Organic Compounds

Units and Measurements

Kg	kilograms
Mg	milligram
ppm	Parts per Million

1.0 Introduction and Description of Remedial Program

1.1 Introduction

This Interim Site Management Plan (ISMP) is required as an element of the remedial program at the Former Bay Ridge Holder Stations A & B site Operable Unit (OU) 2 (the Site) under the New York State (NYS) Inactive Hazardous Waste Disposal Site Remedial Program administered by the Department of Environmental Conservation (NYSDEC). The ISMP is being implemented at the Site in accordance with Order on Consent Index and Administrative Settlement (OCAS) # A2-0552-0606, Site # 224058, which was executed on March 2007 (NYSDEC, 2007).

1.1.1 General

The Brooklyn Union Gas Company (BUG), doing business as KeySpan Energy Delivery New York, entered into the OCAS with the NYSDEC in 2007 to investigate, and if necessary, remediate Manufactured Gas Plant-residuals at several sites, including the Site which is located in an urban area at 829-884 65th Street in Brooklyn, Kings County, New York. The Site location is illustrated on a portion of a United States Geological Survey (USGS) 7.5 Minute Brooklyn Quadrangle map in Figure 1-1. The OCAS required the Remedial Party, National Grid, to investigate and remediate impacted media resulting from the historic operation of the former Gas Holder facility at the Site.

The Former Bay Ridge Holder Stations A & B site is separated into two properties of land, property encompassing the Former Holder Station A facility and property encompassing the Former Holder Station B facility. Each property was designated as an OU. An operable unit represents a portion of the site remedy that for technical or administrative reasons can be addressed separately to eliminate or mitigate a release, threat of release or exposure pathway resulting from the site impacts. The Former Holder Station A facility area was designated as OU1 and the Former Holder Station B facility area was designated as OU2.

After completion of the Site Characterization (SC) and additional SC work described in Site Characterization Work Plan (AECOM, January 2010) and Additional Site Characterization Work Plan (AECOM, April 2013), it was determined that impacted soil and groundwater are present at the Site. A figure showing current Site features and extent of the ISMP is provided in Figure 1-2. The boundaries of the Site are more fully described in the metes and bounds site description and property survey (Appendix A). This ISMP was prepared to manage soil and groundwater impacts at the Site in accordance with NYS Environmental Conservation Law (ECL) Article 71, Title 36. All reports associated with the Site can be viewed by contacting National Grid, the NYSDEC or its successor agency managing environmental issues in NYS.

This ISMP was prepared by AECOM, on behalf of National Grid, in accordance with the requirements in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation (DER-10), dated June 2010 (NYSDEC, 2010), and the guidelines provided by NYSDEC. This ISMP addresses the means for implementing the Institutional Controls (ICs) and Engineering Controls (ECs) that are required for the Site.

1.1.2 Purpose

As contemplated by the letter dated February 4, 2012 (NYSDEC, 2012), from NYSDEC to National Grid, the Site contains residual impacts identified during the Site investigation process. This ISMP is required by the NYSDEC to manage site activities until the final Site Management Plan is approved. ECs have been incorporated into the remedy to control exposure to any potential impacts during the use of the Site to ensure protection of public health and the environment. This ISMP specifies the methods necessary to ensure compliance with all ECs required for impacts that are present at the Site. This ISMP has been approved by the NYSDEC, and compliance with this ISMP is required by any party(ies) performing ground-intrusive work on the Site. This ISMP may only be revised with the approval of the NYSDEC.

This ISMP provides a detailed description of all procedures required to manage impacts at the Site including: (1) implementation and management of all EC/s; and (2) media monitoring. This ISMP also describes which party (future lessee/third party owner/property manager/developer, National Grid, or NYSDEC) is responsible for each of these procedures. This ISMP does not address the allocation of costs for any additional work or costs necessitated by development of the Site; that is a private matter to be worked out between National Grid and the lessee/third party owner/property manager/developer.

To address these needs, this ISMP includes three plans: (1) an Engineering and Institutional Control Plan for implementation and management of ECs; (2) a Monitoring Plan for implementation of site monitoring; and (3) an Excavation Work Plan (EWP) for managing impacts that may be encountered during limited ground intrusive work. Large scale redevelopment including but not limited to building demolition and ground intrusive activities in previously inaccessible areas will be conducted under a separate work plan that may include additional investigation and remediation activities as detailed in Section 2.3.1.

This ISMP also includes a description the periodic submittal of data, information, and recommendations to NYSDEC.

It is important to note that failure to comply with this ISMP is also a violation of ECL and 6 New York Code, Rules, and Regulations (NYCRR) Part 375, and thereby subject to applicable penalties.

1.1.3 Revisions

Revisions to this ISMP will be proposed in writing to the NYSDEC's project manager. The NYSDEC will provide a notice of any approved changes to the ISMP, and append these notices to the ISMP that is retained in its files.

1.2 Site Background

1.2.1 Site Location and Description

The Site is located in Brooklyn, Kings County, New York and is identified as portion of Block 5749 Lot 15 on the New York City (NYC) Tax Map. The Site is an approximately 1.38-acre area bounded by 65th Street to the north, 66th Street to the south, 9th Avenue to the east, and portions of the youth athletic baseball fields to the west (see Figure 1-2). The Site includes three distinct areas:

- A National Grid gate station facility to the northeast;

- An associated vacant area to the south and east; and,
- A small portion of the youth athletic baseball fields along the western boundary of the National Grid gate station facility.

The gate station facility area is partially paved, while the vacant area consists of a combination of gravel and grass surfaces. The portion of the Site that encompasses the youth athletic baseball fields consists of dirt and landscaped surfaces (infield grass), asphalt, and concrete pavement.

The Site is listed by the NYC Department of Finance as Building Class U6–Railroad – Private Ownership. The NYC Department of City Planning has listed the zone classification for this area as M1, which indicates the Site is zoned for light manufacturing and commercial buildings.

National Grid is listed as the current property owner on NYC Department of Finance website information obtained from the NYC Open Accessible Space Information System Cooperative (OASIS) on-line database. Figure 1-3 shows a parcel map of the Site.

The boundaries of the Site are more fully described in the metes and bounds description and on the property survey (Appendix A).

1.2.2 Site History

A summary of the Site history was developed based on a review of the historic Sanborn Fire Insurance maps, aerial photographs, BUG historical drawings, and historical topographical maps for the Site, as well as a review of the database report provided by Environmental Data Resources (EDR).

The Site was used for the storage of manufactured gas by Kings County Gas and Illuminating Company and later Kings County Lighting Company from prior to 1905 to circa 1957, when the BUG acquired Kings County Lighting Company. Over the history of the Site, a total of six gas holder structures were built at the two stations. Holders Nos. 1 through 5 were located at Station B and Holder No. 6 was located at Station A. There is no indication that gas was manufactured at the Site.

Holder No. 6 was constructed on Station A (OU 1) sometime prior to 1951. The 5 million cu ft capacity waterless holder was built along 64th Street between 8th and 9th on a near- or at-grade concrete slab and was operated by Kings County Lighting. The holder was demolished sometime prior to 1970. The southeastern portion of Station A has been vacant and was used for new automobile storage from approximately 1970 to approximately 2011, when the use of the entire lot changed to parking. The BUG sold the property sometime during or after March 1985.

A total of four gas holders were built on the Station B (OU 2) from prior to 1905 and 1926. Two gas holders, Holder No. 1 and Holder No. 2, were present in 1905. Between 1905 and 1926, the two holders (Nos. 1 and 2) were demolished, and Holders Nos. 3 and 4, along with associated structures, were built at Station B. All structures related to gas storage activity were demolished between 1956 and 1966. Following the removal of the holders and other structures, Station B was converted to a gate station facility and youth athletic baseball fields and has remained in this configuration to the present day. Figure 1-4 shows the approximate boundaries and structures of the Former Bay Ridge Holder Station B. Holder No. 5 was located on the portion of Station B that is outside the boundary of OU 2. The holder was demolished at approximately the same time as

Holder Nos. 3 and 4. This portion of the former station is currently used as a youth baseball and football field.

After the SC was performed by National Grid, the NYSDEC determined that no further actions were required at Station A (OU 1) and its discussion has been excluded from the ISMP. The Site, as it is referred to in the remainder of this ISMP, is considered to be Station B (OU 2).

1.2.3 Geologic Conditions

1.2.3.1 Site Geology

The Site geology consists of four unconsolidated units varying widely in thickness and distribution. These units are fill, sand, silty sand/sandy silt, and clay. Geologic sections are shown in Figure 1-5.

FILL

The fill thickness varies across the Site and ranges from 1 to 16 feet with the thickest layers present beneath the center of the Site. The primary components of the fill are silty sand and fine sand, with some angular to sub-angular gravel, and lesser amounts of silt, and cobbles. While the unit closely resembles the underlying sand unit, the fill unit at the Site was typically defined by the presence of anthropogenic materials, such as whole and crushed brick, pieces of concrete, wood fibers, coal ash, coal fragments, and other non-native materials, and cobbles. The fill underneath the youth athletic fields consisted of fine to medium sand with some silt and gravel and was likely brought to the property for the construction of the youth athletic fields.

SAND

The sand unit occurs as 4 to 30 foot thick discontinuous lenses or pockets that cannot be clearly connected across the Site. This sand unit varies between a well graded sand, consisting of fine to medium grained sand and cobbles, to a poorly sorted sand, consisting of fine to medium grained sand, silt, and gravel. This unit was encountered along the southwestern portion of Site, along 66th Street, where it was interlayered with the silty sand unit.

SILTY SAND/SANDY SILT

The most extensive unit underneath the Site is fine grained sand and silt interlayered between poorly and well graded sands. The depth of this unit was encountered as shallow as 7 feet below ground surface (bgs). It’s thickness varies among the borings, where it ranged in thickness between 0.5 feet and 85 feet where the deepest boring was terminated.

CLAY

A small lens of silty clay was encountered in the southwestern portion of the Site, along 66th Street. This material was encountered at a depth of approximate 17 feet bgs and was approximately 8 feet thick.

1.2.3.2 Site Hydrogeology

Groundwater was encountered in the overburden at depths ranging from approximately 80 to 84 feet bgs. Groundwater contour maps (Figure 1-6) have been prepared for three rounds of data (March 24, 2011, July 14, 2011, and October 10, 2013). As shown on these maps, the groundwater flow direction beneath the Site is variable and may be attributable to seasonal conditions.

1.3 Summary of Site Investigation Findings

An Environmental Site Assessment and a Site Characterization (SC) were performed to characterize the nature and extent of impacts at the Site. The results of the Site investigations are described in detail in the following reports:

- Environmental Site Assessment Report [Vanasse Hangen Brustlin, Inc. (VHB), 2000];
- Site Characterization Report (AECOM, 2012); and
- Additional Site Characterization Results Report (AECOM, 2014).

To determine whether the soil, groundwater, and soil vapor were impacted above levels of concern, data from Site investigations were compared to the following standards, criteria and guidance (SCGs):

- Groundwater SCGs are based on the NYSDEC Ambient Water Quality Standards and Guidance Values [(AWQSGV), NYSDEC, 1998] and Part 5 of the NYS Sanitary Code;
- Soil SCGs are based on the NYSDEC Division of Environmental Remediation, 6 NYCRR Part 375 Restricted Commercial Use Soil Cleanup Objectives (SCOs), as well as NYSDEC's alternative polycyclic aromatic hydrocarbons (PAH) criterion for non-residential sites, total PAH of 500 milligram (mg)/kilogram (Kg), specified in NYSDEC Policy CP-51 Soil Cleanup Guidance (NYSDEC, 2010); and
- Indoor air SCGs are based on the NYS Department of Health (NYSDOH) Database summary of indoor and outdoor air sample results in control homes collected and analyzed by NYSDOH from 1989 through 1996.

Generally, the Site investigations determined that there were no ongoing exposures to impacted media from the Site. The Site surface is mostly covered which further reduces the likelihood of direct contact with impacted soils. In addition, access to the Site is restricted via chain link fence thus preventing unauthorized entry into the Site and exposure to impacted soils beneath the ground surface. The presence of some elevated organic compounds and metals (such as lead and mercury) in the shallow soils could have the potential to impact construction and/or maintenance workers should ground intrusive activities be required at the Site. Thus, the appropriate protective measures (detailed in this ISMP) must be utilized by any workers should a need arise to perform activities within the shallow soils at the Site. Exposure to impacted groundwater is not occurring as there are no supply wells located within 1-mile radius of the Site and potable water is provided by the City of New York.

Soil, groundwater, and soil vapor samples were collected during the Site investigations to characterize the nature and extent of Site impacts. The main categories of compounds that exceed their SCGs are volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and lead. The principal human health and environmental risks posed by this Site relate to the presence of lead-impacted soils, highly-weathered coal tar-impacted soils, petroleum residuals-impacted soils, and historic fill.

Highly weathered coal tar belongs to a group of organic contaminants known as dense non-aqueous phase liquids, commonly abbreviated as (DNAPL). DNAPLs do not readily dissolve in water and tend to sink to the bottom of water bodies and aquifers. When released into the subsurface, these liquids can spread out in complex directions, which may or may not be the same direction as groundwater flow. Coal tar is an unusual DNAPL because its density is only slightly greater than water. Although Coal tar does tend to sink, the relatively slight difference in density between coal tar and water makes this sinking effect somewhat unpredictable. The constituents of coal tar include the following chemical compounds of concern:

(1) Benzene, toluene, ethylbenzene, and xylenes (collectively known as the BTEX compounds) are VOCs, which are also commonly found in unleaded gasoline, paint thinners, and other solvents. BTEX compounds are somewhat soluble in water. Consequently, groundwater which comes into contact with coal tar often becomes impacted with these compounds. This contaminated groundwater then typically moves away from the coal tar source, along with the groundwater flow through the subsurface;

(2) PAHs are a large group of SVOCs with several hundred different individual compounds known to exist. They are far less water-soluble than the BTEX compounds, and consequently are far less likely to cause groundwater impacts. They are also less likely to be degraded by soil bacteria, and thus are persistent in the environment. The United States Environmental Protection Agency (USEPA) has identified 17 of the PAHs as priority pollutants, which are commonly used in identifying the presence of potential environmental impacts; and

(3) An inorganic contaminant of concern is cyanide. Cyanide, bound to iron to form ferric-ferrocyanide, is a component of some coal tars. Cyanide was not detected at high levels in Site soils.

Table 1-1, Table 1-2, and Table 1-3 summarize the analytical data for the contaminants of concern in surface soil, subsurface soil, and groundwater; and compare the data with the SCGs for the Site. The locations of all the investigation samples are noted on Figure 1-4.

Below is a summary of Site conditions when the Site investigations were performed between 2000 and 2013:

Historic Fill

Historic fill includes soil and debris, imported to the Site, which may contain organic and inorganic compounds including but not limited to VOCs, SVOCs, polychlorinated biphenyls (PCBs), pesticides, herbicides, and lead. Historic fill material covers the majority of the Site in a layer typically ranging from one to at least 16 ft thick. The historic fill consists of varying amounts of coal fragments, wood fragments, metal fragments, brick fragments, glass, clinkers, cobbles, coal ash, and construction and demolition (C&D) debris.

Soil

Three categories of impacted Site soils were identified during the Site investigations:

- Highly weathered coal tar-impacted soils are present at localized areas of the Site at depths greater than one feet bgs. Coal tar impacts included tar-like odors, tar-like staining, trace tar sheens, tar coatings of soil grains (tar observed on soil grains but not in the pore spaces), and trace tar blebs. Due to the highly weathered nature (meaning the tar is typically more viscous as a result of being composed of fewer volatile compounds) of the coal tar, it is not believed to be an ongoing source of impact to soil and groundwater. The extent of the visual and olfactory impacts is shown on Figure 1-7;

- Lead-impacted soils were detected in Site soils across the Site. Lead-impacted soils exceeding the restricted SCOs were detected below 10 feet bgs at the Youth Baseball Athletic Fields, below 3 feet bgs at the gate station facility, and below ground surface at the vacant area; and
- Petroleum Residual-impacted Soils - Impacts related to petroleum residuals included petroleum-like odors, petroleum-like staining, and petroleum sheens. The SC identified petroleum residuals in soils located in the eastern portion of the Site.

PAH and BTEX impacts in Site soils were detected in areas where visibly weathered coal tar impacts were present. Outside of the zones of coal tar contamination, PAH and BTEX concentrations decrease rapidly. Total soil BTEX concentrations ranged from below analytical method detection limits to 20 parts per million (ppm), and total PAH soil concentrations ranged from below analytical detection limits to 26 ppm. Cyanide was detected in only subsurface samples in the parking lot portion of the Site at levels below the SCGs. Lead concentrations in soils ranged from below analytical detection limits to 18,000 ppm. A summary of compounds detected in surface and subsurface soils are provided in Tables 1-1 and 1-2 respectively.

Concentrations of BTEX, PAHs, metals and cyanide that were detected in Site soils above the 6NYCRR Part 375 Restricted Residential and Commercial Use SCOs are shown in Figure 1-8.

Groundwater

BTEX and naphthalene were detected at concentrations exceeding the AWQSGVs in the groundwater beneath the Site. It is unclear if the presence of these compounds is related to the former operations at the Site or from an off-Site source. No measurable DNAPL were observed in the groundwater monitoring well locations. A summary of compounds detected in groundwater in 2011 and 2013 are provided in Table 1-3 and concentrations of compounds detected in groundwater above AWQSGVs are shown on Figure 1-9.

Soil Gas

One soil gas sample was collected from the Site in March 2000 by VHB near the area of the Site that extends onto the youth athletic baseball fields. The results of the soil vapor analysis indicated that no VOCs or SVOCs were detected indicating that the interstitial migration of vapors did not occur at detectable levels and was therefore not considered further in the Site assessment (VHB, 2000).

2.0 Engineering and Institutional Control Plan

2.1 Introduction

2.1.1 General

Because impacted soil and groundwater remain beneath the Site, EC/ICs are required to protect human health and the environment. This Engineering and Institutional Control Plan describes the procedures for the implementation and management of all EC/ICs at the Site. The Engineering and Institutional Control Plan is one component of the ISMP and revisions are subject to approval by the NYSDEC.

2.1.2 Purpose

This plan provides:

- A description of all EC/ICs on the Site;
- The basic implementation and intended role of each EC/IC;
- A description of the features to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of EC/ICs, such as the implementation of the EWP (Appendix B) for the proper handling of impacted soil and groundwater that may be disturbed during maintenance or limited redevelopment work on the Site;
- A description of the roles and responsibilities of each party with respect to this ISMP; and
- Any other provisions necessary to identify or establish methods for implementing the EC/ICs required by the site remedy, as determined by the NYSDEC.

2.2 Engineering Controls

2.2.1 National Grid Gate Station Facility

2.2.1.1 Engineering Control Systems

Composite Cover System

Exposure to impacts in soil/fill at the National Grid gate station facility is prevented by a composite cover system (CCS) present over the gate station facility. The CCS is an EC that provides a physical barrier that limits potential human and environmental exposures to impacted soils present at the gate station facility. The CCS is comprised of a minimum of 6 inches of soils not impacted by historic Site operations, asphalt pavement, concrete pads, and concrete building slabs. The CCS at the gate station facility is a permanent control that must remain intact above impacted soils. The EWP that appears in Appendix B outlines the procedures required to be implemented in the event the CCS is breached, penetrated or temporarily removed, and any underlying impacted soil is disturbed. Procedures for the inspection and maintenance of this CCS are provided in the Monitoring Plan included in Section 3 of this ISMP.

Procedures for monitoring the CCS are included in the Monitoring Plan (Section 3 of this ISMP). The Monitoring Plan also addresses severe condition inspections in the event that a severe condition, which may affect controls at the gate station facility, occurs.

Secured Site Access

Exposure to impacts in shallow soil/fill at the gate station facility is prevented by securing the Site via a chain link fence to prevent unauthorized access. The chain link fence is an EC that provides a physical barrier that limits potential human and environmental exposures to impacted soils and groundwater present at the Site. The chain link fence at the gate station facility is a permanent control that must be maintained. Procedures for monitoring the chain link fence are included in the Monitoring Plan (Section 3 of this ISMP). The Monitoring Plan also addresses severe condition inspections in the event that a severe condition, which may affect controls at the Site, occurs.

2.2.2 Vacant Area

2.2.2.1 Engineering Control Systems

Secured Site Access

Exposure to impacts in shallow soil/fill at the vacant area of the Site is prevented by securing the Site via a chain link fence to prevent unauthorized access. The chain link fence is an EC that provides a physical barrier that limits potential human and environmental exposures to impacted soils and groundwater present at the Site. The chain link fence at the Site is a permanent control that must be maintained. Procedures for monitoring the chain link fence are included in the Monitoring Plan (Section 3 of this ISMP). The Monitoring Plan also addresses severe condition inspections in the event that a severe condition, which may affect controls at the Site, occurs.

2.2.3 Youth Athletic Baseball Fields

2.2.3.1 Engineering Control Systems

Composite Cover System

Exposure to impacts in soil/fill at the Youth Athletic Baseball Fields is prevented by a CCS present over the Youth Athletic Baseball Fields. The CCS is an EC that provides a physical barrier that limits potential human and environmental exposures to impacted soils present at the Youth Athletic Baseball Fields. The CCS is comprised of a minimum of 12 inches of soils not impacted by historic Site operations and paved areas along 65th street in the location of the concession stand and storage container. The CCS at the Youth Athletic Baseball Fields is a permanent control that must remain intact above impacted soils. The EWP that appears in Appendix B outlines the procedures required to be implemented in the event the cover system is breached, penetrated or temporarily removed, and any underlying impacted soil is disturbed. Procedures for the inspection and maintenance of this SCS are provided in the Monitoring Plan included in Section 3 of this ISMP.

Procedures for monitoring the CCS are included in the Monitoring Plan (Section 3 of this ISMP). The Monitoring Plan also addresses severe condition inspections in the event that a severe condition, which may affect controls at the Youth Athletic Baseball Fields, occurs.

Secured Site Access

Exposure to impacts in shallow soil/fill at the Youth Athletic Baseball Fields is prevented by securing the Youth Athletic Baseball Fields via a chain link fence to prevent unauthorized access. The chain link fence is an EC that provides a physical barrier that limits potential human and environmental exposures to impacted soils present at the Youth Athletic Baseball Fields. The chain link fence at the Youth Athletic Baseball Fields is a permanent control that must be maintained. Procedures for monitoring the chain link fence are included in the Monitoring Plan (Section 3 of this ISMP). The Monitoring Plan also addresses severe condition inspections in the event that a severe condition, which may affect controls at the Youth Athletic Baseball Fields, occurs.

2.3 Institutional Controls

A series of ICs are required by the ISMP to: (1) implement, maintain and monitor the cover systems and the chain link fence; (2) control disturbances of the impacted soil and groundwater (Figures 1-6, 1-7, and 1-8) and to prevent future exposure to MGP-related residuals. These ICs are:

- Compliance with this ISMP by the Grantor and the Grantor's successors and assigns with all elements of this ISMP;
- All ECs must be operated and maintained by National Grid as specified in this ISMP, including Matrix of Responsibilities included as Table 2-1;
- All ECs must be inspected by National Grid at a frequency and in a manner defined in the ISMP;
- Groundwater and indoor air monitoring must be performed by National Grid as defined in this ISMP; and
- Data and information pertinent to Site Management must be reported by National Grid at the frequency and in a manner defined in this ISMP.

ICs identified in this ISMP may not be discontinued without an amendment to or extinguishment of the ISMP.

The Site has a series of ICs in the form of Site restrictions. Adherence to these ICs is required by this ISMP. Site restrictions that apply are:

- All future intrusive activities on the Site that will disturb impacted soil and groundwater must be conducted in accordance with this ISMP;
- The use of the groundwater underlying the Site is prohibited without the approval of the NYSDEC;
- The potential for vapor intrusion must be evaluated prior to any modification of the existing building and for any buildings developed on the Site, and any potential impacts that are identified must be monitored or mitigated; and
- National Grid will submit to NYSDEC a written inspection that states, (1) controls employed at the Site are unchanged from the previous inspection or that any changes to the controls were approved by the NYSDEC; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment, or that constitute a violation or failure to comply with the ISMP. NYSDEC retains the right to access the Site at any time in order to evaluate the continued maintenance of any and all controls. This inspection shall be

provided by National Grid annually, or at an alternate period of time that NYSDEC may allow, and will be made by an expert that the NYSDEC finds acceptable.

2.3.1 Excavation Work Plan

Any future intrusive work that will penetrate the surface, encounter, disturb, or otherwise cause potential contact with potentially impacted media, including any modifications or repairs to the Site surface to maintain its integrity, will be performed in compliance with the EWP (Appendix B.) Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) prepared for the Site. A sample HASP, that is in current compliance with DER-10, and 29 CFR 1910, 29 CFR 1926, and all other applicable Federal, State and local regulations, is attached as Appendix C to this ISMP. Based on future changes to State and Federal health and safety requirements, and specific methods employed by future contractors, the HASP and CAMP will be updated and re-submitted with the notification provided in the EWP. Any future intrusive work that may penetrate, encounter or disturb impacted soil or groundwater will be performed in compliance with the ISMP. Intrusive construction work must also be conducted in accordance with the procedures defined in the EWP, HASP and CAMP, and documentation of the work will be included in the periodic inspection and certification reports submitted under the Site Management Reporting Plan (See Section 5).

It should be noted that the scope of this EWP is limited to management of limited excavation and redevelopment activities on Site. This ISMP includes a provision for further investigation and remediation should large scale redevelopment occur, if any of the existing structures are demolished, or if the subsurface is otherwise made accessible. The nature and extent of residual impacts in areas where access was previously limited or unavailable will be immediately and thoroughly investigated pursuant a plan approved by the NYSDEC. Based on the investigation results and the NYSDEC's determination of the need for a remedy, a Remedial Action Work Plan may be developed for the final remedy for the Site, including removal and/or treatment of any source areas to the extent feasible. Citizen Participation Plan will continue through this process. Any necessary remediation will be completed prior to, or in association with, redevelopment.

The property owner, National Grid, and associated parties located within the limits of this ISMP preparing the remedial documents submitted to the NYSDEC, and parties performing this work, are completely responsible for the safe performance of all intrusive work, the structural integrity of excavations, proper disposal of any liquid dewatered from the excavation, control of run-off from open excavations into remaining contamination, and for structures that may be affected by excavations (such as building foundations and bridge footings). National Grid will ensure that Site development activities will not interfere with, or otherwise impair or compromise, the engineering controls described in this ISMP.

2.3.2 Soil Vapor Intrusion Evaluation

Prior to the construction of any enclosed structures located over areas with impacted soil an SVI evaluation will be performed to determine whether any mitigation measures are necessary to eliminate potential exposure to vapors in the proposed structure. Alternatively, an SVI mitigation system may be installed as an element of the building foundation without first conducting an investigation. Any SVI mitigation system will include a vapor barrier and may include passive sub-slab depressurization system that is capable of being converted to an active system. A passive system may be acceptable if it is deemed effective over time at mitigating contaminated vapors through multiple rounds of sampling.

Prior to conducting an SVI investigation or installing a mitigation system, a work plan will be developed and submitted to the NYSDEC and NYSDOH for approval. This work plan will be developed in accordance with the most recent NYSDOH "Guidance for Evaluating Vapor Intrusion in the State of New York." Measures to be employed to mitigate potential vapor intrusion will be evaluated, selected, designed, installed, and maintained based on the SVI evaluation, the NYSDOH guidance, and construction details of the proposed structure.

Preliminary (unvalidated) SVI sampling data from any SVI investigation will be forwarded by National Grid, in accordance with the Responsibility Matrix (Table 2-1), to the NYSDEC and NYSDOH for initial review and interpretation. Upon validation by National Grid, the final data will be transmitted to the agencies, along with a recommendation for any follow-up action, such as a mitigation system.

SVI sampling results, evaluations, follow-up actions, and any other work related to SVI will also be summarized in the next inspection and data submittal report, and thereafter as appropriate.

2.4 Inspections and Notifications

2.4.1 Inspections

Inspections of all remedial components (ECs and ICs) installed at the Site will be conducted in accordance with the Responsibility Matrix (Table 2-1), at the frequency specified in the ISMP Monitoring Plan schedule. A comprehensive Site-wide inspection will be conducted annually, and will determine and document the following:

- Whether ECs continue to perform as designed;
- If these ECs continue to be protective of human health and the environment;
- Compliance with requirements of this ISMP;
- Achievement of remedial performance criteria, if any;
- Sampling and analysis of appropriate media during monitoring events, if required and when available;
- If Site records are complete and up to date; and
- Changes, or needed changes, to the remedial or monitoring system.

Inspections will be conducted in accordance with the procedures set forth in the Monitoring Plan of this ISMP (Section 3). The reporting requirements are outlined in the Reporting section of this plan (Section 5).

If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs, an inspection of the Site will be conducted within 5 days of the event, or as soon as safely possible. The inspection will be to verify the effectiveness of the EC/ICs implemented at the Site and will be conducted by a qualified environmental professional as determined by NYSDEC.

2.4.2 Notifications and Planning

2.4.2.1 Notifications

Notifications will be submitted by the property owner to the NYSDEC and National Grid as needed for the following reasons:

- 60-day advance notice of any proposed changes in property use;
- 30-business day advance notice of any proposed ground-intrusive activities pursuant to the EWP;
- Notice within 48-hours of any damage or defect to the foundations structures that reduces or has the potential to reduce the effectiveness of other ECs and likewise any action to be taken to mitigate the damage or defect;
- Verbal notice by noon of the following day of any emergency, such as a fire, flood, or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the affected property, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public; and
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action shall be submitted to the NYSDEC within 45 days and shall describe and document actions taken to restore the effectiveness of the ECs.

National Grid Site Investigation and Remediation (SIR) department reserves the right to have a representative on-site, as appropriate, during any ground-intrusive work activities to observe activities and document compliance with this ISMP.

Any proposed change in the ownership or the use of the Site or the responsibility for implementing this ISMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC and National Grid will be notified in writing of the proposed change. This will include a certification that the prospective purchaser has been provided with a copy of the OCAS, and all approved work plans and reports, including this ISMP; and
- Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing by National Grid.

All notifications will be submitted to:

National Grid SIR Project Manager:
Name: Donald Campbell
Address: 287 Maspeth Avenue, Brooklyn, New York 11211
Telephone: (718) 963-5453
Fax: (347) 429-8079
Email: donald.campbell@nationalgrid.com

New York State Department of Environmental Conservation Project Manager:
Name: Scott Deyette
Address: New York State Department of Environmental Conservation
Division of Environmental Remediation, Remedial Bureau C
625 Broadway Albany, New York 12233-7014

Telephone: (518) 402-9662
Fax: (518) 402-9679
Email: scott.deyette@dec.ny.gov

2.5 Contingency Plan

Emergencies may include injury to authorized site personnel, fire or explosion, environmental release, or serious weather conditions.

2.5.1 Emergency Telephone Numbers

In the event of any environmentally related situation or unplanned occurrence requiring assistance the property owner or property owner's representative(s) or the National Grid should contact the appropriate party from the contact list provided in Table 2-2. For emergencies, appropriate emergency response personnel should be contacted. Prompt contact should also be made to National Grid's environmental consultant, who at the date of latest publication is AECOM. This emergency contact list must be maintained in an easily accessible location at the Site and in locations easily accessed by the National Grid project manager and National Grid's environmental consultant's project manager.

2.5.2 Map and Directions to Nearest Health Facility

If life-threatening emergency medical treatment is needed: dial 911.

If non-life-threatening medical treatment is required, the nearest emergency room is:

Site Location:	195 65th Street, Brooklyn, NY
Nearest Hospital Name:	Maimonides Medical Center
Hospital Location:	4802 10th Avenue, Brooklyn, NY 11219 Emergency Medicine – Fort Hamilton Parkway (between 48th and 49th Street, Brooklyn, NY 11219
Hospital Telephone:	(718) 283-6000; (718) 283-6010 (Emergency Medicine)

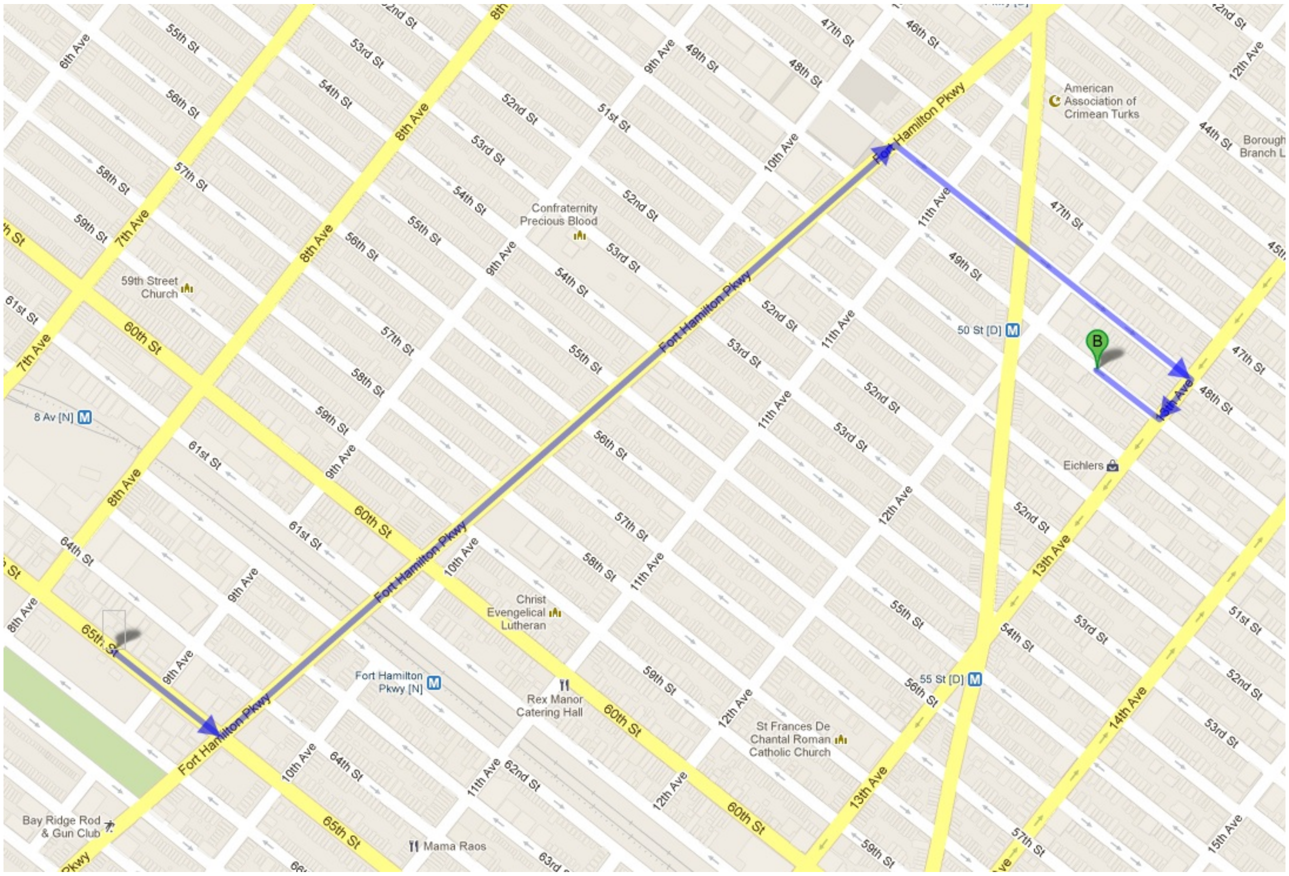
Directions to the Hospital:

1. Head southeast on 65th St towards 9th Avenue (0.1 mile)
2. Take the 2nd left onto Fort Hamilton Parkway (0.9 miles)
3. Turn right onto 48th Street (0.4 miles)
4. Turn right onto 13th Avenue (259 feet)
5. Take the 1st right onto 49th Street (404 feet)
6. Hospital will be on right

   Total Distance: 1.5 miles

   Total Estimated Time: 6 minutes

Map Showing Route from the Site to the Hospital:



2.5.3 Response Procedures

As appropriate, the fire department and other emergency response group will be notified immediately by telephone of an emergency. The emergency telephone number list is found in Table 2-2 of this Contingency Plan. The list will also be posted prominently at the Site and made readily available to all personnel at all times.

2.5.3.1 Emergency Spill Response

Should a spill of petroleum, chemicals, contaminated soil and/or groundwater or other hazardous material occur, immediately employ methods to control or stop the migration of the spilled material, if feasible. If the release is significant or has impacted soil or groundwater, immediately notify the appropriate response agency. The following information must be provided:

- Time and location of spill;
- Type and nature of material spilled;
- Amount of material spilled;
- Whether the spill has affected or has the potential to affect a waterway or sewer;
- A brief description of the affected areas/equipment; and

- The expected time of cleanup completion.

Cleanup and reporting procedures will be in accordance with applicable local, state and federal regulations.

3.0 Site Monitoring Plan

3.1 Introduction

3.1.1 General

The Monitoring Plan describes the measures for evaluating the performance and effectiveness of the implemented ECs to reduce or mitigate impacts at the Site and all affected site media identified below. ECs at the Site include CCS and secured Site access. This Monitoring Plan may only be revised with the approval of NYSDEC. This Monitoring Plan is an integral part of the ISMP.

3.1.2 Purpose and Schedule

This Monitoring Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., groundwater, indoor air, soil vapor, soils);
- Assessing compliance with applicable NYSDEC standards, criteria and guidance, particularly ambient groundwater standards and Part 375 SCOs for soil;
- Assessing achievement of the remedial performance criteria, if any;
- Evaluating Site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment; and
- Preparing reports for the monitoring activities.

To adequately address these issues, this Monitoring Plan provides information on:

- Sampling locations, protocol, and frequency;
- Information on all designed monitoring systems (e.g., well logs);
- Analytical sampling program requirements;
- Reporting requirements;
- Quality Assurance/Quality Control (QA/QC) requirements;
- Inspection and maintenance requirements for monitoring wells;
- Monitoring well decommissioning procedures; and
- Annual inspection and periodic certification.

Annual groundwater sampling is part of the Site Monitoring Program and will be conducted to evaluate trends in groundwater impacts. Annual groundwater sampling will be conducted by National Grid, in accordance with the Responsibility Matrix (Table 2-1), for three (3) years following approval of the ISMP (anticipated completion date: 2017). The frequency thereafter will be decided upon by NYSDEC, with input from National Grid and National Grid's environmental consultant, with reference to all available reports and analytical data since approval of the ISMP. Monitoring programs are summarized in Table 3-1 and outlined in detail in Sections 3.2, 3.3, and 3.4 below.

3.2 Cover System Monitoring

The CCS EC will be inspected annually by a NYS licensed professional engineer or qualified environmental professional to confirm that the cover system is intact, remains unchanged, and continues to be protective of human health and the environment. The inspection will be completed by an individual who is familiar with the cover system and the Site. The annual inspections will be documented on the Annual Inspection and Certification Checklist provided in Appendix D. The form provides a checklist to document if there are any changes since the previous year’s inspection and that the ECs continues to operate as intended. A survey of the composite cover may be completed if changes in the cover occur during the year or if changes are noted in the annual inspection. The survey will be completed by the NYS licensed surveyor and referenced NAVD 88 vertical datum to an accuracy of 0.01 ±foot and referenced to North American Datum (NAD 83).

If an emergency, such as a natural disaster or unforeseen failure of the ECs occurs, an inspection of the affected property will be conducted by a qualified environmental professional within five business days of the event to verify the effectiveness of the composite cover.

3.3 Chain Link Fence

The Chain Link Fence (Secured Site Access) EC will be inspected annually to confirm that the chain link fence is intact, remains secure, and continues to be protective of human health and the environment. The inspection will be completed by an individual that is familiar with the Site and previous conditions. The annual inspections will be documented on the Annual Inspection and Certification Checklist provided in Appendix D. The form provides a checklist to document if there are any changes since the previous year’s inspection and/or if the EC continues to operate as intended.

If an emergency, such as a natural disaster or unforeseen failure of the EC occurs, an inspection of the affected property will be conducted by a qualified environmental professional within five business days, or when safely possible, of the event to verify the effectiveness of the chain link fence.

3.4 Groundwater Monitoring Program

Groundwater monitoring will be performed annually for the first three (3) years following approval of the ISMP, and as required thereafter, to assess trends in groundwater impacts. A network of monitoring wells (Figure 1-6) has been installed to monitor groundwater conditions at the Site. The network of wells has been designed based on the following criteria:

- Monitoring wells MW-105 and MW-106 were installed in the first-encountered, overburden, water-bearing zone, to determine the upgradient/downgradient groundwater conditions;
- Monitoring well MW-112 was installed in the first-encountered, overburden water-bearing zone at the Site, to determine the side-gradient groundwater conditions; and
- Monitoring well MW-111 was installed in the first-encountered, overburden water-bearing zone at the Site, to determine the Site groundwater conditions.

Monitoring well construction details are included in Table 3-2. Monitoring well boring and construction logs are included in Appendix E.

3.4.1 Monitoring Schedule

The monitoring well network will be monitored annually for a period of three years and then as required thereafter to assess trends in groundwater impacts. Groundwater monitoring may be discontinued with the approval of NYSDEC in monitoring wells if concentrations are below NYS AWQSGVs for three consecutive sampling events, asymptotic groundwater conditions exist, or as directed by the NYSDEC.

The sampling frequency may be modified with the approval NYSDEC. The ISMP will be modified to reflect changes in sampling plans approved by NYSDEC.

Deliverables for the groundwater monitoring program are specified below.

3.4.2 Sampling Protocol

All monitoring well sampling activities will be performed by National Grid, in accordance with the Responsibility Matrix (Table 2-1) and will be recorded in a field book and a groundwater-sampling log presented in Standard Operating Procedures included in Appendix F. Other observations (e.g., well integrity, etc.) will be noted on the well sampling log. The well sampling log will serve as the inspection form for the groundwater monitoring well network. Each sample will be collected utilizing low flow groundwater sampling collection methods provided in the Field Sampling Plan (Appendix G).

Purging and sampling of groundwater monitoring wells will be conducted using the low-flow sampling technique specified by the USEPA. Groundwater from the wells will be purged until field parameters stabilize, up to three well volumes are removed, or 1 hour of continuous purging is performed. If a well goes dry before the required volumes are removed, the well will be allowed to recover, purged a second time until dry or the required parameters are met, and sampled when it recovers sufficiently, in accordance with low-flow sampling protocol.

Each groundwater sample will be analyzed for VOCs via USEPA Method 8260, SVOCs via USEPA Method 8270, and Resource Conservation and Recovery Act (RCRA) metals by a NYSDOH environmental laboratory approval program (ELAP) certified laboratory. The groundwater samples will be collected, handled, and analyzed according to the Quality Assurance Project Plan, and any subsequent revisions [(QAPP), Appendix H].

3.4.3 Monitoring Well Repairs, Replacement and Decommissioning

Monitoring wells will be inspected during annual sampling events by National Grid, in accordance with the Responsibility Matrix (Table 2-1). The well sampling log will serve as the inspection form for the groundwater monitoring well network. In particular, wells will be inspected for:

- Decreased flow conditions through the well screen, as indicated by reduced pump flow rates. One cause of such reduced flow is biofouling. If needed to increase flow through the well screen, the well will be redeveloped by physically agitating/surging by National Grid, in accordance with the Responsibility Matrix (Table 2-1);
- Silt accumulation, by checking depth to bottom of the monitoring well and comparing it to previous measurements. If silt accumulation occurs in any Site monitoring wells, the well will be redeveloped by physically agitating/surging; and

- Damage rendering the well unusable. In such a case, the monitoring well will be properly decommissioned and replaced by National Grid, in accordance with the Responsibility Matrix (Table 2-1).

Repairs and/or replacement of wells in the monitoring well network will be completed based on assessments of structural integrity and overall performance.

The NYSDEC will be notified prior to any repair or decommissioning of monitoring wells for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent periodic report. Well decommissioning without replacement will be done only with the prior approval of NYSDEC. Well abandonment will be performed in accordance with NYSDEC's "Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be reinstalled in the nearest possible location, unless otherwise approved by the NYSDEC.

3.5 Site-Wide Inspection

Site-wide inspections will be performed by National Grid, in accordance with the Responsibility Matrix (Table 2-1), on a regular schedule at a minimum of once a year. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring wells. During these inspections, an inspection form will be completed (Appendix D). The form will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General Site conditions at the time of the inspection;
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection;
- Compliance with permits and schedules included in the Operation and Maintenance Plan; and
- Confirm that Site records are up to date.

3.6 Monitoring Quality Assurance/Quality Control

All sampling and analyses will be performed in accordance with the requirements of the QAPP prepared for the Site (Appendix H). Main Components of the QAPP include:

- QA/QC Objectives for Data Measurement;
- Sampling Program:
    - Sample containers will be properly washed and decontaminated and appropriate preservative will be added (if applicable) prior to their use by the analytical laboratory. Containers with preservative will be labeled appropriately.
    - Sample holding times will be in accordance with the NYSDEC Analytical Services Protocol (ASP) requirements.

  - Field QC samples (e.g., trip blanks, coded field duplicates, and matrix spike/matrix spike duplicates) will be collected as necessary.
- Sample Tracking and Custody;
- Calibration Procedures:
  - All field analytical equipment will be calibrated immediately prior to each day's use. Calibration procedures will conform to manufacturer's standard instructions.
  - The analytical laboratory will follow all calibration procedures and schedules as specified in USEPA SW-846 and subsequent updates that apply to the instruments used for the analytical methods.
- Analytical Procedures;
- Preparation of a Data Usability Summary Report (DUSR), which will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain of custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method.
- Internal QC and Checks;
- QA Performance and System Audits;
- Preventative Maintenance Procedures and Schedules; and
- Corrective Action Measures.

3.7 Monitoring Reporting Requirements

Forms and any other information generated during regular monitoring events and inspections will be kept on file. All forms, and other relevant reporting formats used during the monitoring/inspection events, will be

- Subject to approval by NYSDEC; and
- Submitted at the time of the inspection and data submittal report, as specified in the Reporting Plan of this ISMP.

All monitoring results will be reported to the NYSDEC in the report. A letter report will also be prepared, subsequent to each sampling event. The report will include, at a minimum:

- Date of event;
- Personnel conducting sampling;
- Description of the activities performed;
- Type of samples collected (e.g., groundwater, soil);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;

- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations;
- A determination as to whether groundwater conditions have changed since the last reporting event; and,
- All types of reports that will be submitted within a calendar year and what information will be provided in each type of report.

Data will be reported in hard copy and/or digital format as determined by NYSDEC. A summary of the monitoring program deliverables are summarized in Table 3-3.

4.0 Operation and Maintenance Plan

4.1 Introduction

The Site remedy does not rely on any mechanical systems to protect public health and the environment. Examples of mechanical remedies may include sub-slab depressurization systems or air sparge/soil vapor extraction systems. Since there are no mechanical systems at the Site, the operation and maintenance of such components is not included in this ISMP.

5.0 Inspections, Reporting and Certifications

5.1 Site Inspections

5.1.1 Inspection Frequency

All inspections will be conducted by National Grid in accordance with the Responsibility Matrix, attached as Table 2-1, at the frequency specified in the schedules provided in Section 3 – Monitoring Plan of this ISMP. At a minimum, a site-wide inspection will be conducted annually. Inspections of the chain link fence will also be conducted whenever a severe condition has taken place, such as an erosion or flooding event that may affect the EC.

5.1.2 Inspection Forms, Sampling Data, and Maintenance Reports

All inspections and monitoring events will be recorded on the appropriate forms for their respective system which are contained in Appendix D. Additionally, a general Site-wide inspection form will be completed during the Site-wide inspection (see Appendix D). These forms are subject to NYSDEC revision.

All applicable inspection forms and other records, including all groundwater sampling data and system maintenance reports, generated for the Site during the reporting period will be provided in electronic format in the Periodic Review Report.

5.1.3 Evaluation of Records and Reporting

The results of the inspection and Site groundwater monitoring analytical data will be evaluated as part of the EC/IC certification to confirm that the:

- EC/ICs are in place, are performing properly, and remain effective;
- The Monitoring Plan is being implemented; and, based on the above
- The Site conditions continue to be protective of public health and the environment, and the ECs/ICs are performing as detailed in the ISMP.

5.2 Certification of Engineering and Institutional Controls

Information about ECs/ICs can be found in Section 2 – Engineering and Institutional Control Plan portion of the ISMP. Inspection of the ECs/ICs will occur at a frequency described in Section 3 – Monitoring Plan.

5.2.1 National Grid's Certification

National Grid, and/or National Grid's environmental consultant on behalf of National Grid, will document Site conditions. After the last inspection of the reporting period, a qualified environmental professional or Professional Engineer licensed to practice in New York State, as defined by NYSDEC will submit the following certification:

- For each EC/IC identified for the Site, I certify that all of the following statements are true:
    - The inspection of the Site to confirm the effectiveness of the EC/ICs required by the remedial program was performed under my direction;
    - The ECs/ICs employed at this Site are unchanged from the date the control was put in place, or last approved by the NYSDEC;
    - Nothing has occurred that would impair the ability of the control to protect the public health and environment;
    - Nothing has occurred that would constitute a violation or failure to comply with any interim site management plan for this control;
    - Access is available to the Site upon request by the NYSDEC and NYSDOH to evaluate continued maintenance of such controls;
    - The ECs are performing as designed and are effective;
    - To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the Site remedial program and generally accepted engineering practices; and
    - The information presented in this report is accurate and complete.
- I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class “A” misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner or Owner’s Designated Site Representative] for the site.

The signed certifications will be included in the inspection and data submittal report described below.

5.3 Inspection and Data Submittal Report

An inspection and data submittal report will be submitted by National Grid to the NYSDEC every year after the approval of the ISMP. The frequency of these reports may be reduced in subsequent years if approved by the NYSDEC. The report will be prepared in accordance with NYSDEC DER-10 and submitted within 30 days of the end of each certification period. Groundwater sampling results will also be incorporated into the inspection and data submittal report. Specifically, the report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the Site;
- Results of the required annual Site inspections and severe condition inspections, if applicable;
- All applicable inspection forms and other records generated for the Site during the reporting period in electronic format;
- A summary of any discharge monitoring data and/or information generated during the reporting period with comments and conclusions;
- Data summary tables and graphical representations of contaminants of concern by media (e.g., groundwater), which include a listing of all compounds analyzed, along with the

applicable standards, and all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends;

- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted electronically in a NYSDEC-approved format; and
- A site evaluation, which includes the following:
  - The compliance of the EC/ICs with the requirements of the ISMP;
  - Any new conclusions or observations regarding site residual MGP contamination based on inspections or data generated by the Monitoring Plan for the media being monitored;
  - Recommendations regarding any necessary changes to the remedy and/or Monitoring Plan; and
  - The overall performance and effectiveness of the remedy.

The inspection and data submittal report will be submitted, in hard-copy format, to the NYSDEC Central Office and in electronic format to NYSDEC Central Office and the NYSDOH Bureau of Environmental Exposure Investigation.

5.4 Corrective Measures Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control, a corrective measures plan will be submitted to the NYSDEC by National Grid in accordance with the Responsibility Matrix, attached as Table 2-1. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the corrective measures plan until it is approved by the NYSDEC.

6.0 References

AECOM, 2010. Site Characterization Work Plan, Former Bay Ridge Holder Station A&B Site, Brooklyn, New York, Prepared for National Grid, Brooklyn, NY. January 22, 2010.

AECOM, 2012. Site Characterization Report, Former Bay Ridge Holder Station A&B Site, Brooklyn, New York, Prepared for National Grid, Brooklyn, NY. March 2012.

AECOM, 2013. Supplemental Site Characterization Field Activities Letter Work Plan, Former Bay Ridge Holder Station B Site, Brooklyn, New York, Prepared for National Grid, Brooklyn, NY. April 12, 2013.

AECOM, 2014. Revised Supplemental Site Characterization Results Report, Former Bay Ridge Holder Station B Site, Brooklyn, New York, Prepared for National Grid, Brooklyn, NY. September 15, 2014.

New York State Department of Environmental Conservation (NYSDEC), 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, Division of Water Technical and Operational Guidance Series (1.1.1), June 1998.

NYSDEC, 2007. Order on Consent and Administrative Settlement - In the matter of the Development and Implementation of Remedial Programs for Former MGPs and Gas Holder Locations Under Article 27, Title 13 of the ECL by Brooklyn Union, Index # A2-0552-0606, March 2007.

NYSDEC, 2010. DER-10, Technical Guidance for Site Investigation and Remediation.

Vanasse Hangen Brustlin, Inc. (VHB), 2000. Environmental Site Assessment Report, Bay Ridge Little League Baseball Fields, Bay Ridge, New York, May 2000.

Tables

Table 1-1
Summary of Surface Soil Analytical Results Above Restricted Residential and Commercial Use SCOs
Interim Site Management Plan
Former Bay Ridge Holder Stations A & B Site - Operable Unit 2
Brooklyn, New York

Sample Location Sample Date Sample Interval (feet)	CAS Number	NYSDEC Part 375-6 Restricted Residential	NYSDEC Part 375-6 Commercial	SS-08 3/13/2000 (0-0.2)	SS-09 3/13/2000 (0-0.2)	SS-10 3/13/2000 (0-0.2)	SS-19 3/14/2000 (0-0.2)	SS-19 DUP 3/14/2000 (0-0.2)	SS-20 3/14/2000 (0-0.2)	SS-21 3/14/2000 (0-0.2)
Volatile Organic Compounds (VOCs)(mg/Kg)										
Methylene chloride	75-09-2	100	500	ND	ND	ND	**2 J**	**1 J**	**1 J**	**1 J**
Semi Volatile Organic Compounds (SVOC) (mg/Kg)										
Acenaphthene	83-32-9	100	500	ND	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	56-55-3	1	5.6	ND	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	50-32-8	1	1	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	205-99-2	1	5.6	ND	**0.022 J**	ND	ND	ND	ND	ND
Benzo(ghi)perylene	191-24-2	100	500	ND	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	207-08-9	3.9	56	ND	ND	ND	ND	ND	ND	ND
bis(2-Ethylhexyl) phthalate	117-81-7	NL	NL	ND	**0.260 J**	**0.140 J**	**0.360 B**	**0.390 B**	ND	**0.180 BJ**
Butyl benzyl phthalate	85-68-7	NL	NL	ND	ND	ND	ND	ND	ND	ND
Chrysene	218-01-9	3.9	56	ND	ND	**0.017 J**	ND	ND	ND	ND
Di-n-butyl phthalate	84-74-2	NL	NL	ND	ND	**0.028 J**	ND	ND	ND	ND
Di-n-octyl phthalate	117-84-0	NL	NL	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	206-44-0	100	500	ND	ND	**0.034 J**	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	193-39-5	0.5	5.6	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	85-01-8	100	500	ND	ND	ND	ND	ND	ND	ND
Pyrene	129-00-0	100	500	ND	ND	ND	ND	ND	ND	ND
Total SVOCs		NL	NL	ND	**0.282**	**0.219**	ND	ND	ND	ND
Metals (mg/Kg)										
Aluminum	7429-90-5	NL	NL	**2470**	**2490**	NA	NA	NA	NA	NA
Antimony	7440-36-0	NL	NL	ND	**0.68 J**	NA	NA	NA	NA	NA
Arsenic	7440-38-2	16	16	**3.3**	**3.6**	**5**	**1.7**	**2**	**3.5**	**3**
Barium	7440-39-3	400	400	**11.8 J**	**11.5 J**	**12.3 J**	**6.9 J**	**9.6 J**	**14.4 J**	**13.6 J**
Beryllium	7440-41-7	72	590	**0.28 J**	**0.27 J**	NA	NA	NA	NA	NA
Cadmium	7440-43-9	4.3	9.3	ND	ND	ND	ND	ND	ND	ND
Calcium	7440-70-2	NL	NL	**400 J**	**561**	NA	NA	NA	NA	NA
Chromium	7440-47-3	180	1500	**6.9 J**	**8.7 J**	**12.9 J**	**4.2 J**	**5.1 J**	**8.6 J**	**8.2 J**
Cobalt	7440-48-4	NL	NL	**2.7 J**	**2.6 J**	NA	NA	NA	NA	NA
Copper	7440-50-8	270	270	**5.4**	**5.3**	NA	NA	NA	NA	NA
Iron	7439-89-6	NL	NL	**8180**	**8750**	NA	NA	NA	NA	NA
Lead	7439-92-1	400	1000	**5.2 J**	**4.8 J**	**6.0 J**	**3.1 J**	**3.8 J**	**4.3 J**	**6.1 J**
Magnesium	7439-95-4	NL	NL	**383 J**	**429 J**	NA	NA	NA	NA	NA
Manganese	7439-96-5	2000	10000	**85.5**	**82.6**	NA	NA	NA	NA	NA
Mercury	7439-97-6	0.81	2.8	ND	ND	ND	ND	ND	ND	ND
Nickel	7440-02-0	310	310	**3.6 J**	**2.9 J**	NA	NA	NA	NA	NA
Potassium	7440-09-7	NL	NL	**377 J**	**343 J**	NA	NA	NA	NA	NA
Selenium	7782-49-2	180	1500	ND	**0.77**	**0.71**	ND	ND	ND	ND
Silver	7440-22-4	180	1500	**0.18 J**	ND	ND	ND	ND	ND	ND
Sodium	7440-23-5	NL	NL	**505 J**	**510 J**	NA	NA	NA	NA	NA
Thallium	7440-28-0	NL	NL	ND	ND	NA	NA	NA	NA	NA
Vanadium	7440-62-2	NL	NL	**13.6**	**14.7**	NA	NA	NA	NA	NA
Zinc	7440-66-6	10000	10000	**24.9**	**86.4**	NA	NA	NA	NA	NA
Pesticides (mg/Kg)										
DDD,4,4-	72-54-8	13	92	**2 J**	**2 J**	NA	NA	NA	NA	NA
DDE,4,4-	72-55-9	8.9	62	ND	ND	NA	NA	NA	NA	NA
DDT,4,4-	50-29-3	7.9	47	**2 J**	**2 J**	NA	NA	NA	NA	NA
Delta-BHC	319-86-8	100	500	**2 J**	**2 J**	NA	NA	NA	NA	NA
Wet Chemistry (mg/Kg)										
Total Cyanide	57-12-5	27	27	ND	ND	ND	ND	ND	ND	ND
Total Organic Carbon	---	NL	NL	**2510**	**2680**	**1580**	**3120**	**3620**	**628**	**902**

Notes:

mg/Kg = milligrams per kilogram

NA = Not Analyzed

NL = Not Listed

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

J = The associated numerical value is an estimated quantity.

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

Table 1-1
Summary of Surface Soil Analytical Results Above Restricted Residential and Commercial Use SCOs
Interim Site Management Plan
Former Bay Ridge Holder Stations A & B Site - Operable Unit 2
Brooklyn, New York

Sample Location Sample Date Sample Interval (feet)	CAS Number	NYSDEC Part 375-6 Restricted Residential	NYSDEC Part 375-6 Commercial	SS-105 4/12/2010 0-0.5	SS-106 4/12/2010 0-0.5	SS-107 4/12/2010 0-0.5	SS-108 4/12/2010 0-0.5
BTEX (mg/Kg)							
Benzene	71-43-2	4.8	44	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
Ethylbenzene	100-41-4	41	390	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
m+p-Xylene	1330-20-7-M,P	NL	NL	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
o-Xylene	95-47-6	NL	NL	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
Toluene	108-88-3	100	500	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
Total Xylenes		NL	500	ND	ND	ND	ND
Total BTEX		NL	NL	ND	ND	ND	ND
Volatile Organic Compounds (VOCs)(mg/Kg)							
1,1,1-Trichloroethane	71-55-6	100	500	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
1,1,2,2-Tetrachloroethane	79-34-5	NL	NL	<0.0062 U	<0.0060 U	<0.0058 U	<0.0066 U
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	NL	NL	<0.0062 U	<0.0060 U	<0.0058 U	<0.0066 U
1,1,2-Trichloroethane	79-00-5	NL	NL	<0.0062 U	<0.0060 U	<0.0058 U	<0.0066 U
1,1-Dichloroethane	75-34-3	26	240	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
1,1-Dichloroethene	75-35-4	100	500	<0.0062 U	<0.0060 U	<0.0058 U	<0.0066 U
1,2,4-Trichlorobenzene	120-82-1	NL	NL	<0.0062 U	<0.0060 U	R	<0.0066 U
1,2-Dibromo-3-chloropropane	96-12-8	NL	NL	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
1,2-Dibromoethane	106-93-4	NL	NL	<0.0062 U	<0.0060 U	<0.0058 U	<0.0066 U
1,2-Dichlorobenzene	95-50-1	100	500	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
1,2-Dichloroethane	107-06-2	3.1	30	<0.0062 U	<0.0060 U	<0.0058 U	<0.0066 U
1,2-Dichloropropane	78-87-5	NL	NL	<0.0062 U	<0.0060 U	<0.0058 U	<0.0066 U
1,3-Dichlorobenzene	541-73-1	49	280	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
1,4-Dichlorobenzene	106-46-7	13	130	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
2-Butanone	78-93-3	100	500	R	R	R	R
2-Hexanone	591-78-6	NL	NL	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
4-Methyl-2-pentanone	108-10-1	NL	NL	<0.0062 U	<0.0060 U	<0.0058 U	<0.0066 U
Acetone	67-64-1	100	500	R	R	R	R
Bromodichloromethane	75-27-4	NL	NL	<0.0062 U	<0.0060 U	<0.0058 U	<0.0066 U
Bromoform	75-25-2	NL	NL	<0.0062 U	<0.0060 U	<0.0058 U	<0.0066 U
Bromomethane	74-83-9	NL	NL	<0.0062 UJ	<0.0060 UJ	<0.0058 U	<0.0066 UJ
Carbon disulfide	75-15-0	NL	NL	<0.0062 U	<0.0060 U	<0.0058 U	<0.0066 U
Carbon tetrachloride	56-23-5	2.4	22	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
Chlorobenzene	108-90-7	100	500	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
Chloroethane	75-00-3	NL	NL	<0.0062 UJ	<0.0060 UJ	<0.0058 U	<0.0066 UJ
Chloroform	67-66-3	49	350	<0.0062 U	<0.0060 U	<0.0058 U	<0.0066 U
Chloromethane	74-87-3	NL	NL	<0.0062 UJ	<0.0060 UJ	<0.0058 U	<0.0066 UJ
cis-1,2-Dichloroethene	156-59-2	100	500	<0.0062 U	<0.0060 U	<0.0058 U	<0.0066 U
cis-1,3-Dichloropropene	10061-01-5	NL	NL	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
Cyclohexane	110-82-7	NL	NL	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
Dibromochloromethane	124-48-1	NL	NL	<0.0062 U	<0.0060 U	<0.0058 U	<0.0066 U
Dichlorodifluoromethane	75-71-8	NL	NL	<0.0062 UJ	<0.0060 UJ	<0.0058 U	<0.0066 UJ
Isopropylbenzene	98-82-8	NL	NL	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
Methyl acetate	79-20-9	NL	NL	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
Methyl tert-butyl ether	1634-04-4	100	500	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
Methylcyclohexane	108-87-2	NL	NL	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
Methylene chloride	75-09-2	100	500	<0.0062 U	<0.0060 U	<0.0058 U	<0.0066 U
Styrene	100-42-5	NL	NL	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
Tetrachloroethene	127-18-4	19	150	<0.0062 U	<0.0060 U	<0.0058 U	<0.0066 U
trans-1,2-Dichloroethene	156-60-5	100	500	<0.0062 U	<0.0060 U	<0.0058 U	<0.0066 U
trans-1,3-Dichloropropene	10061-02-6	NL	NL	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
Trichloroethene	79-01-6	21	200	<0.0062 U	<0.0060 U	<0.0058 UJ	<0.0066 U
Trichlorofluoromethane	75-69-4	NL	NL	<0.0062 U	<0.0060 U	<0.0058 U	<0.0066 U
Vinyl chloride	75-01-4	0.9	13	<0.0062 UJ	<0.0060 UJ	<0.0058 U	<0.0066 UJ
Total VOCs		NL	NL	ND	ND	ND	ND

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Interim Site Management Plan
Former Bay Ridge Holder Stations A & B Site - Operable Unit 2
Brooklyn, New York

Sample Location Sample Date Sample Interval (feet)	CAS Number	NYSDEC Part 375-6 Restricted Residential	NYSDEC Part 375-6 Commercial	SS-105 4/12/2010 0-0.5	SS-106 4/12/2010 0-0.5	SS-107 4/12/2010 0-0.5	SS-108 4/12/2010 0-0.5
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/Kg)							
2-Methylnaphthalene	91-57-6	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
Acenaphthene	83-32-9	100	500	**0.067 J**	<0.42 U	<0.38 U	<0.4 U
Acenaphthylene	208-96-8	100	500	**0.13 J**	<0.42 U	<0.38 U	<0.4 U
Anthracene	120-12-7	100	500	**0.18 J**	<0.42 U	<0.38 U	<0.4 U
Benzo(a)anthracene	56-55-3	1	5.6	**0.59**	**0.18 J**	**0.045 J**	<0.4 U
Benzo(a)pyrene	50-32-8	1	1	**0.41**	**0.12 J**	<0.38 U	<0.4 U
Benzo(b)fluoranthene	205-99-2	1	5.6	**0.42**	**0.17 J**	<0.38 U	<0.4 U
Benzo(ghi)perylene	191-24-2	100	500	**0.43**	**0.13 J**	<0.38 U	<0.4 U
Benzo(k)fluoranthene	207-08-9	3.9	56	**0.31 J**	**0.067 J**	<0.38 U	<0.4 U
Chrysene	218-01-9	3.9	56	**0.62**	**0.17 J**	**0.041 J**	<0.4 U
Dibenz(a,h)anthracene	53-70-3	0.33	0.56	**0.11 J**	<0.42 U	<0.38 U	<0.4 U
Fluoranthene	206-44-0	100	500	**1.1**	**0.31 J**	**0.074 J**	<0.4 U
Fluorene	86-73-7	100	500	**0.072 J**	<0.42 U	<0.38 U	<0.4 U
Indeno(1,2,3-cd)pyrene	193-39-5	0.5	5.6	**0.049 J**	**0.097 J**	<0.38 U	<0.4 U
Naphthalene	91-20-3	100	500	<0.39 U	<0.42 U	<0.38 U	<0.4 U
Phenanthrene	85-01-8	100	500	**0.65**	**0.18 J**	**0.053 J**	<0.4 U
Pyrene	129-00-0	100	500	**0.97**	**0.26 J**	**0.076 J**	<0.4 U
Total PAHs		NL	NL	**6.108**	**1.684**	**0.289**	ND
Other Semi Volatile Organic Compounds (SVOC) (mg/Kg)							
1,1'-Biphenyl	92-52-4	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
2,2'-oxybis(1-Chloropropane)	108-60-1	NL	NL	<0.39 UJ	<0.42 UJ	<0.38 UJ	<0.4 UJ
2,4,5-Trichlorophenol	95-95-4	NL	NL	<0.8 U	<0.84 U	<0.77 U	<0.82 U
2,4,6-Trichlorophenol	88-06-2	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
2,4-Dichlorophenol	120-83-2	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
2,4-Dimethylphenol	105-67-9	NL	NL	<0.39 UJ	<0.42 UJ	<0.38 U	<0.4 UJ
2,4-Dinitrophenol	51-28-5	NL	NL	<0.8 UJ	<0.84 UJ	<0.77 UJ	<0.82 UJ
2,4-Dinitrotoluene	121-14-2	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
2,6-Dinitrotoluene	606-20-2	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
2-Chloronaphthalene	91-58-7	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
2-Chlorophenol	95-57-8	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
2-Methylphenol	95-48-7	100	500	<0.39 U	<0.42 U	<0.38 U	<0.4 U
2-Nitroaniline	88-74-4	NL	NL	<0.8 U	<0.84 U	<0.77 U	<0.82 U
2-Nitrophenol	88-75-5	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
3,3'-Dichlorobenzidine	91-94-1	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
3-and 4-Methylphenol	3,4-MEPH	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
3-Nitroaniline	99-09-2	NL	NL	<0.8 U	<0.84 U	<0.77 U	<0.82 U
4,6-Dinitro-2-methylphenol	534-52-1	NL	NL	<0.8 U	<0.84 U	<0.77 U	<0.82 U
4-Bromophenyl phenyl ether	101-55-3	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
4-Chloro-3-methylphenol	59-50-7	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
4-Chloroaniline	106-47-8	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
4-Chlorophenyl phenyl ether	7005-72-3	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
4-Nitroaniline	100-01-6	NL	NL	<0.8 U	<0.84 U	<0.77 U	<0.82 U
4-Nitrophenol	100-02-7	NL	NL	<0.8 U	<0.84 U	<0.77 U	<0.82 U
Acetophenone	98-86-2	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
Atrazine	1912-24-9	NL	NL	<0.39 UJ	<0.42 UJ	<0.38 UJ	<0.4 UJ
Benzaldehyde	100-52-7	NL	NL	<0.39 UJ	<0.42 UJ	<0.38 UJ	<0.4 UJ
bis(2-Chloroethoxy)methane	111-91-1	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
bis(2-Chloroethyl) ether	111-44-4	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
bis(2-Ethylhexyl) phthalate	117-81-7	NL	NL	**1.1**	**0.45**	**0.11 J**	**0.052 J**
Butyl benzyl phthalate	85-68-7	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
Caprolactam	105-60-2	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
Carbazole	86-74-8	NL	NL	**0.07 J**	<0.42 U	<0.38 U	<0.4 U
Dibenzofuran	132-64-9	59	350	**0.042 J**	<0.42 U	<0.38 U	<0.4 U
Diethyl phthalate	84-66-2	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
Dimethyl phthalate	131-11-3	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
Di-n-butyl phthalate	84-74-2	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
Di-n-octyl phthalate	117-84-0	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
Hexachlorobenzene	118-74-1	1.2	6	<0.39 U	<0.42 U	<0.38 U	<0.4 U
Hexachlorobutadiene	87-68-3	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
Hexachlorocyclopentadiene	77-47-4	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
Hexachloroethane	67-72-1	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
Isophorone	78-59-1	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
Nitrobenzene	98-95-3	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
N-Nitrosodi-n-propylamine	621-64-7	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
N-Nitrosodiphenylamine	86-30-6	NL	NL	<0.39 U	<0.42 U	<0.38 U	<0.4 U
Pentachlorophenol	87-86-5	6.7	6.7	<0.8 U	<0.84 U	<0.77 U	<0.82 U
Phenol	108-95-2	100	500	<0.39 U	<0.42 U	<0.38 U	<0.4 U
Total SVOCs		NL	NL	**1.212**	**0.45**	**0.11**	**0.052**

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Former Bay Ridge Holder Stations A & B Site - Operable Unit 2
Brooklyn, New York

Sample Location Sample Date Sample Interval (feet)	CAS Number	NYSDEC Part 375-6 Restricted Residential	NYSDEC Part 375-6 Commercial	SS-105 4/12/2010 0-0.5	SS-106 4/12/2010 0-0.5	SS-107 4/12/2010 0-0.5	SS-108 4/12/2010 0-0.5
Metals (mg/Kg)							
Aluminum	7429-90-5	NL	NL	**8240 J**	**6570 J**	**11100 J**	**10300 J**
Antimony	7440-36-0	NL	NL	<0.80 UJ	<0.94 UJ	<0.96 UJ	<0.79 UJ
Arsenic	7440-38-2	16	16	**10.4 J**	**6.2 J**	**8.3 J**	**7.2 J**
Barium	7440-39-3	400	400	**56.8 J**	**96.2 J**	**35.7 J**	**24.0 J**
Beryllium	7440-41-7	72	590	**0.54 J**	**0.45 J**	**0.61 J**	**0.56 J**
Cadmium	7440-43-9	4.3	9.3	**0.36**	**0.35**	**0.23 J**	**0.17 J**
Calcium	7440-70-2	NL	NL	**5330 J**	**5560 J**	**963 J**	**707 J**
Chromium	7440-47-3	180	1500	**24.7 J**	**15.8 J**	**27.7 J**	**28.0 J**
Cobalt	7440-48-4	NL	NL	**3.5 J**	**3.9 J**	**2.9 J**	**3.2 J**
Copper	7440-50-8	270	270	**36.5**	**89.2**	**10.6**	**6**
Iron	7439-89-6	NL	NL	**19500 J**	**11100 J**	**31700 J**	**28200 J**
Lead	7439-92-1	400	1000	**44.3 J**	**81.9 J**	**10.2 J**	**6.8 J**
Magnesium	7439-95-4	NL	NL	**2550 J**	**1700 J**	**601 J**	**554 J**
Manganese	7439-96-5	2000	10000	**165 J**	**244 J**	**119 J**	**133 J**
Mercury	7439-97-6	0.81	2.8	**0.18**	**0.29**	**0.038 J**	**0.021 J**
Nickel	7440-02-0	310	310	**8.8 J**	**10.8 J**	**5.9 J**	**4.4 J**
Potassium	7440-09-7	NL	NL	**861 J**	**717 J**	**753 J**	**693 J**
Selenium	7782-49-2	180	1500	**1.8**	**1.8**	**3.5**	**2.5**
Silver	7440-22-4	180	1500	**0.43 J**	**1.4 J**	**0.19 J**	**0.12 J**
Sodium	7440-23-5	NL	NL	**70**	**222**	**54.3 J**	<40 U
Thallium	7440-28-0	NL	NL	**1.4**	**1.4**	**0.89 J**	**1.3**
Vanadium	7440-62-2	NL	NL	**28.0 J**	**16.4 J**	**38.9 J**	**33.2 J**
Zinc	7440-66-6	10000	10000	**178 J**	**148 J**	**31.5 J**	**20.2 J**
Cyanide (mg/Kg)							
Total Cyanide	57-12-5	27	27	<2.3 U	<2.5 U	<2.3 U	<2.5 U
Pesticides (mg/Kg)							
Aldrin	309-00-2	0.097	0.68	<0.016 U	<0.017 U	<0.0020 U	<0.0021 U
Alpha-BHC	319-84-6	0.48	3.4	<0.016 U	<0.017 U	<0.0020 U	<0.0021 U
Beta-BHC	319-85-7	0.36	3	<0.016 U	<0.017 U	<0.0020 UJ	<0.0021 U
Chlordane, alpha	5103-71-9	4.2	24	<0.016 U	**0.035**	<0.0020 U	<0.0021 U
Chlordane, trans-	5103-74-2	NL	NL	**0.079 NJ**	**0.13 J**	0.0020 U	<0.0021 U
DDD,4,4-	72-54-8	13	92	<0.031 U	<0.033 U	<0.0038 U	<0.0040 U
DDE,4,4-	72-55-9	8.9	62	<0.031 U	<0.033 U	<0.0038 UJ	<0.0040 U
DDT,4,4-	50-29-3	7.9	47	<0.031 U	<0.033 U	<0.0038 U	<0.0040 U
Delta-BHC	319-86-8	100	500	<0.016 U	<0.017 U	<0.0020 U	<0.0021 U
Dieldrin	60-57-1	0.2	1.4	<0.031 U	<0.033 U	<0.0038 UJ	<0.0040 U
Endosulfan I	959-98-8	24	200	<0.016 U	<0.017 U	<0.0020 U	<0.0021 U
Endosulfan II	33213-65-9	24	200	<0.031 U	<0.033 U	<0.0038 U	<0.0040 U
Endosulfan sulfate	1031-07-8	24	200	<0.031 U	<0.033 U	<0.0038 U	<0.0040 U
Endrin	72-20-8	11	89	<0.031 U	<0.033 U	<0.0038 U	<0.0040 U
Endrin aldehyde	7421-93-4	NL	NL	<0.031 U	<0.033 U	<0.0038 UJ	<0.0040 U
Endrin ketone	53494-70-5	NL	NL	<0.031 U	<0.033 U	<0.0038 U	<0.0040 U
Gamma BHC - Lindane	58-89-9	1.3	9.2	<0.016 U	<0.017 U	<0.0020 UJ	<0.0021 U
Heptachlor	76-44-8	2.1	15	<0.016 U	<0.017 U	<0.0020 U	<0.0021 U
Heptachlor Epoxide	1024-57-3	NL	NL	<0.016 U	<0.017 U	<0.0020 UJ	<0.0021 U
Methoxychlor	72-43-5	NL	NL	<0.16 U	<0.17 U	<0.02 UJ	<0.021 U
Toxaphene	8001-35-2	NL	NL	<1.6 U	<1.7 U	<0.2 U	<0.21 U
PCBs (mg/Kg)							
Aroclor 1016	12674-11-2	NL	NL	<0.039 U	<0.042 U	<0.038 U	<0.04 U
Aroclor 1221	11104-28-2	NL	NL	<0.039 U	<0.042 U	<0.038 U	<0.04 U
Aroclor 1232	11141-16-5	NL	NL	<0.039 U	<0.042 U	<0.038 U	<0.04 U
Aroclor 1242	53469-21-9	NL	NL	<0.039 U	<0.042 U	<0.038 U	<0.04 U
Aroclor 1248	12672-29-6	NL	NL	<0.039 U	<0.042 U	<0.038 U	<0.04 U
Aroclor 1254	11097-69-1	NL	NL	<0.039 U	<0.042 U	<0.038 U	<0.04 U
Aroclor 1260	11096-82-5	NL	NL	<0.039 U	<0.042 U	<0.038 U	<0.04 U
Aroclor 1262	37324-23-5	NL	NL	<0.039 U	<0.042 U	<0.038 U	<0.04 U
Aroclor 1268	11100-14-4	NL	NL	<0.039 U	<0.042 U	<0.038 U	<0.04 U
PCB (Total) (ppm)		NL	NL	ND	ND	ND	ND
Herbicides (mg/Kg)							
2,4,5-TP (Silvex)	93-72-1	100	500	<0.00380 U	<0.00438 U	<0.00430 U	<0.00428 U
2,4-D	94-75-7	NL	NL	<0.00411 U	<0.00473 U	<0.00465 U	<0.00463 U
2,4-DB	94-82-6	NL	NL	<0.00579 U	<0.00666 U	<0.00654 U	<0.00652 U
T,2,4,5-	93-76-5	NL	NL	<0.00549 U	<0.00632 U	<0.00620 U	<0.00618 U
Percent Solids							
Percent Solids	SOLIDS	NL	NL	**86.2**	**74.2**	**78.9**	**77.5**
Moisture, percent							
Moisture, percent	MOIST	NL	NL	**16**	**22**	**14**	**19**

Notes:

mg/Kg = milligrams per kilogram

NA = Not Analyzed

ND = Not Detected

NL = Not Listed

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.

Table 1-2
Summary of Subsurface Soil Analytical Results Above Restricted Residential and Commercial Use SCOs
Interim Site Management Plan
Former Bay Ridge Holder Stations A & B Site - Operable Unit 2
Brooklyn, New York

Sample Location Sample Date Sample Interval (feet)	NYSDEC Part 375-6 Restricted Residential	NYSDEC Part 375-6 Commercial	SB-8A 3/15/2000 (4-6)	SB-8B 3/15/2000 (15-18)	SB-8BD 3/15/2000 (15-18)	SB-9A 3/15/2000 (3-5)	SB-9B 3/15/2000 (15-16)	SB-10A 3/15/2000 (5-6.3)
VOCs (mg/Kg)								
Benzene	4.8	44	ND	ND	ND	**0.002 J**	0.014	ND
Methylene Chloride	100	500	**0.002 J**	**0.002 J**	**0.001 J**	**0.002 J**	**0.002 J**	**0.002 J**
Toluene	100	500	**0.005**	**0.0001 J**	**0.001 J**	**0.004 J**	**0.013**	ND
Xylenes (total)	100	500	ND	ND	ND	ND	**0.003 J**	ND
SVOCs (mg/Kg)								
2-Methylnaphthalene	NL	NL	ND	ND	ND	ND	**1.7**	ND
Acenaphthene	100	500	ND	ND	ND	ND	**4.7**	ND
Acenaphthylene	100	500	ND	ND	ND	ND	**1.1**	ND
Anthracene	100	500	**0.44**	ND	ND	ND	**0.8**	ND
Benzo(a)anthracene	1	5.6	**1.6**	ND	ND	**1.5**	**14**	**0.47**
Benzo(a)pyrene	1	1	**1.1**	ND	ND	**1.3**	**11**	**0.320 J**
Benzo(b)fluoranthene	1	5.6	**1.3**	ND	ND	**2**	**14**	**0.42**
Benzo(ghi)perylene	100	500	ND	ND	ND	ND	**2.3**	**0.150 J**
Benzo(k)fluoranthene	3.9	56	**0.78**	ND	ND	**0.67**	**4.2**	**0.130 J**
Bis(2-ethylhexyl)phthalate	NL	NL	ND	**0.150 BJ**	**0.100 BJ**	ND	ND	ND
Chrysene	3.9	56	**1.4**	ND	ND	**1.3**	**14**	**0.47**
Dibenz(a,h)anthracene	0.33	0.56	ND	ND	ND	ND	**0.75**	ND
Dibenzofuran	59	350	ND	ND	ND	ND	**1.8**	ND
Fluoranthene	100	500	**2.8**	ND	ND	**2.8**	**31**	**1.1**
Fluorene	100	500	ND	ND	ND	ND	**5.4**	ND
Indeno(1,2,3-cd)pyrene	0.5	5.6	ND	ND	ND	ND	**2.2**	**0.130 J**
Naphthalene	100	500	ND	ND	ND	ND	**2.6**	ND
Phenanthrene	100	500	**1.6**	ND	ND	**1.5**	**28**	**0.46**
Pyrene	100	500	**2.7**	ND	ND	**2.8**	**35**	**0.94**
Pesticides (mg/Kg)								
DDD,4,4-	13	92	NA	NA	**0.011 J**	NA	NA	NA
DDE,4,4-	8.9	62	NA	NA	ND	NA	NA	NA
Dieldrin	0.2	1.4	NA	NA	**0.011 J**	NA	NA	NA
gamma-BHC (Lindane)	0.2	1.4	NA	NA	ND	NA	NA	NA
Methoxychlor	NL	NL	NA	NA	**0.023 J**	NA	NA	NA
Metals (mg/Kg)								
Aluminum	NL	NL	**4710**	NA	NA	NA	NA	NA
Arsenic	16	16	**2.7 J**	**1.7**	**2.2**	**5.8 J**	**5.4 J**	**4.0 J**
Barium	400	400	**37.5 J**	**29.8**	**32.4 J**	**56.6 J**	**94.1 J**	**29.1 J**
Beryllium	72	590	**0.3 J**	NA	NA	NA	NA	NA
Cadmium	4.3	9.3	**ND**	ND	ND	**0.7**	ND	ND
Calcium	NL	NL	**1950**	NA	NA	NA	NA	NA
Chromium	180	1500	**17.4**	**10**	**9.4**	**14.1**	**16.6**	**13.9**
Cobalt	NL	NL	**5.3 J**	NA	NA	NA	NA	NA
Copper	270	270	**13.7**	NA	NA	NA	NA	NA
Iron	NL	NL	**8910**	NA	NA	NA	NA	NA
Lead	400	1000	**189 J**	**5.9**	**4.7 J**	**206 J**	**284 J**	**22.2 J**
Magnesium	NL	NL	**1620 J**	NA	NA	NA	NA	NA
Manganese	2000	10000	**196 J**	NA	NA	NA	NA	NA
Mercury	0.81	2.8	**1.4**	ND	ND	**0.08**	**14.9**	ND
Nickel	310	310	**15**	NA	NA	NA	NA	NA
Potassium	NL	NL	**733**	NA	NA	NA	NA	NA
Selenium	180	1500	ND	ND	ND	**0.64**	ND	ND
Sodium	NL	NL	**660 J**	NA	NA	NA	NA	NA
Vanadium	NL	NL	**14.5**	NA	NA	NA	NA	NA
Zinc	10000	10000	**66.5**	NA	NA	NA	NA	NA
Wet Chemistry (mg/Kg)								
Total Cyanide	27	27	ND	ND	ND	ND	ND	ND
Total Organic Carbon	NL	NL	5730	ND	ND	10200	NA	2100

Notes:

mg/Kg + milligrams per kilogram

NA = Not Analyzed

NL = Not Listed

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

J = The associated numerical value is an estimated quantity.

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

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

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

Table 1-2
Summary of Subsurface Soil Analytical Results Above Restricted Residential and Commercial Use SCOs
Interim Site Management Plan
Former Bay Ridge Holder Stations A & B Site - Operable Unit 2
Brooklyn, New York

Sample Location Sample Date Sample Interval (feet)	NYSDEC Part 375-6 Restricted Residential	NYSDEC Part 375-6 Commercial	SB-126 4/24/2013 (0-2)	SB-126 4/25/2013 (8-10)	SB-126 4/25/2013 (10.5-12.5)	SB-127 4/24/2013 (3-5)	SB-127 4/25/2013 (8-10)	SB-127 4/25/2013 (10-12)	SB-128 4/24/2013 (2-4)	SB-128 4/25/2013 (10-12)	SB-128 4/25/2013 (18-20)	SB-129 4/24/2013 (1-3)	SB-129 4/24/2013 (1-3)	SB-129 4/25/2013 (8-10)	SB-129 4/25/2013 (18-20)	SB-130 4/24/2013 (2-4)	SB-130 4/25/2013 (15-17)	SB-130 4/25/2013 (18-20)
BTEX (mg/Kg)																		
Benzene	4.8	44	< 0.0027 U	< 0.0032 U	**6.1**	< 0.0028 U	< 0.0024 U	**3.9 J**	< 0.0059 U	**0.0022 J**	**0.0021 J**	< 0.0058 U	< 0.0025 U	**0.019 J**	< 0.0029 U	< 0.0027 U	**0.0018 J**	< 0.0028 U
Ethylbenzene	41	390	< 0.0027 U	< 0.0032 U	**1.7**	< 0.0028 U	< 0.0024 U	**56**	< 0.0059 U	**1.7 J**	**0.071**	< 0.0058 U	< 0.0025 U	**0.039 J**	**0.0019 J**	< 0.0027 U	< 0.0025 U	< 0.0028 U
o-Xylene	NL	NL	< 0.0027 U	< 0.0032 U	**0.33 J**	< 0.0028 U	< 0.0024 U	**29**	< 0.0059 U	**19**	**0.43**	< 0.0058 U	< 0.0025 U	**0.028 J**	**0.00077 J**	< 0.0027 U	**0.0012 J**	< 0.0028 U
p-Xylene	NL	NL	< 0.0027 U	< 0.0032 U	**1.1**	< 0.0028 U	< 0.0024 U	**71**	< 0.0059 U	**23**	**0.51**	< 0.0058 U	< 0.0025 U	**0.053 J**	**0.0015 J**	**0.00089 J**	**0.0020 J**	< 0.0028 U
Toluene	100	500	< 0.0027 U	< 0.0032 U	**0.77 J**	< 0.0028 U	**0.00051 J**	**28 J**	< 0.0059 U	**0.042**	**0.0098**	< 0.0058 U	< 0.0025 U	**0.0093 J**	< 0.0029 U	< 0.0027 U	**0.0020 J**	< 0.0028 U
Xylenes (total)	100	500	< 0.0027 U	< 0.0032 U	**1**	< 0.0028 U	**0.00055 J**	**66**	< 0.0059 U	**35**	**0.81**	< 0.0058 U	< 0.0025 U	**0.081 J**	**0.0022 J**	**0.00089 J**	**0.0032**	**0.00057 J**
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/Kg)																		
2-Methylnaphthalene	NL	NL	< 0.4 U	< 0.37 U	**7.9 J**	< 0.36 U	< 0.35 U	**28**	< 0.37 U	**37 J**	**8.1**	< 0.39 U	< 0.37 U	**6.6**	< 0.35 U	< 0.37 U	**0.087 J**	< 0.35 U
Acenaphthene	100	500	< 0.4 U	< 0.37 U	**5.7 J**	< 0.36 U	< 0.35 U	**2.7**	< 0.37 U	< 0.37 U	< 0.35 U	**0.12 J**	< 0.37 U	**0.3 J**	< 0.35 U	< 0.37 U	< 0.39 U	< 0.35 U
Acenaphthylene	100	500	< 0.4 U	< 0.37 U	**2.6**	< 0.36 U	< 0.35 U	**1.1**	< 0.37 U	< 0.37 U	< 0.35 U	< 0.39 U	**0.2 J**	**0.53**	< 0.35 U	**0.12 J**	< 0.39 U	< 0.35 U
Anthracene	100	500	< 0.4 U	< 0.37 U	**15**	< 0.36 U	< 0.35 U	**5.4**	< 0.37 U	**0.094 J**	**0.1 J**	**0.15 J**	**0.24 J**	**0.77**	< 0.35 U	**0.15 J**	< 0.39 U	< 0.35 U
Benzo(a)anthracene	1	5.6	**0.37 J**	**0.11 J**	**18**	**0.24 J**	**0.17 J**	**6.2 J**	**0.22 J**	**0.3 J**	**0.26 J**	**0.98**	**0.71**	**0.82**	< 0.35 U	**0.44**	**0.17 J**	< 0.35 U
Benzo(a)pyrene	1	1	**0.36 J**	**0.088 J**	**12**	**0.21 J**	**0.16 J**	**5.4**	**0.18 J**	**0.22 J**	**0.22 J**	**0.89**	**0.53**	**0.57**	< 0.35 U	**0.38**	**0.27 J**	< 0.35 U
Benzo(b)fluoranthene	1	5.6	**0.43**	**0.11 J**	**14**	**0.27 J**	**0.2 J**	**6.1**	**0.21 J**	**0.3 J**	**0.27 J**	**1.4**	**0.56**	**0.47**	< 0.35 U	**0.44**	**0.33 J**	< 0.35 U
Benzo(ghi)perylene	100	500	**0.25 J**	< 0.37 U	**5.7 J**	**0.14 J**	**0.13 J**	**2.8**	**0.13 J**	**0.17 J**	**0.18 J**	**0.6**	**0.37 J**	**0.35 J**	< 0.35 U	**0.27 J**	**0.27 J**	< 0.35 U
Benzo(k)fluoranthene	3.9	56	**0.23 J**	< 0.37 U	**4.3**	**0.13 J**	**0.075 J**	**2.6**	**0.094 J**	**0.097 J**	**0.12 J**	**0.62**	**0.26 J**	**0.22 J**	< 0.35 U	**0.15 J**	**0.16 J**	< 0.35 U
Chrysene	3.9	56	**0.46**	**0.12 J**	**19**	**0.3 J**	**0.22 J**	**6.2 J**	**0.26 J**	**0.28 J**	**0.29 J**	**1.6**	**0.79**	**0.96**	< 0.35 U	**0.54**	**0.2 J**	< 0.35 U
Dibenz(a,h)anthracene	0.33	0.56	< 0.4 U	< 0.37 U	**2.7**	< 0.36 U	< 0.35 U	**0.87**	< 0.37 U	< 0.37 U	< 0.35 U	**0.18 J**	**0.098 J**	**0.09 J**	< 0.35 U	< 0.37 U	< 0.39 U	< 0.35 U
Fluoranthene	100	500	**0.54**	**0.19 J**	**38**	**0.39**	**0.28 J**	**11 J**	**0.3 J**	**0.59**	**0.59**	**3.5**	**0.93**	**1.3**	< 0.35 U	**0.65**	**0.18 J**	< 0.35 U
Fluorene	100	500	< 0.4 U	< 0.37 U	**12**	< 0.36 U	< 0.35 U	**3.9**	< 0.37 U	< 0.37 U	< 0.35 U	**0.15 J**	**0.092 J**	**1.1**	< 0.35 U	< 0.37 U	< 0.39 U	< 0.35 U
Indeno(1,2,3-cd)pyrene	0.5	5.6	**0.21 J**	< 0.37 U	**5.2 J**	**0.13 J**	**0.099 J**	**2.4**	**0.11 J**	**0.15 J**	**0.14 J**	**0.57**	**0.28 J**	**0.24 J**	< 0.35 U	**0.2 J**	**0.23 J**	< 0.35 U
Naphthalene	100	500	< 0.4 U	< 0.37 U	**16**	< 0.36 U	< 0.35 U	**160**	< 0.37 U	**370**	**70**	< 0.39 U	< 0.37 U	**5.8**	< 0.35 U	< 0.37 U	**0.24 J**	< 0.35 U
Phenanthrene	100	500	**0.24 J**	**0.13 J**	**57**	**0.21 J**	**0.21 J**	**15 J**	**0.15 J**	**0.41**	**0.43**	**2.7**	**0.68**	**4**	< 0.35 U	**0.48**	**0.084 J**	< 0.35 U
Pyrene	100	500	**0.68**	**0.19 J**	**31**	**0.44**	**0.37**	**11 J**	**0.41**	**0.59**	**0.56**	**2.8**	**1.3**	**2.4**	< 0.35 U	**0.94**	**0.18 J**	< 0.35 U
Metals (mg/Kg)																		
Arsenic	16	16	**5.9 J**	**6.3 J**	**7.2 J**	**6.0 J**	**4.7 J**	**10.1 J**	**7.0 J**	**5.8 J**	**4.1 J**	**8.6 J**	**10.9 J**	**4.6 J**	**3.8 J**	**5.6 J**	**5.1 J**	**3.4 J**
Barium	400	400	**71.1**	**98.7**	**173**	**110**	**80.8**	**211**	**105**	**38.9**	**39.6**	**54.2**	**87.4**	**34.2**	**32.9**	**72.1**	**39.3**	**39.9**
Cadmium	4.3	9.3	**0.72**	**0.47**	**0.77**	**0.67**	**0.59**	**1.1**	**0.57**	**0.32**	**0.41**	**0.53**	**0.81**	**0.26**	**0.30**	**0.66**	**0.64**	**0.25 J**
Chromium	180	1500	**22.6**	**27.1**	**16.4**	**21.5**	**20.6**	**17.5**	**22.1**	**24.5**	**23.7**	**15.7**	**27.3**	**13.8**	**18.7**	**21.0**	**22.2**	**15.5**
Lead	400	1000	**251**	**284**	**480**	**262**	**332**	**779**	**255**	**63.5**	**39.4**	**76.4**	**359**	**190**	**13.3**	**373**	**175**	**19.6**
Selenium	180	1500	**2.4**	**2.6**	**2.3**	**1.8**	**2.2**	**2.8**	**1.5**	**2.0**	**2.0**	**2.5**	**2.8**	**1.5**	**1.9**	**2.3**	**2.2**	**2.4**
Silver	180	1500	< 1.2 U	< 1.5 U	< 1.5 U	< 1.2 U	< 1.3 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.3 U	< 1.5 U	< 1.4 U	< 1.3 U	< 1.1 U	< 1.4 U	< 1.6 U
Mercury	0.81	2.8	**0.21**	**0.16**	**0.83**	**0.18**	**0.15**	**1.3**	**0.14**	**0.026 J**	**0.0065 J**	**0.14**	**0.22**	**0.13**	< 0.040 U	**0.26**	**0.091**	< 0.038 U
Cyanide (mg/Kg)																		
Free Cyanide	27	27	< 1.27 U	< 1.30 U	< 1.34 U	< 1.14 U	< 1.26 U	**1.60**	< 1.04 U	**0.447 J**	< 0.966 U	< 1.12 U	< 1.17 U	< 1.04 U	< 0.986 U	< 1.17 U	**1.31 J**	< 1.07 U

Notes:

mg/Kg - milligrams per kilogram

NL = Not Listed

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.

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

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

Table 1-3
Summary of Groundwater Analytical Results Above AWQSGVs
Interim Site Management Plan
Former Bay Ridge Holder Stations A & B Site - Operable Unit 2
Brooklyn, New York

Location ID **Sample Date** **Sample ID**	**CAS #**	**NYSDEC Groundwater Guidance or Standard Value (Note 1)**	**MW-105** **3/24/2011** **MW-105-032411**	**MW-105** **10/11/2013** **MW-105-101113**	**MW-106** **3/22/2011** **MW-106-032211**	**MW-106** **10/10/2013** **MW-106-101013**	**MW-111** **3/23/2011** **MW-111-032311**	**MW-111** **10/10/2013** **MW-111-101013**	**MW-111 FD** **10/10/2013** **DUP 10/10/13**	**MW-112** **3/23/2011** **MW-112-032311**
BTEX (ug/L)										
Benzene	71-43-2	1 s	<5.0 U	< 5.0 U	**4400**	**310**	**1.1 J**	< 5.0 U	< 5.0 U	**190**
Ethylbenzene	100-41-4	5 s	<5.0 U	< 5.0 U	**2200**	**160**	**1.9 J**	< 5.0 U	< 5.0 U	**180**
Toluene	108-88-3	5 s	**1.1 J**	< 5.0 U	**1700**	**130**	**4.4 J**	< 5.0 U	< 5.0 U	**260**
m+p-Xylene	1330-20-7-M,P	NL	**2.8 J**	< 5.0 U	**11000**	**440**	**6.4**	< 5.0 U	< 5.0 U	**640**
o-Xylene	95-47-6	NL	**1.8 J**	< 5.0 U	**5400**	**250**	**4.5 J**	< 5.0 U	< 5.0 U	**500**
Total Xylenes		5 s	**4.6**	ND	**16400**	**690**	**10.9**	< 5.0 U	< 5.0 U	**1140**
Total BTEX		NL	**5.7**	**ND**	**24700**	**1290**	**18.3**	**ND**	**ND**	**1770**
Volatile Organic Compounds (VOCs)(ug/L)										
1,1,1-Trichloroethane	71-55-6	5 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
1,1,2,2-Tetrachloroethane	79-34-5	5 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	5 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
1,1,2-Trichloroethane	79-00-5	1 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
1,1-Dichloroethane	75-34-3	5 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
1,1-Dichloroethene	75-35-4	5 s	<5.0 UJ	<5.0 U	<5.0 UJ	<5.0 U	<5.0 UJ	<5.0 U	<5.0 U	<5.0 UJ
1,2,4-Trichlorobenzene	120-82-1	5 s	<5.0 UJ	<5.0 U	<5.0 UJ	<5.0 U	<5.0 UJ	<5.0 U	<5.0 U	<5.0 UJ
1,2-Dibromo-3-chloropropane	96-12-8	0.04 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
1,2-Dibromoethane	106-93-4	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
1,2-Dichlorobenzene	95-50-1	3 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
1,2-Dichloroethane	107-06-2	5 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
1,2-Dichloropropane	78-87-5	1 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
1,3-Dichlorobenzene	541-73-1	3 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
1,4-Dichlorobenzene	106-46-7	3 s	<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-Butanone	78-93-3	50 g	R	<5.0 U	R	<5.0 U	R	<5.0 U	<5.0 U	R
2-Hexanone	591-78-6	50 g	<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
Acetone	67-64-1	50 g	R	<5.0 U	R	<5.0 U	R	<5.0 U	<5.0 U	R
Bromodichloromethane	75-27-4	50 g	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
Bromoform	75-25-2	50 g	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
Bromomethane	74-83-9	5 s	<5.0 UJ	<5.0 U	<5.0 UJ	<5.0 U	<5.0 UJ	<5.0 U	<5.0 U	<5.0 UJ
Carbon disulfide	75-15-0	60 g	<5.0 UJ	<5.0 U	<5.0 UJ	<5.0 U	<5.0 UJ	<5.0 U	<5.0 U	<5.0 UJ
Carbon tetrachloride	56-23-5	5 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
Chlorobenzene	108-90-7	5 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
Chloroethane	75-00-3	5 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
Chloroform	67-66-3	7 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
Chloromethane	74-87-3	5 s	<5.0 UJ	<5.0 U	<5.0 UJ	<5.0 U	<5.0 UJ	<5.0 U	<5.0 U	<5.0 UJ
cis-1,2-Dichloroethene	156-59-2	5 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
cis-1,3-Dichloropropene	10061-01-5	0.4 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
Cyclohexane	110-82-7	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
Dibromochloromethane	124-48-1	5 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
Dichlorodifluoromethane	75-71-8	5 s	<5.0 UJ	<5.0 U	<5.0 UJ	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
Isopropylbenzene	98-82-8	5 s	<5.0 U	<5.0 U	**45 J**	**3.6 J**	<5.0 U	<5.0 U	<5.0 U	**3.5 J**
Methyl acetate	79-20-9	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
Methyl tert-butyl ether	1634-04-4	10 g	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
Methylcyclohexane	108-87-2	NL	<5.0 U	<5.0 U	**1.1 J**	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
Methylene chloride	75-09-2	5 s	<5.0 UJ	**1.3 J**	<5.0 UJ	<5.0 U	<5.0 UJ	<5.0 U	<5.0 U	<5.0 UJ
Styrene	100-42-5	5 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
Tetrachloroethene	127-18-4	5 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
trans-1,2-Dichloroethene	156-60-5	5 s	<5.0 UJ	<5.0 U	<5.0 UJ	<5.0 U	<5.0 UJ	<5.0 U	<5.0 U	<5.0 UJ
trans-1,3-Dichloropropene	10061-02-6	0.4 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
Trichloroethene	79-01-6	5 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
Trichlorofluoromethane	75-69-4	5 s	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
Vinyl chloride	75-01-4	2 s	<5.0 UJ	<5.0 U	<5.0 UJ	<5.0 U	<5.0 UJ	<5.0 U	<5.0 U	<5.0 UJ
Total VOCs		NL	**5.7**	**1.3**	24746.1	**1293.6**	18.3	**ND**	**ND**	1773.5

Table 1-3
Summary of Groundwater Analytical Results Above AWQSGVs
Interim Site Management Plan
Former Bay Ridge Holder Stations A & B Site - Operable Unit 2
Brooklyn, New York

Location ID **Sample Date** **Sample ID**	**CAS #**	**NYSDEC Groundwater Guidance or Standard Value (Note 1)**	**MW-105** **3/24/2011** **MW-105-032411**	**MW-105** **10/11/2013** **MW-105-101113**	**MW-106** **3/22/2011** **MW-106-032211**	**MW-106** **10/10/2013** **MW-106-101013**	**MW-111** **3/23/2011** **MW-111-032311**	**MW-111** **10/10/2013** **MW-111-101013**	**MW-111 FD** **10/10/2013** **DUP 10/10/13**	**MW-112** **3/23/2011** **MW-112-032311**
Polynuclear Aromatic Hydrocarbons (PAHs) (ug/L)										
2-Methylnaphthalene	91-57-6	NL	<10 U	NA	**6.2 J**	NA	<10 U			**2.2 J**
Acenaphthene	83-32-9	20 g	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Acenaphthylene	208-96-8	NL	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Anthracene	120-12-7	50 g	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Benzo(a)anthracene	56-55-3	0.002 g	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Benzo(a)pyrene	50-32-8	ND	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Benzo(b)fluoranthene	205-99-2	0.002 g	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Benzo(ghi)perylene	191-24-2	NL	<10 U	< 10 UJ	<10 U	< 10 UJ	<10 U	< 10 UJ	< 10 UJ	<10 U
Benzo(k)fluoranthene	207-08-9	0.002 g	<10 UJ	< 10 U	<10 UJ	< 10 U	<10 UJ	< 10 U	< 10 U	<10 UJ
Chrysene	218-01-9	0.002 g	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Dibenz(a,h)anthracene	53-70-3	NL	<10 U	< 10 UJ	<10 U	< 10 UJ	<10 U	< 10 UJ	< 10 UJ	<10 U
Fluoranthene	206-44-0	50 g	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Fluorene	86-73-7	50 g	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Indeno(1,2,3-cd)pyrene	193-39-5	0.002 g	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Naphthalene	91-20-3	10 g	<10 U	< 10 U	**1000**	**75 J**	**1.3 J**	< 10 U	< 10 U	**110**
Phenanthrene	85-01-8	50 g	<10 U	< 10 U	<10 U	<10 U	<10 U	< 10 U	< 10 U	<10 U
Pyrene	129-00-0	50 g	ND	< 10 U	<10 U	<10 U	<10 U	< 10 U	< 10 U	<10 U
Total PAHs		50 g	ND	ND	**1006.2**	**75 J**	**1.3**	ND	ND	**112.2**
Other Semi Volatile Organic Compounds (SVOC) (ug/L)										
1,1'-Biphenyl	92-52-4	5 s	<10 UJ	< 10 U	<10 UJ	< 10 U	<10 UJ	< 10 U	< 10 U	<10 UJ
2,2'-oxybis(1-Chloropropane)	108-60-1	NL	<10 UJ	< 10 U	<10 UJ	< 10 U	<10 UJ	< 10 U	< 10 U	<10 UJ
2,4,5-Trichlorophenol	95-95-4	NL	<20 U	< 20 U	<20 U	< 20 U	<20 U	< 20 U	< 20 U	<20 U
2,4,6-Trichlorophenol	88-06-2	NL	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
2,4-Dichlorophenol	120-83-2	5 s	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
2,4-Dimethylphenol	105-67-9	50 g	<10 UJ	< 10 U	**22 J**	< 10 U	<10 UJ	< 10 U	< 10 U	<10 UJ
2,4-Dinitrophenol	51-28-5	10 g	<20 UJ	< 20 U	<20 UJ	< 20 U	<20 UJ	< 20 U	< 20 U	<20 UJ
2,4-Dinitrotoluene	121-14-2	5 s	<10 UJ	< 10 U	<10 UJ	< 10 U	<10 UJ	< 10 U	< 10 U	<10 UJ
2,6-Dinitrotoluene	606-20-2	5 s	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
2-Chloronaphthalene	91-58-7	10 g	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
2-Chlorophenol	95-57-8	NL	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
2-Methylphenol	95-48-7	NL	<10 U	< 10 U	**3.6 J**	**1.7 J**	<10 U	< 10 U	< 10 U	<10 U
2-Nitroaniline	88-74-4	5 s	<20 U	< 20 U	<20 U	< 20 U	<20 U	< 20 U	< 20 U	<20 U
2-Nitrophenol	88-75-5	NL	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
3,3'-Dichlorobenzidine	91-94-1	5 s	<10 UJ	< 10 U	<10 UJ	< 10 U	<10 UJ	< 10 U	< 10 U	<10 UJ
3-and 4-Methylphenol	3,4-MEPH	5 s	<10 U	< 10 U	**4.2 J**	< 10 U	<10 U	< 10 U	< 10 U	<10 U
3-Nitroaniline	99-09-2	NL	<20 U	< 20 U	<20 UJ	< 20 U	<20 U	< 20 U	< 20 U	<20 U
4,6-Dinitro-2-methylphenol	534-52-1	NL	<20 UJ	< 20 U	<20 UJ	< 20 U	<20 UJ	< 20 U	< 20 U	<20 UJ
4-Bromophenyl phenyl ether	101-55-3	NL	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
4-Chloro-3-methylphenol	59-50-7	5 s	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
4-Chloroaniline	106-47-8	NL	<10 U	< 10 U	R	< 10 U	<10 U	< 10 U	< 10 U	<10 U
4-Chlorophenyl phenyl ether	7005-72-3	NL	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
4-Nitroaniline	100-01-6	5 s	<20 U	< 20 U	<20 U	< 20 U	<20 U	< 20 U	< 20 U	<20 U
4-Nitrophenol	100-02-7	NL	<20 U	< 20 U	<20 U	< 20 U	<20 U	< 20 U	< 20 U	<20 U
Acetophenone	98-86-2	NL	<10 U	< 10 U	**5.0 J**	**1.2 J**	<10 U	< 10 U	< 10 U	**1.3 J**
Atrazine	1912-24-9	7.5 s	<10 UJ	< 10 U	<10 UJ	< 10 U	<10 UJ	< 10 U	< 10 U	<10 UJ
Benzaldehyde	100-52-7	NL	<10 UJ	< 10 U	<10 UJ	< 10 U	<10 UJ	< 10 UJ	< 10 UJ	<10 UJ
bis(2-Chloroethoxy)methane	111-91-1	5 s	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
bis(2-Chloroethyl) ether	111-44-4	1 s	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
bis(2-Ethylhexyl) phthalate	117-81-7	5 s	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Butyl benzyl phthalate	85-68-7	50 g	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Caprolactam	105-60-2	NL	<10 UJ	**46**	<10 UJ	**78 J**	<10 UJ	**12**	**6.8 J**	<10 UJ
Carbazole	86-74-8	NL	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Dibenzofuran	132-64-9	NL	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Diethyl phthalate	84-66-2	50 g	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Dimethyl phthalate	131-11-3	50 g	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Di-n-butyl phthalate	84-74-2	50 s	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Di-n-octyl phthalate	117-84-0	NL	<10 U	< 10 UJ	<10 U	< 10 UJ	<10 U	< 10 UJ	< 10 UJ	<10 U
Hexachlorobenzene	118-74-1	0.4 s	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Hexachlorobutadiene	87-68-3	0.5 s	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Hexachlorocyclopentadiene	77-47-4	5 s	<10 UJ	< 10 U	<10 UJ	< 10 U	<10 UJ	< 10 U	< 10 U	<10 UJ
Hexachloroethane	67-72-1	5 s	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Isophorone	78-59-1	50 g	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Nitrobenzene	98-95-3	0.4	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
N-Nitrosodi-n-propylamine	621-64-7	50 g	<10 U	< 10 U	<10 UJ	< 10 U	<10 U	< 10 U	< 10 U	<10 UJ
N-Nitrosodiphenylamine	86-30-6	50 g	<10 U	< 10 U	<10 U	< 10 U	<10 U	< 10 U	< 10 U	<10 U
Pentachlorophenol	87-86-5	1 s	<20 UJ	< 20 U	<20 UJ	< 20 U	<20 UJ	< 20 U	< 20 U	<20 UJ
Phenol	108-95-2	1 s	< 10 U	< 10 U	**12**	**3.6 J**	<10 U	< 10 U	< 10 U	<10 U
Total SVOCs			ND	**46**	**1053**	**159.5**	<10 U	**12**	**6.8**	<10 U

Table 1-3
Summary of Groundwater Analytical Results Above AWQSGVs
Interim Site Management Plan
Former Bay Ridge Holder Stations A & B Site - Operable Unit 2
Brooklyn, New York

Location ID Sample Date Sample ID	CAS #	NYSDEC Groundwater Guidance or Standard Value (Note 1)	MW-105 3/24/2011 MW-105-032411	MW-105 10/11/2013 MW-105-101113	MW-106 3/22/2011 MW-106-032211	MW-106 10/10/2013 MW-106-101013	MW-111 3/23/2011 MW-111-032311	MW-111 10/10/2013 MW-111-101013	MW-111 FD 10/10/2013 DUP 10/10/13	MW-112 3/23/2011 MW-112-032311
Metals (ug/L)										
Aluminum	7429-90-5	NL	**114 J**	NA	**2800**	NA	**239**	NA	NA	**173 J**
Antimony	7440-36-0	3 s	**10.5 J**	NA	**14.3 J**	NA	<20 U	NA	NA	<20 U
Arsenic	7440-38-2	25 s	<20 U	**12.4 J**	**7.4 J**	**33.6**	**5.4 J**	**5.8 J**	**9.1 J**	<20 U
Barium	7440-39-3	1,000 s	**222**	**726**	**775**	**1160**	**48.2 J**	**411**	**402**	**501**
Beryllium	7440-41-7	3 g	<5.0 U	NA	<5.0 U		<5.0 U	NA	NA	<5.0 U
Cadmium	7440-43-9	5 s	<5.0 U	< 5.0 U	<5.0 U	< 5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
Calcium	7440-70-2	NL	**171000**	NA	**138000**	NA	**22000**	NA	NA	**127000**
Chromium	7440-47-3	50 s	<20 U	**62.6**	**7910**	**98.5**	**1.5 J**	**34.8**	**32.6**	<20 U
Cobalt	7440-48-4	NL	<50 U	NA	**142**	NA	<50 U	NA	NA	<50 U
Copper	7440-50-8	200 s	<30 U	NA	**277**	NA	<30 U	NA	NA	<30 U
Iron	7439-89-6	300 s	**139 J**	NA	**56900**	NA	**267**	NA	NA	**1880**
Lead	7439-92-1	25 s	<10 U	**54.4**	**8.3 J**	**61.4**	<10 U	**32.3**	**31.2**	<10 U
Magnesium	7439-95-4	35,000 s	**79800**	NA	**55300**	NA	**5320**	NA	NA	**42000**
Manganese	7439-96-5	300 s	**145**	NA	**4060**	NA	**75.2**	NA	NA	**2300**
Mercury	7439-97-6	0.7 s	<0.20 U	< 0.20 UJ	<0.20 U	< 0.20 UJ	<0.20 U	< 0.20 UJ	< 0.20 UJ	<0.20 U
Nickel	7440-02-0	100 s	**4.9 J**	NA	**4030**	NA	**0.90 J**	NA	NA	**3.3 J**
Potassium	7440-09-7	NL	**5850**	NA	**7300**	NA	**4120**	NA	NA	**6050**
Selenium	7782-49-2	10 s	<30.0 U	< 30.0 U	<30.0 U	< 30.0 U	<30.0 U	**14.6J**	< 30.0 U	<30.0 U
Silver	7440-22-4	50 s	<30 U	<30 U	<30 U	<30 U	<30 U	<30 U	<30 U	<30 U
Sodium	7440-23-5	20,000 s	**172000**	NA	**23800**	NA	**26000**	NA	NA	**76200**
Thallium	7440-28-0	0.5 g	<20 U	NA	<20 U	NA	<20 U	NA	NA	<20 U
Vanadium	7440-62-2	NL	**2.0 J**	NA	**95.1**	NA	**3.3 J**	NA	NA	**1.4 J**
Zinc	7440-66-6	2,000 g	**15.0 J**	NA	**63.2**	NA	**12.3 J**	NA	NA	**16.7 J**
Cyanide (ug/L)										
Total Cyanide	57-12-5	200 s	<20 U	NA	**19.1 J**	NA	<20 U	NA	NA	<20 U
Pesticides (ug/L)										
Aldrin	309-00-2	NL	<0.050 U	NA	<0.050 U	NA	<0.050 U	NA	NA	<0.050 U
Alpha-BHC	319-84-6	NL	<0.050 U	NA	<0.050 U	NA	<0.050 U	NA	NA	<0.050 U
Beta-BHC	319-85-7	NL	<0.050 U	NA	**0.057**	NA	<0.050 U	NA	NA	<0.050 U
Chlordane, alpha	5103-71-9	NL	<0.050 U	NA	<0.050 U	NA	<0.050 U	NA	NA	<0.050 U
Chlordane, gamma-	5103-74-2	NL	<0.050 U	NA	<0.050 UJ	NA	<0.050 U	NA	NA	<0.050 U
DDD,4,4-	72-54-8	NL	<0.10 U	NA	<0.10 U	NA	<0.10 U	NA	NA	<0.10 U
DDE,4,4-	72-55-9	NL	<0.10 U	NA	<0.10 U	NA	<0.10 U	NA	NA	<0.10 U
DDT,4,4-	50-29-3	NL	<0.10 U	NA	<0.10 U	NA	<0.10 U	NA	NA	<0.10 U
Delta-BHC	319-86-8	NL	<0.050 U	NA	<0.050 U	NA	<0.050 U	NA	NA	<0.050 U
Dieldrin	60-57-1	NL	<0.10 U	NA	<0.10 U	NA	<0.10 U	NA	NA	<0.10 U
Endosulfan I	959-98-8	NL	<0.050 U	NA	<0.050 U	NA	<0.050 U	NA	NA	<0.050 U
Endosulfan II	33213-65-9	NL	<0.10 U	NA	<0.10 U	NA	<0.10 U	NA	NA	<0.10 U
Endosulfan sulfate	1031-07-8	NL	<0.10 U	NA	<0.10 U	NA	<0.10 U	NA	NA	<0.10 U
Endrin	72-20-8	NL	<0.10 U	NA	<0.10 U	NA	<0.10 U	NA	NA	<0.10 U
Endrin aldehyde	7421-93-4	NL	<0.10 U	NA	<0.10 U	NA	<0.10 U	NA	NA	<0.10 U
Endrin ketone	53494-70-5	NL	<0.10 U	NA	<0.10 U	NA	<0.10 U	NA	NA	<0.10 U
Gamma BHC (Lindane)	58-89-9	NL	<0.050 U	NA	<0.050 U	NA	<0.050 U	NA	NA	<0.050 U
Heptachlor	76-44-8	NL	<0.050 U	NA	<0.050 U	NA	<0.050 U	NA	NA	<0.050 U
Heptachlor Epoxide	1024-57-3	NL	<0.050 U	NA	<0.050 U	NA	<0.050 U	NA	NA	<0.050 U
Methoxychlor	72-43-5	NL	<0.50 U	NA	<0.50 U	NA	<0.50 U	NA	NA	<0.50 U
Toxaphene	8001-35-2	NL	<5.0 U	NA	<5.0 U	NA	<5.0 U	NA	NA	<5.0 U
PCBs (ug/L)										
Aroclor 1016	12674-11-2	NL	<1.0 U	NA	<1.0 UJ	NA	<1.0 U	NA	NA	<1.0 U
Aroclor 1221	11104-28-2	NL	<1.0 U	NA	<1.0 UJ	NA	<1.0 U	NA	NA	<1.0 U
Aroclor 1232	11141-16-5	NL	<1.0 U	NA	<1.0 UJ	NA	<1.0 U	NA	NA	<1.0 U
Aroclor 1242	53469-21-9	NL	<1.0 U	NA	<1.0 UJ	NA	<1.0 U	NA	NA	<1.0 U
Aroclor 1248	12672-29-6	NL	<1.0 U	NA	<1.0 UJ	NA	<1.0 U	NA	NA	<1.0 U
Aroclor 1254	11097-69-1	NL	<1.0 U	NA	<1.0 UJ	NA	<1.0 U	NA	NA	<1.0 U
Aroclor 1260	11096-82-5	NL	<1.0 U	NA	<1.0 UJ	NA	<1.0 U	NA	NA	<1.0 U
Aroclor 1262	37324-23-5	NL	<1.0 U	NA	<1.0 UJ	NA	<1.0 U	NA	NA	<1.0 U
Aroclor 1268	11100-14-4	NL	<1.0 U	NA	<1.0 UJ	NA	<1.0 U	NA	NA	<1.0 U
Herbicides (ug/L)										
2,4-D	94-75-7	NL	<1.0 U	NA	**1.1**	NA	<1.0 U	NA	NA	<1.0 U
2,4-DB	94-82-6	NL	<1.0 U	NA	<1.0 U	NA	<1.0 U	NA	NA	<1.0 U
2,4,5-TP (Silvex)	93-72-1	NL	<0.10 U	NA	<0.10 U	NA	<0.10 U	NA	NA	<0.10 U
2,4,5-T	93-76-5	NL	<0.10 U	NA	<0.10 U	NA	<0.10 U	NA	NA	<0.10 U

Notes:

NA = Not analyzed, not applicable

NL = Not listed

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

J = The associated numerical value is an estimated quantity.

R = The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet the quality control criteria. The presence of absence of the analyte cannot be verified.

Bold value - compound detected at concentration greater than the reporting limit

Shaded value - Compound detected at a concentration greater than the standard or guidance value.

s = Standard Value

g = Guidance Value

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

Table 2-1
Matrix of Responsibility- Youth Athletic Baseball Field
Interim Site Management Plan
Former BayRidge Holder Stations A & B Site - Operable Unit 2
Brooklyn, NewYork

Responsible Party ⟶	NYSDEC	National Grid	Property Manager/Lessee	Action		
Trigger ⬇				**NYSDEC**	**National Grid**	**Property Manager/Lessee**
Memorandum of Understanding (MOU)		✓	✓		MOU will be executed between the Property Manager and National Grid for SMP implementation including maintaining engineering controls, following restrictions and institutional controls, annual inspection, groundwater monitoring, and indoor air monitoring (as needed)	MOU will be executed between the Property Manager or Lessee and National Grid for SMP implementation including maintaining engineering controls, following restrictions and institutional controls, annual inspection, groundwater monitoring, and indoor air monitoring (as needed)
Annual Report	✓	✓		Review and Comment	Report will be completed by National Grid and Submitted to NYSDEC. Report will include results of GW Monitoring and annual inspection	
Emergency Response	✓	✓	✓	Property Owner shall provide details or emergency work to National Grid and NYSDEC within 48 hrs of emergency	National Grid will review emergency activities, conduct maintenance or repair (if necessary) and submit update to NYSDEC	Property Owner or Manager or Lessee have to provide details of emergency work to National Grid and NYSDEC within 48 hrs of emergency
Environmental Easement (EE)	✓	✓	✓	EE will be executed between National Grid and the NYSDEC	National Grid will prepare the EE	EE will be executed between Property Owner and the NYSDEC, if necessary
Future Property Development	✓	✓	✓	Review and Comment, as necessary	National Grid will provide at a minimum 60-business days notice to NYSDEC. Restrictions on type of development activities should be followed. National Grid to review and decide if oversight is required . If new building, decision on indoor air sampling will beevaluated. Following development, National Grid to update SMP and submit to NYSDEC with Annual Inspection Report	Property Owner has to provide at a minimum 45-business days notice to National Grid and NYSDEC
Ground Intrusion Work	✓	✓	✓	Review and Comment, as necessary	National Grid will notify NYSDEC of any event and associated changes 30 business days prior to ground intrusive work. National Grid to review and decide if oversight is required. Following development, National Grid to update SMP and submit to NYSDEC with Annual Inspection Report	Property Owner or Manager or Lessee has to provide at a minimum 30-business days notice to National Grid for any ground intrusive work. All ground intrusive activities shall be pursuant to the SMP
Groundwater Use			✓			Removed groundwater shall be managed pursuant to the SMP
HASP Development	✓	✓	✓	Review and Comment, as necessary	National Grid will develop and/or aid in the development of task-specific HASP for any subsurface work deeper than 24-inches below ground surface	Develop and/or aid in the development of task-specific HASP for any subsurface work deeper than 24-inches
Inspections		✓	✓		Annual Site-wide inspection of Engineering Controls and Institutional Controls	Inspections (annual and following any emergency) of the Engineering Controls and Institutional Controls
Interviews		✓	✓		National Grid to discuss annually with the Property Manager or Lessee	National Grid to discuss annually with the Property Manager or Lessee
Metes and Bounds Survey		✓			National Grid will perform a Metes and Bounds (or similar) Survey to include in the Site Management Plan and Environmental Easement	
Monitoring		✓			Monitoring will be completed by National Grid quarterly, semi-annually, or annually or as needed. Indoor air monitoring will be completed for any building modification or new buildings	
Property Ownership Change		✓			National Grid shall provide at a minimum 60 days notice to NYSDEC. National Grid will submit update to NYSDEC with Annual Inspection Report	
Property Use Change (currently Restricted Residential)	✓	✓		Review and Comment, as necessary	National Grid will provide at a minimum 60 days notice to NYSDEC. National Grid to review and confer with NYSDEC if SMP revision and/or additional ECs/ICs are required. Following use change, National Grid to update SMP and submit to NYSDEC with Annual Inspection Report	
SMP Implementation		✓	✓		Implement the Site Management Plan for any ground intrusive work that will disturb MGP-related residuals or cover system	Implement the Site Management Plan for any ground intrusive work that will disturb MGP-related residuals or cover system

Table 2-1
Matrix of Responsibility- Gate Station Facilityand Parking
Interim Site Management Plan
Former BayRidge Holder Stations A & B - Operable Unit 2
Brooklyn, NewYork

Responsible Party → Trigger ↓	NYSDEC	National Grid SIR	National Grid Gas Operations	Action		
				NYSDEC	**National Grid SIR**	**National Grid Gas Operations**
SMP Scope of Work Memo		✓	✓		A SMP Scope of Work Memo will be developed and provided to National Grid Gas Operations in charge of the Gate Station and Parking Lot Area for SMP implementation including maintaining engineering controls, following restrictions and institutional controls, annual inspection, groundwater monitoring, and indoor air monitoring (as needed)	A SMP Scope of Work Memo will be developed and provided to National Grid Gas Operations in charge of the Gate Station and Parking Lot Area for SMP implementation including maintaining engineering controls, following restrictions and institutional controls, annual inspection, groundwater monitoring, and indoor air monitoring (as needed)
Annual Report	✓	✓		Review and Comment	Report will be completed by National Grid and Submitted to NYSDEC. Report will include results of GW Monitoring and annual inspection	
Emergency Response	✓	✓	✓	Review and Comment, as necessary	National Grid will review emergency activities, conduct maintenance or repair (if necessary) and submit update to NYSDEC	National Grid Gas Oeprations have to provide details of emergency work to National Grid within 48 hrs of emergency
Environmental Easement (EE)	✓	✓		EE will be executed between the Property Owner and the NYSDEC	EE will be executed between National Grid and the NYSDEC	
Future Property Development	✓	✓	✓	Review and Comment, as necessary	SIR will provide at a minimum 30-business days notice to NYSDEC. Following development, SIRto update SMP and submit to NYSDEC with Annual Inspection Report	Gas Operations will provide at a minimum 30-business days notice to SIR Restrictions on type of development activities should be followed. SIR to review and decide if SIR oversight is required . If new building, decision on indoor air sampling will beevaluated. Following development, SIR to update SMP and submit to NYSDEC with Annual Inspection Report
Ground Intrusion Work	✓	✓	✓	Review and Comment, as necessary	SIR will notify NYSDEC of any event and associated changes 30 business days prior to ground intrusive work. SIR to review and decide if SIR oversight is required. Following development, SIR to update SMP and submit to NYSDEC with Annual Inspection Report	Gas Operations has to provide at a minimum 30-business days notice to SIR for any ground intrusive work. All ground intrusive activities shall be pursuant to the SMP
Groundwater Use	✓	✓	✓	Review and Comment, as necessary	Removed groundwater shall be managed pursuant to the SMP	Removed groundwater shall be managed pursuant to the SMP
HASP Development	✓	✓	✓	Review and Comment, as necessary	SIR will develop and/or aid in the development of task-specific HASP for any Site intrusive work	Develop and/or aid in the development of task-specific HASP for anyintrusive work
Inspections		✓	✓		Annual Site-wide inspection of Engineering Controls and Institutional Controls	Inspections (annual and following any emergency) of the Engineering Controls and Institutional Controls
Interviews		✓	✓		SIR to discuss annually with Gas Operations	SIR to discuss annually with Gas Operations
Metes and Bounds Survey		✓			SIR will perform a Metes and Bounds (or similar) Survey to include in the Site Management Plan and Environmental Easement	
Monitoring		✓			Monitoring will be completed bySIR quarterly, semi-annually, or annually or as needed. Indoor air monitoring will be completed for any building modification or new buildings	
Property Ownership Change		✓	✓		SIR will provide NYSDEC 60 days of notification. SIR will submit update to NYSDEC with Annual Inspection Report	Gas Operations to notify SIR 60 days prior to any ownership change
Property Use Change (currently Restricted Residential)	✓			Review and Comment, as necessary	SIR has to provide at a minimum 60 days notice to NYSDEC. SIR to review and confer with DEC if SMP revision and/or additional ECs/ICs are required. Following use change, SIR to update SMP and submit to NYSDEC with Annual Inspection Report	
SMP Implementation		✓	✓		Implement the Site Management Plan for any ground intrusive work that will disturb composite cover system	Implement the Site Management Plan for any ground intrusive work that will disturb composite cover system

Table 2-2
Emergency Contact Numbers
Interim Site Management Plan
Former Bay Ridge Holder Stations A & B Site - Operable Unit 2
Brooklyn, New York

Medical, Fire, and Police:	911
One Call Center:	(800) 272-4480 (3 day notice required for utility markout)
Poison Control Center:	(800) 222-1222
Pollution Toxic Chemical Oil Spills:	(800) 424-8802
NYSDEC Spills Hotline	(800) 457-7362
Kings County Hospital	(718) 254-3131
Electric (Con Edison)	(800) 752-6633
Water/Sewer (NYCDEP)	(212) 639-9675
Gas (National Grid)	(718) 643-4050
Donald Campbell, National Grid	(718) 963-5453
Mark Kubat, National Grid - Operations	(917) 337-0532
Robert Conti, National Grid - Facilities Management	TBD
Nelson Abrams, AECOM - Project Manager	(212) 377-8705

*** Note: Contact numbers subject to change and should be updated as necessary**

Table 3-1
Monitoring/Inspection Schedule
Interim Site Management Plan
Former Bay Ridge Holder Stations A & B Site - Operable Unit 2
Brooklyn, New York

Monitoring Program	Frequency*	Matrix	Analysis
Chain Link Fence	Annually	--	Inspection
Assess Trends to Groundwater Impacts	Annually	Groundwater	Volatile organic compounds, semivolatile organic compounds, RCRA metals
SVI/Indoor Air	Prior to any Building Renovation/Construction	Air	EPA Modified TO-15 Parameters
Excavation	Prior to Disposal	Soil	Disposal Facility Waste Characterization Parameters

***The frequency of events will be conducted as specified until otherwise approved by NYSDEC and NYSDOH**

Notes:

SVI - Soil Vapor Intrusion

Table 3-2

Monitoring Well Construction Summary

Interim Site Management Plan

Former Bay Ridge Holder Statiions A & B Site - Operable Unit 2

Brooklyn, New York

MW ID	Ground Surface Elevation (ft)	Top of Casing Elevation (ft)	Date Installed	Well Diameter	Screen Slot	Screened Interval (ft bgs)	Sump Interval (ft bgs)
MW-105	81.35	80.85	5/13/10	2" PVC	0.020	73-83	83-85
MW-106	82.78	82.27	5/25/10	2" PVC	0.020	73-83	83-85
MW-111	75.91	75.39	5/4/10	2" PVC	0.020	68-78	78-80
MW-112	76.50	75.98	5/5/10	2" PVC	0.020	68-78	78-80

Notes:

DTW = Depth to water from the top of PVC casing

DTB = Depth to bottom of the well from the top of PVC casing

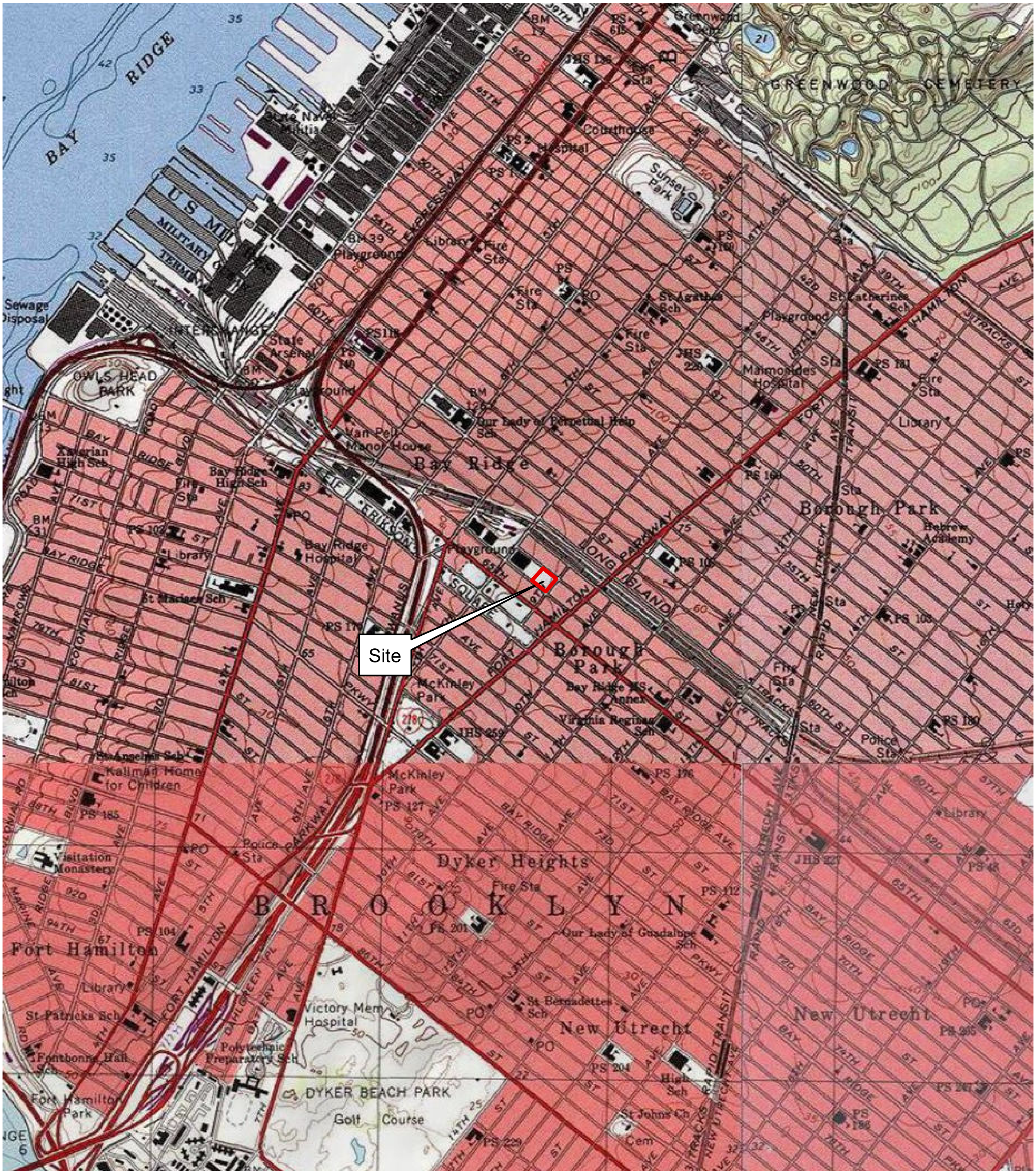
bgs = Below Ground Surface

Table 3-3
Schedule of Monitoring/Inspection Reports
Interim Site Management Plan
Former Bay Ridge Holder Stations A & B Site - Operable Unit 2
Brooklyn, New York

Task	Reporting Frequency
Groundwater	Annual
Periodic Inspections	Annual

***The frequency of events will be conducted as specified until otherwise approved by NYSDEC and NYSDOH**

Figures



AECOM Environment
125 BROAD STREET
NEW YORK, NY 10004
(212) 377-8400
www.aecom.com

Site Location
National Grid
Former Bay Ridge Holder Stations A & B Site
Operable Unit No. 2
Brooklyn, NY

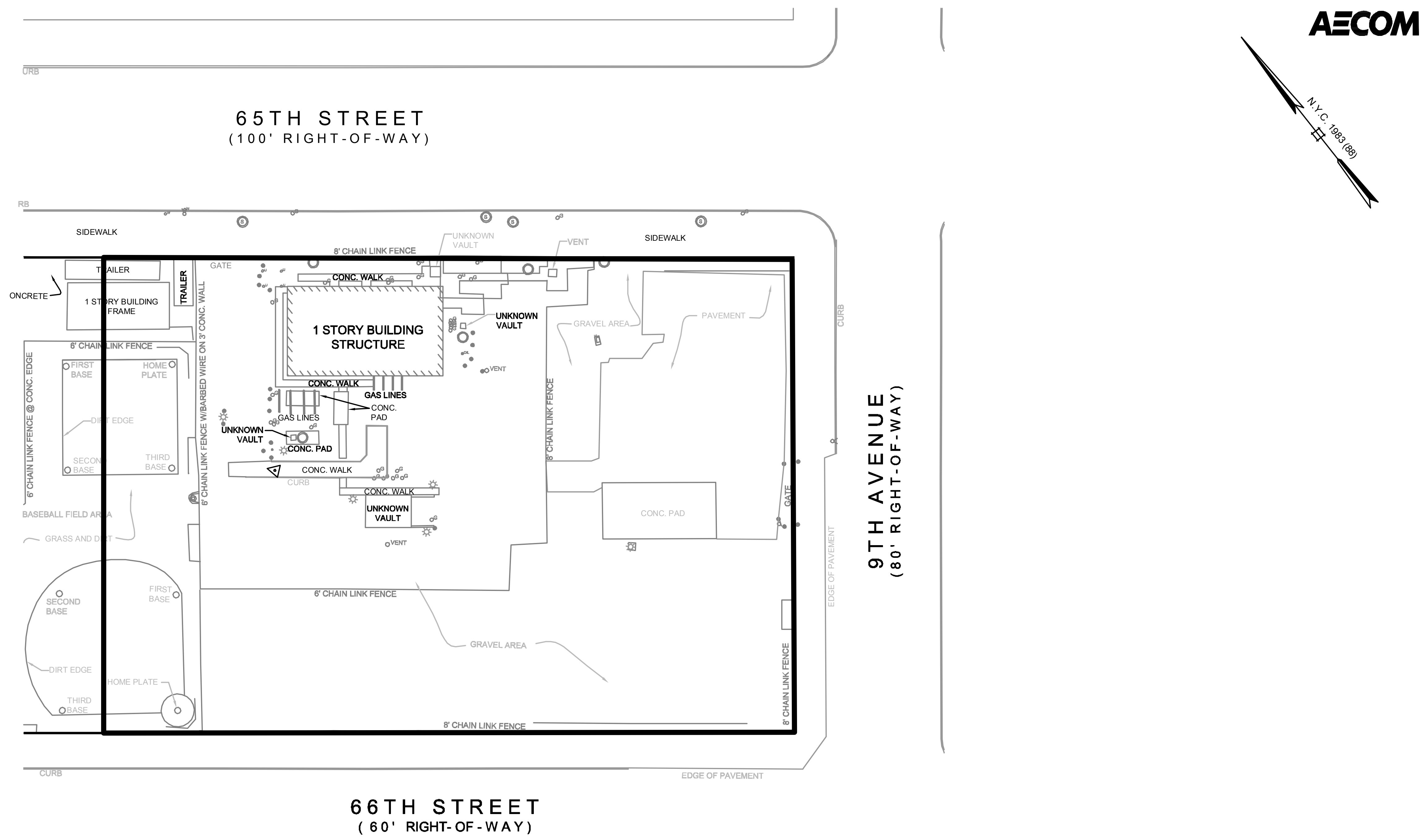
Data Source: USGS Topographic Quadrangles - Jersey City, 2009; Brooklyn, 1995; The Narrows, 1998; Coney Island, 1979.

Scale:	Date:	Project Number:
1"=2000'	9/26/2014	60137360

Figure Number:

1-1

AECOM



DEED REFERENCES:

BLOCK 5749 LOT 1, DEED BOOK 4297 PAGE 1832; BLOCK 5749 LOT 6, DEED BOOK 4047 PAGE 2246;
BLOCK 5749 LOT 70, DEED BOOK 2841 PAGE 469; BLOCK 5749 LOT 71. DEED BOOK 4704 PAGE 2194;
BLOCK 5749 LOT 72, DEED BOOK 2474 PAGE 1751; BLOCK 5749 LOT 15, FROM NYC DIGITAL TAX MAP DATED 12-06-2008;

Legend

○	Unknown Manhole
●	Protective Post
△	Control Points
	Fire Hyrdrant
□	Unknown Vault
□E	Electric Meter
□W	Water Meter
○W	Water Valve
Ⓓ	Drainage Manhole
○G	Gas Valve
☼	Private Light Pole
	Sign
Ⓢ	Sewer Manhole
⊚	Flag Pole
	Wood Pole with Street Light
— —	Fence Line
——	Property Line
- - -	Property Line Adjoiner
— — —	Edge of Pavement Line
— - - —	Right-Of-Way Line
——	Guide Rail
//////	Building
▭	Interim Site Management Plan (ISMP) Boundary

NOTES:

(1) This is not a valid, true copy of this document unless it bears the original signature and the raised, embossed seal of the surveyor noted hereon.

(2) Horizontal Datum is NAD 1983-CORS New York Long Island Zone 3104

(3) Vertical Datum is NAVD 88

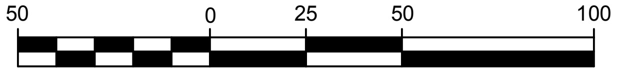
(4) Units = U.S. Survey Feet

(5) Planimetric data shown hereon was generated from field observations in the month of April 2010 and March 2011.

(6) Site survey prepared by Geod Corporation
Project No.: 2918
Date: 6/9/11

(7) Location of historic structures based upon 1905 and 1926 Sanborn Fire Insurance Maps, and 1956 Kings County Lighting Company Drawing No. 5.611-20.

Graphic Scale



(In Feet)
1 inch = 50 ft.

NATIONAL GRID
FORMER BAY RIDGE HOLDER STATIONS A & B SITE
OPERABLE UNIT NO. 2
BROOKLYN, NEW YORK
NYSDEC SITE NO.: 224058

DATE: 09/26/2014 | DRWN: AB | JOB #: 60137360

CURRENT FEATURES
FORMER HOLDER STATION B SITE

FIGURE 1-2

File: L:\work\AECOM_work\60137360\500 Progress Submittal-Deliverables\502 SC Results Report\Figures\Updated_20110921\Figure 3 Location of Soil Borings and Monitoring Wells .dwg

Legend

▭ Proposed ISMP Boundary
- - Bay Ridge Former Gas Holder Stations A & B
▭ Block Boundary

Land Use

- ▨ One & Two Family Residential
- ▨ Multi Family Residential
- ▨ Mixed Use
- ▨ Commercial
- ▨ Industrial and Manufacturing
- ▨ Public Facilities and Institutions
- ▨ Transportation, Utility and Parking
- ▨ Open Space and Outdoor Recreation
- ▨ Vacant Land

Note: Tax Block & Tax Lot files are copyrighted by the New York City Department of City Planning

AECOM

AECOM Environment
200 LIBERTY STREET
NEW YORK, NY 10281
(212) 798-8500
www.aecom.com

Parcel Locations
National Grid
Bay Ridge Former Gas Holder Stations Site
Brooklyn Ridge, NY

Scale:	Date:	Project Number:
1 in = 200 ft	12/3/2014	60137360

Figure Number:
1-3

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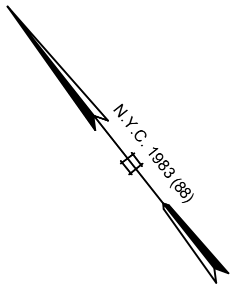
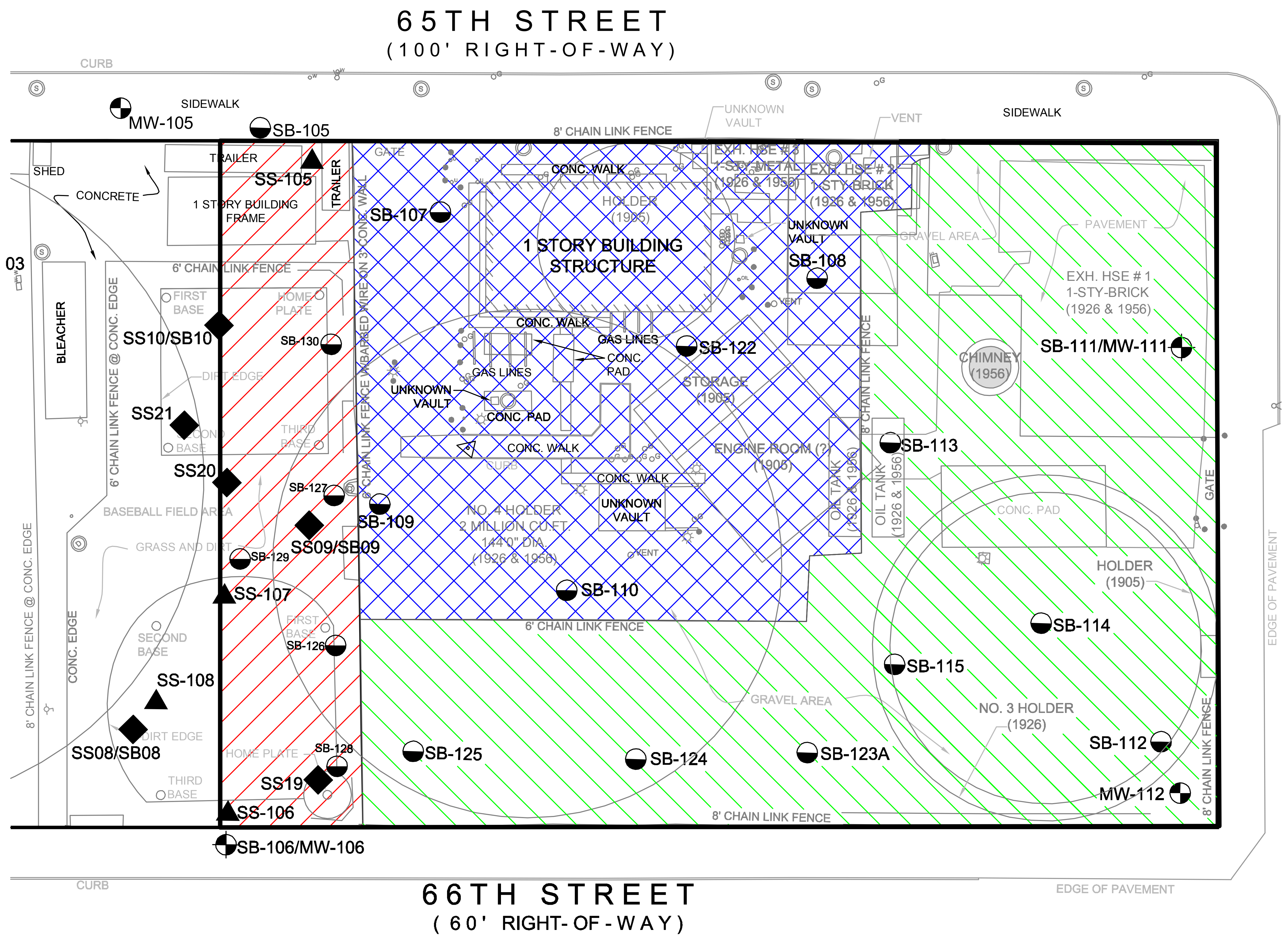
AECOM





Legend

▲ SS-101	Location of Surface Soil Sample
◆ SS01/SB01	VHB Surface Soil/Soil Boring
⊕ MW-102	Location of Monitoring Well
● SS-103/SB-103	Location of Surface Soil Sample and Soil Boring
⊕ SB-101/MW-101	Location of Soil Boring and Monitoring Well
◒ SB-102	Location of Soil Boring
○	Unknown Manhole
•	Protective Post
△	Control Points
	Fire Hydrant
□	Unknown Vault
□	Electric Meter
	Water Meter
	Water Valve
◎	Drainage Manhole
	Gas Valve
	Private Light Pole
	Sign
◎	Sewer Manhole
	Flag Pole
	Wood Pole with Street Light
	Fence Line
	Property Line
	Property Line Adjoiner
	Edge of Pavement Line
	Right-Of-Way Line
	Guide Rail
	Building
▭	Historic Structure
	Limit of Interim Site Management Plan (ISMP)
	Area of Additional Investigation
🟦	National Grid Gate Station
🟥	Youth Athletic Fields
🟩	Vacant Area

NOTES:

(1) This is not a valid, true copy of this document unless it bears the original signature and the raised, embossed seal of the surveyor noted hereon.

(2) Horizontal Datum is NAD 1983-CORS New York Long Island Zone 3104

(3) Vertical Datum is NAVD 88

(4) Units = U.S. Survey Feet

(5) Planimetric data shown hereon was generated from field observations in the month of April 2010 and March 2011.

(6) Site survey prepared by Geod Corporation
Project No.: 2918
Date: 6/9/11

(7) Location of historic structures based upon 1905 and 1926 Sanborn Fire Insurance Maps, and 1956 Kings County Lighting Company, Drawing No. 5.611-20.

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BLOCK 5749 LOT 72, DEED BOOK 2474 PAGE 1751; BLOCK 5749 LOT 15, FROM NYC DIGITAL TAX MAP DATED 12-06-2008;

Graphic Scale

30 0 15 30 60

(In Feet)

1 inch = 15 ft.

NATIONAL GRID
FORMER BAY RIDGE HOLDER STATIONS A & B SITE
OPERABLE UNIT NO. 2
BROOKLYN, NEW YORK
NYSDEC SITE NO.: 224058

HISTORICAL STRUCTURES AND INVESTIGATION LOCATIONS

DATE: 11/04/2014 DRWN: JOB #: 60137360

FIGURE 1-4

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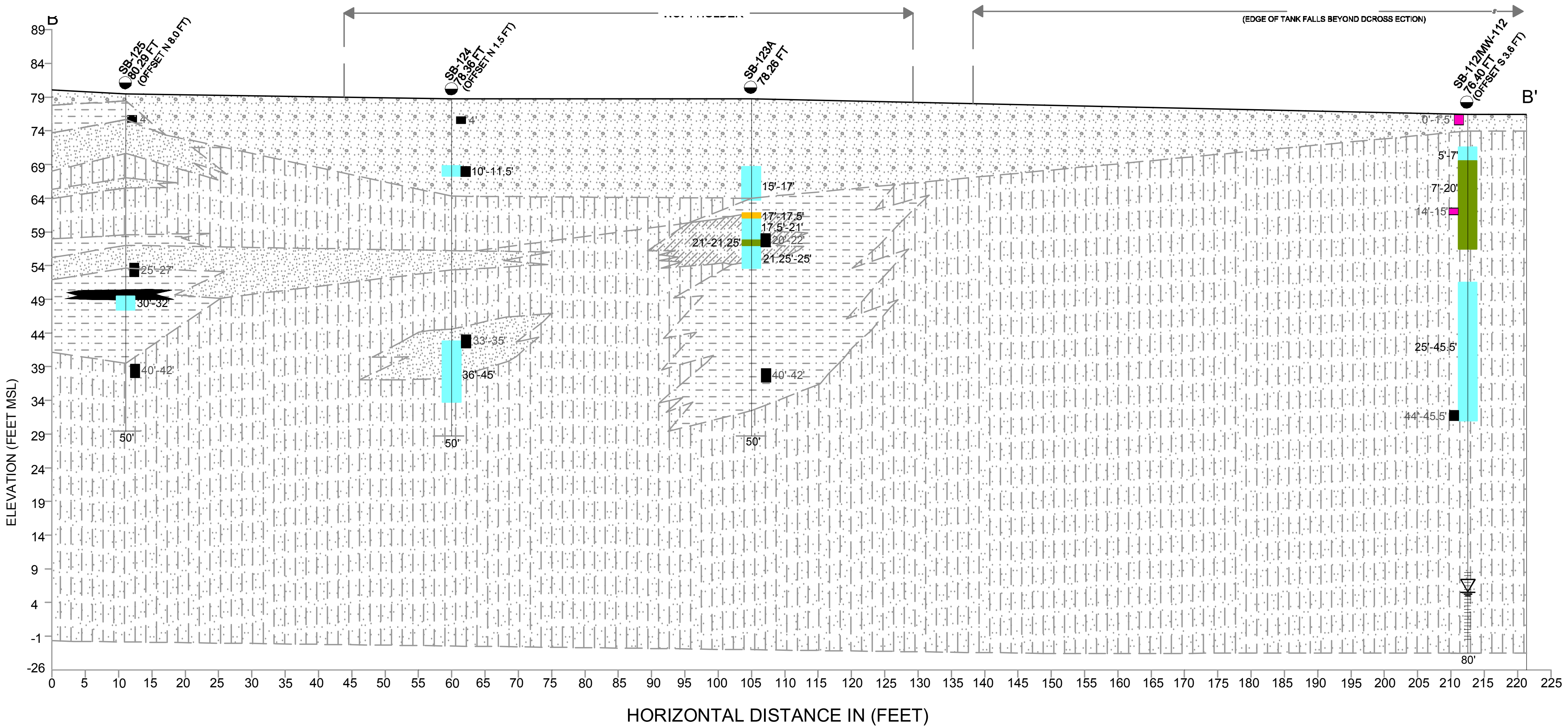
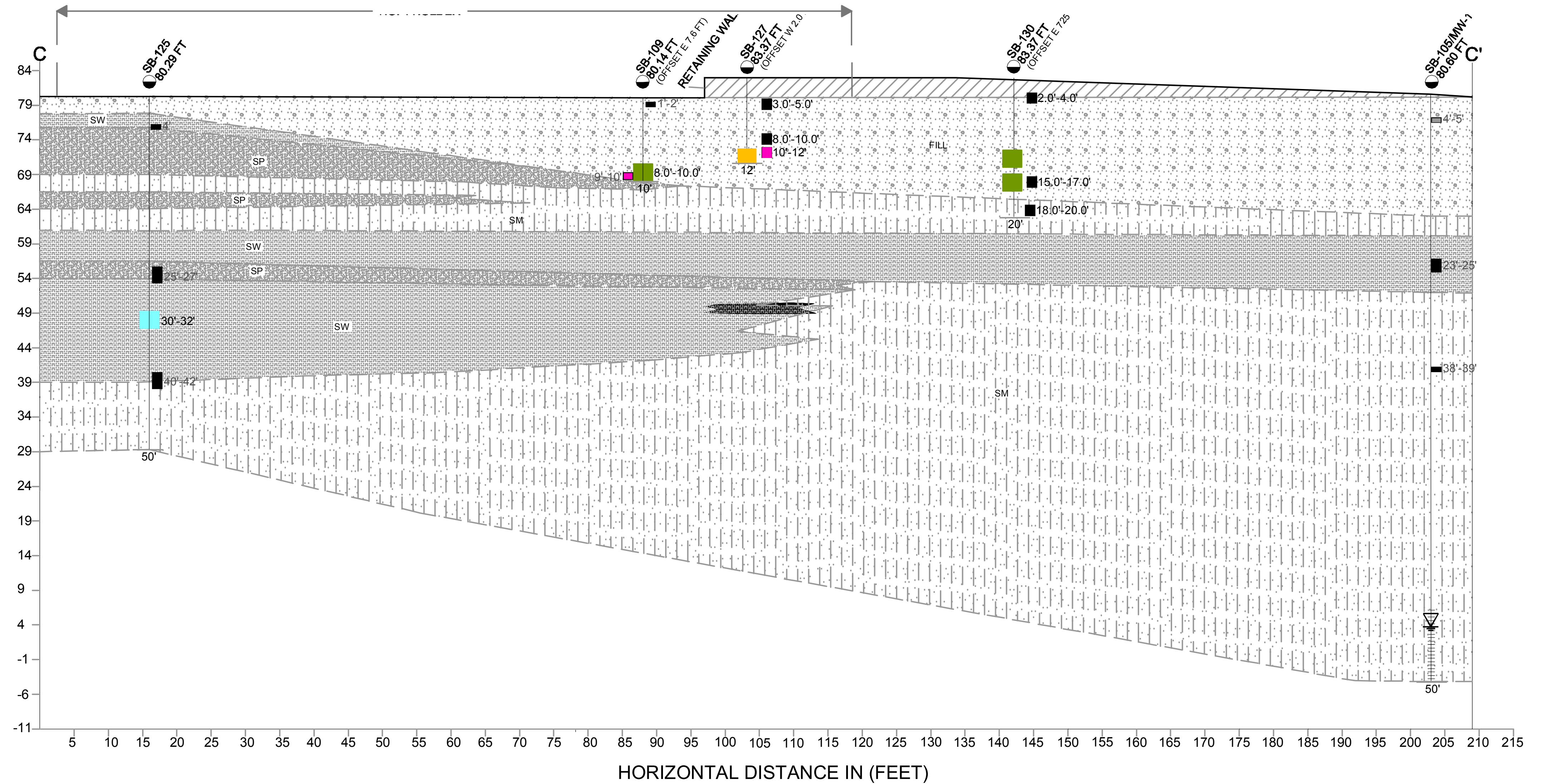
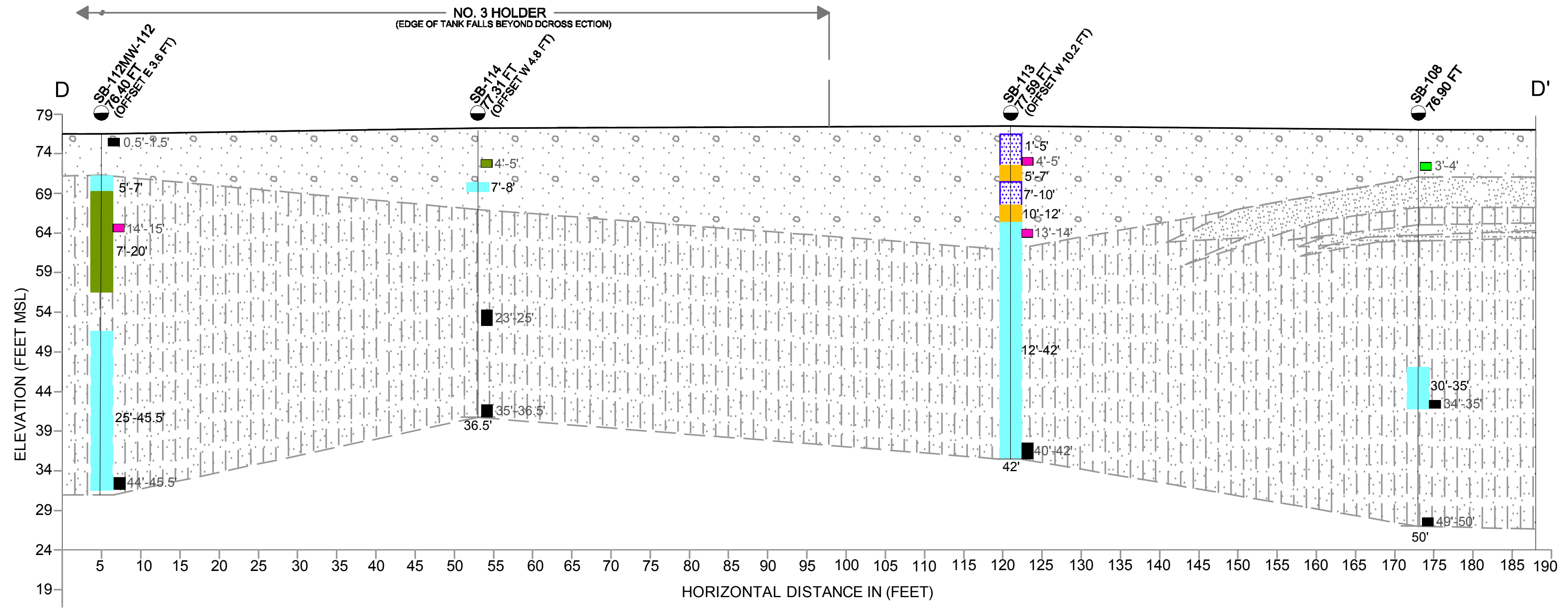


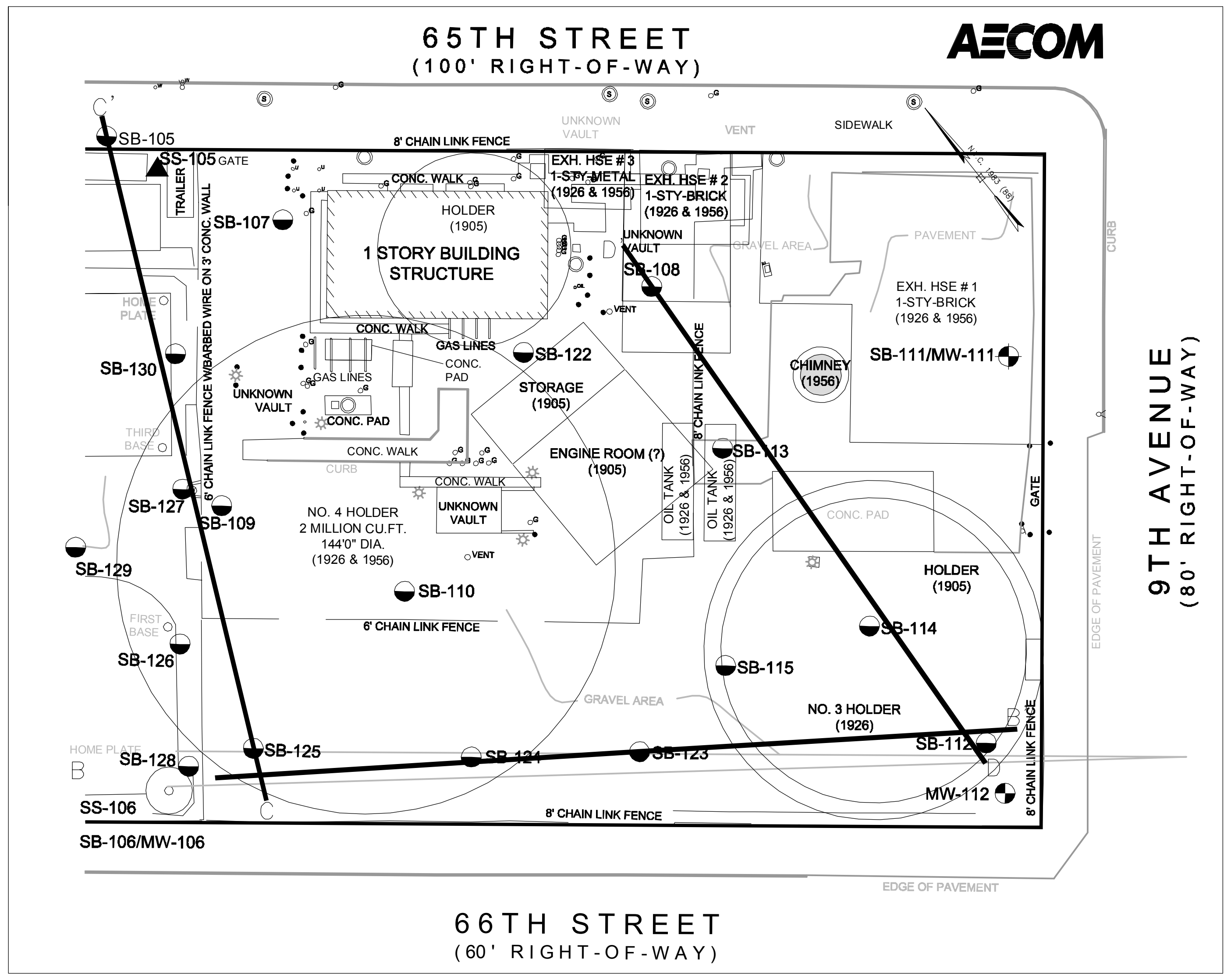
CROSS SECTION B-B'



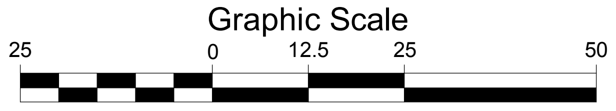
CROSS SECTION C-C'



CROSS SECTION D-D'



CROSS SECTION LOCATION



(In Feet)
1 inch = 50 ft.

STRATIGRAPHY

▨ FILL
▨ WELL GRADED SAND (SW)
▨ POORLY GRADED SAND (SP)
▨ SILTY SAND (SM)
▨ CLAY

VISUAL AND OLFACTORY IMPACTS

🟩 TAR SHEEN/STAINING
🟧 BLEBS, GLOBS, LENSES, COATINGS
🟦 TAR/NAPHTHALENE-LIKE ODORS
▨ PETROLEUM ODORS
∇ GROUNDWATER
┆ SCREEN
— LIMITS OF INTERIM SITE MANAGEMENT PLAN (ISMP)
■ 3'-4' SAMPLE INTERVAL
🟪 4'-5' EXCEEDANCES OF NYSDEC PART 375-6.8 (b) RESTRICTED RESIDENTIAL AND COMMERCIAL USE SOIL CLEANUP OBJECTIVE VALUES
🟩 3'-4' EXCEEDANCES OF NYSDEC PART 375-6.8 (b) RESTRICTED RESIDENTIAL USE SOIL CLEANUP OBJECTIVE VALUES
5'-7' DEPTH RANGE OF VISUAL OLFACTORY IMPACTS (BGS)
50' BORING COMPLETION DEPTH (BGS)
BGS BELOW GROUND SURFACE

NATIONAL GRID
FORMER BAY RIDGE HOLDER STATIONS A & B SITE
OPERABLE UNIT NO. 2
BROOKLYN, NEW YORK
NYSDEC SITE NO.: 224058

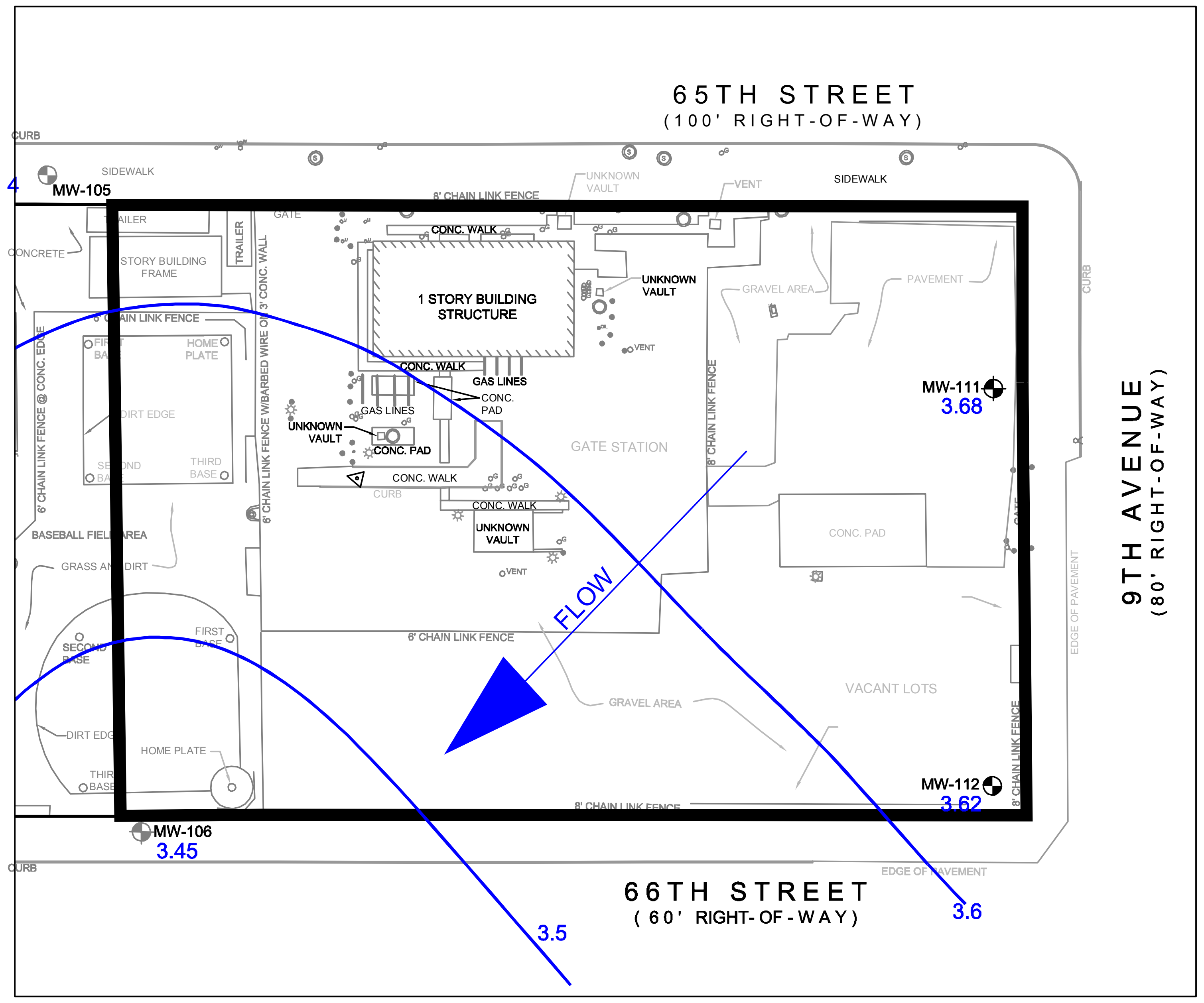
GEOLOGIC CROSS SECTIONS
FORMER HOLDER STATION B SMP SITE

DATE: 10/08/2014 DRWN: AS JOB #: 60137360

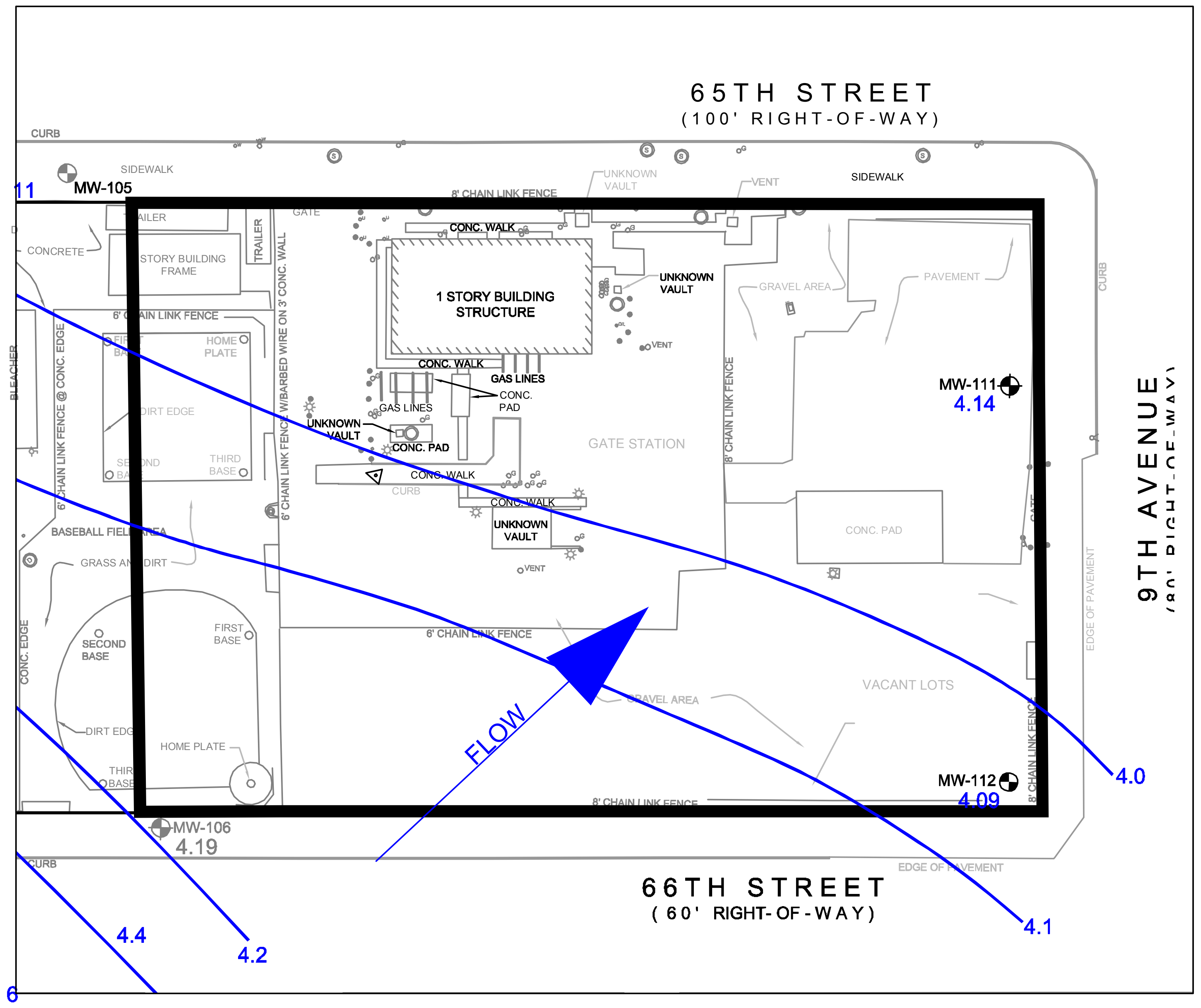
FIGURE 1-5

File: L:\work\AECOM_work\60137360\500 Progress Submittal-Deliverables\502 SC Results Report\Figures\Updated_20110921\Figure 4-6 Cross Section D-D'.dwg Layout: Cross Section D-D'

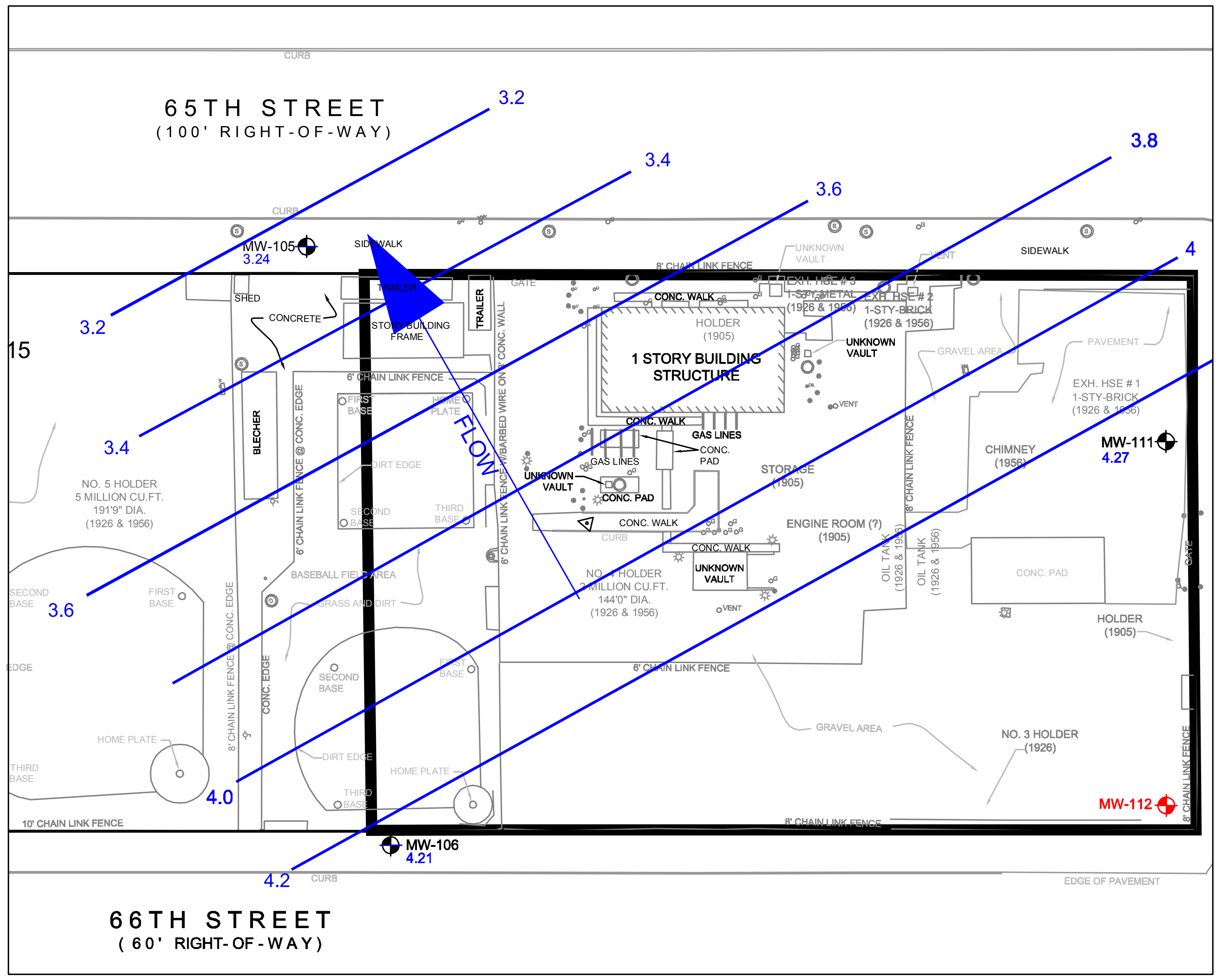
AECOM



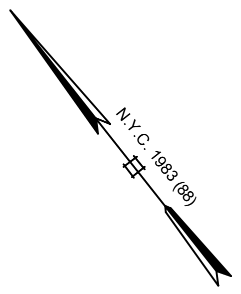
MARCH 24, 2011



JULY 14, 2011



OCTOBER 10, 2013



Legend

⊕ MW-101	Monitoring Well
⊕ MW-101	Location of Damaged Monitoring Well
◎	Unknown Manhole
•	Protective Post
△	Control Points
♀	Fire Hyrdrant
□	Unknown Vault
□E	Electric Meter
□W	Water Meter
oW	Water Valve
Ⓓ	Drainage Manhole
oG	Gas Valve
☼	Private Light Pole
♁	Sign
Ⓢ	Sewer Manhole
⊗	Flag Pole
⊕	Wood Pole with Street Light
— — —	Fence Line
——	Property Line
- - - -	Property Line Adjoiner
— — —	Edge of Pavement Line
—- -—	Right-Of-Way Line
——	Guide Rail
//////	Building
—3.2—	Elevation of Groundwater (Feet NAVD 88)
▬▬	Interim Site Management Plan (ISMP) Boundary

DEED REFERENCES:

BLOCK 5749 LOT 1, DEED BOOK 4297 PAGE 1832;
BLOCK 5749 LOT 6, DEED BOOK 4047 PAGE 2246;
BLOCK 5749 LOT 70, DEED BOOK 2841 PAGE 469;
BLOCK 5749 LOT 71. DEED BOOK 4704 PAGE 2194;
BLOCK 5749 LOT 72, DEED BOOK 2474 PAGE 1751;
BLOCK 5749 LOT 15, FROM NYC DIGITAL TAX MAP DATED 12-06-2008;

NOTES:

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(2) Horizontal Datum is NAD 1983-CORS New York Long Island Zone 3104

(3) Vertical Datum is NAVD 88

(4) Units = U.S. Survey Feet

(5) Planimetric data shown hereon was generated from field observations in the month of April 2010 and March 2011.

(6) Site survey prepared by Geod Corporation
Project No.: 2918
Date: 6/9/11

(7) The groundwater is relatively flat on site and the flow directions can vary due to numerous factors.

(8) The elevation data suggests that the groundwater table is relatively flat; thus any change in the depth to groundwater in any of the wells can impact the suggested groundwater flow direction.

Graphic Scale
50 0 25 50 100
(In Feet)
1 inch = 50 ft.

NATIONAL GRID
FORMER BAY RIDGE HOLDER
STATION A & B SITE
OPERABLE UNIT NO. 2
BROOKLYN, NEW YORK
NYSDEC SITE NO.: 224058

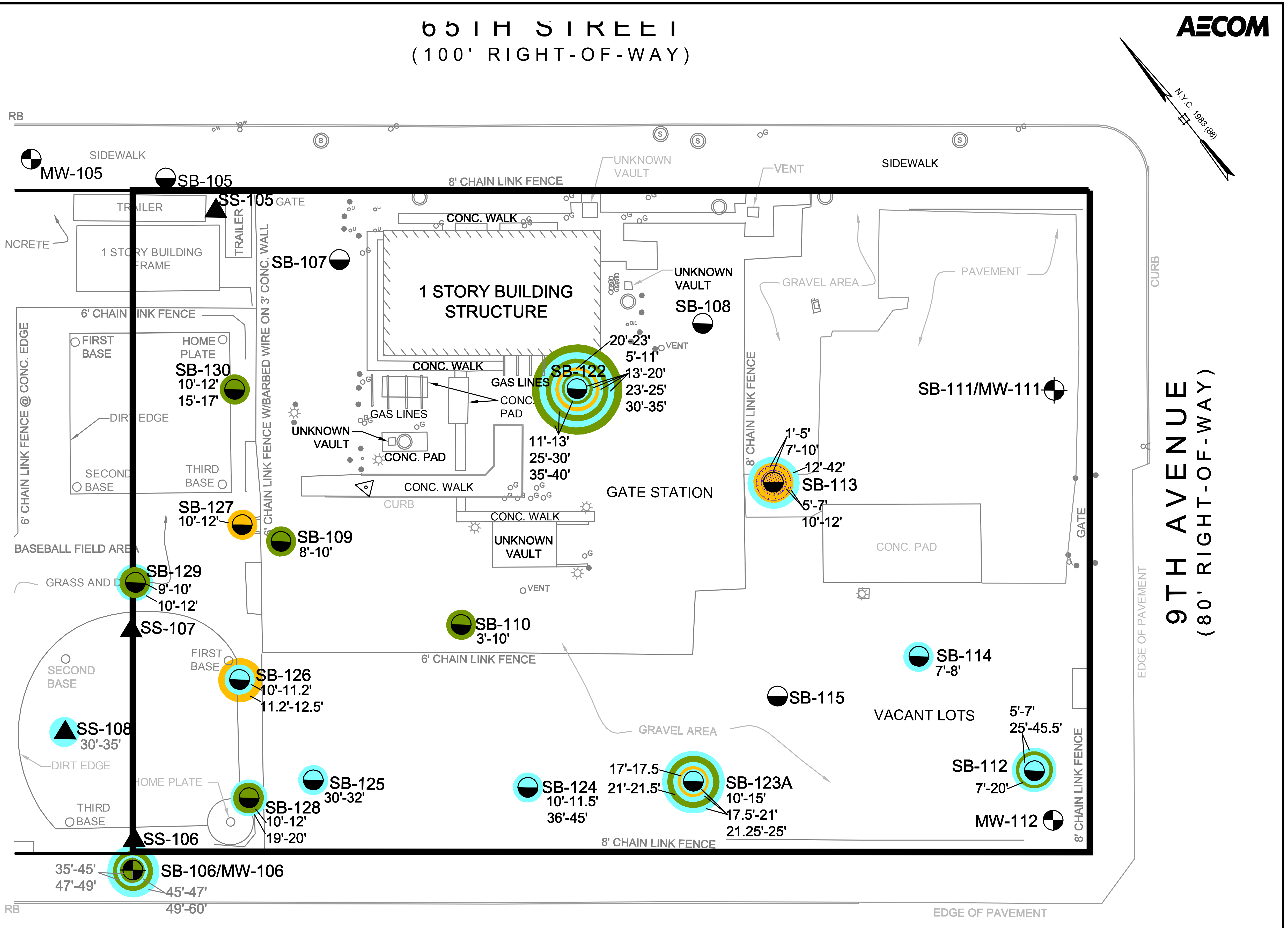
GROUNDWATER CONTOURS

DATE: 09/26/2014
DRWN:
JOB #: 60137360

FIGURE 1-6

File: L:\work\AECOM_work\60137360\500 Progress Submittal-Deliverables\502 SC Results Report\Figures\Updated_20110921\Figure 4 Groundwater Elevation Contour Map March.dwg Layout: Site B

File: L:\work\AECOM_work\60137360\500 Progress Submittal-Deliverables\502 SC Results Report\Figures\Updated_20110921\Figure 3 Location of Soil Borings and Monitoring Wells .dwg



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(3) Vertical Datum is NAVD 88

(4) Units = U.S. Survey Feet

(5) Planimetric data shown hereon was generated from field observations in the month of April 2010 and March 2011.

(6) Site survey prepared by Geod Corporation
Project No.: 2918
Date: 6/9/11

Legend

▲ SS-101	Location of Surface Soil Sample
◍ MW-102	Location of Monitoring Well
● SS-103/SB-103	Location of Surface Soil Sample and Soil Boring
⊕ SB-101/MW-101	Location of Soil Boring and Monitoring Well
◓ SB-102	Location of Soil Boring
○	Unknown Manhole
•	Protective Post
△	Control Points
♁	Fire Hyrdrant
□	Unknown Vault
□E	Electric Meter
□W	Water Meter
oW	Water Valve
Ⓓ	Drainage Manhole
oG	Gas Valve
☼	Private Light Pole
♀	Sign
Ⓢ	Sewer Manhole
◎	Flag Pole
⚲	Wood Pole with Street Light
— —	Fence Line
——	Property Line
- - - - -	Property Line Adjoiner
— — —	Edge of Pavement Line
— - - —	Right-Of-Way Line
═	Guide Rail
//////	Building
▬	Limits of Interim Site Management Plan (ISMP)
🟢	TAR SHEEN/STAINING
🟡	BLEBS, GLOBS, LENSES, COATINGS
🔵	TAR/NAPHTHALENE-LIKE ODORS
░ ●	PETROLEUM ODORS

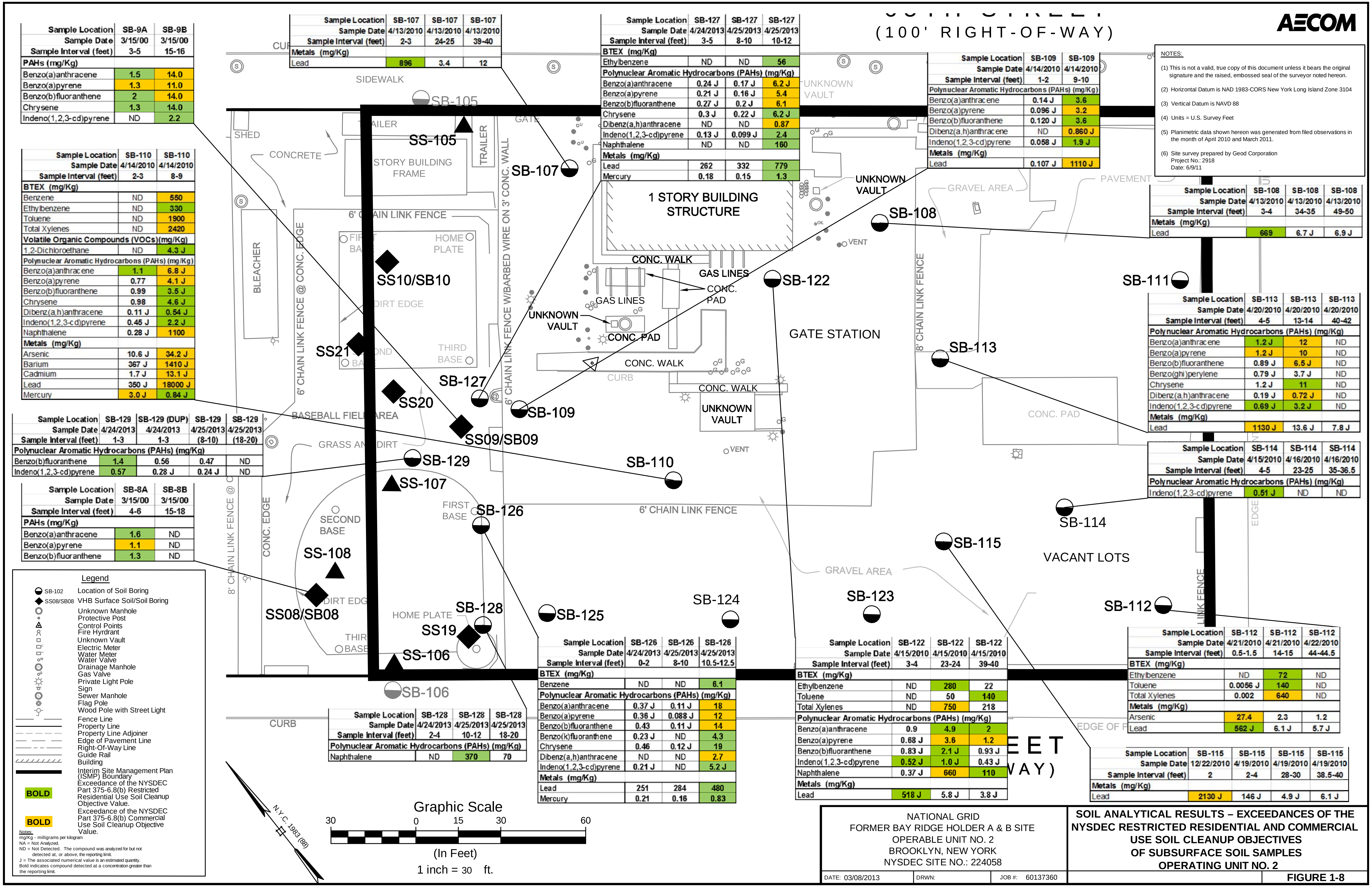
Graphic Scale
30 0 15 30 60
(In Feet)
1 inch = 30 ft.

NATIONAL GRID
FORMER BAY RIDGE HOLDER STATION A & B SITE
OPERABLE UNIT NO. 2
BROOKLYN, NEW YORK
NYSDEC SITE NO.: 224058

SUMMARY OF VISUAL AND OLFACTORY IMPACTS

DATE: 08/05/2014
DRWN:
JOB #: 60137360

FIGURE 1-7



Sample Location	SB-9A	SB-9B
Sample Date	3/15/00	3/15/00
Sample Interval (feet)	3-5	15-16
PAHs (mg/Kg)		
Benzo(a)anthracene	1.5	14.0
Benzo(a)pyrene	1.3	11.0
Benzo(b)fluoranthene	2	14.0
Chrysene	1.3	14.0
Indeno(1,2,3-cd)pyrene	ND	2.2

Sample Location	SB-110	SB-110
Sample Date	4/14/2010	4/14/2010
Sample Interval (feet)	2-3	8-9
BTEX (mg/Kg)		
Benzene	ND	550
Ethylbenzene	ND	330
Toluene	ND	1900
Total Xylenes	ND	2420
Volatile Organic Compounds (VOCs)(mg/Kg)		
1,2-Dichloroethane	ND	4.3 J
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/Kg)		
Benzo(a)anthracene	1.1	6.8 J
Benzo(a)pyrene	0.77	4.1 J
Benzo(b)fluoranthene	0.99	3.5 J
Chrysene	0.98	4.6 J
Dibenz(a,h)anthracene	0.11 J	0.54 J
Indeno(1,2,3-cd)pyrene	0.45 J	2.2 J
Naphthalene	0.28 J	1100
Metals (mg/Kg)		
Arsenic	10.6 J	34.2 J
Barium	367 J	1410 J
Cadmium	1.7 J	13.1 J
Lead	350 J	18000 J
Mercury	3.0 J	0.84 J

Sample Location	SB-129	SB-129 (DUP)	SB-129	SB-129
Sample Date	4/24/2013	4/24/2013	4/25/2013	4/25/2013
Sample Interval (feet)	1-3	1-3	(8-10)	(18-20)
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/Kg)				
Benzo(b)fluoranthene	1.4	0.56	0.47	ND
Indeno(1,2,3-cd)pyrene	0.57	0.28 J	0.24 J	ND

Sample Location	SB-8A	SB-8B
Sample Date	3/15/00	3/15/00
Sample Interval (feet)	4-6	15-18
PAHs (mg/Kg)		
Benzo(a)anthracene	1.6	ND
Benzo(a)pyrene	1.1	ND
Benzo(b)fluoranthene	1.3	ND

Sample Location	SB-107	SB-107	SB-107
Sample Date	4/13/2010	4/13/2010	4/13/2010
Sample Interval (feet)	2-3	24-25	39-40
Metals (mg/Kg)			
Lead	896	3.4	12

Sample Location	SB-127	SB-127	SB-127
Sample Date	4/24/2013	4/25/2013	4/25/2013
Sample Interval (feet)	3-5	8-10	10-12
BTEX (mg/Kg)			
Ethylbenzene	ND	ND	56
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/Kg)			
Benzo(a)anthracene	0.24 J	0.17 J	6.2 J
Benzo(a)pyrene	0.21 J	0.16 J	5.4
Benzo(b)fluoranthene	0.27 J	0.2 J	6.1
Chrysene	0.3 J	0.22 J	6.2 J
Dibenz(a,h)anthracene	ND	ND	0.87
Indeno(1,2,3-cd)pyrene	0.13 J	0.099 J	2.4
Naphthalene	ND	ND	160
Metals (mg/Kg)			
Lead	262	332	779
Mercury	0.18	0.15	1.3

Sample Location	SB-109	SB-109
Sample Date	4/14/2010	4/14/2010
Sample Interval (feet)	1-2	9-10
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/Kg)		
Benzo(a)anthracene	0.14 J	3.6
Benzo(a)pyrene	0.096 J	3.2
Benzo(b)fluoranthene	0.120 J	3.6
Dibenz(a,h)anthracene	ND	0.860 J
Indeno(1,2,3-cd)pyrene	0.058 J	1.9 J
Metals (mg/Kg)		
Lead	0.107 J	1110 J

NOTES:

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(3) Vertical Datum is NAVD 88

(4) Units = U.S. Survey Feet

(5) Planimetric data shown hereon was generated from filed observations in the month of April 2010 and March 2011.

(6) Site survey prepared by Geod Corporation
Project No.: 2918
Date: 6/9/11

Sample Location	SB-108	SB-108	SB-108
Sample Date	4/13/2010	4/13/2010	4/13/2010
Sample Interval (feet)	3-4	34-35	49-50
Metals (mg/Kg)			
Lead	669	6.7 J	6.9 J

Sample Location	SB-113	SB-113	SB-113
Sample Date	4/20/2010	4/20/2010	4/20/2010
Sample Interval (feet)	4-5	13-14	40-42
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/Kg)			
Benzo(a)anthracene	1.2 J	12	ND
Benzo(a)pyrene	1.2 J	10	ND
Benzo(b)fluoranthene	0.89 J	6.5 J	ND
Benzo(ghi)perylene	0.79 J	3.7 J	ND
Chrysene	1.2 J	11	ND
Dibenz(a,h)anthracene	0.19 J	0.72 J	ND
Indeno(1,2,3-cd)pyrene	0.69 J	3.2 J	ND
Metals (mg/Kg)			
Lead	1130 J	13.6 J	7.8 J

Sample Location	SB-114	SB-114	SB-114
Sample Date	4/15/2010	4/16/2010	4/16/2010
Sample Interval (feet)	4-5	23-25	35-36.5
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/Kg)			
Indeno(1,2,3-cd)pyrene	0.51 J	ND	ND

Sample Location	SB-128	SB-128	SB-128
Sample Date	4/24/2013	4/25/2013	4/25/2013
Sample Interval (feet)	2-4	10-12	18-20
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/Kg)			
Naphthalene	ND	370	70

Sample Location	SB-126	SB-126	SB-126
Sample Date	4/24/2013	4/25/2013	4/25/2013
Sample Interval (feet)	0-2	8-10	10.5-12.5
BTEX (mg/Kg)			
Benzene	ND	ND	6.1
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/Kg)			
Benzo(a)anthracene	0.37 J	0.11 J	18
Benzo(a)pyrene	0.36 J	0.088 J	12
Benzo(b)fluoranthene	0.43	0.11 J	14
Benzo(k)fluoranthene	0.23 J	ND	4.3
Chrysene	0.46	0.12 J	19
Dibenz(a,h)anthracene	ND	ND	2.7
Indeno(1,2,3-cd)pyrene	0.21 J	ND	5.2 J
Metals (mg/Kg)			
Lead	251	284	480
Mercury	0.21	0.16	0.83

Sample Location	SB-122	SB-122	SB-122
Sample Date	4/15/2010	4/15/2010	4/15/2010
Sample Interval (feet)	3-4	23-24	39-40
BTEX (mg/Kg)			
Ethylbenzene	ND	280	22
Toluene	ND	50	140
Total Xylenes	ND	750	218
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/Kg)			
Benzo(a)anthracene	0.9	4.9	2
Benzo(a)pyrene	0.68 J	3.6	1.2
Benzo(b)fluoranthene	0.83 J	2.1 J	0.93 J
Indeno(1,2,3-cd)pyrene	0.52 J	1.0 J	0.43 J
Naphthalene	0.37 J	660	110
Metals (mg/Kg)			
Lead	518 J	5.8 J	3.8 J

Sample Location	SB-112	SB-112	SB-112
Sample Date	4/21/2010	4/21/2010	4/22/2010
Sample Interval (feet)	0.5-1.5	14-15	44-44.5
BTEX (mg/Kg)			
Ethylbenzene	ND	72	ND
Toluene	0.0056 J	140	ND
Total Xylenes	0.002	640	ND
Metals (mg/Kg)			
Arsenic	27.4	2.3	1.2
Lead	562 J	6.1 J	5.7 J

Sample Location	SB-115	SB-115	SB-115	SB-115
Sample Date	12/22/2010	4/19/2010	4/19/2010	4/19/2010
Sample Interval (feet)	2	2-4	28-30	38.5-40
Metals (mg/Kg)				
Lead	2130 J	146 J	4.9 J	6.1 J

Legend

◒ SB-102	Location of Soil Boring
◆ SS08/SB08	VHB Surface Soil/Soil Boring
○	Unknown Manhole
•	Protective Post
△	Control Points
	Fire Hyrdrant
□	Unknown Vault
□E	Electric Meter
□W	Water Meter
oW	Water Valve
Ⓓ	Drainage Manhole
oG	Gas Valve
☼	Private Light Pole
	Sign
Ⓢ	Sewer Manhole
◎	Flag Pole
	Wood Pole with Street Light
—	Fence Line
—	Property Line
- - -	Property Line Adjoiner
— —	Edge of Pavement Line
— - - —	Right-Of-Way Line
—	Guide Rail
//////	Building
▬	Interim Site Management Plan (ISMP) Boundary
🟩 BOLD	Exceedance of the NYSDEC Part 375-6.8(b) Restricted Residential Use Soil Cleanup Objective Value.
🟨 BOLD	Exceedance of the NYSDEC Part 375-6.8(b) Commercial Use Soil Cleanup Objective Value.

Notes:
mg/Kg - milligrams per kilogram
NA = Not Analyzed.
ND = Not Detected. The compound was analyzed for but not detected at, or above, the reporting limit.
J = The associated numerical value is an estimated quantity.
Bold indicates compound detected at a concentration greater than the reporting limit.

NATIONAL GRID
FORMER BAY RIDGE HOLDER A & B SITE
OPERABLE UNIT NO. 2
BROOKLYN, NEW YORK
NYSDEC SITE NO.: 224058

SOIL ANALYTICAL RESULTS – EXCEEDANCES OF THE NYSDEC RESTRICTED RESIDENTIAL AND COMMERCIAL USE SOIL CLEANUP OBJECTIVES OF SUBSURFACE SOIL SAMPLES OPERATING UNIT NO. 2

DATE: 03/08/2013
DRWN:
JOB #: 60137360

FIGURE 1-8

File: L:\work\AECOM_work\60137360\500 Progress Submittal–Deliverables\502 SC Results Report\Figures\Updated_20110921\Figure 4 Results of SubSurface Soil Samples.dwg Layout: Site B

AECOM

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(2) Horizontal Datum is NAD 1983-CORS New York Long Island Zone 3104

(3) Vertical Datum is NAVD 88

(4) Units = U.S. Survey Feet

(5) Planimetric data shown hereon was generated from field observations in the month of April 2010 and March 2011.

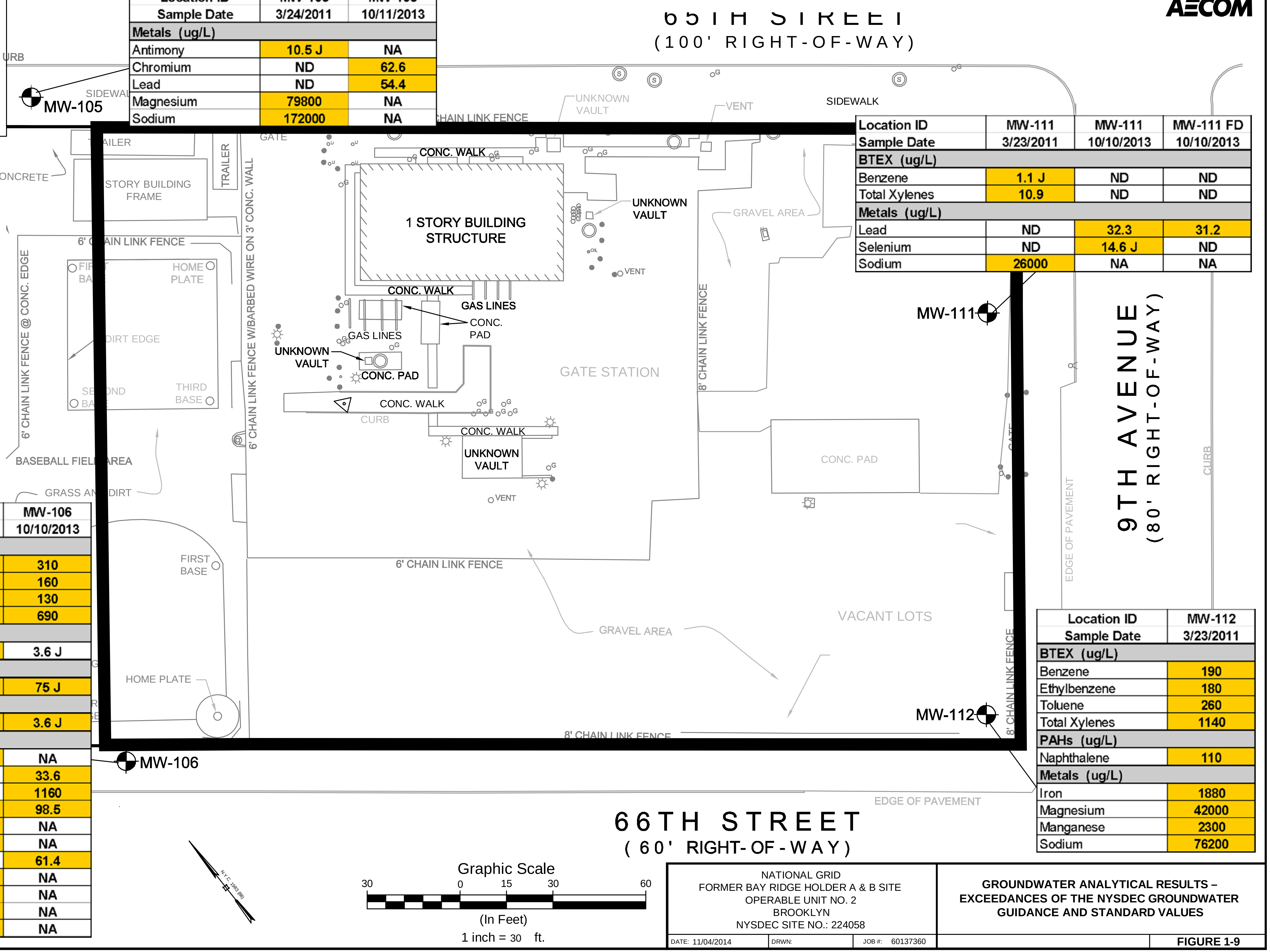
(6) Site survey prepared by Geod Corporation
Project No.: 2918
Date: 6/9/11

Legend

⌖ MW-101	Location of Monitoring Well
○	Unknown Manhole
●	Protective Post
△	Control Points
	Fire Hydrant
□	Unknown Vault
□E	Electric Meter
□W	Water Meter
oW	Water Valve
Ⓓ	Drainage Manhole
oG	Gas Valve
☼	Private Light Pole
	Sign
Ⓢ	Sewer Manhole
◎	Flag Pole
	Wood Pole with Street Light
— —	Fence Line
——	Property Line
- - - - -	Property Line Adjoiner
— — —	Edge of Pavement Line
— - - —	Right-Of-Way Line
——	Guide Rail
//////	Building
▬	Interim Site Management Plan (ISMP) Boundary

Notes:

ug/l = micrograms per liter
NA = Not Analyzed
ND = Not Detected
J = The associated numerical value is an estimated quantity.
Compounds listed were detected above either Guidance or Standard Values - NYSDEC, Division of Water, TOGS (1.1.1) - 6 NYCRR 703.5 [NYSDEC, 1998].
Orange highlight indicates that the compound detected at a concentration greater than the guidance or standard value.



Location ID	MW-105	MW-105
Sample Date	3/24/2011	10/11/2013
Metals (ug/L)		
Antimony	10.5 J	NA
Chromium	ND	62.6
Lead	ND	54.4
Magnesium	79800	NA
Sodium	172000	NA

Location ID	MW-111	MW-111	MW-111 FD
Sample Date	3/23/2011	10/10/2013	10/10/2013
BTEX (ug/L)			
Benzene	1.1 J	ND	ND
Total Xylenes	10.9	ND	ND
Metals (ug/L)			
Lead	ND	32.3	31.2
Selenium	ND	14.6 J	ND
Sodium	26000	NA	NA

Location ID	MW-106	MW-106
Sample Date	3/22/2011	10/10/2013
BTEX (ug/L)		
Benzene	4400	310
Ethylbenzene	2200	160
Toluene	1700	130
Total Xylenes	16400	690
VOCs (ug/L)		
Isopropylbenzene	45 J	3.6 J
PAHs (ug/L)		
Naphthalene	1000	75 J
SVOC (ug/L)		
Phenol	12	3.6 J
Metals (ug/L)		
Antimony	14.3 J	NA
Arsenic	7.4J	33.6
Barium	775	1160
Chromium	7910	98.5
Copper	277	NA
Iron	56900	NA
Lead	8.3J	61.4
Magnesium	55300	NA
Manganese	4060	NA
Nickel	4030	NA
Sodium	23800	NA

Location ID	MW-112
Sample Date	3/23/2011
BTEX (ug/L)	
Benzene	190
Ethylbenzene	180
Toluene	260
Total Xylenes	1140
PAHs (ug/L)	
Naphthalene	110
Metals (ug/L)	
Iron	1880
Magnesium	42000
Manganese	2300
Sodium	76200

NATIONAL GRID
FORMER BAY RIDGE HOLDER A & B SITE
OPERABLE UNIT NO. 2
BROOKLYN
NYSDEC SITE NO.: 224058

GROUNDWATER ANALYTICAL RESULTS – EXCEEDANCES OF THE NYSDEC GROUNDWATER GUIDANCE AND STANDARD VALUES

DATE: 11/04/2014 DRWN: JOB #: 60137360

FIGURE 1-9

Appendices

Appendix A

Metes and Bounds Description and Property Survey

Location No.	Northing	Easting	Elevation	Description
3351	169376.43	981080.59	83.27	SB-130
3352	169341.35	981053.78	83.37	SB-127
3353	169343.52	981021.08	83.69	SB-129
3354	169306.56	981027.30	83.62	SB-126
3355	169278.84	981005.84	83.47	SB-128

Geod Project No: 2918 (Bay Ridge, NY/Bay Ridge Gas Holder)
Horizontal Datum: NAD 83-CORS NYLI 3104
Vertical Datum: NAVD 88
Units: U.S. Survey Feet

Monitoring Well/Soil Boring	NAD 83-CORS NYLI 3104				Elevation (NAVD 88)		
I.D.	Northing	Easting	Latitude	Longitude	Ground	Outer Casing	Inner Casing
ESB-101	169560.04	980955.42	N/A	N/A	85.25	N/A	N/A
ESB-102	169414.52	980798.69	N/A	N/A	87.92	N/A	N/A
ESB-105	169438.63	981104.21	N/A	N/A	80.60	N/A	N/A
ESB-106	169281.40	980966.38	N/A	N/A	82.70	N/A	N/A
ESB107	169386.85	981129.84	N/A	N/A	78.97	N/A	N/A
ESB108	169303.75	981203.79	N/A	N/A	76.90	N/A	N/A
ESB109	169331.37	981063.10	N/A	N/A	80.14	N/A	N/A
ESB110	169277.74	981090.03	N/A	N/A	78.45	N/A	N/A
ESB111	169222.03	981272.43	N/A	N/A	75.85	N/A	N/A
ESB112	169135.71	981198.31	N/A	N/A	76.40	N/A	N/A
ESB113	169253.02	981190.70	N/A	N/A	77.59	N/A	N/A
ESB114	169184.48	981192.62	N/A	N/A	77.31	N/A	N/A
ESB115	169201.51	981152.22	N/A	N/A	77.53	N/A	N/A
ESB120	169808.55	981401.03	N/A	N/A	74.59	N/A	N/A
ESB121	169795.52	981327.76	N/A	N/A	74.71	N/A	N/A
ESB122	169311.68	981161.91	N/A	N/A	78.40	N/A	N/A
ESB123	169197.11	981115.81	N/A	N/A	78.26	N/A	N/A
ESB124	169226.74	981075.54	N/A	N/A	78.36	N/A	N/A
ESB125	169268.82	981025.98	N/A	N/A	80.29	N/A	N/A
SS103	169474.00	980995.22	N/A	N/A	83.84	N/A	N/A
SS104	169424.88	980934.36	N/A	N/A	84.83	N/A	N/A
SS107	169338.56	981012.17	N/A	N/A	83.82	N/A	N/A
SS108	169326.45	980976.59	N/A	N/A	84.02	N/A	N/A
SS109	169364.52	980901.44	N/A	N/A	84.44	N/A	N/A
SS109B	169336.67	981048.95	N/A	N/A	83.4	N/A	N/A
SS111	169410.4	980880.78	N/A	N/A	85.25	N/A	N/A
MW-101	169560.00	980955.37	40-37-55.48	74-00-42.73	85.29	85.31	84.95
MW-102	169414.86	980793.77	40-37-54.05	74-00-44.83	88.05	88.05	87.79
MW-105	169468.53	981075.61	40-37-54.58	74-00-41.17	81.35	81.33	80.85
MW-106	169281.63	980966.42	40-37-52.73	74-00-42.59	82.78	82.76	82.27
MW-111	169222.08	981272.62	40-37-52.15	74-00-38.62	75.91	75.84	75.39
MW-112	169120.40	981193.21	40-37-51.14	74-00-39.65	76.50	76.39	75.98
MW-116	169911.35	981370.19	40-37-58.96	74-00-37.35	74.47	74.40	73.86
MW-117	169791.79	981254.41	40-37-57.78	74-00-38.85	74.27	74.29	73.85
MW-118	169789.02	981466.89	40-37-57.75	74-00-36.10	74.27	74.26	73.84
MW-119	169708.74	981361.26	40-37-56.95	74-00-37.47	74.28	74.29	74.05

Legend

◎	Unknown Manhole
•	Protective Post
	Control Points
⊕	Monitoring Well
◒	Soil Boring
	Fire Hyrdrant
□	Unknown Vault
□E	Electric Meter
▭W	Water Meter
○W	Water Valve
□W	Water Box
Ⓓ	Drainage Manhole
○G	Gas Valve
○OIL	Oil Valve
Ⓒ	Communication Manhole
Ⓦ	Water Manhole
G	Gas Valve
☼	Private Light Pole
	Sign
Ⓢ	Sewer Manhole
	Flag Pole
○U	Unknown Valve
	Wood Pole with Street Light
Ⓖ	Gas Manhole
⇨	Traffic Flow
x00.0	Spot Elevation
— — —	Fence Line
━━━	Property Line
- - - -	Property Line Adjoiner
— — —	Edge of Pavement Line
═══	Curb Line
━ - - ━	Right-Of-Way Line
───	Guide Rail
//////	Building
— G —	Gas Line
— E —	Electric Line
— S —	Sewer Line
— O/H —	Electric overhead Line
	Deciduous Tree

Deed References:

Block 5749 Lot 1, Deed Book 4297 Page 1832; Block 5749 Lot 6, Deed Book 4047 Page 2246;
Block 5749 Lot 70, Deed Book 2841 Page 469; Block 5749 Lot 71. Deed Book 4704 Page 2194;
Block 5749 Lot 72, Deed Book 2474 Page 1751; Block 5749 Lot 15, From NYC Digital Tax Map dated 12-06-2008;
Block 5735 Lots 1 & 11, Deed Book 4071 Page 1607; Block 5735 Lots 17, Deed Book 1685 Page 1765;
Block 5735 Lots 32, Deed Book 3855 Page 0611

Map Reference:

Map entitled "National Flood Insurance Program, firm, flood insurance rate maps city of New York, New York, Brooklyn, Kings County Panel 194 of 457 Number 360497 Suffix F Map revised September 5, 2007

Zoning Map 22a effective date 09-30-2009 C 090387 ZMK Manufacturing district M1-1.

New York city tax maps Block 5749 effective date December 6, 2008 NYC Digital tax map Finance New York

Brooklyn topographical Borough sectional map number 63 dated August 5th, 1970 Revised on March 14th, 1989 and map number 73 Dated March 8th, 1973 Revised on December 13th, 1977.

CERTIFICATION:

TO: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,

I HEREBY CERTIFY THAT THIS SURVEY HAS BEEN PREPARED UNDER MY IMMEDIATE SUPERVISION, THAT IT IS CORRECT AND ACCURATE IN ACCORDANCE WITH AN ACTUAL SURVEY CONDUCTED ON THE PREMISES DURING FEBRUARY 2013, SUBJECT TO SUCH NOTES AS APPEAR HEREON AND THAT THE ACCURACY OF THE SURVEY MEETS OR EXCEEDS THE FEDERAL REQUIREMENTS ESTABLISHED FOR 3RD ORDER, CLASS 1.

PAUL J. EMILIUS JR. PROFESSINAL LAND SURVEYOR LIC. NO. 37186 DATE

NOTES:

(1) This is not a valid, true copy of this document unless it bears the original signature and the raised, embossed seal of the surveyor noted hereon.

(2) Horizontal datum is North American Datum of 1983 (NAD83 New York State Plane Coordinates, Long Island Zone 3104).

(3) Vertical datum is North American Vertical Datum of 1988 (NAVD88).

(4) Units = U.S. Survey Feet.

(5) Planimetric data shown hereon was generated from field observations in the month of February 2013.

(6) The engineering and institutional controls for this Easement are set forth in the Site Management Plan (SMP). A copy of the SMP must be obtained by any party with an interest in the property. The SMP can be obtained from NYS Department of Environmental Conservation, Divesion of Environmental Remediation, Site Control Section, 625 Broadway, Albany, NY 12233 or at derweb@gw.dec.state.ny.us.

(7) No ponds, lakes, springs, rivers of a natural water boundary were found bordering on or running through the surveyed property as of February 2013.

(8) Underground utilities shown are received plans scaled and traced from:
   a. Consolidated Edison Electrical plates CDOP24-G, 25G, LTMSP-24G, 25G
   b. National Grid Gas plates ID 59A-60A, 59A-188, 59A-189, 58-119, 58-129, 59A-59
   c. Cablevision and Empire City Subway reported no utilities in the area.
   e. NYCDEP requests were made with no response at this time on water, sewer, and drainage utilities.

(9) Sewer inverts shown are from obtainable field measurement.

(10) Any topographical features shown outside the defined boundary of this map is for descriptive purposes only.

(11) This property is subject to a sanitary sewer utility easement covenant that is noted in the reference deed and reference plats associated with this property. Any utilities shown hereon are based on field surface locations, and were not verified as to size, depth, material, &/or condition.

(12) Terms, Covenants, Conditions and Provisions of License Agreement made between The Brooklyn Union Gas Company and Mansur Machine, Inc., dated February 2, 1987 and recorded on March 3, 1987 in Reel 1987 Page 33. Exhibit A

(13) Terms, Covenants, Conditions and Provisions of Order on Consent and Administrative Settlement (Index No. A2-0552-0606) issued by the Commissioner of The New York States Department of Environmental Conservation, for which a Notice of Order and Settlement Agreement (Site No. 224058) made by The Brooklyn Union Gas Company d/bl/a Keyspan energy Delivery New York, dated July 6, 2007 is recorded on July 24, 2007 under CRFN 2007000381083. Exhibit B

(14) Due to lack of physical evidence (i.e. property corners, borough monuments) found during field survey, property boundary lines were established by setting existing rights-of-way as depicted on borough sections maps based upon physical centerline of existing roadway.

(15) Unauthorized alteration or addition to a survey map bearing a licensed land surveyor's seal is a violation of section 7209, sub-division 2, of the New York State Education Law.

(16) Wells shown are from field measurements dated April 2010, March, and June 2011.

(17) The public records referenced on this map are only used for the establishment of the boundary. A title search was preformed by Commonwealth Land Title Insurance Company Title No. NY130144 February 25, 2013.

Graphic Scale
30 0 15 30 60
(In Feet)
1 inch = 30 ft.

Date:	By:	Description
08-06-13	RKJ	Soil Borings added

Revisions

GEOD CORPORATION
PHOTOGRAMMETRIC SCIENCES - SURVEY TECHNOLOGIES
CORPORATE OFFICE:
24 Kanouse Rd., Newfoundland, N.J. 07435 - (973) 697-2122 FAX: (973) 838-6433

Property and Topographic Survey
National Grid Gate Station
9th Avenue between 65th and 66th Street
Prepared For:
AECOM
Located In:
Kings County, Brooklyn, New York

Drawn By: EA
Checked: RKJ
Scale: 1" = 30'
Date: 06/10/11
Proj. No. 2918
Page: 1 of 1

PAUL J. EMILIUS Jr.
N.Y. Professional Land Surveyor Lic. No 050203

Appendix B

Excavation Work Plan

AECOM

Prepared for:
National Grid
One Metro Tech Center
Brooklyn, New York

Excavation Work Plan

(Appendix B of the Interim Site Management Plan)

Former Bay Ridge Holder Stations A and B Site
Operable Unit 2
Brooklyn, New York
NYSDEC Site No.: 224058
Order on Consent Index #: A2-0552-0606

Contents

List of Acronyms

ASP	Analytical Services Protocol
CAMP	Community Air Monitoring Plan
C&D	Construction and Debris
CCS	Composite Cover System
COC	Compounds of Concern
DER-10	NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation
DOT	Department of Transportation
EC	Engineering Controls
EWP	Excavation Work Plan
HASP	Health and Safety Plan
NYCRR	New York Codes Rules and Regulations
ISMP	Interim Site Management Plan
NYC	New York City
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OSHA	Occupational Safety and Health Administration
PCBs	Polychlorinated Biphenyls
PPE	Personal Protective Equipment
QA	Quality Assurance
QC	Quality Control
SCO	Soil Cleanup Objectives
ISMP	Interim Site Management Plan
SPDES	State Pollution Discharge Elimination System
SVOCs	Semi-volatile Organic Compounds
TCL	Target Compound List
TCLP	Toxicity Characteristics Leaching Procedure
VOCs	Volatile Organic Compounds
USEPA	United States Environmental Protection Agency

1.0 Introduction and Notifications

1.1 Introduction

This Excavation Work Plan (EWP) is a part of the Site Management Plan (ISMP) for the Former Bay Ridge Holder Stations A & B site, Operable Unit 2 (Site). This EWP pertains to all ground intrusive activities within the area of the ISMP. Ground intrusive activities may encounter impacted soil and groundwater, and thus must be managed in accordance with this EWP and the larger ISMP.

1.2 Notifications

1.2.1 Property Owner Notification

As part of the ISMP, the property manager of the Youth Athletic baseball fields or National Grid employees working at the Gate Station facility must notify the National Grid project manager at least 30 days prior to the performance of any activity that is reasonably anticipated to encounter impacted material or penetrate through the cover system. This work may include, but is not limited to, excavations, sewer or water repairs, foundation work, etc.

The notification to National Grid will include:

- A detailed description of the work to be performed, including the location and aerial extent, plans for re-grading, intrusive elements or utilities to be installed below the composite cover system (CCS), estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control (EC);
- A schedule for the work, detailing the start and completion of all intrusive work;
- A summary of the applicable components of this Excavation Work Plan (EWP);
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120;
- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in Appendix C of the ISMP (AECOM, 2015);
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

The property owner should notify National Grid at:

National Grid Project Manager: Donald Campbell
Address:
National Grid
ATTN: Donald Campbell
Fleet Building/Administrative Office
287 Maspeth Avenue
Brooklyn, NY 11211
Telephone: (718) 963-5453

1.2.2 NYSDEC Notification

At least 15 business days prior to the start of any ground intrusive activity within the area of the ISMP, National Grid will then notify the New York State Department of Environmental Conservation (NYSDEC). At the last revision of the ISMP, this notification will be made to:

NYSDEC Project Manager:
Name: Scott Deyette
Address: New York State Department of Environmental Conservation
Remedial Bureau C, Division of Environmental Remediation
625 Broadway Albany, New York 12233-7014
Telephone: (518) 402-9662
Fax: (518) 402-9679
This notification to NYSDEC will include:

- A detailed description of the work to be performed, including the location and aerial extent, plans for re-grading, intrusive elements or utilities to be installed below the CCS, estimated volumes of contaminated soil to be excavated and any work that may impact an EC;
- A summary of environmental conditions anticipated in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work;
- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120;
- A copy of the contractor’s HASP and Community Air Monitoring Program (CAMP), in electronic format, if it differs from the HASP provided in Appendix C of the ISMP (AECOM, 2015);
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

2.0 Excavation Work Plan

All ground intrusive work in the parking lot area and subsurface site work below the CCS on the National Grid gate station facility and Youth Athletic baseball field (see Figure 2-1 of the ISMP) shall be performed in compliance with 29 CFR 1910.120. The contractor/property owner/National Grid representative(s) shall use an Occupational Safety and Health Administration (OSHA) trained Site Supervisor and HAZWOPER-trained workers to complete surface (parking lot area) and subsurface (gate station facility and Youth Athletic baseball field area) intrusive site work.

Note: Access is restricted at the perimeter of the Site. An 8-foot tall chain-link fence secures the Site. The fence around the Site perimeter includes gates that are locked to restrict access which provides additional physical control. The existing and future access conditions were taken into account in the development of the procedures, methods, and controls discussed in this section.

The qualified environmental professional will investigate the presence of utilities and easements on the site. It will be determined whether a risk or impediment to the planned work under the ISMP is posed by utilities or easements on the Site.

It should be noted that the scope of this EWP is limited to management of limited excavation and redevelopment activities on Site. The associated ISMP includes a provision for further investigation and remediation should large scale redevelopment occur, if any of the existing structures are demolished, or if the subsurface is otherwise made accessible. The nature and extent of residual impacts in areas where access was previously limited or unavailable will be immediately and thoroughly investigated pursuant a plan approved by the NYSDEC. Based on the investigation results and the NYSDEC's determination of the need for a remedy, a Remedial Action Work Plan may be developed for the final remedy for the Site, including removal and/or treatment of any source areas to the extent feasible. Citizen Participation Plan will continue through this process. Any necessary remediation will be completed prior to, or in association with, redevelopment

2.1 Soil Screening Methods

A qualified environmental professional will perform visual, olfactory and instrument-based soil screening during all surface intrusion work on the parking lot and subsurface intrusive work on the remainder portion of the Site. All excavation and invasive work performed during development, such as excavations for foundations and utility work, regardless of when the invasive work is performed, will require visual, olfactory, and instrument-based soil screening.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal, material that requires testing, material that can be returned to the subsurface, and material that can be used as cover soil.

All waste known or suspected of being impacted derived from excavation or other activities will be containerized in appropriate containers (55-gallon steel drums, roll off containers). Containers will be properly labeled. The property owner/contractor should coordinate with the shipping company and disposal facility to ensure that containers are suitable for transport and receipt at the disposal facility. Waste should be grouped by environmental matrix (soil, separate phase oils, and/or water).

Construction and demolition debris (C&D) material, including personal protection equipment (PPE), which has been in contact with impacted soil and/or groundwater will be segregated as well.

Containerized soil and water will be characterized using the laboratory analyses specified by the receiving facility. Following analyses, containerized wastes shall be properly disposed of at an approved facility. The contractor/property owner representative(s) should verify the appropriate analyses and sampling frequency with the disposal facility and maintain any waste disposal records.

2.2 On-Site Material Management

2.2.1 Soils

Visually or olfactory impacted material should be placed in roll-off containers, drums, or stockpiled on plastic sheeting and maintained within a secure location around the work area. Stockpiled material shall be covered for protection from precipitation and to prevent material from becoming airborne. It is anticipated that the material will be transported to a National Grid approved off-Site disposal facility. Material collected in drums will be properly labeled and covered for off-loading to a secure area. The material will then be characterized by the contractor/National Grid representative for subsequent disposal.

Stockpiles containing known or suspected impacts will be continuously encircled with a berm. Contaminated water draining from the soils containing known or suspected impacts will be collected from inside the bermed area and disposed of off-Site in an appropriate manner. Hay bales will be used to prevent sedimentation as needed near catch basins, surface waters and other discharge points. Best efforts will be used to track the location of the Site where the stockpiled material has originated from. Material that has been previously characterized shall be kept segregated and not mixed with uncharacterized material or materials that are incompatible.

Stockpiles containing known or suspected impacts will be kept covered at all times with appropriately anchored impervious covers (e.g. tarps or plastic sheeting.) Stockpiles containing known or suspected impacts will be inspected daily and damaged tarp covers will be promptly replaced.

Stockpiles containing known or suspected impacts will be inspected at a minimum once each day and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC. Stockpiled material not being used will be removed within 30 days following disposal facility characterization.

2.2.2 Water

Site data indicates that the water table is approximately 80 feet below current ground surface. Therefore, groundwater will not be encountered during typical intrusive activities. Contaminated water draining from the soils containing known or suspected impacts will be collected from inside the bermed area and disposed of off-Site in an appropriate manner.

All liquids to be removed from the Site, including excavation dewatering and groundwater monitoring well purge and development waters, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the Site without pretreatment. If on-Site treatment of extracted groundwater is not feasible, dewatering, purge, and development fluids will be managed off-Site.

2.3 Materials Excavation and Load Out

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated Site soils. The property manager and/or National Grid and its contractors are solely responsible for safe execution of all invasive and other work performed under this EWP.

Excavated soil shall be segregated (e.g., on plastic or by containerization) from surface soils regardless of its level of impact.

After the completion of soil removal and any other surface intrusive activities, a demarcation layer, consisting of orange snow fencing material or equivalent material will be placed in excavation areas along the sidewalls and excavation bottom to separate backfill from existing soils.

All waste derived from excavation or other intrusive activities will be either stockpiled or placed in appropriate containers (e.g., 55-gallon steel drums, 20-cubic yard roll off containers, 4,000 gallon Baker tanks) and grouped by environmental matrix (soil or water). C&D material including PPE that has been in contact with impacted soil and/or groundwater shall be containerized, separately unless approved by the impacted material disposal facility.

All removed soil and water will be characterized using the laboratory analyses and sampling frequency specified by the disposal facility. The analyses to be performed may include, but not be limited to, the following, depending on the medium and the selected disposal facility:

- Total Metals by United States Environmental Protection Agency (USEPA) Method 6010B (Mercury 7470A)
- Total Petroleum Hydrocarbons (DRO and GRO) by USEPA Method 8015 modified
- Polychlorinated biphenyl (PCBs) by USEPA 8082
- Toxicity Characteristics Leaching Procedure (TCLP) ZHE Extraction – USEPA Method 1311
- TCLP VOC – USEPA Method 8260B
- TCLP SVOC – USEPA Method 8270C
- TCLP Resource Conservation and Recovery Act (RCRA) Metals – USEPA Method 6010B (Mercury 7470A)
- Corrosivity – USEPA Method 9045C
- Ignitability/Flashpoint – USEPA SW-846 Method 1010A
- Reactive Cyanide and Reactive Sulfide by USEPA SW-846 Chapter 7, Sections 7.3.3.2/7.3.4.2
- Total Organic Halogens – USEPA SW-846 Method 9020B

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYS Department of Transportation (DOT) requirements (and all other applicable transportation requirements).

A truck decontamination area will be operated on-Site. The qualified environmental professional will be responsible for ensuring that all outbound trucks shall be decontaminated at the truck decontamination area before leaving the project site until the activities performed under this section are complete. Water, sand or soil derived from the truck decontamination area will be handled in the same manner specified in Section 2.2.1 and 2.2.2.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the site during intrusive excavation activities. Locations where vehicles enter or exit the project site shall be inspected daily for evidence of off-Site soil tracking. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

2.4 Materials Transport Off-Site

All transportation of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 New York Codes Rules and Regulations (NYCRR) Part 364. Haulers will be appropriately licensed and trucks properly placarded.

At a minimum, trucks transporting any material off-Site should have an impermeable tarp, competent cover systems, and functional tailgates to prevent leakage of liquids. Trucks transporting impacted soils shall be lined with 8-mil polyethylene sheeting large enough to fully cover the top of the load. The truck covers shall be an impermeable soil cover. Additional automatic mesh tarps will be used to secure the liners. Loose-fitting canvas-type truck covers or mesh covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used in addition to polyethylene sheeting. All trucks transporting impacted soils will be decontaminated prior to leaving the Site. Decontaminated water, if any, will be collected and disposed of off-site in an appropriate manner.

Truck transport routes shall be in accordance with all New York City (NYC) DOT and NYSDOT approved roadways.

It is the contractor’s responsibility to follow all applicable state, local, and municipal rules, regulations, and guidelines (including NYCDOT and NYSDOT) regarding truck routes.

All trucks loaded with impacted materials will exit the vicinity of the Site using only the approved truck route. The most appropriate route takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the Site; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

Trucks will be prohibited from stopping and idling in the neighborhood outside the Site. Egress points for truck and equipment transport from the site will be kept clean of dirt and other materials during any site activity and development. Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

2.5 Materials Disposal Off-Site

All soil/fill/solid waste excavated and removed from areas known to have impacted material will be designated as contaminated and regulated material and will be transported and disposed in accordance with all local, state (including 6NYCRR Part 360) and federal regulations. If disposal of soil/fill from this project site is proposed for unregulated off-site disposal (i.e., clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC.

Unregulated off-site management of materials from this project site will not occur without formal NYSDEC approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation NYSDEC notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate (i.e., hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C&D recycling facility, etc). Actual disposal quantities and associated documentation will be reported to the NYSDEC in the ISMP Inspection and Data Submittal Report. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet unrestricted Soil Cleanup Objectives (SCOs) is prohibited from being taken to a NYS recycling facility (6NYCRR Part 360-16 Registration Facility).

2.6 Materials Reuse On-Site

This section provides details for methods to be followed for materials reuse on-site. ‘Reuse on-site’ applies to material that originates at the project site, which does not leave the project site during the excavation, and is replaced into the excavation during backfilling. All impacted material exposed and removed as part of the work at the project site shall be disposed off-site as detailed in this EWP.

All other material excavated during work will require NYSDEC approval prior to any reuse on-site. The qualified environmental professional will ensure that procedures defined for materials reuse by the NYSDEC and DER-10 are followed and that unacceptable material does not remain on-site. Impacted on-site material, including historic fill and impacted soil, that is approved by NYSDEC for re-use on-site will be placed below the demarcation layer or impervious surface, and will not be reused within a CCS, within landscaping berms, or as backfill for subsurface utility lines.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the site will not be reused on-site.

2.7 Fluids Management

All liquids to be removed from the project site, including excavation dewatering and groundwater monitoring well purge and development waters, will be handled, transported and disposed in accordance with applicable local, state, and federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the project site, but will be managed off-site.

Discharge of water generated during large-scale construction activities to surface waters (i.e., a local pond, stream or river) will be performed under a State Pollution Discharge Elimination System (SPDES) permit, as coordinated by the property owner and its contractor(s).

2.8 Cover System Restoration

After the completion of soil removal and any other invasive activities, the CCS will be restored in a manner that complies with the ISMP. The demarcation layer, consisting of orange snow fencing material or equivalent material will be placed in excavation areas with impacted material. The demarcation layer will provide a visual reference to the top of the ‘Impacted Material Zone’, the zone that requires adherence to special conditions for disturbance of impacted soils defined in this ISMP and EWP. If applicable, Figures 1-7, 1-8, and 1-9 of the ISMP will be updated to show the revised extents and limits of impacted material. The revised figures will be included in the subsequent Report and in any updates to the ISMP. If the type of cover system changes from that which exists prior to the excavation (i.e., CCS is replaced by asphalt), this will constitute a modification of the cover element of the remedy and the upper surface of the “Impacted Material Zone.” A figure showing the modified surface will be included in the subsequent Report and in any updates to the ISMP.

2.9 Backfill from Off-Site Sources

All materials proposed for import onto the project site will be approved by the qualified environmental professional and will be in compliance with provisions in this ISMP prior to receipt at the project site.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the project site.

All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d). Soils that meet ‘exempt’ fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this project site, will not be imported onto the project site without prior approval by NYSDEC. Solid waste will not be imported onto the project site. Additionally all imported soils must meet the lower of the 6NYCRR Part 375 Protection of Groundwater and Restricted Use Commercial SCOs on the substation property, and protection of groundwater and restricted residential use SCOs on the baseball field property.

Trucks entering the project site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

2.10 Stormwater Pollution Prevention

Barriers, such as silt fence, and hay bale checks will be installed for erosion control at the Site. Erosion control devices will be installed around the entire perimeter of the construction area. Erosion and sediment control measures will be inspected once a week and after every storm event. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant solids transport and/or impact to receiving waters. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.

Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

2.11 Contingency Plan

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until the appropriate personnel and equipment is mobilized to address the condition.

Sampling will be performed on product and surrounding soils, etc., as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes (Target Analytical List metals; Target Compound List (TCL) volatiles and semi-volatiles, TCL pesticides and PCBs, unless the site history and previous sampling results provide a sufficient justification to limit the list of analytes. In that case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media by screening during invasive Site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the DEC spills hotline and documented in the Periodic Review Reports prepared pursuant to Section 5 of the ISMP.

2.12 Equipment Decontamination

All hand tools and heavy equipment that comes in contact with impacted material will be decontaminated at the end of the work shift, day, when moving to new areas, or anytime it is deemed necessary. Decontamination should be accomplished using industry standard means and methods which may include high pressure washing/steam cleaning equipment, brushes, solvents and/or surfactants. All decontamination related wastes (impacted water, solids and PPE) should be managed appropriately and disposed of off-site at an approved facility. Equipment shall also be decontaminated prior to its use for the placement of clean backfill material if the equipment has been previously used for the handling of contaminated materials

2.13 Health and Safety

The contractor/property owner representative shall develop and utilize site health and safety protocols consistent with the HASP attached as Appendix C of the ISMP. The intention of the health and safety program at the Site is to protect the public, site workers, contractor / property owner representative(s) while they secure/monitor the excavation, utility/maintenance and other Construction Workers during execution of their work, and the environment.

The ISMP and the HASP were developed primarily to handle activities that involve excavation (i.e., replacement/inspection of utilities, etc.) at the Site. While comprehensive, this ISMP and attached HASP cannot anticipate all potential future scenarios for invasive work on the Site.

2.13.1 Community Air Monitoring Plan

The Community Air Monitoring Plan, which is included as Appendix C of the ISMP, is required to be implemented for any invasive work at the Site. Air sampling stations will be placed upwind and downwind of the generally prevailing wind conditions. These locations will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and at least two downwind monitoring stations.

Exceedances of action levels listed in the Community Air Monitoring Plan will be reported to NYSDEC and New York State Department of Health (NYSDOH) Project Managers within 48 hours.

2.14 Odor Control Plan

Fugitive emissions can be generated from a variety of activities during subsurface work at the Site. Work activities that may generate odors include excavation, drilling, and dewatering and/or the temporary staging of materials for characterization, consolidation, and scheduling for transportation.

Due to the Contaminants of Concern (COCs) associated with the remedial activities at Holder Station sites; fugitive emissions can take the form of VOC's, odor, and/or dust. Dust can be entrained with low levels of high molecular weight constituents, while VOC's can volatilize into ambient air. Odor emissions may result from the atmospheric exposure of contaminated media. Contamination may be present in soils and groundwater. The potential for odor generation from groundwater is less than that from solids. The constituent concentrations associated with these odors are typically less than the levels that potentially pose a health risk as the odor threshold of COC's are typically less than health based action levels.

This odor control plan provides the means and method for controlling emissions of nuisance odors off-site. If nuisance odors are identified at the site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the site. Implementation of all odor controls, including the halt of work, is the responsibility of the property owner/lessee/property manager, and their contractors. Any odor events and abatement measures that are implemented will be discussed in the Periodic Review Report.

A three-tiered set of controls constitute the means and methods of this Odor Control:

- Level I - Built into the design of the Odor Control Plan and includes proactive measures to minimize the effect of fugitive emissions. Level 1 includes air monitoring to ensure that levels of VOC's and dust are under site-specific action levels.
- Level II – Procedures that are implemented in response to specific increases in fugitive emissions, but are not likely to have a significant impact in the schedule of site activities.
- Level III – More aggressive procedures, also initiated in response to specific increases in fugitive emissions that are likely to have a more significant impact on production schedule and site activities.

The contractor will be required to progressively implement these options until emission sources are controlled and ambient concentrations no longer have the potential to pose a health risk.

2.14.1 Level 1 Odor Controls

Level 1 Odor Controls are built into the design of the field activities and involve physical controls, Site layout, and scheduling.

Level 1 Odor Controls includes air monitoring will routinely be performed at the fence line of the site as delineated in the Community Air Monitoring Plan (Appendix C of the ISMP) during all work activities. The results will be compared to site-specific action levels for VOC's and total particulates.

Physical Controls

The simplest form of physical control is the use of visual barrier cloth on the Site perimeter fencing. The resistance caused by the visual barrier will elevate the discharge point of emissions leaving the site to the top of the perimeter fence and will promote better atmospheric mixing and dispersion. Another form of simple physical control is the required use of covers on trucks that move or transport impacted material.

All stockpiles of impacted material should be covered, if left inactive for a period of more than 2 hours.

All trucks used for off-site transport should have covers in place to cover impacted material as detailed in Section 2.4. On-Site haul routes should be routinely wetted to control dust using a hose, sprinkler, or dedicated water truck.

Site Layout

The dispersion of fugitive emissions is controlled by meteorological conditions and their impact generally decreases with distance from the source. If possible, transfer/storage areas will be placed either downwind or significantly upwind of off-site receptors.

The height of the stockpiles should be lower than the top of the perimeter fencing (8 feet) to utilize the benefit of the barrier cloth.

Scheduling

Every effort should be made to minimize the amount of time that potentially contaminated material is exposed in the excavation and is stored on-site. Open excavations and stockpiling can be minimized by in situ pre-characterization of soils to be excavated and the sampling of stockpiles as soon as they are placed. Efficient scheduling/coordination of operations can also limit the impact of active emission sources. Excavation activities should be controlled to minimize the surface area of disturbed material, thereby reducing the size of the emission source. A smaller source area can also facilitate the implementation of additional controls, if required.

2.14.2 Level II Controls

Level II controls will be enacted if an exceedance of a site-specific action level is confirmed or if odors are detected at the fence line. If the site-specific action levels are exceeded, additional monitoring will be conducted to confirm the result. Level II controls will be enacted if the exceedance is confirmed. The contractor must then work through the applicable list of site controls, the first of which is to halt work, until the fence line monitoring results for all parameters are determined to be less that their associated action levels. Specific Level II controls are discussed below.

Suppressing Agents

Several agents that can be applied over emissions sources have been determined to be effective in controlling emissions. These include odor suppressant foam for VOC mitigation and water spray for dust suppression.

The following suppressing agents have been identified for use: odex, hydromulch, or ecosorb. Additional agents may be used or substituted if proven effective and safe for this application.

Additional information on the use of odor suppressant foam and water spray for control of emissions follows.

Odor Suppressant Foam

Odor suppressant foam can provide immediate, localized control of VOC and odor emissions. The foam is created by the injection of air into a foam concentrate/water mixture using a Pneumatic Foam Unit. The foam is applied via a hose to cover source areas to a depth of 3 to 6 inches. Foam (Rusmar AC-600 or equivalent) is a short term remedy and can be actively used to control VOC and odor emissions from active excavations/stockpiles, and during the loading of trucks. It is shipped as a concentrate and diluted with water at the site. Under normal conditions, this foam can last for several hours. However, it has been observed to degrade quickly in direct sunlight or precipitation so it must be applied liberally and frequently to all areas that require odor control.

Water Spray

A spray of water can be used to minimize the amount of dust created. A water hose is effective for controlling dust over a small area, while lawn sprinklers or a dedicated water truck may be more efficient for extended control of large areas or on-site haul routes. Water should be used only from a verified clean source.

Tarps

Tarps can provide effective control for emissions from source areas that are likely to be inactive for extended periods of time. To be effective, the size of the source area should be controlled such that it can be covered using a single tarp. Rolls of 6-mil polyethylene will be used to cover inactive stockpiles.

Tarps will also be used for covering exposed soils loaded into trucks. All trucks will be lined with 8 mil polyethylene sheeting, the liners will be large enough to overlap and fully cover the top of the load. Trucks must also be equipped with automatic mesh tarps will be used to secure the liners.

2.14.3 Level III Controls

Level III controls are to be implemented when Level II controls have been exhausted and ambient concentrations of emissions continue to exceed the site-specific action levels, even following temporary halt of work. Each of the control options listed in this subsection has the potential to significantly affect the schedule/production rate of site activities. These delays may be required to ensure that acceptable levels of fugitive emissions are maintained, and are preferable to a long-term work cessation to control Site emissions.

Production/Schedule

It may be necessary to reduce the excavation rate to reduce the surface area of disturbed media or slow the generation rate of stockpiles. These actions would result in smaller emission source areas, which could be more effectively controlled using Level II Controls.

Meteorological Conditions

It may be necessary to limit certain activities, such as excavation or truck loading, to those periods when preferred meteorological conditions exist, such as a particular wind direction or low temperatures.

Relocation of Activities

Another option is cease work in the impacted material areas and work in lesser-impacted areas until adequate control measures can be implemented or more favorable meteorological conditions exists.

Relocating truck loading and/or material transfer areas may also reduce emissions. Eliminating stockpiling by modifying the hauling schedule and directly loading trucks with characterized materials will reduce emission sources. A wind-break could also be constructed adjacent to excavation and loading areas to shelter sources of emissions from the wind.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and material handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

2.15 Dust Control Plan

A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated on-site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles;
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production;
- Gravel will be used on roadways to provide a clean and dust-free road surface;
- On-site roads will be limited in total area to minimize the area required for water truck sprinkling; and
- Water in the truck should be only from a verified clean source. On-site groundwater cannot be used for dust mitigation due to Site related impacts.

2.16 Other Nuisances

A rodent control plan will be developed and utilized by the contractor prior to and during project site clearing and grubbing, and during all work.

A noise control plan will be developed and utilized by the contractor for all work to ensure compliance with local noise control ordinances.

2.17 Quality Assurance/Quality Control Sampling

Field and laboratory quality control (QC) samples will be collected and analyzed to document the accuracy and precision of analytical samples that will require submittal to NYSDEC, if any. The Quality Assurance (QA)/QC samples include trip blanks, field equipment blanks, field duplicates and matrix spikes, and matrix spike duplicates. The data quality level for the investigation will be consistent with procedures outlined in the NYSDEC Analytical Services Protocol (ASP) July 2005 methodologies. A full ASP Category B data package will be prepared by the laboratory for all samples. The data will be reviewed, and a qualified chemist will prepare a Data Usability Summary Report.

Waste characterization samples do not have to meet the QA/QC sampling requirements described in the above paragraph

Appendix C

Health and Safety Plan and Community Air Monitoring Plan

AECOM

Environment

Prepared for:
National Grid
Brooklyn, New York

Submitted by:
AECOM
Manhattan, NY
60144468
March 2013
Revised December 2014

HEALTH AND SAFETY PLAN

Appendix C of the Interim Site Management Plan

Former Bay Ridge Holder Stations A&B Site
Operable Unit 2
Brooklyn, New York
NYSDEC Site No.: 224058
Order on Consent Index #: A2-0552-0606

Emergency Information and Hazard Assessment

Subsurface Work (ISMP) - Former Bay Ridge Holder Stations A&B Site, Operable Unit 2, Brooklyn, Kings County, New York

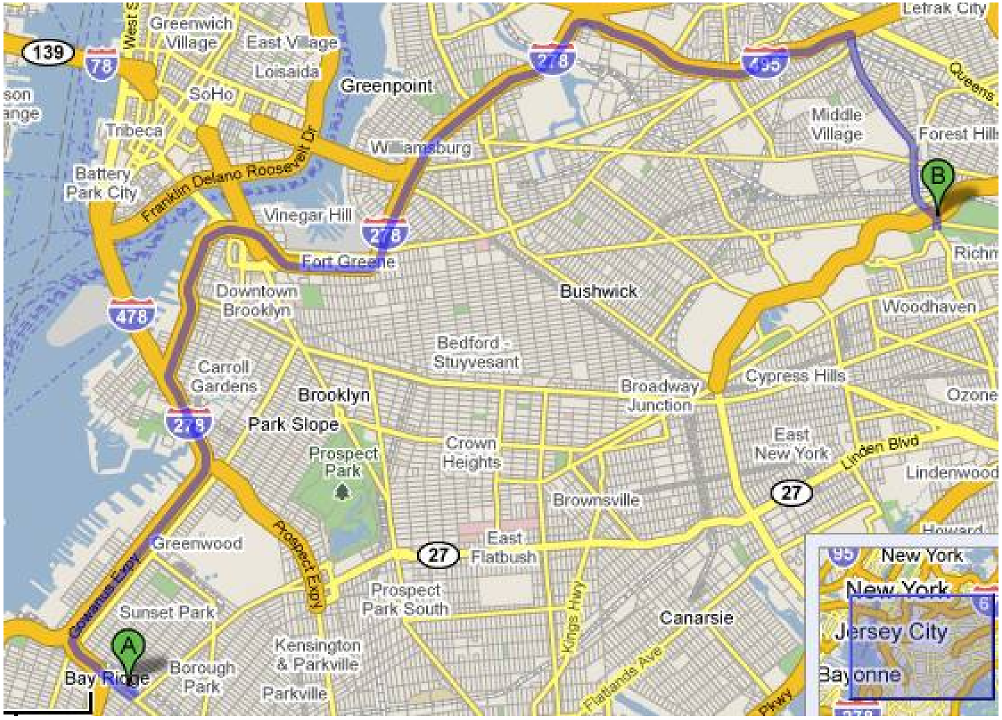
OCCUPATIONAL CARE CLINIC - Once the injury has been reported, seek treatment at the identified occupational care clinic for non-critical injuries; i.e. injuries of the First Aid variety.

Hospital:	*First Medical*
Address:	*82-17 Woodhaven Blvd, Glendale, NY 11385*
Phone #:	*718-805-9581*

Directions from the Site to First Medical

Start out going SOUTHEAST on 64TH ST toward 9TH AVE.	475 ft
Turn RIGHT onto 9TH AVE.	264 ft
Turn RIGHT onto 65TH ST.	0.46 mi
Merge onto I-278 E/BROOKLYN QUEENS EXPY toward MANHATTAN.	10.41 mi
Take the I-495/L I EXPWY exit, EXIT 35, toward MIDTOWN TUN/EASTERN L I/48 ST.	0.16 mi
Merge onto I-495 E via EXIT 35E toward EASTERN LONG IS.	2.09 mi
Take the WOODHAVEN BLVD exit, EXIT 19, toward ROCKAWAYS.	0.80 mi
Turn RIGHT onto WOODHAVEN BLVD.	2.24 mi
Make a U-TURN at MYRTLE AVE onto WOODHAVEN BLVD.	0.18 mi
Turn LEFT onto 81ST RD.	53 ft
Turn LEFT onto WOODHAVEN BLVD.	475 ft
Estimated driving time: 29 minutes	**16.59mi**

(Map image and driving directions were obtained through Google® Earth and Maps)



EMERGENCY REFERENCES

For critical injuries, dial 911 and/or seek treatment at the identified local Emergency Room

Ambulance:	911
Fire:	911
Police:	911

Medical Services:

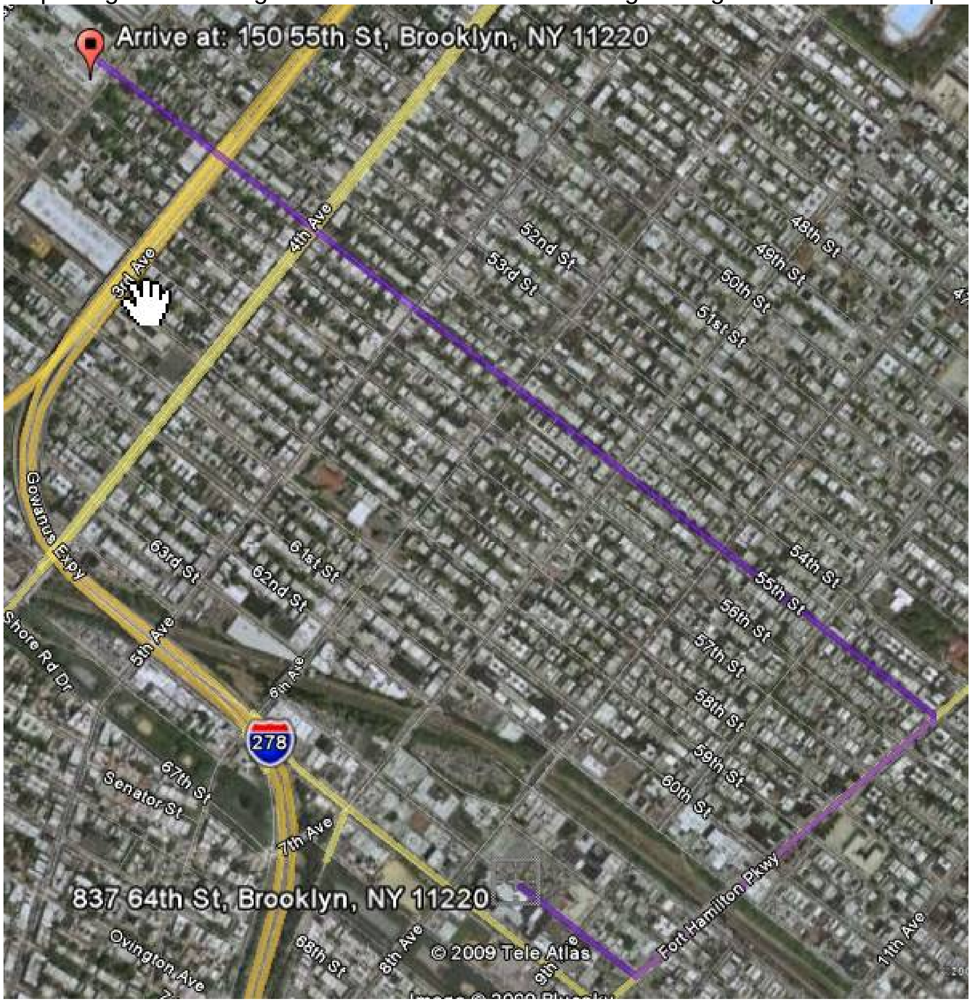
Emergency Room: Lutheran Medical Center, 150 55th Street, Brooklyn, NY 11220, Tel: 718-630-7300

Directions

1. Head southeast on 64th St toward 9th Ave	0.2 mi
2. Take the 2nd left onto Fort Hamilton Pkwy	0.5 mi
3. Turn left at 55th St	1.2 mi

Destination will be on the left

Map image and driving directions were obtained through Google® Earth and Maps.



When using any driving directions or map, it's a good idea to do a reality check and make sure the road still exists, watch out for construction, and follow all traffic safety precautions. This is only to be used as an aid in planning.

Underground Utilities – www.call811.com

Dig Safely of New York
Phone: (800) 272-4480
http://www.digsafelynewyork.com/

Emergency Chemical Information – InfoTrac (800) 535-5053

Poison Control Center – http://www.aapcc.org/

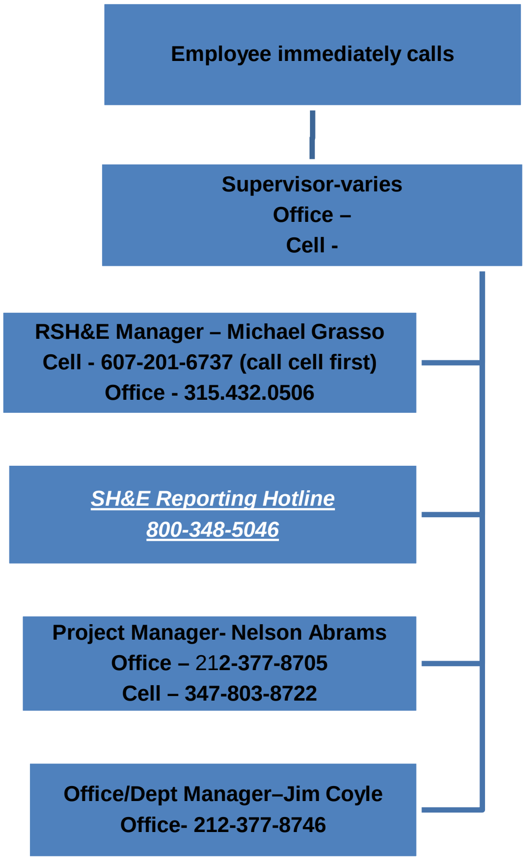
(800) 222-1222

Emergency Muster Point

The escape route from the site and an emergency muster point will be determined and provided to all workers during the project mobilization, and will be noted in the space below.

Emergency Contact Phone Tree

AECOM Personnel:
Regional SM – Michael Grasso
Project Manager – Nelson J. Abrams
Employee Supervisor(s)* – _______________
Client Account Manager – Mark McCabe
Report All Incidents Immediately to the *SH&E Reporting Hotline*



*Supervisor and Department/Office Manager names and numbers will be filled in based on the specific field team assigned to this project.

AECOM Medical Records and Medical Consultant

In the event of a non-critical injury, and once preliminary reporting been completed, if the injured employee desires/needs to speak with a medical professional to consult on the nature of their injury and treatment options, employees may contact WorkCare directly if they have not be directed to call WorkCare, been contacted by WorkCare directly, or they have been unable to speak directly with any of the personnel identified in the Emergency Contact Phone Tree provided above.

Work Care North
Alameda, CA 94502
Telephone: 510-748-6900
Fax: 510-748-6915

When using any driving directions or map, it's a good idea to do a reality check and make sure the road still exists, watch out for construction, and follow all traffic safety precautions. This is only to be used as an aid in planning.

Hazard Assessment

Task-Specific Hazard Assessment – Physical & Chemical

Hazard	**General Site Hazard**	**Soil Boring & MW Installation**	**Excavation**	**Groundwater Sampling**
Cold	√	√	√	√
Concrete Coring	√	√	√	
Corrosive Liquids	√		√	√
Drilling	√	√		
Dust	√	√	√	
Exposure to Chemical Hazards	√	√	√	√
Falling	√	√	√	√
Heat	√	√	√	√
Heavy Equipment	√	√	√	
Insects	√	√	√	√
Lifting	√	√	√	√
Noise	√	√	√	
Overhead Materials	√	√	√	
Overhead Utilities	√	√	√	
Pinch Points	√	√	√	√
Poisonous Plants	√	√	√	√
Rotating Equipment	√	√	√	
Sharp Objects	√	√	√	√
Splashing Liquids	√	√	√	√
Traffic	√	√	√	√
Tripping	√	√	√	√
Underground Utilities	√	√	√	
Vehicle Operations	√	√	√	√
Weather	√	√	√	√

Chemical Hazards

Chemical Name	**PEL**[1]	**TLV**[2]	**VP**[3]	**VD**[4]	**SG**[5]	**SOL**[6]	**FP**[7]	**LEL**[8]	**UEL**[9]
Benzene	1	0.5	75	2.8	0.88	<1	12	1.2	7.8
Toluene	200	50	21	4	0.87	<1	40	1.1	7.1
Ethyl Benzene	100	100	7	4	0.87	<1	55	0.8	6.7
Xylene	100	100	9	4	0.86	<1	81	1.1	7.0
Benzo(a)Pyrene	?	?	<1	NA	NA	<1	>300	NA	NA
Cyanide	**	***	630	0.95	0.69	100	0	5.6	40
Naphthalene	10	10	1	4.4	1.2	<1	189	0.9	5.9

[1] Permissible Exposure Limit in ppm
[2] Threshold Limit Value in ppm
[3] Vapor Pressure in mm Hg
[4] Vapor Density (air = 1)
[5] Specific Gravity (water = 1)
[6] Solubility in Water in %
[7] Flash Point in °F
[8] Lower Explosive Limit in % by volume
[9] Upper Explosive Limit in % by volume
NA = Not Applicable
? = Not known
C = Ceiling limit not to be exceeded

Personal Protective Equipment

PPE Item	General Site Hazard	Soil Boring & MW Installation	Excavation	Groundwater Sampling
Hard Hat	1	✓	✓	1
Traffic Vests	1	1	1	1
Steel Toed Safety Shoes	✓	✓	✓	✓
Safety Glasses with Side shields	✓	✓	✓	✓
Goggles or Face shield	2	2	2	2
Hearing Protection	3	✓	3	3
Tyvek Coveralls	4	4	4	4
Nitrile Gloves	4	4	4	4
Heavy Duty Work or Kevlar Gloves	5	5	5	5
Ivy Block® or Ivy Screen® barrier cream	6	6	6	6
Polycoated Tyvek coveralls with hood, double Nitrile gloves, rubber boots, and taped transitions.	7	7	7	7

✓ Required PPE

1 Traffic vests and hardhats are required when working within twenty feet of any public road or any private road with active traffic. Hard hats are also required when working around heavy equipment, when falling objects may cause impact injuries, or when working around energized electrical lines.

2 Goggles or a Face Shield are necessary when splashing liquid hazards are present in the work area. If tool use presents a hazard of creating high velocity object hazards, a Face Shield is recommended to protect against face and eye trauma.

3 Hearing protection should be worn around soil boring equipment if normal conversation cannot be understood.

4 Tyvek coveralls and Nitrile gloves are only required of those that are likely to come in direct contact with potentially contaminated soils and/or groundwater. Tyvek coveralls and Nitrile gloves will be worn to protect workers from poison ivy and poison oak when contact cannot be avoided.

5 Heavy duty work gloves should be worn when handling tools and equipment that present pinch point and laceration hazards. Kevlar gloves should be used when cut and laceration hazards are present.

6 Ivy Block® or Ivy Screen® barrier cream should be worn on exposed skin where there is a potential for exposure to poison ivy or oak.

7 When working in areas with high potential for excessive contact with hazardous chemicals, precautions will be taken to reduce the potential for direct dermal contact that may incorporate the use of polycoated Tyvek, double gloves, and additional protective measures based upon the permeability of the PPE chosen and the potential for chemicals of concern to degrade the selected PPE.

If the sustained PID reading exceeds 250 ppm as isobutylene or if irritating dust is encountered Level B PPE must be donned.

Air Monitoring Instruments

Task	Instrument	Action Limit and Action
All tasks involving potential exposure to contaminated soils and/or groundwater	Photoionization Detector	**5 ppm as isobutylene**; Don respiratory protection as discussed in Section 7
All tasks involving exposure to site chemicals of concern	Colorimetric detector tubes or Draeger Chip System for Benzene	**0.5 ppm Benzene** Don respiratory protection described in section 7.2
All tasks with the potential to generate dust.	Particulate meter	**>1.0 mg/m^3**; Apply dust suppression controls and don respiratory protection **>1.5 mg/m^3**; **STOP WORK** until levels are reduced below1.0 mg/m^3

Respiratory Protection

Task	Action Limit	Respiratory Protection	Level
All tasks involving potential exposure to contaminated soils and/or groundwater	5 ppm as Isobutylene for 5 minute	Half or full face mask respirator with combination organic vapor/HEPA cartridges	C
	10 ppm as Isobutylene	Full face respirator with organic vapor/HEPA cartridges	C
	50 ppm as isobutylene	Supplied air respirator, STOP WORK	B
All tasks involving potential exposure to contaminated soils and/or groundwater	0.5-10 ppm as Benzene on Draeger tube	Half or full face mask respirator with combination organic vapor/HEPA cartridges	C
	10 ppm as Benzene on Draeger tube	Full face respirator with organic vapor/HEPA cartridges	C
	50 ppm as Benzene on Draeger tube	Supplied air respirator, STOP WORK	B
All tasks with the potential to produce Dust	1.0 mg/m3 particulates in air	Half or full face mask respirator with combination organic vapor/HEPA cartridges	C
	1.5 mg/m3 particulates in air	STOP WORK and apply dust suppression techniques until levels have returned to ambient conditions	C

Job Hazard Analysis

JHA Type: ☐ Investigation ☐ O&M ☐Office ☒ Construction | ☒ New ☐ Revised | Date

Office: Manhattan Client: National Grid USA Location: Bay Ridge, Brooklyn, New York

Work Type: Excavation

Work Activity: Excavation and backfilling on the National Grid and Offsite Properties, loading and transport of impacted materials, dewatering, water treatment and discharge, excavation soil (if required) and water sampling

Personal Protective Equipment (PPE):

Minimum PPE is Level D including: hard hat, safety glasses or goggles, steel-toed boots, high visibility safety vest, hearing protection as needed, and gloves as needed (type dependent on job-specific requirements).

Additional PPE may be required in the Health & Safety Plan (HASP). Also refer to the HASP for air monitoring, and emergency procedures.

Development Team	Position/Title	Reviewed By	Position/Title	Date

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, and notification to required contacts (e.g. site managers, clients, subcontractors, etc.). Additionally, safety meeting must be performed and documented at the beginning of each workday. Relevant forms should be updated if modifications are made in the field. Also consider weather conditions (heat, cold, rain, lightning).

❶ Job Steps	❷ Potential Hazard	❸ Critical Actions
1. General Site Safety	Hand injury	• Use shears rather than utility knives whenever practical. • Wear leather or heat-resistant gloves while performing manual work. • Avoid touching hot surfaces without proper protective equipment. • Identify and avoid pinch points • Use only appropriate tools for the task.
	Slip, Trip, and Fall on same level or to lower level	• Maintain a clean work area and good housekeeping practices by drying wet surfaces, cleaning up muddy areas, and keeping unnecessary equipment and supplies out of walkways. • Inspect tread on steel-toed boots for signs of wear and replace as necessary • When carrying field equipment maintain clear view of footing • Never run while on the job site • Use backpacks for moving gear around the site to keep hands free. • Be aware of slippery conditions.
	Lifting – Back and Foot injury	• Follow standard safe lifting practices. • Wear proper PPE, i.e., steel-toed shoes with metatarsals. • Use Mechanical lifting devices when ever possible. • Ensure path is clear prior to lifting and moving materials.
	Overexertion when lifting supplies/equipment	• Use equipment whenever possible. • Procure help when lifting awkward loads or materials that weigh greater than 60 lbs. • Use proper lifting techniques.
	Contact with electrical energy	• Use operable GFCIs for any tool. • Inspect electrical equipment for frayed cords,

		damaged parts, etc. at least once a week.
	Heat Stress	• Monitor self and other workers when ambient temperature exceed 85°F • Wear appropriate clothing • Consume sufficient quantities of water/electrolytes to avoid dehydration • Monitor yourself and co-workers for signs of heat stress • Take frequent breaks and take shelter to cool-off if feeling signs of heat stress
	Fall to Lower Level (from trailers, equipment)	• Limit walking on elevated surface • Clean mud from boots prior to walking on trailers • Only rental company personnel to remove equipment off of low boy trailers (should equipment be rented)
	Trip/Slip/Fall on Same Level	• Establish and enforce housekeeping protocol
	Safety equipment not in place or operating	• Perform an initial and weekly inspection of heavy equipment
2. Equipment Mobilization	Struck by Heavy Equipment	• Ensure backup alarms are operable • Never approach equipment without establishing eye contact with operator • Establish protocol for hand and arm signals • Limit walking on elevated surface
	Fall to Lower Level (from trailers, equipment)	• Clean mud from boots prior to walking on trailers • Only rental company personnel to remove equipment off of low boy trailers (should equipment be rented)
	Trip/Slip/Fall on Same Level	• Establish and enforce housekeeping protocol
	Safety equipment not in place or operating	• Perform an initial and weekly inspection of heavy equipment
3. Excavation	Struck by Heavy Equipment/ Heavy equipment operations	• Ensure backup alarms are operable • Keep proper clearance from equipment • Be aware of excavator swing radius • Establish eye contact with operator(s) prior to approaching equipment • Listen for backup indicators • Operators should always wear seat belts while equipment is running • Operators must be aware of their surroundings at all times • Establish protocol for hand and arm signals
	Fall to Lower Level (from trailers, equipment)	• Limit walking on elevated surface • Clean mud from boots prior to walking on trailers • Only rental company personnel to remove equipment off of low boy trailers (should equipment be rented)
	Trip/Slip/Fall on Same Level	• Establish and enforce housekeeping protocol
	Safety equipment not in place or operating	• Perform an initial and weekly inspection of heavy equipment

3. Excavation	Hydrocarbon exposure/ Chemical exposure and Dust exposure	• Perform air monitoring prior to entering excavation area (MultiRae meter) • Continue to monitor periodically throughout the day • Properly document all calibration activities and readings performed on the proper sheets • Continue to monitor periodically throughout the day • Properly document all calibration activities and readings performed on the proper sheets
	Noise	• Use hearing protection and make sure it is inserted properly
	Sidewall instability	• Carefully examine the condition of the sidewall prior to approaching the edge • Signs of instability: look for active sloughing of soils, water seepage in the sidewall, and the presence of tension cracks in the surface above the side wall • Never stand in the excavation immediately adjacent to a side wall • If it is necessary to enter the excavation, always select a sloped route that is not too steep and proceed slowly
	Uneven ground	• Wear steel-toed boots that extend over the ankle • Never run while on the job site
	Underground utilities	• Check utility plans and expose if necessary prior to work
4. Loading haul trucks	Heavy equipment operation	• Keep proper clearance from equipment • Be aware of loaders rapid movements • Establish eye contact with operator(s) and truck drivers prior to approaching equipment • Listen for backup indicators
	Impacted Soil Exposure	• Wear splash proof PPE over Nomex coveralls when spraying trucks • Don face shield prior to spraying trucks
	Falling material	• Never stand on the opposite side of a trailer that is being loaded; material may spill over the side
Truck decontamination	Impacted Soil Exposure	• Wear splash proof PPE over Nomex coveralls when spraying trucks • Don face shield prior to spraying trucks
	Slips, trips, falls	• Exposed liner in sump area is very slippery, extreme caution must be used • Never run around the decon area • The decon area will be kept in an order fashion
	Heavy equipment operation	• Never approach a truck until it comes to a complete stop • Truck driver and decon personnel must make eye contact prior to approaching the truck or before truck movement is initiated • Driver shall sound the horn once prior to pulling out to serve as a warning to decon personnel • Decon personnel shall give a visual indication that all is clear prior to the driver

		pulling out of the decon area
	Falling material	• Decon personnel shall take care to avoid standing directly under the trailer as they try to remove pieces of sludge that may be lodged on the truck. • Use extension poles to remove loose material overhead
Backfill excavation	Heavy equipment operations	• Keep proper clearance from equipment • Be aware of heavy truck traffic • Establish eye contact with operator(s) prior to approaching equipment • Listen for backup indicators • To the maximum extent possible, remain clear of confined areas in which multiple pieces of equipment are operating
	Noise	• Use hearing protection and make sure it is inserted properly
	Uneven ground – backfilled ground may be very uneven, padfoot compactor leaves a rough uneven	• Wear steel-toed boots that extend over the ankle • Never run while on the job site; caution should be used while traversing backfilled areas
Soil Sampling (If Needed)	Chemical exposure and Dust exposure	• Perform air monitoring prior to entering excavation area (dust monitor and PID) • Continue to monitor periodically throughout the day • Properly document all calibration activities and readings performed on the proper sheets
	Entering excavations	• NEVER enter an excavation deeper than 4 feet bgs!!! Sampling in deep excavations will be conducted using the backhoe. • Maintain a safe distance from where the current excavation is being conducted. • Be sure the operators are aware of your location at all times. • Always wear proper PPE including gloves while sampling.
Truck/Vehicle Traffic	Contact with Pedestrian and Road Traffic	• Ensure all site personnel are wearing orange safety vests. • If necessary, employ flagmen on public street.
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Job Hazard Analysis

AECOM

JHA Type: ☐ Investigation ☐ O&M ☐Office ☒ Construction | ☒ New ☐ Revised | Date:

Office: Client: Loc: Bay Ridge, Brooklyn, NY

Work Type: Demolition | Work Activity: Various Demolition

Personal Protective Equipment (PPE):

Minimum PPE is Level D including: Safety glasses, Steel toed boots, hard hat, Leather gloves, orange safety vest, face shield, hear protection (plugs and/or muffs)

Additional PPE may be required in the Health & Safety Plan (HASP). Also refer to the HASP for air monitoring, and emergency procedures. Please refer to Excavation JHA for additional site-specific requirements.

Development Team	Position/Title	Reviewed By	Position/Title	Date

❶ Job Steps	❷ Potential Hazard	❸ Critical Actions
Jack-Hammering Concrete (hand operated hammer)	1. Flying Debris	• Wear appropriate PPE: hardhat with face shield, safety glasses, leather gloves, steel-toed boots, full body clothing.
	2. Noise	• Wear appropriate hearing protection in areas where decibel levels are > 85db • Be sure to use the hearing protection properly (either plugs, muffs or both)
	3. Vibration/ergonomic hazards	• Where appropriate footwear and gloves to lessen the effects of vibration on the body • Take frequent breaks: share the task with coworkers. • Use proper body positioning, avoid straining the back when moving the hammer
	4. Steel reinforcement bar removal	• Wear proper hand protection (leather gloves)

Hammering Concrete using backhoe/excavator hammer attachment	1. Flying Debris	• Wear appropriate PPE: hardhat with face shield, safety glasses, leather gloves, steel-toed boots, full body clothing.
	2. Noise	• Wear appropriate hearing protection in areas where decibel levels are > 85db • Be sure to use the hearing protection properly (either plugs, muffs or both)
	3. Heavy Equipment Operation	• Keep proper clearance from equipment • Be aware of excavator or backhoe swing radius • Establish eye contact with operator(s) prior to approaching equipment • Listen for backup indicators • To the maximum extent possible, remain clear of confined areas in which multiple pieces of equipment are operating • Operators should always wear seat belts while equipment is running • Operators must be aware of their surroundings at all times
Loading debris onto trucks	1. Heavy Equipment Operation	• Keep proper clearance from equipment • Be aware of excavator or backhoe swing radius • Establish eye contact with operator(s) prior to approaching equipment • Listen for backup indicators • To the maximum extent possible, remain clear of confined areas in which multiple pieces of equipment are operating • Operators should always wear seat belts while equipment is running • Operators must be aware of their surroundings at all times
	2. Manually handling/moving concrete and steel debris	• Avoid hand injuries by wearing proper hand protection (leather gloves are recommended) • Do not attempt to lift more than you're capable of lifting safety • If debris is too large to handle, employ heavy equipment to move it. • Wear appropriate eye protection, hard hat, and steel-toed boots
	3. Heavy Equipment (Truck Traffic)	• Keep proper clearance from moving trucks • Maintain eye contact with drivers or communicate your actions with them • Listen for backup indicators • Stay clear of areas around the truck while they are being loaded with debris; falling debris could cause serious injury or a fatality.

AECOM Environment

Prepared for:
National Grid
Brooklyn, New York

Submitted by:
AECOM
Manhattan, NY
60144468
March 2013
Revised December 2014

HEALTH AND SAFETY PLAN

Appendix C of the Interim Site Management Plan

Former Bay Ridge Holder Stations A&B Site
Operable Unit 2
Brooklyn, New York
NYSDEC Site No.: 224058
Order on Consent Index #: A2-0552-0606

September 28, 2009
Prepared By Jennifer Atkins Date

September 28, 2009
Reviewed By Peter Sullivan, Regional SH&E Manager Date

October 15, 2014
Revised By Nelson J. Abrams, PG, Senior Project Manager Date

Contents

List of Appendices

1.0 Introduction

1.1 AECOM Environment Safety Policy

AECOM Environment (AECOM) is committed to providing our employees with a safe and healthy work environment. It is not only our obligation to each other, but also a sound business practice to do so. Work related injuries and illnesses cause needless pain and suffering, cost money, and adversely affect our reputation with our clients. It is our firm belief that all work related injuries and illnesses are preventable, and it is therefore our goal to have a workplace that is free from occupational injuries and illnesses. Every attempt shall be made to eliminate the possibility of injuries and illnesses. No aspect of the company's activities, including expediency and cost, shall take precedence over the health and safety of our employees.

1.1.1 Maximum Duration of the Work Day for Field Activities

An employee may not work a shift that exceeds 16 hours in duration. For the purpose of this policy, the work shift includes time spent at lunch on break, and driving to and from the site. If an employee works more than one shift during the course of a calendar day, the total number of hours worked in that day cannot exceed 16 hours. If work is to be done continuously in ambient air temperatures of less than 20^{o}F, the Site Safety Officer and Field Manager will use a guideline of limiting work shifts to 10 hours in duration, including 8 hours working outdoors and 2 hours of time spent at lunch, breaks, and travel. Refer to Section 5.15, Cold Stress, for further work day guidelines.

1.1.2 Short Service Employee

A Short Service Employee (SSE) is an employee with fewer than three months experience working supervised on field projects or an employee who has not completed required training or received required certifications.

Short Service Employees will not be assigned to this project unless they are supervised on site by a qualified person.

1.2 Health and Safety Plan (HASP)

1.2.1 HASP Purpose

The purpose of this HASP is to identify hazards associated with this project and specify engineering and administrative controls and personal protective equipment necessary to mitigate the risks associated with these hazards. This HASP addresses the hazards recognized prior to writing or updating the documents. As new hazards are encountered, a Job Hazard Assessment (JHA) or Job Safety Analysis (JSA) must be conducted and the results input into the HASP.

This HASP also assigns responsibilities for the implementation of safety programs on this project and defines monitoring and emergency response planning specific to the project.

1.2.2 HASP Applicability

This site-specific Health and Safety Plan (HASP) has been developed by AECOM. It establishes the health and safety procedures required to minimize potential risk to AECOM and contractor personnel involved with the work at the former Bay Ridge Holder Stations A & B Site located in Brooklyn, Kings County, New York. AECOM is conducting this work on behalf of National Grid USA (National Grid). Future contractors working directly for National Grid or other property owners shall develop their own site-specific HASP. This HASP can be used as a template to develop the future site-specific HASP. Based on future changes to State and Federal health and safety requirements, and specific methods employed by future contractors, the HASP and CAMP will be updated and re-submitted.

The provisions of this plan apply to AECOM personnel who could potentially be exposed to safety and/or health hazards related to activities described in Section 3.0 of this document.

Client, Subcontractor employees, and third party personnel performing work that potentially exposes them to the chemical and physical hazards at the site are recommended to work under their own HASP and are also expected to review and acknowledge this HASP as a recognition of the SH&E standards that AECOM expects outside personnel to uphold.

This HASP has been written to comply with the requirements of the Occupational Safety and Health Administration (OSHA) Personal Protective Equipment Standard (29 CFR 1910.132) for all activities and the OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) for tasks where there are potential exposures to subsurface contaminants. All activities covered by this HASP must be conducted in complete compliance with this HASP and with all applicable federal, state, and local health and safety regulations. Personnel covered by this HASP who cannot or will not comply will be excluded from site activities.

This plan will be distributed to each employee involved with the proposed activities at the Site, including subcontractor employees. Each employee must sign a copy of the attached health and safety plan sign-off sheet (see Attachment A).

This HASP only pertains to the tasks that are listed in Section 3.0. A task specific HASP or addendum to this HASP will be developed at a later date for any other subsequent investigative/remedial activities at the Site.

1.3 Organization/Responsibility

The implementation of health and safety at this project location will be the shared responsibility of the AECOM Project Manager (PM), the AECOM Regional Safety, Health & Environment Manager (RSM), the AECOM Project Site Safety Officer (SSO) and other AECOM personnel and AECOM’s contractors implementing the proposed scope of work.

1.3.1 AECOM Project Manager

The AECOM PM (Nelson Abrams) is the individual who has the primary responsibility for ensuring the overall health and safety of this project. As such, the PM is responsible for ensuring that the requirements of this HASP are implemented. Some of the PM's specific responsibilities include:

- Assuring that all personnel to whom this HASP applies, including AECOM subcontractors, have received a copy of it;
- Providing the RSM with updated information regarding conditions at the site and the scope of site work;
- Providing adequate authority and resources to the on-site SSO to allow for the successful implementation of all necessary safety procedures;
- Supporting the decisions made by the SSO and RSM;

- Maintaining regular communications with the SSO and, if necessary, the RSM;
- Coordinating the activities of all AECOM subcontractors and ensuring that they are aware of the pertinent health and safety requirements for this project,
- In the event that an incident occurs, leading the incident investigation to identify root causes, corrective actions and lessons learned; and
- Conducting random project audits.

1.3.2 AECOM Regional Safety, Health & Environment Manager

The AECOM RSM (Michael Grasso) is the individual responsible for the preparation, interpretation and modification of this HASP. Modifications to this HASP which might result in less stringent precautions cannot be undertaken by the PM or the SSO without the approval of the RSM. Specific duties of the RSM include:

- Writing, approving and amending the HASP for this project;
- Advising the PM and SSO on matters relating to health and safety on this site;
- Recommending appropriate personal protective equipment (PPE) and respiratory equipment to protect personnel from potential site hazards;
- Assisting with Incident investigations; and,
- Maintaining regular contact with the PM and SSO to evaluate site conditions and new information which might require modifications to the HASP; and
- Conducting random project audits.

1.3.3 AECOM Site Safety Officer

All AECOM field technicians are responsible for implementing the safety requirements specified in this HASP. However, one field technician will serve as the SSO. The SSO will be appointed by the PM. The SSO will be on-site during all activities covered by this HASP. The SSO is responsible for enforcing the requirements of this HASP once work begins. The SSO has the authority to immediately correct all situations where noncompliance with this HASP is noted and to immediately stop work in cases where an immediate danger is perceived. Some of the SSO's specific responsibilities include:

- Assuring that all personnel to whom this HASP applies, including all subcontractors, have reviewed this HASP, and submitted a completed copy of the HASP review and acceptance form (Attachment A);
- Assuring that all personnel to whom this HASP applies have attended a pre-entry briefing and any subsequent safety meetings that are conducted during the implementation of the program;
- Maintaining a high level of health and safety consciousness among employees implementing the proposed investigative activities;
- Securing Work Permits. The SSO must determine what, if any, work permits must be secured from the facility prior to the commencement of activities. If required, the SSO must determine how long the work permit is good for and verify that all the provisions of the work permit can be met by AECOM and its subcontractors.
- Procuring the air monitoring instrumentation required and performing air monitoring for investigative activities;

- Procuring and distributing the PPE and safety equipment needed for this project for AECOM employees;
- Verifying that all PPE and health and safety equipment used by AECOM is in good working order;
- Verifying that AECOM contractors are prepared with the PPE, respiratory protection and safety equipment required for this program;
- Preparing an initial Job Safety Analysis (JSA) during the initial mobilization and revising the Job Safety Analysis if conditions or tasks change and communicating with all workers the results of the Job Safety Analysis. See attachment B for a JSA form. The JSA will be reviewed daily by all workers and updated as needed.
- Notifying the PM of all noncompliance situations and stopping work in the event that an immediate danger situation is perceived;
- Monitoring and controlling the safety performance of all personnel within the established restricted areas to ensure that required safety and health procedures are being followed;
- Conducting accident/incident investigations and preparing accident/incident investigation reports;
- Conducting the pre-entry briefing prior to beginning work and subsequent safety meetings as necessary; and
- Initiating emergency response procedures in accordance with Section 11.0 of this HASP.

1.3.4 AECOM Field Personnel

All AECOM field personnel covered by this HASP are responsible for following the health and safety procedures specified in this HASP and for performing their work in a safe and responsible manner. Some of the specific responsibilities of the field personnel are as follows:

- Assess each task prior to beginning work on that task for hazards and necessary precautions.
- Assess the work area for changing conditions and new hazards and address the hazards;
- Stop work and initiate corrective actions if work site hazards create unacceptable risk;
- Reading this HASP in its entirety prior to the start of on-site work;
- Submitting a completed HASP Review and acceptance form (Attachment A)to the AECOM SSO prior to the start of work;
- Attending the required pre-entry briefing prior to beginning on-site work and any subsequent safety meetings that are conducted during the implementation of the program;
- Bringing forth any questions or concerns regarding the content of the HASP to the PM or the SSO prior to the start of work;
- Reporting all Incidents, injuries and illnesses, regardless of their severity, to the AECOM SSO; and,
- Complying with the requirements of this HASP and the requests of the SSO.

1.3.5 Contractors

Additionally, contractors hired by AECOM are responsible for:

- Reading the HASP in its entirety prior to the start of on-site work;
- Attending the required pre-entry briefing prior to beginning on-site work and any subsequent safety meetings that are conducted during the implementation of the program;
- Ensuring that their equipment is in good working order via daily inspections;
- Operating their equipment in a safe manner;
- Appointing an on-site safety coordinator to interface with the AECOM SSO;
- Providing AECOM with copies of material safety data sheets (MSDS) for all hazardous materials brought on-site; and,
- Providing all the required PPE, respiratory equipment and safety supplies to their employees.

1.4 SH&E Expectations

Commitment to safety, health, and environmental excellence requires that all work proceed only after it is safe and environmentally sound to do so. The responsibility for ensuring that this takes place rests with every worker present at this property. Effectively meeting these responsibilities depends upon open communication between individuals and their supervisors prior to work beginning, and – in certain cases – after safety, health and/or environmental issues are identified. Completing a Job Hazard Analysis (JHA) to aid in planning safe work performance will be an integral part of meeting safety, health and environment (SHE) expectations.

The safety and health of on Site personnel will take precedence over cost and schedule considerations for all project work. All AECOM personnel have the authority to STOP WORK if they see a potential or actual hazard that may threaten the safety of people or the environment. Upon stopping work, the SSO must be immediately notified and provided with information regarding the nature of the safety, health or environmental concern. The SSO should meet with the worker with the intent of resolving the worker's concerns. Once the concerns are resolved to the satisfaction of the worker, work can proceed.

If the concerns are not resolved to the satisfaction of the worker and/or the SSO, work does not proceed. The AECOM RSM will be contacted to obtain assistance in resolving the concerns. Using his/her expertise, safety, health, and environmental rules, regulations, and procedures, the AECOM RSM will attempt to resolve the matter with all parties involved. Work will not resume until this criterion is met.

1.5 Management of Change/Modification of the HASP

1.5.1 Management of Change

This document discusses the physical hazards associated with the proposed activities. However, unanticipated site-specific conditions or situations might occur during the implementation of this project. Also, AECOM and/or the contractors may elect to perform certain tasks in a manner that is different from what was originally intended due to a change in field conditions. As such, this HASP must be considered a working document that is subject to change to meet the needs of this dynamic project.

1.5.2 HASP Modification

Should significant information become available regarding potential on-site hazards, it will be necessary to modify this HASP. All proposed modifications to this HASP must be reviewed and approved by the AECOM RSM before such modifications are implemented. Any significant modifications must be incorporated into the written document as addenda and the HASP must be reissued. The AECOM PM will ensure that all personnel covered by this HASP receive copies of all issued addenda. Sign-off forms will accompany each addendum and must be signed by all personnel covered by the addendum. Sign-off forms will be submitted to the AECOM PM. The HASP addenda should be distributed during the daily safety meeting so that they can be reviewed and discussed. Attendance forms will be collected during the meeting.

1.5.3 Job Hazard Analysis (JHA)

AECOM and/or AECOM's contractors will prepare a Job Hazard Analysis (JHA) for each task to be performed prior to commencing work. The use of new techniques will be reviewed and if new hazards are associated with the proposed changes, they will be documented and evaluated on the JHA form. An effective control measure must also be identified for each new hazard. JHA forms will be reviewed by the SSO prior to being implemented. Once approved, the completed forms will be reviewed with all field staff during the daily safety meeting. A blank JHA form is presented as Attachment B.

1.5.4 Employees Working Alone

Employees working alone at project sites will review the JHA for their tasks as they are conducting their daily overview and reconnaissance of the site. After completing the JHA review/revision and site reconnaissance, the employee should call the Project Manager and report any new hazards or site conditions observed.

2.0 Site Description and History

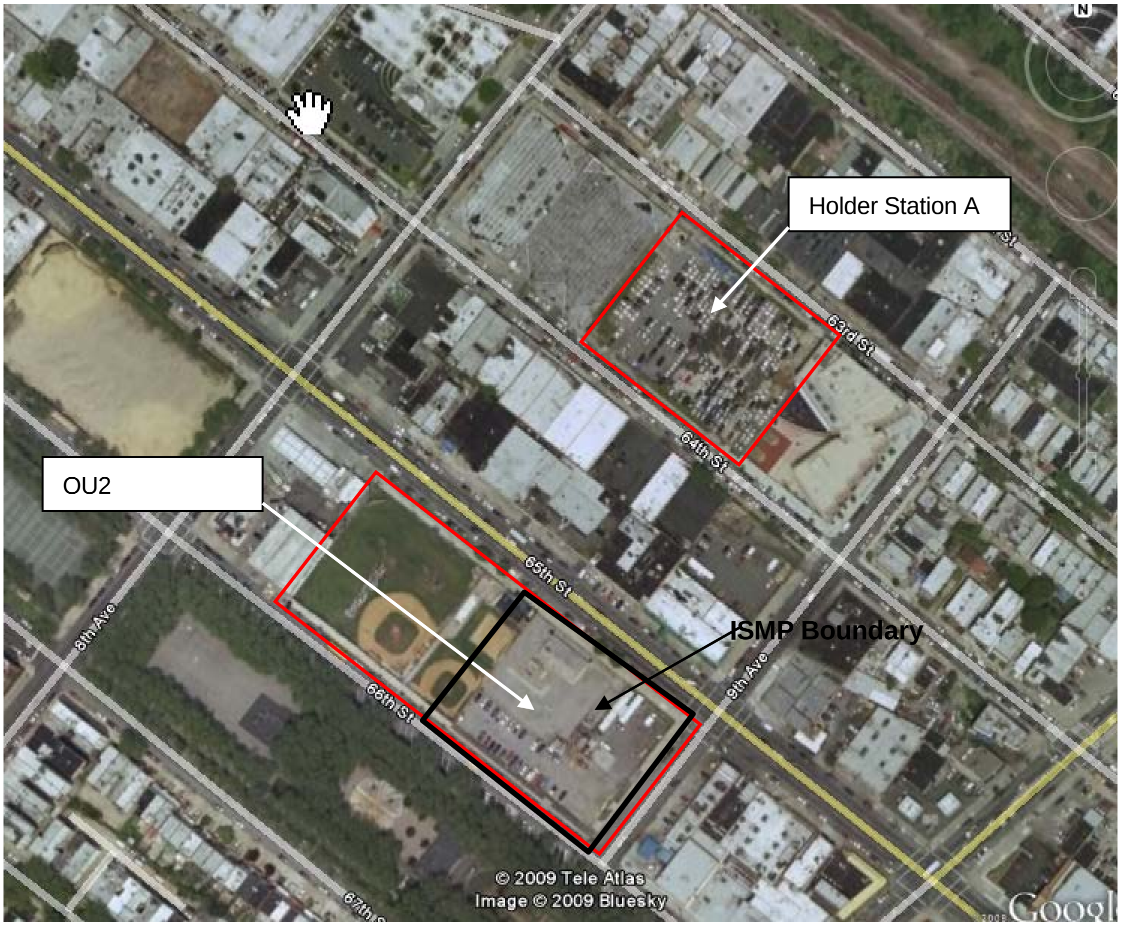
2.1 Site Description

The Former Bay Ridge Holder Stations A&B Site is located in Brooklyn, Kings County, New York. The site is comprised of parcel located between 8th and 9th Avenues, with Holder Station A between 63rd and 64th Streets, and Holder Station B between 65th and 66th Streets.

The Site was operated by Kings County Gas and Illuminating Company, a predecessor company to National Grid, and began operations prior to 1905 and ceased operations sometime between 1950 and 1970.

Holder Station B is currently used as a National Grid gate station (eastern portion) and as little league baseball fields (western portion). This parcel is fenced with gates on 65th Street and 9th Avenue. There are two ball fields with bleachers, dugouts, a concession building and a storage shed on the western portion of the parcel and not subjected to the ISMP. The gate station has a building on 65th Street, asphalt parking area on 9th Avenue and a grassed area on 66th Street and subjected to the ISMP.

Map image was obtained through Google® Earth.



2.2 Site History

A review of the site history of the Site has been developed based on a review of the historic Sanborn Fire Insurance maps, aerial photographs for the Site as well as historic investigation reports.

2.2.1 Bay Ridge Holder Station A&B

Sanborn maps were available for Holder Station B from 1905, 1926, 1950, 1977, 1981, 1992, 1993, 1994, and 1995. Aerial photos were available for 1966, 1975 and 1984 and reviewed in the *Environmental Site Assessment Report* (Vanasse Hangen Brustlin, Inc. [VHB], May 2000). A summary is provided below.

1905 Sanborn	Two gas holders (80- and 90-foot diameters) and two other structures including a storage shed owned by Kings County Gas and Illuminating Company were present southeast of the site in the area of the current KeySpan gate station. Residential property lots existed across 65th Street and a proposed highway in noted across 66th Street from the site.
1926 Sanborn	The structures from the 1905 map are gone, and three gas holders (100-, 140-, and 180-foot diameters), oil tanks, and several other structures owned by Kings County Lighting Company existed at the site. The largest diameter gas holder is labeled 235 feet (tall). Across 65th Street at the corner of 9th Avenue are the shop and stables of the Kings County Lighting Co. A portion of the former residential lots across 65th Street from the site house Sheffield Farms Company wagon house and milk depot. The property across 66th Street is identified as “Leif Eriksson Square.”
1950 Sanborn	Ownership and site layout are essentially the same as in 1926 with the addition of one small structure (shed). However, a gasoline filling station was present at the corner of 65th Street and 8th Avenue. In addition, the property across 65th Street formerly owned by Sheffield Farms is identified as T. Cohn, Inc. (toy manufacturing).
1966 aerial photo	One large gas holder and several smaller structures existed. The two other gas holders are not present, and were therefore removed some time between 1950 and 1966.
1975 aerial photo	The remaining gas holder had been removed, the site re-graded, and only one structure (gate station) existed on the parcel.
1977 Sanborn	The gate station is the only identifiable structure on the parcel. A small unidentifiable building that was not present in 1975 is present to the west of the gate station. New unspecified development is present at the eastern corner of 8th Avenue and 66th Street.
1984 aerial photo	The baseball diamond on the large playing field was in place.
1977, 1988, 1992-1995 Sanborns	Each of these maps are similar. All gas holders and other related structures have been removed from the site. The Brooklyn Union Gas Company gate station building is present in its current location on all maps and additional commercial development is present along 8th Avenue and across 65th Street including a second filling station, auto repair shop, a glass manufacturer, and freight company.

2.3 Contaminants of Concern

Contaminants of concern in the Site subsurface include:

- VOCs, primarily BTEX;

- SVOCs, primarily naphthalene and low molecular weight PAHs;
- Total petroleum hydrocarbons
- Metals, primarily arsenic, lead, and mercury
- Cyanide
- Possibly pesticides and herbicides
- Possibly PCBs

3.0 Chemical Hazard Assessment and Control

3.1 Chemical Contaminants of Concern

Typical wastes associated with former Holder operations could include VOCs such as BTEX, polycyclic aromatic hydrocarbons (PAHs), tar-like materials, cyanide complexes and compounds, and certain trace metals associated with ash and clinkers.

3.1.1 BTEX

Petroleum is a highly complex mixture of aliphatic and aromatic hydrocarbons. Benzene, toluene, ethylbenzene, and xylene are natural but minor components of fuel oils, kerosene and diesel fuels. Gasoline contains higher quantities of these aromatic hydrocarbons.

Exposure to the vapors of BTEX above their respective permissible exposure limits (PELs) as an 8-hr time weighted average (TWA) may produce irritation of the mucous membranes of the upper respiratory tract, nose and mouth. Overexposure may also result in the depression of the central nervous system. Symptoms of such exposure include drowsiness, headache, fatigue and euphoria. Chronic and prolonged overexposure to the vapors of benzene may cause damage to the blood-forming organs and is known to cause leukemia in humans.

Gasoline is typically 1 – 2% benzene. The PEL for benzene is 1 ppm. The ACGIH has set a TLV for Benzene at 0.5 ppm; however, for this project the SSO will use the OSHA PEL's and will utilize an action level of one half the PEL for various responses. Benzene is considered to be a carcinogen by the ACGIH.

The PELs for ethylbenzene and xylene are 100 ppm. The PEL for toluene is 200 ppm. The American Conference of Governmental Industrial Hygienists (ACGIH) have recommended a threshold limit value of 50 ppm for toluene.

3.1.2 Petroleum Hydrocarbons

Petroleum hydrocarbons are generally considered to be of moderate to low toxicity. Federal or recommended airborne exposure limits have not been established for the vapors of petroleum hydrocarbons. However, inhalation of low concentrations of the vapor may cause mucous membrane irritation. Inhalation of high concentrations of the vapor (which would only be likely to occur in confined spaces where the liquid had been significantly heated) may cause extensive pulmonary edema. Chronic direct skin contact with the liquid may produce skin irritation as a result of defatting.

3.1.3 Volatile Organic Compounds (VOCs & SVOCs)

Volatile Organic Compounds refer to a group of volatile compounds or mixtures that are relatively stable chemically and that exists in the liquid state at temperatures of approximately 32° to 82°F.

VOCs are typically organic solvents used for extracting, dissolving, or suspending materials such as fats, waxes, and resins that are not soluble in water. The removal of the solvent from a solution permits the recovery of the solute intact with its original properties. Solvents are used in paints, adhesives, glues coatings, and degreasing/ cleaning agents.

Semivolatile Organic Compounds (SVOCs) are less volatile chemicals that tend to persist in the environment.

Inhalation and percutaneous absorption are the primary routes of exposure. Organic compounds are metabolized or they accumulate in the lipid-rich tissues such as the liver, fat cells, or the nervous system.

Solvent inhalation by workers can cause effects ranging from an alcohol-like intoxication to narcosis and death from respiratory failure. Symptoms that include drowsiness, headache, dizziness, dyspepsia, and nausea.

3.1.4 Dust

Dust generated during coring or cutting of concrete, boring, or excavations can be hazardous to the respiratory system and irritating to the eyes. Dust can also carry the contaminants of concern potentially exposing workers by skin contact and inhalation. The ACGIH has established an eight-hour exposure limit for dust at 3 mg/M^3. The concentrations of the chemicals of concern in the soil are low enough that inhalation of dust would not by itself be an exposure hazard. However contamination of skin and clothing can provide additional exposures. Therefore the generation and contact with dust should be minimized.

Water or other methods should be used to control dust during dusty operations; however care must be used to prevent electrical shock if electric tools are used in the same area. If dusts become irritating and engineering controls such as the application of water cannot be used, respirators should be donned as discussed in Section 7.

3.1.5 Coal Tar

Typical coal gasification byproduct (coal tar) constituents are referred to as polycyclic aromatic hydrocarbon (PAH) compounds. Repeated contact with PAH compounds may cause photosensitization of the skin, producing skin burns after subsequent exposure to ultra-violet light. Repeated contact with certain PAHs has been associated with the development of cancer.

Of the PAH compounds typically present at former Holder sites, naphthalene is typically present at higher concentrations than the other compounds. Naphthalene is easily detected due to its characteristic moth-ball like odor. The inhalation of high concentrations of naphthalene vapor may result in nausea, vomiting, abdominal pain and irritation of the bladder. Prolonged overexposure may result in renal shut down.

Phenolic compounds are often associated with coal tars. Phenolics are generally strong irritants that can have a corrosive effect on the skin and can also penetrate the skin. Chronic overexposure to phenol and phenolic compounds may result in liver and kidney damage.

3.1.6 Benzo(a)Pyrene

The toxicological properties of this chemical have not been fully investigated. However, the chemical is a suspect carcinogen and is recognized as a carcinogen in California. Contact with dust containing Benzo(a)pyrene can cause skin, respiratory tract, and eye irritation.

3.1.7 Naphthalene

Inhalation of dust or vapors can cause headache, nausea, vomiting, extensive sweating, and disorientation. The predominant reaction is delayed intravascular hemolysis with symptoms of anemia, fever, jaundice, and kidney or liver damage.

Contact with Naphthalene can irritate the skin and, prolonged contact, may cause rashes and allergy. "Sensitized" individuals may suffer a severe dermatitis.

3.1.8 Cyanide

Cyanide present in soil or groundwater normally exists as a salt with various metals. Unless the pH is low no hydrogen cyanide is expected. Hydrogen cyanide and the common salts of cyanide will penetrate intact skin. All skin surfaces that could come in contact with contaminated water or soil must be protected.

Cyanide when inhaled, ingested or absorbed through skin reacts with the muscle cells preventing them from using oxygen in the blood. The result is that the muscles cease to function and the oxygen level in the blood reaches saturation. The saturated blood causes the victim to become flushed and the lips and fingernails become very red. CPR is not affective on victims of cyanide poisoning. Get medical attention immediately if cyanide poisoning is suspected.

3.1.9 Metals

Common toxic metals found at industrial sites include Arsenic, Cadmium, Chromium, Lead, Mercury, Nickel, Silver and Zinc. The metal contaminate level at this site is expected to be below worker health and safety levels of concern.

Metals can enter the body by:

- Ingesting small amounts present in food and water
- Drinking contaminated water near manufacturing or waste sites
- Drinking contaminated water or a beverage that has been stored in metal containers or flows through pipes that have been coated with zinc to resist rust
- Breathing zinc particles in the air at manufacturing sites.

Many of these metals are required in trace amounts for normal human metabolic process. Harmful health effects generally begin at levels from 10-15 times the Recommended Daily Amount (in the 1 to 250 mg/day range). Doses in this range can cause irritability, hypertension, stomach cramps, nausea, and vomiting.

Breathing large amounts of the metals (as dust or fumes) can cause a specific short-term disease called metal fume fever. This is believed to be an immune response affecting the lungs and body temperature.

3.2 Summary of Hazardous Properties of Potential Contaminants

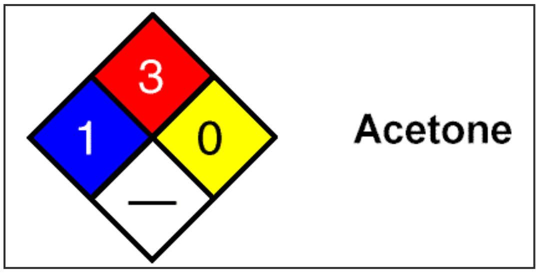
Chemical Name	PEL[1]	TLV[2]	VP[3]	VD[4]	SG[5]	SOL[6]	FP[7]	LEL[8]	UEL[9]
Benzene	1	0.5	75	2.8	0.88	<1	12	1.2	7.8
Toluene	200	50	21	4	0.87	<1	40	1.1	7.1
Ethyl Benzene	100	100	7	4	0.87	<1	55	0.8	6.7
Xylene	100	100	9	4	0.86	<1	81	1.1	7.0
Benzo(a)Pyrene	?	?	<1	NA	NA	<1	>300	NA	NA
Cyanide	**	***	630	0.95	0.69	100	0	5.6	40
Naphthalene	10	10	1	4.4	1.2	<1	189	0.9	5.9

Chemical Name	PEL[1]	TLV[2]	VP[3]	VD[4]	SG[5]	SOL[6]	FP[7]	LEL[8]	UEL[9]
[1] Permissible Exposure Limit in ppm [2] Threshold Limit Value in ppm [3] Vapor Pressure in mm Hg [4] Vapor Density (air = 1) [5] Specific Gravity (water = 1) [6] Solubility in Water in %				[7] Flash Point in °F [8] Lower Explosive Limit in % by volume [9] Upper Explosive Limit in % by volume NA = Not Applicable ? = Not known C = Ceiling limit not to be exceeded					

3.3 Hazard Substances Brought On Site by Contractor

A material safety data sheet (MSDS) must be available for each hazardous substance that contractors bring on the property. This includes solutions/chemicals that will be used to decontaminate equipment, foam to prevent odors, and gases needed to calibrate air monitoring equipment.

In addition, all containers of hazardous materials must be labeled in accordance with OSHA's Hazard Communication Standard. Either the original manufacturer’s label or an NFPA 704M label specific for the material (as shown at the right) is considered to be an acceptable label.



3.4 Chemical Exposure and Control

3.4.1 Chemical Exposure Potential

Employees can be exposed by inhalation to the chemicals of concern during the excavation, decontamination, and sampling activities. Another route of potential exposure to the contaminants of concern is via direct dermal contact with soils and groundwater during excavation or sampling.

Although highly unlikely, exposure to all of the contaminants of concern can occur via ingestion (hand-to-mouth transfer). The decontamination procedures described in Section 9.0 address personal hygiene issues that will limit the potential for contaminant ingestion.

3.4.2 Chemical Hazard Control

The chemical hazards associated with the investigative and sampling activities can be controlled in several ways, including:

By performing air monitoring (Section 6) in the worker's breathing zone to determine exposure to the chemicals of concern during the intrusive work or sampling. If exposures exceed the action levels, respiratory protection as discussed in Section 7, will be donned.

To avoid direct dermal contact with contaminated media, protective clothing, as described in Section 7 will be required when excavating, collecting samples, and decontaminating excavation or sampling equipment.

3.5 Hazardous Waste Management

Waste generated as a result of investigation activities or excavation will be containerized local to the point of generation, sampled for characterization purposes and secured prior to off-site transportation and disposal. Upon receipt of analytical results, the project team will work with the Client to properly characterize, profile and dispose of the waste(s).

4.0 Physical Hazards and Controls

4.1 Back Safety

Using the proper techniques to lift and move heavy pieces of equipment is important to reduce the potential for back injury. The following precautions should be implemented when lifting or moving heavy objects:

- Bend at the knees, not the waist. Let your legs do the lifting;
- Do not twist while lifting;
- Bring the load as close to you as possible before lifting;
- Be sure the path you are taking while carrying a heavy object is free of obstructions and slip, trip and fall hazards;
- Use mechanical devices to move objects that are too heavy to be moved manually; and,
- If mechanical devices are not available, ask another person to assist you.

4.2 Concrete and Asphalt Coring & Cutting

Cutting and coring concrete and asphalt can involve numerous hazards. The noise generated as a result of the tools used, and adequate hearing protection is necessary when conditions outlined in the Noise section below are encountered. Tools used which can include drills and saws, must be appropriately guarded to prevent hands, PPE, and other objects from being caught-up in the moving parts and drawing employees in. Dust may also be generated while cutting concrete and either respiratory protection or dust suppression will need to be utilized to prevent exposure. Additional consideration must be given chemical hazard concerns that may exist in the materials underlying the concrete.

4.3 Corrosive Liquids

Site activities may require the use of corrosive liquids for preserving samples once collected, identifying substances in the field, or as part of system operations and maintenance. When corrosive liquids are identified in the work area, PPE upgrades will need to include an appropriate glove to mitigate the hazard, protective eye wear to guard against splashing liquids, and the potential need for poly-coated Tyvek to be worn. Additionally, the job task will be analyzed to determine if splashing and spilling can be minimized through the use of special equipment or procedures. Examples include using a funnel, identifying an alternative substance for use, and more.

4.4 Drilling Hazards

Use of a drill rig to advance soil borings and install monitoring wells will require all personnel in the vicinity of the operating rig to wear steel-toed boots, hard hats, hearing protection and safety eyewear. Personnel shall not remain in the vicinity of operating equipment unless it is required for their work responsibilities. Drill rigs are considered to be heavy equipment, and therefore precautions must be incorporated into job activities when working in close proximity to drill rigs. In addition the wearing the PPE that has been determined to be necessary for the project, employees will need to ensure that Drill Rig Operators conduct inspections of the drill rig on a daily basis. A drill rig inspection is included in Attachment D as a reference. Focal points of the inspection should include checking hydraulic lines, tools and drilling equipment, emergency stop switches, and other parts of the equipment to insure that they are maintained in a safe operating condition.

Employees will also consider the staging their work area so that they are not within the shadow of the drill rig's mast. Working within this area creates a potential to be contacted by the drill rig if it were to tip over on its side. Likewise, when establishing a drilling location, the rig shall be positioned so that it won't clip overhead power lines should it tip over.

Additionally, the following safety requirements must be adhered to:

- All drill rigs and other machinery with exposed moving parts must be equipped with an operational emergency stop device. Drillers and geologists must be aware of the location of this device. This device must be tested prior to job initiation and periodically thereafter.
- The driller must never leave the controls while the tools are rotating unless all personnel are kept clear of rotating equipment.
- A long-handled shovel or equivalent must be used to clear drill cuttings away from the hole and from rotating tools. Hands and/or feet are not to be used for this purpose.
- A remote sampling device must be used to sample drill cuttings if the tools are rotating or if the tools are readily capable of rotating. Samplers must not reach into or near the rotating equipment. If personnel must work near any tools, which could rotate, the driller must shut down the rig prior to initiating such work.
- Driller's Drillers, helpers and geologists must secure all loose clothing, long hair, or jewelry when in the vicinity of drilling operations.
- Only equipment, that has been approved by the manufacturer, may be used in conjunction with drilling equipment Pins that protrude excessively from augers shall not be allowed
- No person shall climb the drill mast while tools are rotating.
- No person shall climb beyond 6 feet above ground on the drill mast without the use of ANSI-approved fall protection (approved belts, lanyards and a fall protection slide rail) or portable ladder that meets the requirements of OSHA standards.
- When using the rig's hoist to lift or move objects other than the equipment associated with the direct push operation, an assessment of the force required to perform the lift and the rig's design specifications must be made to determine whether the lift can be made safely. In all cases personnel must not be in line with the cable when it is under tension.
- If drilling operations are to be performed within an enclosed space proper procedures must be followed to prevent the accumulation of carbon monoxide within the work area.
- Open doors and windows and provide ventilation to the outside.
- Employ the use of a mechanical ventilation system, i.e. blower or fan, appropriately sized for the room to circulate fresh air.
- Connect equipment exhaust points to hoses that can be direct ventilated to an outside area.

4.4.1 Rotary Auger & Rotating Parts

Exposure to rotating parts can occur when working near the drilling rig or the internal combustion engine. All rotating parts should be covered with guards to prevent access by workers. When performing maintenance activities that require the rotating parts to be exposed, workers should not allow loose clothing, hands, or tools to approach the rotating parts. Guards must be replaced as soon as possible after completing the maintenance task.

Operation of drilling equipment also creates hazards associated with pinch points and rotating equipment. Employees will evaluate work procedures to avoid placing their body and extremities in the path of rotating equipment and tools to avoid being struck by moving equipment, tools and machinery. Similarly, these hazards also create pinch point hazards where the body and extremities, especially the hands, can be caught in moving equipment and crushed. Employees will evaluate equipment and tool use procedures to identify pinch points and develop procedures to avoid placing body parts in a position where they can be caught in moving equipment, tools and machinery.

4.4.2 Direct Push Hazards

Use of the Direct Push System to advance soil borings and collect soil samples will require all personnel in the vicinity of the operating unit to wear steel-toed boots, hardhats, hearing protection and safety eyewear. Personnel shall not remain in the vicinity of operating equipment unless it is required for their work responsibilities. Additionally, the following safety requirements must be adhered to:

- A remote vehicle ignition is located on the control panel of the Geoprobe unit. This allows the operator to start and stop the vehicle engine from the rear. This device must be tested prior to job initiation and periodically thereafter. All employees should be aware of how to access and operate the rear ignition.
- The driller must never leave the controls while the probe is being driven.
- Drillers, helpers and geologists must secure all loose clothing when in the vicinity of drilling operations.
- The Geoprobe vehicle shall not be moved any distance with the probe in the extended position. Check for clearance at roof or the vehicle before folding the Geoprobe out of the carrier vehicle.
- Be sure the parking brake is set, or vehicle wheels have been chocked, before probing.
- Never allow the derrick foot to be lifted more than 6" off of the ground surface.
- Deactivate hydraulics when adding or removing probe rods, anvils or any tool in the hammer.
- Verify that all threaded parts are completely threaded together before probing.

4.4.2.1 Cuts and Lacerations

Geoprobe soil samples are collected in acetate liners that must be cut open in order to collect the sample. Additionally, tubing will need to be cut to facilitate groundwater sampling. Additional tasks for the job may also pose laceration hazards. Tube-cutters are available and should be used to eliminate this hazard. However, if it is necessary to use knives or blades, follow the safety precautions listed below:

- Keep your free hand out of the way
- Secure the acetate liner so it won't roll or move while you are cutting
- Use only sharp blades; dull blades require more force which results in less knife control
- Pull the knife at an angle to your body; pulling motions are easier to manage
- Don't put your knife in your pocket
- Use a hooked knife (i.e. linoleum knife) or a utility knife with a self-retracting blade
- Wear leather or Kevlar® gloves when using knives or blades.

4.4.3 Sonic Drilling

Use of a Sonic Drill Rig to advance soil borings, collect soil samples and/or install monitoring wells will require all personnel in the vicinity of the operating unit to wear steel-toed boots, hardhats, hearing protection and safety eyewear. Personnel shall not remain in the vicinity of operating equipment unless it is required for their work responsibilities. Additionally, the following safety requirements must be adhered to:

- A remote vehicle ignition may be located on the control panel of the Drill Rig. This allows the operator to start and stop the vehicle engine from the rear. This device must be tested prior to job initiation and periodically thereafter. All employees should be aware of how to access and operate the rear ignition.
- The driller must never leave the controls while the probe is being driven.
- Drillers, helpers and geologists must secure all loose clothing when in the vicinity of drilling operations.
- The Drill Rig shall not be moved any distance with the mast in the extended position. Check for clearance at roof or the vehicle before folding the Rig out of the carrier vehicle.
- Be sure the parking brake is set, vehicle wheels have been chocked and/or outrigger stabilizers have been positioned before drilling.
- Never allow the derrick foot to be lifted more than 6" off of the ground surface.
- Deactivate hydraulics when adding or removing rods, anvils or any tool in the hammer.
- Verify that all threaded parts are completely threaded together before drilling.

4.4.4 Soil Loading Machinery

Heavy equipment including excavators and soil loading machinery will be used to excavate impacted soils. Heavy equipment at the project site requires all employees working in the exclusion zone to wear ANSI-approved hard hats, steel-toed safety shoes/boots, safety glasses and hearing protection, as well as traffic vests as indicated above.

Operators will inspect the equipment daily before use to ensure safe operating conditions and to determine that the brakes and operating systems are in proper working condition and that all required safety devices are in place and functional (i.e., reverse gear alarms are working properly).

All personnel will place the spotter within close proximity to the operating machinery. When working around heavy equipment, employees should:

- Make sure that the operator is aware of your presence/activities;
- Stay in the operator's line of sight, don't work in his/her blind spot;
- Approach areas where equipment is operating from a direction visible to the operator;
- Be aware of the swing radius of the excavator;
- Do not walk or work underneath loads handled by digging equipment;
- Do not ride in buckets of loaders;
- Stand away from soil stockpile areas to avoid being struck by any spillage or falling materials.; and,
- Develop a series of hand signals to facilitate communication with the operator.

4.5 Trench/Excavation Cave-In or Collapse

The excavation depths vary depending on the activity to be completed. In some instances the proposed depths exceed five feet. Under no circumstances is the project team to enter an unshored or unsloped excavation greater than five feet in depth. If samples need to be collected, they will be collected from the bucket of the backhoe or by using a remote sampling device.

4.6 Driving Safety

Drivers must be licensed to drive the class of vehicle they are operating and trained in defensive driving. Only AECOM personnel may drive AECOM vehicles or vehicles rented for AECOM business; client, subcontractor, or other work-related personnel may ride. Drivers and passengers must comply with all traffic laws and posted signs, and will not operate a vehicle if under the influence of impairing medication, alcohol, or any other substance.

Make sure that the following basic safe driving practices are followed at all times while working on this project:

- Always wear a seat belt while operating a motor vehicle or while traveling as a passenger.
- Obey speed limits and local traffic laws at all times.
- Obtain proper directions to the site in advance and take the route that is most likely to be free of known traffic hazards (e.g., congestion, construction, etc.) and that avoids travel through potentially dangerous neighborhoods.
- Abstain from distractions while driving (e.g., the use of cell phones, eating/drinking, reading maps, etc.) If necessary, stop the vehicle and pull over to perform such activities safely. AECOM policy is engine on, cell phone off. You must **NOT** operate a vehicle while talking on your cell phone, regardless of “hands free” or not. If you receive a call, pull over to answer it. **DO NOT** allow other distractions to interfere with your safe operation of the vehicle.
- Do not operate a motor vehicle if you are tired and/or have not had sufficient rest. AECOM’s H&S policy 1.2 limits the maximum length of the workday to 16 hours for fieldwork. This limit includes the time spent driving to/from a site.
- All unattended personnel transport vehicles will not be allowed to idle, and must be turned off when not in use.

4.6.1 Planning / Preparation

- Prior to departure, check traffic reports, weather conditions, road construction, and road closures. If necessary, develop an alternate route and new, approved JMP (Journey Management Plan).
- Prior to entering the vehicle, inspect the vehicle.
- Leave early to allow for contingencies.

4.6.2 DOT

If you are to operate a vehicle exceeding 10,000 pounds (or vehicle and trailer with a combined weight over 10,000 pounds), or you are to transport greater than 1,000 pounds of hazardous materials, you MUST comply with DOT regulations. These are NOT addressed in this HASP; contact the H&S Department if this applies.

4.6.3 Secure Packing

Do not move your vehicle unless all equipment and supplies are secured. Items and material which may roll, slide, or move about in your vehicle while traveling are a major hazard. Secure the load!

4.6.4 Emergency Procedures

Always move out of traffic if possible; even if those in front of you have stopped. Stopping on an active highway can precipitate being hit from the rear. If you must stop on an active roadway, leave at least one car length in front of you, and watch the rear mirror, so you can ease up if someone behind can't stop. Keep your flashers on in this situation. If you are the only driver coming to a stop on an active roadway, leave the flashers on and when safe to do so, exit the car and get to a safe location.

If you must stop due to vehicle failure, etc. try to coast out of traffic. Put on your flashers, and tie a white handkerchief, etc. on the driver's side door or mirror. If you remain in the vehicle, lock the doors. Use your cell phone to summon help.

4.7 Flying Objects Hazards

Activities involving the use of power tools, drilling rigs, and hand tools, among other activities, can create flying object hazards where objects can become projectiles. When flying objects represent projectiles employees need to use equipment that is appropriately guarded to minimize the creation of projectile hazards, and also use the appropriate PPE including hard hats, safety goggles, face shields to prevent projectiles from causing injuries to employees.

4.8 Hand Safety

4.8.1 Glove Selection

To protect onsite workers from hand injuries, the following gloves will be used for when performing a specific duty:

Brightly colored gloves will be used to help emphasize and easily locate the hands. It is recommended that the color of gloves be changed monthly to draw attention to the hands.

Pinch points are found between a moving object and a stationary object, or between two continuously moving objects. Yellow hand stickers will be placed on equipment to remind workers of pinch points.

4.8.2 Working with Glassware

Glass bottles, laboratory equipment, and VOA vials can break and cause lacerations and puncture wounds. The follow preventive measures should be taken to reduce the potential for broken glassware.

- Package all glassware such that there is no glass to glass contact during transportation or storage;
- Assume that any time glass strikes another object it is damaged;
- Inspect all glassware for cracks, scratches, and other damage before using;
- Lids and caps should be "finger tight" unless there is a torque specification and you use a torque wrench;
- Never fill a glass container (other than VOA vials with a septum) liquid full, always leave an air space to buffer thermal expansion of the liquid; and
- Avoid rapid temperature changes when filling glass containers.

Glass often has flaws that cannot be detected by visual inspection and the force needed to open and tighten lids can cause these flaws to fracture the glass. Any time force is applied to glass, workers should wear leather or preferably Kevlar® gloves. Kevlar® glove liners are available for use under Nitrile or cotton gloves.

4.8.3 Hand Tools

Rules for the safe use of hand tools:

- Select the right size tool for the job. Don't use "cheaters" and avoid pulling old tools from the waste stream. There's a reason why they were thrown away!
- All hand tools must be in safe condition.
- Handles must be sound, straight and tight-fitting.
- Always inspect tools before use and replace or repair worn or damaged tools.
- Always keep the cutting edges sharp and never test a cutting edge with your finger.
- When working on an elevated surface (ladder, truck, scaffold), ensure your tools are secure. Falling tools can cause serious injury.
- Always carry your tools correctly and never put sharp or pointed tools in your pocket.
- When carrying hand tools, always point the cutting edge to the ground.
- Always keep your tools in a dry place to prevent rust.
- Cutting tools must be kept sharp and properly shaped.
- Secure work pieces prior to cutting or drilling.
- Keep the unused hand and other people away from the tool.

4.8.4 Specific Tool Use

4.8.4.1 Screwdrivers

Most screwdrivers are not designed to be used on electrical equipment. Use an insulated screwdriver for electrical work.

Do not hold an object in the palm of one hand and press a screwdriver into it; place the object on a bench or table. Never hammer with a screwdriver. Never use a screwdriver with a broken handle, bent or burred blade, etc.

4.8.4.2 Pliers

Do not use pliers as a substitute for hammers, wrenches, pry bars, etc. Use insulated pliers when doing electrical work. Inspect the pliers frequently to make certain that they are free of breaks or cracks.

Use the right type of pliers for the specific task – adjustable, locking (Vise Grip®), standard, bolt size fit, pipe wrench.

4.8.4.3 Hammers

Use the correct hammer for the specific type of striking work (task) to be done. Always wear safety glasses when using a hammer to strike an object. Always use the claw portion of a hammer to remove nails and not as a pick or awl. Have an unobstructed view and swing when using a hammer. Watch for overhead interference on back and forward swing. Use a good grip and use something other then your hand to hold a nail when starting hammering. Check for defects on the handle and head before using. If the hammer head shows signs of mushrooming, replace it immediately.

Handles may be wood, tubular/solid steel or fiberglass. Replace any hammer with a loose handle before the head flies off and causes injury to you or someone else. Tighten loose handles with the proper wedges; never use nails or staples for wedges. If a steel or fiberglass handle is loose replace it, since it is more difficult to repair than a wooden one. Some fiberglass handles can be tightened with the aid of a repair kit with epoxy materials.

4.8.4.4 Wrenches

Select the correct size of wrench for the job. Never use a pipe wrench as a wrench handle extension. Too much leverage can ruin a tool and cause injury.

To avoid sudden slips, stand in a balanced position and always pull on the wrench instead of pushing against the fixed jaw, particularly when a pinch point is created. Wear gloves when using a wrench in a confined space.

Whenever possible use a box end wrench instead of an open end wrench to avoid slipping.

4.8.4.5 Chisels

Always wear safety goggles or a face shield when using a chisel. Drive chisels outward and away from your body. Do not use chisels to pry. Keep edges sharp for most effective work and protect when not in use. Driven tools (chisels, punches, etc.) must be dressed to remove any mushrooming. Use the proper hammer when using a chisel.

4.8.4.6 Knives

Always perform a thorough Job Safety Analysis (JSA) to define the proper cutting tool for the task.

Always place the item to be cut on a solid surface, attempt to hold the cut item without your hand and cut in a direction away from the body and hand.

Always keep hands and body clear of the knife stroke. Always keep the cutting tool blades sharp.

Make sure there is plenty of open space around you when using any cutting tool.

Use the following safer tools in replace of fixed open blade knives (FOBK) whenever possible:

- Self-retracting utility knives
- Guarded utility knives
- Shears, snips, and/or scissors
- Concealed blade cutters
- Pipe cutters
- Specialty cutters (e.g. Geoprobe Acetate Liner Cutter)
- Ratcheting tools

4.8.5 Power Tools

To prevent hazards associated with the use of power tools, workers should observe the following general precautions:

- Never carry a tool by the cord or hose.
- Never yank the cord or the hose to disconnect it from the receptacle.
- Keep cords away from heat, oil and sharp edges.
- Disconnect tools when not using them, before servicing or cleaning them and when changing accessories such as blades, bits and cutters.
- If a tool is only temporarily being removed from the power source and the cord is not in the immediate control of the user, it is strongly suggested that a cord plug lockout be used to prevent the tool from accidentally being re-plugged in.
- Secure work with clamps or vise, freeing up both hands to operate the tool.
- Avoid accidental starting. Do not hold fingers on the switch button when carrying a plugged-in tool.
- Keep tools sharp and clean for best performance.
- Wear appropriate clothing. Loose clothing or jewelry can become caught in moving parts.
- Keep all guards in place.

4.8.6 Electric Tools

A variety of power tools may also be used during the proposed activities. When using portable tools that are electrically powered, follow the safety precautions listed below:

- Check to see that electrical outlets used to supply power during field operations is of the three wire grounding type.
- Extension cords used for field operations should be of the three wire grounding type and designed for hard or extra-hard usage. This type of cord uses insulated wires within an inner insulated sleeve and will be marked S, ST, STO, SJ, SJO or SJTO.
- NEVER remove the ground plug blade to accommodate ungrounded outlets.
- Do not use extension cords as a substitute for fixed or permanent wiring. Do not run extension cords through openings in walls, ceilings or floors.
- Protect the cord from becoming damaged if the cord is run through doorways, windows or across pinch points.
- Examine extension and equipment cords and plugs prior to each use. Damaged cords with frayed insulation or exposed wiring and damaged plugs with missing ground blades MUST BE REMOVED from service immediately.
- All portable or temporary wiring which is used outdoors or in other potentially wet or damp locations must be connected to a circuit that is protected by a ground fault circuit interrupter (GFCI). GFCI's are available as permanently installed outlets, as plug-in adapters and as extension cord outlet boxes. DO NOT CONTINUE TO USE A PIECE OF EQUIPMENT OR EXTENSION CORD THAT CAUSES A GFCI TO TRIP.
- When working in flammable atmospheres, be sure that the electrical equipment being used is approved for use in Class I, Division I atmospheres.

- Do not touch a victim who is still in contact with current. Separate the victim from the source using a dry, nonmetallic item such as a broomstick or cardboard box. Be sure your hands are dry and you are standing on a dry surface. Turn off the main electrical power switch and then begin rescue efforts.

4.9 Heavy Equipment

The use of heavy equipment for earth moving work poses potential hazards to employees. Such equipment can cause trauma injuries to the operator or nearby workers. It may also roll over, or fall on sloped ground or unstable soil. AECOM personnel are to remain clear of operating heavy equipment to the extent feasible.

Operators of earth moving equipment must be experienced or trained in the use of the equipment. They must inspect the equipment each day before use to assure that it is in safe operational condition. The equipment must be set up in a stable configuration, with the outriggers fully extended and supported on stable soil to prevent rollover. The rear swing-radius must be barricaded to prevent injuries to persons passing behind the equipment.

When employees must work near the equipment, eye contact and clear communication must be maintained.

4.10 Heavy Equipment – Drill Rigs

Drill rigs are considered to be heavy equipment, and therefore precautions must be incorporated into job activities when working in close proximity to drill rigs. In addition the wearing the PPE that has been determined to be necessary for the project, employees will need to ensure that Drill Rig Operators conduct inspections of the drill rig on a daily basis. A drill rig inspection is included in Attachment D as a reference. Focal points of the inspection should include checking hydraulic lines, tools and drilling equipment, emergency stop switches, and other parts of the equipment to insure that they are maintained in a safe operating condition.

Employees will also consider the staging their work area so that they are not within the shadow of the drill rig’s mast. Working within this area creates a potential to be contacted by the drill rig if it were to tip over on its side. Likewise, when establishing a drilling location, the rig shall be positioned so that it won’t clip overhead power lines should it tip over.

4.11 Insects, Spiders, Wasps and Bees

Employees are encouraged to review AECOM SHE SOP 509 – Biological Hazards Injury & Illness Prevention, for detailed discussion on working around insects within the workplace and procedures that can be used to minimize and prevent exposure.

4.11.1 Ticks

Ticks are bloodsuckers, attaching themselves to warm-blooded vertebrates to feed. Deer ticks are the most common carriers of Lyme disease, a bacterial infection that is transmitted to humans through the bite of the tick.

Personnel should carefully inspect themselves each day for the presence of ticks or any rashes. This is important since prompt removal of the tick can prevent disease transmission. Female deer ticks are about one-quarter inch in length and are black and brick red in color. Males are smaller and all black.

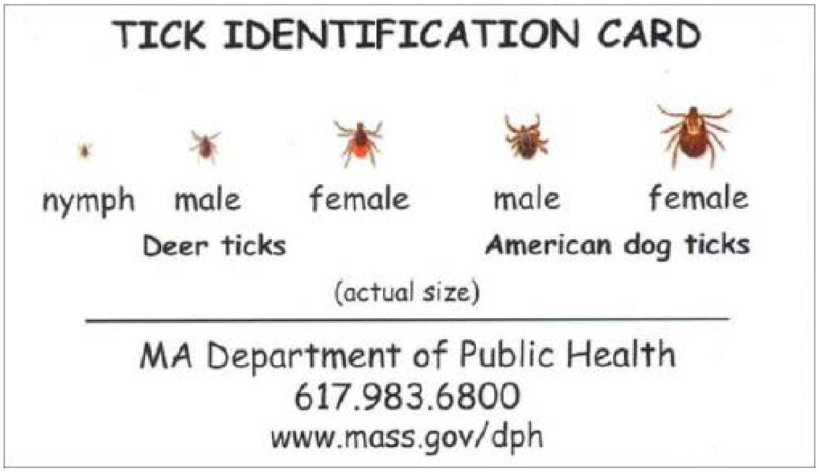
Removal of the tick is important in that the tick should not be crushed and care must be taken so that the head is also removed. If the head is not completely removed or if the tick is allowed to remain for days feeding on human blood, a condition known as tick paralysis can develop, this is due to a neurotoxin that the tick apparently injects while engorging. This neurotoxin acts upon the spinal cord causing loss of coordination, weakness and paralysis.

One characteristic symptom of Lyme disease is a bulls-eye rash that develops around the bite site. The rash appears in about 60-80% of all Lyme disease cases. Contact your OHSC immediately if you develop such a rash.

Tick season typically lasts from April through October; peak season is May through July; seasons can very depending on climate. Wear light-colored clothing (easier to spot ticks) with long sleeves and make sure that shirts are tucked into pants and pants are tucked into socks or boots. Ticks have a tendency to crawl upwards. These procedures will make it more difficult for a tick to reach your skin.

Studies have determined that repellants containing DEET as a main ingredient are most effective against mosquitoes and ticks. DEET can be directly applied to the exposed skin of adults and/or clothing. Products containing DEET can't be used with Fire Resistant Clothing (FRC) as it diminishes the garments' capacity to resist ignition in a fire. Permethrin is another repellent; however, it can only be directly applied to clothing.

The pictogram below, provided by the Massachusetts Department of Public Health, can be used to identify ticks and depicts the approximate actual size of ticks.



4.11.2 Mosquitoes

Mosquitoes, carriers of the West Nile Virus, Yellow Fever and other diseases, are indigenous to the area. As mentioned above, DEET is an effective mosquito repellent and is recommended. Although concentrated DEET formulations protect longer than those that are more dilute, little improvement is offered by concentrations of the active ingredient higher than 50 percent. Adverse effects, though documented, are infrequent and are generally associated with gross overuse of the product. Users should avoid the temptation to apply the most concentrated product available. The transient protection offered by more dilute preparations can be extended by reapplication. When using DEET care should be taken to reapply the repellant when its effectiveness wears off.

4.11.3 Spiders

Spiders and wasps may be found in derelict buildings, sheltered areas, and even on open ground. Exercise care when collecting samples and avoid reaching into areas where visibility is limited. If bitten by a spider, notify a co-worker or someone who can help if you should you have an allergic reaction or develop other symptoms related to spider venom. Stay calm and treat the area with ice or cold water.

Seek medical attention if you have any reactions to the bite such as developing a rash, excessive swelling or pain at the site of the bite or sting or any swelling or numbness beyond the site of the bite.

4.11.4 Wasps and Bees

Wasps (hornets and yellow-jackets) and bees (honeybees and bumblebees) are common insects that may pose a potential hazard to the field team if work is performed during spring, summer or fall. Bees normally build their nests in the soil. However, they use other natural holes such as abandoned rodent nests or tree hollows. Wasps make a football-shaped, paper-like nest either below or above the ground. Yellow-jackets tend to build their nests in the ground but hornets tend to build their nests in trees and shrubbery. Bees are generally more mild-mannered than wasps and are less likely to sting. Bees can only sting once while wasps sting multiple times because their stinger is barbless. Wasps sting when they feel threatened. By remaining calm and not annoying wasps by swatting, you lessen the chance of being stung.

Wasps and bees inject a venomous fluid under the skin when they sting. The venom causes a painful swelling that may last for several days. If the stinger is still present, carefully remove it with tweezers or y scraping a credit card or other blunt object against the sting site in the opposite direction in which the stinger is embedded. Some people may develop an allergic reaction, i.e. anaphylaxis, to a wasp or bee sting. If such a reaction develops, seek medical attention at once. Persons who are allergic to bee and wasp stings should carry an epinephrine pen, e.g., epi-pen, with them that is prescribed by a doctor and used to help abate swelling that occurs due to their allergy. Even if an employee utilizes their epi-pen, they still need to seek medical attention for follow-up care and observation.

4.12 Noise Exposure

The use of drilling equipment can expose the field team to noise levels that exceed the OSHA PEL of 90 dB for an 8-hour day. Exposure to noise can result in the following:

- Temporary hearing losses where normal hearing returns after a rest period;
- Interference with speech communication and the perception of auditory signals;
- Interference with the performance of complicated tasks; and,
- Permanent hearing loss due to repeated exposure resulting in nerve destruction in the hearing organ.

Since personal noise monitoring will not be conducted during the proposed activities, employees must follow this general rule of thumb: If the noise levels are such that you must shout at someone two (2) feet away from you, you need to be wearing hearing protection. Employees can wear either disposable earplugs or earmuffs but all hearing protection must have a minimum noise reduction rating (NRR) of 27 dB.

4.13 Overhead Materials

Overhead materials can include objects, tools, utilities, equipment and machinery that are, or have the potential to be, elevated above the work area. Overhead materials pose a significant safety risk because of the force that can be generated when they fall and strike an employee. Special attention should be paid when setting up a work area to evaluate the potential for overhead materials to cause traumatic blunt force trauma. Consideration must be given to potential for these overhead objects to be contacted during the course of work by AECOM employees and Subcontractors, and what the result of contacting these overhead materials will be.

If possible, the work area should be adjusted or moved so that no overhead materials present a hazard. Likewise, if the object overhead can be relocated to remove the hazard, that is the preferred course of mitigation. When the hazard can't be eliminated, then protective measures to shield the employees from being struck by falling objects should be taken. As a last resort, and as part of the minimum PPE for site work, employees working in areas where falling objects pose a hazard will wear a hard hat.

4.14 Pinch Points

The use of hand tools, mechanical equipment, heavy machinery and more can create pinch points within the working area. Pinch points can be recognized when moving objects are present in the work space in close proximity to employees, and it is reasonable to assume that a part of the employee's body can be caught between the moving objects. Pinch points will be considered when performing a Job Safety Analysis for the task being performed and recommendations will be made to reduce the potential for body parts to become caught in moving parts, including but not limited to:

- The use of PPE, e.g. gloves, boots, etc, to protect exposed body parts;
- Guarding machinery and equipment to prevent body parts from being caught in the moving objects;
- Using tools as an extension of the body to avoid placing body parts in the path of harm. When tools are used as an extension of the body consideration will be given to how the tool may become a hazard if it is caught within moving parts.

4.15 Poisonous Plants

Employees are encouraged to review AECOM SHE SOP 509 – Biological Hazards Injury & Illness Prevention, for detailed discussion on working around poisonous plants within the workplace and procedures that can be used to minimize and prevent exposure.

All undeveloped property potentially has poison ivy, oak, or sumac growing in areas where vegetation is not controlled. These plants can also be found in cultivated and landscaped areas. Perform a hazard analysis appropriate for the working conditions and consider the existence of poisonous plants. Use appropriate PPE to prevent exposure, including but no limited to, full length clothing, Tyvek coveralls, and dermal barrier creams.

Poison Ivy • Grows in West, Midwest, Texas, East. • Several forms – vine, trailing shrub, or shrub. • Three leaflets (can vary 3-9). • Leaves green in summer, red in fall. • Yellow or green flowers. • White berries.	 
Poison Oak • Grown in the East (NJ to Texas), Pacific Coast. • 6-foot tall shrubs or long vines. • Oak-like leaves, clusters of three. • Yellow berries.	 
Poison Sumac • Grows in boggy areas, especially in the Southwest and Northern states. • Shrub up to 15 feet tall. • Seven to 13 smooth-edged leaflets. • Glossy pale yellow or cream-colored berries.	 
Giant Hogweed • Grows in the East; present in eastern Nassau County, NY. • Invasive and introduced Asian weed. • “Umbelliferous” plant looks like a giant carrot or parsnip plant. • Parasol-shaped flower cluster. • Grows up to 15-feet in height with 5-foot wide leaves. • Poisonous sap causes Phytophotodermatitis (psoralen chemicals react to UV). • Causes blistering and dermal lesions. • Avoid leaves and flowers.	

If you must enter areas containing such plants, wear protective clothing, such as Tyvek® coveralls, Nitrile or latex gloves, and boot covers. The use of a barrier cream such as Ivy Block can prevent the active agent in poisonous plants from affecting skin and Tecnu cleansing wipes can remove the plant oil from exposed skin.

Avoid using mowers and weed trimmers in areas where poison ivy and oak are likely. Additional care should be taken during early winter after the leaves have fallen from the poisonous plants; the poison still exists in the vines and stubble remaining above the ground. Wash any contaminated skin immediately with cold water and mild soap.

4.16 Slips, trips and fall hazards

On any work area, it is expected that the ground might be uneven. The ground surface might be unreliable due to settling. Surface debris might be present and wet or swampy areas can exist.

Employees should walk around, not over or on top of debris or trash piles. When carrying equipment, identify a path that is clear of any obstructions. It might be necessary to remove obstacles to create a smooth, unobstructed access point to the work areas on site.

During the winter months, snow shovels and salt crystals or calcium chloride should be kept on site to keep work areas free of accumulated snow and ice. Furthermore, use sand or other aggregate material to help keep work surfaces from being slippery, especially where salt/calcium chloride cannot be used. In addition, make sure work boots have soles that provide good traction. When walking on ice is necessary crampons or Yaktrax® should be used.

Maintaining a work environment that is free from accumulated debris is the key to preventing slip, trip and fall hazards at construction sites. Essential elements of good housekeeping include

- Orderly placement of materials, tools and equipment;
- Placing trash receptacles at appropriate locations for the disposal of miscellaneous rubbish;
- Prompt removal and secure storage of items that are not needed to perform the immediate task at hand; and,
- Awareness on the part of all employees to walk around, not over or on, equipment that might have been stored in the work area.

4.17 Splashing Liquids

Groundwater sampling activities can produce splashing hazards in the work area. Employees will use techniques that minimize the production of splashing hazards while handling liquids, including groundwater, sample container preservatives, decontamination solutions and any other liquids in the work area. Employees will also evaluate the working tasks to consider the use of goggles while working with liquids.

4.18 Traffic Safety

4.18.1 Transportation Plan

A transportation plan would be prepared for the Site as per the Excavation Work Plan (Appendix A of the ISMP). This plan would addresses requirements for accessing the project Site, limitations of public use of the streets or sidewalks adjacent to the project Site, securing any necessary permits to use and/or close public streets and sidewalks, and the need for flaggers and signage when traffic flow will be impeded on public streets.

4.18.2 Basic Procedures

To make certain that motorists are aware of our presence, all employees who are potentially exposed to traffic hazards should wear orange or yellow ANSI Class II or III safety vests. Work area should be delineated with traffic cones, or other suitable warning barriers, to prevent motorists from inadvertently driving through. As for vests, cones or other barrier materials should be reflectorized if work will be performed during dusk or evening hours. Where it is not feasible to implement such procedures, a standby observer should be assigned to warn the work crew of any impending traffic hazards.

4.18.3 Work On/Adjacent to Public Roadways

For projects that involve potential exposure to traffic on or adjacent to public roadways, consult the "**Work Zone Traffic Control" handbook**, under "Traffic Control" on AECOM's H&S Website, at the following web address: http://intranet.AECOM.com/healthweb.

The handbook was developed by the State of Maine DOT and provides examples of traffic control applications for typical road work situations (e.g., closure of one lane of a two lane road, stationary work on the shoulder of a road, mobile work along the shoulder of a road, etc.). Although it was written to reflect the basic requirements of Part VI of the Federal Highway Administration's (FHWA) Manual of Uniform Traffic Control Devices (MUTCD), this handbook is not a regulatory document. Since specific requirements will vary from state to state, and within a state, by county, city or town.

4.18.4 Flagging/Redirecting Traffic

Specific requirements exist when traffic must be redirected around a work area that is on or adjacent to a public roadway. In certain locations only police officers may redirect traffic. As a minimum, OSHA requires that flaggers be formally trained in accordance with the requirements specified in ANSI D6.1-1971. As a result, AECOM personnel should not redirect traffic on public roadways.

http://www.atssa.com/cs/flagger

When traffic must be redirected, and the local police do not perform that role, a traffic control firm should be hired (these are frequently listed in the yellow pages under "safety").

4.19 Utility Hazards

4.19.1 Underground Utilities

Law requires that a utility clearance be performed prior to initiation of any subsurface work.

Dig Net of New York City and Long island
(800) 272-4480 or http://www.dignetnycli.com/

Call to request a mark-out of natural gas, electric, telephone, cable television, water and sewer lines in the proposed drilling locations. In many locations, a separate location request must be submitted to the municipality providing potable water, sanitary and storm sewerage. Work will not begin until the required utility clearances have been performed.

Utility clearance organizations typically do not mark-out underground utility lines that are located on private property. As such, the drilling contractor must exercise due diligence and try to identify the location of any private utilities on the property being investigated. AECOM can fulfill this requirement in several ways, including:

- Obtaining as-built drawings for the areas being investigated from the property owner;

- Visually reviewing each proposed soil boring locations with the property owner or knowledgeable site representative;
- Performing a geophysical survey to locate utilities;
- Hiring a private line locating firm to determine the location of utility lines that are present at the property;
- Identifying a no-drill zone; or
- Hand digging in the proposed soil boring locations if insufficient data is available to accurately determine the location of the utility lines.

The client or property owner may have specific requirements and procedures for underground utility clearance.

4.19.2 Overhead Utilities

All overhead lines will be considered “energized” unless properly de-energized, grounded and tested by the utility company before working within the clearance distance as defined below. The AECOM SSO must observe de-energizing process and reconfirm that the lines are de-energized on a daily basis.

Any vehicle or mechanical equipment that is capable of having parts of its structure elevated near energized overhead lines shall be operated so that a minimum clearance of 10 feet is maintained at all times. This 10 foot distance shall be increased a minimum of 0.4 inches for each 1 kV over 50 kV. If the voltage of the overhead line is unknown, maintain a clearance distance of 35 feet from ground projection of the nearest power line to the vehicle. Any work within the clearance distance must be approved by the Regional Health and Safety Manager and the utility company.

Precautions must be taken when handling lengths of pipe or tubing that can approach overhead power and utility lines. When working with pipe or tubing, maintain a distance equal to the length of pipe plus the clearance distance defined above.

4.20 Weather

4.20.1 Inclement Weather

The Site Safety Officer will check the weather forecast for the project area each morning prior to mobilization. Predicted weather conditions will be included in the Job Safety Analysis. Weather changes should initiate a review and update of the JSA as necessary.

Severe weather can occur with little warning. The employee must be aware of the potentials for lightning, flash flooding and high wind events.

Be Prepared, Know What is Coming your Way

- Listen to the radio for severe weather alerts.
- Check the Storm Prediction Center's web page for alerts and warnings.

http://www.spc.noaa.gov/products/wwa/

- Pay attention to the weather in your area, up wind of your location, and in the watershed up stream from your location.
- When in the field, be aware of the route you must take to get to shelter.

- When working in low areas be aware of the potential for flash flooding and the route to higher ground.

4.20.2 Heat Stress

4.20.2.1 Types of Heat Stress

Heat related problems include heat rash, fainting, heat cramps, heat exhaustion and heat stroke. Heat rash can occur when sweat isn't allowed to evaporate; leaving the skin wet most of the time and making it subject to irritation. Fainting may occur when blood pools to lower parts of the body and as a result, does not return to the heart to be pumped to the brain. Heat related fainting often occurs during activities that require standing erect and immobile in the heat for long periods of time. Heat cramps are painful spasms of the muscles due to excessive salt loss associated with profuse sweating.

Heat exhaustion results from the loss of large amounts of fluid and excessive loss of salt from profuse sweating. The skin will be clammy and moist and the affected individual may exhibit giddiness, nausea and headache.

Heat stroke occurs when the body's temperature regulatory system has failed. The skin is hot, dry, red and spotted. The affected person may be mentally confused and delirious. Convul¬sions could occur. EARLY RECOGNITION AND TREATMENT OF HEAT STROKE ARE THE ONLY MEANS OF PREVENTING BRAIN DAMAGE OR DEATH. A person exhibiting signs of heat stroke should be removed from the work area to a shaded area. The person should be soaked with water to promote evaporation. Fan the person's body to increase cooling.

Increased body temperature and physical discomfort also promote irritability and a decreased attention to the performance of hazardous tasks.

4.20.2.2 Early Symptoms of Heat-Related Health Problems:

decline in task performance

incoordination

decline in alertness

unsteady walk

excessive fatigue

reduced vigilance

muscle cramps

dizziness

4.20.2.3 Susceptibility to Heat Stress Increases due to:

lack of physical fitness

lack of acclimatization

increased age

dehydration

obesity

drug or alcohol use

sunburn

infection

People unaccustomed to heat are particularly susceptible to heat fatigue. First timers in PPE need to gradually adjust to the heat.

4.20.2.4 The Effect of Personal Protective Equipment

Sweating normally cools the body as moisture is removed from the skin by evaporation. However, the wearing of certain personal protective equipment (PPE), particularly chemical protective coveralls (e.g., Tyvek), reduces the body's ability to evaporate sweat and thereby regulate heat buildup. The body's efforts to maintain an acceptable temperature can therefore become significantly impaired by the wearing of PPE.

4.20.2.5 Measures to Avoid Heat Stress:

The following guidelines should be adhered to when working in hot environments:

- Establish work-rest cycles (short and frequent are more beneficial than long and seldom).
- Identify a shaded, cool rest area.
- Rotate personnel, alternative job functions.
- Water intake should exceed sweat produced. Most workers exposed to hot conditions drink less fluids than needed because of an insufficient thirst. **DO NOT DEPEND ON THIRST TO SIGNAL WHEN AND HOW MUCH TO DRINK.** Consume enough liquid to force urination every two hours. In humid climates ice water or ice should be consumed to help maintain normal body temperature since evaporation does not provide an efficient mechanism for heat removal.
- Eat light meals before and during work shifts. Avoid highly salted foods.
- Drink sports drinks such as Gatorade® diluted 1:1 with water.
- Save most strenuous tasks for non-peak heat hours such as the early morning or at night.
- Avoid alcohol during prolonged periods of heat. Alcohol will cause additional dehydration.
- Avoid double shifts and/or overtime.

The implementation and enforcement of the above mentioned measures will be the joint responsibility of the Project Manager and health and the Site Safety Officer. Potable water and fruit juices should be made available each day for the field team.

4.20.2.6 Heat Stress Monitoring Techniques

Site personnel should regularly monitor their heart rate as an indicator of heat strain by the following method:

Radial pulse rates should be checked by using fore-and middle fingers and applying light pressure top the pulse in the wrist for one minute at the beginning of each rest cycle. If the pulse rate exceeds 110 beats/minute, the next work cycle will be shortened by one-third and the rest period will be kept the same. If, after the next rest period, the pulse rate still exceeds 110 beats/minute, the work cycle will be shortened again by one-third.

4.20.3 Cold Stress

4.20.3.1 Type of Cold Stress

Cold injury is classified as either localized, as in frostbite, frostnip or chilblain; or generalized, as in hypothermia. The main factors contributing to cold injury are exposure to humidity and high winds, contact with wetness and inadequate clothing.

The likelihood of developing frostbite occurs when the face or extremities are exposed to a cold wind in addition to cold temperatures. The freezing point of the skin is about 30o F. When fluids around the cells of the body tissue freeze, skin turns white. This freezing is due to exposure to extremely low temperatures. As wind velocity increases, heat loss is greater and frostbite will occur more rapidly.

4.20.3.2 Symptoms of Cold Stress

The first symptom of frostbite is usually an uncomfortable sensation of coldness, followed by numbness. There might be a tingling, stinging or aching feeling in the affected area. The most vulnerable parts of the body are the nose, cheeks, ears, fingers and toes.

Symptoms of hypothermia, a condition of abnormally low body temperature, include uncontrollable shivering and sensations of cold. The heartbeat slows and can become irregular, the pulse weakens and the blood pressure changes. Pain in the extremities and severe shivering can be the first warning of dangerous exposure to cold.

Maximum severe shivering develops when the body temperature has fallen to 95o F. Productive physical and mental work is limited when severe shivering occurs. Shivering is a serious sign of danger. Immediately remove any person who is shivering from the cold.

4.20.3.3 Methods to Prevent Cold Stress

When the ambient temperature, or a wind chill equivalent, falls to below 40o F (American Conference of Governmental Industrial Hygienists recommendation), site personnel who must remain outdoors should wear insulated coveralls, insulated boot liners, hard hat helmet liners and insulated hand protection. Wool mittens are more efficient insulators than gloves. Keeping the head covered is very important, since 40% of body heat can be lost when the head is exposed. If it is not necessary to wear a hard hat, a wool knit cap provides the best head protection. A facemask may also be worn.

Persons should dress in several layers rather than one single heavy outer garment. The outer piece of clothing should ideally be wind and waterproof. Clothing made of thin cotton fabric or synthetic fabrics such as polypropylene is ideal since it helps to evaporate sweat. Polypropylene is best at wicking away moisture while still retaining its insulating properties. Loosely fitting clothing also aids in sweat evaporation. Denim is not a good protective fabric. It is loosely woven which allows moisture to penetrate. Socks with a high wool content are best. If two pairs of socks are worn, the inner sock should be smaller and made of cotton, polypropylene or similar types of synthetic material that wick away moisture. If clothing becomes wet, it should be taken off immediately and a dry set of clothing put on.

If wind conditions become severe, it might become necessary to shield the work area temporarily. The SSO and the PM will determine if this type of action is necessary. Heated break trailers or a designated area that is heated should be available if work is performed continuously in the cold at temperatures, or equivalent wind chill temperatures, of 20o F.

Dehydration occurs in the cold environment and can increase the susceptibility of the worker to cold injury due to significant change in blood flow to the extremities. Drink plenty of fluids, but limit the intake of caffeine

4.20.4 Work/Rest Cycles for Cold Weather

If wind chill temperatures fall below minus 25o F, breaks from the cold will occur at a rate of one every hour. If wind chill temperatures fall below minus 45o F, all work will cease and persons will be required to go indoors. Also see Section 1.1.1 regarding shift duration. However, these guidelines can be modified at any time based on actual site conditions and professional judgment rendered by either the Field Manger and/or SSO. For example, the Field Manger and/or SSO will evaluate field crew fitness; the condition of their cold-weather gear, including boots; and will observe employees alertness, including fatigue and rate of cold tolerance/acclimation.

If weather conditions warrant, portable tents might become necessary to shield the work area from wind, rain, snow, etc. The SSO and the Field Manager will determine if this type of action is necessary. However, under no conditions will the tents be heated and as a precautionary measure, a

Photoionization Detector (PID) with a 10.6 ev lamp will be used to monitor the breathing zone of personnel inside the tent. See Section 6 for action levels based on PID readings. A JSA should be prepared and discussed with all workers detailing the precautions for working in these cold weather conditions.

4.21 Well Development and Groundwater Monitoring

During purging and development of borings into monitoring wells, the PPE indicated in Section 7 below will be worn to avoid chemical contact / exposure, as well as physical trauma. Bailing wells requires proper gloves, eye protection, and possibly protective coveralls to prevent splashing. Back and lifting precautions outlined in Section 5.1 shall be used to avoid ergonomic injuries.

4.22 Confined Spaces

Confined Space entry may be required for personnel to enter vaults or manholes in the work areas. The following procedures must be followed in an event confined space entry is necessary. Proper permits must be obtained and regulatory agencies notified prior to performing a confined space entry.

When working in industrial settings, it is common to need to enter a confined space to make observations, collect samples, or perform other duties. AECOM employees or sub contractors must not enter any confined space containing a hazard.

A confined space is defined as any space that meets the following criteria:

- Is not designed for human occupancy
  - excludes vehicles, elevator cabins etc,
  - includes elevator shafts and wells, tanks, vaults, etc.
- Is large enough to physically enter with the whole body, and
- Has a restricted exit path (you must climb over pipes, through man ways, etc.)

If the confined space contains any hazard, entry may only be made if permitted in writing by the space owner or the Regional Health and Safety Manger, the entry is monitored by an observer, and with the prior written approval of the Regional Health and Safety Manager.

Typical hazards include but are not limited to:

- Flammable materials
- Toxic materials
- Corrosive materials
- Exposed electrical circuits
- Falls greater than six feet
- Moving machinery
- Oxygen deficient atmosphere

If there is any doubt about whether a space meets the above criteria, call the Health and Safety Staff.

4.23 Hot Work

Prior to initiation of any hot work procedures, a “Hot Work Permit” (Attachment E) must be approved by a National Grid representative and the SSHO.

5.0 Air Monitoring

The Site has some tar impacts dating from the Site's historical use as an Holder Station. As such, the contaminants of concern are VOCs, SVOCs and metals. The primary VOCs of concern are BTEX. The primary SVOCs of concern are PAHs. Heavy metals like lead, arsenic, and mercury are also present in shallow soils on-site. Airborne dust is also a concern and must be monitored due to its ability to co-transport contaminants and because of its nuisance properties. Odors, though not necessarily indicative of high contaminant concentrations, could create a nuisance and will be monitored and controlled to the extent practicable

5.1 Monitoring

5.1.1 VOC Monitoring

A photoionization detector (PID), such as a RaeSystems MiniRae 2000 PID equipped with a 10.6 ev lamp or equivalent, will be used to screen the breathing zone of employees during all subsurface investigations as Site and off-Site area conditions warrant but no less than at least once every hour. If breathing zone concentrations of total VOCs are sustained (5 minutes) above 5 ppm (calibrated to isobutylene), a measurement will be made for the presence of benzene using a colorimetric detector tube, e.g. Draeger or Sensydine, or a Draeger Chip system equipped with the appropriate constituent monitoring chip, shall be used to confirm the presence and concentration of site-specific chemicals of concern. In the absence of benzene, respiratory protection will be donned if total VOC concentration is sustained at 25 units as indicated by the PID. If benzene is present at concentrations of 1 ppm or more as indicated by the detector tube, respiratory protection will be donned. Requirements for respiratory protection are outlined in Section 6.2 of this HASP.

5.1.2 Dust/Particulate Monitoring

Dust control measures, as described in this HASP, will be implemented to prevent and/or control the concentration of airborne dust levels during the subsurface activities. A MIE Data-Ram total dust monitor, or its equivalent, will be used to monitor the effectiveness of these engineering controls and to determine if measures to mitigate the dust are effective and/or if respiratory protection is required.

An action level of 0.15 mg/m^3 has been established for total dust (sustained within the breathing zone for 15-minutes) and is based on the PEL for PAHs. The total dust monitor will be used to determine that total dust levels within the established restricted areas are maintained below this action level. The readings will be taken at the locations within the restricted area, and during the time periods, which are likely to represent worst case conditions. The determination of worst case will be made by the SSO and will be dependent upon such variables as the type of work being performed and number of personnel or level of activity in the zone.

Task	Instrument	Action Limit and Action
All tasks involving potential exposure to contaminated soils and/or groundwater	Photoionization Detector	**5 ppm as isobutylene**; Don respiratory protection as discussed in Section 7
All tasks involving exposure to site chemicals of concern	Colorimetric detector tubes or Draeger Chip System for Benzene	**0.5 ppm Benzene** Don respiratory protection described in section 7.2

All tasks with the potential to generate dust.	Particulate meter	**>1.0 mg/m^3**; Apply dust suppression controls and don respiratory protection **>1.5 mg/m^3**; **STOP WORK** until levels are reduced below1.0 mg/m^3

5.2 Community Air Monitoring Plan

A Community Air Monitoring Plan (CAMP) has been developed for the Site. The Site is located in a commercial community. This CAMP presents methods and procedures that will be used to provide protection for the downwind residences and businesses by assuring that the work activities do not spread constituents off-site through the air.

The community air monitoring will be performed around the project site perimeter and will measure the concentrations of organic vapors and dust. Air monitoring will be continuous during the activities. Monitoring will be conducted prior to mobilization to establish a baseline. The CAMP developed as per the NYSDEC DER-10 (NYSDEC, January 2010) is attached as Attachment C.

5.3 Personal Air Sampling

The need for personal air sampling is not anticipated by AECOM during the activities covered by this HASP. The Project Manager can prescribe personal air sampling based on observations or concerns recognized during the project.

5.4 Calibration and Recordkeeping

Equipment will be calibrated in accordance with AECOM's standard operating procedures. A log of the calibrations and readings will be kept in the field notebook. Daily calibration information will also be recorded in the field notebook.

6.0 Personal Protective Equipment

Personal protective equipment (PPE) will be worn during these activities to prevent on-site personnel from being injured by the safety hazards posed by the project site and/or the activities being performed. In addition, chemical protective clothing will be worn to prevent direct dermal contact with the project site's chemical contaminants. The following table describes the PPE to be worn for certain specific tasks. At a minimum, steel toe safety shoes, safety glasses with side shields, and nitrile or NAPL-resistant gloves will be worn when working in the areas with remaining contamination as detailed in the ISMP

6.1 Personal Protective Equipment

PPE Item	Environmental Monitoring	Excavation and Utility Work	Sample Collection
Hard Hat	✓	✓	✓
Steel Toed Safety Shoes	✓	✓	✓
Safety Glasses with Sideshields	✓	✓	✓
ANSI-approved Class II Traffic Vest	✓	✓	✓
Outer Nitrile Gloves with inner Latex liners			✓
Kevlar gloves			
Hearing Protection	✓	✓	✓

✓ Required PPE

6.2 Engineering Controls to Prevent Exposure to Contaminants of Concern

Engineering controls will be used by the Contractor to control dusts, vapors and odors both inside the structure and at the project site perimeter, if necessary. If the engineering controls are unsuccessful at controlling employee exposures within the structure to below the action limits defined in Section 5.1.1 and 5.1.2 of this HASP, then Level C respiratory protection will be required.

6.3 Respiratory Protection

Although not likely, respiratory protection as described below will be required if worker breathing zone PID concentrations are sustained above the action levels in the following table.

Task	Action Limit	Respiratory Protection	Level
All tasks involving potential exposure to contaminated soils and/or groundwater	5 ppm as Isobutylene for 5 minute	Half or full face mask respirator with combination organic vapor/HEPA cartridges	C
	10 ppm as Isobutylene	Full face respirator with organic vapor/HEPA cartridges	C
	50 ppm as isobutylene	**STOP WORK**	
All tasks involving potential exposure to contaminated soils and/or groundwater	0.5-10 ppm as Benzene on Draeger tube	Half or full face mask respirator with combination organic vapor/HEPA cartridges	C
	10 ppm as Benzene on Draeger tube	Full face respirator with organic vapor/HEPA cartridges	C
	50 ppm as Benzene on Draeger tube	**STOP WORK**	
All tasks with the potential to produce Dust	1.0 mg/m^3 particulates in air	Half or full face mask respirator with combination organic vapor/HEPA cartridges	C
	1.5 mg/m^3 particulates in air	**STOP WORK** and apply dust suppression techniques until levels have returned to ambient conditions	C

Respiratory protection (half or full face mask respirator with combination organic vapor/HEPA cartridges) should also be donned if odors become objectionable at any time or if respiratory tract irritation is noticed.

All employees who are expected to don respiratory protection must have successfully passed a qualitative or quantitative fit-test within the past year for the brand, model and size respirator they plan to don.

If worn, respirators will be cleaned after each use with respirator wipe pads and will be stored in plastic bags after cleaning. Respirators will be thoroughly cleaned using disinfectant material within one week following any respirator use. Refer to the cleaning instructions provided with the respirator or specified by Appendix B-2 to the OSHA regulations at 29 CFR 1910.134.

6.4 Other Safety Equipment

The following is a list of additional safety items that may need to be available at the project site depending on the facility activity level, proximity to emergency assistance and other factors:

- Portable, hand-held eyewash bottles,
- First aid kit,
- Type A-B-C Fire extinguisher,
- Fire blanket,
- Emergency telephone and, if available, two-way radio on facility frequency,
- Emergency air horn,
- Drinking water, ice and cups,

- Caution tape or traffic cones,
- High visibility traffic vests (if working near vehicle traffic),
- Traffic cones or barricades,
- Flashlight/lantern, and
- Spill containment kit.

7.0 Site Control

To prevent both exposure of unprotected personnel and migration of contamination due to tracking by personnel or equipment, hazardous work areas will be clearly identified and decontamination procedures will be required for personnel and equipment leaving those areas.

7.1 Designation of Zones

AECOM designates work areas or zones as suggested in the "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities," NIOSH/OSHA/USCG/EPA, November 1985. They recommend that the areas surrounding each of the work areas to be divided into three zones:

- Exclusion or "Hot" Zone
- Contamination Reduction Zone
- Support Zone

7.1.1 Exclusion Zone

An exclusion zone will be established around the work area. The perimeter of the exclusion zone will be marked with caution tape, traffic cones or other identifier so that employees, visitors, and client or host employer personnel are aware of the work being conducted.

All AECOM and contractor personnel entering these work areas must wear the prescribed level of protective equipment.

7.1.2 Contamination Reduction Zone

A decontamination zone will be established adjacent to each work area. Personnel will remove contaminated gloves and other disposable items in this area and place them in a plastic bag until they can be properly disposed of.

7.1.3 Support Zone

At this site the support zone will include the area outside of the exclusion zone.

7.1.4 Site Access Control

The public will be restricted from the project site and monitoring well locations (during monitoring) by fences, barricade tape, traffic cones, and/or signs.

7.1.5 Parking and Staging Areas

Parking will be restricted to areas that have been cleared of tall grass and combustible material. Vehicles parked on the public streets will be marked with cones both in front of and behind the vehicle.

7.1.6 Pedestrian Walkways

Pathways within the work areas will be kept clear of obstructions. Public pathways will be clearly marked to provide access to the business onsite and protect the public from the hazards of the project.

7.2 General Site Safety Practices

The following measures are designed to augment the specific health and safety guidelines provided in this plan.

- The "buddy system" will be used at all times by all field personnel. No one is to perform field work alone. Standby team member must be intimately familiar with the procedures for initiating an emergency response. If an employee will be alone in a work area, they will develop a procedure to contact their Supervisor or PM on a regular schedule to confirm that the employee is safe. Subcontractors working on-site with AECOM employees can help fulfill the role of a Buddy while site activities are occurring.
- Eating, drinking, chewing gum or tobacco, smoking or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials is prohibited in the immediate work area and the decontamination zone. Water and Ice may be consumed in all areas to prevent heat stress but precautions must be taken to prevent contamination of the water and ice.
- Smoking is prohibited in all work areas. Matches and lighters are not allowed in these areas.
- Hands must be thoroughly washed upon leaving the work area and before eating, drinking or any other activities.
- Beards or other facial hair that interfere with respirator fit are prohibited.
- The use of alcohol or illicit drugs is prohibited during the conduct of field operations.
- All equipment must be decontaminated or properly discarded before leaving the site in accordance with the project work plan.
- Parking and pedestrian areas will be established and communicated to all workers.

8.0 Decontamination

8.1 Personal Decontamination

Proper decontamination is required of all personnel before leaving the site. Decontamination will occur within the contamination reduction zone.

Regardless of the type of decontamination system required, a container of potable water and liquid soap should be made available so employees can wash their hands and face before leaving the site for lunch or for the day.

8.2 PPE Decontamination

Disposable PPE, such as Tyvek coveralls, gloves, etc. will be removed in the decon zone and placed in garbage bags. Final disposal of contaminated PPE will be in accordance with the work plan.

If worn, respirators assigned to an individual will be cleaned after each use with respirator wipe pads and will be stored upright in plastic bags. Respirators will be thoroughly cleaned using disinfectant material within one week following any respirator use. Respirators that have the potential to be shared by employees within the workplace will be completely dismantled and thoroughly cleaned after each use. Refer to the cleaning instructions provided with the respirator or specified by Appendix B-2 to the OSHA regulations at 29 CFR 1910.134.

8.3 Equipment Decontamination

Equipment will be decontaminated prior to being moved to other locations. Decontamination procedures will be specified in the Field Sampling and Analysis Plan (FSAP).

9.0 Medical Monitoring and Training Requirements

Each worker subject to this HASP shall have copies of documentation that the requirements for training, medical surveillance, and respirator use are current. Copies of these documents shall be made available to any owner or their representative upon request.

9.1 Medical Monitoring

All personnel performing activities covered by this HASP must be active participants in a medical monitoring program that complies with 29 CFR 1910.120(f). Each individual must have completed an annual surveillance examination and/or an initial baseline examination within the last year prior to performing any work on the site covered by this HASP.

9.2 Health and Safety Training

9.2.1 HAZWOPER

All personnel performing activities covered by this HASP must have completed the appropriate training requirements specified in 29 CFR 1910.120 (e). Each individual must have completed an annual 8-hour refresher training course and/or initial 40-hour training course within the last year prior to performing any work on the sites covered by this HASP.

9.2.2 Pre-Entry Briefing/Tailgate Meetings

Prior to the commencement of daily project activities, a pre-entry briefing or tailgate meeting will be conducted by the SSO to review the specific requirements of this HASP, review and revise the JSA, discuss Incidents, Near Misses and lessons learned from the previous day’s activities, and discuss site conditions that have changed since the previous day or trip to the site. Attendance at the daily tailgate meeting is mandatory for all personnel covered by this HASP at the site and must be documented on the attendance form provided in Attachment F. HASP sign-off sheets should also be collected at the time of the tailgate meetings. All documentation should be maintained in the project file.

The pre-entry briefing must be completed for each new employee before they begin work at the site. Short safety refresher meetings will be conducted, as needed, throughout the duration of the project.

10.0 Emergency Response

OSHA defines emergency response as any "response effort by employees from outside the immediate release area or by other designated responders (i.e., mutual-aid groups, local fire departments, etc.) to an occurrence which results, or is likely to result in an uncontrolled release of a hazardous substance." This section is written to comply with the requirements of 29 CFR 1910.38 (a).

The basic elements of an emergency evacuation plan include:

- employee training
- alarm systems
- escape routes
- escape procedures
- critical operations or equipment
- rescue and medical duty assignments
- designation of responsible parties
- emergency reporting procedures
- methods to account for all employees after evacuation

10.1 Spill Response

Employees are only authorized to respond to incidental spills and releases of hazardous substances. The following criteria must be met for a spill to be considered incidental with the employee having the ability to respond to the spill:

- Quantity of spilled material is minimal enough where additional, third party assistance is not needed to manage the spill
- Material is not immediately threatening to impact an open water way
- The conditions of the spill do not present a hazardous condition that is immediately dangerous to life and health (IDLH)
- The employee responding has:
  - received training on proper spill response techniques relative to the spilled material
  - full knowledge of what has been spilled and the proper clean up techniques to be used
  - the means to protect themselves against exposure to harmful conditions caused by the spill including the necessary PPE
  - the means to containerize and dispose of the spilled material properly

Employees may be equipped with the following materials, assembled into a spill response kit, to manage incidental workplace spills:

- Absorbent pads or media, i.e. speedy-dry, kitty litter
- Broom and dust pan to clean up spent granular spill control media or impacted earth

- Shovel to clean up impacted earth or create a dam or dyke to prevent the spill area from increasing
- Disposal drums and over-pack drums
- Appropriate waste identification labels
- Appropriate PPE

If a spill is not considered incidental, then additional assistance will be sought to aid in clean-up. The responding employee shall contact the Project Manager and provide initial notification of the release. The Project Manager will then notify the client representative and determine a suitable course of action. Chem-trec may be contacted to provide additional support in responding to a spill. Consideration will need to be given to whether or not the spill is deemed to be a reportable quantity (RQ) by the EPA, if the National Spill Response Center needs to be contacted due to surface water impact, and if local, state or federal agencies need to be contacted to provide information related to public health threats and environmental impact.

All spills must be reported to the AECOM PM and RSM, with the PM providing notification to the client representative, no matter how small the spill is. After initial response actions have been completed an incident investigation will be performed to determine the root causes of the incident and corrective actions, and lessons learned shall be shared to prevent future reoccurrence. Once the response is complete, the responding employee will also conduct an inventory of supplies used during the response effort and re-stock any used response equipment that could not be decontaminated and reused.

10.2 Employee Training

Employees must be instructed in the site-specific aspects of emergency evacuation. On-site refresher or update training is required anytime escape routes or procedures are modified or personnel assignments are changed.

10.3 Alarm System/Emergency Signals

An emergency communication system must be in effect at all sites. The simplest and most and effective emergency communication system in many situations will be direct verbal communications. Each site must be assessed at the time of initial site activity and periodically as the work progresses. Verbal communications must be supplemented anytime voices can not be clearly perceived above ambient noise levels (i.e., noise from heavy equipment; drilling rigs, backhoes, etc.) and anytime a clear line-of-sight can not be easily maintained amongst all AECOM personnel because of distance, terrain or other obstructions.

Verbal communications will be adequate to warn employees of hazards associated with the immediate work area. The property is occupied but AECOM may not have access to facility phones. Therefore, AECOM will bring a portable phone to the site to ensure that communications with local emergency responders is maintained, when necessary.

10.4 Escape Routes and Procedures

The escape route from the site and an emergency muster point will be determined and provided to all workers during the project mobilization.

Prior to mobilizing to a new project area, the Site Safety Officer or his designee will confirm that the escape routes are clear and lead to a safe area.

10.5 Employee Accounting Method

The SSO is responsible for identifying all AECOM personnel on-site at all times. AECOM and its subcontract employees will notify the SSO when they enter and leave the site. The SSO will account for all AECOM and its subcontract employees following an evacuation.

10.6 Injuries and Illnesses

The phone numbers of the police and fire departments, ambulance service, local hospital, and AECOM representatives are provided in the emergency reference sheet on page 1. This sheet will be posted in the site vehicle.

10.6.1 First Aid

Minor injuries will be treated on site using materials from the first aid kit or other local sources. All cuts and abrasions will be cleaned with potable water and a clean dressing applied. The injured employee will be evaluated at the end of the work day and the following day when the employee arrives at the project site to determine whether the wound has started the healing process. The wound will be protected from contamination during the project activities.

10.6.2 Professional Treatment

In the event an injury or illness requires more than first aid treatment, the SSO will accompany the injured person to the medical facility and will remain with the person until release or admittance is determined. The escort will relay all appropriate medical information to the on-site project manager and the RSM.

If the injured employee can be moved from the accident area, he or she will be brought to the CRZ where their PPE will be removed. If the person is suffering from a back or neck injury the person will not be moved and the requirements for decontamination do not apply. The SSO must familiarize the responding emergency personnel about the nature of the site and the injury. If the responder feels that the PPE can be cut away from the injured person's body, this will be done on-site. If this not feasible, decontamination will be performed after the injured person has been stabilized.

10.7 Designation of responsible parties

The SSO is responsible for initiating emergency response. In the event the SSO can not fulfill this duty, the alternate SSO will take charge.

10.8 Emergency Response Drills

A table-top run through of the evacuations procedures will be conducted the first day on the site and reviewed with all workers arriving on site after that date.

Emergency Response drills and subsequent personnel briefings on evacuation procedures will be documented in the safety briefing agenda or briefing notes.

10.9 Incident Reporting and Investigation

Any incident (other than minor first aid treatment) resulting in injury, illness or property damage requires an Incident investigation and report. The investigation should be conducted as soon as emergency conditions are under control. The purpose of the investigation is not to attribute blame but to determine the pertinent facts so that repeat or similar occurrences can be avoided. An Incident investigation form is presented in Attachment G of this HASP. The injured employee's supervisor, the Project Manager, and the RSM should be notified immediately of the injury.

If a subcontractor employee is injured, they are required to notify the SSO. Once the incident is under control, the subcontractor will submit a copy of their company's Incident investigation report to the SSO.

Attachments

Attachment A

Health and Safety Plan Receipt and Acceptance Form

Health and Safety Plan Acceptance Form

Bay Ridge Former Holder Station A&B Site – OU2
Brooklyn, New York

I have reviewed a copy of the Health and Safety Plan prepared for the above-referenced site and activities. I have read and understood its contents and I agree that I will abide by its requirements.

Name: ______________________________

Signature: ______________________________

Date: ______________________________

Representing: ______________________________

Attachment B

EHS Field Forms

Blank Job Hazard Analysis Form

Job Hazard Analysis

AECOM

JHA Type: ☐ Investigation ☐ O&M ☐Office ☒ Construction	☒ New ☐ Revised	Date:
Office: Client: Loc:		
Work Type:	Work Activity:	
Personal Protective Equipment (PPE):		

Development Team	Position/Title	Reviewed By	Position/Title	Date

❶ Job Steps	❷ Potential Hazard	❸ Critical Actions

Health and Safety Plan
Pre-Entry Briefing
Attendance Form

Health and Safety Pre-Entry Briefing Attendance Form

Site Characterization Work Plan
Bay Ridge Former Holder Stations A and B Site
Brooklyn, New York

Conducted by:		**Date Performed:**	
List of Daily Activities/Tasks	1.		
	2.		
	3.		
	4.		
Topics Discussed:	1. Review of the content of the HASP (Required 1st day; applicable sections ongoing)		
	2.		
	3.		
	4.		

Printed Name	Signature	Representing

Drill Rig Inspection Form

Drill Rig Inspection Log

Project Name: ______________________________ Project Number: ______________________________

Date: ______________________________ Subcontractor Inspected: ______________________________

AECOM Site Manager: ______________________________ ______________________________

General Safety		
Safety Officer Designated for Job:	☐ Yes	☐ No
Name:		
Safety Meeting Performed (Daily)	☐ Yes	☐ No
Personal Protective Equipment (PPE)		
Hard Hats	☐ Yes	☐ No
Safety Glasses	☐ Yes	☐ No
Steel Toed Boots	☐ Yes	☐ No
Hearing Protection	☐ Yes	☐ No
Work Gloves	☐ Yes	☐ No
Orange Work Vests	☐ Yes	☐ No
Traffic Cones and Signs	☐ Yes	☐ No
Other	☐ Yes	☐ No
Disposal of PPE in Proper Waste Containers (if applicable)	☐ Yes	☐ No
Comments:		
Daily Inspections of Drill Rig:		
Structural Damage, Loose Bolts	☐ Yes	☐ No
Proper Tension in Chain Drives	☐ Yes	☐ No
Loose or Missing Guards, Fluid Leaks	☐ Yes	☐ No
Damaged Hoses and/or Damaged Pressure	☐ Yes	☐ No
Gages and Pressure Relief Valves	☐ Yes	☐ No
Comments:		

Check and test all safety devices such as:		
Emergency shutdown switches, at least daily	☐ Yes	☐ No
All gages and warning lights and ensure control levers are functioning properly	☐ Yes	☐ No
First Aid and fire extinguishers on drill rig	☐ Yes	☐ No
Back up alarm functioning properly	☐ Yes	☐ No
Comments:		

Drill Crew Training Requirements:		
40-hour OSHA Training	☐ Yes	☐ No
8-hour Annual Refresher Training	☐ Yes	☐ No
Drill Rig Training/Safe Operating Practices	☐ Yes	☐ No
First Aid/CPR	☐ Yes	☐ No
Emergency Procedures	☐ Yes	☐ No
Emergency Phone Numbers Posted	☐ Yes	☐ No
Site Orientation	☐ Yes	☐ No
Health and Safety Plan Review	☐ Yes	☐ No
Comments:		

Housekeeping:		
Suitable storage for tools, materials, and supplies	☐ Yes	☐ No
Pipes, drill rods, casing, and augers stacked on racks to prevent rolling and sliding	☐ Yes	☐ No
Platforms and other work areas free of debris materials and obstructions	☐ Yes	☐ No
Comments:		

Hand Tools:		
Tools in good condition	☐ Yes	☐ No
Broken tools discarded and replaced	☐ Yes	☐ No
Right tool used for the right job	☐ Yes	☐ No
Comments:		

Drilling Operations:		
Mast or derrick down when moving rig	☐ Yes	☐ No
Overhead obstructions identified before mast is raised	☐ Yes	☐ No
Drill rig stabilized using leveling jacks or solid cribbing	☐ Yes	☐ No
Secure and lock derrick	☐ Yes	☐ No
Comments:		

Overhead and Buried Utilities:		
Buried utilities identified and marked	☐ Yes	☐ No
Safe distance of drill rig from overhead power lines	☐ Yes	☐ No
Comments:		

Wire Line Hoists Wire Rope and Hardware:		
Inspection for broken wires where reduction in rope diameter, wire diameter, fatigue, corrosion, damage from gear jamming, crushing, bird caging, kinking	☐ Yes	☐ No
Inspect and lubricate parts daily	☐ Yes	☐ No
Comments:		

Auger Operations - What to look for:

- A system of responsibility between the operator and the tool handler when connecting and disconnecting auger sections and inserting and removing auger fork.
- During connecting and disconnecting auger sections and inserting auger for the tool, handler should position himself away from the auger column while it is rotating.
- When securing the auger to the power coupling, pin should be inserted and tapped into place using a hammer or other similar device.
- Tool hoist should be used to lower second section of auger into place.
- Both operators should be clear of auger as it is being lifted into place.
- Long-handled shovel should be used to move dirt away from auger.

Overall Summary:

Hot Work Permit Form

Hot Work Permit

Permit Valid
For 1 Work Day

Site Name: ________________________ **Project Number**:______________________

H&S Officer:_______________________ **Client**:________________________

Hot Work Description:____

____

____

Workers/Welders Conducting Hot Work:____

Permits Must be Completed in its Entirety Before Hot Work Begins

	Yes	**No**
Has project supervisor been notified of intended Hot Work?		
Does client representative need to be notified of the intended Hot Work?		
Will Hot Work impact the general public, clients, or operation employees?		
Will the intended Hot Work need to be coordinated with other contractors who may be working on the site to make them aware of any hazards and the scope of work to be performed?		
Have hazardous energy sources been identified, isolated, and locked out – tagged out before the start of the project?		
Will Hot Work be conducted within a confined space?		
All testing equipment (i.e., CGI, oxygen meter, etc.) and firefighting equipment (i.e., extinguisher, etc.) have been checked to ensure proper operation and calibration before the start of this project?		
Has a fire watch been designated and on station?		
Have coatings on metal surfaces been tested for ignitability and flame spread?		
Has the area been cleared of all flammable materials?		
Have all fuel sources been identified and protected?		
Has the area been restricted with proper barriers and signs?		
Has the area been tested to be certain that atmosphere is 0% LEL before starting Hot Work?		
Have flame sensitive areas and equipment (including cylinders and gas delivery lines) exposed to slag and sparks been protected by flame resistant blankets or removed from the area?		
Have all equipment and hoses been protected from falling metal structures and debris?		

Have escape routes been identified before starting work?		
Is ventilation equipment needed? Type needed:		

The Following Protective Equipment Will be Required:

	Yes	No		Yes	No
Welding Goggles/Shield Tint			Supplied Air Respirator		
Safety Boots			Head Protection		
Leather gloves			Safety Harness		
Hearing Protection			Welding Leathers – Top		
APR Cartridge			Welding Leathers - Bottom		

Permit Valid for 1 Work Day

The following procedures will be applicable prior to Hot Work on tanks or other types of enclosed structures. (Check all that apply and fill in appropriate information)

- ☐ Ventilate to 0% LEL
- ☐ Confined Space Entry Permit
- ☐ Mechanical Ventilation Required
- ☐ Cold Cut Only Method Allowed:____________________________________
- ☐ Hot Cutting Permitted Method Allowed:________________________________

Inert to <____________________________% Oxygen

Approvals:

____
Date

____
National Grid Representative

____
Site Safety Officer

____
Fire Watch

____
Performed Hot Work Employee

File Permit in Project Work File and Health and Department

Injury/Exposure Report

Supervisor’s Report of Incident

1. Seek immediate medical attention if necessary.
2. Employee must report **all** incidents to their supervisor **immediately**.
3. Supervisor calls the Incident, Injury and Near Miss Reporting Line at **(800) 348-5046**.

Section 1 - Organization Information

Region: ☐West ☐ Midwest ☐ Southwest/Mountain ☐ Southeast ☐ Mid-Atlantic ☐ Northeast	District:	Section/Dept Number:
Business Line: ☐ Infrastructure-Water ☐ Infrastructure-Transportation ☐ Infrastructure-Energy & Power ☐ PDD-Facilities ☐ PDD-Design ☐ Environmental		Office Name:
Client Name:		Project Number:
Project Name:		

Section 2 - Type of Incident (SRI Sections to be Completed)

☐ Injury/ illness (Sections 3, 4, and 7)	☐ Vehicle Incident (Sections 3, 4, 5, and 7)	☐ Property Damage (Sections 3, 4, 6 and 7)	☐Environmental Spill/Release ☐ (Sections 3, 4, and 7)
☐ Regulatory Inspection or Notification: (Sections 3, 4,7)			☐ Other (describe)

Section 3 – Contact/Incident Information

Employee/Claimant Name:		Employee Job Title:	☐ Full-Time Employee ☐ Subcontractor/Subconsultant ☐ Temp Agency Employee ☐ Part-Time Employee ☐ Third Party Employee
Work Phone:	Cell Phone:	Home Phone:	Employee Number:
Date/Time of Incident:		Date/Time Reported to Supervisor:	
Street Address of Incident or approximately:		City:	State/Zip:
Body Part Injured:		Type of Treatment: Medical/hospital or doctor ☐ First Aid Only ☐	
Medical Facility Contact Info: (Name, Address, Phone)			

Section 4 - Descriptions of Incident *(employee, supervisor and witness statements)*

Employee Description of Incident: *(use additional paper if necessary)*	
Employee Signature:	**Date and Time:**

Supervisor Description of Incident: (*Supervisor signs in Section 7*)

(*use additional paper if necessary*)

Witness Name :	Witness Address:	Witness Phone No.:
Witness Description of the Incident: (*use additional paper if necessary*)		
Witness Signature:		***Date and time:***

Section 5 - Vehicle Incident Information (fill out for motor vehicle incidents only)

5a - AECOM Driver Name:		Drivers License #:	State Issued:	Expiration Date:	
Vehicle Year:	Make:	Model:	Color:	License Plate:	State:
VIN Number:					
AECOM Vehicle was:	☐ AECOM Owned ☐ Leased	☐ Rented ☐ Personal Vehicle	**Who was involved?**	☐ AECOM Vehicle(Section 5a) ☐ Another Vehicle(Section 5b)	☐ Pedestrian ☐ Property
Use of Vehicle at Time of Incident: ☐ Office Visit ☐ Site Visit ☐ Client Meetings ☐ Field Work ☐ Personal ☐ Other__________			Vehicle Type: ☐ Commercial Motor Vehicle ☐ Non Commercial Motor Vehicle		

5b - Name of Other Driver:		Address:	City:	State/Zip:	
Work Phone:			Cell Phone:		
Date of Birth:	Drivers License #:		State Issued:	Expiration Date:	
Vehicle Year:	Make:	Model:	Color:	License Plate:	State:
VIN Number, Insurance Company Name, Insurance Policy Number:					

If *Vehicle Owner* is different from driver then complete owner's contact information	Owner Name:	
	Address, City, State, Zip:	
	Work Phone:	Cell Phone:
Authorities contacted? ☐ Yes ☐ No	If so, who responded?	
Citations Issued? ☐ Yes ☐ No	Type of Citation:	Person Cited:

Section 6 - General Liability (*Fill out for property damage only*)

Description of damaged property:	
Where can the property be seen?	
Property Owner Name:	
Address, City, State, Zip:	
Work Phone:	Cell Phone:

Section 7- Signatures

Supervisor

Print Name:	Signature:	Date:	Telephone:

Office/Location Manager

Print Name:	Signature:	Date:	Telephone:

Regional SH&E Manager

Print Name:	Signature:	Date:	Telephone:
Comments:			

Attention: This form must be completed and forward to the Regional SH&E Manager within one (1) business day following the occurrence of the incident.

Attachment C

Community Air Monitoring Plan

AECOM

Environment

Prepared for:
National Grid
Brooklyn, New York

Submitted by:
AECOM
Manhattan, NY
60144468
December 2014

Community Air Monitoring Plan

Former Bay Ridge Holder Stations A&B Site
Operable Unit 2
Brooklyn, New York
NYSDEC Site No.: 224058
Order on Consent Index #: A2-0552-0606

AECOM Environment

Prepared for:
National Grid
Brooklyn, New York

Submitted by:
AECOM
Manhattan, NY
60144468
December 2014

Community Air Monitoring Plan

Former Bay Ridge Holder Stations A&B Site
Operable Unit 2
Brooklyn, New York
NYSDEC Site No.: 224058
Order on Consent Index #: A2-0552-0606

Prepared By Jennifer L. Atkins, Project Engineer

Reviewed By Peter S. Cox, Project Manager

Revised By: Nelson J. Abrams, Senior Project Manager

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1.0 Introduction

This document provides the Community Air Monitoring Plan (CAMP) that will be implemented during any ground intrusive activities covered under the Interim Site Management Plan [(ISMP); AECOM, November 2014] for the Former Bay Ridge Holder Station A&B Site, Operable Unit 2 (Site) located in Brooklyn, New York. This Site is comprised parcel located between Youth Athletic Field and 9th Avenues and between 65th and 66th Streets.

This CAMP has been prepared by AECOM Environment (AECOM) on behalf of National Grid to present the methods and procedures that will be used to evaluate air quality in the immediate vicinity of subsurface activities and provide protection to potential off-site receptors.

The Site is located in Brooklyn, Kings County, New York and is identified as Block 5749, Lot 15 on New York City (NYC) Tax Map. The parcel comprises of Youth Athletic Fields in the western portion, Gate Station in the middle, and vacant lot in the eastern and southern portion as shown on Figures 1-2 and 1-3 of the ISMP. The Site address is 195 65th Street, Brooklyn, NY and it is owned by National Grid.

The Site was operated by Kings County Gas and Illuminating Company, a predecessor company to National Grid USA (National Grid), from prior to 1905 to sometime between 1950 and 1970. The Gate Station portion of the Site has a building along 65th Street and the vacant lot is paved parking lot along 9th Avenue and unpaved lot along 66th Street.

The objectives of this CAMP are to:

- Ensure that the airborne concentrations of constituents of concern (COC) are minimized to protect human health and the environment.
- Provide an early warning system so that potential emissions can be controlled on Site at the source.
- Measure and document the concentrations of airborne COC to confirm compliance with regulatory limits.

The community air monitoring will be performed around the Site perimeter, and will measure the concentrations of organic vapors and dust during all ground-intrusive activities (excavation, utility work, test pitting, soil boring, and well installations).

This CAMP is Attachment C of the site-specific Health and Safety Plan (HASP). The HASP is Appendix C of the ISMP and is directed primarily toward protection of on-site workers within the designated work zones.

2.0 Constituents of Concern and Action Levels

The Site is known to have subsurface impacts dating from the Site's historical use as Holder Station. As such, the constituents of concern are volatile and semi-volatile organic compounds (VOCs and SVOCs). The primary VOCs of concern are benzene, ethylbenzene, toluene, and xylene (BTEX compounds). VOCs are more volatile than SVOCs and are generally of greater concern when monitoring the air quality during subsurface activities.

Airborne dust is also a concern and must be monitored and controlled due to its ability to co-transport adsorbed constituents and because of its nuisance properties.

Odors, though not necessarily indicative of high constituent concentrations, could create a nuisance (especially when working within or in close proximity to existing buildings and building entrances) and will be monitored and controlled to the extent practicable.

State and federal regulatory agencies have provided action levels for many of these constituents. The action levels are the allowable airborne concentrations above which respiratory protection or other health and safety controls are required. For work at the Site, the following levels should not be exceeded for more than 15 consecutive minutes at the downwind perimeter of the Site:

• Benzene	1 part per million (ppm)
• Total VOCs	5 ppm
• Dust	100 micrograms per cubic meter (µg/m^3)

The action levels cited here are above (in addition to) the background ambient (upwind) concentration.

3.0 Air Monitoring Equipment and Methods

Air quality monitoring will be performed for total VOCs, benzene, and dust as outlined below.

Two perimeter locations will be established each day and an air monitoring technician will check the instrumentation at each of these locations frequently during the work. Typically there will be monitoring locations at one upwind site perimeter location and one downwind perimeter location. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. Field personnel will be prepared to monitor multiple locations in the event that there is little wind or if the wind direction changes frequently.

The monitoring instruments will be calibrated at the start of each workday, and again during the day if the performance of an instrument is in question.

3.1 Volatile Organic Compounds and Benzene Monitoring

3.1.1 Ambient Air Monitoring

VOC monitoring will be performed using three field photoionization detectors (PIDs) (RAE Systems MiniRAE or equivalent). The monitoring instruments will be checked by a technician every 15 minutes, and the real-time measurements recorded. The PIDs will be equipped with an audible alarm to indicate exceedance of the action level.

A 15-minute running average concentrations will be calculated, which can then be compared to the action levels. If real-time measurements of total VOCs indicate that the action level is exceeded, the benzene concentration will also be determined at that location using benzene-specific colorimetric tubes. The data will be downloaded at the end of each day, and monitoring records will be kept at the Site during the work in case there is an inquiry or complaint.

PID measurements will be made at one upwind and one downwind location around the work area. The locations of the instruments may be changed during the day to adapt to changing wind directions.

3.2 Particulate (dust) Monitoring

Particulate (dust) monitoring will be performed during intrusive activities (i.e., excavation, drilling) at the Site. Two particulate monitors (TSI DustTrak or equivalent) will be used for continuous real-time dust monitoring. The monitoring instruments will be checked by a technician every 15 minutes, and the real-time measurements recorded. A 15-minute average concentration will be determined. The data will be downloaded at the end of each day, and monitoring records will be kept at the site during the work in case there is an inquiry or complaint.

Measurements will be made at one upwind and one downwind location around the work area. The locations of the instruments may be changed during the day to adapt to changing wind directions. In addition, fugitive dust migration will be visually assessed during all Site activities, and the observations will be recorded.

4.0 Emission Control Plan

4.1 Ambient Air

Odor, vapor, and dust control will be required for this project due to the close proximity of commercial buildings and public roadways and sidewalks. Figure 4-1 provides a response chart for the monitoring and control of vapor emissions. Table 4-1 provides a list of emergency contacts.

- If the ambient air concentration of total VOC levels at the downwind perimeter of the work area or exclusion zone exceeds 5 ppm (or the benzene level exceeds 1 ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor levels readily decreases (per instantaneous readings) below 5 ppm (and the benzene level drops below 1 ppm) over background, work activities can resume with continued monitoring.
- If total VOC levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm (or the benzene level persists over 1 ppm) over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions until the concentrations drop below the action levels, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.

Site perimeter particulate concentrations will also be monitored continuously. In addition, dust migration will be visually assessed during all work activities.

- If the downwind particulate level is 100 µg/m^3 greater than the background (upwind perimeter) level for a 15-minute period, or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work may continue with dust suppression techniques provided that downwind particulate levels do not exceed 150 µg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind particulate levels are greater than 150 µg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind particulate concentration to within 150 µg/m^3 of the upwind level and in preventing visible dust migration.

Typical emission control measures may include:

- Apply water for dust suppression;
- Relocate operations, if applicable; and
- Reassess the existing control measures.

Figure 4-1 Vapor Emission Response Chart

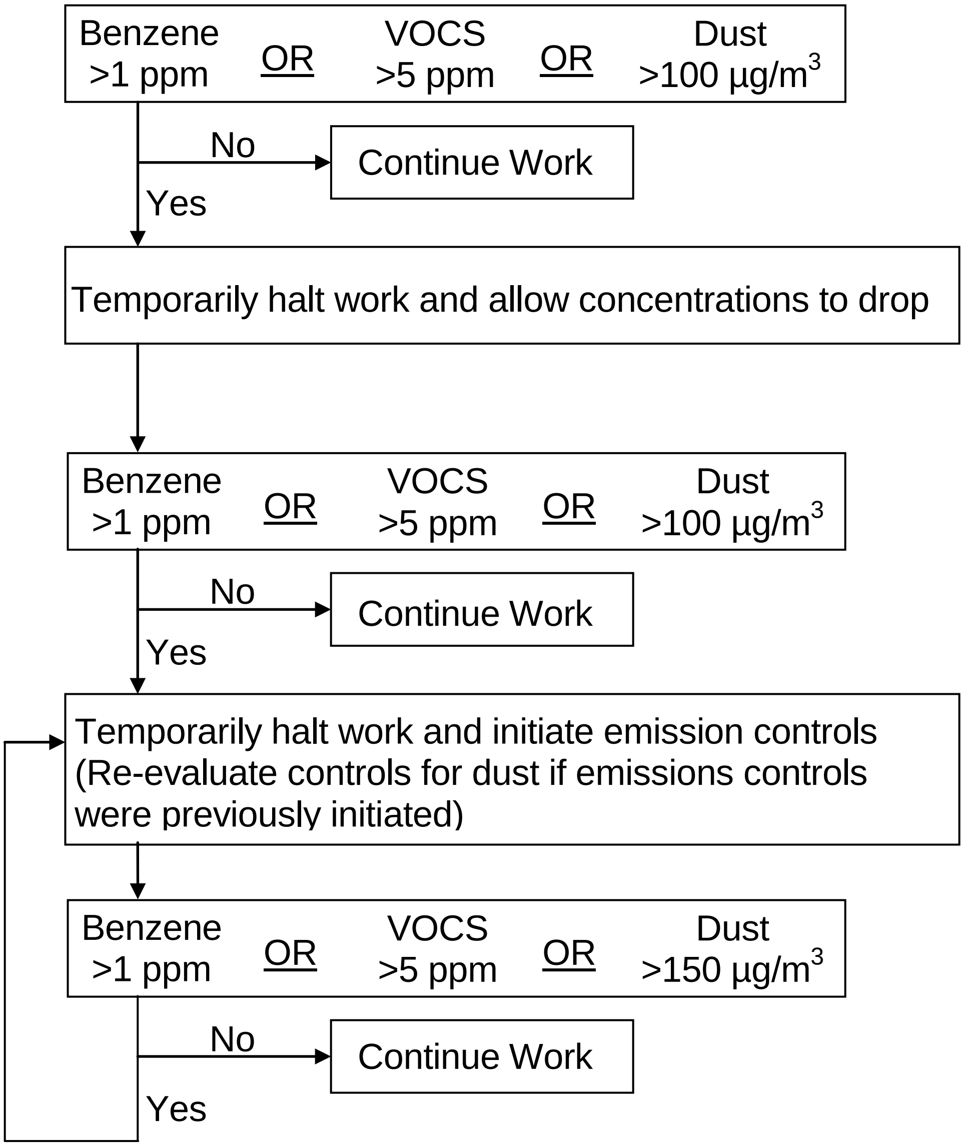

Table 4-1 Emergency Contacts and Telephone Numbers

Fire:	911	
Police:	911	
Ambulance:	911	
AECOM Environment Contacts	Shail Pandya	(718) 309-5643 cell
National Grid Contacts	Donald Campbell	(973) 715-8447 cell

5.0 Odor Control Procedures

This section outlines the procedures to be used to control odors that may be generated during the ground intrusive activities. The intrusive activities at the Site may generate odors: excavation, test pitting, drilling, utility work, and subsurface soil borings/monitoring well installations. The remainder of this section is intended to provide Site managers, representatives of NYSDEC and New York State Department of Health (NYSDOH), and the public with information summarizing typical odor control options, and to provide some guidance for their implementation. A description of potential sources of odors and methods to be used for odor control is presented in the following sections.

5.1 Potential Sources of Odors

Generally, the residuals encountered at former gas holder sites are well defined. They are related to residual coal tar-like materials and petroleum, and principally contain VOCs, polynuclear aromatic hydrocarbons (PAHs), and a number of inorganic constituents, including metals. Constituents indicative of holder residuals or petroleum products can produce odor emissions during investigation activities when they are unearthed in soil borings/well installations or during excavation or utility work. When this occurs, VOCs and light-end SVOCs can volatilize into the ambient air. Some holder residuals can cause distinctive odors that are similar to mothballs, roofing tar, or asphalt driveway sealer. However, the constituent concentrations generally associated with these odors are typically significantly less than levels that might pose a potential health risk. It is important to note that the CAMP will provide for continual monitoring of VOCs and dust during the fieldwork to monitor for any potential release of constituents which may pose a threat to health.

5.2 Odor Monitoring

The field investigation personnel will record observations of odors generated during the implementation of the subsurface work. When odors attributable to the uncovering of impacted media are generated in the work area during intrusive activities such as excavation or soil borings, observations will also be made at the down-wind limit of the Site, in order to assess the potential for off-site odors. The down-wind odor monitoring will be performed in conjunction with the vapor and dust monitoring program described in this CAMP.

Upon detection of odors at the Site perimeter, Site controls, starting in the work area, will be implemented. The Site controls described in the following sections will be used to assist with odor mitigation to minimize, and to prevent where practicable, the off-site migration of odors. Due to the short distances between any work area at the Site and the property line or nearby potential receptors, Site controls will be implemented proactively when odors are detected in the breathing zone at any work area.

5.3 General Site Controls

Several general excavation or drilling procedure Site controls that will be implemented include:

- Every effort will be made to minimize the amount of time that impacted material is exposed to ambient air at the Site.
- For excavations, it may be possible to move some amount of soil around within the footprint of the excavation in order to minimize the amount of soil removal and subsequent stockpiling of

impacted soil at the ground surface. The use of in-excavation stockpiling of excavated soil will be evaluated on a case-by-case basis, and will only be performed with the approval of the NYSDEC field representative, and will be completed only if it does not impede the collection of subsurface soils or the full delineation of the subsurface features being investigated.

- Drill cuttings from the soil borings will be containerized as soon as possible during completion of each soil boring.
- Loading of excavated debris or soil that has been found by the Site manager to be unsuitable material to return to excavation may generate odors. Every effort will be made to complete this work as quickly as possible and to keep these materials covered at all times.
- Meteorological conditions are also a factor in the generation and migration of odors. Some Site activities may be limited to times when specific meteorological conditions prevail, such as when winds are blowing away from a specific receptor.

5.4 Secondary Site Controls

If substantial odors still present an issue following implementation of the above procedures, secondary controls will be enacted. The field representative should work through the applicable list of secondary controls until the perimeter odor issues are resolved. The field representative should work closely with National Grid and NYSDEC during this task, if present. Final selection of controls will be dependent on field conditions encountered. Secondary controls include the following:

- For stockpiled impacted soil, temporary tarps or polyethylene covers will be used to control odors.
- The placement of portable barriers close to small active source areas (excavations) can elevate the discharge point of emissions to facilitate dispersion and minimize the effect on downwind receptors. The barriers can be constructed using materials such as plastic “Jersey barriers”, or fence poles and visual barrier fabric/plastic. The barriers are placed as temporary two or three-sided structures around active excavation or other intrusive areas, oriented such that the barriers are placed on the upwind and downwind sides of the source. If only one side of the source can be accessed, then the barrier should be placed on the downwind side.
- Two agents that can be sprayed over impacted soil have been determined to be effective in controlling emissions. They include odor suppressant solution (BioSolve™), and hydro-mulch. These agents may be used where tarps cannot be effectively deployed over the source material, or where tarps are ineffective in controlling odors:
  - BioSolve™ can provide immediate, localized control of odor emissions. Information regarding the preparation and use of BioSolve™ is provided in Appendix A.
  - Hydromulch - Although it is unlikely that it will be necessary, a modified hydromulch slurry may be used to cover inactive sources for extended periods of time (up to several days). The hydromulch, typically cellulose fibers (HydroSealR) is modified by mixing a tackifier (glue) with the mulch and water to form a slurry. It is applied using a standard hydroseed applicator to a thickness of ¼ inch. The material forms a sticky, cohesive, and somewhat flexible cover. Reapplication may be necessary if the applied layer becomes desiccated or begins to crack.

5.5 Record Keeping and Communication

Similar to readings recorded during the monitoring specified in the CAMP, all odor monitoring results will be recorded in the field log book or other air monitoring forms, and be available for review by the agencies upon request.

The field representative, in consultation with National Grid, will also provide information on odor monitoring and odor management to residents of the neighborhood should they inquire. In the event that odors persist after these efforts, work will be temporarily discontinued until a mutually agreeable solution with National Grid, NYSDEC, and NYSDOH staff can be worked out which allows the work to be completed while minimizing the off-site transport of nuisance odors.

6.0 Documentation and Reporting

Data generated during perimeter air monitoring will be recorded in field logs and summarized daily in spreadsheets. The electronic measurements from the PIDs and dust meters will be downloaded each day, reviewed, and archived. Exceedances of the action levels, if any, and the actions to be taken to mitigate the situations, will be discussed immediately with the on-site representatives. Summaries of all air monitoring data will be provided to NYSDEC and NYSDOH in electronic format, as requested.

Appendix A

Vapor Suppression Information

BIOSOLVE®
Hydrocarbon Mitigation Technology

...Is Making A Difference!

VAPOR SUPPRESSION / ODOR CONTROL

BioSolve® offers a relatively simple and cost effective method of suppressing Odors and VOC release from soils, during excavation, loading, stockpiling, etc. The following guidelines will apply to the most common situations encountered on site.

In most cases a 3% BSW solution (1 part **BioSolve®** concentrate to 33 parts water) will be adequate to keep vapor emissions within acceptable limits and control fugitive odor problems on contact. Although, some sites may only require a 2% solution, up to a 6% solution may be recommended on sites with elevated levels or particularly difficult/ mixed stream contaminants are present.

The **BioSolve®** solution should be applied evenly to the soil surface in sufficient quantity to saturate the surface area. As a general rule, use 1-3 litres of **BioSolve®** solution to 1 square metre of surface area. (1 gallon of **BioSolve®** per solution will cover approximately 4-sq. yd. of soil surface area) **BioSolve®** is a water-based surfactant that will apply like water.

BioSolve®, in its concentrated form, is a viscous liquid material that must be diluted with water. A fluorescent red tracing dye is present in the formula allowing **BioSolve®** to be detected during application. Once diluted, **BioSolve®** can be applied with virtually any equipment that can spray water. **BioSolve®** will not harm equipment or clog pipes. For large sites, applicators such as water truck, portable agricultural sprayers, foam inductors & pressure sprayers can be used. For smaller jobs, garden sprayers, water extinguishers or a garden hose with a fertiliser attachment on the nozzle can be used effectively. This characteristic makes **BioSolve®** very adaptable and much most convenient to use in almost any situation. **BioSolve®** is equally effective when used with all types of water (soft, hard, salt or potable).

On stockpiled soil or other soil that will be left undisturbed, a single application of **BioSolve®** to the exposed surfaces may last up to 10 to 14 days or more (depending on environmental conditions). **BioSolve®,** when applied, will form a "cap" of clean soil. If the soil is not disturbed, via weather, movement, etc. this "cap" will remain functional. During excavation, loading or other movement of the soil, it may be required to spray an additional amount of **BioSolve®** to the freshly exposed surface area to keep emissions at an acceptable level.

In case of an extremely high level of emissions, or if the soil is heavily contaminated, it may be necessary to increase the strength of the **BioSolve®** solution or apply more solution per square metre to reduce emissions adequately. It is important that the site be monitored regularly and that the **BioSolve®** solution be reapplied if and when necessary to insure that VOC emissions and odors remain under control.

BioSolve® is packaged and readily available in 55 gallon (208 liter) drums, 5 gallon (19 liter) pails and in 4X1 gallon (3.8 liter X 4) cases. Contact The Westford Chemical Corporation® Toll Free @ 1-800-225-3909, via e-mail at info@biosolve.com or your Local BioSolve distributor for pricing.

BioSolve® ***should only be used in accordance with all regulatory rules and regulations.***

This material is made available or use by professionals or persons having technical skill to be used at the own discretion and risk. These protocols are guidelines only and may need to be modified to site specific conditions. Nothing included herein is a warrantee or to be taken as a license to use **BioSolve** without the proper permits, approvals, etc. of the appropriate regulatory agencies, nor are the protocols provided as instructions for any specific application of **BioSolve**.

SOIL VAPOR SUPPRESSION UTILIZING BIOSOLVE

BioSolve is being utilized by numerous environmental consultants, response contractors, and fire departments to suppress VOC’s & LEL’s as well as problem odors. BioSolve encapsulates the source of the vapor rather than temporarily blanketing it like a foam or other physical barrier. Vapor reduction is so fast and effective that BioSolve is used to comply with the tough emission standards regulated by each State.

BioSolve offers a relatively simple and cost effective method of suppressing VOC vapor release from soils during excavation, loading, stockpiling… The following guidelines will apply to the most common situations encountered on site.

In most cases a 3% solution of BioSolve will be adequate to keep vapor emissions within acceptable limits. Dilute BioSolve concentrate with water at a ratio of 1 part BioSolve to 33 parts water to make a 3% solution.

The BioSolve solution should be applied evenly to the soil surface in sufficient quantity to dampen the surface well, (as a general rule, 1 gallon of BioSolve solution will cover approximately 4 sq. yd. of soil surface area). BioSolve is not a foam, it is a surfactant based product that will apply like water. The solution may be applied with a hand sprayer, high pressure power sprayer, water truck, etc., whichever method best suits the site and/or conditions.

NOTE: In the case of extremely high emission levels and/or very porous soil it may be necessary to increase the strength of the BioSolve solution (6%) or apply more per sq. yd. to reduce emissions adequately. On stockpiled soil or other soil that will be undisturbed, a single application of BioSolve to the exposed surfaces may last 10-14 days or more. During excavation, loading, or other movement of soil it may be necessary or required to spray each freshly exposed surface to keep emissions below acceptable levels.It is important that the site be monitored regularly and the BioSolve solution be reapplied if/when necessary to insure that vapor emissions remain at or below acceptable standards.

MATERIAL SAFETY DATA SHEET

THE WESTFORD CHEMICAL CORPORATION®
P.O. Box 798
Westford, Massachusetts 01886 USA

Ref. No.: 2001
Date: 1/1/2002

Phone: (978) 392-0689
Phone: (508) 878-5895
Emergency Phone-24 Hours: 1-800-225-3909

Fax: (978) 692-3487
Web Site: http://www.BioSolve.com
E-Mail: info@BioSolve.com

SECTION I - IDENTITY

Name:	**BioSolve®**
CAS #:	138757-63-8
Formula:	Proprietary
Chemical Family:	Water Based, Biodegradable, Wetting Agents & Surfactants
HMIS Code:	Health 1, Fire 0, Reactivity 0
HMIS Key:	4 = Extreme, 3 = High, 2 = Moderate, 1 = Slight, 0 = Insignificant

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SECTION II - HAZARDOUS INGREDIENTS

Massachusetts Right to Know Law or 29 C.F.R. (Code of Federal Regulations) 1910.1000 require listing of hazardous ingredients.

This product does not contain any hazardous ingredients as defined by CERCLA, Massachusetts Right to Know Law and California's Prop. 65.

SECTION III - PHYSICAL - CHEMICAL CHARACTERISTICS

Boiling Point	: 265°F	Specific Gravity	: 1.00 +/-.01
Melting Point	: 32°F	Vapor Pressure mm/Hg	: Not Applicable
Surface Tension- 6% Solution	: 29.1 Dyne/cm at 25°C	Vapor Density Air = 1	: Not Applicable
Reactivity with Water	: No	Viscosity - Concentrate	: 490 Centipoise
Evaporation Rate	: >1 as compared to Water	Viscosity - 6% Solution	: 15 Centipoise
Appearance	: Clear Liquid unless Dyed	Solubility in Water	: Complete
Odor	: Pleasant Fragrance	pH	: 9.1+/-.3
Pounds per Gallon	: 8.38		

SECTION IV - FIRE AND EXPLOSION DATA

Special Fire Fighting Procedures	: None	Flammable Limit	: None
Unusual Fire and Explosion Hazards	: None	Auto Ignite Temperature	: None
Solvent for Clean-Up	: Water	Fire Extinguisher Media	: Not Applicable
Flash Point	: None		

SECTION V - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be taken in Handling and Storage: Use good normal hygiene.
Precautions to be taken in case of Spill or Leak -
Small spills, in an undiluted form, contain. Soak up with absorbent materials.
Large spills, in an undiluted form, dike and contain. Remove with vacuum truck or pump to storage/salvage vessel. Soak up residue with absorbent materials.
Waste Disposal Procedures -
Dispose in an approved disposal area or in a manner which complies with all local, state, and federal regulations.

SECTION VI - HEALTH HAZARDS

Threshold Limit Values: Not applicable
Signs and Symptoms of Over Exposure-
Acute : Moderate eye irritation. Skin: Causes redness, edema, drying of skin.
Chronic: Pre-existing skin and eye disorders may be aggravated by contact with this product.
Medical Conditions Generally Aggravated by Exposure: Unknown
Carcinogen: No
Emergency First Aid Procedures -
Eyes: Flush thoroughly with water for 15 minutes. Get medical attention.
Skin: Remove contaminated clothing. Wash exposed areas with soap and water. Wash clothing before reuse. Get medical attention if irritation develops.
Ingestion: Get medical attention.
Inhalation: None considered necessary.

SECTION VII - SPECIAL PROTECTION INFORMATION

Respiratory Protection	: Not necessary	Local Exhaust Required	: No
Ventilation Required	: Normal	Protective Clothing	: Gloves, safety glasses Wash clothing before reuse.

SECTION VIII - PHYSICAL HAZARDS

Stability	: Stable	Incompatible Substances	: None Known
Polymerization	: No	Hazardous Decomposition Products	: None Known

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SECTION IX - TRANSPORT & STORAGE

DOT Class	: Not Regulated/Non Hazardous		
Freeze Temperature	: 28°F	Storage	: 35°F-120°F
Freeze Harm	: None (thaw & stir)	Shelf Life	: Unlimited Unopened

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SECTION X - REGULATORY INFORMATION

The Information on this Material Safety Data Sheet reflects the latest information and data that we have on hazards, properties, and handling of this product under the recommended conditions of use. Any use of this product or method of application, which is not described on the Product label or in this Material Safety Data Sheet, is the sole responsibility of the user. This Material Safety Data Sheet was prepared to comply with the OSHA Hazardous Communication Regulation and Massachusetts Right to Know Law.

Attachment D

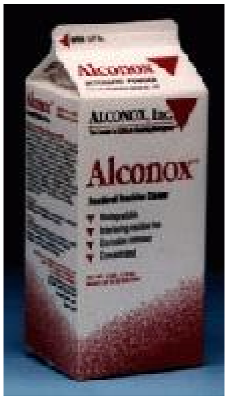
Material Safety Data Sheets

SPI Supplies Division
Structure Probe, Inc.
P.O. Box 656 West Chester, PA 19381-0656 USA
Phone: *1-(610)-436-5400* ***Fax:*** *1-(610)-436-5755*
E-mail: *spi3spi@2spi.com*
WWW: http://www.2spi.com
Manufacturer's CAGE: 1P573

Material Safety Data Sheet

SPI #01200-AB and #01200A-AB Alconox® Powdered Detergent

Section 1: Identification



Date Effective........... November 14, 2005 (most recent revision)

Chemical Name/Synonyms... On Label: Alconox®

Chemical Family.......... Anionic powdered detergent

Emergencies
Contacting CHEMTREC:

24 Hour Emergency Use Only #'s...
Worldwide phone: 1-(703)-527-3887
Worldwide FAX: 1-(703)-741-6090
Toll-free phone: 1-(800)-424-9300 USA only

Product or Trade Name.... SPI #01200-AB and #01200A-AB Alconox® Powdered Detergent

CAS #. Not applicable

Chemical Formula......... Not applicable

Section 2 Composition Component Name CAS # OSHA OSHA ACGIH ACGIH

No hazardous ingredients in Alconox Powdered Detergent as defined by the OSHA Standard and Hazardous Substance List 29 CFR 1910 Subpart Z.

Hazardous Material Information System USA	**Health**	**0**	**National Fire Protection Association USA**	
	Fire Hazard	**0**		
	Reactivity	**0**		

	Personal Protection			

NFPA (National Fire Protection Association) Rating (Scale 0-4):
HEALTH=0 FLAMMABILITY=0 REACTIVITY=0 OTHER=0 Not known

Section 3: Hazard Identification

Routes of entry
Inhalation? Yes
Skin? No
Ingestion? Yes

Health Hazards (Acute and chronic):
Inhalation of powder may prove locally irritating to mucous membranes.
Ingestion may cause discomfort and/or diarrhea. Eye contact may prove irritating.

Carcinogenicity:
NTP? No
IARC Monographs? No
OSHA Regulated? No

Section 4: First Aid Measures

Signs and Symptoms of Exposure:
Exposure may irritate mucous membranes. May cause sneezing.

Medical conditions generally aggravated by exposure: Not established. Unnecessary exposure to this product or any industrial chemical should be avoided.

Respiratory conditions may be aggravated by powder if air borne.

Emergency and First Aid Procedures:

Eyes: Immediately flush eyes with copious amounts of water for minimum 15 minutes. Call physician.

Skin: Flush with plenty of water.

Ingestion: Drink large quantities of water or milk. Do not induce vomiting. If vomiting occurs re-administer fluids. See a physician for discomfort.

Section 5: Fire Fighting Measures

NFPA Rating: Not known

Extinguishing Media
Suitable/Not suitable:

SMALL FIRE: Use DRY chemical powder, water, foam, carbon dioxide

LARGE FIRE: Use extinguishing media suitable for the surrounding materials.

Special firefighting procedures:
Self-contained positive pressure breathing apparatus and protective clothing should be worn when fighting fires involving chemicals.

Unusual Fire/Explosion Hazards: None

Hazardous thermal decomposition products: None known.

Protection of fire fighters: No special measures are required.

Flammable Limits:
LEL: No data
UEL: No data

Section 6: Accidental Release Measures

Personal precautions: No special precautions

Environmental Precautions and Clean Up Methods:
Material foams profusely. Recover as much as possible and flush remainder to sewer. Material is biodegradable.

Section 7: Handling and Storage

Material should be stored in a dry area to prevent caking.

Section 8: Exposure Controls and Personal Protection

Engineering controls: Normal ventilation is normally required when handling or using this product. Avoid conditions that could produce dusting.

Personal Protective Equipment

Respiratory system: Dust mask recommended but not required.

Skin and body: Laboratory coat recommended but not required.

Hands: Impervious gloves recommended

Eyes: Goggles are recommended, especially when handling solutions irrespective of what they might be.

Other: Wash hands before eating, drinking, or smoking.

Section 9: Physical and Chemical Properties

Physical State and Appearance: White powder interspersed with cream colored flakes.

Odor: None

Boiling Point: Not applicable

Melting Point: Not applicable

Density (water = 1): Not applicable

Solubility: Appreciable, to 10% at ambient conditions.

Octanol/water partition coefficient: Not available

pH: Not known

Flash Point: None

Flammability: Non-flammable

Autoignition temperature: Not applicable

Section 10: Stability and Reactivity

Chemical Stability: The product is stable

Hazardous polymerization: Will not occur

Conditions to Avoid: None

Hazardous Products of Deposition: May release CO_2 on burning.

Reactions with Air and Water:
Does not react with air, water or other common materials.

Section 11: Toxicological Information

Summary: Not considered to be toxic to humans or animals.

Skin Effects: Can be locally irritating

Eye Irritation: Can be irritating to the eyes

Inhalation: Dust can be irritating to mucous membranes

Sensitization: Not known

Chronic toxicity: There is no known effect from the chronic exposure to this product.

Section 12: Ecological Information

Exotoxicity: Not know but it is expected to be low because the material is biodegradable.

Environmental Fate: It is biodegradable.

Bioaccumulation: Not expected to occur (because the material is biodegradable).

Section 13: Disposal Considerations

This material is NOT classified as a hazardous material by RCRA. Use only licensed transporters and permitted disposal facilities and conform to all laws.

Recycle to process, if possible.

Germany water class: VCI WGK: No products were found.

Methods of disposal; waste of residues; contaminated packaging:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

Proper Shipping Name: Non-Regulated, No dangerous cargo

DOT Hazard Class: Non-Regulated, No dangerous cargo

UN/NA ID: Non-Regulated, No dangerous cargo

Packing Group: Not Applicable

Labels: Not Regulated

Marine Pollutant: No

NAER Guidebook: Not Regulated

DOT Status: Not Regulated

Land-Road/Railway:
ADR/RID Class: No dangerous cargo

Sea:
IMDG Class: No dangerous cargo

Air:

IATA-DGR Class: No dangerous cargo

Section 15: Regulatory Information

TSCA: All components of this product are listed on the TSCA 8(b) inventory. If identified components of this product are listed under the TSCA 12(b) Export Notification Rule, they will be listed below.
TSCA 12(b) Component Listed under TSCA Section
SARA Title 3: Section 313 Information/Emissions Reporting (**40 CFR 372**):
Component Reporting Threshold
SARA-Section 311/312:
No components present in this product are subject to the reporting requirements of this statute.

CERCLA Hazardous Substances and their Reportable Quantities:
Component Reportable Quantity
EU Regulations: Risk Phrases: This product is not classified according to the EU regulations.

Safety Phrases: Not applicable

Contains: Not applicable

California Prop. 65:
Proposition 65 requires manufacturers or distributors of consumer products into the State of California to provide a warning statement if the product contains ingredients for which the State has found to cause cancer, birth defects or other reproductive harm. If this product contains an ingredient listed by the State of California to cause cancer or reproductive toxicity, it will be listed below:

None found

Section 16: Other Information

Disclaimer of Liability:

Caution! Do not use SPI Supplies products or materials in applications involving implantation within the body; direct or indirect contact with the blood pathway; contact with bone, tissue, tissue fluid, or blood; or prolonged contact with mucous membranes. Products offered by SPI Supplies are not designed or manufactured for use in implantation in the human body or in contact with internal body fluids or tissues. SPI Supplies will not provide to customers making devices for such applications any notice, certification, or information necessary for such medical device use required by US FDA (Food and Drug Administration) regulation or any other statute. SPI Supplies and Structure Probe, Inc. make no representation, promise, express warranty or implied warranty concerning the suitability of these materials for use in implantation in the human body or in contact with internal body tissues of fluids.

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The information and recommendations set forth above are taken from sources believed to be accurate as of the date hereof, however SPI Supplies and Structure Probe, Inc. make no warranty with respect to the accuracy of the information or the suitability of the recommendations, and assume no liability to any user thereof. The information contained in this sheet does not constitute a hazard assessment and should not be used in place of the user's own assessment of work place risks as required by other health and safety legislation. Be aware of the Structure Probe, Inc. Copyright Policy. Structure Probe, Inc. grants a nonexclusive license to make unlimited copies of this safety sheet for internal use only. Quite obviously, this information would pertain only to this material when purchased from SPI Supplies as product from other sources, with other ingredients and impurity levels could have substantially different properties.

Thursday February 22, 2007

Worldwide Distributors, Representatives, and Agents

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS:	**NON-FLAMMABLE GAS MIXTURE**
•	Document Number: 002103
PRODUCT USE:	For general analytical/synthetic chemical uses.
SUPPLIER/MANUFACTURER'S NAME:	AIRGAS INC.
ADDRESS:	259 North Radnor-Chester Road, Suite 100 Radnor, PA 19087-5283
BUSINESS PHONE:	1-610-687-5253
EMERGENCY PHONE:	1-800-949-7937
International:	1-423-479-0293
DATE OF PREPARATION:	April 22, 2001

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA		NIOSH	OTHER
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	ppm
Isobutylene	115-11-7	1 ppm - 1.7%	There are no specific exposure limits for Isobutylene. Isobutylene is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					
Air	25635-88-5	Balance	There are no specific exposure limits applicable to Air.					
Air is a mixture of gases. The primary components of air, and the approximate concentration of each component, are listed below								
Nitrogen	7727-37-9	79%	There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					
Oxygen	7782-44-7	21%	There are no specific exposure limits for Oxygen					

NE = Not Established. See Section 16 for Definitions of Terms Used.

NOTE (1): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a colorless, odorless, non-flammable gas. The main health hazards associated with releases of this gas are related to the high pressure within the cylinder. Air, the main component of this product, is generally considered non-flammable, however, Air will support combustion. The flammable component of this gas mixture is below the LEL. A cylinder rupture hazard exists when this product, which is under pressure, is subjected to heat or flames. Emergency responders must wear personal protective equipment appropriate for the situation to which they are responding.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for air is by inhalation at elevated or reduced pressure.

INHALATION: This product is non-toxic. Air, the main component of this product, is necessary for life.

OTHER POTENTIAL HEALTH EFFECTS: Contact with rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after contact with liquid can quickly subside.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**. Over-exposure to this product may cause the following health effects:

ACUTE: The most significant hazards associated with compressed air is the pressure hazard. Contact with rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after contact with liquid can quickly subside.

CHRONIC: There are currently no known adverse health effects associated with chronic exposure to this gas.

TARGET ORGANS: ACUTE: Respiratory system under ambient low pressure conditions. Central nervous system under ambient high pressure conditions. CHRONIC: None expected.

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus equipment should be worn.

Victim(s) must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to physician or other health professional with victim(s). Remove victim(s) to fresh air, as quickly as possible. In case of eye contact which leads to irritation, immediately flush eyes with copious amounts of water for at least 15 minutes. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Only trained personnel should administer supplemental oxygen.

In case of frostbite, place the frostbitten part in warm water. DO NOT USE HOT WATER. If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area in the armpit. Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Acute or chronic respiratory conditions, as well as disorders involving the “Target Organs”, as listed in Section 3 (Hazard Information), may be aggravated by overexposure to the components of this product.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen as soon as possible, following exposure.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.
AUTOIGNITION TEMPERATURE: Not applicable.
FLAMMABLE LIMITS (in air by volume, %):
Lower (LEL): Not applicable.
Upper (UEL): Not applicable.

5. FIRE-FIGHTING MEASURES (Continued)

FIRE EXTINGUISHING MATERIALS: Non-flammable gas. Use extinguishing media appropriate for surrounding fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: When involved in a fire, this material may decompose and produce toxic gases including carbon monoxide and carbon dioxide. Additionally, when involved in fire, the cylinders may rupture.

Explosion Sensitivity to Mechanical Impact: Not Sensitive.
Explosion Sensitivity to Static Discharge: Not Sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Move fire-exposed cylinders from area, if it can be done without risk to fire-fighters. Withdraw immediately in case of rising sounds from venting pressure relief devices or any discoloration of tanks or cylinders due to a fire.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a release, clear the affected area, protect people, and respond with trained personnel. Minimum Personal Protective Equipment should be **Level D: safety glasses, and mechanically-resistant gloves. Level B, which includes the use of Self-Contained Breathing Apparatus, should be worn when oxygen levels are below 19.5% or are unknown.** Locate and seal the source of the leaking gas. If this does not stop the release (or if it is not possible to reach the valve), allow the gas to release in place or remove it to a safe area and allow the gas to be released there.

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: Do not eat or drink while handling chemicals.

STORAGE AND HANDLING PRACTICES: Cylinders should be stored in dry, well-ventilated areas away from sources of heat. Compressed gases can present significant safety hazards. Store containers away from heavily trafficked areas and emergency exits.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Protect cylinders against physical damage. Store in cool, dry, well-ventilated, fireproof area, away from flammable or combustible materials and corrosive atmospheres. Store away from heat and ignition sources and out of direct sunlight. Do not store near elevators, corridors or loading docks. Do not allow area where cylinders are stored to exceed 52°C (125°F). Isolate from incompatible materials including flammable materials (see Section 10, Stability and Reactivity), which can burn violently. Use only storage containers and equipment (pipes, valves, fittings to relieve pressure, etc.) designed for the storage of Air. Do not store containers where they can come into contact with moisture. Cylinders should be stored upright and be firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Never tamper with pressure relief devices in valves and cylinders. The following rules are applicable to situations in which cylinders are being used:
Before Use: Move cylinders with a suitable hand-truck. Do not drag, slide or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap in-place until cylinder is ready for use.
During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Use check valve or trap in discharge line to prevent hazardous backflow into the cylinder. Do not use oils or grease on gas-handling fittings or equipment.
After Use: Close main cylinder valve. Replace valve protection cap. Mark empty cylinders “EMPTY”.
NOTE: Use only DOT or ASME code containers. Earth-ground and bond all lines and equipment associated with this product. Close valve after each use and when empty. Cylinders must not be recharged except by or with the consent of owner. For additional information refer to the Compressed Gas Association Pamphlet P-1, *Safe Handling of Compressed Gases in Containers*. Additionally, refer to CGA Bulletin SB-2 “*Oxygen Deficient Atmospheres*”.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged out safely. Purge gas handling equipment with inert gas (i.e. nitrogen) before attempting repairs. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation.
RESPIRATORY PROTECTION: Maintain Oxygen levels above 19.5% in the workplace. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93 and applicable standards of Canadian Provinces. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).
EYE PROTECTION: Splash goggles, face-shields or safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133, or Canadian Standards.
HAND PROTECTION: Wear mechanically-resistant gloves when handling cylinders of this product. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.
BODY PROTECTION: Use body protection appropriate for task. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for **Air**, the main component of this product , unless otherwise stated:
RELATIVE VAPOR DENSITY: 1 EVAPORATION RATE (nBuAc = 1): Not applicable.
SPECIFIC GRAVITY: Not applicable. FREEZING POINT: -216.2°C (-357.2°F)
SOLUBILITY IN WATER: 1.49% (v/v) BOILING POINT @ 1 atmos: -194.3°C(-317.8°F)
VAPOR PRESSURE, mmHg @ 20°C:. pH: Not applicable.
EXPANSION RATIO: Not applicable. VAPOR PRESSURE: Not applicable.
SPECIFIC VOLUME: 13.3 ft$_3$/lb; (0.833 m$_3$/kg) ODOR THRESHOLD: Not applicable.
COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

The following information is pertinent to this gas mixture:
APPEARANCE, ODOR AND COLOR: This product is a colorless, odorless gas.
HOW TO DETECT THIS SUBSTANCE (warning properties): There are no distinctive properties to this product. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

10. STABILITY and REACTIVITY

STABILITY: Normally stable.
DECOMPOSITION PRODUCTS: None known.
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE. Air (the main component of this product) is not compatible with fuels, in that air will support combustion. The Isobutylene component of this mixture is incompatible with Strong oxidizers (e.g., chlorine, bromine pentafluoride, oxygen, oxygen difluoride, and nitrogen trifluoride).
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Contact with incompatible materials and exposure to heat, sparks and other sources of ignition. Cylinders exposed to high temperatures or direct flame can rupture or burst.

PART III *How can I prevent hazardous situations from occurring?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology data are for the components of this gas mixture present at a level greater than 1 mole %:
ISOBUTYLENE:
LC50 (Inhalation-Rat) 620 gm/m3/4 hours LC50 (Inhalation-Mouse) 415 gm/m3/2 hours

SUSPECTED CANCER AGENT: No component of this gas mixture is found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC, and therefore is not considered to be, nor suspected to be, cancer causing agents by these agencies.

IRRITANCY OF PRODUCT: Contact with rapidly expanding gases can cause frostbite and damage to exposed skin and eyes.
SENSITIZATION OF PRODUCT: No component of this product is a skin or respiratory sensitizer.
REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system.
Mutagenicity: This product is not reported to cause mutagenic effects in humans.
Embryotoxicity: This product is not reported to cause embryotoxic effects in humans.
Teratogenicity: This product is not reported to cause teratogenic effects in humans.

Reproductive Toxicity: This product is not reported to cause adverse reproductive effects in humans.
A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.
BIOLOGICAL EXPOSURE INDICES: Biological Exposure Indices (BEIs) have been determined for the components of this product are as follows:

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: This gas will be dissipated rapidly in well-ventilated areas.
EFFECT OF MATERIAL ON PLANTS or ANIMALS: No adverse effect is anticipated to occur to plant-life, except for frost produced in the presence of rapidly expanding gases.
EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence of an adverse effect of this product on aquatic life is currently available.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Product removed from cylinder must be disposed of in accordance with appropriate U.S. Federal, State and local regulations or with regulations of Canada and its Provinces. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

14. TRANSPORTATION INFORMATION

THIS GAS MIXTURE IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME:	Compressed gases, n.o.s. (Air, Isobutylene)
HAZARD CLASS NUMBER and DESCRIPTION:	2.2 (Compressed Gas)
UN IDENTIFICATION NUMBER:	UN 1956
PACKING GROUP:	Not Applicable
DOT LABEL(S) REQUIRED:	Compressed Gas

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 126
TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas mixture is considered as dangerous goods, per regulations of Transport Canada. Use the above information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:
U.S. SARA REPORTING REQUIREMENTS: The components of this gas mixture are not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act.

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this material. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.
U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.
U.S. TSCA INVENTORY STATUS: The components of this product are listed on the TSCA Inventory.
OTHER U.S. FEDERAL REGULATIONS: Not applicable.
U.S. STATE REGULATORY INFORMATION: The components of this gas mixture are covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: None.
California - Permissible Exposure Limits for Chemical Contaminants: None.
Florida - Substance List: Isobutylene. **Illinois - Toxic Substance List:** None.
Kansas - Section 302/313 List: None.
Minnesota - List of Hazardous Substances: Isobutylene.
Massachusetts - Substance List: None.
Missouri - Employer Information/Toxic Substance List: None.
New Jersey - Right to Know Hazardous Substance List: Isobutylene.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: None.
Pennsylvania - Hazardous Substance List: Isobutylene.
Rhode Island - Hazardous Substance List: None.
Texas - Hazardous Substance List: None.
West Virginia - Hazardous Substance List: None.
Wisconsin - Toxic and Hazardous Substances: None.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): No component of this product is on the California Proposition 65 Lists.

LABELING: **CAUTION:** HIGH PRESSURE GAS.
MAY ACCELERATE COMBUSTION.
Keep oil and grease away.
Use equipment rated for cylinder pressure.
Close valve after each use and when empty.
Use in accordance with the Material Safety Data Sheet.

FIRST-AID: **IF INHALED**, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
IN CASE OF FROSTBITE, obtain immediate medial attention.
DO NOT REMOVE THIS PRODUCT LABEL.

ADDITIONAL CANADIAN REGULATIONS:
CANADIAN DSL INVENTORY: The components of this product are listed on the DSL Inventory.
OTHER CANADIAN REGULATIONS: Not applicable.
CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of this product are not on the CEPA Priorities Substances Lists.
CANADIAN WHMIS SYMBOLS: **Class A:** Compressed Gases

16. OTHER INFORMATION

PREPARED BY: CHEMICAL SAFETY ASSOCIATES, Inc.
9163 Chesapeake Drive, San Diego, CA 92123-1002
858/565-0302

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. AirGas, Inc. assumes no responsibility for injury to the vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, AirGas, Inc. assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent.

EXPOSURE LIMITS IN AIR:

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV -** Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average **(TWA)**, the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level **(C)**. Skin absorption effects must also be considered.

OSHA - U.S. Occupational Safety and Health Administration. **PEL -** Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, “Vacated 1989 PEL,” is placed next to the PEL which was vacated by Court Order.

IDLH - Immediately Dangerous to Life and Health **-** This level represents a concentration from which one can escape within 30- minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany’s Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. **O**ccupational **S**afety and **H**ealth **A**dministration (**OSHA**). NIOSH issues exposure guidelines called **R**ecommended **E**xposure **L**evels (**REL**s). When no exposure guidelines are established, an entry of **NE** is made for reference.

HAZARD RATINGS:

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93 ☐C [100-200☐F]); **3** (Class IB and IC flammable liquids with flash points below 38 ☐C [100☐F]); **4** (Class IA flammable liquids with flash points below 23 ☐C [73☐F] an
points below 38 ☐C [100☐F]). Reactivity Hazard: **0** (normally stable); **1** (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

PERSONAL PROTECTIVE EQUIPMENT CODES: B: Gloves and goggles; **C:** Gloves, goggles, rubber apron (appropriate body protection); **D:** Gloves, goggles, faceshield; rubber apron (appropriate body protection);. **X:** Special attention should be given to PPE Selection.

NATIONAL FIRE PROTECTION ASSOCIATION: Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure could cause death or major residual injury). Flammability Hazard and Reactivity Hazard: Refer to definitions for “Hazardous Materials Identification System”.

FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point – Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL – the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:

Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD50 -** Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC50** – Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m3** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: EC is the effect concentration in water.

REGULATORY INFORMATION:

This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency**. WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act **(SARA)**; the Canadian Domestic/Non-Domestic Substances List **(DSL/NDSL)**; the U.S. Toxic Substance Control Act **(TSCA)**; Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act **(CERCLA or Superfund)**; and various state regulations.

Appendix D

Site-wide and Annual Inspection Forms

AECOM

Annual Inspection Checklist and Certification
Interim Site Management Plan
Former Bay Ridge Holder Stations A&B Site, Operable Unit 2
Brooklyn, New York

Property: ______________________

Type	Inspection Task	Status	Condition	Date Completed	Initials	Remarks
Infrastructure	Building (s)					
	Building Slabs and Floor					
	Pavements					
	Underground Services					
	New Structures					
	Monitoring Wells					
	Use					
Physical	Site Fences					
	Topography					
	Surface Drainage					
	Depressions					
	Vegetation					
	Ground Cover					
	Surface Soil					
Contamination	Odors					
	Staining					
	Sheens					
Groundwater	Use					
	Monitoring					
	Reporting					
Property Owner/ Representative	New					
	Interview					

Inspection and Interview Acknowledgement	Signature/Date: ______________________	______________________
	Name: ______________________	______________________
	National Grid/Representative	Gate Station Representative/Youth Athletic Field Representative/Lessee

Notes:

Status - Modified/Unchanged

Condition - Unchanged/Deteriorated

Interview - Work completed during the previous year and future plans

Soil Removal - Any soil removal activities will be detailed here and Figures of the SMP revised accordingly.

Appendix E

Monitoring Well Boring and Construction Logs

AECOM
20 Exchange Place, 13th Floor
New York, New York 10005

Boring Log Legend

Project Name: Bay Ridge Former Station Holder B
Project Number: 60137360
Location: Brooklyn, NY
Client: National Grid

Stratigraphy

- ▧ **Fill**
- ░ **(GW) Well Graded Gravel**
- **Meadow Mat**
  - ▩ **(PT) Fibrous and Friable Peat**
  - ▩ **(OH) Organic Clay**
- ▦ **(SM) Silty Sand**
- ▤ **(SC) Clayey Sand**
- ░ **(SW) Well Graded Sand**
- ░ **(SP) Poorly Graded Sand**
- ▩ **(LIG) Lignite**
- ▥ **(ML) Sandy Silty**
- ▨ **(CL) Clay and Silty Clay of Low Plasticity**
- ▨ **(CH) Clay and Silty Clay of High Plasticity**
- ▥ **(BR) Bedrock**

Visual Impacts

- 🟫 **Tar Saturated**
- 🟧 **Interbedded Lenses of Saturated Tar**
- 🟨 **Blebs, Globs, Lenses, Coatings**
- 🟩 **Tar Sheen/Staining**
- 🟦 **Tar/Naphthalene-Like Odors**
- ▨ **Petroleum Sheen/Staining**
- ░ **Petroleum Odors**
- 🟩 **Solid Tar**
- 🟪 **Purifier Material**
- 🟪 **Purifier Odors**

Definitions:
1.) NA - Not Applicable
2.) ft - feet
3.) bgs - below ground surface
4.) SAA - Same As Above 5.) ppm - parts per million
6.) NAVD 88 - North American Vertical Datum of 1988
7.) PID - Photo Ionization Meter
8.) U.S.C.S. - Unified Soil Classification System
9.) WOR - Weight of Rods (drilling)
10.) WHO - Weight of Hammer

VHB

Soil Boring Report

Environmental Risk Management Group

Site Data:

Bayridge Site - KeySpan Energy
65th Street and 9th Avenue
Brooklyn, NY

Project # 0639200 00110

Boring #: SB-8

Driller: Aquifer Drilling & Testing, Inc.
Drill Rig: Mobile B-59
Technique: 2¼-inch HSA with 2-in split spoons
Date: 3/15/2000
Weather: Partly sunny, 40°F

Boring Depth: 19 feet BGS
Depth to Ground Water: Perched water 5 - 7' BGS
VHB Representative: Rick Watt

Depth (feet BGS)	Sample #	Blow Counts				Recovery	PID (PPM)	Field Classification And Remarks
								0 - 1.5' Orange brown sand (baseball infield sand).
1 - 3		2	7	13	11	80%	0	1.5 - 4' Medium brown silty sand with debris (brick, cinder-like material, glass).
3 - 5	SB-8A (4 - 6')	14	10	11	10	60%	0	4 - 7' Light brown, well-sorted, fine-grained sand; some brick and glass to 4.5' BGS; wet below 5' BGS; concrete on split spoon shoe at 6.5' BGS.
5 - 7		3	4	34	50/1"	50%	0	
7 - 9		15	14	14	30	20%	0	7 - 7.5' Crushed stone (poor recovery).
9 - 11		14	13	34	30	30%	0	7.5 - 9' No recovery.
11 - 13		11	10	9	13	30%	0	9 - 9.6' Multicolored (but primarily reddish brown) fine- to coarse-grained sand with trace sandstone gravel.
13 - 15		7	22	22	25	40%	0	
15 - 17	SB-8B (15-16' + 17-18')	26	21	22	21	60%	0	9.6 - 11' No recovery.
17 - 19		18	17	21	18	90%	0	11 - 11.6' Same as 9 - 9.6' BGS.
								11.6 - 13' No recovery.
								13 - 13.8' Primarily gray, with some white and yellow, silt to coarse sand - saprolite consisting of quartz with high mica content and some mafic minerals.
								13.8 - 15' No recovery.
								15 - 16.2' Reddish brown, well-sorted silt with very fine-grained sand; wet.
								16.2 - 17' No recovery.
								17 - 19' Well-compacted, reddish brown, sandy silt with gravel (till).

Key:

BGS = below ground surface
HSA = hollow-stem auger
N/A = not applicable
PID = photo-ionization detector
PPM = parts per million

VHB

Soil Boring Report

Environmental Risk Management Group

Site Data:

Bayridge Site - KeySpan Energy
65th Street and 9th Avenue
Brooklyn, NY

Project # 0639200 00110

Boring #: SB-9

Driller: Aquifer Drilling & Testing, Inc.
Drill Rig: Mobile B-59
Technique: 2¼-inch HSA with 2-in split spoons
Date: 3/15/2000
Weather: Partly sunny, 55°F

Boring Depth: 19 feet BGS
Depth to Ground Water: Perched water approx. 7 - 16' BGS
VHB Representative: Rick Watt

Depth (feet BGS)	Sample #	Blow Counts				Recovery	PID (PPM)
1 - 3		8	12	50/1"	x	100%	0
3 - 5	SB-9A (3-5')	4	10	10	13	65%	59
5 - 7		6	7	6	8	20%	0
7 - 9		7	10	10	6	15%	0
9 - 11		3	3	5	3	40%	0
11 - 13		1	2	3	4	0%	N/A
13 - 15		50/2"	x	x	x	0%	N/A
15 - 17	SB-9B (15-16')	10	14	11	9	80%	0
17 - 19		6	7	8	12	80%	0

Field Classification And Remarks
0 - 1' Orange brown sand (baseball infield sand).
1 - 2' Dark brown sandy loam with debris (brick, cinder-like material). Split spoon refusal at 2' BGS; auger through about 6 inches of concrete/rubble.
2 - 3' No recovery.
3 - 5' Dark brown silty sand with gravel and debris (brick, cinder-like material [black, hard, brittle, with reflective "grains"]). Maximum PID reading 59 ppm and maximum HCN reading 0.3 ppm from split spoon (HCN = 4.3 ppm in sample jar headspace), H_2S = 0 ppm.
5 - 5.4' Brick and concrete; wet.
5.4 - 7' No recovery.
7 - 7.3' Brick and concrete; wet.
7.3 - 9' No recovery.
9 - 9.8' Reddish brown fine- to coarse-grained sand; wet.
9.8 - 11' No recovery.
11 - 13' No recovery; split spoon is wet.
13'± Refusal on concrete; auger through to 15' BGS.
15 - 16' Gray gravelly sand with brick; wet.
16 - 19' Well-compacted, reddish brown, sandy silt with gravel (till); dry.

Key:

BGS = below ground surface
HSA = hollow-stem auger
N/A = not applicable
PID = photo-ionization detector
PPM = parts per million

VHB

Soil Boring Report

Environmental Risk Management Group

Site Data:

Bayridge Site - KeySpan Energy
65th Street and 9th Avenue
Brooklyn, NY

Project # 0639200 00110

Boring #: SB-10

Driller: Aquifer Drilling & Testing, Inc.
Drill Rig: Mobile B-59
Technique: 2¼-inch HSA with 2-in split spoons
Date: 3/15/2000
Weather: Sunny, light wind, 55°F

Boring Depth: 19 feet BGS
Depth to Ground Water: Not encountered
VHB Representative: Rick Watt

Depth (feet BGS)	Sample #	Blow Counts				Recovery	PID (PPM)	Field Classification And Remarks
								0 - 1.5' Orange brown sand (baseball infield sand).
1 - 3		8	8	7	7	80%	0	1.5 - 3.5' Medium brown silty sand with gravel and trace debris (brick, cinder-like material).
3 - 5		7	10	6	2	55%	0	
5 - 7	SB-10A (5-6.3')	10	10	10	8	65%	0	3.5 - 4' Orange-brown, well-sorted, fine-grained sand.
7 - 9		7	10	10	6	85%	0	4 - 5.1' Orange-brown sandy silt with gravel.
9 - 11		7	9	11	11	75%	0	5.1 - 6.3' Orange- to reddish brown sandy silt with gravel; trace cinder-like debris.
11 - 13		7	4	5	6	80%	0	6.3 - 7' No recovery.
13 - 15		9	7	11	10	55%	0	7 - 7.2' Reddish brown sandy silt.
15 - 17		15	13	11	13	60%	0	7.2 - 8.5' Tan, well-sorted, fine-grained sand.
17 - 19		15	12	11	12	65%	0	8.5 - 11' Reddish brown silt.
								11 - 19' Multicolored fine- to coarse-grained sand of varied origin; becomes increasingly gravelly below 15' BGS.

Key:

BGS = below ground surface
HSA = hollow-stem auger
N/A = not applicable
PID = photo-ionization detector
PPM = parts per million

AECOM

Boring ID: SB - 105 / MW - 105

Page 1 of 5

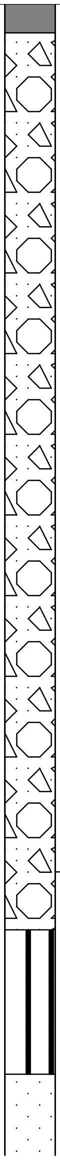
Project Name: Bay Rdge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 8, 2010
Date Started/Completed: Apr. 22/May 13, 2010

Drilling Company: Fenley and Nicol
Drilling Method: Geoprobe, HSA, and air hammer
Sampling Method: Disposable plastic liner 2" Split Spoon
Boring Diameter: 6 inches
Logged By: Ron Kantor

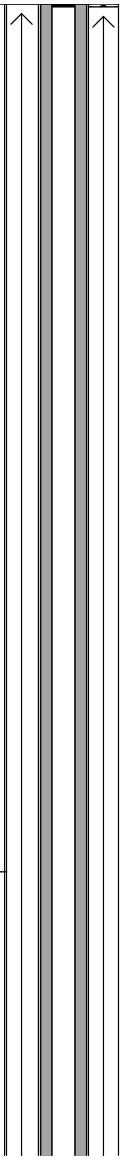
Water Level: ~78 ft bgs
Total Depth: 85 ft bgs
Ground Elevation: 81.35 NAVD88
Converted To Well (Y/N): Yes
Well ID: MW - 105

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Geologic Description
0	5.0/ 5.0	0.0				FILL	0.0-5.0 ft bgs: FILL: Top 6": concrete. Middle 18": fine to medium grained sand, ~5% silt and fine grained subangular gravel, cobble at 18", brown. Bottom 36": fine to medium grained sand, ~20% fine to medium grained subrounded gravel, moist, brown, no odor.
-1		0.0					
-2		0.0					
-3		0.0					
-4		0.0		▨	SB-105 (4-5)		
-5	2.25/ 5.0	0.0					5.0-10.0 ft bgs: FILL: Top 23": fine to medium grained sand, <20% fine to medium grained subangular gravel up to 2" diameter, wood at 21-23", medium dense, moist to wet, tan-brown, no odors. Bottom 4": fine grained sand, loose, dry, tan-brown.
-6 -7		0.0					
-8		0.0					
-9		0.0					
-10 -11	1.75/ 5.0	0.0					10.0-15.0 ft bgs: FILL: fine grained sand, <5% medium grained sand and coarse grained gravel up to 2" diameter from 9' 8" to 10', <5% wood, loose, moist to dry, tan-brown, no odors.
-12 -13		0.0					
-14		0.0					
-15 -16	3.75/ 5.0	0.0					15.0-20.0 ft bgs: Top 5": FILL: SAA
-17		0.0				ML	Middle 26": SANDY SILT (ML) silt, <15% very fine grained sand, soft, moist to wet, brown, no odor.
-18		0.0					
-19 -20		0.0				SW	Bottom 14": WELL GRADED SAND (SW) fine to coarse grained sand, <10% fine grained subangular gravel, very loose, dry, tan-brown, no odor.

Lithology



Well Construction



Notes:
Field impacts refers to visual/olfactory impacts.
Geoprobe from 0-27.5 ft bgs hit obstruction, moved soil boring.
Geoprobe to 25 ft bgs at new location. HSA start 25 ft bgs at new location.
2" split spoon used 25-57 ft bgs, no blow count data recorded..
HSA and air hammer used from 57-85 ft bgs.

Definitions:
NR - No Recovery
ND - Not Documented
SAA - Same As Above
HSA - Hollow stem auger
ft bgs - feet below grade surface
ppm - Parts per million
PID - Photoionization detector
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB - 105 / MW - 105

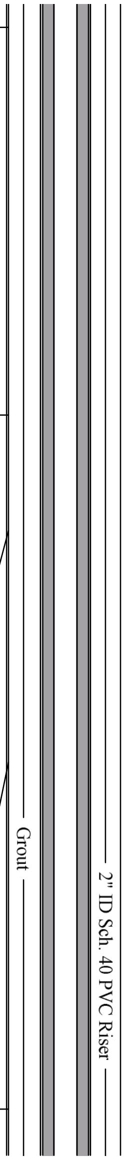
Project Name: Bay Rdge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 8, 2010
Date Started/Completed: Apr. 22/May 13, 2010

Drilling Company: Fenley and Nicol
Drilling Method: Geoprobe, HSA, and air hammer
Sampling Method: Disposable plastic liner 2" Split Spoon
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: ~78 ft bgs
Total Depth: 85 ft bgs
Ground Elevation: 81.35 NAVD88
Converted To Well (Y/N): Yes
Well ID: MW - 105

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
-20	3.5/ 5.0	0.0						20.0-25.0 ft bgs: Top 12": WELL GRADED SAND (SW) SAA Middle 6": SANDY SILT (ML) silt, ~20% fine grained sand, very soft, moist to wet, dark brown, no odor. Bottom 24": WELL GRADED SAND (SW) fine to coarse grained sand, <20% fine to coarse grained subangular gravel up to 2" diameter, <10% silt, loose, dry, tan-brown, no odors.
-21		0.0						
-22		0.0						
-23		0.0		▨	SB-105 (23-25)			
-24		0.0		▨				
-25	1.08/ 2.0	0.0						25.0-27.0 ft bgs: SAA
-26		0.0						
-27	0.83/ 2.0	0.0						27.0-29.0 ft bgs: Top 3": SAA Bottom 7": SANDY SILT (ML) very fine grained sandy silt, ~10% medium to coarse grained subangular gravel, moderately soft, dry to moist, brown, no odor.
-28		0.0				ML		
-29	1.83/ 2.0	0.0				SM		29.0-31.0 ft bgs: SILTY SAND (SM) very fine grained silty sand, ~20% medium to coarse grained gravel up to 2.5" diameter, <5% medium to coarse grained sand, firm, dry, brown, no odor.
-30		0.0						
-31	1.42/ 2.0	0.0						31.0-33.0 ft bgs: SILTY SAND (SM) very fine grained silty sand, ~10% medium to coarse grained sand, <5% fine grained angular gravel up to 0.5" diameter, moderately soft, dry, brown, no odor.
-32		0.0						
-33	1.33/ 2.0	0.0				ML		33.0-35.0 ft bgs: SANDY SILT (ML) very fine grained sandy silt, <10% fine grained angular gravel up to 1" diameter, soft, dry, brown, no odor.
-34		0.0						
-35	1.58/ 2.0	0.0						35.0-37.0 ft bgs: SAA
-36		0.0						
-37	1.75/ 2.0	0.0						37.0-39.0 ft bgs: SAA
-38		0.0		▨	SB-105 (38-39)			
-39	ND	ND				ND		39.0-45.0 ft bgs: Not Documented
-40								

Well Construction



Notes:
Field impacts refers to visual/olfactory impacts.
Geoprobe from 0-27.5 ft bgs hit obstruction, moved soil boring.
Geoprobe to 25 ft bgs at new location. HSA start 25 ft bgs at new location.
2" split spoon used 25-57 ft bgs, no blow count data recorded..
HSA and air hammer used from 57-85 ft bgs.

Definitions:
NR - No Recovery
ND - Not Documented
SAA - Same As Above
HSA - Hollow stem auger
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U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

AECOM

Boring ID: SB - 105 / MW - 105

Project Name: Bay Rdge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 8, 2010
Date Started/Completed: Apr. 22/May 13, 2010

Drilling Company: Fenley and Nicol
Drilling Method: Geoprobe, HSA, and air hammer
Sampling Method: Disposable plastic liner 2" Split Spoon
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: ~78 ft bgs
Total Depth: 85 ft bgs
Ground Elevation: 81.35 NAVD88
Converted To Well (Y/N): Yes
Well ID: MW - 105

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description	Well Construction
-40									
-41									
-42									
-43									
-44									
-45	0.92/ 2.0	0.0				SM		45.0-47.0 ft bgs: SILTY SAND (SM) very fine grained silty sand, <10% fine to coarse grained gravel up to 1.25", very soft, dry, brown, no odor.	
-46		0.0							
-47	ND	ND				ND		47.0-50.0 ft bgs: Not Documented	
-48									
-49									
-50	1.42/ 2.0	0.0				SM		50.0-52.0 ft bgs: SILTY SAND (SM) very fine grained silty sand, <10% fine to coarse grained gravel up to 2.5" diameter, broken gravel in tip, <5% medium to coarse grained sand, moderately soft, dry, brown, no odor.	
-51									
-52	ND	ND				ND		52.0-55.0 ft bgs: Not Documented	
-53									
-54									
-55	NR	NA				NR		55.0-57.0 ft bgs: No Recovery, large gravel in tip.	
-56								End of boring with geoprobe at 57 ft bgs	
-57								HSA and air hammer were used from 57 ft bgs to depth of 85 ft bgs due to large cobbles and boulders. The lithology was not documented as per drilling methods described in work plan.	
-58									
-59									

Notes:
Field impacts refers to visual/olfactory impacts.
Geoprobe from 0-27.5 ft bgs hit obstruction, moved soil boring.
Geoprobe to 25 ft bgs at new location. HSA start 25 ft bgs at new location.
2" split spoon used 25-57 ft bgs, no blow count data recorded..
HSA and air hammer used from 57-85 ft bgs.

Definitions:
NR - No Recovery
ND - Not Documented
SAA - Same As Above
HSA - Hollow stem auger
ft bgs - feet below grade surface
ppm - Parts per million
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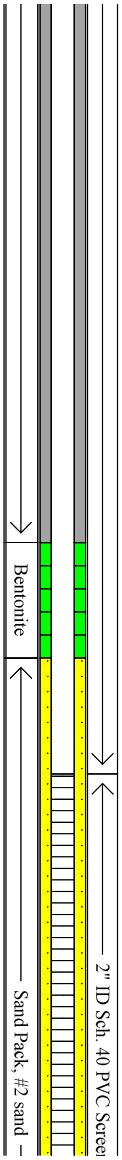
Boring ID: SB - 105 / MW - 105

Project Name: Bay Rdge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 8, 2010
Date Started/Completed: Apr. 22/May 13, 2010

Drilling Company: Fenley and Nicol
Drilling Method: Geoprobe, HSA, and air hammer
Sampling Method: Disposable plastic liner 2" Split Spoon
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: ~78 ft bgs
Total Depth: 85 ft bgs
Ground Elevation: 81.35 NAVD88
Converted To Well (Y/N): Yes
Well ID: MW - 105

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description	Well Construction
-60									
-61									
-62									
-63									
-64									
-65									
-66									
-67									
-68									
-69									
-70									
-71									
-72									
-73									
-74									
-75									
-76									
-77									
-78									
-79									



Notes:
Field impacts refers to visual/olfactory impacts.
Geoprobe from 0-27.5 ft bgs hit obstruction, moved soil boring.
Geoprobe to 25 ft bgs at new location. HSA start 25 ft bgs at new location.
2" split spoon used 25-57 ft bgs, no blow count data recorded..
HSA and air hammer used from 57-85 ft bgs.

Definitions:
NR - No Recovery
ND - Not Documented
SAA - Same As Above
HSA - Hollow stem auger
ft bgs - feet below grade surface
ppm - Parts per million
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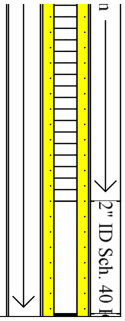
Boring ID: SB - 105 / MW - 105

Project Name: Bay Rdge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 8, 2010
Date Started/Completed: Apr. 22/May 13, 2010

Drilling Company: Fenley and Nicol
Drilling Method: Geoprobe, HSA, and air hammer
Sampling Method: Disposable plastic liner 2" Split Spoon
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: ~78 ft bgs
Total Depth: 85 ft bgs
Ground Elevation: 81.35 NAVD88
Converted To Well (Y/N): Yes
Well ID: MW - 105

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description	Well Construction
-80									
-81									
-82									
-83									
-84								END OF BORING 85 ft bgs	
-85									



Notes:
Field impacts refers to visual/olfactory impacts.
Geoprobe from 0-27.5 ft bgs hit obstruction, moved soil boring.
Geoprobe to 25 ft bgs at new location. HSA start 25 ft bgs at new location.
2" split spoon used 25-57 ft bgs, no blow count data recorded..
HSA and air hammer used from 57-85 ft bgs.

Definitions:
NR - No Recovery
ND - Not Documented
SAA - Same As Above
HSA - Hollow stem auger
ft bgs - feet below grade surface
ppm - Parts per million
PID - Photoionization detector
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

AECOM

Boring ID: SB - 106 / MW - 106

Project Name: Bay Rdge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 22, 2010
Date Started/Completed: Apr. 22/May 25, 2010

Drilling Company: Fenley and Nicol
Drilling Method: Geoprobe, HSA, and air hammer
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: ~79 ft bgs
Total Depth: 85 ft bgs
Ground Elevation: 82.78 NAVD88
Converted To Well (Y/N): Yes
Well ID: MW - 106

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description	Well Construction
0	5.0/ 5.0	0.0				FILL		0.0-5.0 ft bgs: FILL: Top 8": concrete. Bottom 52": fine to medium grained sand, <5% fine to medium subrounded gravel, loose, moist, dark brown.	
-1		0.0							
-2		0.0							
-3		0.0		▨	SB-106 (3-4)				
-4		0.0							
-5	1.67/ 5.0	0.0						5.0-10.0 ft bgs: FILL: Top 10": fine to medium grained sand, <5% fine grained subangular gravel up to 1" diameter and silt, loose, moist, dark brown. Bottom 10": very fine grained silty sand, <5% fine grained rounded gravel and coarse grained sand, soft, moist, brown, no odors.	
		0.0							
		0.0							
		0.0							
-10	1.67/ 5.0	0.0				SW		10.0-15.0 ft bgs: WELL GRADED SAND (SW) fine to medium grained sand, ~20% fine to medium grained subangular gravel up to 1.25" diameter, <10% coarse grained sand and silt, loose, moist, brown, no odor.	
		0.0							
		0.0							
-15	1.83/ 5.0	0.0						15.0-20.0 ft bgs: WELL GRADED SAND (SW) fine to medium grained sand, ~35% fine to medium subangular gravel up to 1.25" diameter, <10% coarse grained sand and silt, loose, moist, brown, no odor.	
		0.0							
		0.0							
-20									

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.
HSA and air hammer used from 60-85 ft bgs.

Definitions:
NR - No Recovery
ND - Not Documented
SAA - Same As Above
HSA - Hollow stem auger
ft bgs - feet below grade surface
ppm - Parts per million
PID - Photoionization detector
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NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB - 106 / MW - 106

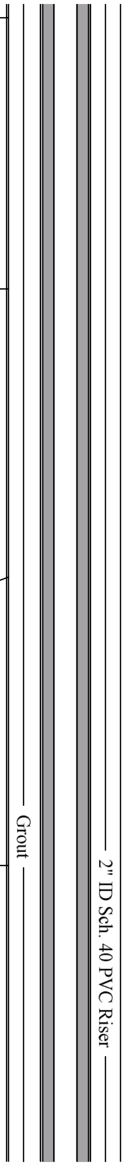
Project Name: Bay Rdge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 22, 2010
Date Started/Completed: Apr. 22/May 25, 2010

Drilling Company: Fenley and Nicol
Drilling Method: Geoprobe, HSA, and air hammer
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: ~79 ft bgs
Total Depth: 85 ft bgs
Ground Elevation: 82.78 NAVD88
Converted To Well (Y/N): Yes
Well ID: MW - 106

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
-20 -21 -22 -23 -24	NR	NR				NR		20.0-25.0 ft bgs: No Recovery, coarse angular gravel and very stiff silt in tip.
-25 -26 -27 -28 -29	2.58/ 5.0	0.0 0.0 0.0 0.0				SM SW		25.0-30.0 ft bgs: Top 20": SILTY SAND (SM) very fine grained silty sand, ~5% fine grained subrounded gravel up to 0.75" diameter, <5% medium to coarse grained sand, firm, moist to wet, brown, no odors. Bottom 11": WELL GRADED SAND (SW) fine to medium grained sand, <30% fine to medium grained subangular gravel up to 1.25" diameter, <5% coarse grained sand, loose, moist, brown, no odors.
-30 -31 -32 -33 -34	NR	NR				NR		30.0-35.0 ft bgs: No Recovery, coarse angular gravel and very stiff silt in tip.
-35 -36 -37 -38 -39 -40	2.67/ 5.0	2966 8427 6610 1894	🟩			SM		35.0-40.0 ft bgs: SILTY SAND (SM) very fine grained silty sand, <10% fine to medium grained subrounded gravel up tp 1" diameter, <5% medium grained sand, stiff, moist, brown, strong naphthalene-varnish-like odor, moderate sheen throughout.

Well Construction



Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.
HSA and air hammer used from 60-85 ft bgs.

Definitions:
NR - No Recovery
ND - Not Documented
SAA - Same As Above
HSA - Hollow stem auger
ft bgs - feet below grade surface
ppm - Parts per million
PID - Photoionization detector
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB - 106 / MW - 106

Project Name: Bay Rdge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 22, 2010
Date Started/Completed: Apr. 22/May 25, 2010

Drilling Company: Fenley and Nicol
Drilling Method: Geoprobe, HSA, and air hammer
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: ~79 ft bgs
Total Depth: 85 ft bgs
Ground Elevation: 82.78 NAVD88
Converted To Well (Y/N): Yes
Well ID: MW - 106

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description	Well Construction
-40 -41 -42 -43 -44	2.17/ 5.0	4956 6686 9999 4428	🟩	▨ (43-45)	SB-106 (43-45)			40.0-45.0 ft bgs: SILTY SAND (SM) very fine grained silty sand, ~5% fine to coarse grained subangular gravel up to 2" diameter, <5% medium grained sand, stiff, moist, brown, strong naphthalene-varnish-like odor, light to moderate sheen throughout.	
-45 -46 -47 -48 -49	3.83/ 5.0	1171 429 274 119	🟦 🟩 🟦			ML		45.0-50.0 ft bgs: SANDY SILT (ML) Top 42": very fine grained sandy silt, stiff, dry, brown, slight to moderate naphthalene-varnish-like odor. Bottom 4": SAA, slight naphthalene-varnish-like odor, moderate sheen from 47-49 ft bgs.	
-50 -51 -52 -53 -54	5.0/ 5.0	334 257 373 726 433	🟦					50.0-55.0 ft bgs: SANDY SILT (ML) silt, ~10% very fine grained sand, stiff, dry to moist, very slight naphthalene-varnish-like odor, no sheen.	
-55 -56 -57 -58 -59 -60	5.0/ 5.0	98.6 78.5 62.8 101 98.6	🟦	▨ (58-60)	SB-106 (58-60)			55.0-60.0 ft bgs: SANDY SILT (ML) Top 16": SAA Bottom 44": silt, ~10% very fine grained sand and clay, moist, brown, very slight naphthalene-varnish-like odor, no sheen. End of boring with geoprobe at 60 ft bgs	

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.
HSA and air hammer used from 60-85 ft bgs.

Definitions:
NR - No Recovery
ND - Not Documented
SAA - Same As Above
HSA - Hollow stem auger
ft bgs - feet below grade surface
ppm - Parts per million
PID - Photoionization detector
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

AECOM

Boring ID: SB - 106 / MW - 106

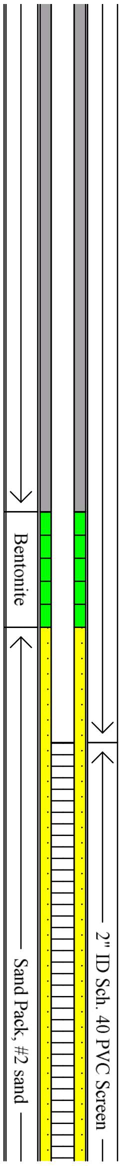
Project Name: Bay Rdge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 22, 2010
Date Started/Completed: Apr. 22/May 25, 2010

Drilling Company: Fenley and Nicol
Drilling Method: Geoprobe, HSA, and air hammer
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: ~79 ft bgs
Total Depth: 85 ft bgs
Ground Elevation: 82.78 NAVD88
Converted To Well (Y/N): Yes
Well ID: MW - 106

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
-60								HSA and air hammer were used from 60 ft bgs to depth of 85 ft bgs due to large cobbles and boulders. The lithology was not documented as per drilling methods described in work plan.
-61								
-62								
-63								
-64								
-65								
-66								
-67								
-68								
-69								
-70								
-71								
-72								
-73								
-74								
-75								
-76								
-77								
-78								
-79								
-80								

Well Construction



Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.
HSA and air hammer used from 60-85 ft bgs.

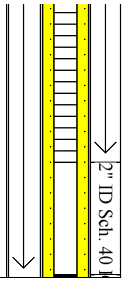
Definitions:
NR - No Recovery
ND - Not Documented
SAA - Same As Above
HSA - Hollow stem auger
ft bgs - feet below grade surface
ppm - Parts per million
PID - Photoionization detector
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB - 106 / MW - 106

Page 5 of 5

Project Name: Bay Rdge Former Gas Holder A&B	**Drilling Company:** Fenley and Nicol	**Water Level:** ~79 ft bgs
Project Number: 60137360	**Drilling Method:** Geoprobe, HSA, and air hammer	**Total Depth:** 85 ft bgs
Client: National Grid	**Sampling Method:** Disposable plastic liner	**Ground Elevation:** 82.78 NAVD88
Date Pre-Cleared: Apr. 22, 2010	**Boring Diameter:** 6 inches	**Converted To Well (Y/N):** Yes
Date Started/Completed: Apr. 22/May 25, 2010	**Logged By:** Ron Kantor	**Well ID:** MW - 106

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description	Well Construction
-81									
-82									
-83									
-84								END OF BORING 85 ft bgs	
-85									



Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.
HSA and air hammer used from 60-85 ft bgs.

Definitions:

NR - No Recovery	ft bgs - feet below grade surface
ND - Not Documented	ppm - Parts per million
SAA - Same As Above	PID - Photoionization detector
HSA - Hollow stem auger	U.S.C.S. - Unified Soil Classification System
	NAVD 88 - North American Vertical Datum of 1988

AECOM

Boring ID: SB - 107

Page 1 of 2

Project Name: Bay Ridge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 13, 2010
Date Started/Completed: Apr. 13, 2010

Drilling Company: Fenley annd Nicol
Drilling Method: Geoprobe
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: NA
Total Depth: 40 ft bgs
Ground Elevation: 78.97 NAVD88
Converted To Well (Y/N): No
Well ID: NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
0	3.0/ 5.0	0.0				FILL		0.0-5.0 ft bgs: FILL: fine grained sand, ~35% silt, <5% coal and brick fragments, medium grained angular gravel up to 1.5" diameter, dry to moist, brown.
-1								
-2		0.0		▨	SB-107 (2-3)			
-3		0.0						
-4								
-5	4.58/ 5.0	0.0						5.0-10.0 ft bgs: Top 28": FILL: very fine grained sand, ~20% silt, firm, moist, tan-brown. Middle 23": FILL: silt, ~20% very fine grained sand, stiff, moist to wet, reddish brown. Bottom 4": POORLY GRADED SAND (SP) fine grained sand, <5% silt and fine grained subangular gravel, moist, tan-brown.
-6		0.0						
-7		0.0						
-8		0.0						
-9		0.0						
-10	4.08/ 5.0	0.0				SP		10.0-15.0 ft bgs: Top 37": POORLY GRADED SAND (SP) fine to medium grained sand, <5% coarse grained sand and silt, loose, dry, tan-brown. Bottom 12": SILTY SAND (SM) very fine grained silty sand, <5% medium grained sand, firm, dry, brown.
-11		0.0						
-12		0.0						
-13								
-14		0.0				SM		
-15	3.83/ 5.0	0.0				SP		15.0-20.0 ft bgs: Top 15": POORLY GRADED SAND (SP) fine grained sand, ~20% medium grained sand, <5% silt, loose, dry, tan-brown. Bottom 31": SANDY SILT (ML) very fine grained sandy silt, firm, dry, brown.
-16		0.0						
-17		0.0				ML		
-18								
-19		0.0						
-20								20.0-25.0 ft bgs: SANDY SILT (ML)

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
ft bgs - feet below grade surface
ppm - Parts per million
PID - Photoionization detector
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

AECOM

Boring ID: SB - 107

Project Name: Bay Ridge Former Gas Holder A&B	**Drilling Company:** Fenley annd Nicol	**Water Level:** NA
Project Number: 60137360	**Drilling Method:** Geoprobe	**Total Depth:** 40 ft bgs
Client: National Grid	**Sampling Method:** Disposable plastic liner	**Ground Elevation:** 78.97 NAVD88
Date Pre-Cleared: Apr. 13, 2010	**Boring Diameter:** 6 inches	**Converted To Well (Y/N):** No
Date Started/Completed: Apr. 13, 2010	**Logged By:** Ron Kantor	**Well ID:** NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
-21	3.75/ 5.0	0.0 0.0						Top 43": very fine grained sandy silt, firm, dry, brown.
-22								Bottom 2": silt, stiff, moist, brown.
-23		0.0						
-24		0.0		▨	SB-107 (24-25)			
-25	3.33/ 5.0	0.0						25.0-30.0 ft bgs: SANDY SILT (ML) silt, ~20% medium to coarse grained sand, ~10% fine grained sand and gravel up to 2" diameter, start till unit, stiff, dry, brown.
-26								
-27		0.0						
-28								
-29		0.0						
-30	3.08/ 5.0	0.0						30.0-35.0 ft bgs: SANDY SILT (ML) silt, ~35% medium grained sand, ~10% coarse grained sand and fine grained angular gravel, stiff, moist to dry, brown.
-31								
-32		0.0						
-33								
-34		0.0						
-35	3.75/ 5.0	0.0						35.0-40.0 ft bgs: SANDY SILT (ML) silt, ~20% fine grained sand and fine to medium grained angular gravel, 4" gravel layer at 37' 5" bgs, <5% medium to coarse grained sand, stiff, dry to moist, brown.
-36		0.0						
-37								
-38		0.0						
-39		0.0		▨	SB-107 (39-40)			
-40								END OF BORING 40 ft bgs

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
ft bgs - feet below grade surface
ppm - Parts per million
PID - Photoionization detector
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

AECOM

Boring ID: SB - 108

Project Name: Bay Ridge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 13, 2010
Date Started/Completed: Apr. 13, 2010

Drilling Company: Fenley annd Nicol
Drilling Method: Geoprobe
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: NA
Total Depth: 50 ft bgs
Ground Elevation: 76.90 NAVD88
Converted To Well (Y/N): No
Well ID: NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
0 -1 -2 -3 -4	3.83/ 5.0	0.1 0.1 0.2 0.1		▨	SB-108 (3-4)	FILL		0.0-5.0 ft bgs: FILL: Top 16": fine grained sand, ~20% brick and concrete, <5% medium to coarse grained sand and coal, firm, moist, dark brown, no odor. Upper mid 12": fine grained sand, ~10% silt, <5% coal ash, firm, moist, brown to orange-brown, no odor. Lower mid 7": coal and coal ash cinders, moist. Bottom 11": very fine grained silty sand, <5% gravel in tip, moist, brown, no odor.
-5 -6 -7 -8 -9	4.0/ 5.0	0.0 0.0 0.0 0.0				SP SM		5.0-10.0 ft bgs: Top 30": POORLY GRADED SAND (SP) fine grained sand, <5% silt lenses <0.25" thick, large gneiss gravel up to 2" diameter at contact, tan. Bottom 18": SILTY SAND (SM) silty fine grained sand, ~15% silt, ~10% medium grained sand, <5% coarse grained sand, moist, brown.
-10 -11 -12 -13 -14	4.08/ 5.0	0.0 0.0 0.0 0.0				SP SW ML		10.0-15.0 ft bgs: Top 8": POORLY GRADED SAND (SP) fine grained sand, <5% silt, bottom 1" broken gravel, tan-brown. Middle 8": WELL GRADED SAND (SW) fine to medium grained sand, ~10% silt, <5% coarse grained sand, moist, tan-brown. Bottom 33": SANDY SILT (ML) silt, ~20% medium to coarse grained angular gravel, ~10% very fine grained sand, very stiff, dry, brown.
-15 -16 -17 -18 -19	3.33/ 5.0	0.0 0.0 0.0 0.0						15.0-20.0 ft bgs: SAA, ~25-30% gravel.
-20								20.0-25.0 ft bgs: SAA, ~10% gravel.

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
ppm - parts per million
ft bgs - feet below grade surface
PID - Photoionization detector
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB - 108

Project Name: Bay Ridge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 13, 2010
Date Started/Completed: Apr. 13, 2010

Drilling Company: Fenley annd Nicol
Drilling Method: Geoprobe
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: NA
Total Depth: 50 ft bgs
Ground Elevation: 76.90 NAVD88
Converted To Well (Y/N): No
Well ID: NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
-21	2.67/ 5.0	0.0						
-22		0.0						
-23 -24		0.0						
-25 -26	3.17/ 5.0	0.0						25.0-30.0 ft bgs: SAA
-27		0.0						
-28 -29		0.0						
-30 -31	2.83/ 5.0	0.0	▨					30.0-35.0 ft bgs: SANDY SILT (ML) very fine grained sandy silt, ~20% fine to medium grained angular gravel up to 1.5" diameter, firm, moist, brown, very slight naphthalene-like odor.
-32		0.1	▨					
-33 -34		0.2	▨	▨	SB-108 (34-35)			
-35 -36	3.25/ 5.0	0.0						35.0-40.0 ft bgs: SANDY SILT (ML) very fine grained sandy silt, ~20% fine to medium grained subangular gravel up to 1.5" diameter, <5% medium grained sand, firm, moist, brown, no odors.
-37		0.0						
-38		0.0						
-39 -40		0.0						
	3.0/	0.0						40.0-45.0 ft bgs: SANDY SILT (ML) fine grained sandy silt, ~20%

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
ppm - parts per million
ft bgs - feet below grade surface
PID - Photoionization detector
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

AECOM

Boring ID: SB - 108

Project Name: Bay Ridge Former Gas Holder A&B	**Drilling Company:** Fenley annd Nicol	**Water Level:** NA
Project Number: 60137360	**Drilling Method:** Geoprobe	**Total Depth:** 50 ft bgs
Client: National Grid	**Sampling Method:** Disposable plastic liner	**Ground Elevation:** 76.90 NAVD88
Date Pre-Cleared: Apr. 13, 2010	**Boring Diameter:** 6 inches	**Converted To Well (Y/N):** No
Date Started/Completed: Apr. 13, 2010	**Logged By:** Ron Kantor	**Well ID:** NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
-41	5.0							fine to medium grained subrounded gravel up to 2" diameter, <10% medium to coarse grained sand, firm, moist, brown, no odors.
-42		0.0						
-43		0.0						
-44								
-45	1.58/ 5.0	0.0						45.0-50.0 ft bgs: SANDY SILT (ML) fine grained sandy silt, ~10% fine to medium grained subangular gravel and medium to coarse grained sand, firm, moist, brown, no odor.
-46								
-47		0.0						
-48		0.0						
-49				▨	SB-108 (49-50)			END OF BORING 50 ft bgs
-50								

Notes:

Field impacts refers to visual/olfactory impacts.

Hand clearance from 0-5 ft bgs.

Geoprobe started at 5 ft bgs.

Definitions:

NA - Not Applicable

NR - No Recovery

ND - Not Documented

SAA - Same As Above

ppm - parts per million

ft bgs - feet below grade surface

PID - Photoionization detector

U.S.C.S. - Unified Soil Classification System

NAVD 88 - North American Vertical Datum of 1988

AECOM

Boring ID: SB - 109

Project Name: Bay Ridge Former Gas Holder A&B	**Drilling Company:** Fenley annd Nicol	**Water Level:** NA
Project Number: 60137360	**Drilling Method:** Geoprobe	**Total Depth:** 11 ft bgs
Client: National Grid	**Sampling Method:** Disposable plastic liner	**Ground Elevation:** 80.14 NAVD88
Date Pre-Cleared: Apr. 14, 2010	**Boring Diameter:** 6 inches	**Converted To Well (Y/N):** No
Date Started/Completed: Apr. 14, 2010	**Logged By:** Ron Kantor	**Well ID:** NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
0	3.17/ 5.0	0.0				FILL	⬡	0.0-5.0 ft bgs: FILL: fine grained sand, ~15% subrounded gravel up to 1.5" diameter, ~10% medium to coarse grained sand, loose, dry, no odor.
-1		0.0		▨	SB-109 (1-2)		⬡	
-2		0.0					⬡	
-3							⬡	
-4		0.0					⬡	
-5	3.0/ 5.0	0.0					⬡	5.0-10.0 ft bgs: FILL:
-6		0.0					⬡	Top 20": fine grained sand, <10% medium grained sand and fine grained subrounded gravel up to 0.75" diameter, loose, wet, brown.
-7		0.1					⬡	Bottom 16": fine grained sand, <10% medium to coarse grained sand and ash cinders, loose, wet, stained black, slight naphthalene-like odor, very slight sheen.
-8			🟩				⬡	
-9		1.8	🟩	▨	SB-109 (9-10)		⬡	
-10	0.5/ 1.0	NA					■	10.0-11.0 ft bgs: concrete slab, possible holder pad.
-11								END OF BORING 11 ft bgs

Notes:

Field impacts refers to visual/olfactory impacts.

Hand clearance from 0-5 ft bgs.

Geoprobe started at 5 ft bgs.

Definitions:

NA - Not Applicable

NR - No Recovery

ND - Not Documented

SAA - Same As Above

ppm - parts per million

ft bgs - feet below grade surface

PID - Photoionization detector

U.S.C.S. - Unified Soil Classification System

NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB - 110

Project Name: Bay Ridge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 14, 2010
Date Started/Completed: Apr. 14, 2010

Drilling Company: Fenley annd Nicol
Drilling Method: Geoprobe
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: NA
Total Depth: 9 ft bgs
Ground Elevation: 78.45 NAVD88
Converted To Well (Y/N): No
Well ID: NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
0	4.75/ 5.0	0.2				FILL		0.0-5.0 ft bgs: FILL: Top 10": fine grained sand, <5% fine grained subrounded gravel and medium to coarse grained sand, loose, dry, dark brown. Upper mid 7": brick and concrete. Middle 9": fine grained sand, <10% fine grained subrounded gravel, silt and coal, loose, dry, dark brown. Bottom 31": silt, ~10% fine grained subangular gravel, <10% brick, coal, and ash cinders, two dark grey clay bands about 1" thick at 3' 4" and 4' 4" bgs, very stiff, dry, dark brown to grey brown, slight naphthalene-varnish-like odor.
-1		0.0						
-2		0.8		▨	SB-110 (2-3)			
-3		0.4	🟦					
-4		0.2	🟦					
-5	4.0/ 4.0	8.6	🟦					5.0-9.0 ft bgs: FILL: Top 32": silt, ~30% very fine grained brown sand, ~10% coal ash, <10% fine grained subangular gravel, brick and glass, stiff, dry, dark brown to dark grey brown, moderate to strong naphthalene-varnish-like odor. Bottom 16": very fine grained sand, ~35% wood fragments, ~10% clayey silt, <10% ash cinders and small brick fragments, 4" thick layer of concrete, weathered from 8' 1" to 8' 5" (possible holder pad), medium dense, moist, dark brown to black, stained, strong naphthalene-varnish-like odor.
-6		47.9	🟦					
-7		206	🟦					
-8		542	🟦	▨	SB-110 (8-9)			END OF BORING 9 ft bgs
-9								

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
ppm - parts per million
ft bgs - feet below grade surface
PID - Photoionization detector
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB-111 / MW - 111

Page 1 of 4

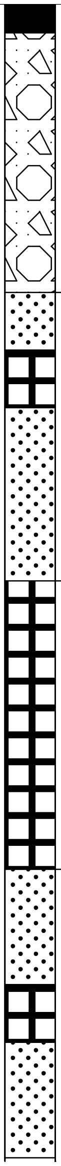
Project Name: Bay Rdge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 7, 2010
Date Started/Completed: Apr. 20/May 4, 2010

Drilling Company: Fenley and Nicol
Drilling Method: Geoprobe, HSA, and air hammer
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Ron Kantor

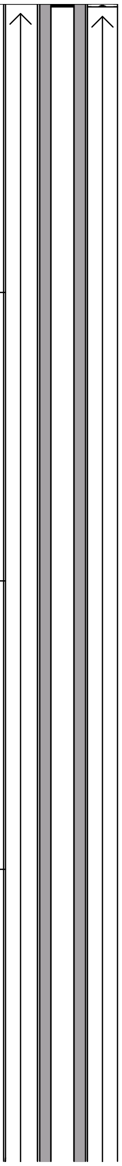
Water Level: ~73 ft bgs
Total Depth: 80 ft bgs
Ground Elevation: 75.91 NAVD88
Converted To Well (Y/N): Yes
Well ID: MW - 111

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Geologic Description
0	4.0/ 5.0	ND				FILL	0.0-5.0 ft bgs: FILL: Top 6": ASPHALT Middle 38": fine grained sand, <5% medium grained sand, loose, dry, brown, no odor. Bottom 4": fine to medium grained sand, ~10% ash cinders, ~5% brick, loose, moist, dark brown.
-1		0.0					
-2		0.0					
-3		0.0					
-4		0.0		▨	SB-111 (4-5)		
-5	4.25/ 5.0	0.0				SP-ML-SP	5.0-10.0 ft bgs: Top 13": POORLY GRADED SAND (SP) fine grained sand, ~10% silt, <10% medium to coarse subangular gravel up to 0.5" diameter, dry, brown. Middle 6": SANDY SILT (ML) silt, <10% fine grained sand, wet, brown, no odor. Bottom 32": POORLY GRADED SAND (SP) very fine grained sand, ~10% silt and fine grained subangular gravel, moderately dense, moist, brown, no odor.
-6		0.0					
-7		0.0					
-8		0.0					
-9		0.0					
-10	3.5/ 5.0	0.0				SM	10.0-15.0 ft bgs: SILTY SAND (SM) very fine grained silty sand, ~10% fine grained gravel, up to 0.75" diameter, subrounded, ~10% medium grained sand, moderately dense, dry, brown, no odor.
-11		0.0					
-12		0.3		▨	SB-111 (12-14)		
-13		0.0		▨			
-14		0.0					
-15	3.42/ 5.0	0.0				SP-SM-SP	15.0-20.0 ft bgs: Top 5": POORLY GRADED SAND (SP) fine grained sand, ~10% medium grained sand, loose, dry, tan-brown. Next 5": POORLY GRADED SAND (SP) fine grained sand, ~5% fine grained subrounded gravel, dry, orange-brown. Next 2": POORLY GRADED SAND (SP) fine grained sand, loose, dry, dark brown. Next 10": POORLY GRADED SAND (SP) fine grained sand, ~10% medium grained sand, loose, dry, tan-brown. Next 14": SANDY SILT (SM) silt, ~25% fine grained
-16		0.0					
-17		0.0					
-18		0.0					
-19		0.0					
-20							

Lithology



Well Construction



Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.
HSA and air hammer used from 75 to 80 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
PID - Photoionization detector
ppm - parts per million
ft bgs - feet below grade surface
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

AECOM

Boring ID: SB-111 / MW - 111

Project Name: Bay Rdge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 7, 2010
Date Started/Completed: Apr. 20/May 4, 2010

Drilling Company: Fenley and Nicol
Drilling Method: Geoprobe, HSA, and air hammer
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: ~73 ft bgs
Total Depth: 80 ft bgs
Ground Elevation: 75.91 NAVD88
Converted To Well (Y/N): Yes
Well ID: MW - 111

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description	Well Construction
-20	NR	0.0				NR		sand, ~5% fine to medium grained angular gravel, very stiff, dry, brown. Bottom 6": weathered powdery gneiss cobble. 20.0-25.0 ft bgs: No Recovery, sample tube damaged.	
-21									
-22									
-23									
-24									
-25	3.5/ 5.0	0.0				SM		25.0-30.0 ft bgs: SILTY SAND (SM) very fine grained silty sand, ~10% fine to medium grained gravel,, up to 0.5" diameter, subrounded, <5% medium to coarse grained sand, stiff, dry, brown, no odor.	
-26		0.0							
-27		0.0							
-28		0.0							
-29		0.0							
-30	3.33/ 5.0	0.0						30.0-35.0 ft bgs: SILTY SAND (SM) very fine grained silty sand, ~30% fine to medium grained subrounded gravel, large 4" weathered siltstone at 32' 8" bgs, stiff, dry, brown, no odor.	
-31		0.0							
-32		0.0							Grout
-33		0.0							2" ID Sch. 40 PVC Riser
-34		0.0							
-35	3.75/ 5.0	0.0						35.0-40.0 ft bgs: SILTY SAND (SM) very fine grained silty sand, silt decreasing, ~15% fine to medium grained subrounded gravel up to 0.5", ~10% medium to coarse grained sand, stiff, dry to slightly moist, brown.	
-36		0.0							
-37		0.0							
-38		0.0							
-39		0.0							
-40									

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.
HSA and air hammer used from 75 to 80 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
PID - Photoionization detector
ppm - parts per million
ft bgs - feet below grade surface
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB-111 / MW - 111

Project Name: Bay Rdge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 7, 2010
Date Started/Completed: Apr. 20/May 4, 2010

Drilling Company: Fenley and Nicol
Drilling Method: Geoprobe, HSA, and air hammer
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: ~73 ft bgs
Total Depth: 80 ft bgs
Ground Elevation: 75.91 NAVD88
Converted To Well (Y/N): Yes
Well ID: MW - 111

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description	Well Construction
-40	2.25/ 5.0	0.0						40.0-45.0 ft bgs: SILTY SAND (SM) very fine grain silty sand, ~20% fine to medium grained subangular to angular gravel, ~5% medium to coarse grained sand, stiff, dry, brown.	
-41		0.0							
-42		0.0							
-43		0.0							
-44		0.0							
-45	1.67/ 5.0	0.0				GW		45.0-50.0 ft bgs: WELL GRADED GRAVEL (GW) gravelly very fine grained sand and silt, <5% medium to coarse grained sand, dense, dry, brown, glacial till structure.	
-46		0.0							
-47		0.0							
-48		0.0							
-49		0.0							
-50	2.67/ 5.0	0.0				SM		50.0-55.0 ft bgs: SILTY SAND (SM) very fine grained silty sand, ~35% fine to medium grained subangular to subrounded gravel up to 1" diameter, stiff, dry to moist, brown, no odor.	
-51		0.0							
-52		0.0							
-53		0.0							
-54		0.0							
-55	1.67/ 5.0	0.0						55.0-60.0 ft bgs: SILTY SAND (SM) very fine grained silty sand, ~20% fine to coarse subrounded gravel, large 4" broken cobble near bottom, very stiff, dry, brown, no odor.	
-56		0.0							
-57		0.0							
-58		0.0							
-59		0.0							
-60									

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.
HSA and air hammer used from 75 to 80 ft bgs.

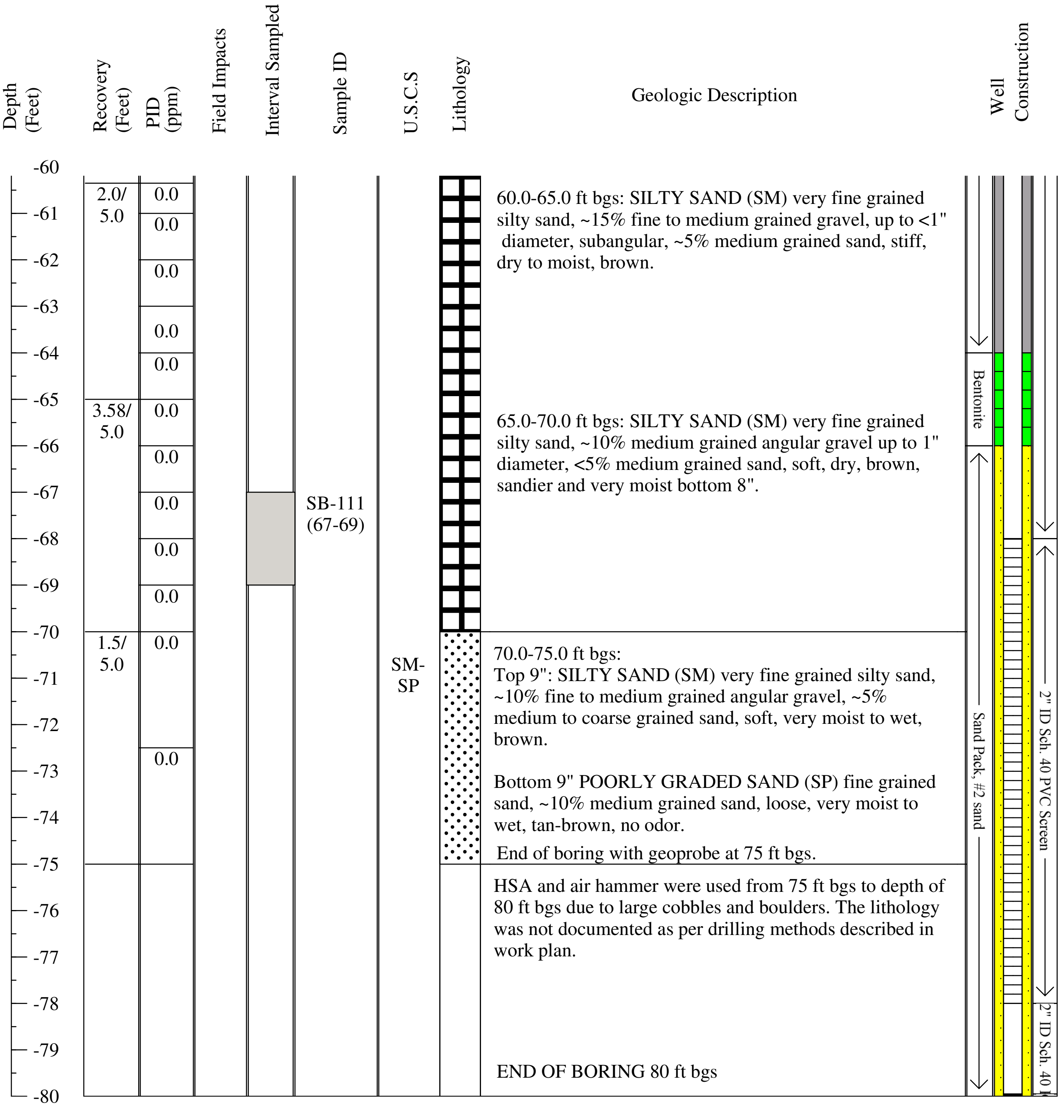
Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
PID - Photoionization detector
ppm - parts per million
ft bgs - feet below grade surface
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB-111 / MW - 111

Project Name: Bay Rdge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 7, 2010
Date Started/Completed: Apr. 20/May 4, 2010

Drilling Company: Fenley and Nicol
Drilling Method: Geoprobe, HSA, and air hammer
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: ~73 ft bgs
Total Depth: 80 ft bgs
Ground Elevation: 75.91 NAVD88
Converted To Well (Y/N): Yes
Well ID: MW - 111



Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description	Well Construction
-60 to -65	2.0/ 5.0	0.0 0.0 0.0 0.0 0.0						60.0-65.0 ft bgs: SILTY SAND (SM) very fine grained silty sand, ~15% fine to medium grained gravel, up to <1" diameter, subangular, ~5% medium grained sand, stiff, dry to moist, brown.	
-65 to -70	3.58/ 5.0	0.0 0.0 0.0 0.0 0.0		67-69	SB-111 (67-69)			65.0-70.0 ft bgs: SILTY SAND (SM) very fine grained silty sand, ~10% medium grained angular gravel up to 1" diameter, <5% medium grained sand, soft, dry, brown, sandier and very moist bottom 8".	Bentonite
-70 to -75	1.5/ 5.0	0.0 0.0				SM-SP		70.0-75.0 ft bgs: Top 9": SILTY SAND (SM) very fine grained silty sand, ~10% fine to medium grained angular gravel, ~5% medium to coarse grained sand, soft, very moist to wet, brown. Bottom 9" POORLY GRADED SAND (SP) fine grained sand, ~10% medium grained sand, loose, very moist to wet, tan-brown, no odor. End of boring with geoprobe at 75 ft bgs.	Sand Pack, #2 sand 2" ID Sch. 40 PVC Screen
-75 to -80								HSA and air hammer were used from 75 ft bgs to depth of 80 ft bgs due to large cobbles and boulders. The lithology was not documented as per drilling methods described in work plan. END OF BORING 80 ft bgs	2" ID Sch. 40

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.
HSA and air hammer used from 75 to 80 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above

PID - Photoionization detector
ppm - parts per million
ft bgs - feet below grade surface
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB-112/MW-112

Project Name: Bay Rdge Former Gas Holder A&B	**Drilling Company:** Fenley and Nicol	**Water Level:** ~72 ft bgs
Project Number: 60137360	**Drilling Method:** Geoprobe, HSA, and air hammer	**Total Depth:** 80 ft bgs
Client: National Grid	**Sampling Method:** Disposable plastic liner	**Ground Elevation:** 76.50 NAVD88
Date Pre-Cleared: Apr. 21, 2010	**Boring Diameter:** 6 inches	**Converted To Well (Y/N):** Yes
Date Started/Completed: Apr. 21/May 5, 2010	**Logged By:** Ron Kantor	**Well ID:** MW - 112

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description	Well Construction
0	3.33/ 5.0	0.0		▨	SB-112 (0.5-1.5)	FILL		0.0-5.0 ft bgs: FILL Top 12": fine to medium grained sand and ash cinders, ~15% fine to medium grained gravel, dry, brown, no odor. Middle 24": very fine grained sand and silt, <5% fine grained subrounded gravel, soft, moist, brown, no odor. Bottom 4": fine to medium grained sand and gravel, <5% silt, brown.	
-1		0.0							
-2		0.0							
-3		0.0							
-4									
-5	2.58/ 5.0	193	🟦			ML		5.0-10.0 ft bgs: SANDY SILT (ML) very fine grained sandy silt, ~20% medium to coarse grained gravel up to 1.5" diameter, <5% medium grained sand, stiff, moist, brown, moderate naphthalene-like odor, light sheen on soil from 7-10 ft bgs.	
-6		663	🟦						
-7		1295	🟩						
-8		840	🟩						
-9			🟩						
-10	2.92/ 5.0	310	🟩			SM		10.0-15.0 ft bgs: SILTY SAND (SM) very fine grained silty sand, <5% fine grained subangular gravel and medium grained sand, firm, moist, brown, strong naphthalene-like odor, light to moderate sheen on soil.	
-11		873	🟩						
-12		1305	🟩						
-13		3269	🟩						
-14			🟩	▨	SB-112 (14-15)				
-15	ND	ND	🟩					15.0-20.0 ft bgs: SAA, light sheen.	
-16		ND	🟩						
-17		ND	🟩						
-18		ND	🟩						
-19			🟩						
-20									

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.
HSA and air hammer used from 45.5-80 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
PID - Photoionization Detector
ppm - Parts per million
ft bgs - feet below grade surface
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

AECOM

Boring ID: SB-112/MW-112

Project Name: Bay Rdge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 21, 2010
Date Started/Completed: Apr. 21/May 5, 2010

Drilling Company: Fenley and Nicol
Drilling Method: Geoprobe, HSA, and air hammer
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: ~72 ft bgs
Total Depth: 80 ft bgs
Ground Elevation: 76.50 NAVD88
Converted To Well (Y/N): Yes
Well ID: MW - 112

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description	Well Construction
-20	3.17/ 5.0	391				ML- SP		20-25 ft bgs: SANDY SILT (ML)/POORLY GRADED SAND (SP) Top 10": silt, dry, brown. Upper mid 4": fine grained sand, dry, brown. Middle 14": silt, dry, brown. Lower mid 5": fine grained sand, dry, brown. Bottom 5": silt, dry, brown.	Grout 2" ID Sch. 40 PVC Riser
-21		27.6							
-22		31.8							
-23		16.5							
-24		103							
-25	3.42/ 5.0	98.4	🟦					25.0-30.0 ft bgs: SANDY SILT (ML) very fine grained sand silt, <10% fine to medium grained subrounded gravel up to 1.25" diameter, <10% medium grained sand, dry, brown, slight naphthalene-like odor.	
-26		53.6	🟦						
-27			🟦						
-28		71.8	🟦						
-29		20.3	🟦						
-30	3.33/ 5.0	64.6	🟦			SM		30.0-35.0 ft bgs: SILTY SAND (SM) very fine grained silty sand, ~10% fine to medium grained subrounded gravel up to 1.5" diameter, ~5% medium to coarse grained sand, stiff, dry, brown, slight naphthalene-like odor.	
-31		245	🟦						
-32			🟦						
-33		44.7	🟦						
-34		21.8	🟦						
-35	3.0/ 5.0	292	🟦					35.0-40.0 ft bgs: SILTY SAND (SM) very fine grained silty sand, ~10% fine to medium grained subrounded gravel up to 1" diameter, ~5% medium to coarse grained sand, stiff, dry, brown, slight to moderate naphthalene-like odor.	
-36			🟦						
-37		199	🟦						
-38			🟦						
-39			🟦						
-40		149	🟦						

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.
HSA and air hammer used from 45.5-80 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above

PID - Photoionization Detector
ppm - Parts per million
ft bgs - feet below grade surface
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

AECOM

Boring ID: SB-112/MW-112

Project Name: Bay Rdge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 21, 2010
Date Started/Completed: Apr. 21/May 5, 2010

Drilling Company: Fenley and Nicol
Drilling Method: Geoprobe, HSA, and air hammer
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: ~72 ft bgs
Total Depth: 80 ft bgs
Ground Elevation: 76.50 NAVD88
Converted To Well (Y/N): Yes
Well ID: MW - 112

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description	Well Construction
-41	3.58/ 5.0	386 205	🟦				⊞	40.0-45.0 ft bgs: SILTY SAND (SM) very fine grained silty sand, <10% fine to medium grained subrounded gravel up to 1.25" diameter, <5% medium to coarse grained sand, stiff, dry, brown, slight to moderate naphthalene-like odor.	
-42		137	🟦				⊞		
-43		318	🟦				⊞		
-44		195	🟦	▨	SB-112 (44-45.5)		⊞	45.0-45.5 ft bgs: SAA, hit obstruction.	
-45	0.5/ 0.5	328	🟦	▨			⊞	End of boring with geoprobe at 45.5 ft bgs.	
-46								HSA and air hammer were used from 45.5 ft bgs to depth of 80 ft bgs due to large cobbles and boulders. The lithology was not documented as per drilling methods described in work plan.	
-47									
-48									
-49									
-50									
-51									
-52									
-53									
-54									
-55									
-56									
-57									
-58									
-59									
-60									

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.
HSA and air hammer used from 45.5-80 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
PID - Photoionization Detector
ppm - Parts per million
ft bgs - feet below grade surface
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

AECOM

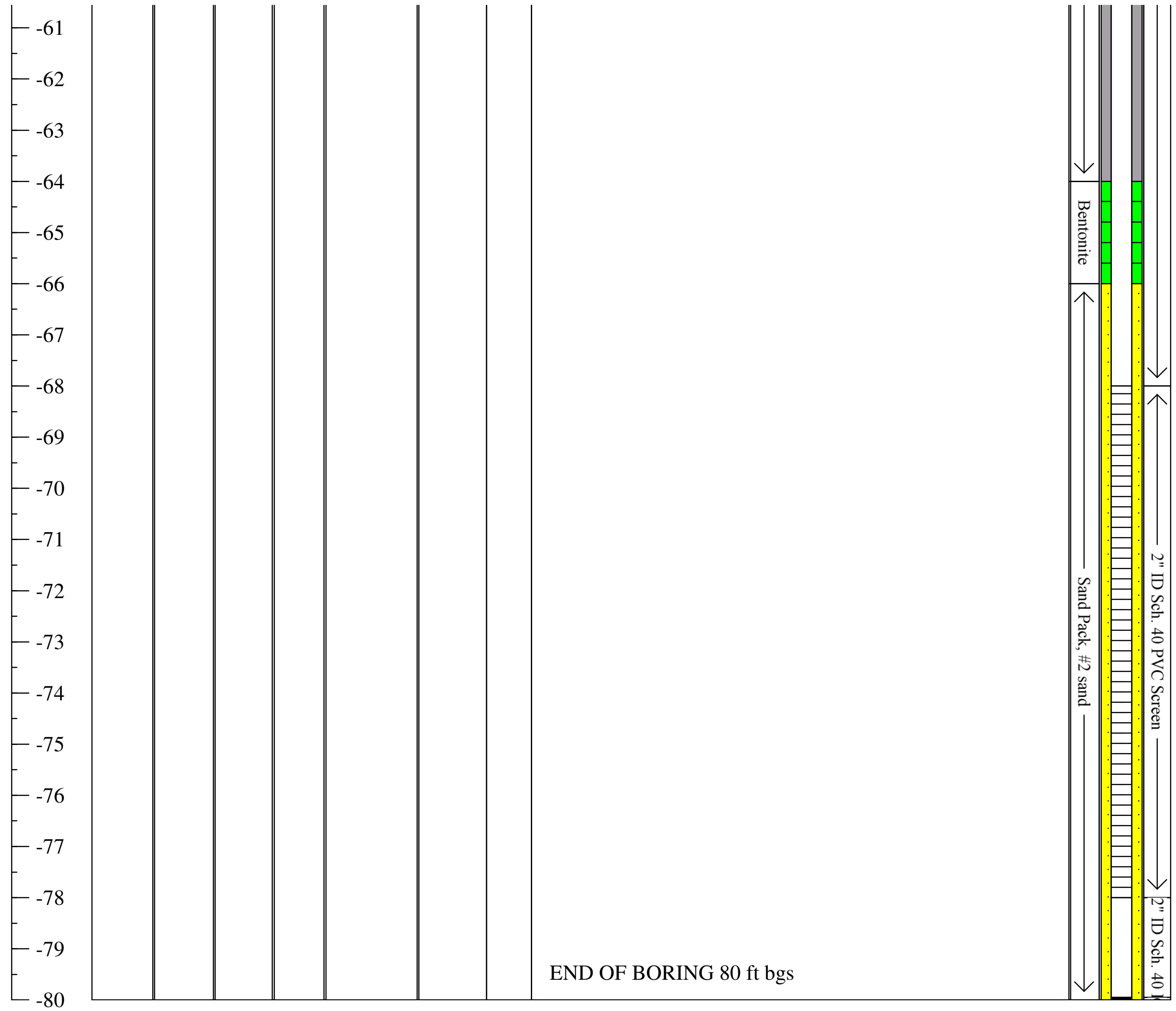
Boring ID: SB-112/MW-112

Project Name: Bay Rdge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 21, 2010
Date Started/Completed: Apr. 21/May 5, 2010

Drilling Company: Fenley and Nicol
Drilling Method: Geoprobe, HSA, and air hammer
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: ~72 ft bgs
Total Depth: 80 ft bgs
Ground Elevation: 76.50 NAVD88
Converted To Well (Y/N): Yes
Well ID: MW - 112

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description	Well Construction



END OF BORING 80 ft bgs

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.
HSA and air hammer used from 45.5-80 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
PID - Photoionization Detector
ppm - Parts per million
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AECOM

Boring ID: SB - 113

Page 1 of 2

Project Name: Bay Ridge Former Gas Holder A&B	**Drilling Company:** Fenley annd Nicol	**Water Level:** NA
Project Number: 60137360	**Drilling Method:** Geoprobe	**Total Depth:** 42 ft bgs
Client: National Grid	**Sampling Method:** Disposable plastic liner	**Ground Elevation:** 77.59 NAVD88
Date Pre-Cleared: Apr. 7, 2010	**Boring Diameter:** 6 inches	**Converted To Well (Y/N):** No
Date Started/Completed: Apr. 20, 2010	**Logged By:** Ron Kantor	**Well ID:** NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
0 -1	4.0/ 5.0	0.0	 🟦			FILL		0.0-5.0 ft bgs: FILL: Top 10": Asphalt Bottom 38": fine to medium grained sand, ~10% fine grained angular gravel, ~5% brick and ash cinders, moist, dark brown, slight fuel oil-like odor.
-2		0.0	🟦					
-3		1.9	🟦					
-4		51.9	🟦	▨	SB-113 (4-5)			
-5 -6	3.5/ 5.0	21.5	🟧					5.0-10.0 ft bgs: FILL: Top 19": fine to medium grained sand, ~20% fine to medium grained angular gravel and concrete, <5% ash cinder and brick, moist, dark brown, product coated, strong fuel oil-like odor. Middle 18": weathered concrete with wire mesh, strong fuel oil-like odor. Bottom 5": fine grained gravelly sand, <5% silt, moist, dark brown, strong fuel oil-like odor.
-7		866	🟧 🟦					
-8		120	🟦					
-9		567	🟦					
-10 -11	2.5/ 5.0	24.3	🟧					10.0-15.0 ft bgs: FILL: Top 21": fine grained sand, ~10% fine grained subrounded gravel, <5% silt, loose, very moist, dark brown to black, stained/coated, strong fuel oil-like odor. Bottom 9": fine grained silty sand, <5% medium grained sand, very firm, moist, brown, moderate naphthalene-like odor.
-12		56.8	🟧 🟦					
-13		122	🟦	▨	SB-113 (13-14)			
-14		94.6	🟦					
-15 -16	3.0/ 5.0	28.4	🟦			SM		15.0-20.0 ft bgs: SILTY SAND (SM) fine grained silty sand, <10% fine to medium grained angular gravel up to 0.75" diameter, <10% medium grained sand, firm, moist, brown, moderate naphthalene-like odor.
-17		22.8	🟦					
-18		22.2	🟦					
-19		12.0	🟦					
-20 -21	2.67/ 5.0	12.2	🟦					20.0-25.0 ft bgs: SILTY SAND (SM) fine grained silty sand, <5% fine grained subrounded gravel and medium grained sand, soft, moist to dry, brown, slight naphthalene-like odor.
		3.6	🟦					

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
PID - Photoionization Detector
ft bgs - feet below grade surface
ppm - Parts per million
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB - 113

Project Name: Bay Ridge Former Gas Holder A&B	**Drilling Company:** Fenley annd Nicol	**Water Level:** NA
Project Number: 60137360	**Drilling Method:** Geoprobe	**Total Depth:** 42 ft bgs
Client: National Grid	**Sampling Method:** Disposable plastic liner	**Ground Elevation:** 77.59 NAVD88
Date Pre-Cleared: Apr. 7, 2010	**Boring Diameter:** 6 inches	**Converted To Well (Y/N):** No
Date Started/Completed: Apr. 20, 2010	**Logged By:** Ron Kantor	**Well ID:** NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
-22								
-23		5.0						
-24		10.6						
-25	3.5/ 5.0	21.1						25.0-30.0 ft bgs: SILTY SAND (SM) fine grained silty sand, <10% fine subangular gravel up to 1.25" diameter and medium to coarse grained sand, firm, moist, brown, very slight naphthalene-like odor.
-26		11.2						
-27								
-28		6.8						
-29		5.5						
-30	4.25/ 5.0	2.8						30.0-35.0 ft bgs: SAA
-31		3.2						
-32		4.6						
-33		2.7						
-34		2.7						
-35	4.08/ 5.0	4.3						35.0-40.0 ft bgs: SAA
-36		7.6						
-37		3.9						
-38		4.6						
-39		3.9						
-40		1.8						
-41	1.92/ 2.0	4.3			SB-113 (40-42)			40.0-42.0 ft bgs: SAA
-42		5.9						END OF BORING 42 ft bgs

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
PID - Photoionization Detector
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Boring ID: SB - 114

Page 1 of 2

Project Name: Bay Ridge Former Gas Holder A&B	**Drilling Company:** Fenley annd Nicol	**Water Level:** NA
Project Number: 60137360	**Drilling Method:** Geoprobe	**Total Depth:** 36.5 ft bgs
Client: National Grid	**Sampling Method:** Disposable plastic liner	**Ground Elevation:** 77.31 NAVD88
Date Pre-Cleared: Apr. 7, 2010	**Boring Diameter:** 6 inches	**Converted To Well (Y/N):** No
Date Started/Completed: Apr. 15/Apr. 16, 2010	**Logged By:** Ron Kantor	**Well ID:** NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
0	4.25/ 5.0	0.0				FILL		0.0-5.0 ft bgs: FILL: Top 7" fine grained sandy gravel, dry, brown. Upper mid 5": fine to medium grained sand, <5% ash cinder, loose, dry, dark brown to black. Lower mid 24": fine grained sand, ~15% subangular gravel up to 0.5" diameter, <5% ash cinders and glass, dry, brown. Bottom 15": fine grained sand, ~10% fine grained subrounded gravel, moderately dense, moist, dark brown, no odor.
-1		0.0						
-2		0.0						
-3		0.0						
-4		0.0		▒	SB-114 (4-5)			
-5	4.0/ 5.0	0.0						5.0-10.0 ft bgs: FILL: Top 15": fine grained sand, <10% coarse grained sand and fine grained rounded gravel, loose, wet, dark brown. Upper mid 9": fine grained sand, <10% medium to coarse grained sand and ash cinders, wet, dark brown to black, wood with a slight creosote-like odor. Lower mid 21": weathered concrete, ~25% fine to medium grained sand, dry, light tan. Bottom 3": silt, <10% fine to medium grained rounded gravel, <5% fine grained sand, dry, brown, no odor.
-6		0.0						
-7		0.9	🟦					
-8		0.0						
-9		0.0						
-10	3.08/ 5.0	0.0				ML		10.0-15.0 ft bgs: SANDY SILT (ML) silt, ~10% very fine grained sand, ~5% fine grained subangular gravel, stiff, dry, brown, no odor.
-11		0.0						
-13		0.0						
-15	3.0/ 5.0	0.0						15.0-20.0 ft bgs SANDY SILT (ML) silt, ~15% very fine grained sand, <10% fine to medium grained subangular gravel up to 1.5" diameter, stiff, dry, brown, no odor.
-16		0.0						
-18		0.0						
-20								

Notes:
- Field impacts refers to visual/olfactory impacts.
- Hand clearance from 0-5 ft bgs.
- Geoprobe started at 5 ft bgs.
- Boring terminated at 36.5 ft due to an obstruction.

Definitions:

NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
PID- Photoionization Detector
ft bgs - feet below grade surface
ppm - Parts per million
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

AECOM

Boring ID: SB - 114

Project Name: Bay Ridge Former Gas Holder A&B	**Drilling Company:** Fenley annd Nicol	**Water Level:** NA
Project Number: 60137360	**Drilling Method:** Geoprobe	**Total Depth:** 36.5 ft bgs
Client: National Grid	**Sampling Method:** Disposable plastic liner	**Ground Elevation:** 77.31 NAVD88
Date Pre-Cleared: Apr. 7, 2010	**Boring Diameter:** 6 inches	**Converted To Well (Y/N):** No
Date Started/Completed: Apr. 15/Apr. 16, 2010	**Logged By:** Ron Kantor	**Well ID:** NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
-20	3.5/ 5.0	0.0						20.0-25.0 ft bgs: SAA
-21		0.0						
-22		0.0						
-23				▨	SB-114 (23-25)			
-24		0.0		▨				
-25	4.0/ 5.0	0.0						25.0-30.0 ft bgs: SANDY SILT (ML) very fine grained sandy silt, ~40% sand, ~15% fine to medium grained rounded gravel, very firm, dry to moist, brown, no odor.
-26		0.0						
-27								
-28		0.0						
-29		0.0						
-30	4.0/ 5.0	0.0						30.0-35.0 ft bgs: SAA
-31		0.0						
-32								
-33		0.0						
-34		0.0						
-35	1.33/ 1.5	0.0		▨	SB-114 (35-36.5)			35.0-36.5 ft bgs: SANDY SILT (ML) silt, ~15% very fine grained sand, <10% fine grained subangular gravel, very stiff, moist (1" of water on top of sample), brown, no odor.
-36		0.0		▨				END OF BORING 36.5 ft bgs

Notes:	**Definitions:**	
		PID- Photoionization Detector
Field impacts refers to visual/olfactory impacts.	NA - Not Applicable	ft bgs - feet below grade surface
Hand clearance from 0-5 ft bgs.	NR - No Recovery	ppm - Parts per million
Geoprobe started at 5 ft bgs.	ND - Not Documented	U.S.C.S. - Unified Soil Classification System
Boring terminated at 36.5 ft due to an obstruction.	SAA - Same As Above	NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB-115

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Project Name: Bay Ridge Former Gas Holder A&B	**Drilling Company:** Fenley annd Nicol	**Water Level:** NA
Project Number: 60137360	**Drilling Method:** Geoprobe	**Total Depth:** 40 ft bgs
Client: National Grid	**Sampling Method:** Disposable plastic liner	**Ground Elevation:** 77.53 NAVD88
Date Pre-Cleared: Apr. 7, 2010	**Boring Diameter:** 6 inches	**Converted To Well (Y/N):** No
Date Started/Completed: Apr. 19, 2010	**Logged By:** Ron Kantor	**Well ID:** NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
0	4.25/ 5.0	0.0				FILL		0.0-5.0 ft bgs: FILL: Top 12": fine grained sand, ~15% silt, <10% fine grained angular gravel, <5% brick and ash cinders, dry, dark brown, no odor. Upper mid 7": blackened bricks. Lower mid 21": very fine grained silty sand, <10% ash cinders, fine grained subrounded gravel, and glass, dry to moist, brown, no odor. Bottom 11": very fine grained silty sand, <5% medium grained sand, firm, moist, brown, no odor.
-1		0.0						
-2		0.0		▨	SB-115 (2-4)			
-3		0.0		▨				
-4		0.0						
-5	3.17/ 5.0	0.0				ML		5.0-10.0 ft bgs: SANDY SILT (ML) Top 6": very fine grained silty sand, <5% medium grained angular gravel and medium grained sand, firm, dry, brown. Middle 14": silt, firm, moist, brown. Bottom 18": banded silt ~60% and very fine grained ~40% sand, 2-1" silt bands at top with a 0.5" band of sand between a 5" silt band, silt content increases with depth, sand bands 0.25-0.5" wide, silt is brown, sand is tan, no odor.
-6		0.0						
-7		0.0						
-8		0.0						
-9		0.0						
-10	2.08/ 5.0	0.0				SP- ML		10.0-15.0 ft bgs: Top 11": POORLY GRADED SAND (SP) very fine grained sand, ~10% medium grained sand, slightly dense, dry, tan. Bottom 14": SANDY SILT (ML) silt, ~5% fine grained sand, firm, dry, tan, no odor.
-11								
-12		0.0						
-13								
-14		0.0						
-15	4.0/ 5.0	0.0				ML		15.0-20.0 ft bgs: SANDY SILT (ML) silt, ~30% medium to coarse grained subangular gravel up to 1.5" diameter, <5% very fine to medium grained sand, moderately stiff, dry, brown, no odor.
-16		0.0						
-17		0.0						
-18								
-19		0.0						
-20								

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
PID - Photoionization Detector
ft bgs - feet below grade surface
ppm - Parts per million
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB-115

Project Name: Bay Ridge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 7, 2010
Date Started/Completed: Apr. 19, 2010

Drilling Company: Fenley annd Nicol
Drilling Method: Geoprobe
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: NA
Total Depth: 40 ft bgs
Ground Elevation: 77.53 NAVD88
Converted To Well (Y/N): No
Well ID: NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
-20	ND	0.0				SM	▦	20.0-25.0 ft bgs: SILTY SAND (SM) very fine grained silty sand, <5% fine grained subrounded gravel up to 0.5" diameter, 4" thick silt layer from 24' 1" to 24' 5" bgs, very firm, dry, brown, no odor.
-21							▦	
-22		0.0					▦	
-23							▦	
-24							▦	
-25	3.67/ 5.0	0.0				SM-ML	▦	25.0-30.0 ft bgs: SILTY SAND (SM) / SANDY SILT (ML) layered very fine grained silty sand and very fine grained sandy silt 8" to 12" thick, ~5% fine grained subrounded gravel up to 0.5" diameter, brown, no odor.
-26		0.0					▦	
-27		0.0					▦	
-28		0.0		▨	SB-115 (28-30)		▦	
-29		0.0		▨			▦	
-30	4.0/ 5.0	0.0				ML	‖	30.0-35.0 ft bgs: SANDY SILT (ML) silt, ~10% fine to medium grained angular gravel, <5% fine grained sand, very firm, dry, brown, no odor.
-31		0.0					‖	
-32		0.0					‖	
-33		0.0					‖	
-34							‖	
-35	1.33/ 5.0	0.0					‖	35.0-40.0 ft bgs: SAA
-36							‖	
-37		0.0					‖	
-38							‖	
-39				▨	SB-115 (38.5-40)		‖	
-40				▨			‖	END OF BORING 40 ft bgs

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
PID - Photoionization Detector
ft bgs - feet below grade surface
ppm - Parts per million
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB - 122

Project Name: Bay Ridge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 9, 2010
Date Started/Completed: Apr. 15, 2010

Drilling Company: Fenley annd Nicol
Drilling Method: Geoprobe
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: NA
Total Depth: 40 ft bgs
Ground Elevation: 78.40 NAVD88
Converted To Well (Y/N): No
Well ID: NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
0 -1	3.08/ 5.0	0.0				FILL	⬡	0.0-5.0 ft bgs: FILL: Top 30": fine grained sand, ~20% fine grained angular gravel up to 0.5" diameter, <10% concrete and ash cinders, firm, moist, brown. Bottom 7": silt, ~5% fine grained sand, dry, brown, no odors.
-2		0.0					⬡	
-3		0.0		▨	SB-122 (3-4)		⬡	
-4		0.0					⬡	
-5 -6	4.0/ 5.0	0.2	🟦				⬡	5.0-10.0 ft bgs: FILL: Top 36": silt, ~15% fine grained sand, <10% clay and fine grained subrounded gravel, soft, wet, brown, very slight coal tar-like odor. Bottom 12": very fine grained sand, ~10% coal and ash cinders, fine grained subrounded gravel, and silt, moderately soft, moist, dark brown to black, slight coal tar-like odor.
-7		2.2	🟦				⬡	
-8		8.3	🟦				⬡	
-9		11.9	🟦				⬡	
-10 -11	3.42/ 5.0	57.2	🟦				⬡	10.0-15.0 ft bgs: Top 15": FILL: fine grained sand, ~10% silt and wood, moderately soft, moist, dark brown to black, slight coal tar-like odor. Middle 20": SANDY SILT (ML) silt, ~20% medium to coarse grained gravel up to 2" diameter, <10% fine grained sand, banded in bottom 6", stiff, moist, tan-brown to black, slight to moderate coal tar-like odor, sand is stained black. Bottom 6": POORLY GRADED SAND (SP) fine grained sand, <10% silt, tan-brown, strong naphthalene-varnish-like odor.
-12		42.0	🟩			SP	⁘	
-13		64.9	🟩				⁘	
-14		219	🟦				⁘	
-15 -16	3.0/ 5.0	756	🟦				⁘	15.0-20.0 ft bgs: SAA, strong naphthalene-varnish-like odor.
-17 -18		983	🟦				⁘	
-19		1286	🟦				⁘	
-20			🟧				⁘	20.0-25.0 ft bgs:

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.
End boring at 40 ft bgs, to be advanced at a later date.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
ft bgs - feet below grade surface
ppm - Parts per million
PID - Photoionization Detector
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB - 122

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Project Name: Bay Ridge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Apr. 9, 2010
Date Started/Completed: Apr. 15, 2010

Drilling Company: Fenley annd Nicol
Drilling Method: Geoprobe
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Ron Kantor

Water Level: NA
Total Depth: 40 ft bgs
Ground Elevation: 78.40 NAVD88
Converted To Well (Y/N): No
Well ID: NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
-21	3.5/ 5.0	786	🟧				░	Top 30": POORLY GRADED SAND (SP) SAA, non-contiguous areas of product coated sand and very thin product stringers, moist, sheen.
-22		953	🟧				░	
-23			🟦				░	
-24		1896	🟦	▨	SB-122 (23-24)	SM	▦	Bottom 12": SILTY SAND (SM) very fine grained silty sand, ~15% medium grained sand, ~5% fine grained subangular gravel, moist, brown, strong naphthalene-varnish-like odor.
-25	3.33/ 5.0	1268	🟩			ML-GW	║	25.0-30.0 ft bgs: SANDY SILT (ML) / WELL GRADED GRAVEL (GW) very fine grained silty sand, ~20% medium to coarse grained subangular gravel up to 2.5" diameter, ~10% medium grained sand, moist, brown, strong naphthalene-varnish-like odor, light sheen.
-26		1952	🟩				║	
-27			🟩				║	
-28		2464	🟩				║	
-29		1078	🟩				║	
-30	3.0/ 5.0	762	🟦			ML	║	30.0-35.0 ft bgs: SANDY SILT (ML) silt, ~25% very fine grained sand, ~10% fine to medium grained subangular gravel up to 1" diameter, dry, brown, strong naphthalene-varnish-like odor, no sheen.
-31			🟦				║	
-32		464	🟦				║	
-33			🟦				║	
-34		1224	🟦				║	
-35	2.5/ 5.0	702	🟩				║	35.0-40.0 ft bgs: SANDY SILT (ML) silt, ~30% fine to coarse grained gravel up to 1.5" diameter, ~15% very fine grained sand, very stiff, dry to moist, brown, strong naphthalene-varnish-like odor, slight sheen.
-36			🟩				║	
-37		848	🟩				║	
-38			🟩				║	
-39		1829	🟩				║	
-40			🟩	▨	SB-122 (39-40)		║	END OF BORING 40 ft bgs

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Geoprobe started at 5 ft bgs.
End boring at 40 ft bgs, to be advanced at a later date.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
ft bgs - feet below grade surface
ppm - Parts per million
PID - Photoionization Detector
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB - 123A

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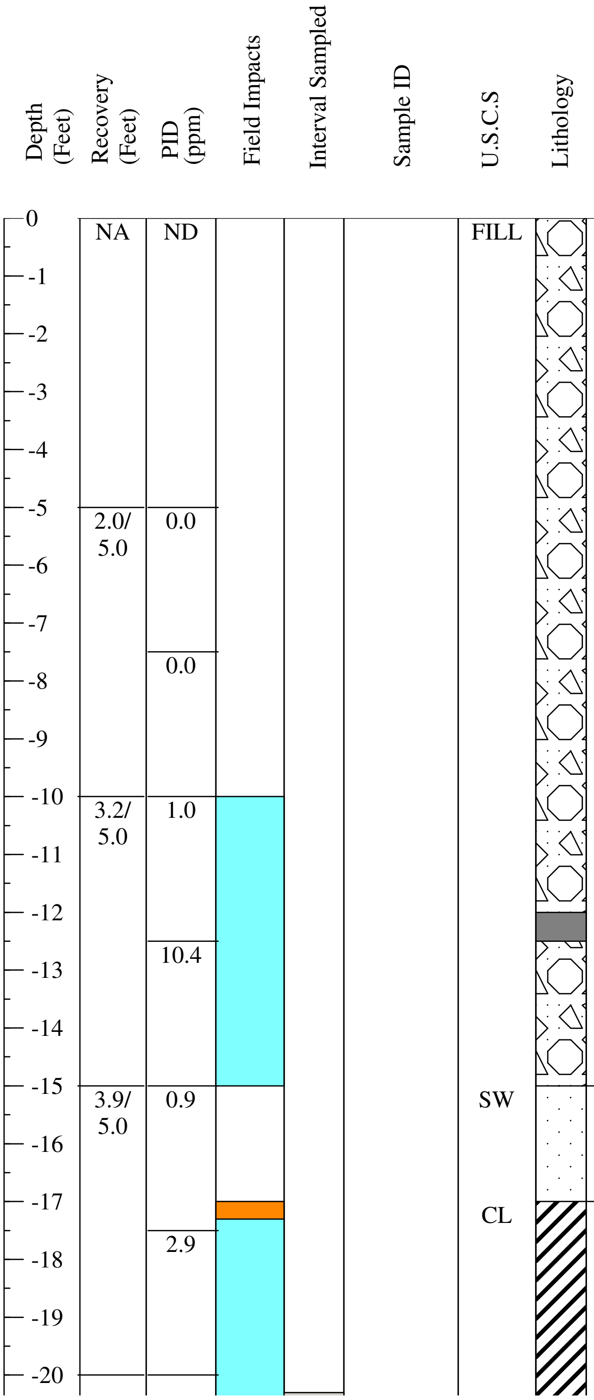
Project Name: Bay Ridge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Jan. 18, 2011
Date Started/Completed: Jan. 18/Jan. 19, 2011

Drilling Company: ADT
Drilling Method: Sonic
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Rita Papagian

Water Level: NA
Total Depth: 50 ft bgs
Ground Elevation: 78.26 NAVD88
Converted To Well (Y/N): No
Well ID: NA



Geologic Description

0.0-0.5 ft bgs: FILL: gravel

0.5-1.0 ft bgs: FILL: medium to coarse grained sand, ~35% gravel, dark brown.

1.0-2.0 ft bgs: FILL: medium to coarse grained sand, ~35% gravel, few brick fragments, dark brown.

2.0-3.0 ft bgs: SAA, at 3 ft bgs there is a layer of upright bricks mixed with sand.

3.0-4.0 ft bgs: FILL: medium to coarse grained sand, ~35% gravel, few brick fragments, brown.

4.0-5.0 ft bgs: SAA, no brick fragments.

5.0-10.0 ft bgs: FILL: fine to medium grained sand, ~35% silt and gravel, loose, moist, brown.

10.0-15.0 ft bgs: FILL: fine grained sand with silt, ~20% gravel, firm, dry, reddish brown, slight naphthalene-like odor, (12-12.5 ft bgs concrete slab, holder bottom).

15.0-17.0 ft bgs: WELL GRADED SAND (SW) fine to medium grained sand, ~35% silt, ~20% gravel, reddish brown.

17.0-20.0 ft bgs: SILTY CLAY OF LOW PLASTICITY (CL) silt with ~35% very fine grained sand, <5% clay, firm, moist, naphthalene-like odor, tar-like material lens from 17-17.3 ft bgs.

20.0-25.0 ft bgs: SILTY CLAY OF LOW PLASTICITY (CL) silt with

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Sonic started at 5 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
ft bgs - feet below grade surface
ppm - Parts per million
PID - Photoionization Detector
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

Project Name: Bay Ridge Former Gas Holder A&B	**Drilling Company:** ADT	**Water Level:** NA
Project Number: 60137360	**Drilling Method:** Sonic	**Total Depth:** 50 ft bgs
Client: National Grid	**Sampling Method:** Disposable plastic liner	**Ground Elevation:** 78.26 NAVD88
Date Pre-Cleared: Jan. 18, 2011	**Boring Diameter:** 6 inches	**Converted To Well (Y/N):** No
Date Started/Completed: Jan. 18/Jan. 19, 2011	**Logged By:** Rita Papagian	**Well ID:** NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
-21	3.7/ 5.0	73.4	🟦	▨	SB-123A (20-22)		▨	~35% very fine grained sand, <5% clay, firm, moist, reddish brown, naphthalene-like odor, tar-like sheen from 21-21.1 ft bgs.
-22			🟦				▨	
-23		75.5	🟦				▨	
-24			🟦				▨	
-25	3.2/ 5.0	0.0				SW	⁚	25.0-30.0 ft bgs: WELL GRADED SAND (SW) fine to medium grained sand, ~35% gravel, ~20% silt, firm, dry, reddish brown.
-26							⁚	
-27							⁚	
-28		0.0					⁚	
-29							⁚	
-30	3.0/ 5.0	0.0					⁚	30.0-35.0 ft bgs: WELL GRADED SAND (SW) fine to medium grained sand, ~35% silt, ~20% gravel, firm, dry, reddish brown.
-31							⁚	
-32							⁚	
-33		0.0					⁚	
-34							⁚	
-35	3.9/ 5.0	0.0					⁚	35.0-40.0: SAA
-36							⁚	
-37							⁚	
-38		0.0					⁚	
-39							⁚	
-40	2.7/	0.0		▨	SB-123A		⁚	40.0-42.0 ft bgs: WELL GRADED SAND (SW) fine to coarse grained

Notes:	**Definitions:**	
Field impacts refers to visual/olfactory impacts.	NA - Not Applicable	ft bgs - feet below grade surface
Hand clearance from 0-5 ft bgs.	NR - No Recovery	ppm - Parts per million
Sonic started at 5 ft bgs.	ND - Not Documented	PID - Photoionization Detector
	SAA - Same As Above	U.S.C.S. - Unified Soil Classification System
		NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB - 123A

Project Name: Bay Ridge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Jan. 18, 2011
Date Started/Completed: Jan. 18/Jan. 19, 2011

Drilling Company: ADT
Drilling Method: Sonic
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Rita Papagian

Water Level: NA
Total Depth: 50 ft bgs
Ground Elevation: 78.26 NAVD88
Converted To Well (Y/N): No
Well ID: NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
-41	5.0			▨	(40-42)			sand, ~35% gravel, ~15% silt, reddish brown.
-42								
		0.0						42.0-45.0 ft bgs: WELL GRADED SAND (SW) fine to medium grained sand, ~35% silt, ~20% gravel, firm, dry, reddish brown, boulder from 44.5-45 ft bgs.
-43								
-44								
-45	NR	0.0				NR		45.0-50.0 ft bgs: No Recovery
-46								
-47								
-48								
-49								
-50								END OF BORING 50 ft bgs

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Sonic started at 5 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
ft bgs - feet below grade surface
ppm - Parts per million
PID - Photoionization Detector
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB - 124

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Project Name: Bay Ridge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Jan. 20, 2011
Date Started/Completed: Jan. 20, 2011

Drilling Company: ADT
Drilling Method: Sonic
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Jesse Lloyd

Water Level: NA
Total Depth: 50 ft bgs
Ground Elevation: 78.36 NAVD88
Converted To Well (Y/N): No
Well ID: NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
0	NA	ND				FILL		0.0-1.0 ft bgs: FILL
-1		0.0						1.0-2.0 ft bgs: FILL: fine to coarse grained sand, ~20% silt and gravel, dark brown.
-2		0.0						2.0-3.0 ft bgs: FILL: fine grained sand and silt, moist, brown.
-3		0.0						3.0-4.0 ft bgs: FILL: fine to medium grained sand, ~35% silt, ~20% gravel, wet, light brown (large granite boulder from 2-4 ft bgs along East wall).
-4		0.0		▨	SB-124 (4.0)			4.0-5.0 ft bgs: SAA, wood fragments, wet.
-5	3.20/ 5.0	0.6						5.0-8.0 ft bgs: FILL: fine to medium grained sand, <5% silt and coarse sand, loose, wet, reddish brown.
-6								
-7		2.2						
-8								8.0-10.0 ft bgs: FILL: wood fragments mixed with little sand, wet.
-9								
-10	3.4/ 5.0	276	🟦	▨	SB-124 (10-11.5)			10.0-11.5 ft bgs: FILL: fine grained sand, ~20% silt and gravel, firm, dry, brown, naphthalene-like odor.
-11								
-12								11.5-15.0 ft bgs: FILL: pulverized concrete.
-13								
-14								
-15	4.0/ 5.0	0.0				SM		15.0-20.0 ft bgs: SILTY SAND (SM) fine grained sand, ~20% silt, cobble fragments, firm, dry, reddish brown.
-16								
-17		0.1						
-18								
-19								
-20								20.0-22.0 ft bgs: SAA, little dark mottling.

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Sonic started at 5 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above

ft bgs - feet below grade surface
ppm - Parts per million
PID - Photoionization Detector
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

AECOM

Boring ID: SB - 124

Project Name: Bay Ridge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Jan. 20, 2011
Date Started/Completed: Jan. 20, 2011

Drilling Company: ADT
Drilling Method: Sonic
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Jesse Lloyd

Water Level: NA
Total Depth: 50 ft bgs
Ground Elevation: 78.36 NAVD88
Converted To Well (Y/N): No
Well ID: NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
-21	4.0/ 5.0	0.5					▦	
-22						SP	░	22.0-25.0 ft bgs: POORLY GRADED SAND (SP) fine to medium sand, loose, dry, brown.
-23		0.1					░	
-24							░	
-25	3.5/ 5.0	1.0					░	25.0-26.0 ft bgs: SAA.
-26						SM	▦	26.0-30.0 ft bgs: SILTY SAND (SM) fine grained sand, ~20% silt, <5% gravel, firm, dry, reddish brown, little gray mottling 27-28 ft bgs.
-27							▦	
-28		0.3					▦	
-29							▦	
-30	3.6/ 5.0	0.5					▦	30.0-35.0 ft bgs: SILTY SAND (SM) fine grained sand, ~20% silt, <5% gravel, firm (30-33 ft bgs) loose (33-35 ft bgs), dry, reddish brown.
-31							▦	
-32							▦	
-33		0.9		▨	SB-124 (33-35)		▦	
-34				▨			▦	
-35	4.0/ 5.0	3.8				SP	░	35.0-40.0 ft bgs: POORLY GRADED SAND (SP) fine grained sand, dry, reddish brown, naphthalene-like odor (36-40 ft bgs).
-36			🟦				░	
-37			🟦				░	
-38		17.9	🟦				░	
-39			🟦				░	
-40	5.0/	22.5	🟦			ML	‖	40.0-45.0 ft bgs: SANDY SILT (ML) silt, <5% fine grained sand,

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Sonic started at 5 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
ft bgs - feet below grade surface
ppm - Parts per million
PID - Photoionization Detector
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB - 124

Project Name: Bay Ridge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Jan. 20, 2011
Date Started/Completed: Jan. 20, 2011

Drilling Company: ADT
Drilling Method: Sonic
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Jesse Lloyd

Water Level: NA
Total Depth: 50 ft bgs
Ground Elevation: 78.36 NAVD88
Converted To Well (Y/N): No
Well ID: NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
-41	5.0		🟦					moist, reddish brown, naphthalene-like odor.
-42			🟦					
-43		33.6	🟦					
-44			🟦					
-45	4.1/ 5.0	26.5				SW		45.0-50.0 ft bgs: WELL GRADED SAND (SW) fine to medium grained sand, ~35% cobbles and gravel, <5% silt, moist (45-46.5) dry (46.5-50), reddish brown.
-46								
-47								
-48		27.9						
-49								
-50								END OF BORING 50 ft bgs

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Sonic started at 5 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
ft bgs - feet below grade surface
ppm - Parts per million
PID - Photoionization Detector
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB - 125

Project Name: Bay Ridge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Jan. 21, 2011
Date Started/Completed: Jan. 21, 2011

Drilling Company: ADT
Drilling Method: Sonic
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Jesse Lloyd

Water Level: NA
Total Depth: 50 ft bgs
Ground Elevation: 80.29 NAVD88
Converted To Well (Y/N): No
Well ID: NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
0	NA	ND				FILL		00-1.0 ft bgs: Sidewalk, asphalt
-1		0.0				SW		1.0-3.0 ft bgs: WELL GRADED SAND (SW) fine grained sand, ~35% gravel, <5% silt, dry, brown.
-2		0.0						
-3		0.1				SP		3.0-5.0 ft bgs: POORLY GRADED SAND (SP) fine grained sand, dry, brown.
-4		0.2		▨	SB-125 (4)			
-5	2.3/ 5.0	0.0						5.0-10.0 ft bgs: POORLY GRADED SAND (SP) fine grained sand, <5% silt, dry, brown.
-6								
-7		0.0						
-8								
-9								
-10	5.0/ 5.0	0.0				SM		10.0-12.5 ft bgs: SILTY SAND (SM) fine grained sand, ~20% silt, firm, dry, reddish brown.
-11								
-12		0.0				SP		12.5-14.0 ft bgs: POORLY GRADED SAND (SP) fine to medium grained sand, loose, dry, brown.
-13								
-14						SM		14.0-15.0 ft bgs: SILTY SAND (SM) sand and silt, dry, reddish brown.
-15	5.0/ 5.0	0.0						15.0-18.0 ft bgs: SILTY SAND (SM) fine grained sand and silt, firm, dry, reddish brown.
-16								
-17		0.0						
-18						SP ML		18.0-18.4 ft bgs: POORLY GRADED SAND (SP) fine to medium grained sand, dry, brown and olive.
-19						SP		18.4-19.2 ft bgs: SANDY SILT (ML) silt, <5% fine grained sand,
-20								

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Sonic started at 5 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
ft bgs - feet below grade surface
ppm - Parts per million
PID - Photoionization Detector
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

AECOM

Boring ID: SB - 125

Project Name: Bay Ridge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Jan. 21, 2011
Date Started/Completed: Jan. 21, 2011

Drilling Company: ADT
Drilling Method: Sonic
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Jesse Lloyd

Water Level: NA
Total Depth: 50 ft bgs
Ground Elevation: 80.29 NAVD88
Converted To Well (Y/N): No
Well ID: NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
-20	4.1/ 5.0	0.0				SW		moist, brown.
-21								19.2-20.0 ft bgs: POORLY GRADED SAND (SP) fine to medium grained sand, loose, dry, brown.
-22						SP		20.0-22.0 ft bgs: WELL GRADED SAND (SW) fine to coarse grained sand, loose, moist, brown.
-23		0.0						
-24								22.0-25.0 ft bgs: POORLY GRADED SAND (SP) very fine to fine grained sand, loose, dry, brown.
-25	4.3/ 5.0	6.7		▨	SB-125 (25-27)	SW		25.0-30.0 ft bgs: WELL GRADED SAND (SW) fine grained sand, ~20% silt, <5% gravel, few small cobbles, reddish brown.
-26				▨				
-27								
-28		0.7						
-29								
-30	3.5/ 5.0	2.2	■					30.0-35.0 ft bgs: WELL GRADED SAND (SW) fine grained sand, ~20% silt, <5% gravel, firm, dry, reddish brown, very slight naphthalene-like odor.
-31			■					
-32								
-33		1.6						
-34								
-35	4.1/ 5.0	0.1						35.0-40.0 ft bgs: SAA, no odor.
-36								
-37								
-38		0.1						
-39								
-40								

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Sonic started at 5 ft bgs.

Definitions:
NA - Not Applicable
NR - No Recovery
ND - Not Documented
SAA - Same As Above
ft bgs - feet below grade surface
ppm - Parts per million
PID - Photoionization Detector
U.S.C.S. - Unified Soil Classification System
NAVD 88 - North American Vertical Datum of 1988

Boring ID: SB - 125

Project Name: Bay Ridge Former Gas Holder A&B
Project Number: 60137360
Client: National Grid
Date Pre-Cleared: Jan. 21, 2011
Date Started/Completed: Jan. 21, 2011

Drilling Company: ADT
Drilling Method: Sonic
Sampling Method: Disposable plastic liner
Boring Diameter: 6 inches
Logged By: Jesse Lloyd

Water Level: NA
Total Depth: 50 ft bgs
Ground Elevation: 80.29 NAVD88
Converted To Well (Y/N): No
Well ID: NA

Depth (Feet)	Recovery (Feet)	PID (ppm)	Field Impacts	Interval Sampled	Sample ID	U.S.C.S	Lithology	Geologic Description
-40				▨	SB-125 (40-42)			
-41	4.6/ 5.0	0.0		▨		SM SP		40.0-40.5 ft bgs: SILTY SAND (SM) fine grained sand, ~20% silt, firm, dry, reddish brown.
-42								40.5-41.5 ft bgs: POORLY GRADED SAND (SP) fine to medium grained sand, loose, dry, brown. 41.5-45.0 ft bgs: POORLY GRADED SAND (SP) fine grained sand, <5% silt and gravel, reddish brown.
-43		0.0						
-44								
-45	5.0/ 5.0	0.0				SM		45.0-50.0 ft bgs: SILTY SAND (SM) fine grained sand, ~20% silt, <5% gravel, firm, dry, reddish brown.
-46								
-47								
-48		0.0						
-49								
-50								END OF BORING 50 ft bgs

Notes:
Field impacts refers to visual/olfactory impacts.
Hand clearance from 0-5 ft bgs.
Sonic started at 5 ft bgs.

Definitions:

	ft bgs - feet below grade surface
NA - Not Applicable	ppm - Parts per million
NR - No Recovery	PID - Photoionization Detector
ND - Not Documented	U.S.C.S. - Unified Soil Classification System
SAA - Same As Above	NAVD 88 - North American Vertical Datum of 1988

AECOM

Client: National Grid
Project Number: 60137360
Site Location: Bay Ridge Former Station Holder B
Boring Location: 65th Street btwn 8th and 9th Avenues, Brooklyn, NY
Drilling Method: Geoprobe
Sample Type(s): 5' disposable plastic liner
Boring Diameter: 2-inch

BORING ID: SB-126

Sheet: 1 of 1
Monitoring Well Screen: NA
Monitoring Well Sump: NA
Depth of Boring: 12.5 ft bgs
Water Level: N/A

Logged By: Sara Meissner
Drilling Contractor: ZEBRA
Ground Elevation: N/A (ft NAVD 88)
Date Started/Pre-Cleared: 4/24/2013
Date Finished: 4/25/2013

Depth (feet)	Recovery (inches)	PID (ppm)	(depth interval for PID reading)	Stratigraphy	U.S.C.S	Observed Impacts	**Geologic Description**	Lab Sample ID	Lab Sample Depth (ft)
0 1 2		0.0 0.0	(0-1.5) (1.5-3)		FILL		0.0'-3': Light brown fine to medium SAND, little silt and gravel (moist).	SB-126 (0-2')	0'-2'
3 4		0.0	(3-5)				3.0'-5.0': Brown, fine to medium SAND, some silt, gravel, brick fragments, rocks and cobbles (moist).		
5 6 7	45"/60"	0.0	(5-7.5)				5.0'-8': SAA (moist).		
8 9		0.0	(7.5-10)				8.0'-10': Brown fine silty SAND, some gravel (5" section of black coal within) (moist).	SB-126 (8-10')	8'-10'
10 11	24"/60"	4.7 66.2	(10-11)			🟦	10.0'-11.2': Light brown silty SAND, some wood, brick fragments, gravel (slight tar like odor).		
12		87.1 42.3	(11-12.5)			🟩	11.2'-12.5': SAA (strong tar like odor and slightly tar coated).	SB-126 (10.5-12.5')	10.5'-12.5'

EOB @ 12.5' bgs

NOTES:

1.) The location was pre-cleared to 5 ft bgs by using soft dig hand clearing methods.

Definitions:
1.) NA - Not Applicable
2.) ft - feet
3.) bgs - below ground surface
4.) SAA - Same As Above
5.) ppm - parts per million
6.) NAVD 88 - North American Vertical Datum of 1988
7.) PID - Photo Ionization Detector
8.) U.S.C.S. - Unified Soil Classification System

AECOM

Client: National Grid
Project Number: 60137360
Site Location: Bay Ridge Former Station Holder B
Boring Location: 65th Street btwn 8th and 9th Avenues, Brooklyn, NY
Drilling Method: Geoprobe
Sample Type(s): 5' disposable plastic liner | *Boring Diameter: 2-inch*

BORING ID: SB-127

Sheet: 1 of 1
Monitoring Well Screen: NA
Monitoring Well Sump: NA
Depth of Boring: 12 ft bgs
Water Level: N/A

Logged By: Sara Meissner
Drilling Contractor: ZEBRA
Ground Elevation: N/A (ft NAVD 88)
Date Started/Pre-Cleared: 4/24/2013
Date Finished: 4/25/2013

Depth (feet)	Recovery (inches)	PID (ppm)	(depth interval for PID reading)	Stratigraphy	U.S.C.S	Observed Impacts	**Geologic Description**	Lab Sample ID	Lab Sample Depth (ft)
0 1		0.0	(0-1.5)	▨	FILL		0.0'-3': Brown to dark brown fine to medium SAND, some silt and gravel (moist).		
2		0.0	(1.5-3)						
3 4		0.0	(3-5)				3.0'-5.0': Brown fine to medium SAND, some silt, brick fragments, concrete, and cobbles (moist).	SB-127 (3-5')	3'-5'
5 6 7	40"/60"	0.0	(5-7.5)				5.0'-8': SAA, some non - tar like black staining, no odor (moist).		
8		0.0	(7.5-10)				8.0'-10': Grey-brown fine to medium SAND, some silt, gravel, rocks, and brick fragments (dry).	SB-127 (8-10')	8'-10'
9		0.2							
10 11	24"/60"	0.0 13.0	(10-11)			🟩	10.0'-12.0': SAA, slightly tar coated and slight tar odor (moist).	SB-127 (10-12')	10'-12'
12		14.8 6.7	(11-12)						

EOB @ 12' bgs

NOTES:

1.) The location was pre-cleared to 5 ft bgs by using soft dig hand clearing methods.

Definitions:
1.) NA - Not Applicable
2.) ft - feet
3.) bgs - below ground surface
4.) SAA - Same As Above
5.) ppm - parts per million
6.) NAVD 88 - North American Vertical Datum of 1988
7.) PID - Photo Ionization Detector
8.) U.S.C.S. - Unified Soil Classification System

AECOM	*Client: National Grid*	**BORING ID: SB-128**
	Project Number: 60137360	
	Site Location: Bay Ridge Former Station Holder B	
	Boring Location: 65th Street btwn 8th and 9th Avenues, Brooklyn, NY	*Sheet: 1 of 1*
	Drilling Method: Geoprobe	*Monitoring Well Screen: NA*
	Sample Type(s): 5' disposable plastic liner · *Boring Diameter: 2-inch*	*Monitoring Well Sump: NA*

Logged By: Sara Meissner	*Ground Elevation:*	*Date Started/Pre-Cleared: 4/24/2013*	*Depth of Boring: 20 ft bgs*
Drilling Contractor: ZEBRA	*N/A (ft NAVD 88)*	*Date Finished: 4/25/2013*	*Water Level: N/A*

Depth (feet)	Recovery (inches)	PID (ppm)	(depth interval for PID reading)	Stratigraphy	U.S.C.S	Observed Impacts	**Geologic Description**	Lab Sample ID	Lab Sample Depth (ft)
0		0.0	(0-1.5)		FILL		0.0'-3': Light brown fine to medium SAND, some silt and gravel (moist).		
1									
2		0.0	(1.5-3)					SB-128 (2-4')	2'-4'
3		0.0	(3-5)				3.0'-5.0': Brown fine to medium SAND, some silt, gravel, brick fragments, concrete and cobbles (moist).		
4									
5	60"/60"	0.1 0.5	(5-7')				5.0'-10.0': SAA (moist).		
6									
7		0.1 0.1	(7-8.5')						
8									
9		0.1 0.0	(8.5-10')						
10	40"/60"	1.4 44.8	(10-11.5')			🟩	10.0'-12.0': SAA, slight black staining and strong tar odor (dry).	SB-128 (10-12')	10'-12'
11						🟩			
12		43.7 27.1	(11.5'-13.5')				12.0'-13.0': Red-brown medium silty SAND (dry).		
13							13.0'-15.0': Brown fine to medium SAND, some silt, gravel, brick, and wood fragments (dry).		
14		18.1 1.2 1.4	(13.5-15')						
15	24"/60"	13.2 8.7	(15-16.5')				15.0'-20.0': SAA, slight tar like odor at end of boring (dry).		
16									
17		6.1 1.4	(16.5-18.5')						
18								SB-128 (18-20')	18'-20'
19		3.2 1.0	(18.5-20')			🟦			
20									

EOB @ 20' bgs

NOTES:

1.) The location was pre-cleared to 5 ft bgs by using soft dig hand clearing methods.

Definitions:
1.) NA - Not Applicable
2.) ft - feet
3.) bgs - below ground surface
4.) SAA - Same As Above
5.) ppm - parts per million
6.) NAVD 88 - North American Vertical Datum of 1988
7.) PID - Photo Ionization Detector
8.) U.S.C.S. - Unified Soil Classification System

Client: National Grid		***BORING ID: SB-129***
Project Number: 60137360		
Site Location: Bay Ridge Former Station Holder B		
Boring Location: 65th Street btwn 8th and 9th Avenues, Brooklyn, NY		*Sheet: 1 of 1*
Drilling Method: Geoprobe		*Monitoring Well Screen: NA*
Sample Type(s): 5' disposable plastic liner	*Boring Diameter: 2-inch*	*Monitoring Well Sump: NA*

Logged By: Sara Meissner	*Ground Elevation:*	*Date Started/Pre-Cleared: 4/24/2013*	*Depth of Boring: 20 ft bgs*
Drilling Contractor: ZEBRA	*N/A (ft NAVD 88)*	*Date Finished: 4/25/2013*	*Water Level: N/A*

Depth (feet)	Recovery (inches)	PID (ppm)	(depth interval for PID reading)	Stratigraphy	U.S.C.S	Observed Impacts	**Geologic Description**	Lab Sample ID	Lab Sample Depth (ft)
0		0.0	(0-1.5)		FILL		0.0'-3': Brown fine to medium SAND, some silt and gravel (moist).		
1								SB-129 (1-3')	1'-3'
2		0.0	(1.5-3)						
3		0.0	(3-5)				3.0'-5.0': Brown fine to medium SAND, some silt, gravel, brick fragments, concrete and cobbles (moist).		
4									
5	45"/60"	0.0 0.0	(5-7')				5.0'-8.0': SAA (moist).		
6									
7		0.0 7.1	(7-8.5')						
8							8.0'-9.0': Light brown silty fine SAND, some brick and rock fragments (dry).	SB-129 (8-10')	8'-10'
9		12.4 25.2	(8.5-10')			🟩	9.0'-10.0': SAA, black stained and slight tar odor (dry).		
10	30"/60"	14.1 2.2	(10-11.5')			🟦	10.0'-12.0': SAA, slight tar odor (moist).		
11									
12		0.1 0.0	(11.5'-13.5')				12.0'-15.0': Reddish brown fine to medium SAND, some green-grey silt and rock fragments (moist).		
13									
14		0.0 0.0	(13.5-15')						
15	30"/60"	2.5 1.7	(15-16.5')				15.0'-20.0': SAA (dry).		
16									
17		0.0 0.0	(16.5-18.5')						
18								SB-129 (18-20')	18'-20'
19		0.0	(18.5-20')						
20									

EOB @ 20' bgs

NOTES:

1.) The location was pre-cleared to 5 ft bgs by using soft dig hand clearing methods.

Definitions:
1.) NA - Not Applicable
2.) ft - feet
3.) bgs - below ground surface
4.) SAA - Same As Above
5.) ppm - parts per million
6.) NAVD 88 - North American Vertical Datum of 1988
7.) PID - Photo Ionization Detector
8.) U.S.C.S. - Unified Soil Classification System

Client: National Grid		***BORING ID: SB-130***
Project Number: 60137360		
Site Location: Bay Ridge Former Station Holder B		
Boring Location: 65th Street btwn 8th and 9th Avenues, Brooklyn, NY		*Sheet: 1 of 1*
Drilling Method: Geoprobe		*Monitoring Well Screen: NA*
Sample Type(s): 5' disposable plastic liner	*Boring Diameter: 2-inch*	*Monitoring Well Sump: NA*

Logged By: Sara Meissner	*Ground Elevation:*	*Date Started/Pre-Cleared: 4/24/2013*	*Depth of Boring: 20 ft bgs*
Drilling Contractor: ZEBRA	*N/A (ft NAVD 88)*	*Date Finished: 4/25/2013*	*Water Level:* N/A

Depth (feet)	Recovery (inches)	PID (ppm)	(depth interval for PID reading)	Stratigraphy	U.S.C.S	Observed Impacts	**Geologic Description**	Lab Sample ID	Lab Sample Depth (ft)
0		0.0	(0-1.5)		FILL		0.0'-3': Brown to dark brown fine to medium SAND, some silt and gravel (moist).		
1									
2		0.0	(1.5-3)					SB-130 (2-4') & DUP 1	2'-4'
3							3.0'-5.0': Brown fine to medium SAND, some silt, gravel, brick fragments, concrete, and cobbles (moist).		
4		0.0	(3-5)						
5	60"/60"	0.0 0.0	(5-7')				5.0'-7.0': SAA (moist).		
6									
7		0.0 0.0	(7-8.5')				7.0'-7.5': Brown fine to medium SAND, some black coal pieces and gravel (moist). 7.5'-9.0': Brown to reddish brown fine silty SAND, dense (dry).		
8		0.0 1.4	(8.5-10')						
9							9.0'-10.0': 6" Black coal chunks. 6" Reddish-black fine SAND, some coal pieces and gravel (dry).		
10	45"/60"	6.2 7.4	(10-11.5')			🟩	10.0'-12.0': Brown fine SAND, some silt and gravel. Slight tar like staining and tar like odors (moist).		
11		1.2 0.1	(11.5'-13.5')			🟩			
12							12.0'-15.0': Brown fine silty SAND (dry).		
13		0.0 0.0	(13.5-15')						
14									
15	58"/60"	5.0 4.3	(15-16.5')			🟩	15.0'-17.0': Brown fine silty SAND, black tar like staining and slight tar like odor (moist).	SB-130 (15-17')	15'-17'
16		8.7 3.1 0.1	(16.5-18.5')			🟩			
17							17.0'-20.0': Reddish brown fine dense SAND, some silt, rock fragments, and gravel (dry).		
18		0.0 0.0	(18.5-20')					SB-130 (18-20')	18'-20'
19									
20									

EOB @ 20' bgs

NOTES:

1.) The location was pre-cleared to 5 ft bgs by using soft dig hand clearing methods.

Definitions:

1.) NA - Not Applicable
2.) ft - feet
3.) bgs - below ground surface
4.) SAA - Same As Above
5.) ppm - parts per million
6.) NAVD 88 - North American Vertical Datum of 1988
7.) PID - Photo Ionization Detector
8.) U.S.C.S. - Unified Soil Classification System

Appendix F

Standard Operating Procedures

December 2014

Standard Operating Procedures

(AECOM and National Grid)

AECOM Standard Operating Procedures

Contents

1.0 Field Log Books

All field activities will be carefully documented in field log books. Entries will be of sufficient detail that a complete daily record of significant events, observations, and measurements is obtained. The field log book will provide a legal record of the activities conducted at the project site. Accordingly:

- Field books will be assigned a unique identification number.
- Field books will be bound with consecutively numbered pages.
- Field books will be controlled by the Field Team Leader while field work is in progress.
- Entries will be written with waterproof ink.
- Entries will be signed and dated at the conclusion of each day of field work.
- Erroneous entries made while field work is in progress will be corrected by the person that made the entries. Corrections will be made by drawing a line through the error, entering the correct information, and initialing the correction.
- Corrections made after departing the field will be made by the person who made the original entries. Corrections will be made by drawing a line through the error, entering the correct information, and initialing and dating the time of the correction.
- At a minimum, daily field book entries will include the following information:
    - Location of field activity;
    - Date and time of entry;
    - Names and titles of field team members;
    - Names and titles of any site visitors and site contacts;
    - Weather information, for example: temperature, cloud coverage, wind speed and direction;
    - Purpose of field activity;
    - A detailed description of field work conducted;
    - Sample media (soil, sediment, groundwater, *etc.*);
    - Sample collection method;
    - Number and volume of sample(s) taken;

- Description of sampling point(s);
- Volume of groundwater removed before sampling;
- Preservatives used;
- Analytical parameters;
- Date and time of collection;
- Sample identification number(s);
- Sample distribution (*e.g.* laboratory);
- Field observations;
- Any field measurements made, such as pH, temperature, conductivity, water level, *etc.*;
- References for all maps and photographs of the sampling site(s); and
- Information pertaining to sample documentation such as:
    - Bottle lot numbers
    - Dates and method of sample shipment
    - Chain-of-Custody (COC) Record numbers
    - Federal Express Air Bill Number

2.0 Field Equipment Decontamination and Management of Investigation Derived Waste

2.1 Decontamination Area

A temporary decontamination area lined with polyethylene sheeting will be constructed on-site for decontaminating the drilling equipment. Water collected from the decontamination cleaning activities will be collected in 55-gallon drums and managed as IDW.

2.2 Equipment Decontamination

The following procedures will be used to decontaminate equipment used during the field activities:

- All drilling equipment including the drilling rig, augers, bits, rods, tools, split-spoon samplers, and tremie pipe will be cleaned with a high-pressure steam cleaning or hot water pressure washing unit, as appropriate, before beginning work.
- Tools, drill rods, and augers will be placed on sawhorses or polyethylene plastic sheets following steam cleaning or pressure washing. Direct contact with the ground will be avoided.
- All augers, rods, and tools will be decontaminated between each drilling location according to the above procedures.
- The back of the drill rig and all tools, augers, and rods will be decontaminated at the completion of the work and prior to leaving the project site.

2.2.1 Sampling Equipment Decontamination

Suggested Materials:

- Potable water
- Phosphate-free detergent (*e.g.* Alconox^{TM})
- Distilled water
- Aluminum foil
- Plastic/polyethylene sheeting
- Plastic buckets and brushes
- Personal protective equipment in accordance with the HASP

Procedures:

- Prior to sampling, all non-dedicated sampling equipment (bowls, spoons, interface probes, *etc.*) will be either steam cleaned or washed with potable water and a phosphate-free detergent (such as Alconox^{TM}). Decontamination may take place at the sampling location as long as all liquids are contained in pails, buckets, *etc.*

- The sampling equipment will then be rinsed with potable water followed by a deionized water rinse.

- Between rinses, equipment will be placed on polyethylene sheets or aluminum foil if necessary. At no time will washed equipment be placed directly on the ground.

- Equipment will be wrapped in polyethylene plastic or aluminum foil for storage or transportation from the designated decontamination area to the sampling location.

2.3 Management of Investigation Derived Wastes

2.3.1 Decontamination Fluids

Steam-cleaning and decontamination fluids will be collected in 55-gallon drums. The drums will be labeled as investigation derived wastewater subsequently characterized and disposed.

2.3.2 Drill Cuttings

Visibly impacted drill cuttings will be contained in 55-gallon drums. The drums will be labeled as investigation derived soils and subsequently characterized and properly disposed.

2.3.3 Development and Purge Water

All development and purge water will be contained in 55-gallon drums. The drums will be labeled as investigation derived wastewater and subsequently characterized and properly disposed.

2.3.4 Personal Protective Equipment

All personal protective equipment (PPE) will be placed in 55-gallon drums for proper disposal.

2.3.5 Dedicated Sampling Equipment

All dedicated groundwater sampling equipment, if used, will be placed in 55-gallon drums for proper disposal.

3.0 Drilling and Soil Sampling Procedures

3.1 Introduction

Drilling activities during the field work might consist of:

- Soil borings
- Monitoring well installations
- DNAPL collection well installations

These procedures are described in the following section.

3.2 Soil Borings and Subsurface Soil Sampling

The following methods will be used for conducting soil borings.

3.2.1 Suggested Equipment

- Field book
- Project plans
- Personal protective equipment in accordance with the HASP
- Metal detector
- Stakes and flagging
- One pint containers for lithology samples
- Tape measure
- Decontamination supplies
- Water level indicator
- Photoionization detector (PID) with a 10.2 or 10.6 eV lamp
- Camera
- Clear tape, duct tape
- Aluminum foil

- Laboratory sample bottles
- Coolers and ice
- Shipping supplies

3.3 Drilling and Geologic Logging Method

- Soil borings will be advanced using rotosonic, hollow stem auger, or direct push drilling methods. The rotosonic method is preferred.
- Soil samples will be collected continuously to the bottom of the borings using 5 to 10-foot long 4-inch diameter sonic sample bags, 4-foot long, 2-inch diameter macro core samplers or 2-foot long, 2-inch diameter split spoon samplers.
- Soil samples retrieved from the borehole will be visually described for:
    - Percent recovery
    - Soil type
    - Color
    - Moisture content
    - Texture
    - Grain size and shape
    - Consistency
    - Visible and olfactory evidence of staining and/or contamination
    - Any other observations

The descriptions will be in accordance with the Unified Soil Classification System (USCS), American Society for Testing and Materials (ASTM) guidelines, or the modified Burmeister system.

- Soil samples will be immediately screened for the evolution of organic vapors with a PID.
- A representative portion of the sample will be placed in a plastic “zip lock” bag or an eight-ounce sample jar filled approximately half full. The container will be labeled with the boring number and interval sampled. Aluminum foil will be placed on the top of the jar and the cap will be screwed on tightly.
- After a minimum of 10 minutes, the lid will be unscrewed and the tip of the PID will be inserted through the aluminum foil across the cap or into the bag to measure the headspace for organic vapors.

- Remaining soil will be disposed of in accordance with methods specified in the procedure for the management of IDW.

- All borings will be completed as monitoring wells, backfilled with cuttings if soil is not impacted, or sealed with bentonite or cement/bentonite grout following completion.

- All drilling equipment will be decontaminated between each boring in accordance with methods specified in the procedure for field equipment decontamination.

- The designated field geologist will log borehole geology and headspace measurements in the field book and the drilling record along with any other observations (for example, odors, NAPL, soil staining, *etc*.)

3.3.1 Soil Sampling

- Samples for VOC analysis will be collected directly from the sonic liners or split-spoons, placed into appropriate containers, and compacted to minimize headspace and pore space. The remaining sample volume will be placed into a stainless steel bowl or plastic bag, homogenized, and placed in appropriate containers for the other analyses.

- The sample containers will be labeled, placed in a laboratory-supplied cooler, and packed on ice (to maintain a temperature of 4ºC). The coolers will be shipped overnight to the laboratory for analysis.

- Chain-of-custody procedures will be followed as outlined in the QAPP.

- The sampling equipment will be decontaminated between samples in accordance with procedures described in the procedure for field equipment decontamination.

- Excess soil remaining after sampling will be contained in accordance with methods specified in the procedure for the management of IDW.

- The sample locations, descriptions, and depths will be recorded in the field book.

3.4 Monitoring Well Installation and Development

The following methods will be used for drilling, installing, and developing the monitoring wells.

3.4.1 Suggested Equipment

- Field book

- Project plans

- Personal protective equipment in accordance with the HASP

- Metal detector

- Stakes and flagging

- One pint containers for lithology samples
- Tape measure
- Decontamination supplies
- Water level indicator
- Photoionization detector (PID) with a 10.2 or 10.6 eV lamp
- Camera
- Clear tape, duct tape
- Aluminum foil
- Laboratory sample bottles
- Coolers and ice
- Shipping supplies
- Polyethylene disposable bailers (development)
- Polypropylene rope (development)
- Waterra pump or other purge pump (development)
- Stainless steel or glass beakers (development)
- Turbidity meter (development)
- Temperature, conductivity, pH meter (development)

3.4.2 Monitoring Well Installation

The monitoring wells will be installed in accordance to the following specifications:

- The monitoring well borings will be advanced with 6-inch diameter sonic casing pipe or 4.25-inch inner diameter (ID) hollow stem augers.
- Wells will be constructed with 2-inch ID, threaded, flush-joint PVC casings and screens.
- Screens will be 10 feet long with 0.01-inch or 0.02-inch slot openings with a 2-foot sump at the base. Alternatives may be used at the discretion of the field geologist and approval of National Grid based on field conditions.
- The annulus around the screens will be backfilled with silica sand having appropriate size (*e.g.* Morie No. 1) to a minimum height of two feet above the top of the screen. Auger flights will be withdrawn as sand is poured in a manner that will minimize hole collapse and bridging.

- A bentonite pellet seal or slurry seal with a minimum thickness of one foot will be placed above the sand pack. The bentonite seal (pellets) will be allowed to hydrate before placement of grout above the seal.

- The remainder of the annular space will be filled with a cement-bentonite grout to the ground surface. The grout will be pumped through a tremie pipe from the bottom up. The grout will be allowed to set for a minimum of 24 hours before wells are developed.

- Each monitoring well will have a locking expandable gas-tight cap and will be contained in a flush-mount vault.

- The concrete seal or pad will be sloped to channel water away from the well, and be deep enough to remain stable during freezing and thawing of the ground.

- The op of the PVC well casing will be marked and surveyed to 0.01 foot, and the elevation will be determined relative to a fixed benchmark or datum.

- The measuring point on all wells will be on the innermost PVC casing.

- Monitoring well construction details will be recorded in the field book and on a construction log.

3.4.3 Monitoring Well Development

- After a minimum of 24 hours after completion, the monitoring wells will be developed by surging and pumping. Pumping methods may include using a centrifugal or peristaltic pump and dedicated polyethylene tubing, using a Waterra positive displacement pump and dedicated polyethylene tubing, or other methods at the discretion of the field geologist.

- Water levels will be measured in each well to the nearest 0.01 foot prior to development.

- The wells will be developed until the water in the well is reasonably free of visible sediment (50 NTU if possible or until pH, temperature, and specific conductivity stabilize). A portable nephelometer will be used to take this measurement.

- Development water will be contained in accordance with methods specified in the procedure for the management of IDW.

Following development, wells will be allowed to recover for at least 14 days before groundwater is purged and sampled. All monitoring well development will be overseen by a field geologist and recorded in the field book.

4.0 Groundwater Sampling Procedures

4.1 Introduction

Groundwater sampling will be conducted on Site monitoring well locations. Procedures for obtaining samples of groundwater are described in this section.

4.2 Groundwater Sampling

4.2.1 Suggested Equipment

- Field book
- Project plans
- Personal protective equipment in accordance with the HASP
- Water level indicator
- Disposable polyethylene bailers or low flow sampling pump
- Polypropylene rope
- Temperature, conductivity, pH meters
- Turbidity meter
- Dissolved oxygen meter
- 250-mL glass beaker
- Flow through cell (if low flow sampling pump is used)
- Decontamination supplies
- Waterra pump or other purge pump
- Plastic tubing
- Plastic sheeting
- Photovac PID
- Clear tape, duct tape
- Coolers and ice

- Laboratory sample bottles
- Federal Express labels

4.2.2 Groundwater Sampling Method

4.2.2.1 Purging

- The number and frequency of groundwater samples to be collected and the associated analytical parameters are summarized in Section 3-3 of the SMP.
- Prior to sampling, the static water level and thickness of any free product will be measured to the nearest 0.01 foot from the surveyed well elevation mark on the top of the PVC casing with a decontaminated oil/water interface probe. NAPL thickness will be determined using a clear bailer or a weighted string. The measurement will be recorded in the field book.
- The probe will be decontaminated according to procedures outlined in the procedures for field equipment decontamination.
- The well will be purged by removing groundwater until field parameters stabilize to within 10% of previous reading; up to 3 well volumes are removed or 1 hour of purging is performed. Purging will be conducted using a low-stress sampling technique such as the USEPA Region 1 Low-Stress sampling guidance.
- If a well goes dry before the required volumes are removed, it will be allowed to recover, purged a second time until dry or the required parameters are met, and sampled when it recovers sufficiently, in accordance with low flow sampling protocol.
- Purge water will be managed and disposed of in accordance with procedures described in the management of IDW.

4.2.2.2 Sampling

- Samples will be collected using dedicated ¼-inch polyethylene tubing and micro purging techniques consistent with low flow sampling protocol.
- Prior to filling the sample bottles, one 250-mL beaker will be filled with water. The temperature, pH, conductivity, oxidation reduction potential, dissolved oxygen, and turbidity will be measured with a pre-calibrated probe and recorded in the field book. If low flow sampling methods are used, these parameters (except turbidity) will be measured within a flow through cell.
- The sample containers will be labeled, placed in a laboratory-supplied cooler and packed on ice (to maintain a temperature of 4ºC). The cooler will be shipped overnight or delivered to the laboratory for analysis.
- Chain-of-custody procedures will be followed as outlined in the QAPP.

Well sampling data will be recorded on groundwater sampling record forms.

5.0 Field Instruments and Calibration

All field analytical equipment will be calibrated immediately prior to each day’s use and more frequently if required. The calibration procedures will conform to manufacturer’s standard instructions. This calibration will ensure that the equipment is functioning within the allowable tolerances established by the manufacturer and required by the project. All instrument calibrations will be documented in the project field book and in an instrument calibration log. Records of all instrument calibration will be maintained by the Field Team Leader and will be subject to audit by the Quality Assurance Officer (QAO). Copies of all of the instrument manuals will be maintained on-site by the Field Team Leader. All changes to instrumentation will be noted in the field log book.

The following field instruments will be used during the investigation:

- PID
- pH probe
- Mini-RAM dust meter
- Dissolved oxygen probe
- Specific Conductivity probe
- Temperature probe
- Turbidity meter

Probes used to measure pH, dissolved oxygen, specific conductivity, and temperature are all housed in a single instrument and parameters are measured in a sealed flow through cell.

5.1 Portable Photoionization Analyzer

- The photoionization analyzer will be a Thermo 580B (or equivalent), equipped with a minimum 10.2 or 10.6 eV lamp. The PID is capable of ionizing and detecting compounds with an ionization potential of less than 10.6 eV. This accounts for up to 73% of the volatile organic compounds on the Target Compound List.
- Calibration must be performed at the beginning and end of each day of use with a standard calibration gas having an approximate concentration of 100 parts per million of isobutylene. If the unit experiences abnormal perturbation or erratic readings, additional calibration will be required.
- All calibration data must be recorded in field notebooks and on calibration log sheets to be maintained on-site.
- A battery check must be completed at the beginning and end of each working day.

- All changes to the PID will be noted in the field notes (such as bulb or filter cleaning or replacement).

5.2 pH

- Calibration of the pH meter must be performed at the start of each day of use, and after very high or low readings as required by this plan, according to manufacturer's instructions.

- National Institute of Standards and Technology (NIST) – traceable standard buffer solutions which bracket the expected pH range will be used. The standards will be pH of 4.0, 7.0, and 10.0 standard units.

- The use of the pH calibration must be used to set the meter to display the value of the standard being checked.

- The calibration data must be recorded on calibration sheets and maintained on-site.

5.3 Dissolved Oxygen

Calibration of the dissolved oxygen meter must be performed at the start of each day of use, after very high or low readings (approaching or outside of the theoretical dissolved oxygen range at a given temperature), and after bubbles or spurious readings are observed.

Calibrate the meter to a prepared standard or other method in accordance with manufacturer's instructions and note the scale and units on the meter.

5.4 Specific Conductivity and Temperature

- Calibration checks using the conductivity standard must be performed at the start of each day of use, after five to ten readings or after very high or low readings as required by this plan, according to manufacturer's instructions.

- The portable conductivity meter must be calibrated using a reference solution of 200 ohms/cm on a daily basis. Readings must be within five percent to be acceptable.

- The thermometer of the meter must be calibrated against the field thermometer on a weekly basis.

5.5 Turbidity Meter

The turbidity meter must be checked at the start of each day of use and at the end of the day according to manufacturer's instructions.

6.0 Sample Documentation

6.1 Chain of Custody

- A Chain-of-Custody (COC) record will accompany the sample containers during selection and preparation at the laboratory, during shipment to the field, and during return shipment to the laboratory.

- The COC will identify each sample container and the analytical parameters for each, and will list the field personnel that collected the samples, the project name and number, the name of the analytical laboratory that will receive the samples, and the method of sample shipment.

- If samples are split and sent to different laboratories, a copy of the COC record will be sent with each sample shipment.

- The COC will be completed by field personnel as samples are collected and packed for shipment.

- Erroneous markings will be crossed-out with a single line and initialed by the author.

- The REMARKS space will be used to indicate if the sample is a matrix spike, matrix spike duplicate, or matrix duplicate.

- Trip and field blanks will be listed on separate rows.

- After the samples have been collected and sample information has been listed on the COC form, the method of shipment, the shipping cooler identification number(s), and the shipper air bill number will be entered on the COC.

- Finally, a member of the sampling team will write his/her signature, the date, and time on the first RELINQUISHED BY space. Duplicate copies of each COC must be completed.

- One copy of the COC will be retained by sampling personnel. The other copy and the original will be sealed in a plastic bag and taped inside the lid of the shipping cooler.

- Sample shipments will be refrigerated at 4ºC, typically by packing with ice, to preserve the samples during shipment.

- After the shipping cooler is closed, custody seals provided by the laboratory will be affixed to the latch and across the front and back of the cooler lid, and signed by the person relinquishing the samples to the shipper.

- The seal will be covered with clear tape, and the cooler lid will be secured by wrapping with packing tape.

- The cooler will be relinquished by the shipper, typically an overnight carrier.

- The COC seal must be broken to open the container. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the Project Manager, and the samples will not be analyzed.

- The samples must be delivered to the laboratory within 48 hours of collection.

6.2 Sample Documentation

The field team leader will retain a copy of the COC, and, in addition, the field team leader will ensure that the following information about each sample is recorded in the field book:

- Sample identifier
- Identification of sampled media (*e.g.* soil, sediment, groundwater)
- Sample location with respect to a known reference point
- Physical description of sample location
- Field measurements (*e.g.* pH, temperature, conductivity, and water levels)
- Date and time of collection
- Sample collection method
- Volume of groundwater purged before sampling
- Number of sample containers
- Analytical parameters
- Preservatives used
- Shipping information:
    - Dates and method of sample shipment
    - Chain-of-Custody Record numbers
    - Federal Express Air Bill numbers

Sample recipient (*e.g.* laboratory name)

National Grid Standard Operating Procedures

Field Descriptions of Samples for Former Manufactured Gas Plant (MGP) Sites

SOIL SAMPLE DESCRIPTIONS

It is important that descriptive qualifiers are consistently used to characterize degree and nature of contaminant impacts and visual-manual soil classification. The following presents some examples of descriptive qualifiers.

SOIL LOGGING

- All soils are to be logged using the **Unified Soil Classification** (ASTM D 2488 field descriptions)
- **PID or FID** used to screen all soil samples (Jar Headspace method) – maximum readings should be recorded and included on the logs. PID/FID to be calibrated daily at a minimum
- **Moisture terms** are: Dry, Moist, and Wet
- **Color terms** - use geotechnical color charts - colors may be combined: e.g. red-brown. Color terms should be used to describe the "natural color" of the sample as opposed to staining caused by contamination (see below)
- **Log of each sample interval** should be prepared as follows:

  [Coarse Grained Example] NARROWLY GRADED SAND (SP); mostly fine sand; <5% fines; red-brown, moist, environmental/depositional/geologic descriptions.

  [Fine Grained Example] SANDY SILT (ML); heterogeneous till structure, nonplastic, ~30% fine to coarse, subangular sand; ~10% subangular fine gravel, max. size ~ 10 mm; brown; environmental/depositional/geologic descriptions.
- **Representativeness** – Soil logs should include particular notes if the field representative believes that there is a possibility the soil sample being described is not representative of the interval sampled.
- **Intervals for Description** – if using a 2' (split spoon) or 4' (Macro-core) long sampler – the field description should not necessarily be for the entire sample interval. It is important to look for, identify, and describe small-scale units and changes within each sample interval.

DESCRIPTION OF CONTAMINANTS

Visible Contamination Descriptors

- **Sheen** - iridescent petroleum-like sheen. Not to be used to describe a "bacterial sheen" which can be distinguished by its tendency to break up on the water surface at angles whereas petroleum sheen will be continuous and will not break up. A field test for sheen is to put a soil sample in a jar of water and shake the sample (jar shake test) , then observe the presence/absence of sheen on the surface of the water in the jar.

- **Stained** - used w/ color (i.e. black or brown stained) to indicate that the soil matrix is stained a color other than the natural (unimpacted) color of the soil.

- **Coated** - soil grains are coated with tar/free product – there is not sufficient free-phase material present to saturate the pore spaces.

- **Blebs** - observed discrete sphericals of tar/free product - but for the most part the soil matrix was not visibly contaminated or saturated. Typically this is residual product.

- **Saturated** - the entirety of the pore space for a sample is saturated with the tar/free product. Care should be taken to ensure that you're not observing water saturating the pore spaces if you use this term. Depending on viscosity, tar/free-phase saturated materials may freely drain from a soil sample.

- **Oil**. Used to characterize free and/or residual product that exhibits a distinct fuel oil or diesel fuel like odor; distinctly different from MGP-related odors/impacts.

- **Tar**. Used to describe free and/or residual product that exhibits a distinct "coal tar" type odor (e.g. naphthalene-like odor). Colors of product can be brown, black, reddish-brown, or gold.

- **Solid Tar**. Used to describe product that is solid or semi-solid phase. The magnitude of the observed solid tar should be described (e.g. discrete granules or a solid layer).

- **Purifier Material**. Purifier material is commonly brown/rust or blue/green wood chips or granular material. It is typically associated with a distinctive sulfur-like odor. Other colors may be present.

Olfactory Descriptors

- Use terms such as " tar-like odor" or "naphthalene-like odor" or "fuel oil-like odor" that provide a qualitative description (opinion) as to the possible source of the odor.
- Use modifiers such as strong, moderate, faint to indicate intensity of the observed odor.

DNAPL/LNAPL

- A jar shake test should be performed to identify and determine whether observed tar/free-phase product is either denser or lighter than water. In addition, MGP residues can include both light and dense phases - this test can help determine if both light and dense phase materials are present at a particular location.

Viscosity of Free-Phase Product – If free-phase product/tar is present a qualitative description of viscosity should be made. Descriptors such as:

- Highly viscous (e.g. taffy-like)
- Viscous (e.g. No. 6 fuel oil or bunker crude like)
- Low viscosity (e.g. No. 2 fuel oil like)

GROUNDWATER SAMPLING OBSERVATIONS

- Any observations of sheen, blebs, free-phase product/tar, staining or coating of the sampling equipment, odor, etc. that made during sampling of groundwater are to be included in the groundwater sample collection log.

MGP COLOR CHART

		RGB Color	Auto Cad Index
🟥	**TAR SATURATED**	255,0,0	10
🟪	**COATED MATERIAL, LENSES**	255,0,255	210
🟧	**BLEBS, GLOBS, SHEEN**	255,191,0	40
🟨	**STAINING, ODOR**	255,255,0	50
🟦	**PETROLEUM IMPACTS SHEEN, STAINING, ODORS**	127,233,255	141
🟦	**PURIFIER WASTE AND ODOR**	0,0,255	170
🟩	**NO OBSERVED IMPACTS**	0,165,0	92

2.4.3 Sampling Interval and Flow Controller Setting

When you request canisters and flow controllers from Air Toxics Ltd., you will be asked for the sampling interval, and the flow controllers will be pre-set prior to shipment according to the table below. The flow controller is set to collect 5 L of sample over the sample interval. Final canister vacuum is targeted at 5 in. Hg. The flow rate is set at standard atmospheric conditions (approximately sea level). If the air sample is a process (pressurized or under vacuum) or is collected at elevation, the canisters will fill faster or slower depending on the sampling conditions. If you specify the pressure of the source at project set-up, we can set the flow controller accordingly. See Section 4 for a discussion of collecting a sample at elevation. The 24-hr flow controllers should not be used for process or source samples.

Table 2.4.3 Flow Rates for Selected Sampling Intervals (mL/min)

Sampling Interval (hrs)	**0.5**	**1**	**2**	**4**	**8**	**12**	**24**
6 L Canister	167	83.3	41.7	20.8	11.5	7.6	3.5
1 L Canister	26.6	13.3	6.7	-	-	-	-

Note: Target fill volumes for 6 L and 1 L canisters are 5,000 mL and 800 mL, respectively.

$$\text{Flow Rate(mL/min)} = \frac{\text{Target Fill Volume (mL)}}{\text{Sampling Interval (min)}}$$

2.4.4 Final Canister Vacuum and Flow Controller Performance

Ideally the final vacuum of a 6 L canister should be 5 in. Hg or greater. As long as the differential pressure is greater than 4 in. Hg ambient pressure, then the flow through the device will remain approximately constant as the canister fills. If there is insufficient differential pressure, the flow through the controller will decrease as the canister pressure approaches ambient. Because of the normal fluctuations in the flow rate (due to changes in ambient temperature, pressure, and diaphragm instabilities) during sampling, the final vacuum will range between 2 and 10 in. Hg.

Compliance Assessment Site Investigation and Remediation

nationalgrid

General Information

Observation Date

Time AM / PM

Primary Task of Crew

(e.g., Installing wire, fusing gas line, etc.)

Additional info on Crew Task

Observed Department

Who did you observe? ○ **Employees** ○ **Contractor**

# of People Observed:

Observers

Observed Employees or Contractor Company Name

Location of Observation

Site Name

Address

City

State

Location Type ○ Company Site ○ Non-Company Site (e.g., Office, Right of Way, etc.)

Observation Items

Communication & Risk Assessment	****Additonal information required under Observation Details***				
1. Understands "What's the worst thing that could happen on the job?"	○ Poor*	○ Needs Improvement*	○ Fair	○ Good	○ Very Good
2. Crew members demonstrate clear understanding of job hazards and conditions	○ Poor*	○ Needs Improvement*	○ Fair	○ Good	○ Very Good
3. Daily safety meeting has been documented and performed with crew	○ Safe	○ Unsafe*			
4. Demonstrates clear understanding of the controls necessary to minimize the risks associated with the hazards at the job site (demarcation, position of equipment, shoring, atmospheric monitoring, adequate egress for excavations, etc)	○ Poor*	○ Needs Improvement*	○ Fair	○ Good	○ Very Good
5. A complete, well-written, Job Brief has been performed identifying the hazards and risks associated with the job and the steps put in place to reduce those risks. (ie: proximity of energized lines, grounding, shoring, low hanging pipes, etc.)	○ Poor*	○ Needs Improvement*	○ Fair	○ Good	○ Very Good
Work Zone Safety	****Additonal information required under Observation Details***				
6. Actively Managing Work Area - Good Housekeeping, maintains walking and work surfaces, clear areas of egress and good lighting for task	○ Poor*	○ Needs Improvement*	○ Fair	○ Good	○ Very Good
7. Appropriate use of barricade and tape to secure the work area.	○ Safe	○ Unsafe*			
8. Keeps to designated pedestrian routes	○ Safe	○ Unsafe*			
9. Properly manages the debris generated by their work	○ Poor*	○ Needs Improvement*	○ Fair	○ Good	○ Very Good
10. Well-written Job Brief completed identifying the hazards and risks associated with the Work Zone?	○ Poor*	○ Needs Improvement*	○ Fair	○ Good	○ Very Good
11. Steps in place to reduce the Work Zone risks identified in the Job Brief?	○ Yes	○ No*			
12. Work Area properly maintained to protect public from hazards such as excavations, equipment and materials being used or stored?	○ Poor*	○ Needs Improvement*	○ Fair	○ Good	○ Very Good
13. Work Zone Traffic Protection (flags, signs, cones and barricades) in place at the proper distances correctly positioned and maintained?	○ Yes	○ No*			
14. Work Zone signs placed in the correct order?	○ Yes	○ No*			
15. Proper number of cones on vehicle to provide proper traffic flow?	○ Yes	○ No*			
16. Proper tapper and buffer lengths established?	○ Yes	○ No*			

Work Zone Safety

****Additonal information required under Observation Details***

17. Channelizing devices are clean, aligned, and properly spaced?	○ Safe	○ Unsafe*			
18. Protective systems placed appropriately for vehicles near the excavation?	○ Safe	○ Unsafe*			
19. Barricade used properly?	○ Yes	○ No*			
20. Vehicles properly positioned at the work site for the conditions?	○ Safe	○ Unsafe*			
21. Is supplemental lighting used to improve worksite visibility when required?	○ Yes	○ No*			
22. Is Hi-Vis outer clothing worn as required?	○ Yes	○ No*			
23. Flaggers / Police Details being utilized when required?	○ Yes	○ No*			
24. Flagger illumination adequate and distinguishable from work zone?	○ Safe	○ Unsafe*			
25. Flagger, certified, properly equipped, in the correct location and using hand signals?	○ Poor*	○ Needs Improvement*	○ Fair	○ Good	○ Very Good
26. Police detail properly equipped and in the correct location?	○ Safe	○ Unsafe*			

Personal Protection

****Additonal information required under Observation Details***

27. Maintains PPE in good condition	○ Poor*	○ Needs Improvement*	○ Fair	○ Good	○ Very Good
28. Wears all required PPE correctly	○ Safe	○ Unsafe*			

Excavation Section

****Additonal information required under Observation Details***

29. Are employees clear from under and around excavating equipment when digging is in progress?	○ Safe	○ Unsafe*			
30. Are employees clear from underneath loads handled by lifting or by excavation equipment?	○ Safe	○ Unsafe*			
31. Did the Competent Person consider the use of a protection system whenever an employee is in a prone position in an excavation (i.e. lying flat under a pipe)?	○ Safe	○ Unsafe*			
32. Excavation protection is in place was it is built to OSHA / National Grid requirements (M-1301)?	○ Poor*	○ Needs Improvement*	○ Fair	○ Good	○ Very Good
33. For Excavation activities conducted during emergency conditions were Dig Safe and Company Policies followed? (NG-USA-EOP G013, GOPB 101, CNST 5010)	○ Safe	○ Unsafe*			
34. Has a dig safe/One Call case number been assigned to the worksite?	○ Safe	○ Unsafe*			
35. Has adequate physical protection been established to protect works, equipment and general public from falling into the excavation?	○ Poor*	○ Needs Improvement*	○ Fair	○ Good	○ Very Good
36. Has all underground facilities been identified?	○ Safe	○ Unsafe*			
37. Has the competent person been identified?	○ Safe	○ Unsafe*			
38. Has the excavation been inspected and documented by the competent person prior to entry?	○ Safe	○ Unsafe*			
39. Has the risks associated with the job tasks and excavation been identified and documented on the job brief?	○ Poor*	○ Needs Improvement*	○ Fair	○ Good	○ Very Good
40. Has the soil been classified?	○ Poor*	○ Needs Improvement*	○ Fair	○ Good	○ Very Good
41. Is atmospheric testing required prior to entry?	○ Safe	○ Unsafe*			
42. Is equipment being properly maintained away from the edge of the excavation / secured from falling into the excavation?	○ Safe	○ Unsafe*			
43. Is excavation house keeping properly being maintained?	○ Safe	○ Unsafe*			
44. Is excavation protection required?	○ Safe	○ Unsafe*			
45. Is excavation protection system free of damage / defects that might impair their proper function?	○ Safe	○ Unsafe*			
46. Is the employee protected from loose rock / soil and debris?	○ Safe	○ Unsafe*			
47. Methods used in classifying the soil?	○ Poor*	○ Needs Improvement*	○ Fair	○ Good	○ Very Good
48. Methods used in identifying the underground facilities?	○ Poor*	○ Needs Improvement*	○ Fair	○ Good	○ Very Good
49. Were all underground facilities, such as telephone, waterlines, gas, electric, etc., shall be located and marked prior to digging?	○ Safe	○ Unsafe*			
50. Where the stability of adjoining buildings, walls, sidewalks, pavement or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning in place?	○ Poor*	○ Needs Improvement*	○ Fair	○ Good	○ Very Good
51. Is the soil stable?	○ Safe	○ Unsafe*			
52. Has the proper soil set back been maintained (24")?	○ Yes	○ No*			

Excavation Section

****Additonal information required under Observation Details***

53. Are warning systems, such as barricades, hand or mechanical signals or stop logs, in use when mobile equipment is operating next to the excavation? ○ Safe ○ Unsafe*

54. Are employees in the excavation while power equipment digging is in progress? ○ Safe ○ Unsafe*

55. Are the support systems such as shoring, bracing, or underpinning in place where the stability is in question of adjoining buildings, walls, sidewalks, pavement or other structures? ○ Safe ○ Unsafe*

56. Is there evidence of characteristics indicating the potential for a cave-in? ○ Safe ○ Unsafe*

57. Has a SUPERVISOR NOTIFICATION been made prior to the use of a protective system on a job site? ○ Safe ○ Unsafe*

58. Was this notification and discussion documented on the Excavation Log? ○ Safe ○ Unsafe*

59. Is the tabulated data / MFG specifications available at the job site? ○ Yes ○ No*

60. Has proper access / egress been established (Ladder @ 4' in depth and no more than 25' lateral travel) extending 3' excavation? ○ Yes ○ No*

61. Can the competent person explain adequate precautions to prevent employee exposure to hazardous atmospheres / water accumulation? ○ Poor ○ Needs Improvement* ○ Good

62. Was testing for hazardous levels of natural gas conducted prior to entry? ○ Safe ○ Unsafe*

63. Are the LEL readings within prescribed limits as per Gas Operating procedures (for Gas only excavations)? ○ Safe ○ Unsafe*

64. Was testing for Hazardous Gases, Flammable, Oxygent and Hydrogen Sulfide conducted when near landfills, gasoline stations, or hazardous waste sites? ○ Yes ○ No*

65. When hazardous conditions are present or reasonably expected to develop; is emergency rescue equipment, such as breathing apparatus, safety harness and lifeline available to be worn by the employee at the job site? ○ Poor ○ Needs Improvement* ○ Good

66. Has adequate physical protection been established to protect workers, equipment and general public from falling into the excavation? ○ Poor ○ Needs Improvement* ○ Good

67. Are walkways or bridges provided to permit employees, the public or equipment to safely cross over excavations? ○ Safe ○ Unsafe*

68. Are guardrails for walkways over excavations > 6 feet in depth provided? ○ Poor ○ Needs Improvement* ○ Good

69. Has adequate protection been provided for the excavation if it is left open unattended? ○ Safe ○ Unsafe*

70. Protective Barriers for Unattended Excavations in MA Only: Is access to unattended excavations over three (3) feet deep restricted by covers or portable barriers? ○ Poor ○ Needs Improvement* ○ Good

Vehicles / Mobile Equipment

****Additonal information required under Observation Details***

71. Follows safe vehicle backing procedures ○ Safe ○ Unsafe*

72. Loads are secured properly ○ Poor* ○ Needs Improvement* ○ Fair ○ Good ○ Very Good

73. Properly positioned vehicle at the work site ○ Poor* ○ Needs Improvement* ○ Fair ○ Good ○ Very Good

74. Required distances are maintained from energized lines, excavation and trenching operations while using excavator, crane or other non-typical equipment. ○ Safe ○ Unsafe*

Work Methods and Procedures

****Additonal information required under Observation Details***

75. Crews understand the applicable sections of the HASP ○ Poor* ○ Needs Improvement* ○ Fair ○ Good ○ Very Good

76. Environmental permits/plans are on site and conditions followed ○ Poor* ○ Needs Improvement* ○ Fair ○ Good ○ Very Good

77. Exclusion zone is properly delineated ○ Safe ○ Unsafe*

78. Follows proper procedures for confined space / enclosed space ○ Safe ○ Unsafe*

79. Follows the proper regulatory and corporate safety procedures for trenching, excavation, backfilling, compaction and restoration work ○ Poor* ○ Needs Improvement* ○ Fair ○ Good ○ Very Good

80. Maintains minimum approach distances (MAD) ○ Safe ○ Unsafe*

81. OSHA certificates and medical monitoring documents are on site ○ Safe ○ Unsafe*

82. Proper decon procedures are followed ○ Safe ○ Unsafe*

83. The HASP is on site ○ Safe ○ Unsafe*

84. Visitor sign in sheet is onsite ○ Safe ○ Unsafe*

Work Place Environment

****Additonal information required under Observation Details***

85. Fire Extinguishers - Placement and Inspection Date ○ Safe ○ Unsafe*
86. Adequate spill clean up equipment is on site ○ Poor* ○ Needs Improvement* ○ Fair ○ Good ○ Very Good
87. First Aid equipment is available and fully stocked ○ Safe ○ Unsafe*
88. Lighting (Safety and Security) within building, garage, yard, parking area and at job site. ○ Poor* ○ Needs Improvement* ○ Fair ○ Good ○ Very Good
89. Work site is secure from unauthorized entry ○ Safe ○ Unsafe*

Work Practices

****Additonal information required under Observation Details***

90. Not climbing or walking over materials, equipment or waste ○ Safe ○ Unsafe*
91. Maintains awareness of other activities in the work area (distance from moving equipment, work overhead, near excavations, confined areas, traffic, gas lines, etc) ○ Poor* ○ Needs Improvement* ○ Fair ○ Good ○ Very Good
92. Stockpiles are covered and secured at the end of each work day ○ Poor* ○ Needs Improvement* ○ Fair ○ Good ○ Very Good
93. Takes precautions when working in unique conditions - uneven surfaces, slopes, steps, in excavation/trench, poorly lit areas, adverse weather, etc. ○ Poor* ○ Needs Improvement* ○ Fair ○ Good ○ Very Good

Environmental

****Additonal information required under Observation Details***

94. Containers of waste appropriately marked ○ Safe ○ Unsafe*
95. Ensures waste is properly managed ○ Poor* ○ Needs Improvement* ○ Fair ○ Good ○ Very Good
96. Follows procedures / methods to help protect the environment during work activities (use of absorbant materials, covers drains, proper location of equipment, hay bales to protect wetlands, good housekeeping etc.) ○ Poor* ○ Needs Improvement* ○ Fair ○ Good ○ Very Good
97. Knows procedures for responding to spills or other releases ○ Poor* ○ Needs Improvement* ○ Fair ○ Good ○ Very Good
98. Perimiter air monitoring is performed and documented ○ Poor* ○ Needs Improvement* ○ Fair ○ Good ○ Very Good
99. Water quality monitoring is performed and documented ○ Poor* ○ Needs Improvement* ○ Fair ○ Good ○ Very Good

Cargo Securement - Vehicle

****Additonal information required under Observation Details***

100. Does the device have the potential to move forward, backward, laterally or vertically? ○ Poor* ○ Needs Improvement* ○ Fair ○ Good ○ Very Good
101. Is the vehicle loaded properly to prevent the cargo from leaking, spilling, blowing or falling from the motor vehicle? ○ Poor* ○ Needs Improvement* ○ Fair ○ Good ○ Very Good
102. Is the cargo, contained, immobilized or secured to prevent shifting on or within the vehicle to such an extent that the vehicles stability or maneuverability is not adversely affected? ○ Yes ○ No*
103. Are the securement devices in good working condition free of defects? ○ Yes ○ No*
104. Are all of the securement attachment points free from defects, cracks or damage? ○ Yes ○ No*
105. Are the tie downs attached and secured in a manner that prevents it from loosening, unfastening, opening or releasing while the vehicle is in transit? ○ Yes ○ No*

Cargo Securement - Trailering

****Additonal information required under Observation Details***

106. Pintle latch is closed ○ Yes ○ No*
107. Latch pin fully inserted ○ Yes ○ No*
108. Chains are crossed under trailer tongue ○ Yes ○ No*
109. Trailer electrical cord is connected ○ Yes ○ No*
110. Trailer brakes (if equipped) are connected ○ Yes ○ No*
111. Emergency breakaway device is connected (electric brakes) ○ Yes ○ No*

Cargo Securement - Heavy Equipment Securement

****Additonal information required under Observation Details***

112. All units had four (4) individual tie downs securing the main machine or tractor ○ Yes ○ No*
113. All hydraulic shovels or attachments were secured using a completely separate tie down system ○ Yes ○ No*
114. All units used properly rated tie down systems for securement ○ Safe ○ Unsafe*

Excavation Section (Draft)

****Additonal information required under Observation Details***

115. Has a dig safe/One Call case number been assigned to the worksite? ○ Yes ○ No*

Excavation Section (Draft)

<u>Additonal information required under Observation Details</u>

116. Has all underground facilities been identified such as telephone, waterlines, gas, electric, etc.?	○ Yes	○ No*	
117. Methods used in identifying the underground facilities is an accepted practice?	○ Poor	○ Needs Improvement*	○ Good
118. For Excavation activities conducted during emergency conditions were Dig Safe and Company Policies followed? (NG-USA-EOP G013, GOPB 101, CNST 5010)	○ Safe	○ Unsafe*	
119. Is the soil stable?	○ Safe	○ Unsafe*	
120. Has the competent person been identified who has determined the soil classification and adequate protective systems (sloping, shoring, shielding) are in place?	○ Safe	○ Unsafe*	
121. Has the soil been classified by an approved method?	○ Poor	○ Needs Improvement*	○ Good
122. Is the employee protected from loose rock / soil and debris?	○ Safe	○ Unsafe*	
123. Has the proper soil set back been maintained (24")?	○ Yes	○ No*	
124. Housekeeping properly being maintained with tools and equipment away from edge of excavation.	○ Safe	○ Unsafe*	
125. Are warning systems, such as barricades, hand or mechanical signals or stop logs, in use when mobile equipment is operating next to the excavation?	○ Safe	○ Unsafe*	
126. Are workers clear from equipment and out of swing radius when digging, moving, or handling an overhead load is in progress?	○ Poor	○ Needs Improvement*	○ Good
127. Are the support systems such as shoring, bracing, or underpinning in place where the stability is in question of adjoining buildings, walls, sidewalks, pavement or other structures?	○ Safe	○ Unsafe*	
128. Is there evidence of characteristics indicating the potential for a cave-in?	○ Safe	○ Unsafe*	
129. Has a SUPERVISOR NOTIFICATION been made prior to the use of a protective system with notification and discussion noted on the excavation log?	○ Safe	○ Unsafe*	
130. If employees are working in the prone position in the excavation did the competent person consider the use of a protective system?	○ Safe	○ Unsafe*	
131. Excavation protection is in place and built to OSHA / National Grid requirements (M-1301) and is free of damage/defects that might impair their function?	○ Poor	○ Needs Improvement*	○ Good
132. Is the tabulated data / MFG specifications available at the job site?	○ Yes	○ No*	
133. Has proper access / egress been established (Ladder @ 4' in depth and no more than 25' lateral travel) extending 3' excavation?	○ Yes	○ No*	
134. Was testing for atmospheric hazardous levels conducted prior to entry?	○ Yes	○ No*	
135. Can the competent person explain adequate precautions to prevent employee exposure to hazardous atmospheres / water accumulation?	○ Poor	○ Needs Improvement*	○ Good
136. Was testing for hazardous levels of natural gas conducted prior to entry?	○ Safe	○ Unsafe*	
137. Are the LEL readings within prescribed limits as per Gas Operating procedures (for Gas only excavations)?	○ Safe	○ Unsafe*	
138. Was testing for Hazardous Gases, Flammable, Oxygen and Hydrogen Sulfide conducted when near landfills, gasoline stations, or hazardous waste sites?	○ Yes	○ No*	
139. When hazardous conditions are present or reasonably expected to develop, is emergency rescue equipment, such as breathing apparatus, safety harness and lifeline available to be worn by the employee at the job site?	○ Poor	○ Needs Improvement*	○ Good
140. Has adequate physical protection been established to protect works, equipment and general public from falling into the excavation?	○ Poor	○ Needs Improvement*	○ Good
141. Are walkways or bridges provided to permit employees, the public or equipment to safely cross over excavations?	○ Safe	○ Unsafe*	
142. Are guardrails for walkways over excavations > 6 feet in depth provided?	○ Poor	○ Needs Improvement*	○ Good
143. Has adequate protection been provided for the excavation if it is left open unattended?	○ Safe	○ Unsafe*	
144. Protective Barriers for Unattended Excavations in MA Only: Is access to unattended excavations over three (3) feet deep restricted by covers or portable barriers?	○ Poor	○ Needs Improvement*	○ Good

Observation Details

Observation Details for Observation #:

List Applicable Employees

Primary Cause (See List)

Immediate Action Taken (See List)

Comments

Observation Details for Observation #:

List Applicable Employees

Primary Cause (See List)

Immediate Action Taken (See List)

Comments

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Observation Details for Observation #:

List Applicable Employees

Primary Cause (See List)

Immediate Action Taken (See List)

Comments

Follow-up Items

Description	Assigned To	Due Date	Complete Date

Additional Comments

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Executive Summary

This document presents standard operating procedures (SOPs) for conducting soil vapor intrusion evaluations at National Grid's manufactured gas plant (MGP) sites in New York State. These procedures have been developed on behalf of National Grid in cooperation with the New York State Departments of Health (NYSDOH) and Environmental Conservation (NYSDEC).

These SOPs are based on a current understanding of soil vapor intrusion, existing site-specific conditions at National Grid's MGP sites in New York State, and the current regulatory climate in the state. They have been developed in consideration of NYSDOH's Draft *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH, 2006~~5~~), NYSDEC and NYSDOH input, ~~standards~~ guidance documents issued by the United States Environmental Protection Agency (USEPA), O'Brien & Gere's and Haley & Aldrich's indoor air and soil vapor intrusion evaluation experience and expertise, National Grid's experience in New York State and New England, and consultation with other New York utility companies. As such, this set of SOPs may be updated or modified as the understanding of vapor intrusion continues to evolve, and as guidance documents and regulations are revised and updated. Further, these SOPs may be modified based on site-specific conditions.

Although the regulatory community generally considers soil vapor intrusion of non-chlorinated constituents ~~a~~ "… less of a ~~ower~~ priority in the evaluation of past sites …" (NYSDEC 2006), National Grid is working with the NYSDOH and NYSDEC to identify MGP sites where evaluation of the potential vapor intrusion pathway is warranted. For these sites, a soil vapor intrusion evaluation should be conducted during the Remedial Investigation (RI) phase so it can be adequately addressed in the Feasibility Study (FS) and integrated in the selection of a comprehensive site remedy.

SOP Objectives

While the NYSDOH guidance document (2006~~5~~) identified above provides general guidance for evaluating soil vapor intrusion for a wide range of sites, this set of SOPs complements that guidance document by focusing on specific procedures for evaluating soil vapor intrusion at MGP sites. Specifically, the primary objectives of these SOPs are to:

1. Establish consistent protocols for collecting and analyzing samples and evaluating data at National Grid's MGP sites in New York State; and

2. Establish uniform work plan and reporting elements for each applicable MGP site, thus streamlining work plan and report development and review.

Overview of Soil Vapor Intrusion Evaluations

The goal of a soil vapor intrusion evaluation is to assess whether there are complete exposure pathways of soil vapor to indoor air. A complete exposure pathway exists if vapors from MGP-related constituents are migrating through various pathways into nearby buildings at concentrations that may result in an unacceptable human health risk. If a complete exposure pathway does not exist, then further assessment of soil vapor intrusion is not required, unless there is a relevant change in site conditions, or as noted above, the understanding of soil vapor intrusion evolves and guidance documents and regulations are revised and updated. Because soil vapor intrusion requires a complete pathway to exist between the source of the vapors and the receptor, a phased approach can be applied to establish if a complete pathway exists. This phased approach to soil vapor intrusion evaluations, as it applies to National Grid's MGP sites in New York State, includes:

Phase 1 – Documentation Review

Phase 2 – Soil Vapor Sampling

Phase 3 – Sub-Slab Sampling

Phase 4 – Indoor Air Sampling

Please note that not all of these phases may need to be conducted. Depending upon available site-specific data, any one of these phases may be bypassed. For instance, if Phase 1 reveals a high potential for impacted buildings, Phase 2 may be bypassed and the evaluation may proceed directly from Phase 1 to Phase 3 or 4. In addition, Phases 3 and 4 may be conducted simultaneously if site conditions dictate.

The remainder of this document describes the various procedures to review site documentation, conduct sampling, and evaluate sampling data, organized into the four phases outlined above. To facilitate the steps required for each phase, process flow diagrams for all four phases are provided (Figures 1 through 4).

1. Phase 1. Documentation Review

1.1. Objective

The first phase of the soil vapor intrusion evaluation for an MGP site involves reviewing available site documentation, and supplementing that data as necessary, to identify potential vapor receptors with respect to MGP-impacted soil and groundwater and to identify preferential pathways by which vapors would migrate to those receptors.

The steps of Phase 1 include:

Step 1. Data Compilation and Review

Step 2. Data Evaluation

Step 3. Data Reporting

Figure 1 illustrates a process flow diagram for Phase 1. If, during the Phase 1 documentation review, the data suggest that potential receptors are sufficiently close to potential MGP-impacted soil or groundwater, then the evaluation should proceed to Phase 2. This section discusses the Phase 1 steps in more detail and provides guidance on whether to proceed to Phase 2. Please note that the following steps may be modified based on site-specific conditions.

1.2. Step 1. Data Compilation and Review

Step 1 involves compiling and reviewing site-specific data to identify potential vapor receptors, MGP-impacted soil or groundwater, and preferential vapor pathways, as defined in the following subsections. Documentation to be compiled and reviewed includes data collected during the Site Characterization (SC) and/or RI phase, as well as other data/documents generated for the site. For some MGP sites, additional data may be needed to complete this first step, and a site visit may be necessary to collect more data.

1.2.1. Identify Potential Vapor Receptors

During the review of site-specific data, potential vapor receptors must be identified and located. Potential receptors are occupied or unoccupied buildings (which are anticipated to be reoccupied in the near future) to which soil vapors could migrate; however, potential receptors do not include:

- Buildings that are occupied infrequently and are not intended for long-term occupancy (such as storage garages and other storage buildings);
- Active and inactive non-residential buildings where large quantities of petroleum products are~~/were~~ used and/or stored (such as gas stations, auto repair shops, and vehicle staging buildings); and

- Unoccupied buildings owned by National Grid.

Vacant properties are not considered as potential vapor receptors. If no potential vapor receptors are found during this step, then there is no need to continue with the evaluation.

1.2.2. Identify Impacted Groundwater and Soil

During this first step, MGP-impacted groundwater and soil must also be identified. After compiling the necessary site-specific data, that information should be reviewed to determine:

- Depth to groundwater;
- Direction of groundwater flow;
- Location, depth, extent, and concentration of potential MGP-related constituents in unsaturated soil and groundwater;
- Location, depth, and extent of NAPL; and
- Presence of an overlying water bearing zone that does not have MGP impacts and provides an effective barrier to vapor migration.

1.2.3. Identify Preferential Vapor Pathways

During the review of site-specific documentation, preferential vapor pathways (if any) must be identified. A variety of site features can act as preferential pathways for vapor migration, including:

- Common anthropogenic features such as buried utilities and foundations that are backfilled with gravel or other porous fill. Because soil vapor can migrate horizontally and travel further in these features than in the surrounding native soil, vapors may enter buildings that are in contact with these features.
- Natural, buried drainage channels, which can also act as preferential vapor pathways and must be noted if present or suspected.

Most likely, these features would have been identified during previous investigation activities. Only preferential vapor pathways that overlay or intersect impacted groundwater or soil and abut or lay below the foundation of potential receptors, should be considered in the evaluation. However, features that are in saturated soils (*e.g.*, below the water table) do not act as preferential vapor pathways, and should not be evaluated further unless they are found to be transmitting impacted groundwater.

1.3. Step 2. Data Evaluation

The second step of Phase 1 involves evaluating the site-specific data to determine if one or both of the following conditions exist:

Condition 1. MGP-related impacts exist above screening levels in groundwater or detectable levels in unsaturated soil located within 100 feet[1] of a potential receptor.

Condition 2. A potential preferential vapor pathway exists between potential receptors and areas with MGP-related soil or groundwater impacts.

To assess the distance to a receptor (Condition 1), the horizontal distance from the nearest detectable concentration of MGP-impacted groundwater or soil must be determined. In the case of a non-impacted water table or saturated soil layers overlying impacted groundwater or soil, the upper water table serves as a vapor barrier; therefore, these areas should not be considered in this evaluation. It should be noted, that other barriers may also exist and inhibit vapor migration, such as subsurface structures, low-permeable soils, surface water bodies, and other features. These features and their influence on vapor migration need to be evaluated on a site-specific basis.

If one or both of the above conditions exist, then the following screening check~~s~~ must be conducted:

- Compare the impacted groundwater concentrations with the screening levels presented in Table 1. If the concentrations are equal to or greater than the screening levels, then the evaluation should proceed to Phase 2. If the concentrations are less than the screening levels, then further evaluation is not warranted at this time.[1] However, if site conditions change (e.g., soil and/or groundwater impacts increase in concentration or there is a change in property use), then this step must be revisited to confirm if Condition 1 and/or Condition 2 apply and additional investigation is necessary.

~~? Confirm the location of the impacted soil in relation to potential receptors if the site has soil impacts but no groundwater impacts. If the impacted soil lies directly below any receptor, then the evaluation must proceed to Phase 2. If the impacted soil does not lie below any receptors, then further evaluation is not warranted at this time.~~

1.4. Step 3. Data Reporting

Upon completion of Steps 1 and 2, a Phase 1 Summary Report must be prepared to document the site conditions and conclusions from this phase. The report should include pertinent MGP-related data/data trends (e.g., from ~~the most~~ recent rounds of groundwater sampling) or summarize the data/data trends and reference a publicly available document(s) which includes the data. The Phase I Summary Report should also include a site map that shows the following:

- Locations of potential vapor receptors;
- Description of the existing land use (commercial, industrial, residential) and type of commercial or industrial activities at potential vapor receptors;
- Locations of explorations and environmental sampling, such as groundwater monitoring wells, soil boring, and test pits;
- Areas of impacted groundwater and soil;

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[1] Guidance from the USEPA recommends that buildings within 100 feet of known soil or groundwater contaminants be evaluated for potential vapor intrusion (USEPA, 2002).

- Soil type;
- Locations of preferential vapor pathways and/or vapor barriers; and
- Distances between impacted groundwater and soil to receptors.

If no further evaluation is warranted, then the Phase 1 Summary Report must be submitted to NYSDEC and NYSDOH stating that no further evaluation is warranted at this time, and include the basis and supporting documentation for this recommendation. If further evaluation is warranted, then the documentation assembled for this report must be included in the Phase 2 ~~Summary Report~~Work Plan (refer to Section 2).

2. Phase 2. Soil Vapor Sampling

2.1. Objective

Phase 2 involves collecting samples of the soil vapor to assess if vapors exist near potential receptors (which are identified in Phase 1), and at concentrations that would warrant further evaluation. The steps of this phase consist of:

Step 1. Work Plan Development

Step 2. Sampling and Analysis

Step 3. Data Evaluation

Step 4. Data Reporting

Figure 2 illustrates a process flow diagram for Phase 2, and the remainder of this section discusses these steps in more detail. Please note that the following steps may be modified based on site-specific conditions.

2.2. Step 1. Work Plan Development

Step 1 consists of developing a Sampling and Analysis Work Plan that will include:

- Sampling locations (which should be depicted on a site map included with the work plan), quantities, and rationale ;
- Sampling depths and rationale;
- Sampling and analysis methods*;
- Target analytes and reporting limits*;
- Quality assurance/quality control (QA/QC) program*;
- Data evaluation criteria*; and
- Data reporting.

* Details for these items do not need to be included in the work plan. Instead, refer to the details in this SOP.

Any deviations from these items listed above must be called out and briefly explained in the work plan. The work plan must be submitted to the NYSDEC and NYSDOH for review and approval. The work plan items are discussed below along with the remaining steps of Phase 2.

2.3. Step 2. Sampling and Analysis

This step involves implementing the Sampling and Analysis Work Plan that was developed during Step 1. Specifically, this section discusses the rationale for selecting site-specific sampling locations, quantities, and depths, and provides some details on the sampling and analytical methods, target analytes and reporting limits, and QA/QC procedures.

2.3.1. Determine Sample Locations, Quantities, and Rationale

Step 2 includes collecting soil vapor samples to assess the presence (if any) and magnitude of MGP-related constituents in soil vapor at the potential vapor receptors identified during Phase 1. This sampling effort could include the following:

- Sampling Near Buildings – Soil vapor samples would be collected near buildings (potential receptors) identified in Step 1 to assess if MGP-related constituents are present in soil vapor near the building. If this effort involves more than one building, sampling should start at a point nearest the contaminant source and work outward until soil vapor concentrations no longer warrant additional sampling.

Sampling locations should be as close as practical to the building without being in the backfill material surrounding the building's foundation. The number of samples to be collected depends on the anticipated degree of variability of soil vapor concentrations surrounding the building. For instance, buildings that are above or close to a relatively high vapor source may have variable soil vapor concentrations surrounding the building, higher nearer the source and lower farther from the source. In this instance, additional sampling may be required to obtain data that are representative. Such sampling may include collection of samples along one or more sides of the building to assess soil vapor and concentration gradients. Alternatively, buildings that are at some distance from a vapor source or are located above groundwater containing similar concentrations may have equivalent soil vapor concentrations along their foundations. In this second instance, less sampling would be required, such as the collection of one or more samples along the building side nearest the vapor source.

- Sub-Slab Representation – Some surface features may act as vapor caps, by capping the soil vapor and preventing or reducing its release rate to atmosphere. Vapor concentrations tend to equilibrate under these caps and spread out horizontally until they reach the edge of the cap where they release to the atmosphere. Soil vapor sample results can represent sub-slab concentrations when:
    - Soil vapor samples are collected under surface features that are contiguous with the building's foundation;
    - The surface feature is in good condition, without major cracks or openings;
    - The foundation is slab-on-grade;
    - Impacted soil is not located directly under the foundation; and
    - Impacted groundwater concentrations under the foundation are relatively uniform.

When these conditions are met, soil vapor sampling locations should be selected near the building's foundation, which may also include a sample collected on one or more sides of the building to assess whether soil vapor surrounding the building is consistent. These surface features should be shown on the site map presented in the Sampling and Analysis Work Plan, and the condition of the surfaces (e.g., broken pavement or concrete slab without cracks) should be noted.

- Ambient Air Sampling — In conjunction with the soil vapor sampling near buildings, at least one ambient air sample should be collected at breathing zone height above ground and immediately upwind of each building. If there are suspected outdoor sources in close proximity to the building, then additional ambient samples should be collected upwind and downwind of the local sources. The purpose of the ambient air sample collected along with soil vapor samples is to assess the site-specific background. This data may be used in data evaluation or planning for future potential sampling events (Steps 3 and 4).

2.3.2. Determine Sample Depths

Soil vapor samples should be collected from depths that are equivalent to the depth of the building's foundation slab, if possible. This guideline assumes that the sampling objective is to assess the potential soil vapor concentrations beneath an adjacent building. However, the sampling depth may be modified if the sampling objective is different. Although site-specific information may vary, in the case of slab-on-grade foundations, this depth would most likely be approximately 4 feet below grade. For crawl spaces and basements, samples depths would typically be 5 and 8 feet, respectively.

Other considerations for determining the appropriate soil vapor sample depth include the following:

- Sample depths of 3 feet or more below grade may help minimize potential entrainment of ambient air from the surface into the sample. However, a~~A~~ tracer gas should be used during sampling at any depth to assess whether entrainment of ambient air is not occurring (see Section 2.3.3).

- Selection of target sample depths should also consider the presence of any confining or saturated units in the subsurface. Because soil vapor sampling is not recommended in soils that have become saturated from heavy rain, sampling events should be postponed after a heavy rainfall until the soil has time to drain. Selected soil vapor sample depths should not target the capillary fringe. For the purposes of this document, collection of samples from less than 1 foot above the water table is not recommended.

2.3.3. Perform Sampling and Analysis

Detailed soil vapor and ambient air sampling procedures are provided in Appendices A and B, respectively. These procedures can be referenced in the Sampling and Analysis Work Plan. Important sampling and analysis considerations include the following:

- Sampling durations can range from 1 to 8 hours, depending on the practicality of site access.

- Purging and s~~S~~ampling rates must not exceed 0.2 liter per minute.

- Soil vapor samples must be analyzed using USEPA Compendium Method TO-15.

Care should be taken when installing soil vapor probes with direct push or Geoprobe-type drill rigs. The sand used as filter pack or tubing used by some of these contractors is suspected to contaminate the installation with iso-octane and other trimethylpentane isomers. The filter pack material should be glass beads or clean sand that has been confirmed to be free of volatile organic compounds through a laboratory analysis. It is important that the tubing is food grade.

2.3.4. Confirm Target Analytes and Reporting Limits

Target analytes are provided in Table 2, including analytes for which Method TO-15 has been validated and additional analytes that the laboratory must report for both soil vapor and ambient air samples. These additional analytes may assist with identifying MGP-related vapors and are identified in the NYSDOH's guidance document (2006~~5~~) as indicator compounds for MGP sites. These additional analytes may be analyzed as tentatively identified compounds (TICs), which assumes semi-quantitation (using the calibration curve of an analyte with similar detector response).

Table 2 also provides reporting limits for the Method TO-15 list of parameters. The actual reporting limits of field samples may be higher due to sample dilution by the laboratory necessary to properly quantify compounds with elevated concentrations (above the instrument's calibration range) and other factors. In some cases, the elevated compounds will not be related to MGP materials. An accurate quantitation of these compounds is not as important as obtaining appropriate reporting limits for potential MGP-related constituents, if possible. Therefore, the laboratory should be instructed to contact National Grid if sample dilution is warranted and not ~~prior~~ to dilute~~ing~~ samples unless approved by National Grid~~to obtain further guidance~~.

A smaller target list may be appropriate if previous sampling was conducted using the list in Table 2. Once previous sample results establish a site-specific list of analytes (often referred to as Compounds of Concern (COCs)), National Grid may request the laboratory to report results of just the COCs for subsequent sampling.

A larger list of target analytes may be appropriate in some instances where there is a probable subsurface contamination from petroleum-based sources other than MGP residuals. The larger list will assist in a forensic analysis that compares the sampling results to typical chemical fingerprints of various other petroleum sources (gasoline, diesel, etc). If a forensic analysis is warranted, a sample from of a known MGP residual soil vapor may also need to be collected. If other petroleum-based sources are suspected in the vicinity of the proposed sampling, assistance should be sought to evaluate and setup such analyses, as this document does not provide all the details on forensic analyses needed for complete guidance.

2.3.5. Monitor QA/QC Program

As summarized in Table 3, QA/QC samples may include one blind duplicate soil vapor sample for every 10 field samples. Other details of the QA/QC program include the following:

- The relative percent difference (RPD) between the duplicate sample and the co-located field sample must be less than 30% for results that are greater than five times the reporting limit. If this RPD criterion is exceeded, the results may lack adequate precision and may need to be qualified accordingly. If duplicate pair results are less than five times the reporting limit, RPD calculations are not applicable.

- Trip or equipment blanks are not necessary.

- Prior to use, sample canisters must be pre-certified by the laboratory as clean. Batch certification (one canister analyzed per 10) is adequate for soil vapor and ambient air sampling.

- Canisters must be sampled within 15 days of receipt from the laboratory. Canisters exceeding this time limit should be returned to the laboratory unused.

- Sampled canisters must be analyzed within 30 days of sample collection. Samples analyzed after this date shall have its results flagged during the validation process as "estimated."

- Analytical QA/QC, results, and documentation must meet the requirements of NYSDEC Category B deliverables. The analytical data must be reviewed and a Data Usability Summary Report (DUSR) must be generated.

2.4. Step 3. Data Evaluation

Step 3 involves evaluating the data collected during the sampling and analysis program, and includes the following specific tasks:

- Assess whether the constituents detected in the vapors (if any) are MGP-related;

- Compare the sample results to screening criteria of indoor air background and health risk levels; and

- Determine follow-on actions (e.g., continue the investigation, terminate the investigation, or collect more soil vapor data).

Each of these tasks is discussed in more detail below.

2.4.1. Assess Whether Vapor Constituents are MGP-Related

Vapor constituents that may result from MGP materials are also common to household and consumer products. As such, results for vapor constituents which may be related to MGP materials should be assessed.

Potential MGP-related constituents include the following:

- Certain volatile aromatic hydrocarbons such as benzene, toluene, ethylbenzene, and xylene (BTEX).

- Certain semivolatile organic compounds (SVOCs) such as naphthalenes, polycyclic aromatic hydrocarbons (PAHs), thiopenes, and some phenolic compounds.

- Additional volatile constituents associated with MGP sites where the carbureted water gas (CWG) process was employed may also include certain C10 through C19 compounds such as alkyl benzenes and normal alkanes.

The presence of the constituents listed above does not necessarily indicate that the vapors are MGP-related. For example, BTEX compounds are common constituents of gasoline. Table 5 lists some of the types of commonly found non-MGP-related sources and their vapor constituents that are similar to MGP-related constituents.

An analysis must be conducted to evaluate the soil vapor data set and determine the source(s) of the soil vapor impacts. The analysis will evaluate the soil vapor data with respect to:

- Potential MGP and non-MGP vapor constituents (Tables 4 and 5);
- Existing groundwater and soil data; and
- Historic and existing activities at and adjacent to the site.

The conclusions of the analysis will be included in the Phase 2 Summary Report (see Section 2.5).

2.4.2. Compare Sample Results to Screening Criteria

Soil vapor results must be compared to screening criteria which assume that the resulting indoor air concentrations are equal or less than the one-tenth of the soil vapor concentrations. Indoor air concentrations attributable to vapor intrusion are lower, by orders of magnitude, than soil vapor concentrations due to the attenuation caused by the slab and due to the dilution of the compound into a large volume of indoor air. USEPA guidance recommends an attenuation factor[2] of 0.1 be used to conservatively screen shallow soil vapor concentrations (USEPA, 2002). Actual attenuation factors have been found to be as low as 10^{-5}. National Grid has elected to conservatively use the 0.1 attenuation factor to screen soil vapor data.

Soil vapor sample results should be divided by 10 and the resultants compared to two types of criteria: 1) background concentrations; and 2) health risk concentrations. Background concentrations are those indoor air concentrations that already exist or are likely to exist without the influence of vapor intrusion. Two sources of background concentrations will be used: 1) site-specific ambient air; and 2) typical indoor air concentrations published by NYSDOH. The highest concentration for a given compound from these two sources of background concentrations will be used. In urban settings, ambient air concentrations may be higher than typical indoor concentrations. Table 6 presents the typical indoor air concentrations for MGP-related constituents.

USEPA's guidance recommends target indoor air concentrations for some MGP-related constituents (USEPA, 2002). The guidance provides three levels of health risk for potential carcinogenic compounds representing 10^{-4}, 10^{-5}, and 10^{-6} cancer risks. The guidance does not recommend which levels to use for various exposure settings. However, USEPA often uses the 10^{-5} risk level when evaluating health risk under the environmental indicators program for residential exposures. National Grid has elected to also use the 10^{-5} risk level for residential exposures and the 10^{-4} risk level for non-residential exposures. Furthermore, for those non-residential properties where petroleum-related constituents are routinely stored or used, alternate exposure numbers may be appropriate (e.g., Occupational Safety and Health Administration [OSHA] permissible exposure limits [PELs]). Table 6 provides the USEPA health risk levels for potential MGP-related constituents.

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[2] Attenuation factor = indoor air concentration / soil vapor concentration

2.4.3. Determine Follow-On Actions

After sample results are compared to appropriate screening levels, follow-on actions must be determined. Three data evaluation scenarios and associated actions include:

Scenario 1: All MGP-related constituents in soil vapor are less than 10 times the highest criteria.
Next Action: No further investigation is warranted at this time.

Scenario 2: At least one MGP-related constituent in soil vapor is greater than 10 times the highest criteria. Soil vapor does not represent sub-slab vapor.
Next Action: Proceed to Phase 3 and conduct soil vapor sampling of adjacent buildings, if any.

Scenario 3: At least one MGP-related constituent in soil vapor is greater than 10 times the highest criteria. Soil vapor does represent sub-slab vapor.
Next Action: Proceed to Phase 4 or directly to mitigation. Conduct soil vapor sampling of adjacent buildings, if any.

2.5. Step 4. Data Reporting

The final step of Phase 2 involves transmitting data to the State Agencies (which include NYSDEC and NYSDOH) and preparing a Phase 2 Summary Report.

Within 48 hours after receiving data from the laboratory and before data are validated, analytical reports ~~data tables~~ and a figure showing sampling locations must be prepared and transmitted to the State Agencies. Any data summaries should be clearly labeled as preliminary. Receipt of data from the laboratory means the initial receipt of data and not the complete data package that is used for data validation. After validation is complete, any ~~additional~~ changes to the data must be submitted to the Agencies.

After data validation, a ~~complete~~ Phase 2 Summary Report must be submitted to the State Agencies and include the following:

- Phase 1 summary (see Section 1.4);
- Tabulated s~~S~~ummary of validated results of detected compounds;
- Analytical reports showing results of all detected and non-detected compounds;
- Site plan showing sampling locations, impacted groundwater and soil locations, potential vapor receptors, preferential vapor pathways, surface features, and hydraulic vapor barriers;
- Overview of sampling and analysis activities;
- Results of data evaluation; and
- Recommendations for follow-on actions, if appropriate.

The Phase 2 Summary Report will include an evaluation sufficient to conclude that either no further evaluation is warranted at this time or that the evaluation should proceed to Phase 3 or 4.

Article 27, Title 24 of the NYS Environmental Conservation Law (N Y ECL 27-2403(1)) requires any responsible party to provide vapor intrusion test results to the owner of the property that was tested within 30 days of data validation. The date of the finalized DUSR (validated data), discussed in Section 2.3.5, will commence the 30-day period. Results should be submitted in a letter to the property owner from National Grid that presents a table of results showing only detected compounds, an attachment of the laboratory report showing results of all analyzed compounds, and a figure showing locations from where samples were taken. The letter should also provide an interpretation of the results with respect to any follow-on actions based on input from the State Agencies. In order to accommodate input from the State Agencies, the draft letter should be submitted to the State for review at the beginning of or just prior to the start of the 30-day reporting period.

3. Phase 3. Sub-Slab Sampling

3.1. Objective

Phase 3 involves sub-slab sampling in buildings to assess if vapor from MGP-impacted groundwater and/or soil is present under the slab at such a magnitude that it could potentially intrude into the indoor air. The steps of this phase include:

Step 1. Building Survey and Chemical Inventory

Step 2. Work Plan Development

Step 3. Sampling and Analysis

Step 4. Data Evaluation

Step 5. Data Reporting

Figure 3 illustrates a process flow diagram for Phase 3. Each of the steps listed above is discussed in more detail below. Please note that the following steps may be modified based on site-specific conditions.

3.2. Step 1. Building Survey and Chemical Inventory

For Phase 3 of the evaluation, the first step is to conduct a building survey and chemical inventory to compile the following information:

- Ownership, contact information and address;
- Tenant name(s) and contact information;
- Type of foundation (basement, crawlspace or slab-on-grade);
- Condition of the slab;
- Sub-slab sample location(s);
- Indoor air pressure differential (i.e., negative or positive with respect to outdoor air pressure); and
- Indoor air sources that may contain the same compounds as MGP-related volatile constituents.

The NYSDOH Indoor Air Quality Questionnaire and Building Inventory Field Form (Appendix C) must be completed while conducting the building survey and chemical inventory. The purpose of the chemical inventory at this step is to assess potential indoor air sources in the event that indoor air sampling (Step 4) is required. When selecting the sampling locations, Dig Safely New York will be called and any sub-slab utilities must be identified and, if possible, reviewed with the property owner to avoid potential damage/injury when drilling.

3.3. Step 2. Work Plan Development

The second step is to develop a Sampling and Analysis Work Plan that will include:

- Building survey and chemical inventory findings;
- Building foundation type (i.e., full basement, crawlspaces, slab-on grade);
- Building interior foundations (due to additions, different foundation elevations, etc.)
- Sampling locations and quantities;
- Sampling and analysis methods*;
- Target analytes and reporting limits*;
- QA/QC*;
- Data evaluation criteria*; and
- Data reporting.

* Do not discuss these items in detail in the work plan. Instead, refer to the details in this SOP.

Any deviations from these items listed above must be called out and briefly explained in the work plan. The remaining work plan items are discussed below. The Sampling and Analysis Work Plan should be submitted to NYSDEC and NYSDOH for review and approval prior to implementation.

3.4. Step 3. Sampling and Analysis

This step involves sampling and analysis to implement the work plan that was developed during Step 2. Specifically, this section discusses the rationale for selecting sampling locations, quantities, and depths, and provides some details on the sampling and analytical methods, target analytes and reporting limits, and QA/QC procedures.

3.4.1. Determine Sample Locations and Quantities

Sub-slab samples must be collected directly beneath the floor of the lowest level of the building. These samples should be collected near the center of the slab and away from slab openings (sumps, drains) and major cracks.

For residential buildings, one sample is usually sufficient. However, if the building is large or contains multiple additions and/or multiple foundation depths, more than one sample should be collected. If a building is directly above a known source area, multiple sub-slab locations should be sampled to evaluate the soil vapor concentration gradient.

Ambient air sampling is not necessary unless ambient air concentrations are expected to have changed since the soil vapor sampling. As stated in Section 2.3.1, the purpose of the ambient air sampling is to establish site-specific background.

3.4.2. Perform Sampling and Analysis

Detailed sub-slab sampling procedures are provided in Appendix D. These procedures do not need to be reiterated in the Sampling and Analysis Work Plan. Important sampling and analysis considerations include the following:

- Sampling durations can range from 1 to 24 hours, depending on the practicality of site access.
- Sampling rate should not exceed 0.2 liter per minute.
- Soil vapor samples must be analyzed using USEPA Compendium Method TO-15.

3.4.3. Confirm Target Analytes and Reporting Limits

The same target analytes and reporting limits discussed above in Section 2.3.4 for soil vapor sampling should be used for sub-slab sampling. However, a smaller target list may be appropriate if previous sampling was conducted using the list in Table 2. Once previous sample results establish a site-specific list of analytes (often referred to as Compounds of Concern (COCs)), National Grid may request the laboratory to report results of just the COCs for subsequent sampling.

In addition, forensic analyses also discussed in Section 2.3.4 may be an option for sub-slab sampling.

3.4.4. Monitor QA/QC Program

The same QA/QC components discussed above in Section 2.3.5 for soil vapor sampling should be used for sub-slab sampling.

3.5. Step 4. Data Evaluation

Step 4 of this phase includes the following data evaluation tasks:

- Assess whether the constituents detected in the vapors (if any) are MGP-related;
- Compare the sample results to screening criteria of indoor air background and health risk levels; and
- Determine follow-on actions (e.g., continue the investigation, terminate the investigation, or collect additional sub-slab data).

Refer to Section 2.4 for a discussion of MGP-related vapor constituents and screening criteria. After sample results are compared to appropriate screening levels, follow-on actions must be determined. Two data evaluation scenarios and associated actions include:

Scenario 1: All MGP constituents in sub-slab vapor are less than 10 times the highest criteria.
Next Action: No further investigation is warranted at this time.

Scenario 2: At least one MGP constituent in sub-slab vapor is greater than 10 times the highest criteria.
Next Action: Proceed to Phase 4 or directly to mitigation.

3.6. Step 5. Data Reporting

The final step of Phase 3 involves transmitting the sub-slab sampling data to the State Agencies and preparing a Phase 3 Summary Report. Within 48 hours after receiving data from the laboratory and before data are validated, ~~data tables~~analytical reports and a figure showing sampling~~potential receptor~~ locations must be prepared and transmitted to the State Agencies. Any data summaries should be clearly labeled as preliminary. Receipt of data from the laboratory means the initial receipt of data and not the complete data package that is used for data validation. After validation is complete, any ~~additional~~ changes to the data must be submitted to the Agencies.

Following data validation, a ~~complete~~ Phase 3 Summary Report must be submitted to the State Agencies and include:

- Tabulated summary of validated results of detected compounds;
- Analytical reports showing results of all detected and non-detected compounds;

~~? Summary of validated results;~~

- Site plan showing sampling locations, impacted groundwater and soil locations, potential vapor receptors, preferential vapor pathways, surface features, and hydraulic vapor barriers;
- Overview of sampling and analysis activities;
- Results of data evaluation; and
- Recommendations for follow-on actions, if appropriate.

As described in Section 2.5, the results of samples collected from property not owned by National Grid must be provided to the property owner within 30 days of data validation. See Section 2.5 for more detail.

4. Phase 4. Indoor Air Sampling

4.1. Objective

Phase 4 involves indoor air sampling in buildings identified in Phases 2 and/or 3 to assess if sub-slab vapor is intruding into the indoor space at such a magnitude that it has the potential to cause a health risk. The steps of this phase include:

Step 1. Building Survey and Chemical Inventory

Step 2. Work Plan Development

Step 3. Sampling and Analysis

Step 4. Data Evaluation

Step 5. Data Reporting

Figure 4 illustrates a process flow diagram for Phase 4. Each of these steps is discussed in more detail below. Please note that the following steps may be modified based on site-specific conditions.

4.2. Step 1. Building Survey and Chemical Inventory

If not already completed as part of Phase 3, a site visit to survey the building and inventory indoor chemicals must be conducted (or reconducted as appropriate). The same procedures discussed above in Section 3.2 must be followed. However, some additional tasks for the indoor air sampling program include the following:

- Complete a more detailed chemical survey. Potential sources of VOCs must be identified and photographed. Labels of indoor products should be reviewed for VOC contents; any findings must be recorded on the NYSDOH Indoor Air Quality Questionnaire and Building Inventory Field Form (Appendix C).

- Establish whether the building has a positive or negative pressure with respect to outdoors. Smoke pens may be used to help with this assessment. This may be done immediately before and immediately after indoor air sampling, but not during sampling.

4.3. Step 2. Work Plan Development

The second step is to develop a Sampling and Analysis Work Plan that will include:

- Building survey and chemical inventory findings;
- Sampling locations and quantities;
- Sampling and analysis methods*;

- Target analytes and reporting limits*;
- QA/QC*;
- Data evaluation criteria*; and
- Data reporting.

* Details for these items do not need to be included in the work plan. Instead, refer to the details in this SOP.

Any deviations from these items listed above must be called out and briefly explained in the work plan. The remaining work plan items are discussed in more detail below. The Work Plan should be submitted to NYSDEC and NYSDOH for review and approval prior to implementation.

4.4. Step 3. Sampling and Analysis

Step 3 involves implementing the work described in the Sampling and Analysis Work Plan. Specifically, this section discusses the rationale for selecting sampling locations and quantities, and provides some details on the sampling and analytical methods, target analytes and reporting limits, and QA/QC procedures.

4.4.1. Determine Sample Locations and Quantities

Indoor air samples should be collected from the lowest level of the building. In a large building or buildings with multiple tenants or rooms on the lowest level, more than one sample may be required. Other considerations when collecting indoor air samples include the following:

- Indoor air samples must be collected within the breathing zone, which is approximately 3 to 5 feet above the floor.
- Ambient air sampling must be conducted at the same time and for the same duration as indoor air sampling.
- At least one ambient air sample must be collected at breathing zone height above ground and immediately upwind of the building(s), if possible. For buildings with HVAC intakes, sampling in proximity to the intakes should be considered.
- If suspected outdoor sources are closely located to the building(s), then additional ambient samples must be collected upwind and downwind of those sources.
- One ~~If more than 3 months have lapsed between~~ sub-slab sample~~ing~~ (Phase 3) should be collected concurrently and co-located with each ~~and~~ indoor air sample~~ing, then an additional sub-slab sample may be collected~~.
- Sampling must be conducted under conditions when vapors could potentially migrate and/or accumulate within the indoor air, which is typically when all doors and windows are closed and when the HVAC system is operating. If the property is a business, the sampling should

be conducted during a time of limited activity to avoid door openings to the outdoors, if possible.

4.4.2. Perform Sampling and Analysis

Detailed indoor air sampling procedures are provided in Appendix E, and ambient air sampling procedures are provided in Appendix B. These procedures do not need to be reiterated in the Sampling and Analysis Work Plan. Important sampling and analysis considerations include the following:

- Sampling durations can range from 4 to 24 hours, depending on the practicality of site access and the exposure scenario being evaluated (8 hour sample duration for commercial and industrial settings and 24 hours for residential settings).
- Sampling rate must not exceed 0.2 liter per minute.
- Soil vapor samples must be analyzed using USEPA Compendium Method TO-15.

In addition, building occupants should be instructed that within 24 hours of the sampling and during the sampling to avoid, to the extent possible the activities provided in Appendix F.

4.4.3. Confirm Target Analytes and Reporting Limits

The same target analytes and reporting limits discussed above in Section 2.3.4 for soil vapor sampling should be used for indoor air sampling.~~Air samples must be analyzed using USEPA Compendium Method TO-15 with instrumentation tuned to low levels, which allows for lower reporting limits as those discussed for soil vapor and sub-slab sample analysis. Table 7 provides a list of TO-15 low level analytes, which is a subset of the analyte list for the standard TO-15 analysis (Table 2). The laboratory must also include additional compounds identified in Table 7.~~ However, at this point previous sampling has been conducted that established a site-specific list of analytes (COCs), National Grid may request the laboratory to report results of just the COCs for subsequent sampling.

4.4.4. Monitor QA/QC Program

The same QA/QC components discussed above for sub-slab sampling in Section 3.3.4 should be used for indoor air sampling, except that canisters must be individually certified clean and not batch certified.

4.5. Step 4. Data Evaluation

Step 4 of this phase consists of the following data evaluation tasks:

- Evaluate whether the indoor air sample results are not attributable to vapor intrusion, indoor air sources or ambient air sources;
- Compare the indoor air sample results to criteria of ambient air background and health risk levels; and

- Determine follow-on actions (e.g., discontinue the investigation, additional assessment, or implement mitigation measures).

Each of these tasks is discussed in more detail below.

4.5.1. Assess Whether Vapor Constituents are MGP-Related

The primary goal of the assessment is to determine which detected indoor air analytes, if any, are solely or partially attributable to indoor air sources. As such, results for vapor constituents which may be related to MGP materials should be assessed.

- Compare the indoor air results with data from the sub-slab sampling. The ratio of indoor air to sub-slab vapor must be calculated for all analytes detected in both sample types.

- Compare the indoor air results with information obtained from the chemical inventory to verify the assumptions made from the first comparison.

4.5.2. Compare Sample Results to Screening Criteria

After completing the forensic analysis summarized above, the next task is to compare any indoor air results that are suspected to be partially or solely attributable to vapor intrusion with ambient air data and USEPA target indoor air concentrations. These indoor air screening criteria are presented in Table 6.

4.5.3. Determine Follow-On Actions

After sample results are compared to appropriate screening levels, follow-on actions must be determined. Two data evaluation scenarios and associated actions include:

Scenario 1: No MGP-related constituents in indoor air are attributable to vapor intrusion or all are less than the respective ambient air concentration or background or health risk criteria (whichever is higher).
Next Action: No further investigation is warranted.

Scenario 2: At least one MGP-related constituent in indoor air attributable to vapor intrusion is greater than the respective ambient air concentration, background, and health risk criteria.
Next Action: Resampling or mitigation is warranted.

4.6. Step 5. Data Reporting

The final step of Phase 4 involves transmitting the sub-slab, indoor air, and ambient air sampling data to the State Agencies and preparing a Phase 4 Summary Report. Within 48 hours after receiving data from the laboratory and before data are validated, ~~data tables~~analytical reports and a figure showing ~~potential receptor~~sampling locations must be prepared and submitted to the State Agencies. Any data summaries should be clearly labeled as preliminary. Receipt of data from the laboratory means the initial receipt of data and not the complete data package that is used for data validation. After validation is complete, any ~~additional~~ changes to the data must be submitted to the Agencies.

Following data validation, a ~~complete~~ Phase 4 Summary Report will be prepared and submitted to the State Agencies and will include:

- Tabulated summary of validated results of detected compounds;
- Analytical reports showing results of all detected and non-detected compounds;

~~? Summary of validated results;~~

- Site plan showing sampling locations, impacted groundwater and soil locations, potential vapor receptors, preferential vapor pathways, surface features, and hydraulic vapor barriers;
- Overview of sampling and analysis activities;
- Results of data evaluation; and
- Recommendations for follow-on actions.

As described in Section 2.5, the results of samples collected from property not owned by National Grid must be provided to the property owner within 30 days of data validation. See Section 2.5 for more detail.

References

NYSDEC. 2006. *DER-13 / Strategy for Evaluating Soil Vapor Intrusion at Remedial Sites in New York.* DEC Program Policy. (October 18, 2006)

NYSDOH. 2006~~5~~. *Guidance for Evaluating Soil Vapor Intrusion in the State of New York.* ~~Public Comment Draft~~ (October~~February~~).

USEPA. 2002. *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils.* Office of Solid Waste and Emergency Response (November).

Table 1
Groundwater Screening Levels

Standard Operating Procedures for Soil Vapor Intrusion Evaluations at National Grid MGP Sites in New York State

MGP-Related Constituent	**USEPA OSWER Target Groundwater Concentrations (ug/L)** [a, b]		**NYS Class GA Groundwater Standard**[c]
	Residential	**Non-Residential**	
Benzene	14	140	1
Ethylbenzene	700	700	5
Toluene	1500	1500	5
m,p-Xylenes	22000	22000	5
o-Xylene	33000	33000	5
Naphthalene	150	150	5
1,2,4-Trimethylbenzene	24	24	5

Notes:

a. USEPA. 2002. Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils. Office of Solid Waste and Emergency Response (November). R=10^{-5} used for residential. R=10^{-4} used for non-residential.

b. ug/L = micrograms per liter

c. NYS, Div. Of Water Technical Operational Guidance Series (TOGS) 1.1.1, Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limittations, June 1998.

Table 2
TO-15 Target Analtyes and Reporting Limits

Standard Operating Procedures for Soil Vapor Intrusion Evaluations at National Grid MGP Sites in New York State

Compound	CAS Number	Reporting Limit (ppbv)	Reporting Limit (ug/m^3)
Acetone (2-propanone)	67-64-1	5.0	12
Benzene	71-43-2	0.20	0.64
Bromodichloromethane	75-27-4	0.20	1.3
Bromoethene	593-60-2	0.20	0.87
Bromoform	75-25-2	0.20	2.1
Bromomethane (Methyl bromide)	74-83-9	0.20	0.78
1,3-Butadiene	106-99-0	0.20	0.49
2-Butanone (Methyl ethyl ketone)	78-93-3	0.50	1.5
Carbon disulfide	75-15-0	0.50	1.6
Carbon tetrachloride	56-23-5	0.20	1.3
Chlorobenzene	108-90-7	0.20	0.92
Chloroethane	75-00-3	0.20	0.53
Chloroform	67-66-3	0.20	0.98
Chloromethane (Methyl chloride)	74-87-3	0.20	0.41
3-Chloropropene (allyl chloride)	107-05-1	0.20	0.63
2-Chlorotoluene (o-Chlorotoluene)	95-49-8	0.20	1.04
Cyclohexane	110-82-7	0.20	0.69
Dibromochloromethane	124-48-1	0.20	2.0
1,2-Dibromoethane	106-93-4	0.20	1.5
1,2-Dichlorobenzene	95-50-1	0.20	1.2
1,3-Dichlorobenzene	541-73-1	0.20	1.2
1,4-Dichlorobenzene	106-46-7	0.20	1.2
Dichlorodifluoromethane (Freon 12)	75-71-8	0.20	0.99
1,1-Dichloroethane	75-34-3	0.20	0.81
1,2-Dichloroethane	107-06-2	0.20	0.81
1,1-Dichloroethene	75-35-4	0.20	0.79
1,2-Dichloroethene (cis)	156-59-2	0.20	0.79
1,2-Dichloroethene (trans)	156-60-5	0.20	0.79
1,2-Dichloropropane	78-87-5	0.20	0.92
cis-1,3-Dichloropropene	10061-01-5	0.20	0.91
trans-1,3-Dichloropropene	10061-02-6	0.20	0.91
1,2-Dichlorotetrafluoroethane (Freon 114)	76-14-2	0.20	1.4
1,4-Dioxane	123-91-1	5.0	18
Ethylbenzene	100-41-4	0.20	0.87
4-Ethyltoluene (p-Ethyltoluene)	622-96-8	0.20	0.98
n-Heptane	142-82-5	0.20	0.83
Hexachlorobutadiene	87-68-3	0.20	2.1
n-Hexane	110-54-3	0.20	0.70
Isopropyl Alcohol	67-63-0	5.0	12.5
Methylene chloride	75-09-2	0.50	1.7
Methyl Butyl Ketone	591-78-6	0.50	2.05
4-Methyl-2-pentanone (MIBK)	108-10-1	0.50	2.05
MTBE (Methyl tert-butyl ether)	1634-04-4	0.50	1.8
Styrene	100-42-5	0.20	0.85
Tertiary butyl alcohol (TBA)	75-65-0	5.0	15
1,1,2,2-Tetrachloroethane	79-34-5	0.20	1.4
Tetrachloroethene (PCE)	127-18-4	0.20	1.4
Toluene	108-88-3	0.20	0.75
1,2,4-Trichlorobenzene	120-82-1	0.50	3.7
1,1,1-Trichloroethane	71-55-6	0.20	1.1
1,1,2-Trichloroethane	79-00-5	0.20	1.1
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon TF)	76-13-1	0.20	1.5
Trichloroethene (TCE)	79-01-6	0.20	1.07
Trichlorofluoromethane (Freon 11)	75-69-4	0.20	1.1
1,2,4-Trimethylbenzene	95-63-6	0.20	0.98
1,3,5-Trimethylbenzene	108-67-8	0.20	0.98
2,2,4-Trimethylpentane	540-84-1	0.20	1.08
Vinyl chloride	75-01-4	0.20	0.51
Xylenes (m&p)	1330-20-7	0.20	0.87
Xylenes (o)	95-47-6	0.20	0.87
Additional Compounds to be Requested			
1,2,3-Trimethylbenzene	80-62-6	0.20	0.98
Naphthalene	91-20-3	0.50	2.9
1-Methylnaphthalene	90-12-0	TBD	TBD
2-Methylnaphthalene	91-57-6	TBD	TBD
Tetramethylbenzene	25619-60-7	TBD	TBD
Indene	95-13-6	TBD	TBD
Indane	496-11-7	TBD	TBD
Thiophene	110-02-1	TBD	TBD

Notes:

a. Actual reporting limits of field samples may be higher due to sample dilution by the laboratory to quantify compounds at elevated concentrations.(see note b)

b. The laboratory must notify National Grid prior to sample dilution.

c. ppbv = part per billion by volume

d. ug/m3 = microgram per cubic meter

e. TBD = to be determined

Table 4
Potential MGP-Related Volatile Constituents

Standard Operating Procedures for Soil Vapor Intrusion Evaluations at National Grid MGP Sites in New York State

---

Benzene
Ethylbenzene
Toluene
Xylenes
Naphthalene
Indene
Indane
1,2,4-Trimethylbenzene [a]
Tetramethylbenzenes [a]
n-Nonane [a]
n-Decane [a]
n-Undecane [a]
n-Dodecane [a]

Note:

a. Volatile constituents associated with petroleum used at MGP sites that employed the carbureted water gas process.

Table 6

Data Evaluation Criteria

Standard Operating Procedures for Soil Vapor Intrusion Evaluations at National Grid MGP Sites in New York State

MGP-Related Constituent	Typical Indoor Air Concentrations (ug/m^3) [a] Residential	Typical Indoor Air Concentrations (ug/m^3) [a] Non-Residential	USEPA OSWER Target Indoor Air Concentrations (ug/m^3) [b] Residential	USEPA OSWER Target Indoor Air Concentrations (ug/m^3) [b] Non-Residential
Benzene	13	9.4	3.1	31
Ethylbenzene	6.4	5.7	22	220
Toluene	57	43	400	400
m,p-Xylenes	11	22.2	7000	7000
o-Xylene	7.1	7.9	7000	7000
Naphthalene	NA [c]	5.1	3	3
Indene	NA	NA	NA	NA
Indane	NA	NA	NA	NA
1,2,4-Trimethylbenzene	9.8	9.5	6	6
n-Nonane	7.9	7.8	NA	NA
n-Decane	15	17.5	NA	NA
n-Undecane	12	22.6	NA	NA
n-Dodecane	9.2	15.9	NA	NA

Notes:

a. NYSDOH. 2005. " Guidance for Evaluating Soil Vapor Intrusion in the State of New York". Public Comment Draft (October 2006). As recommended by NYSDOH, typical indoor air concentrations in residential settings are the upper fence values from the NYSDOH 2003 Fuel Oil Study data. Typical concentrations in non-residential settings are the 90th percentile values from the USEPA BASE data. ug/m^3 = microgram per cubic meter.

b. USEPA. 2002. "Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils". Office of Solid Waste and Emergency Response (November). R=10^{-5} used for residential. R=10^{-4} used for non-residential.

c. NA = not available

APPENDIX A

SOIL VAPOR SAMPLE COLLECTION PROCEDURES

(NYSDEC and NYSDOH Approved, March 15, 2007)

[Updated by National Grid and resubmitted September 18, 2007]

This set of procedures outlines the general steps to collect soil vapor samples. The site-specific Sampling and Analysis Work Plan should be consulted for proposed sample locations, sample depths, and sampling duration.

Soil Vapor Probe Installation

Permanent and temporary soil vapor probes will be installed using the procedure outlined below:

- Record weather information (temperature, barometric pressure, rainfall, wind speed, and wind direction). Record substantial changes to these conditions that may occur during the course of the probe installation. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).

- Install soil vapor probes using a direct-push drill rig (e.g., GeoProbe® or similar) or manually using a slide hammer. Probes will consist of stainless-steel drive points with stainless steel screens attached to food-grade (inert) Teflon® or polyethylene tubing through which the soil vapor sample will be drawn. Recommended tubing is ¼-inch O.D. flouropolymer tubing that can be found at AMS, Inc. (Item 215.00).

- Attach the drive points to a drive rod (stainless-steel tube) and drive the rod to the target depth, as define in the site-specific work plan.

- Withdraw the drive rods from the hole, leaving the drive point and tubing.

- Place filter pack material, such as glass beads or clean silica sand, in the annular space surrounding the tubing directly above the sample point to a height of approximately 1 to 2 foot. The depth of the filter pack material should always be adequate to prevent the bentonite slurry above from going over the drive point and sample inlet screen. Recommended ground glass blast media can be found at W.W. Grainger, Inc. (Item 6ZC15).

- Place bentonite slurry in the annulus above the filter pack material to provide a seal in the borehole. Ideally, place the bentonite annular seal at least 3 feet thick, although adjustments to this thickness may be required based on site-specific conditions. The entire borehole must be filled to the ground surface with either entirely bentonite or with natural fill between two bentonite seals (one above the filter pack material and one at the ground surface). Permanent installations must have a surface seal made of cement or cement/bentonite grout.

- For permanent installations, install flush-mounted protective covers to protect the probe and the tubing.

- Cut the end of the tubing to allow proper closure of the flush-mounted protective cover, but with a sufficient length of tubing exposed at the surface to facilitate connection of sampling equipment.

- Close or cap the sample tubing following installation and following collection of each sample.

Collection of Soil Vapor Samples

Collecting soil vapor samples will be accomplished by using the following procedure:

- Record weather information (i.e., temperature, barometric pressure, rainfall, wind speed, and wind direction) at the beginning of the sampling event. Also, record substantial changes to these conditions that may have occurred over the past 24 to 48 hours and that do occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).

- Sampling personnel must avoid activities immediately before and during the sampling that may contaminate the sample (e.g., using markers, fueling vehicles, etc.).

- Identify sampling locations on a plot plan that also identifies buildings, other landmarks, and potential sources of VOC contamination to both the surface and outdoor air. Record the depth of the probe screen below grade.

- If necessary, connect additional tubing to the tubing extending from the soil vapor probe to allow for connection to sample collection equipment.

- Calculate the volume of air in the probe, tubing (volume = πr^2h), including any additional tubing added in the step above and the annular space between the probe and the native material if sand or glass beads were used.

- Connect a vacuum pump or gas-tight syringe (~60 cubic centimeters [cc]) to the sample tubing. At a flow rate of no more than 0.2 liter per minute (lpm), purge air from the tubing until one to three of the above-calculated air volumes are removed.

- During purging, evaluate the potential for ambient air to be introduced in the soil vapor sample through the annulus of the soil vapor probe or tubing connections using a tracer gas such as helium. The procedures for the tracer gas evaluation are described below. Note that the bentonite used in the probe installation should have sufficient time to seal before the samples are collected. The tracer gas evaluation will verify if the seal is sufficient.

- Use an evacuated Summa® passivated (or equivalent) stainless-steel canister to collect the soil vapor sample. The canister will be provided by the laboratory, along with a flow controller equipped with an in-line particulate filter and a vacuum gauge. The flow controller will be pre-calibrated by the laboratory for the desired flow rate or duration of sample collection, as identified in the project-specific work plan. The sampling flow rate should always be less than 0.2 lpm. The canisters will be batch certified as clean by the laboratory.

- Remove the protective brass plug from the canister. Connect the pre-calibrated flow controller to the canister.

- Record the identification numbers for the canister and flow controller. Record the initial canister pressure on the vacuum gauge (check equipment-specific instructions for taking this measurement). A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling. Record these numbers and values on the chain-of-custody form for each sample.

- Connect the tubing from the soil vapor probe to the flow controller.

- Completely open the valve on the canister. Record the time that the valve was opened (beginning of sampling) and the canister pressure on the vacuum gauge.

- Photograph the canister and the area surrounding the canister.

- Monitor the vacuum pressure in the canister routinely during sampling.

- Stop sample collection when the canister still has a minimum amount of vacuum remaining. Check with the laboratory supplying the canister and flow controller for the ideal final vacuum pressure. Typically, the minimum vacuum is between 2 and 5 inches of mercury, but not zero. If there is no vacuum remaining, the sample will be rejected and collected again in a new canister.

- Record the final vacuum pressure and close the canister valve. Record the date and time that sample collection was stopped.

- Remove the flow controller from the canister and replace the protective brass plug.

- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.

- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.

- Enter the information required for each sample on the chain-of-custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.

- Include the required copies of the chain-of-custody form in the shipping packaging, as directed by the laboratory. The field crew will retain a copy of the chain-of-custody for the project file.

- Deliver or ship the samples to the laboratory within one business day of sample collection and via overnight delivery (when shipping).

- Provided that no additional sampling is expected to be conducted, either pull out (if practical) or abandon in place the sampling probe. When abandoning, cut the tubing back as far down as practical and cover to surface with native soil.

Tracer Gas Evaluation

The tracer gas evaluation provides a means to evaluate the integrity of the soil vapor probe seal and assess the potential for introduction of ambient air into the soil vapor sample. A tracer gas evaluation should be conducted on all soil vapor probes. After the initial round of sampling and with the approval of the regulating agency, the use of tracer gas may be reduced to a minimum of 10 percent for permanent and semi-permanent probes if the initial round results showed installations with competent seals.

The following tracer gas evaluation procedure uses in-field tracer gas measurements and tracer gases (e.g., helium) that can be measured by portable detectors.

- Retain the tracer gas around the sample probe by filling an air-tight chamber (such as a plastic bucket) positioned over the sample location.

- Make sure the chamber is suitably sealed to the ground surface.

- Introduce the tracer gas into the chamber. The chamber will have tubing at the top of the chamber to introduce the tracer gas into the chamber and a valved fitting at the bottom to let the ambient air out while introducing tracer gas. A tracer gas detector will be attached to the valve fitting at the bottom of the chamber to verify the presence of the tracer gas. Close the valve after the chamber has been enriched with tracer gas at concentrations >50%.

- The chamber will have a gas-tight fitting or sealable penetration to allow the soil vapor sample probe tubing to pass through and exit the chamber.

- After the chamber has been filled with tracer gas, attach the sample probe tubing to a pump that will be pre-calibrated to extract soil vapor at a rate of no more than 0.2 lpm. Purge the tubing using the pump. Calculate the volume of air in the tubing and probe and purge one to three tubing/probe volumes prior measuring the tracer gas concentration.

- Use the tracer gas detector to measure the tracer gas concentration in the pump exhaust.

- Record the tracer gas concentrations in the chamber and in the soil vapor sample.

If the evaluation indicates a high concentration of tracer gas in the sample (>10% of the concentration of the tracer gas in the chamber), then the surface seal is not sufficient and requires improvement via repair or replacement prior to commencement of the sample collection. A non-detectable level of tracer gas is preferred; however, if the evaluation indicates a low potential for introduction of ambient air into the sample (<10% of the concentration of the tracer gas in the chamber), then proceed with the soil vapor sampling. While lower concentrations of tracer gas are acceptable, the impact of the detectable leak on sample results should be evaluated in the sampling report.

APPENDIX B

AMBIENT AIR SAMPLE COLLECTION PROCEDURES

(NYSDEC and NYSDOH Approved, March 15, 2007)

This set of procedures outlines the general steps to collect ambient air samples. The site-specific Sampling and Analysis Work Plan should be consulted for proposed sample locations and sampling duration.

The following procedures will be followed for the collection of ambient air samples:

- Sampling personnel must avoid activities immediately before and during the sampling that may contaminate the sample (e.g., using markers, fueling vehicles, etc.).

- Select a location upwind of the building or other area that is being evaluated. If possible, select a location upwind or near the HVAC air intake for the building being sampled.

- Record weather information (i.e., temperature, barometric pressure, relative humidity, wind speed, and wind direction) at the beginning of the sampling event. Record substantial changes to these conditions that may occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).

- Use an evacuated Summa® passivated (or equivalent) stainless-steel canister to collect the ambient air sample. The canister will be provided by the laboratory, along with a flow controller equipped with an in-line particulate filter and a vacuum gauge. The flow controller will be pre-calibrated by the laboratory for the desired flow rate or duration of sample collection, as defined in the site-specific work plan. The sampling flow rate should always be less than 0.2 lpm. The canisters will be individually certified as clean by the laboratory.

- Place the canister at the sampling location. If the sample should be collected from breathing height (e.g., 3 to 5 feet above ground), then mount the canister on a stable platform such that the sample inlet will be at the proper height.

- Remove the protective brass plug from canister. Connect the pre-calibrated flow controller to the canister.

- Record the identification numbers for the canister and flow controller. Record the initial canister pressure on the vacuum gauge (check equipment-specific instructions for taking this measurement). A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling. Record these numbers and values on the chain-of custody form for each sample.

- Completely open the valve on the vacuum pressure in the canister. Record the time that the valve was opened (beginning of sampling) and the canister pressure on the vacuum gauge.

- Photograph the canister and the area surrounding the canister.

- Document on a field form an outdoor plot sketch that indicates the building being sampled, streets, sampling location, location of potential outdoor air sources, north direction and paved areas. Also record pertinent observations such as odors, readings from field instrumentation, and significant activities in the vicinity that result in air emissions.

- Monitor the vacuum pressure in the canister routinely during sampling, when practical (sometimes the canister will sample over a 24-hour period and routine monitoring is not practical). During monitoring, note the vacuum pressure on the gauge.

- Stop sample collection after the scheduled duration of sample collection but make sure that the canister still has a minimum amount of vacuum remaining. Check with the laboratory supplying the canister and flow controller for the ideal final vacuum pressure. Typically, the minimum vacuum is between 2 and 5 inches of mercury, but not zero. If there is no vacuum remaining, the sample will be rejected and collected again in a new canister.

- Record the final vacuum pressure and close the canister valves. Record the date and time that sample collection was stopped.

- Remove the flow controller from the canister and replace the protective brass plug.

- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.

- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.

- Enter the information required for each sample on the chain-of-custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.

- Include the required copies of the chain-of-custody form in the shipping packaging, as directed by the laboratory. The field crew will retain a copy of the chain-of-custody for the project file.

- Deliver or ship the samples to the laboratory within one business day of sample collection and via overnight delivery (when shipping).

OSR – 3

NEW YORK STATE DEPARTMENT OF HEALTH
INDOOR AIR QUALITY QUESTIONNAIRE AND BUILDING INVENTORY
CENTER FOR ENVIRONMENTAL HEALTH

This form must be completed for each residence involved in indoor air testing.

Preparer's Name ____________________________________ Date/Time Prepared ______________

Preparer's Affiliation ________________________________ Phone No.______________________

Purpose of Investigation____

1. OCCUPANT:

Interviewed: Y / N

Last Name: _________________________ First Name: _________________________

Address: ____

County: _________________

Home Phone: ____________________ Office Phone: ____________________

Number of Occupants/persons at this location _______ Age of Occupants ______________________

2. OWNER OR LANDLORD: (Check if same as occupant ___)

Interviewed: Y / N

Last Name: _________________________ First Name: _________________________

Address: ____

County: _________________

Home Phone: ____________________ Office Phone: ____________________

3. BUILDING CHARACTERISTICS

Type of Building: (Circle appropriate response)

Residential	School	Commercial/Multi-use
Industrial	Church	Other: _________________

If the property is residential, type? (Circle appropriate response)

Ranch
Raised Ranch
Cape Cod
Duplex
Modular

2-Family
Split Level
Contemporary
Apartment House
Log Home

3-Family
Colonial
Mobile Home
Townhouses/Condos
Other:________________

If multiple units, how many? ________

If the property is commercial, type?

Business Type(s) ______________________________________

Does it include residences (i.e., multi-use)? Y / N   If yes, how many? ______

Other characteristics:

Number of floors______   Building age______

Is the building insulated? Y / N   How air tight? Tight / Average / Not Tight

4. AIRFLOW

Use air current tubes or tracer smoke to evaluate airflow patterns and qualitatively describe:

Airflow between floors

Airflow near source

Outdoor air infiltration

Infiltration into air ducts

5. BASEMENT AND CONSTRUCTION CHARACTERISTICS (Circle all that apply)

a. Above grade construction:	wood frame	concrete	stone	brick
b. Basement type:	full	crawlspace	slab	other ________
c. Basement floor:	concrete	dirt	stone	other ________
d. Basement floor:	uncovered	covered	covered with _______________	
e. Concrete floor:	unsealed	sealed	sealed with ________________	
f. Foundation walls:	poured	block	stone	other ________
g. Foundation walls:	unsealed	sealed	sealed with ________________	
h. The basement is:	wet	damp	dry	moldy
i. The basement is:	finished	unfinished	partially finished	
j. Sump present?	Y / N			

k. Water in sump? Y / N / not applicable

Basement/Lowest level depth below grade: ________(feet)

Identify potential soil vapor entry points and approximate size (e.g., cracks, utility ports, drains)

____

____

6. HEATING, VENTING and AIR CONDITIONING (Circle all that apply)

Type of heating system(s) used in this building: (circle all that apply – note primary)

Hot air circulation
Space Heaters
Electric baseboard
Heat pump
Stream radiation
Wood stove
Hot water baseboard
Radiant floor
Outdoor wood boiler
Other ___________

The primary type of fuel used is:

Natural Gas
Electric
Wood
Fuel Oil
Propane
Coal
Kerosene
Solar

Domestic hot water tank fueled by: ____________________________

Boiler/furnace located in: Basement Outdoors Main Floor Other___________

Air conditioning: Central Air Window units Open Windows None

Are there air distribution ducts present? Y / N

Describe the supply and cold air return ductwork, and its condition where visible, including whether there is a cold air return and the tightness of duct joints. Indicate the locations on the floor plan diagram.

____

____

____

____

7. OCCUPANCY

Is basement/lowest level occupied? Full-time Occasionally Seldom Almost Never

Level	**General Use of Each Floor (e.g., familyroom, bedroom, laundry, workshop, storage)**
Basement	____
1st Floor	____
2nd Floor	____
3rd Floor	____
4th Floor	____

8. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY

a. Is there an attached garage? Y / N

b. Does the garage have a separate heating unit? Y / N / NA

c. Are petroleum-powered machines or vehicles stored in the garage (e.g., lawnmower, atv, car) Y / N / NA Please specify___________________

d. Has the building ever had a fire? Y / N When?__________________

e. Is a kerosene or unvented gas space heater present? Y / N Where? _________________

f. Is there a workshop or hobby/craft area? Y / N Where & Type? _________________

g. Is there smoking in the building? Y / N How frequently? ________________

h. Have cleaning products been used recently? Y / N When & Type? _________________

i. Have cosmetic products been used recently? Y / N When & Type? _________________

j. Has painting/staining been done in the last 6 months? Y / N Where & When? _______________

k. Is there new carpet, drapes or other textiles? Y / N Where & When? _______________

l. Have air fresheners been used recently? Y / N When & Type? ________________

m. Is there a kitchen exhaust fan? Y / N If yes, where vented?____________

n. Is there a bathroom exhaust fan? Y / N If yes, where vented?____________

o. Is there a clothes dryer? Y / N If yes, is it vented outside? Y / N

p. Has there been a pesticide application? Y / N When & Type?_________________

Are there odors in the building? Y / N
If yes, please describe: ____

Do any of the building occupants use solvents at work? Y / N
(e.g., chemical manufacturing or laboratory, auto mechanic or auto body shop, painting, fuel oil delivery, boiler mechanic, pesticide application, cosmetologist

If yes, what types of solvents are used? ____

If yes, are their clothes washed at work? Y / N

Do any of the building occupants regularly use or work at a dry-cleaning service? (Circle appropriate response)

Yes, use dry-cleaning regularly (weekly)
Yes, use dry-cleaning infrequently (monthly or less)
Yes, work at a dry-cleaning service
No
Unknown

Is there a radon mitigation system for the building/structure? Y / N Date of Installation: ____________
Is the system active or passive? Active/Passive

9. WATER AND SEWAGE

Water Supply: Public Water Drilled Well Driven Well Dug Well Other: _______

Sewage Disposal: Public Sewer Septic Tank Leach Field Dry Well Other: _______

10. RELOCATION INFORMATION (for oil spill residential emergency)

a. Provide reasons why relocation is recommended: _____________________________________

b. Residents choose to: remain in home relocate to friends/family relocate to hotel/motel

c. Responsibility for costs associated with reimbursement explained? Y / N

d. Relocation package provided and explained to residents? Y / N

11. FLOOR PLANS

Draw a plan view sketch of the basement and first floor of the building. Indicate air sampling locations, possible indoor air pollution sources and PID meter readings. If the building does not have a basement, please note.

Basement:

First Floor:

12. OUTDOOR PLOT

Draw a sketch of the area surrounding the building being sampled. If applicable, provide information on spill locations, potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s) and PID meter readings.

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and septic system, if applicable, and a qualifying statement to help locate the site on a topographic map.

13. PRODUCT INVENTORY FORM

Make & Model of field instrument used: ______________________________________

List specific products found in the residence that have the potential to affect indoor air quality.

Location	**Product Description**	**Size** **(units)**	**Condition**[*]	**Chemical Ingredients**	**Field Instrument Reading** **(units)**	**Photo** [**] **Y / N**

* Describe the condition of the product containers as **Unopened (UO), Used (U),** or **Deteriorated (D)**
** Photographs of the **front and back** of product containers can replace the handwritten list of chemical ingredients. However, the photographs must be of good quality and ingredient labels must be legible.

APPENDIX D

SUB-SLAB VAPOR SAMPLE COLLECTION PROCEDURES

(NYSDEC and NYSDOH Approved, March 15, 2007)

This set of procedures outlines the general steps to collect sub-slab vapor samples. The site-specific Sampling and Analysis Work Plan should be consulted for proposed sample locations, sample depths, and sampling duration.

Sub-Slab Vapor Probe Installation

Temporary sampling probes will be installed using the following procedures:

- Sampling personnel must avoid activities immediately before and during the sampling that may contaminate the sample (e.g., using markers, fueling vehicles, etc.).
- If appropriate, record weather information (temperature, barometric pressure, rainfall, wind speed, and wind direction) at the beginning of the sampling event. Record substantial changes to these conditions that may have occurred over the past 24 to 48 hours and that do occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).
- Identify sampling location(s) on a floor plan that also identifies any slab breeches (e.g., utility penetrations, sumps, drains, and cracks) and locations of HVAC equipment.
- Insert a section of food-grade (inert) Teflon® or other appropriate tubing through a 3/8-inch (approx.) hole drilled through the slab. If necessary, advance the drill bit 2 to 3 inches into the sub-slab material to create an open cavity.
- Install the tubing inlet to the specified sampling depth below the slab, not to exceed 2 inches.
- Seal the annular space between the hole and tubing using 100% beeswax or another inert, non-shrinking sealing compound such as permagum®.

Sub-Slab Vapor Sample Collection

Sub-slab vapor samples will be collected by following the steps outlined below.

- Purge the tubing using a vacuum pump or gas-tight syringe (~60 cc). Calculate the volume of air (volume = πr^2h) in the tubing and purge one to three tubing volumes prior to sample collection at a rate no greater than 0.2 liter per minute (lpm).

- Use an evacuated Summa® passivated (or equivalent) canister to collect the sub-slab vapor sample. The canister will be provided by the laboratory, along with a flow controller equipped with an in-line particulate filter and a vacuum gauge. The flow controller will be pre-calibrated by the laboratory for the desired flow rate or duration of sample collection, as defined in the site-specific work plan. The sampling flow rate should always be less than 0.2 lpm. The canisters will be batch certified as clean by the laboratory.

- Remove the protective brass plug from canister. Connect the pre-calibrated flow controller to the canister.

- Record the identification numbers for the canister and flow controller. Record the initial canister pressure on the vacuum gauge (check equipment-specific instructions for taking this measurement). A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling. Record these numbers and values on the chain-of-custody form for each sample.

- Connect the tubing from the sub-slab vapor sampling probe to the flow controller.

- Completely open the valve on the canister. Record the time that the valve is opened (beginning of sampling) and the canister pressure on the vacuum gauge.

- Photograph the canister and the area surrounding the canister.

- Monitor the vacuum pressure in the canister routinely during sampling, when practical (sometimes the canister will sample over a 24-hour period and routine monitoring is not practical).

- Complete the NYSDOH building survey and chemical survey form.

- Stop sample collection after the scheduled duration of sample collected, but when the canister still has a minimum amount of vacuum remaining. Check with the laboratory supplying the canister and flow controller for the ideal final vacuum pressure. Typically, the minimum vacuum is between 2 and 5 inches of mercury, but not zero. If there is no vacuum remaining, the sample will be rejected and collected again in a new canister.

- Record the final vacuum pressure and close the canister valve. Record the date and time that sample collection was stopped.

- Remove the flow controller from the canister and replace the protective brass plug.

- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.

- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.

- Enter the information required for each sample on the chain-of-custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.

- Include the required copies of the chain-of-custody form in the shipping packaging, as directed by the laboratory. The field crew will retain a copy of the chain-of-custody for the project file.

- Deliver or ship the samples to the laboratory within one business day of sample collection and via overnight delivery (when shipping).

- For temporary probes, remove the probe and seal the slab hole with cement. Repair flooring, if any.

APPENDIX E
INDOOR AIR SAMPLE COLLECTION PROCEDURES
(NYSDEC and NYSDOH Approved, March 15, 2007)

This set of procedures outlines the general steps to collect indoor air samples. The site-specific Sampling and Analysis Work Plan should be consulted for proposed sampling locations and other indoor air requirements (inventory, etc.).

Indoor air samples will be collected by following the steps outlined below:

- Sampling personnel must avoid activities immediately before and during the sampling that may contaminate the sample (e.g., using markers, fueling vehicles, etc.).

- Record weather information (temperature, barometric pressure, relative humidity, wind speed, and wind direction) and indoor temperature and humidity at the beginning of the sampling event. Record substantial changes to these conditions that may have occurred over the past 24 to 48 hours and that do occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).

- Identify sampling location(s) on a floor plan that also identifies locations of HVAC equipment, chemical storage areas, garages, doorways, stairways, sumps, drains, utility perforations, north direction, and separate footing sections

- Use an evacuated Summa® passivated (or equivalent) stainless-steel canister to collect the outdoor air sample. The canister will be provided by the laboratory, along with a flow controller equipped with an in-line particulate filter and a vacuum gauge. The flow controller will be pre-calibrated by the laboratory for the desired flow rate or duration of sample collection, as defined in the site-specific work plan. The sampling flow rate should always be less than 0.2 lpm. The canisters will be individually certified as clean by the laboratory.

- Place the canister at the sampling location. The sample should be collected from breathing height (e.g., 3 to 5 feet above ground). Either mount the canister on a stable platform or attach a length of inert tubing to the flow controller inlet and support it such that the sample inlet will be at the proper height.

- Remove the protective brass plug from canister. Connect the pre-calibrated flow controller to the canister.

- Record the identification numbers for the canister and flow controller. Record the initial canister pressure on the vacuum gauge (check equipment-specific instructions for taking this measurement). A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling. Record these numbers and values on the chain-of custody form for each sample.

- Completely open the valve on the vacuum pressure in the canister. Record the time that the valve was opened (beginning of sampling) and the canister pressure on the vacuum gauge.

- Photograph the canister and the area surrounding the canister.

- Monitor the vacuum pressure in the canister routinely during sampling, when practical (sometimes the canister will sample over a 24-hour period and routine monitoring is not practical). During monitoring, note the vacuum pressure on the gauge.

- Complete the NYSDOH building survey and chemical survey form.

- Stop sample collection after the scheduled duration of sample collection, but make sure that the canister still has a minimum amount of vacuum remaining. Check with the laboratory supplying the canister and flow controller for the ideal final vacuum pressure. Typically, the minimum vacuum is between 2 and 5 inches of mercury, but not zero. If there is no vacuum remaining, the sample will be rejected and collected again in a new canister.

- Record the final vacuum pressure and close the canister valves. Record the date and time that sample collection was stopped.

- Remove the flow controller from the canister and replace the protective brass plug.

- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.

- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.

- Enter the information required for each sample on the chain-of-custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.

- Include the required copies of the chain-of-custody form in the shipping packaging, as directed by the laboratory. The field crew will retain a copy of the chain-of-custody for the project file.

- Deliver or ship the samples to the laboratory within one business day of sample collection and via overnight delivery (when shipping).

Appendix F

Building Owner/Occupant Instructions Prior to Vapor Intrusion Sampling

Some household products and activities can emit chemicals into the indoor air that could interfere with the evaluation of the sampling results. Therefore, it is strongly urged that building occupants refrain from the following activities at least 48 hours before sampling is conducted and during sampling:

- opening windows, fireplace openings or vents;
- keeping doors open for long periods of time;
- operating ventilation fans or air conditioning;
- use of scented candles, air fresheners or odor eliminators;
- smoking;
- use of wood stoves, fireplaces or auxiliary heating equipment, such as a kerosene heater;
- use of paints or varnishes;
- use of cleaning products such as household cleaners, floor cleaners, bathroom cleaners, furniture polish, etc.
- use of cosmetics, including hair spray, nail polish removers and perfume, etc.;
- use of solvents, such as paint thinners, glues, automobile degreasing chemicals, WD-40, etc.;
- use of pesticides (e.g. RAID), herbicides and fungicides;
- use of building repair or maintenance products, such as caulk and roofing tar;
- lawn mowing, paving with asphalt, or snow blowing;
- storing gasoline, oil or petroleum-based or other solvents within the building or attached garage (except for fuel oil tanks); and
- operating or storing automobiles or other gasoline-powered equipment or vehicles in an attached garage.

It should also be noted that any containers of paint, varnish, cleaning products, or solvents stored inside the building should be securely sealed.

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Ambient Air (Canister) Sample Collection Field Form

Project # ____________________
Consultant ____________________
Project Name ____________________
Collector ____________________

Sample ID ____________________

Vacuum gauge "zero" ("Hg) __________
Start Date/Time ____________________
Start Pressure ("Hg) __________
End Date/Time ____________________
End Pressure ("Hg) __________
Canister ID ____________________
End pressure > "zero"? __________
Flow controller ID ____________________
Sampling duration (intended) __________

Tubing type used __________
Length of tubing __________ cm
Tubing volume __________ cc
Volume purged __________ cc @ __________ min
1 to 3 volumes purged @ < 200cc/min? __________

Weather Conditions at Start of Sampling:

Air temperature (°F) __________
Rainfall __________
Wind direction __________
Barometric pressure __________
Relative humidity __________
Wind speed (mph) __________

Substantial changes in weather conditions during sampling or over the past 24 to 48 hrs:

____

____

Site Plan showing sample location, building(s) being sampled, building HVAC inlet, outdoor air sources, wind direction

Comments: ____________________

____

____

____

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nationalgrid

Indoor Air (Canister) Sample Collection Field Form

Project # ____________________ Consultant ____________________

Project Name ____________________ Collector ____________________

Sample ID ____________________

Vacuum gauge "zero" ("Hg) __________

Start Date/Time ____________________ Start Pressure ("Hg) __________

End Date/Time ____________________ End Pressure ("Hg) __________

Canister ID ____________________ End pressure > "zero"? __________

Flow controller ID ____________________ Sampling duration (intended) __________

Associated ambient air sample ID __________ Associated sub-slab vapor sample ID __________

Tubing type used __________ Length of tubing __________ cm Tubing volume __________ cc

Volume purged __________ cc @ __________ min 1 to 3 volumes purged @ < 200cc/min? __________

Weather Conditions at Start of Sampling:

Air temperature (°F) __________ Rainfall __________ Wind direction __________

Barometric pressure __________ Relative humidity __________ Wind speed (mph) __________

Substantial changes in weather conditions during sampling or over the past 24 to 48 hrs:

____

____

Indoor air temp (°F) ____________________ Indoor relative humidity (%) __________

Building Survey and Chemical Inventory Form Completed? __________ Photograph IDs __________

Floor Plan showing sample location, HVAC equipment, indoor air sources, preferential pathways

Comments: ____

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Sub-slab Vapor (Canister) Sample Collection Field Form

Project # ____________________ Consultant ____________________

Project Name ____________________ Collector ____________________

Sample ID ____________________

Vacuum gauge "zero" ("Hg) __________

Start Date/Time ____________________ Start Pressure ("Hg) __________

End Date/Time ____________________ End Pressure ("Hg) __________

Canister ID ____________________ End pressure > "zero"? __________

Flow controller ID ____________________ Sampling duration (intended) __________

Associated indoor air sample ID __________ Associated ambient air sample ID __________

Tubing type used __________ Length of tubing __________ cm Tubing volume __________ cc

Volume purged __________ cc @ __________ min 1 to 3 volumes purged @ < 200cc/min? __________

Weather Conditions at Start of Sampling:

Air temperature (°F) __________ Rainfall __________ Wind direction __________

Barometric pressure __________ Wind speed (mph) __________

Substantial changes in weather conditions during sampling or over the past 24 to 48 hrs:

Indoor air temp (°F) __________ Indoor relative humidity (%) __________

Building Survey and Chemical Inventory Form Completed? __________ Photograph IDs __________

Floor Plan showing sample location, HVAC equipment, indoor air sources, preferential pathways

Comments: ____________________

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Soil Vapor (Canister) Sample Collection Field Form

Project # ______________________ Consultant ______________________

Project Name ______________________ Collector ______________________

Sample ID ______________________

Vacuum gauge "zero" ("Hg) __________

Start Date/Time ______________________ Start Pressure ("Hg) __________

End Date/Time ______________________ End Pressure ("Hg) __________

Canister ID ______________________ End pressure > "zero"? __________

Flow controller ID ______________________ Sampling duration (intended) __________

Associated ambient air sample ID __________ Depth of sample point below grade __________

Tubing type used __________ Length of tubing __________ cm Tubing volume __________ cc

Volume purged __________ cc @ __________ min 1 to 3 volumes purged @ < 200cc/min? __________

Chamber tracer gas conc. __________ Tracer gas conc. during purging __________

Weather Conditions during Probe Installation:

Air temperature (°F) __________ Rainfall __________ Wind direction __________

Barometric pressure __________ Wind speed (mph) __________

Substantial changes in weather conditions during sampling or over the past 24 to 48 hrs:

____

Weather Conditions at Start of Sampling:

Air temperature (°F) __________ Rainfall __________ Wind direction __________

Barometric pressure __________ Wind speed (mph) __________

Substantial changes in weather conditions during sampling or over the past 24 to 48 hrs:

____

____

Site Plan showing sample location, buildings, landmarks, potential soil vapor and outdoor air sources, preferential pathways

Comments: ____

____

____

____

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Ambient Air (Canister) Sample Collection Field Form

Project #

Consultant

Project Name

Collector

Sample ID

Vacuum gauge "zero" ("Hg)

Start Date/Time

Start Pressure ("Hg)

End Date/Time

End Pressure ("Hg)

Canister ID

End pressure > "zero"?

Flow controller ID

Sampling duration (intended)

Tubing type used

Length of tubing cm

Tubing volume cc

Volume purged cc @ min

1 to 3 volumes purged @ < 200cc/min?

Weather Conditions at Start of Sampling:

Air temperature (°F)

Rainfall

Wind direction

Barometric pressure

Relative humidity

Wind speed (mph)

Substantial changes in weather conditions during sampling or over the past 24 to 48 hrs:

Site Plan showing sample location, building(s) being sampled, building HVAC inlet, outdoor air sources, wind direction

Comments:

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Indoor Air (Canister) Sample Collection Field Form

Project # __________ Consultant __________

Project Name __________ Collector __________

Sample ID __________

Vacuum gauge "zero" ("Hg) __________

Start Date/Time __________ Start Pressure ("Hg) __________

End Date/Time __________ End Pressure ("Hg) __________

Canister ID __________ End pressure > "zero"? __________

Flow controller ID __________ Sampling duration (intended) __________

Associated ambient air sample ID __________ Associated sub-slab vapor sample ID __________

Tubing type used __________ Length of tubing __________ cm Tubing volume __________ cc

Volume purged __________ cc @ __________ min 1 to 3 volumes purged @ < 200cc/min? __________

Weather Conditions at Start of Sampling:

Air temperature (^{o}F) __________ Rainfall __________ Wind direction __________

Barometric pressure __________ Relative humidity __________ Wind speed (mph) __________

Substantial changes in weather conditions during sampling or over the past 24 to 48 hrs:

Indoor air temp (^{o}F) __________ Indoor relative humidity (%) __________

Building Survey and Chemical Inventory Form Completed? __________ Photograph IDs __________

Floor Plan showing sample location, HVAC equipment, indoor air sources, preferential pathways

Comments: __________

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Sub-slab Vapor (Canister) Sample Collection Field Form

Project # ____________________ Consultant ____________________

Project Name ____________________ Collector ____________________

Sample ID ____________________

Vacuum gauge "zero" ("Hg) ____________

Start Date/Time ____________________ Start Pressure ("Hg) ____________

End Date/Time ____________________ End Pressure ("Hg) ____________

Canister ID ____________________ End pressure > "zero"? ____________

Flow controller ID ____________________ Sampling duration (intended) ____________

Associated indoor air sample ID ____________ Associated ambient air sample ID ____________

Tubing type used ________ Length of tubing ________ cm Tubing volume ________ cc

Volume purged ________ cc @ ________ min 1 to 3 volumes purged @ < 200cc/min? ________

Weather Conditions at Start of Sampling:

Air temperature (^{o}F) ________ Rainfall ____________ Wind direction ________

Barometric pressure ________ Wind speed (mph) ________

Substantial changes in weather conditions during sampling or over the past 24 to 48 hrs:

____

____

Indoor air temp (^{o}F) ____________ Indoor relative humidity (%) ____________

Building Survey and Chemical Inventory Form Completed? ________ Photograph IDs ____________

Floor Plan showing sample location, HVAC equipment, indoor air sources, preferential pathways

Comments: ____

____

____

____

____

nationalgrid

Soil Vapor (Canister) Sample Collection Field Form

Project # ____________________ Consultant ____________________

Project Name ____________________ Collector ____________________

Sample ID ____________________

Vacuum gauge "zero" ("Hg) ____________

Start Date/Time ____________________ Start Pressure ("Hg) ____________

End Date/Time ____________________ End Pressure ("Hg) ____________

Canister ID ____________________ End pressure > "zero"? ____________

Flow controller ID ____________________ Sampling duration (intended) ____________

Associated ambient air sample ID ____________ Depth of sample point below grade ____________

Tubing type used __________ Length of tubing __________ cm Tubing volume __________ cc

Volume purged __________ cc @ __________ min 1 to 3 volumes purged @ < 200cc/min? ______

Chamber tracer gas conc. ____________ Tracer gas conc. during purging ____________

Weather Conditions during Probe Installation:

Air temperature (°F) __________ Rainfall __________ Wind direction __________

Barometric pressure __________ Wind speed (mph) __________

Substantial changes in weather conditions during sampling or over the past 24 to 48 hrs:

Weather Conditions at Start of Sampling:

Air temperature (°F) __________ Rainfall __________ Wind direction __________

Barometric pressure __________ Wind speed (mph) __________

Substantial changes in weather conditions during sampling or over the past 24 to 48 hrs:

Site Plan showing sample location, buildings, landmarks, potential soil vapor and outdoor air sources, preferential pathways

Comments: ____________________

Appendix G

Field Sampling Plan

Field Sampling and Analytical Plan

(Appendix G of Interim Site Management Plan)

Former Bay Ridge Holder Stations A&B Site
Operable Unit 2
Brooklyn, New York
NYSDEC Site No.: 224058
Order on Consent Index #: A2-0552-0606

Field Sampling and Analytical Plan

(Appendix G of Interim Site Management Plan)

Former Bay Ridge Holder Stations A&B Site
Operable Unit 2
Brooklyn, New York
NYSDEC Site No.: 224058
Order on Consent Index #: A2-0552-0606

Prepared By: Scott G. Olson, PG, Project Geologist

Reviewed By: Peter S. Cox, PG, Senior Geologist

Revised By: Nelson J. Abrams, PG, Senior Project Manager

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1.0 Introduction

This Field Sampling and Analytical Plan (FSAP) presents the methods and procedures to be used for performing any ground intrusive, maintenance, and monitoring activities covered under the Interim Site Management Plan [(ISMP); AECOM, 2014] at the Bay Ridge Former Holder Station A&B Site, Operable Unit 2 (Site) located in Brooklyn, New York. This Site is comprised eastern portion of the parcel between 8th and 9th Avenues, and between 65th and 66th Streets. The Site comprises of the portion of the Athletic League Ball Fields, National Grid ate Station, and vacant lots portion of the Block 5749, Lot 15 of the New York City Tax Map.

1.1 Scope of Work

The scope of work at the Site covered under this FSAP includes.

- Underground utility work
- Surface/shallow subsurface soil sampling and analysis
- Soil boring advancement, subsurface soil sampling and analysis
- Excavation
- Monitoring well installation and development
- Groundwater sampling and analysis
- Indoor air and ambient air sampling and analysis
- Investigation-derived waste management
- Community air monitoring
- Data validation evaluation, and reporting

This FSAP will be modified for specialized work including:

- Sheet Pile Installation
- Confined Space Activities
- Groundwater Dewatering, Treatment, and Discharge

Any modification to the FSAP will require approval in writing from the NYSDEC. The property owner or its representative must notify National Grid of any scheduled ground intrusive work at least 15 days prior to the start of field activity.

2.0 General Field Guidelines

2.1 Site Hazards

Potential on-site surface hazards, such as sharp objects, overhead power lines, energized areas, vehicular traffic, and building hazards will be identified prior to initiation of the fieldwork. Generally, potential hazards at the site will be identified during a site reconnaissance by the project team on the first day of the investigation field activities. Additional safety measures to be undertaken for the work performed during the investigation are addressed in the Site-Specific Health and Safety Plan (HASP, Appendix C of the ISMP).

2.2 Underground Utilities

Underground utilities, including electric lines, gas lines, water lines, storm and sanitary sewers, and communication lines will be identified prior to any subsurface work. Underground utility location will be accomplished as follows:

- All Site Characterization investigation locations will be flagged or marked out with white paint.
- Dig Safely of New York (800) 272-4480 will be contacted to initiate the locating activities. New York State law requires that Dig Safely of New York be notified at least two working days, and not more than 10 working days, before subsurface work is conducted.
- Companies with subsurface utilities present will locate and mark out all subsurface utility lines.
- Geophysical methods will be used to further evaluate the potential presence of underground utilities in the area of each proposed investigation location.
- Subsurface investigation locations will be hand cleared to five feet below ground surface (bgs) prior to advancing borings with mechanized equipment.

2.3 Field Log Books

All field activities will be carefully documented in field log books. Entries will be of sufficient detail that a complete daily record of significant events, observations, and measurements is developed. The field log book will provide a legal record of the activities conducted at the site. Accordingly:

- Field books will be assigned a unique identification number.
- Field books will be bound with consecutively numbered pages.
- Field books will be controlled by the Site Manager while fieldwork is in progress.
- Entries will be written with waterproof ink.
- Entries will be signed and dated at the conclusion of each day of fieldwork.
- Erroneous entries made while fieldwork is in progress will be corrected by the field person that made the entries. Corrections will be made by drawing a line through the error, entering the correct information, and initialing the correction.
- Corrections necessary after departing the field will be made by the person who entered the original information. Corrections will be made by drawing a line through the error, entering the correct information, and initialing and dating the time of the correction.

At a minimum, daily field book entries will include the following information:

- Location of field activity;
- Date and time of entry;
- Names and titles of field team members on site and site contacts;
- Names, titles of any site visitors, as well as the date and time entering and leaving the site;
- Weather information, for example: temperature, cloud coverage, wind speed, and direction;
- Purpose of field activity;
- A detailed description of the fieldwork conducted;
- Sample media (soil, sediment, groundwater, etc.);
- Sample collection method;
- Number and volume of sample(s) taken;
- Description of sampling point(s);
- Volume of groundwater removed before sampling;
- Preservatives used;
- Analytical parameters;
- Date and time of collection;
- Sample identification number(s);
- Sample distribution (e.g., laboratory);
- Field observations;
- All field measurements made, such as volatile organic compounds (VOCs) using a PID, pH, temperature, conductivity, water level, etc.;
- References for all maps and photographs of the sampling site(s); and
- Information pertaining to sample documentation such as:
  - Bottle lot numbers;
  - Dates and method of sample shipments;
  - Chain-of-custody (COC) record numbers; and
  - Federal Express air bill number.

3.0 Field Equipment Decontamination and Management of Investigation-Derived Residuals

3.1 Decontamination Area

A temporary decontamination area lined with polyethylene sheeting will be constructed on site for use during decontamination of the excavation or drilling equipment. Water collected from the decontamination activities will be collected in 55-gallon drums or a bulk tank and managed as described in Section 3.3.

3.2 Equipment Decontamination

The following procedures will be used to decontaminate equipment used during any activities.

- All equipment including the backhoe bucket; drilling rig; augers; bits; rods; tools; split-spoon samplers; and tremie pipes will be cleaned with a high-pressure, hot water pressure washing unit between locations and following completion of activities.
- Tools, drill rods, and augers will be placed on polyethylene plastic sheets following pressure washing. Direct contact with the ground will be avoided.
- All earth moving equipment, the back of the drill rig and all tools, augers, and rods will be decontaminated at the completion of the work and prior to leaving the project site.

3.2.1 Sampling Equipment Decontamination

Suggested Materials:

- Potable water;
- Phosphate-free detergent (such as Alconox™);
- Distilled water;
- Aluminum foil;
- Plastic/polyethylene sheeting;
- Plastic buckets and brushes; and
- Personal protective equipment (PPE) in accordance with the HASP.

Procedures:

- Prior to sampling, all non-dedicated sampling equipment (bowls, spoons, interface probes, etc.) will be washed with potable water and a phosphate-free detergent (such as Alconox™). Decontamination may take place at the sampling location as long as all liquids are contained in pails, buckets, etc.
- The sampling equipment will then be rinsed with potable water followed by a de-ionized water rinse.
- Between rinses, equipment will be placed on polyethylene sheets or aluminum foil, if necessary. At no time will washed equipment be placed directly on the ground.

- Equipment will be wrapped in polyethylene plastic or aluminum foil for storage or transportation from the designated decontamination area to the sampling location.

3.3 Management of Investigation-Derived Residuals

3.3.1 Decontamination Fluids

Hot water pressure wash and decontamination fluids will be collected in 55-gallon drums or a bulk tank. The storage drums or tank will be labeled as “pending analysis – investigation-derived residual decon water” and temporarily stored in a plastic-lined containment area pending characterization and proper disposal.

3.3.2 Drill Cuttings

Drill cuttings will be contained in 55-gallon drums. The drums will be labeled as “pending analysis – investigation-derived residual – soil from drill cuttings” and temporarily stored in a plastic-lined containment area pending characterization and proper disposal.

3.3.3 Development and Purge Water

All development and purge water will be contained in 55-gallon drums or a bulk tank. The drums or tank will be labeled as “pending analysis - investigation derived residual development and purge water” and temporarily stored in a plastic-lined containment area pending characterization and proper disposal.

3.3.4 Personal Protective Equipment

All used PPE will be placed in 55-gallon drums or a lined cardboard yard box for proper disposal.

3.3.5 Dedicated Sampling Equipment

All dedicated groundwater sampling equipment will be placed in 55-gallon drums for disposal.

4.0 Soil Sampling and Well Installation Procedures

4.1 Introduction

Surface and subsurface activities to be conducted at the Site may consist of utility work; excavation; the advancement of soil borings; collection of soil samples; groundwater monitoring, soil vapor intrusion sampling, and the installation of monitoring wells. These activities will require the use of the following equipment and material:

- Field book;
- Project plans;
- PPE in accordance with the HASP;
- Stakes, flagging and marking paint;
- Plastic bags for soil screening samples;
- Stainless steel or disposable bowls and spoons/spatulas;
- Tape measure;
- Decontamination supplies;
- Water level indicator;
- Electronic oil/water interface probe
- Clear polyethylene disposable bailers (NAPL confirmation in wells);
- Polyethylene disposable bailers (well development);
- Polypropylene rope (well development);
- Waterra™ pump or other purge pump (well development);
- Submersible electric pump (well development);
- Stainless steel or glass beakers (well development);
- Turbidity meter (well development);
- Temperature, conductivity, pH meter (well development).
- PID with a 10.2 or 10.6 eV lamp;
- Digital camera;
- Clear tape, duct tape;
- Laboratory sample bottles;
- Coolers and ice; and
- Shipping supplies.

Procedures for these activities are described in the following sections.

4.2 Excavation

Excavation activities will be dictated by the Contractor hired to conduct the work and will follow the Excavation Work Plan included as Appendix B of the ISMP [AECOM, 2013]. During field activities, personnel will stand upwind of the excavation area to the extent possible. Air monitoring and odor mitigation (if necessary) will be conducted in accordance with the Community Air Monitoring Project (CAMP) and HASP. Excavation materials will be photographed and logged for future reference. Material removed from the excavation will be placed on polyethylene sheeting. The location and size of the excavation will be measured and described in the field logbook.

Visually clean soils, such as surface soils, will be segregated from soils that may be impacted. The visually clean soils may be placed back in the excavation with prior approval of the NYSDEC. At a minimum, the top 2 feet of backfilled soil will be visually clean. The excavation will be backfilled as soon as possible after completion and in general prior to the cessation of activities at the end of the day. If excavation resulted in removal of any impacted material, a demarcation layer as detailed in EWP - Appendix B of the ISMP [AECOM, 2014] will be placed over the surface prior to backfilling. Following restoration of the excavation, the excavation will be staked/marked to facilitate subsequent location by surveying crews.

4.3 Soil Sampling

4.3.1 Soil Borings

Soil borings will be advanced and sampled with a combination of either rotosonic drilling methods equipped with 4-inch diameter sampling cores or hollow-stem augers (HSAs) equipped with 2-inch or 3-inch diameter split-spoon samplers. In some instances, a direct-push (Geoprobe™) drilling rig equipped with 4-foot long, 2-inch diameter Macro-Core™ samplers may be used if there are access limitations. All drilling equipment will be decontaminated between each boring in accordance with methods specified in Section 3.2.

All locations will be properly abandoned following the collection of samples. Boreholes for the direct-push borings will be filled with bentonite chips. All rotosonic or auger soil borings not used for the construction of monitoring wells will be tremie grouted to the ground surface following the completion of the soil sampling to prevent cross-contamination of permeable zones. The borings will be filled using a cement/bentonite grout mixture with the following specifications:

- Bentonite will be powdered sodium montmorillonite furnished in moisture resistant sacks without additives.
- Cement shall be a low-alkaline Portland cement, Type I in conformance with ASTM C-150 and without additives.
- The cement/bentonite grout mixture shall be to the following proportion:
  - Three sacks (94 pounds) of Type I Portland cement;
  - 14 pounds of granular bentonite (5% mix); and
  - 25 gallons of water.

The cement will be mechanically mixed, above ground, with water from a potable water source. Bentonite will be added to ensure a lump-free consistency. The mixture will be pumped through a tremie pipe as the drill is being withdrawn.

4.3.2 Geologic Logging Methods

The field geologist will log borehole geology and headspace measurements, and any other observations (e.g., odors, NAPL, soil staining, etc.), in the field book and the Drilling Record shown in Figure 4-1, or similar form. Soil samples retrieved from the borehole will be visually described for:

1) percent recovery,
2) soil type,
3) color,
4) moisture content,
5) texture,
6) grain size and shape,
7) consistency,
8) visible evidence of staining or other hydrocarbon-related impacts, and
9) any other relevant observations.

The descriptions will be in accordance with the Unified Soil Classification System (USCS) and the American Society for Testing and Materials (ASTM) guidelines. Descriptions will also follow National Grid's internal field description guidance (KeySpan, 2005).

Immediately after describing the core, a representative soil sample will be placed in a re-sealable plastic (e.g., "ziplock") bag filled approximately half full. The bag will be labeled with the boring number and interval sampled. After allowing the bagged soil to warm, the tip of the sample probe attached to the PID will be inserted into the bag to measure the headspace for organic vapors. Soil remaining after completion of sample description, collection, and field screening will be disposed of properly.

4.3.3 Collection of Samples

The number and frequency of samples to be collected from each boring and the associated analytical parameters will be based on the field activity. The sample locations, descriptions, and depths will be recorded on the borelogs in the fieldbook.

Samples for laboratory analyses will be collected directly from the sampling spoon (test pits), acetate liners, split-spoons, and/or core barrel and placed into appropriate containers (for VOC analyses); homogenized (for non-VOC analyses); and compacted to minimize headspace and pore space. Soil used for headspace analysis will not be used for laboratory VOC analysis. The sampling equipment will be decontaminated between samples in accordance with procedures described in Section 3. Soil remaining after completion of sample description, collection, and field screening will be disposed of properly.

The sample containers will be labeled, placed in a laboratory-supplied cooler, and packed with ice. The coolers will then be shipped to the laboratory for analysis. COC procedures will be followed as outlined in the Quality Assurance Project Plan (QAPP – Appendix H of ISMP). If there is a delay of sample shipment due to insufficient samples to warrant overnight delivery, the samples will be stored in a cool, secure place with sufficient ice to maintain a temperature of 4˚ C.

4.4 Monitoring Well Installation and Development

The following methods will be used for drilling, installing, and developing the monitoring wells.

4.4.1 Overburden Monitoring Well Installation

Figure 4-2 illustrates the construction details for a typical overburden monitoring well. Specific details regarding the depth and anticipated screened interval of proposed monitoring wells will be based on the needed data and approved work plan. In general, monitoring wells will be installed according to the following specifications:

- The monitoring well borings will be advanced with either 4.25-inch inner diameter (ID) hollow-stem augers or 4-inch ID flush casing.
- Wells will be constructed with 2-inch ID, threaded, flush-joint, Schedule 40 PVC casings and screens.
- Screens will be 10-feet long with 0.01-inch slot openings (or 0.02-inch, if NAPL present) with a 2-foot DNAPL sump at the base. Alternative screen lengths up to 20 feet long may be used at the discretion of the field geologist and with the approval of NYSDEC, based on site conditions.
- The annulus around the screens will be backfilled with clean silica sand having appropriate size (e.g., Morie No. 1) to a minimum height of 2 feet above the top of the screen. Auger flights or casing will be withdrawn as sand is poured in a manner that will minimize hole collapse and bridging.
- A bentonite chip seal with a minimum thickness of 2 feet will be placed above the sand pack. The bentonite seal will be hydrated with clean, potable water before placement of grout above the seal layer.
- The remainder of the annular space will be filled with cement-bentonite grout to ground surface. The grout will be allowed to set for a minimum of 24 hours before wells are developed, although 48 hours is preferred.
- Each monitoring well will include an expandable plug and locking cap. Completion as stickup or flushmount installations will depend on the monitoring well location. All well locations will be clearly marked with appropriate stakes, flagging, or other signage to facilitate location of the wells.
- The concrete pad will be sloped to channel water away from the well, and be of sufficient dimension and depth to remain stable during freezing and thawing of the ground.
- The top of the PVC well casing and ground surface will be marked and surveyed to 0.01 foot, and the elevation will be determined relative to a fixed benchmark or datum.
- The measuring point on all wells will be on the innermost PVC casing.
- Monitoring well construction details will be recorded on the Monitoring Well Construction Log shown in Figure 4-3.

- If commercially available nested wells are considered to sample multiple aquifer depth zones in the same borehole, they will be discussed with NYSDEC prior to installation.

4.4.2 Monitoring Well Development

- A minimum of 24 hours after installation, the monitoring wells will be developed by surging and purging. Surging will be performed periodically, across the length of screen in 2-foot increments prior to, at interim periods of pumping, and immediately before the final pumping. Pumping methods may include using a centrifugal, submersible, or peristaltic pump and dedicated polyethylene tubing, using a Waterra™ positive displacement pump and dedicated polyethylene tubing, or other methods at the discretion of the field geologist.
- Water levels will be measured in each well to the nearest 0.01 foot prior to development.
- The wells will be developed until the water in the well is reasonably free of visible sediment (50 NTU if possible or until pH, temperature, and specific conductivity stabilize). A portable nephelometer will be used to make the turbidity measurement.

- Development water will be contained in 55-gallon drums and properly disposed of.

Following development, wells will be allowed to recover for at least 14 days before groundwater is purged and sampled. All monitoring well development will be performed or overseen by a field geologist and recorded in the field book.

5.0 Groundwater Sampling Procedures

5.1 Introduction

Procedures for obtaining samples of groundwater are described in this section. Groundwater samples will be collected using low-flow, low-stress purge and sampling methods.

Procedures for conducting aquifer conductivity testing are also described in this section. Aquifer conductivity testing will be done by using slug or pneumatic testing methods.

5.2 Groundwater Sampling

The number and frequency of the samples that will be collected for laboratory analysis from each well and the analytical parameters are listed in Table 3-1 of the ISMP (AECOM, 2014).

The following method will be used to collect groundwater samples from monitoring wells:

5.2.1 Required Equipment and Supplies

- Field book
- Groundwater collection records
- Project plans
- PPE in accordance with the HASP
- Electronic oil/water interface probe
- Disposable polyethylene bailers and low-flow sampling pump
- Polypropylene rope
- Temperature, conductivity, and pH meter
- Turbidity meter
- Flow-through cell
- Decontamination supplies
- Peristaltic or submersible pump capable of achieving low-flow rates (i.e., 0.5 liters per minute or less)
- Plastic tubing
- Plastic sheeting
- PID
- Clear tape, duct tape
- Coolers and ice
- Laboratory sample bottles
- Federal Express labels

5.2.2 Groundwater Purging and Sampling Method

5.2.2.1 Groundwater Purging

- Prior to sampling, the static water level and thickness of any light non-aqueous phase liquid (LNAPL) or dense non-aqueous phase liquid (DNAPL) will be measured to the nearest 0.01 foot from the surveyed well elevation mark on the top of the PVC casing with a decontaminated oil/water interface probe. If NAPL is present, the NAPL thickness will be confirmed using a clear bailer or a weighted string. The measurement will be recorded in the field book.
- The probe will be decontaminated between uses.
- Purging will be conducted using the low-flow sampling technique specified by the USEPA Region 1 in its guidance document entitled “Low-Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells”.
- Groundwater from the well will be purged until field parameters (measured within a flow through cell) stabilize, up to three well volumes are removed, or 1 hour of continuous purging is performed. Field parameters are considered to be stable when three consecutive readings are within the stabilization criteria for that parameter. The stabilization criteria are as follows:
  - Turbidity within10% or below 10 NTU;
  - Conductivity within 3%;
  - Temperature within 3%;
  - pH within 0.1 unit;
  - Oxidation Reduction Potentials (ORP) within 10 mV; and
  - Dissolved Oxygen (DO) within 10%, or within 0.5 mg/L if < 1 mg/L.
- The purge rate will be approximately 0.5 liter per minute or less.
- If a well goes dry before the required volumes are removed, it will be allowed to recover, purged a second time until dry or the required volumes and parameter stabilization criteria are met, and sampled when it recovers sufficiently, and ideally to allow for collection of the entire sample volume in one purge, in accordance with low-flow sampling protocol.
- Purge water will be managed and disposed of properly.
- Peristaltic pumps will not be used to collect VOC samples.

5.2.2.2 Groundwater Sampling

- Samples will be collected using dedicated 1/4- or 3/8-inch polyethylene tubing and/or bailers.
- Prior to filling the sample bottles, the temperature, pH, conductivity, dissolved oxygen, and oxidation reduction potential (ORP) will be measured within a flow-through cell. Turbidity will be measured with a separate portable turbidity meter. All measurements will be recorded on groundwater collection record.
- Appropriate laboratory sample containers will be filled in order from most to least volatile.
- Sample vials for VOC analyses will be filled to ensure that no bubbles are in the sample.
- Each sample container will be labeled, placed in a laboratory-supplied cooler, and packed on ice to maintain a temperature of 4ºC or lower. The cooler will be shipped overnight or delivered to the laboratory for analysis.
- COC procedures will be followed as outlined in the QAPP.

- Well sampling data will be recorded on the Groundwater Sampling Record shown in Figure 5-1, or similar form.

Hydraulic Conductivity tests if performed shall be recorded on Figure 5-2.

6.0 Indoor Air Sampling

An indoor air evaluation will be performed at the Site in case of Site development or change in usage to determne conditions. The work will be performed in accordance with *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* [DOH, 2006] and the USEPA document entitled *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils, Office of Solid Waste and Emergency Response* [USEPA, 2002]. Methods will also be consistent with National Grid's Draft Standard Operating Procedure for Soil Vapor Intrusion Evaluations at National Grid MGP Sites in New York State. A draft Indoor Air Sampling Plan will be submitted to NYSDEC for approval outlining the locations and frequency of the samples.

A pre-sampling survey and a product inventory will be conducted on the day of sampling. The surveys and inventories will be completed in accordance with the NYDOH guidance. The chemical inventory check will be performed at each location to document current conditions with the regard to the storage of chemicals. The previous surveys will be reviewed and any changes in conditions from the previous sampling will be noted. As with previous surveys, a screening for total volatiles will be conducted with a ppbRAE. An ambient air sample will be collected concurrently with the indoor air samples.

The methods to be used for the collection of the indoor air samples and the ambient air sample are summarized as follows:

- The indoor air sample will be collected from a minimum of two-feet above the floor surface.
- The ambient air sample will be collected at a location determined to be upwind at time of sampling.
- The indoor air and ambient air samples will be collected as an integrated (not grab) sample. A laboratory-provided flow controller fixed to a negative pressure vessel (a batch certified clean 6-liter Summa™ canister) will be used to collect the integrated sample. The controller will be a fixed-rate flow controller and the approximate length of the sample time will be set by the laboratory. The flow controllers are fitted with an internal filter to prevent particulates from entering the Summa^{TM} Canister.
- The sample time for the canisters will be set to 8 hours. The collection of the samples in 6-liter canisters over an approximate 8-hour interval will ensure that the samples are collected at the rate specified by the NYSDOH (less than 0.2 liters per minute).
- The sample tubing will be attached to the sampling canister with Swagelok™ fittings.
- Prior to sampling, the initial vacuum in each canister will be checked prior to use to ensure mechanical integrity of the canister. The initial vacuum should be approximately 30 inches mercury (in. Hg).
- To start sampling, the canister ball valve is opened and the initial time and vacuum is recorded.
- The final vacuum should be between 10 and 4 in. Hg, with a target of 5 in. of Hg. The initial and final vacuum in each canister will be recorded on the laboratory chain-of-custody form to be returned to the laboratory with the samples. The gauges provided with the canisters are accurate only for "indication of change", and are not sufficiently accurate to provide gauge-to-gauge comparisons. The final vacuum will also be measured in the laboratory.

- Following collection of the sample, the canister will be sealed by closing the ball valve and fitting on the canister inlet. The inlet will then be capped with a laboratory-provided threaded end cap.
- Following collection of the sample, the PID will be used to obtain a final reading from the probe assembly or tubing for the concentration of total organic vapors.
- Quality assurance and quality control samples will include one field duplicate, one trip blank, a laboratory blank and laboratory quality control samples as required by the analytical method.
- The site name, sample identification, canister number, canister certification number, sampler's name, sample times and date will be recorded on a tag that is attached to each canister.
- The indoor air samples will be shipped overnight to a NY ELAP-certified laboratory for analysis.

Figure 6-1 shows a typical helium tracer and sub-slab set up. The field sampling team will record all information regarding the sampling on field forms. Copies of the field forms that will be used are included as Figures 6-2 and 6-3. Information that will be recorded will include the following: sample identification, date and times of sample collection, identity of the field personnel, sampling methods and equipment, purge volumes and rates, tracer test results, and any other relevant observations made during the sampling. A NYSDOH indoor air quality questionnaire and building inventory form will also be filled out prior to indoor air sampling (Figure 6-4).

7.0 Air Monitoring

7.1 Introduction

Two types of air monitoring will be performed during the instructive work on the Site:

1) work zone monitoring for protection of the workers performing the subsurface work; and
2) community air monitoring at the perimeter of the work zones onsite or at the property boundary for protection of the local community.

7.2 Breathing Zone Air Monitoring During Ground-Intrusive Activity

Monitoring of air in the breathing zone within the work site will be conducted periodically during all subsurface work and sampling activities.

- An organic vapor meter (OVM) equipped with a PID will be used to monitor total organic vapors in the breathing zone and borehole, and to screen the samples.
- Additional air monitoring may be required as specified in the site-specific HASP.

The PID readings will be recorded in the field book and on the boring logs during drilling activities. The procedure for the PID operation and calibration is included in HASP (Appendix C of ISMP). Note that equipment calibration will be performed as often as needed to account for changing conditions or instrument readings. The minimum frequency of calibration is specified in the HASP; more frequent calibration will be performed if erratic and/or spurious readings are observed or there are other problems with the instruments.

7.3 Community Air Monitoring

Community air monitoring requires real-time monitoring for VOCs, particulates (i.e., dust), and residual holder-related odors at the downwind perimeter of each designated work area when certain activities are in progress at impacted sites. The community air monitoring is not intended for use in establishing action levels for worker respiratory protection. Rather, it is intended to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels for community air monitoring require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, community air monitoring helps to confirm that work activities do not spread contamination off site through the air.

The procedures and action levels for community air monitoring are presented in the CAMP and in the HASP for the Site.

8.0 Field Instruments and Calibration

All field analytical equipment will be calibrated immediately prior to each day's use and more frequently if required. The calibration procedures will conform to manufacturer's standard instructions. This calibration will ensure that the equipment is functioning within the allowable tolerances established by the manufacturer and required by the project. All instrument calibrations will be documented in the project field book and in an instrument calibration log. Records of all instrument calibration will be maintained by the Field Team Leader. Copies of all of the instrument manuals will be maintained on site by the Field Team Leader. All changes to instrumentation will be noted in the field log book.

The following field instruments will be used during the investigation:

- PID
- Particulate monitors
- Multi-parameter meter (pH, specific conductivity, dissolved oxygen, oxidation reduction, and temperature meter)
- Turbidity meter

8.1 Portable Photo-Ionization Detector (PID)

- The photo-ionization detector will be equipped with either a 10.2 or 10.6 eV lamp. In this configuration, the PID is capable of ionizing and detecting compounds that account for over 70% of the VOCs on the USEPA Target Compound List.
- Calibration must be performed at the beginning of each day of use with a standard calibration gas having a concentration of 100 parts per million of isobutylene. If the unit experiences abnormal perturbation or erratic readings, more frequent or additional calibration will be required.
- All calibration data must be recorded in the project field notebooks.
- A battery check must be completed at the beginning and end of each working day.
- All changes to the PID will be noted in the field notes (such as lamp or filter cleaning or replacement or change of instrument).

8.2 Multi-Parameter Meter

- Calibration of the meter (YSI or equivalent) must be performed at the start of each day of use, and after very high or low readings as required by this Plan, according to manufacturer's instructions.
- National Institute of Standards and Technology - traceable standard calibration solutions will be used (where applicable). At least one backup meter will also be present on-site in the event of a malfunction.
- The calibration data must be recorded in the project field book each time it is performed.

8.3 Turbidity Meter

- The turbidity meter must be checked at the start of each day of use according to manufacturer's instructions.

9.0 Analytical Program

9.1 Environmental Sample Analyses

The laboratory samples for each media and the chemical analyses to be performed are summarized in Table 3-1 of the ISMP.

9.1.1 Soil Analyses

Surface soil and subsurface soil samples will be analyzed for the following parameters:

- TCL VOCs by USEPA Method 8260B;
- TCL SVOCs by USEPA Method 8270C;
- TAL Metals by USEPA Method 6000-7000 Series;
- Free Cyanide with extraction by USEPA Method 9014A and analysis by ASTM Method D4282-02 (microdiffusion);
- TCL Pesticides by USEPA Method 8081A;
- TCL Herbicides by USEPA Method 8151A; and
- PCBs (as Aroclors) by USEPA Method 8082.

9.1.2 Groundwater Analyses

Similar to soils, the groundwater samples will be analyzed for the following parameters:

- TCL VOCs by USEPA Method 8260B;
- TCL SVOCs by USEPA Method 8270C;
- TAL Metals by USEPA Method 6000-7000 Series;
- Total Cyanide by USEPA Method 9014;
- TCL Pesticides by USEPA Method 8081A;
- TCL Herbicides by USEPA Method 8151A; and
- PCBs (as Aroclors) by USEPA Method 8082.

9.1.3 Indoor Air/Ambient Air Analyses

The indoor air and ambient air samples, when needed, will be analyzed for VOCs by USEPA Method TO-15 (including naphthalene). The indoor air samples will also be analyzed for helium by ASTM Method ASTM D-1945. In addition to the standard TO-15 list of compounds, several additional compounds will be analyzed for, including: 1,2,3-trimethyl benzene, 1-methylnaphthalene, 2-methylnaphthalene, tetramethylbenzene, indene, indane, thiophene , 2-methylpentane, isopentane, and 2,3-dimethylpentane.

9.1.4 Waste Characterization/Profiling

Sufficient samples (a minimum of two) will be collected during the excavation or investigation and analyzed for full RCRA Hazardous Characteristics testing to determine if materials exhibiting hazardous characteristics may be present at the site and to support waste disposal profiling purposes. The analyses to be performed may include, but not be limited to, the following, depending on the medium and the selected disposal facility:

- Total Metals by USEPA Method 6010B (Mercury 7470A);
- Total Petroleum Hydrocarbons (DRO and GRO) by USEPA Method 8015 modified;
- PCBs by USEPA Method 8082;
- TCLP ZHE Extraction by USEPA Method 1311;
- TCLP VOC by USEPA Method 8260B;
- TCLP SVOC by USEPA Method 8270C;
- TCLP RCRA Metals by USEPA Method 6010B (Mercury 7470A);
- Corrosivity by USEPA Method 9045C;
- Ignitability/Flashpoint by USEPA Method 1010A;
- Reactive Cyanide and Reactive Sulfide by USEPA SW-846 Chapter 7, Sections 7.3.3.2 and 7.3.4.2; and
- Total Organic Halogens – USEPA Method 9020B.

9.2 Field Quality Control Samples

Field quality control samples will be collected and analyzed to document the accuracy and precision of the samples. The quality control samples are described as follows:

- Trip Blank: One trip blank will accompany each shipment of samples for VOC analysis sent to the laboratory. The trip blank will be analyzed to test for any contaminants introduced while samples are being stored or transported to the laboratory. The trip blanks will be analyzed for VOCs only.
- Field Equipment Blanks: The purpose of the equipment blank is to detect any contamination from sampling equipment, cross-contamination from previously sampled locations, and contamination caused by conditions at sampling locations (e.g., airborne contaminants). One equipment blank will be collected for every 20 samples per medium collected during sampling with non-disposable sampling equipment. The samples will be collected by pouring analyte-free water, prepared in the laboratory, over decontaminated sampling equipment and collecting it in sample jars. The blanks will be collected in the vicinity of a sample location. This field blank will be analyzed for VOCs, SVOCs, PCBs, total or free cyanide (depending if the blank is from groundwater or soil sampling equipment), pesticides and herbicides, and TAL metals.
- Field Duplicates: Field duplicates are collected to determine the precision of the soil samples collected. This is achieved by homogenizing soil (for non-VOC analyses) and splitting it evenly between separate sample jars. Duplicate samples will be collected and analyzed for VOC, SVOCs, PCBs, total or free cyanide (depending if the duplicate sample is from groundwater or soil), pesticides and herbicides, and TAL metals. The minimum required number of field duplicates is one for every 20 samples per medium.
- Matrix Spikes, and Matrix Spike Duplicates (MS/MSD): These samples are laboratory quality control samples and will be completed as part of the laboratory analytical batch quality control. These samples will be collected in the same manner as the field duplicates. Both the matrix spike and matrix spike duplicate will be collected at the same sample location. The minimum required number of MS/MSD samples is one for every 20 samples per medium.

9.3 Sample Location Numbering System

- Surface soil samples will be numbered consecutively beginning with SS-200 (if applicable).

- Subsurface soil borings will be numbered consecutively beginning with SB-200 (soil borings). Individual samples will also be designated with a depth code (see below).
- Monitoring wells will be numbered consecutively beginning with MW-200. Note the exceptions at locations where monitoring wells are being installed adjacent to existing monitoring wells to create well pairs or triplets.

9.4 Sample Identification

Each sample will be given a unique alphanumeric identifier in accordance with the following classification system:

Table 9-1 Sample Identification

LL*	NN*	N-N	LL
Sample Type	Sample Number	Depth Code	QC Identifier

Sample Type:	GW – Boring Groundwater Grab	MW – Monitoring Well
	SB – Soil Boring	SV – Soil Vapor
	SS – Surface Soil	IA – Indoor Air
	AMB – Ambient Air	
Sample Number:	Number referenced to a sample location map.	
Depth Code:	Depth in feet of sample interval (0-0.5, 2-4, 10-12, etc.)	
QC Identifier:	TB – Trip Blank	MS – Matrix Spike
	EB – Equipment Blank	MSD–Matrix Spike Duplicate
		MB – Matrix Blank

* L = Letter   * N = Number

Field duplicate samples will be assigned identifiers that do not allow the laboratory to distinguish them as field duplicates. Each sample container will be labeled prior to packing for shipment. The sample identifier, site name, date and time of sampling, and analytical parameters will be written on the label in waterproof ink and recorded in the field book.

9.5 Chain-of-Custody

- A Chain-of-Custody (COC) record (Figure 9-1 or similar) will accompany the sample containers during selection and preparation at the laboratory, during shipment to the field, and during return shipment to the laboratory.
- The COC will include the sample identities of each sample container and the analytical parameters for each, and will list the field personnel that collected the samples, preservation method, the project name and number, the name of the analytical laboratory that will receive the samples, and the method of sample shipment.
- If samples are split and sent to different laboratories, such as to a specialty laboratory for fingerprint analysis, a copy of the COC record will be sent with each sample shipment.

- The COC will be completed by field personnel as samples are collected and packed for shipment.
- Erroneous markings will be crossed-out with a single line and initialed by the author.
- The REMARKS space will be used to indicate if the sample is a matrix spike, matrix spike duplicate, or matrix duplicate.
- Trip and field blanks will be listed on separate rows.
- After the samples have been collected and sample information has been listed on the COC form, the method of shipment, the shipping cooler identification number(s), and the shipper airbill number will be entered on the COC.
- Finally, a member of the sampling team will write his/her signature, the date, and time on the first RELINQUISHED BY space.
- One copy of the COC will be retained by sampling personnel. The other copy and the original will be sealed in a plastic bag and taped inside the lid of the shipping cooler.
- Sample shipments will be refrigerated at 4˚C, typically by packing with bagged ice, to preserve the samples during shipment.
- After the shipping cooler is closed, custody seals provided by the laboratory will be affixed to the latch and across the front and back of the cooler lid, and signed by the person relinquishing the samples to the shipper.
- The seal will be covered with clear tape, and the cooler lid will be secured by wrapping with packing tape.
- The cooler will be relinquished to the shipper, typically an overnight carrier.
- The COC seal must be broken to open the container. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the Project Manager, and the samples will not be analyzed until directed to do so.
- The samples must be delivered to the laboratory within 48 hours of collection.

9.6 Sample Documentation

The field team leader will retain a copy of the COC, and, in addition, the field team leader will ensure that the following information about each sample is recorded in the field book:

- Sample identifier;
- Identification of sampled media (e.g., soil, sediment, groundwater);
- Sample location with respect to known reference point;
- Physical description of sample location;
- Field measurements, (e.g., pH, temperature, conductivity, and water levels);
- Date and time of collection;
- Sample collection method;
- Volume of groundwater purged before sampling;
- Number of sample containers;
- Analytical parameters;
- Preservatives used; and

- Shipping information:
  - Dates and method of sample shipments;
  - COC Record numbers;
  - Federal Express Air Bill numbers; and
  - Sample recipient (e.g., laboratory name).

Figures

AECOM

Figure 4-1

Boring/Well ID:________________

Page _______ of ________

Project Name:	Drilling Company:	Surface Comp:
Project Number:	Drilling Method:	Grout (bgs):
Date Pre-Cleared:	Rig Type:	Filter Pack (bgs):
Date Started Drilling:	Casing ID:	Riser (bgs):
Date Finished Drilling:	Water Level While Drilling (bgs):	Well Screen (bgs):
Logged By:	Total Depth of Boring (bgs):	Sump (bgs):

(Note: bgs = below ground surface)

Depth Range	Blow per 6 Inch	Re-covery ft/ft	PID	Lab Sample ID	USCS	Geologic Description Method:________________________________

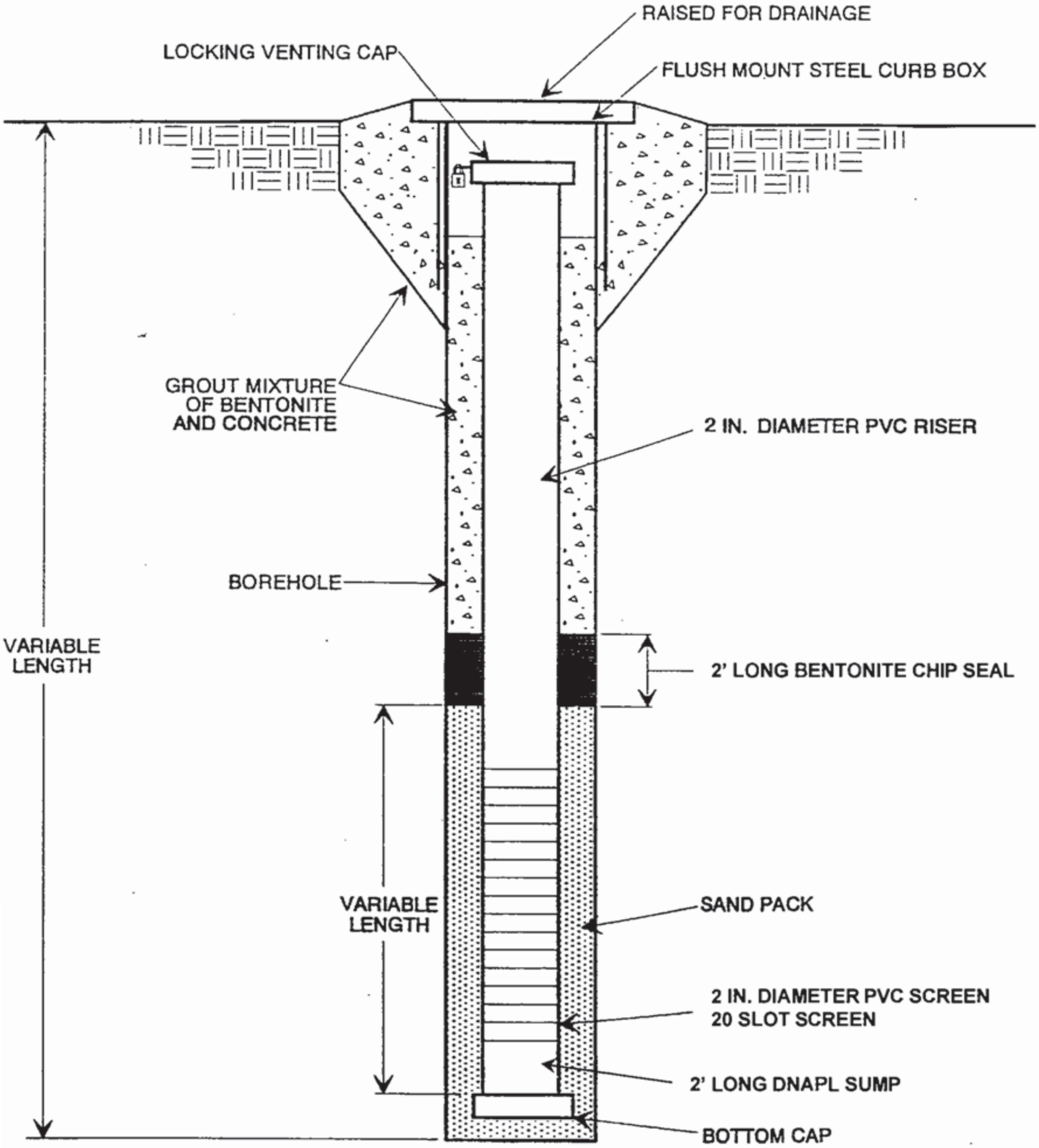
Lithology:

1.)	5.)
2.)	6.)
3.)	7.)
4.)	8.)

Comments:

Figure 4-2

TYPICAL MONITORING WELL CROSS SECTION



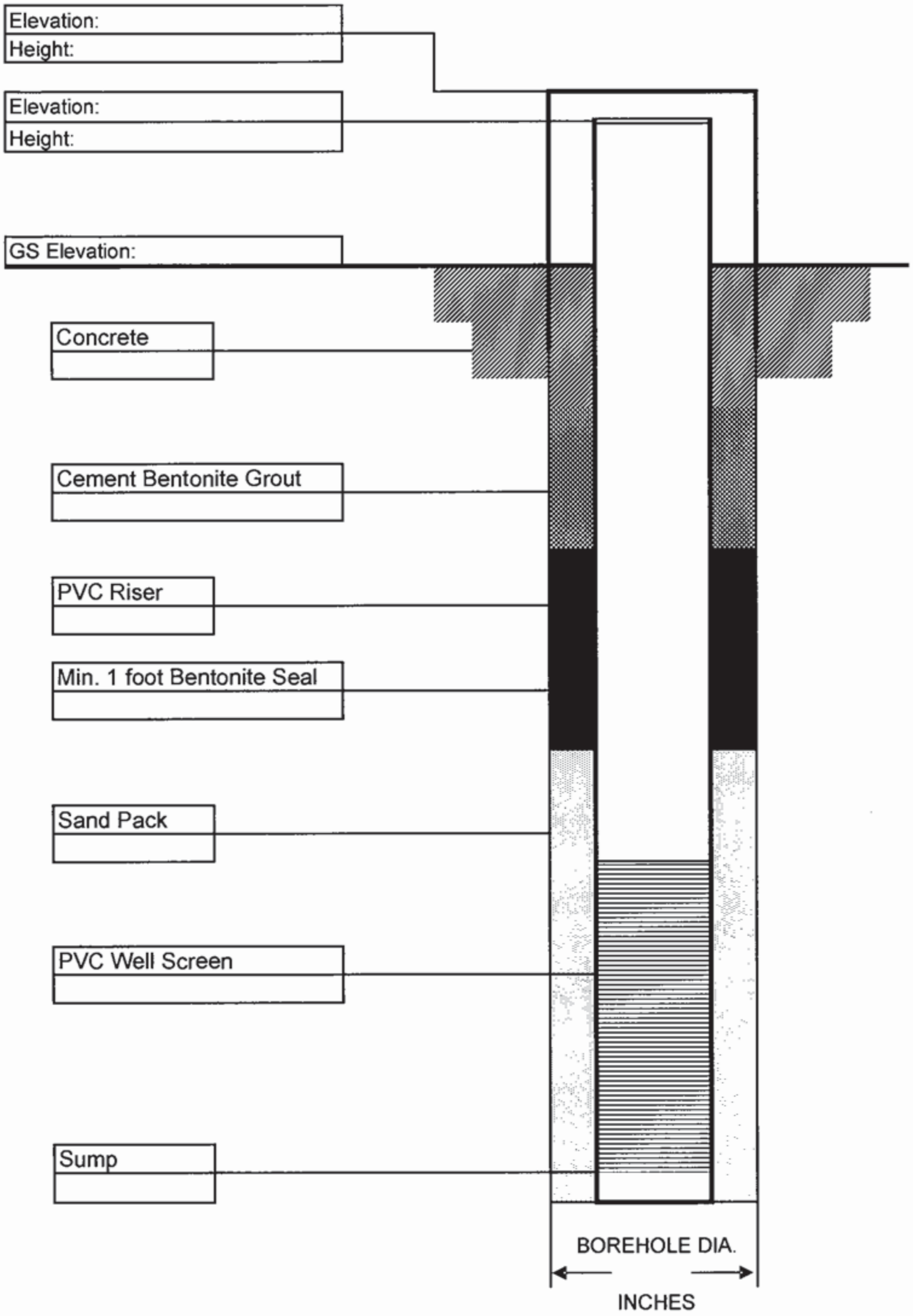
NOT TO SCALE

Figure 4-3

WELL CONSTRUCTION LOG

WELL NO.:
PROJ. NO.:
INSPECTOR:
DATE START:
LOCATION:

FACILITY/SITE NAME:
CLIENT:
DRILLING CONTACTOR:
DATE END:
DRILLING METHOD:



PROTECTIVE CASING

Material:
Diameter:
Depth BGS:
Water Tight Seal:
Flushmount:
Weep hole:

GUARD POSTS

Material:
No. & Size:

SURFACE PAD

Composition:
Size:

RISER PIPE

Material:
Schedule:
Joint Type:
O-ring:
Diameter:

GROUT

Amt cement:
Amt bentonite:
Amt water:
Tremied:
Interval:

SEAL

Material:
Type:
Amount Used:
Interval:

FILTER PACK

Material:
Brand Name:
Amount Used:
Grain Size Dist.:
Interval:
Tremied:

SCREEN

Material:
Diameter:
Slot Size & Type:
Interval BGS:

SUMP

Interval BGS:
Bottom Cap:

BACKFILL PLUG

Material:
Setup/Hydration Time:

Figure 5-1

LOW-STRESS GROUND WATER SAMPLING FORM

Project Number:
Project Name:
Date:
Weather:

Well ID:
Sample ID:
Permit Number:
Well Condition:

PRE-PURGE INFORMATION

Protective Casing Diameter (inch):
Inner Casing Diameter (inch):
Inner Casing Material:
Purge/Sample Method:
Pump Intake Setting* (feet):
PID/FID Reading of Well Headspace (ppm)
Before Cap Removal:
After Cap Removal:

Depth to Product* (feet):
Initial Depth to Water* (feet):
Product Thickness (feet):
Depth to Top of Screen* (feet):
Total Depth* (feet):
Water Column (feet):
Casing Volume (gal):
DTW After Pump Installed:

PURGING/SAMPLING INFORMATION

Time	Rate (gpm)	Gallons Purged	pH (SI Units)	Conductivity (µohms/cm)	Temp (°C)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mv)	Depth to Water (ft)	Comments

Start Purge Date/Time:
End Purge Date/Time:
Total Volume Purged (gal):
Depth to Water After Purge* (feet):

Pre-Sample Depth to Water* (feet):
Start Sample Date/Time:
End Sample Date/Time:
Sampler Names:

Observations During Sampling (e.g. slow recharge, turbidity, odor, sheen, PID/FID readings):

AECOM

Figure 5-1

LOW-STRESS GROUND WATER SAMPLING FORM

Sampling Sequence:

Analysis	Method	Container	Number of Bottles	Preservative	Comments
Volatile Organics					
Base/neutrals					
TPH					
Total Metals					
Dissolved Metals					
Cyanide					
Sulfate and Chloride					
Nitrate and Ammonia					
Preserved Inorganics					
Non-Preserved Inorg					
Bacteria					

Complete those analyses that apply.

Stabilization Ranges
Dissolved Oxygen: +/- 10%
Turbidity: +/- 10%
Specific Conductance: +/- 3%
Temperature: +/-3 %
pH: +/- 0.1 unit
Redox Potential: +/- 10mv

* = Measured from top of inner casing
DTW - Depth to Water
Thermo Environmental Instruments Model 580s OVM w/ 10.2 ev bulb
Water Levels Measured with an Electronic Water Level Meter
Field parameter meter calibration results are recorded in the field book.

Figure 5-2

Well ID:

HYDRAULIC CONDUCTIVITY TEST LOG

Client: ______ Date: ______ Time: Start ______ am/pm
Project No: ______ Finish ______ am/pm
Site Location: ______
Weather Conds: ______ Tester (s): ______

1. WELL INFORMATION

a. Ref. Point Elev. ______ e. Total Well Depth ______ i. Screen Length ______

b. Static Depth to GW ______ f. Gravel Pack Diameter ______ j. Geology of Screened Interval

c. Time of GW reading ______ g. Water Column Height ______ (e-b) ______

d. Static GW Elev.(Ho) ______ (a-b) h. Casing Diameter ______

2. SLUG INFORMATION (see back for volume calculation)

a. Slug Length ______

b. Slug Diameter ______

3. DATA COLLECTION

a. Method of Data Collection: Manual ______ (see back) Electronic ______

b.Transducer Information
Make ______
Model ______
Serial Number ______
Offset ______
Linearity ______
Scale ______
Coefficient ______
Diameter/Length ______

c. Data Logging Information
Make ______
Model ______
Serial Number ______
Mode ______ (linear or logarithmic)
Ref. Point (designation) ______ (TOC, Ground Surface, actual el
Ref. Point value (if elev.) ______
Positive numbers indicate increase or decrease in water level
(circle one)

4. HYDRAULIC TEST INFORMATION

Start Time	Test Type (rising, falling)	Electronic File Name	Comments	End Time

5. MANUAL WATER LEVEL READINGS (as needed for control)

Time	Location	Depth to Water	Time	Location	Depth to Water

Signature ______ Date ______

Q:\mw97\sops\7720\hydraulicconductivitytestlog.xls, page 1

Figure 5-2

6. EXPECTED WATER LEVEL DISPLACEMENT CALCULATION (optional)

a. Diameter of Slug (in) __________
b. Length of Slug (ft) __________
c. Volume/Linear ft of Slug (gal/ft from chart) __________
d. Volume of Slug (gal) __________ (b*c)
e. Diameter of Well (in) __________
f. Volume/Linear ft of Well (gal/ft from chart) __________
g. Expected Change in Water Level __________ (d/f)

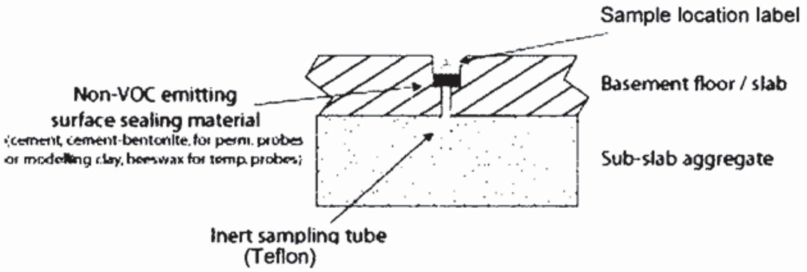
Volume / Linear Ft. of Pipe		
Diam. (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
0.75	0.0229	0.0869
1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178

Note: Water column height (1-g from front page) should be greater than transducer length plus length of slug, unless well geometry prohibits.

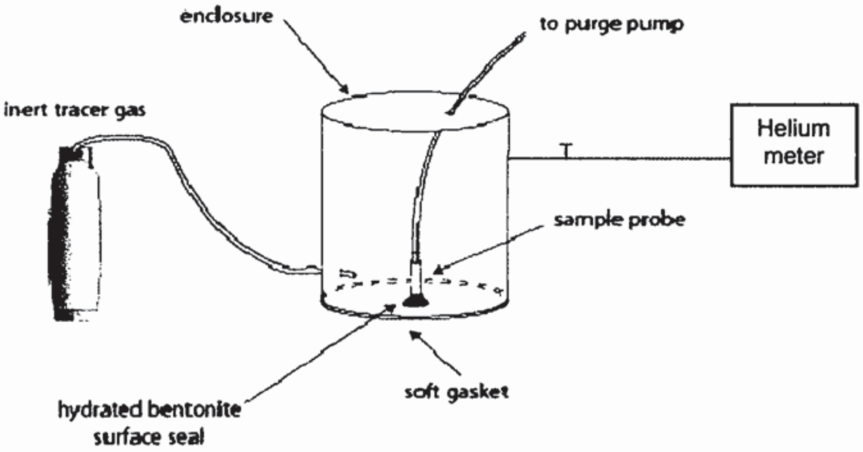
7. MANUAL WATER LEVEL MEASUREMENTS

Time (HH:MM)	Elapsed Time (min)	Depth to Water from TOC (ft)	Head, h (TOC - water depth)	h/Ho	Comments
	0			1	

q:\mw97\sops\7720\hydraulicconductivitytestlog.xls, page 2



TYPICAL SUB-SLAB SAMPLING PROBE SET UP



TYPICAL HELIUM TRACER TEST SET UP

AECOM

TYPICAL HELIUM TRACER
AND SUB-SLAB

DATE. 9/5/06
DRWN. MLR

FIGURE 6-1

File: H:\18600\18600s057.dwg Layout: FIGURE 2-2 User: astenberg Plotted: Sep 19, 2005 4:00pm Xref's: 18600B001

FIGURE 6-2

Soil Gas Sampling Log Sheet

Sample ID_______________

Client:____________________
Project Name:_____________
Project Number:___________
Date:______________
Sampler:___________________

Location:____
Canister Number:________________
Core Diameter:_______________ Core Material:__________________
Core Length:_________________
Magnehelic Measurement: (Positive number indicates higher pressure in Core)________
Depth of Hand Auguring:______________
Soil Type:____
Method of Probe Advancement:______________________________
Depth of Probe Advancement:________ Length Probe is Retracted:_________

Time of Purging	PID Reading	Time of Purging	PID Reading

Starting Time:_______________ Starting Pressure:_________
Finish Time:_________________ Final Pressure:___________

Room Dimensions: Length:______ Width:_____ Height:_____

Comments:

Indoor Air/Ambient Air Sample

Sample ID___________________

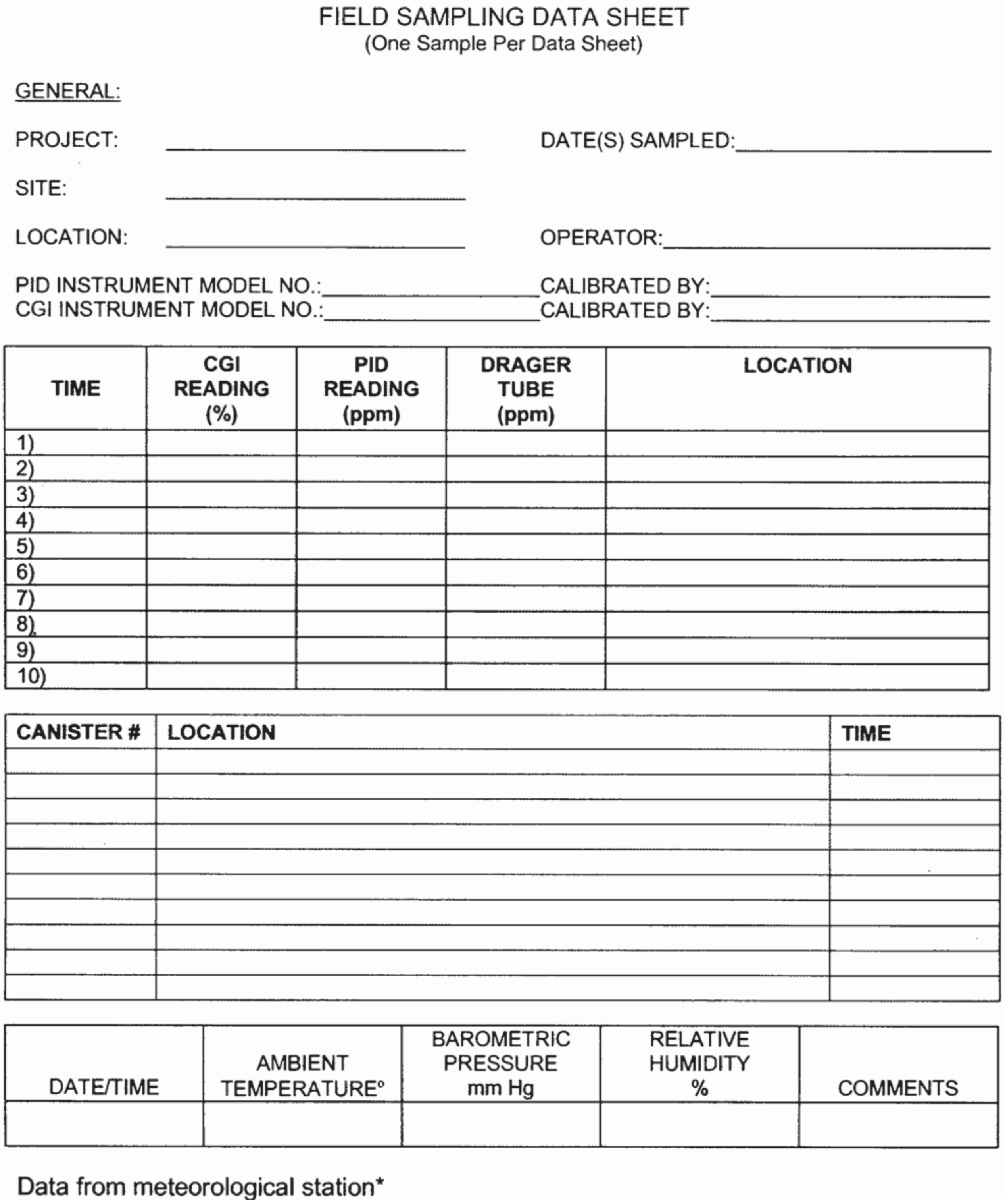
Location:____
Sample ID:__________________
Canister Number:____________
Starting Time:_______________ Starting Pressure:_________
Finish Time:_________________ Final Pressure:___________

Comments:

General Weather Conditions:____
Chemical Inventory:

AECOM

FIGURE 6-3



FIELD SAMPLING DATA SHEET

(One Sample Per Data Sheet)

GENERAL:

PROJECT: ____________________ DATE(S) SAMPLED: ____________________

SITE: ____________________

LOCATION: ____________________ OPERATOR: ____________________

PID INSTRUMENT MODEL NO.: ____________________ CALIBRATED BY: ____________________
CGI INSTRUMENT MODEL NO.: ____________________ CALIBRATED BY: ____________________

TIME	**CGI READING (%)**	**PID READING (ppm)**	**DRAGER TUBE (ppm)**	**LOCATION**
1)				
2)				
3)				
4)				
5)				
6)				
7)				
8)				
9)				
10)				

CANISTER #	**LOCATION**	**TIME**

DATE/TIME	AMBIENT TEMPERATURE°	BAROMETRIC PRESSURE mm Hg	RELATIVE HUMIDITY %	COMMENTS

Data from meteorological station*

Figure 6-4

OSR-3

NEW YORK STATE DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH ASSESSMENT
BUREAU OF TOXIC SUBSTANCE ASSESSMENT

INDOOR AIR QUALITY QUESTIONNAIRE AND BUILDING INVENTORY

This form must be completed for each residence involved in indoor air testing.

Preparer's Name ______________________________ Date Prepared ____________

Preparer's Affiliation ______________________________ Phone No. ____________

1. **OCCUPANT**

Name: ______________________________
Address: ______________________________
County: ______________________________

Home Phone No. ____________ Office Phone No ____________

2. **OWNER OR LANDLORD:**
(If different than occupant)

Name: ______________________________
Address: ______________________________
____
Phone No. ______________________________

A. Building Construction Characteristics

Type (circle appropriate responses): Single Family Multiple Dwelling Commercial Public School

Ranch
Raised Ranch
Split Level
Colonial
Mobile Home

2-Family
Duplex
Apartment House ____________ Units
Number of floors ____________
Other specify ____________________

Residence Age ____________ General Description of Building Construction Materials ____________________

Is the building insulated? Yes / No How air tight is the building? ______________________________

____

____

Figure 6-4

OSR-3 (continued)

B. Basement construction characteristics (circle all that apply):

1. Full basement, crawlspace, slab on grade, other ___________
2. Basement floor: concrete, dirt, other _________
3. Concrete floor: unsealed, painted, covered, with _________
4. Foundation walls: poured concrete, block, laid up stone, other ___________
5. The basement is: wet, damp, dry___ Sump present? y / n ______ Water in sump? y / n ______
6. The basement is: finished, unfinished ______________
7. Identify potential soil vapor entry points (e.g., cracks, utility ports, etc.)
   ____
8. Describe how air tight the basement is ____
   ____

C. HVAC (circle all that apply):

1. The type of heating system(s) used in this residence is/are:

   Hot Air Circulation
   Hot Water Radiation
   Steam Radiation
   Electric Baseboard
   Heat Pump
   Unvented Kerosene Heater
   Wood stove
   Other (specify)__________________________________

2. The type(s) of fuel(s) used is/are: Natural Gas, Fuel Oil, Electric, Wood, Coal Solar

   Other (specify)_________________________________

3. Is the heating system's power plant located in the basement or another area? _________________
4. Is there air-conditioning? Yes / No Central Air or Window Units?

   Specify the location ______________________________

5. Are there air distribution ducts present? Yes / No
6. Describe the supply and cold air return duct work in the basement including whether there is a cold air return, the tightness of duct joints
   ____
   ____

OSR-3 (continued)

D. Potential Indoor Sources of Pollution

1. Has the house ever had a fire? Yes / No
2. Is there an attached garage? Yes / No
3. Is a vehicle normally parked in the garage? Yes / No
4. Is there a kerosene heater present? Yes / No
5. Is there a workshop, hobby or craft area in the residence? Yes / No
6. An inventory of all products used or stored in the home should be performed. Any products that contain volatile organic compounds or chemicals similar to the target compounds should be listed. The attached product inventory form should be used for this purpose.
7. Is there a kitchen exhaust fan? Yes / No Where is it vented? ____________________
8. Has the house ever been fumigated? If yes describe date, type and location of treatment.

____

E. Water and Sewage (Circle the appropriate response)

Source of Water

Public Water Drilled Well Driven Well Dug Well Other (Specify)______________

Water Well Specifications:

Well Diameter ______________________ Grouted or Ungrouted _________________

Well Depth _________________________ Type of Storage Tank __________________

Depth to Bedrock ____________________ Size of Storage Tank __________________

Feet of Casing ______________________ Describe type(s) of Treatment ___________

____

Water Quality:

Taste and/or odor problems? y / n If so, describe ____

How long has the taste and/or odor been present? ____

Sewage Disposal: Public Sewer Septic Tank Leach Field Other (Specify) ______________________

Distance from well to septic system___________Type of septic tank additive ____________________

Figure 6-4

OSR-3 (continued)

F. Plan View

Draw a plan view sketch for each floor of the residence and if applicable, indicate air sampling locations, possible indoor air pollution sources and PID meter readings.

Figure 6-4

OSR-3 (continued)

G. Potential Outdoor Sources of Pollution

Draw a sketch of the area surrounding the residence being sampled. If applicable, provide information on the spill location (if known), potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s) and PID meter readings.

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and septic system if applicable, and a qualifying statement to help locate the site on a topographical map.

Figure 6-4

Household Products Inventory

Occupant / residence ____________________

Investigator: ____________________ Date: ____________

Product description (dispenser, size, manufacturer …)	**VOC Ingredients**

Chain of Custody Record № 0476

AECOM

FIGURE 9-1

Project Name:
Project Number:
Send Report To:
Sampler (Print Name):
Address:
Sampler (Print Name):
Shipment Method:
Airbill Number:
Phone:
Laboratory Receiving:
Fax:

Page ____ of ____

Purchase Order #:______________________

Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Analysis Requested											Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)

Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:

Sample Custodian Remarks (Completed By Laboratory):

QA/QC Level		Turnaround		Sample Receipt	
				Total # Containers Received?	
Level I	☐	Routine	☐	COC Seals Present?	
Level II	☐	24 Hour	☐	COC Seals Intact?	
Level III	☐	1 Week	☐	Received Containers Intact?	
Other	☐	Other ______		Temperature?	

White: Lab Copy   Yellow: PM Copy   Pink: Field Copy   Gold: PM/QA/QC Copy

Appendix H

Quality Assurance Project Plan

AECOM

Prepared for:
National Grid
One Metro Tech Center
Brooklyn, New York

Quality Assurance Project Plan

(Appendix H of the Interim Site Management Plan)

Former Bay Ridge Holder Stations A & B Site
Operable Unit 2
NYSDEC Site No.: 224058
Order on Consent Index #: A2-0552-0606

Contents

List of Tables

List of Figures

List of Acronyms

%R	Percent recovery
ASP	Analytical services program
ASTM	American Society for Testing Materials
CAMP	Community Air Monitoring Plan
CAR	Corrective Action Request
CLP	Contract laboratory program
COC	Chain of custody
CRDLs	Contract Required Detection Limits
CRQLs	Contract Required Quantitation Limits
DQOs	Data quality objectives
DUSR	Data Usability Summary Report
EDD	Electronic data deliverable
ELAP	Environmental Laboratory Accreditation Program
GC/MS	Gas Chromatography/Mass Spectroscopy
HASP	Health and safety plan
LIMS	Laboratory information management system
MDLs	Method detection limits
MS	Matrix spike
MSD	Matrix spike duplicate
NIST	National Institute of Standards and Technology
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PA	Preliminary assessment
PID	Photoionization detector
PQL	Practical quantitation limit
QA	Quality assurance
QAO	Quality assurance officer
QAPP	Quality Assurance Project Plan
QC	Quality control
RPD	Relative percent difference
SOPs	Standard operating procedures
SVOA	Semivolatile organic analysis

SVOCs	Semivolatile organic compounds
TCLP	Toxicity characteristics leaching procedure
USEPA	United States Environmental Protection Agency
VOA	Volatile organic analysis
VOCs	Volatile organic compounds

1.0 Introduction

This Quality Assurance Project Plan (QAPP) details the protocols and procedures that will be followed during any ground intrusive and monitoring activities covered under the Interim Site Management Plan [(ISMP); AECOM, 2014] for the Former Bay Ridge Holder Stations A & B Operable Unit 2 (Site) located in Brooklyn, New York. The purpose of these protocols and procedures is to ensure that all project activities will be performed in a manner consistent with the data quality objectives (DQOs) established for the project and all data collected are precise, accurate, representative, comparable, and complete.

1.1 Project Description

This document is required as an element of the remedial program at the Site under the New York State (NYS) Inactive Hazardous Waste Disposal Site Remedial Program administered by the New York State Department of Environmental Conservation (NYSDEC). The Site was characterized in accordance with Order on Consent Index A2-0552-0606, Site Number 224058 [NYSDEC, 2007], which was executed in March 2007. The Site location and layout is shown on Figures 1-1 and 1-2 of the ISMP.

1.1.1 General

The Order on Consent required National Grid, to characterize contaminated media at the Site. For purposes of further discussion in this document, the term “Site” will comprise of portions of the Athletic League Ball Fields, Gate Station and vacant lots portion of the Block 5749 Lot 15 located between 65th Street and 66th Street and 8th Avenue and 9th Avenue.

After completion of the site characterization work described in the Site Characterization Work Plan [AECOM, 2011], some impacts were identified in the subsurface of the Site. This FSAP was developed as an appendix (Appendix H) to the ISMP which was prepared to manage residual contamination at the Site in perpetuity or until extinguishment of the Environmental Easement in accord with NYS Environmental Conservation Law (ECL) Article 71, Title 36.

This document was prepared by AECOM, on behalf of National Grid, in accord with the requirements in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation [(DER-10); DEC, 2010] and the guidelines provided by NYSDEC.

1.2 Scope of Work

The scope of work covered under this QAPP includes but is not limited to:

- Underground utility work
- Surface/shallow subsurface soil sampling and analysis
- Soil boring advancement, subsurface soil sampling and analysis
- Excavation of test pits, soil sampling and analysis
- Monitoring well installation and development

- Groundwater sampling and analysis
- Indoor air and ambient air sampling and analysis
- Investigation-derived waste management
- Community air monitoring
- Site survey
- Data validation evaluation, and reporting

1.3 Data Quality Objectives

DQOs are qualitative and quantitative statements to ensure that data of known and appropriate quality are obtained during any activities. Data may be used to achieve the overall objectives of the project. These objectives are to:

- Identify potential impacted material during any subsurface activity.
  - Data will identify Site-related constituents in soil and groundwater.
  - Data will be collected using a systematic method to delineate the perimeter of Site-related impacts.
  - Analytical methods will be of sufficient sensitivity that method detection limits (MDLs) and practical quantitation limits (PQLs) measure constituent concentrations at or below constituent NYSDEC guidance values.
  - To compare contaminant concentrations in groundwater over time.
- Perform, if necessary, an indoor air survey in accordance with NYS Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York. The DQOs for vapor intrusion data include the following items.
  - Data will identifySite-related constituents in indoor air (if present).
  - Data will be collected using a systematic method to determine whether vapor intrusion of Site-related impacts is occurring.
  - Analytical methods will be of sufficient sensitivity to meet a minimum PQL of at most one part per billion.

1.3.1 Data Quality Levels

There are five analytical levels of data quality which may be used to accomplish these objectives. They are typically designated as follows:

- Level I – Field screening or analysis using portable instruments, calibrated to non-compound specific standards
- Level II – Field analysis using portable instruments, calibrated to specific compounds
- Level III – Non-Contract Laboratory Program (CLP/ASP) laboratory methods
- Level IV – ASP-CLP Routine Analytical Services methods
- Level V – Non-standard analytical methods.

To meet the specific objectives of this project, Levels I and III data quality levels will be utilized.

1.3.1.1 Level I – Field Screening Methods

These tests, which are quantitative and/or semi-quantitative, are classified as field screening evaluations, even though they typically are not used for characterization purposes.

Soil and soil headspace screening will be conducted using a photoionization detector (PID) to determine the soil boring interval(s) that will be submitted for analytical laboratory analysis.

In addition, as part of the Health and Safety Plan (HASP) and the Community Air Monitoring Plan (CAMP), worker safety and ambient air quality may be monitored using one or more of a variety of field screening tests. Applicable equipment may include but not be limited to: a PID, Draeger tubes, and personal monitors to test for volatile organic vapors, or a combustible gas indicator to test for explosive potential. Worker health and safety requirements are specified in the HASP.

1.3.1.2 Level III – Non-Contract Laboratory Program (CLP/ASP) Laboratory Methods

Samples will be analyzed according to the required United States Environmental Protection Agency (USEPA) SW-846, ASTM, and USEPA Compendium air methods described in the most recent editions of the USEPA reference methods (see section 7.0). Data will be analyzed using Level III Non-Contract Laboratory Program (CLP/ASP) laboratory methods; however, the laboratory will provide Level IV data packages for all data including hazardous waste classification data. Laboratory data will be reported in the New York State Analytical Services Program (ASP) Category B deliverables format. This level of data quality will ensure the generation of legally and technically defensible data for project use. The laboratory performing the analysis of samples will be certified for the specific parameters pursuant to NYSDOH ELAP Certification program.

2.0 Project Organization

Any field activity will be completed for National Grid by an environmental contractor (the Contractor), who will arrange for analytical services and provide an onsite field representative to perform the oversight, soil logging, soil sampling, surveying, and groundwater sampling. The Contractor will also perform the data interpretation and reporting tasks.

Any field activity to be completed on behalf of the respective Property owner must require at least 15 day notification to National Grid and NYSDEC.

Key contacts for this project are as follows:

National Grid Project Manager:

Name: Donald Campbell
Address: 287 Maspeth Avenue, Brooklyn, NY
Telephone: (718) 963-5453
Fax: (718) 963-5611

NYSDEC Project Manager:

Name: Section Chief
Address: New York State Department of Environmental Conservation
Site Control Section, Bureau of Technical Support
625 Broadway Albany, New York 12233-7014
Telephone: (518) 402-9662
Fax: (518) 402-9679

3.0 Quality Assurance/Quality Control Objectives for Measurement of Data

3.1 Introduction

The quality assurance and quality control (QA/QC) objectives for all measurement data include precision, accuracy, representativeness, completeness, and comparability. These objectives are defined in following subsections. They are formulated to meet the requirements of the USEPA SW-846. The analytical methods and their Contract Required Quantitation Limits (CRQLs) and Contract Required Detection Limits (CRDLs) are provided in Section 7.

3.2 Precision

Precision is an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Specifically, it is a quantitative measurement of the variability of a group of measurements compared to their average value (USEPA, 1987). Precision is usually stated in terms of standard deviation, but other estimates such as the coefficient of variation (relative standard deviation), range (maximum value minus minimum value), relative range, and relative percent difference (RPD) are common.

For this Site, field sampling precision will be determined by analyzing coded duplicate samples (labeled so that the laboratory does not recognize them as duplicates) for the same parameters, and then, during data validation (Section 8), calculating the RPD for field duplicate sample results.

Analytical precision will be determined by the laboratory by calculating the RPD for the results of the analysis of internal QC duplicates and matrix spike duplicates. The formula for calculating RPD is as follows:

$$RPD = \frac{|V1 - V2|}{(V1 + V2)/2} \times 100$$

where:

RPD= Relative Percent Difference

V1, V2 = The two values to be compared

|V1 - V2| = The absolute value of the difference between the two values

(V1 + V2)/2 = The average of the two values

For soil samples, the data quality objectives for analytical precision, calculated as the RPD between duplicate analyses, is presented in Table 3-1.

The same is presented for groundwater in Table 3-2 and air samples in Table 3-3.

Table 3-1 Quality Control Limits For Soil Samples

Analytical	Analytical Method [(a)]	Matrix Spike (MS) Compounds	Laboratory Accuracy and Precision			Surrogate Compounds	Surrogate Recovery (%)
			MS/MSD [(b)] Recovery (%)	MS/MSD RPD [(c)] (%)	LCS [(d)] Recovery (%)		
VOCs [(e)]	8260B	1,1-Dichloroethane	77-139	20	50-150	Toluene-d8	63-124
		Trichloroethene	81-129	20	82-113	Bromofluorobenzene	50-133
		Benzene	83-135	20	81-118	1,2-Dichloroethane-d4	54-142
		Toluene	79-140	20	81-115		
		Chlorobenzene	80-141	20	83-114		
SVOCs [(f)]	8270C	Phenol	42-105	20	48-96	Nitrobenzene-d5	28-110
		2-Chlorophenol	52-107	20	54-92	2-Fluorobiphenyl	32-109
		1,4-Dichlorobenzene	40-101	20	57-86	Terphenyl-d14	30-150
		N-Nitroso-di-n-propylamine	63-97	20	49-99	Phenol-d5	29-104
		1,2,4-Trichlorobenzene	42-98	20	57-93	2-Fluorophenol	23-104
		4-Chloro-3-methylphenol	60-100	20	57-92	2,4,6-Tribromophenol	24-112
		Acenaphthene	65-100	20	52-97		
		4-Nitrophenol	45-95	20	24-120		
		2,4-Dinitrotoluene	56-104	20	61-101		
		Pentachlorophenol	33-111	20	32-102		
		Pyrene	49-120	20	53-103		
PCBs (as Aroclors)	8082	Aroclor-1016	55-128	20	67-121	TCMX	44-141
		Aroclor-1260	58-140	20	78-128	DCB	34-145
Pesticides	8081A	4,4'-DDD	35-165	20	86-133	TCMX	30-158

Analytical	Analytical Method [a]	Matrix Spike (MS) Compounds	Laboratory Accuracy and Precision			Surrogate Compounds	Surrogate Recovery (%)
			MS/MSD [b] Recovery (%)	MS/MSD RPD [c] (%)	LCS [d] Recovery (%)		
		4,4'-DDE	50-144	20	80-130	DCB	30-161
		4,4'-DDT	23-170	20	72-141		
		Aldrin	57-145	20	84-133		
		alpha-BHC	37-154	20	81-136		
		beta-BHC	51-161	20	83-132		
		delta-BHC	43-159	20	77-131		
		gamma-BHC (Lindane)	48-159	20	83-135		
		alpha-Chlordane	44-156	20	88-132		
		gamma-Chlordane	61-147	20	87-135		
Pesticides (cont.)	8081A	Dieldrin	41-154	20	81-129		
		Endosulfan II	52-151	20	85-132		
		Endosulfan sulfate	32-162	20	76-135		
		Endrin	31-165	20	82-134		
		Endrin aldehyde	48-152	20	85-134		
		Endrin ketone	70-141	20	87-132		
		Heptachlor	41-155	20	85-132		
		Heptachlor epoxide	44-160	20	86-132		
		Methoxychlor	44-163	20	82-137		
		Toxaphene	50-150	20	50-150		
Herbicides	8151A	2,4,5-TP (Silvex)	47-128	20	47-128	2,4-DCAA	50-130
		2,4,5-T	72-130	20	72-130		

Analytical	Analytical Method (a)	Matrix Spike (MS) Compounds	Laboratory Accuracy and Precision			Surrogate Compounds	Surrogate Recovery (%)
			MS/MSD (b) Recovery (%)	MS/MSD RPD (c) (%)	LCS (d) Recovery (%)		
		2,4-D	55-122	20	55-122		
		2,4-DB	75-125	20	75-125		
Inorganics (h)	6010B	Inorganic Analyte	75-125 (i)	20 (j)	80-120	NA	NA
	6020		75-125 (i)	20 (j)	80-120	NA	NA
	7471A		75-125 (i)	20 (j)	80-120	NA	NA
	ASTM D4282-02 (free cyanide)		75-125 (i)	20 (j)	90-110	NA	NA

Notes

(a) Analytical Methods: USEPA SW-846, 3rd edition, Revision 1, November 1990, any subsequent revisions shall supersede this information
(b) Matrix Spike/Matrix Spike Duplicate
(c) Relative Percent Difference
(d) Laboratory Control Sample
(e) Target Compound List Volatile Organic Compounds
(f) Target Compound List Semivolatile Organic Compounds
(g) Limits are advisory only
(h) Target Analyte List Inorganics (metals and cyanide)
(i) Matrix spike only
(j) Laboratory duplicate RPD
NA - Not Applicable

Table 3-2 Quality Control Limits for Water Samples

Analytical	Analytical Method [(a)]	Matrix Spike Compounds	Laboratory Accuracy and Precision			Surrogate Compounds	Surrogate Recovery (%)
			MS/MSD [(b)] Recovery (%)	MS/MSD RPD [(c)] (%)	LCS [(d)] Recovery (%)		
VOCs [(e)]	8260B	1,1-Dichloroethane	55-139	20	55-139	Toluene-d8	83-117
		Trichloroethene	55-138	20	61-138	Bromofluorobenzene	74-123
		Benzene	85-121	20	66-125	1,2-Dichloroethane-d4	75-124
		Toluene	83-123	20	68-121		
		Chlorobenzene	85-119	20	70-122		
SVOCs [(f)]	8270C	Phenol	11-48	20	10-100	Nitrobenzene-d5	30-120
		2-Chlorophenol	35-99	20	41-91	2-Fluorobiphenyl	35-111
		1,4-Dichlorobenzene	49-88	20	53-91	Terphenyl-d14	26-135
		N-Nitroso-di-n-propylamine	55-127	20	54-116	Phenol-d5	30-77
		1,2,4-Trichlorobenzene	62-105	20	59-104	2-Fluorophenol	30-78
		4-Chloro-3-methylphenol	12-125	20	46-97	2,4,6-Tribromophenol	27-118
		Acenaphthene	68-99	20	63-101		
		4-Nitrophenol	10-89	20	10-78		
		2,4-Dinitrotoluene	61-99	20	67-106		
		Pentachlorophenol	39-107	20	33-100		
		Pyrene	72-112	20	64-108		
PCBs (as Aroclors)	8082	Aroclor-1016	30-150	20	65-126	TCMX	42-133
		Aroclor-1260	36-147	20	76-131	DCB	30-141
Pesticides	8081A	4,4'-DDD	55-177	20	86-134	TCMX	30-150
		4,4'-DDE	54-126	20	89-126	DCB	45-131
Pesticides	8081A	4,4'-DDT	55-160	20	74-138		

Analytical	Analytical Method [(a)]	Matrix Spike Compounds	Laboratory Accuracy and Precision			Surrogate Compounds	Surrogate Recovery (%)
			MS/MSD [(b)] Recovery (%)	MS/MSD RPD [(c)] (%)	LCS [(d)] Recovery (%)		
(continued)		Aldrin	57-167	20	83-131		
		alpha-BHC	63-178	20	87-136		
		beta-BHC	50-150	20	88-131		
		delta-BHC	98-131	20	78-128		
		gamma-BHC (Lindane)	89-138	20	86-133		
		alpha-Chlordane	69-144	20	88-131		
		gamma-Chlordane	76-126	20	92-133		
Pesticides (cont.)	8081A	Dieldrin	72-136	20	81-132		
		Endosulfan I	84-127	20	91-132		
		Endosulfan II	79-138	20	90-129		
		Endosulfan sulfate	84-134	20	99-130		
		Endrin	75-143	20	87-130		
		Endrin aldehyde	62-160	20	95-133		
		Endrin ketone	87-135	20	90-130		
		Heptachlor	63-131	20	85-131		
		Heptachlor epoxide	82-125	20	89-132		
		Methoxychlor	76-161	20	88-139		
		Toxaphene	50-150	20	50-150		
Herbicides	8151A	2,4,5-TP (Silvex)	48-140	20	48-140	2,4-DCAA	45-140
		2,4,5-T	60-145	20	60-145		
Herbicides (continued)	8151A	2,4-D	60-138	20	60-138		
		2,4-DB	75-125	20	75-125		

Analytical	Analytical Method (a)	Matrix Spike Compounds	Laboratory Accuracy and Precision			Surrogate Compounds	Surrogate Recovery (%)
			MS/MSD (b) Recovery (%)	MS/MSD RPD (c) (%)	LCS (d) Recovery (%)		
Inorganics (h)	6010B	Inorganic Analyte	75-125 (i)	20 (j)	80-120	NA	NA
	6020		75-125 (i)	20 (j)	80-120	NA	NA
	7470A		75-125 (i)	20 (j)	80-120	NA	NA
	9012 (cyanide)		75-125 (i)	20 (j)	80-120	NA	NA

Notes

(a) Analytical Methods: USEPA SW-846, 3rd edition, Revision 1, November 1990, any subsequent revisions shall supersede this information
(b) MS/MSD = Matrix Spike/Matrix Spike Duplicate
(c) RPD = Relative Percent Difference
(d) LCS = Laboratory Control Sample
(e) Target Compound List Volatile Organic Compounds
(f) Target Compound List Semivolatile Organic Compounds
(g) Limits are advisory only
(h) Target Analyte List Inorganics (metals and cyanide)
(i) Matrix spike only
(j) Laboratory duplicate RPD
NA - Not Applicable

Table 3-3 Quality Control Limits for Air Samples

Analytical Parameter	Analytical Method [(a)]	Analyte Compounds	LCS [(d)] Recovery (%)	Duplicate RPD [(c), (e)] (%)	Laboratory Accuracy and Precision			
					MS/MSD [(b)] Recovery (%)	MS/MSD RPD [(c)] (%)	Surrogate Compounds	Surrogate Recovery (%)
VOCs	TO-15 Mod.	Acetone	60-140	25	NA	NA	Toluene-d8 Bromofluorobenzene 1,2-Dichloroethane-d4	70-130 70-130 70-130
		Bromodichloromethane	60-140	25				
		Butadiene, 1,3-	60-140	25				
		Carbon Disulfide	60-140	25				
		Chloro-1-Propene, -3 (Allyl Chloride)	60-140	25				
		Chlorodibromomethane	60-140	25				
		Cumene	60-140	25				
		Dichloroethylene, Trans-1,2-	60-140	25				
		Dioxane, 1,4-	60-140	25				
		Hexane	60-140	25				
		Methyl Ethyl Ketone	60-140	25				
		Methyl Isobutyl Ketone	60-140	25				
		Methyl Tert-Butyl Ether (MTBE)	60-140	25				
		Naphthalene	60-140	25				
		Propylbenzene, N-	60-140	25				
		Tribromomethane (Bromoform)	60-140	25				
		Cyclohexane	60-140	25				
		2-Hexanone	60-140	25				
		4-Ethyltoluene	60-140	25				
		Ethanol	60-140	25				

Analytical Parameter	Analytical Method (a)	Analyte Compounds	LCS (d) Recovery (%)	Duplicate RPD (c), (e) (%)	Laboratory Accuracy and Precision			
					MS/MSD (b) Recovery (%)	MS/MSD RPD (c) (%)	Surrogate Compounds	Surrogate Recovery (%)
		Heptane	60-140	25				
		2-Methylpentane	60-140	25				
		Isopentane	60-140	25				
		2,3-Dimethylpentane	60-140	25				
		2,2,4-Trimethylpentane	60-140	25				
		Indene	60-140	25				
		Indan	60-140	25				
		Thiopene	60-140	25				
		2-Propanol	60-140	25				
		Tetrahydrofuran	60-140	25				
VOCs	TO-15 Mod.	Benzene	70-130	25	NA	NA	Toluene-d8 Bromofluorobenzene 1,2-Dichloroethane-d4	70-130 70-130 70-130
		Bromomethane	70-130	25				
		Carbon Tetrachloride	70-130	25				
		Chlorobenzene	70-130	25				
		Chloroethane	70-130	25				
		Chloroform	70-130	25				
		Dibromoethane, 1,2- (Ethylene Dibromide)	70-130	25				
		Dichlorobenzene, 1,2-	70-130	25				
		Dichlorobenzene, 1,3-	70-130	25				

Analytical Parameter	Analytical Method [(a)]	Analyte Compounds	LCS [(d)] Recovery (%)	Duplicate RPD [(c), (e)] (%)	Laboratory Accuracy and Precision			
					MS/MSD [(b)] Recovery (%)	MS/MSD RPD [(c)] (%)	Surrogate Compounds	Surrogate Recovery (%)
		Dichlorobenzene, 1,4-	70-130	25				
		Dichlorodifluoromethane (Freon 12)	70-130	25				
		Dichloroethane, 1,1-	70-130	25				
		Dichloroethane, 1,2-	70-130	25				
		Dichloroethylene, 1,1-	70-130	25				
		Dichloroethylene, Cis-1,2-	70-130	25				
		Dichloromethane (Methylene Chloride)	70-130	25				
		Dichloropropane, 1,2-	70-130	25				
		Dichloropropene, Cis-1,3-	70-130	25				
		Dichloropropene, Trans-1,3-	70-130	25				
		1,2-Dichloro-1,1,2,2,-tetrafluoroethane	70-130	25				
		Ethyl Benzene	70-130	25				
		Fluorotrichloromethane (Freon 11)	70-130	25				
		Methyl Chloride	70-130	25				
		Styrene	70-130	25				
		Tetrachloroethane, 1,1,2,2-	70-130	25				
		Tetrachloroethylene (PCE)	70-130	25				
		Toluene	70-130	25				
		Trichloro-1,2,2-Trifluoroethane,	70-130	25				

Analytical Parameter	Analytical Method (a)	Analyte Compounds	LCS (d) Recovery (%)	Duplicate RPD (c), (e) (%)	Laboratory Accuracy and Precision			
					MS/MSD (b) Recovery (%)	MS/MSD RPD (c) (%)	Surrogate Compounds	Surrogate Recovery (%)
		1,1,2- Trichlorobenzene, 1,2,4-	70-130	25				
VOCs	TO-15 Mod.	Trichloroethane, 1,1,1-	70-130	25	NA	NA	Toluene-d8 Bromofluorobenzene 1,2-Dichloroethane-d4	70-130 70-130 70-130
		Trichloroethane, 1,1,2-	70-130	25				
		Trimethylbenzene, 1,3,5-	70-130	25				
		Vinyl Chloride	70-130	25				
		m,p-xylene	70-130	25				
		o-xylene	70-130	25				
		Hexachlorobutadiene	70-130	25				
		alpha-chlorotoluene	70-130	25				
Fixed Gas	ASTM D1945 Mod.	Helium	75-125	30	NA	NA	NA	NA

Notes

(a) USEPA, 1999. Compendium Method TO-15, Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared-Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS). January 1999.

American Society of Testing Materials, 2003. D1945-03. Standard Test Method for Analysis of Natural Gas by Gas Chromatograph, 2003.

(b) Matrix Spike/Matrix Spike Duplicate

(c) Relative Percent Difference

(d) Laboratory Control Sample

(e) Laboratory duplicate RPD

NA - Not Applicable

3.3 Accuracy

Accuracy is a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern (Taylor, 1987), or the difference between a measured value and the true or accepted reference value. The accuracy of an analytical procedure is best determined by the analysis of a sample containing a known quantity of material, and is expressed as the percent of the known quantity which is recovered or measured. The recovery of a given analyte is dependent upon the sample matrix, method of analysis, and the specific compound or element being determined. The concentration of the analyte relative to the detection limit of the analytical method is also a major factor in determining the accuracy of the measurement. Concentrations of analytes which are close to the detection limits are less accurate because they are more affected by such factors as instrument "noise". Higher concentrations will not be as affected by instrument noise or other variables and thus will be more accurate.

Sampling accuracy may be determined through the assessment of the analytical results of field blanks and trip blanks for each sample set. Analytical accuracy is typically assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), and the percent recoveries of matrix spike compounds added to selected samples and laboratory blanks. Additionally, initial and continuing calibrations must be established and be within method control limits. Instrument and method analytical accuracy can then be determined for any sample set.

Accuracy is normally measured as the percent recovery (%R) of a known amount of analyte, called a spike, added to a sample (matrix spike) or to a blank (blank spike). The %R is calculated as follows:

$$\%R = \frac{SSR - SR}{SA} \times 100$$

where:

%R = Percent recovery
SSR = Spike sample result: concentration of analyte obtained by analyzing the sample with the spike added
SR = Sample result: the background value, i.e., the concentration of the analyte obtained by analyzing the sample
SA = Spiked analyte: concentration of the analyte spike added to the sample

The acceptance limits for accuracy for each parameter are presented in Tables 3-1, 3-2, and 3-3.

3.4 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter which is most concerned with the proper design of the sampling program (USEPA, 1987). Samples must be representative of the environmental media being sampled. Selection of sample locations and sampling procedures will incorporate consideration of obtaining the most representative sample possible.

Field and laboratory procedures will be performed in such a manner as to ensure, to the degree that is technically possible, that the data derived represents the in-place quality of the material sampled. Every effort will be made to ensure that chemical compounds will not be introduced into the sample via sample containers, handling, and analysis. Decontamination of sampling devices and digging equipment will be performed between samples. Analysis of field blanks, trip blanks, and method blanks will also be performed to monitor for potential sample contamination from field and laboratory procedures.

The assessment of representativeness also must consider the degree of heterogeneity in the material from which the samples are collected. Sampling heterogeneity will be evaluated during data validation through the analysis of coded field duplicate samples. The analytical laboratory will also follow acceptable procedures to assure the samples are adequately homogenized prior to taking aliquots for analysis, so the reported results are representative of the sample received.

Chain-of-custody procedures will be followed to document that contamination of samples has not occurred during container preparation, shipment, and sampling. Details of blank, duplicate and chain-of-custody procedures are presented in Sections 4 and 5.

3.5 Completeness

Completeness is defined as the percentage of measurements made which are judged to be valid (USEPA, 1987). The QC objective for completeness is generation of valid data for at least 90 percent of the analyses requested. Completeness is defined as follows for all sample measurements:

$$\%C = \frac{V}{T} \times 100$$

where:

%C = Percent completeness
V = Number of measurements judged valid
T = Total number of measurements

3.6 Comparability

Comparability expresses the degree of confidence with which one data set can be compared to another (USEPA, 1987). The comparability of all data collected for this project will be ensured by:

- Using identified standard methods for both sampling and analysis phases of this project,
- Requiring traceability of all analytical standards and/or source materials to the USEPA or National Institute of Standards and Technology (NIST),
- Requiring that all calibrations be verified with an independently traceable standard from a source other than that used for calibration (if applicable),
- Using standard reporting units and reporting formats including the reporting of QC data,
- Performing a complete data validation on all of the analytical results, including the use of data qualifiers in all cases where appropriate,
- Requiring that all validation qualifiers be considered any time an analytical result is used for any purpose.

These steps will ensure all future users of either the data or the conclusions drawn from them will be able to judge the comparability of these data and conclusions.

4.0 Sampling Program

4.1 Introduction

The sampling program, if necessary, will provide data concerning the presence and the nature and extent of contamination of groundwater, soil, and air. This section presents sample collection procedures, sample container preparation procedures, sample preservation procedures, sample holding times, and field QC sample requirements.

4.2 Sample Collection

Soil, groundwater, and air samples may be collected at the Site. The location and frequency of sampling and the methods selected for field procedures and laboratory analysis are described in detail in the ISMP.

4.3 Sample Container Preparation and Sample Preservation

All sample containers will be new and will meet the specifications required by the USEPA. Copies of the sample container QC analyses will be provided by the laboratory for each container lot used for sample collection. The containers will be labeled and the appropriate preservatives will be added. The container requirements are shown in Tables 4-1, 4-2, and 4-3.

Samples shall be preserved according to the preservation techniques given in Tables 4-1 through 4-3. Preservatives will be added to the sample bottles by the laboratory prior to their shipment in sufficient quantities to ensure that proper sample pH is met. Following sample collection, the sample bottles should be placed on ice in the shipping cooler, cooled to 4 ± 2 ºC with ice, and delivered to the laboratory within 48 hours of collection. Chain-of-custody (COC) procedures are described in Section 5.

4.4 Sample Holding Times

The sample holding times for organic and inorganic parameters are given in Tables 4-1 through 4-3 and must be in accordance with the NYSDEC ASP requirements. Holding times for Toxicity Characteristic Leaching Procedure (TCLP) samples are given in Table 4-4. The NYSDEC ASP holding times must be strictly adhered to by the laboratory. Any holding time exceedances must be reported to National Grid.

4.5 Field Quality Control Samples

To assess field sampling and decontamination performance, two types of "blanks" will be collected and submitted to the laboratory for analyses. In addition, the precision of field sampling procedures will be assessed by collecting coded field duplicates and matrix spike/matrix spike duplicates (MS/MSD). The blanks will include the following.

- Trip Blanks – A trip blank will be prepared before the sample containers are sent by the laboratory. The trip blank will consist of a 40-ml VOA vial containing distilled, deionized water, which accompanies the water sample bottles into the field and back to the laboratory. A trip blank will be included with each shipment of water samples for volatiles analysis. The trip blank will be analyzed for volatile organic compounds to assess any contamination from sampling, transport, storage, and internal laboratory procedures.

- Rinseate Blanks – Rinseate blanks will be taken at a minimum frequency of one per 20 field samples per sample matrix. Rinseate blanks are used to determine the effectiveness of the decontamination procedures for sampling equipment. It is a sample of reagent water provided by the laboratory that has passed through a decontaminated bailer or other sampling apparatus. It is usually collected as a last step in the decontamination procedure, prior to taking an environmental sample. The rinseate blank may be analyzed for all or some of the parameters of interest.

The duplicates collected to assess field sampling/laboratory precision and sample homogeneity will consist of the following.

- Coded Field Duplicate – To determine the representativeness of the sampling methods, coded field duplicates will be collected. The samples are termed "coded" because they will be labeled in such a manner that the laboratory will not be able to determine that they are field duplicate samples. This will eliminate any possible bias that could arise. Field duplicates will be taken at a minimum frequency of one per 20 field samples per sample matrix.

- Matrix Spike/Matrix Spike Duplicate (MS/MSD) – MS/MSD samples (MS/MSD for organics; MS and laboratory duplicate for inorganics) will be collected at a frequency of one pair per 20 field samples. MS/MSD samples are used to assess the effect of the sample matrix on the recovery of target compounds or target analytes. The advisory acceptance limits for MS/MSD %R and RPDs are given in Tables 3-1 and 3-2.

Table 4-1 Soil and Waste Sample Containerization and Holding Times

Analysis	Bottle Type	Preservation (a)	Holding Time (b)
Volatile Organic Compounds (VOCs)	Wide-mouth glass w/ Teflon lined cap	Cool to 4ºC	10 days
Extractable Organic Compounds (c)	Wide-mouth glass w/ Teflon lined cap	Cool to 4ºC	10 days*
Metals	Wide-mouth plastic or glass	Cool to 4ºC	6 months, except mercury (26 days)
Cyanide	Wide-mouth plastic	Cool to 4ºC	10 days
TCLP Organic Compounds	Wide-mouth glass w/ Teflon lined cap	Cool to 4ºC	See Table 4-5
TCLP Metals	Wide-mouth plastic or glass	Cool to 4ºC	See Table 4-5
Total Petroleum Hydrocarbons (TPH)	DRO: Clear glass GRO: Clear glass	DRO: Cool to 4ºC GRO: Cool to 4ºC	DRO: 7 days to extraction/40 days to analysis GRO: 14 days
Corrosivity	Clear glass	None	Analyze ASAP
Ignitability	Clear glass	None	Analyze ASAP
Reactive Cyanide and Sulfide	Clear glass	None	Analyze ASAP
Total Organic Halogens	Amber glass	pH < 2 with H_2SO_4, Cool to 4ºC, Dark	28 days

Notes

(a) All samples to be preserved with ice during collection and transport

(b) Days from verified time of sample receipt (VTSR).

(c) Semivolatile organic compounds, PCBs, pesticides, herbicides.

* Sohxlet or sonication procedures for extraction and concentration of soil/waste samples for SVOCs must be completed within 5 days of VTSR. Sohxlet or sonication procedures for extraction and concentration of soil/sediment/waste samples for PCBs must be completed within 5 days of VTSR. Extracts of soil samples must be analyzed within 40 days of extraction.

Table 4-2 Water Sample Containerization and Holding Times

Analysis	Bottle Type	Preservation [(a)]	Holding Time [(b)]
Volatile Organic Compounds (VOCs)	(2) 40 mL glass vial with Teflon septum	Cool to 4ºC	10 days
Extractable Organic Compounds [(c)]	1000 mL glass w/ Teflon-lined cap	Cool to 4ºC	5 days*
Metals	1000 mL plastic bottle	Nitric Acid to pH < 2 Cool to 4ºC	6 months, except mercury (26 days)
Cyanide	500 mL plastic bottle	NaOH to pH > 12 Cool to 4ºC	10 days

Notes

(a) All samples to be preserved in ice during collection and transport.

(b) Days from validated time of sample receipt (VTSR)

(c) Semivolatile organic compounds, PCBs, pesticides, herbicides

* Continuous liquid-liquid extraction is the required extraction for water samples for SVOCs. Continuous liquid-liquid extraction and concentration of water samples for SVOC analysis must begin within 5 days and be completed within 7 days of VTSR. Extracts of water samples must be analyzed within 40 days of extraction.

Table 4-3 Soil Gas Sample Containerization and Holding Times

Analysis	Bottle Type	Preservation	Holding Time [(b)]
Volatile Organic Compounds (VOCs)	6 L Summa® canister [(a)]	NA	30 days
Fixed Gases (Helium)	6 L Summa® canister [(a)]	NA	30 days

Notes

(a) Stainless steel SUMMA® canisters must be certified clean by the laboratory using TO-15 § 8.4.1. The canisters will be delivered to the field with a pressure of 28-30" Hg. Canisters received with a vacuum pressure less than 25" Hg will not be used.

(b) Days from date of sample collection. The holding time for the TO-15 analysis is 30 days. The holding time for an evacuated canister is 30 days. After 30 days, unused canisters must be exchanged for recently cleaned canisters.

Table 4-4 TCLP [(a)] Sample Holding Times

Analytical Parameter	From: Sample Collection To: TCLP Extraction*	From: TCLP Extraction To: Preparative Extraction	From: Preparative Extraction To: Determinative Analysis
Volatiles	7 days	NA	7 days
Semivolatiles	5 days	7 days	40 days
PCBs (as Aroclors)	5 days	7 days	40 days
Mercury	5 days	NA	28 days
Metals (except Mercury)	180 days	NA	180 days

Notes:
NA - Not Applicable.
(a) Toxicity Characteristic Leaching Procedure.

*Times shown are from verified time of sample receipt (VSTR).

5.0 Sample Tracking and Custody

5.1 Introduction

This section presents sample custody procedures for both the field and laboratory. Implementation of proper custody procedures for samples collected in the field is the responsibility of field personnel. Both laboratory and field personnel involved in collection and transfer of samples will be trained as to the purpose and procedures for sample custody prior to implementation.

Evidence of sample traceability and integrity is provided by COC procedures. These procedures document the sample traceability from the selection and preparation of the sample containers by the laboratory, to sample collection, to sample shipment, to laboratory receipt and analysis. The sample custody flowchart is shown in Figure 5-1. A sample is considered to be in a person's custody if the sample is:

- In a person's possession,
- Maintained in view after possession is accepted and documented,
- Locked and tagged with Custody Seals so that no one can tamper with it after having been in physical custody,
- In a secured area which is restricted to authorized personnel.

5.2 Field Sample Custody

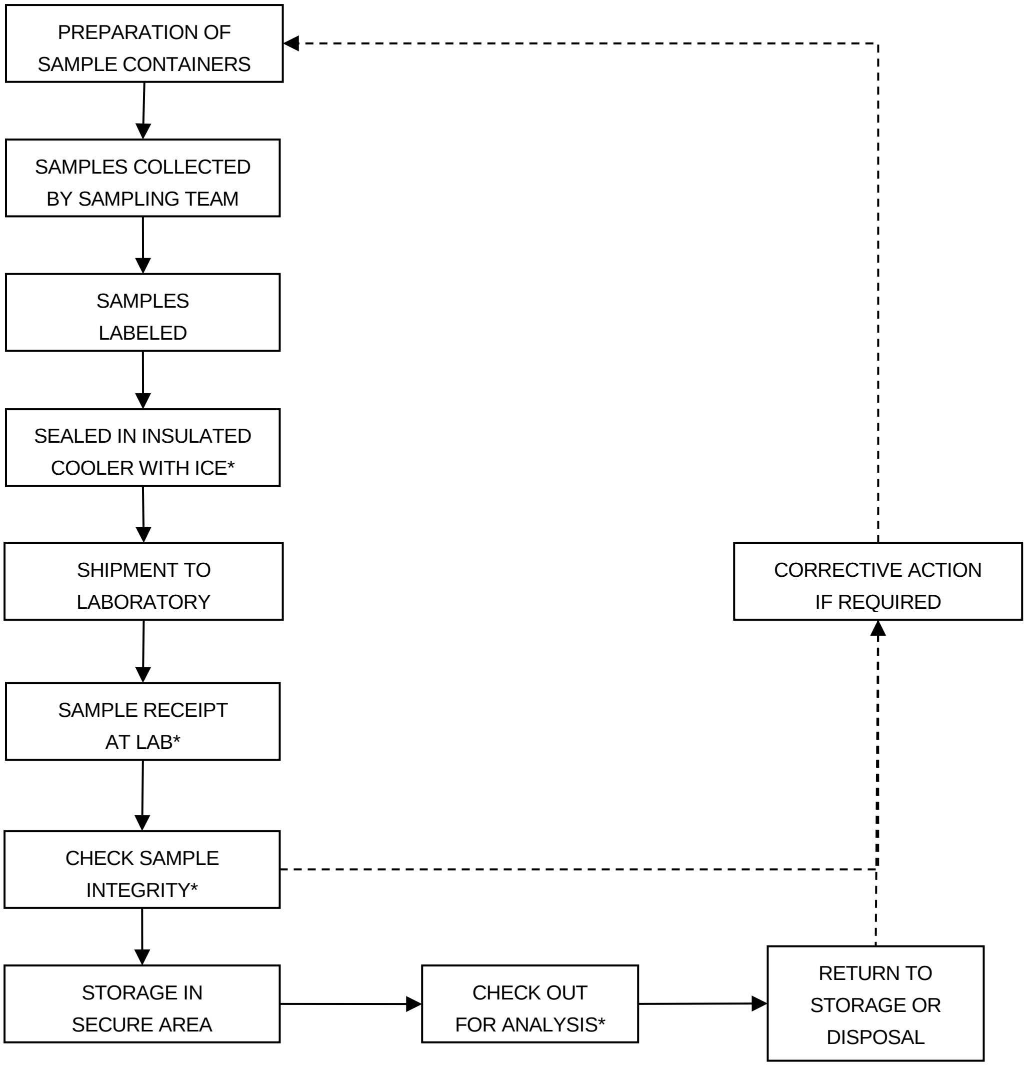
A COC record (Figure 5-2 or similar) accompanies the sample containers from selection and preparation at the laboratory, during shipment to the field for sample collection and preservation, and during the return to the laboratory. Triplicate copies of the COC must be completed for each sample set collected.

The COC lists the field personnel responsible for taking samples, the project name and number, the name of the analytical laboratory to which the samples are sent, and the method of sample shipment. The COC also lists a unique description of every sample bottle in the set. If samples are split and sent to different laboratories, a copy of the COC record will be sent with each sample.

The **REMARKS** space on the COC is used to indicate if the sample is a matrix spike, matrix spike duplicate, or any other sample information for the laboratory. Since they are not specific to any one sample point, trip and field blanks are indicated on separate rows. Once all bottles are properly accounted for on the form, a sampler will write his or her signature and the date and time on the first **RELINQUISHED BY** space. The sampler will also write the method of shipment, the shipping cooler identification number, and the shipper airbill number on the top of the COC. Errors in field records will be crossed out with a single line in ink and initialed by the author.

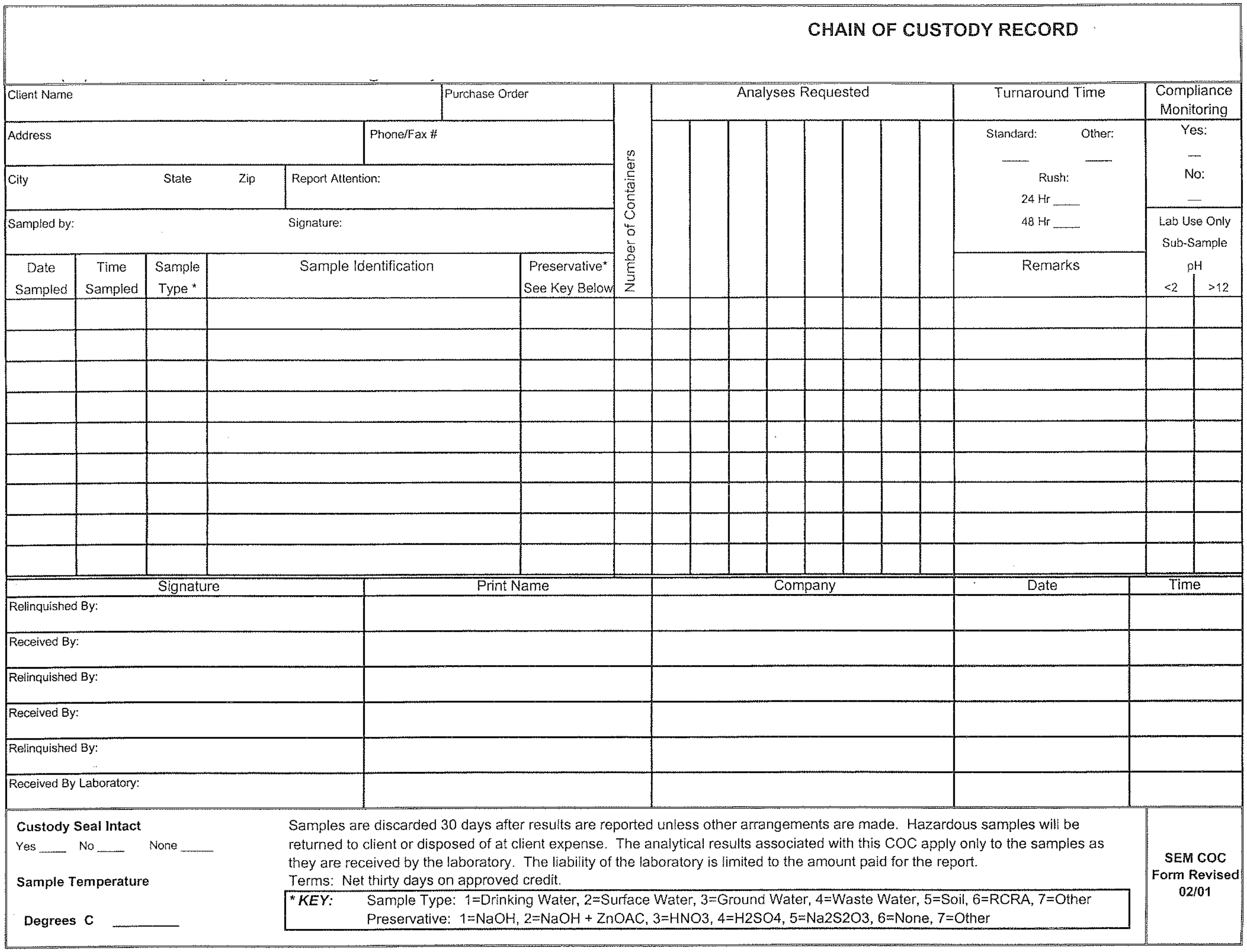
One copy of the COC is retained by sampling personnel and the other two copies are put into a sealable plastic bag and taped inside the lid of the shipping cooler. The cooler lid is closed, custody seals provided by the laboratory are affixed to the latch and across the back and front of the cooler lid, and the person relinquishing the samples signs their name across the seal. The seal is taped, and the cooler is wrapped tightly with clear packing tape. It is then relinquished by field personnel to personnel responsible for shipment, typically an overnight carrier. The COC seal must be broken to open the container. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the Project Manager, and the sample(s) will not be analyzed.

Figure 5-1 Sample Custody Flowdown



*Requires Sign-Off On Chain-Of-Custody.

Figure 5-2 Chain-Of-Custody Record



CHAIN OF CUSTODY RECORD

Client Name
Purchase Order
Address
Phone/Fax #
City State Zip
Report Attention:
Sampled by:
Signature:

Turnaround Time
Standard: ____ Other: ____
Rush:
24 Hr ____
48 Hr ____

Compliance Monitoring
Yes: —
No: —

Date Sampled	Time Sampled	Sample Type *	Sample Identification	Preservative* See Key Below	Number of Containers	Analyses Requested								Remarks	Lab Use Only Sub-Sample pH	
															<2	>12

Signature	Print Name	Company	Date	Time
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				
Relinquished By:				
Received By Laboratory:				

Custody Seal Intact
Yes ____ No ____ None _____

Sample Temperature

Degrees C ________

Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense. The analytical results associated with this COC apply only to the samples as they are received by the laboratory. The liability of the laboratory is limited to the amount paid for the report.
Terms: Net thirty days on approved credit.

KEY: Sample Type: 1=Drinking Water, 2=Surface Water, 3=Ground Water, 4=Waste Water, 5=Soil, 6=RCRA, 7=Other
Preservative: 1=NaOH, 2=NaOH + ZnOAC, 3=HNO3, 4=H2SO4, 5=Na2S2O3, 6=None, 7=Other

SEM COC
Form Revised
02/01

5.3 Laboratory Sample Custody

The Project Manager or Field Team Leader will notify the laboratory of upcoming field sampling activities and the subsequent shipment of samples to the laboratory. This notification will include information concerning the number and type of samples to be shipped as well as the anticipated date of arrival.

The following laboratory sample custody procedures will be used:

- The laboratory will designate a sample custodian who will be responsible for maintaining custody of the samples and for maintaining all associated records documenting that custody.
- Upon receipt of the samples, the custodian will check cooler temperature, and check the original COC documents and compare them with the labeled contents of each sample container for correctness and traceability. The sample custodian will sign the COC record and record the date and time received.
- Care will be exercised to annotate any labeling or descriptive errors. In the event of documentation or sample integrity issues, the laboratory will immediately contact the Project Manager or Field Team Leader as part of the corrective action process. A qualitative assessment of each sample container will be performed to note any anomalies, such as broken or leaking bottles. This assessment will be recorded as part of the incoming COC procedure.
- The soil, water, and air samples will be stored in a secured area until analyses commence, at a temperature of approximately 4 ± 2 ˚C if required.
- A laboratory tracking record will accompany the sample or sample fraction through final analysis for control.

A copy of the tracking record will accompany the laboratory report and will become a permanent part of the project records.

6.0 Calibration Procedures

6.1 Field Instruments

All field analytical equipment will be calibrated immediately prior to each day's use. The calibration procedures will conform to manufacturer's standard instructions. This calibration will ensure that the equipment is functioning within the allowable tolerances established by the manufacturer and required by the project. Records of all instrument calibration will be maintained by the Field Team Leader. Copies of all the instrument manuals will be maintained onsite by the Field Team Leader.

Calibration procedures for instruments used for monitoring health and safety hazards (e.g., photoionization detector [PID] and explosimeter) are provided in the HASP. More frequent calibration may be needed depending on conditions encountered in the field.

6.2 Laboratory Instruments

The laboratory will follow all calibration procedures and schedules as specified in the sections of the USEPA SW-846 and subsequent updates that apply to the instruments used for the analytical methods given in Section 7.

7.0 Analytical Procedures

7.1 Introduction

Soil, water, and waste samples will be analyzed according to the USEPA SW-846 "*Test Methods for Evaluating Solid Waste*," November 1986, 3rd edition and subsequent updates. Air and soil gas samples will be analyzed according to the USEPA Compendium Method TO-15, *Determination of VOCs in Air Collected in Specially Prepared-Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)*, January 1999 and helium (fixed gas) analyses will be performed using American Society for Testing Materials (ASTM), Method 1945 modified. The methods to be used for the laboratory analysis of water and soil samples are presented in Tables 7-1 and 7-2. The soil gas and ambient air samples will be analyzed by USEPA Method TO-15 as presented in Table 7-3. T hese methods were selected because they attain the quantitation limits and DQOs required by the project, which are compiled on Tables 7-1 through 7-3. All analytical analysis will be conducted at an ELAP certified laboratory as per Section 1.3.1.2.

Table 7-1 Project Quantitation Limits for Soil and Water

CAS No.	Analysis/Compound	Method	Quantitation Limits		State of New York Standards	
			Water (µg/L)	Soil (µg/kg)	Water (a) (µg/L)	Soil (b) (µg/kg)
Volatile Organics						
71-55-6	1,1,1-Trichloroethane	SW8260B	5	5	5	800
79-34-5	1,1,2,2-Tetrachloroethane	SW8260B	5	5	5	600
79-00-5	1,1,2-Trichloroethane	SW8260B	5	5	1	
76-13-1	1,1,2-Trichlorotrifluoroethane	SW8260B	5	5	5	
75-34-3	1,1-Dichloroethane	SW8260B	5	5	5	200
75-35-4	1,1-Dichloroethene	SW8260B	5	5	5	400
120-82-1	1,2,4-Trichlorobenzene	SW8260B	5	5	5	3400
96-12-8	1,2-Dibromo-3-Chloropropane	SW8260B	5	5	0.04	
106-93-4	1,2-Dibromoethane	SW8260B	5	5	0.0006	
95-50-1	1,2-Dichlorobenzene	SW8260B	5	5	3	7900
107-06-2	1,2-Dichloroethane	SW8260B	5	5	0.6	100
78-87-5	1,2-Dichloropropane	SW8260B	5	5	1	
541-73-1	1,3-Dichlorobenzene	SW8260B	5	5	3	1600
106-46-7	1,4-Dichlorobenzene	SW8260B	5	5	3	8500
78-93-3	2-Butanone	SW8260B	25	25	50	300
591-78-6	2-Hexanone	SW8260B	25	25	50	
108-10-1	4-Methyl-2-Pentanone	SW8260B	25	25		1000
67-64-1	Acetone	SW8260B	25	25	50	200
71-43-2	Benzene	SW8260B	5	5	1	60
75-27-4	Bromodichloromethane	SW8260B	5	5	50	
75-25-2	Bromoform	SW8260B	5	5	50	
74-83-9	Bromomethane	SW8260B	5	5	5	
75-15-0	Carbon Disulfide	SW8260B	5	5		2700
56-23-5	Carbon Tetrachloride	SW8260B	5	5	5	600
108-90-7	Chlorobenzene	SW8260B	5	5	5	1700
75-00-3	Chloroethane	SW8260B	5	5	5	1900
67-66-3	Chloroform	SW8260B	5	5	7	300
74-87-3	Chloromethane	SW8260B	5	5	5	
156-59-2	cis-1,2-Dichloroethene	SW8260B	5	5	5	
10061-01-5	cis-1,3-Dichloropropene	SW8260B	5	5	0.4	
110-82-7	Cyclohexane	SW8260B	5	5		
124-48-1	Dibromochloromethane	SW8260B	5	5	50	
75-71-8	Dichlorodifluoromethane	SW8260B	5	5	5	
100-41-4	Ethyl Benzene	SW8260B	5	5	5	5500
98-82-8	Isopropylbenzene	SW8260B	5	5	5	
79-20-9	Methyl Acetate	SW8260B	5	5		
1634-04-4	Methyl tert-butyl Ether	SW8260B	5	5		
108-87-2	Methylcyclohexane	SW8260B	5	5		
75-09-2	Methylene Chloride	SW8260B	5	5	5	100
100-42-5	Styrene	SW8260B	5	5	930	
10061-02-6	t-1,3-Dichloropropene	SW8260B	5	5	0.4	
127-18-4	Tetrachloroethene	SW8260B	5	5	5	1400

CAS No.	Analysis/Compound	Method	Quantitation Limits		State of New York Standards	
			Water (µg/L)	Soil (µg/kg)	Water (a) (µg/L)	Soil (b) (µg/kg)
108-88-3	Toluene	SW8260B	5	5	5	1500
156-60-5	trans-1,2-Dichloroethene	SW8260B	5	5	5	300
79-01-6	Trichloroethene	SW8260B	5	5	5	700
75-69-4	Trichlorofluoromethane	SW8260B	5	5	5	
Volatile Organics (continued)						
75-01-4	Vinyl Chloride	SW8260B	5	5	2	200
136777-61-2	m/p-Xylenes	SW8260B	10	10	5	1200
95-47-6	o-Xylene	SW8260B	5	5	5	
Semivolatile Organics						
92-52-4	1',1-Biphenyl	SW8270C	10	330	5	
108-60-1	2,2'-oxybis(1-Chloropropane)	SW8270C	10	330	5	
95-95-4	2,4,5-Trichlorophenol	SW8270C	10	330		100
88-06-2	2,4,6-Trichlorophenol	SW8270C	10	330		
120-83-2	2,4-Dichlorophenol	SW8270C	10	330		400
105-67-9	2,4-Dimethylphenol	SW8270C	10	330		
51-28-5	2,4-Dinitrophenol	SW8270C	10	330		200
121-14-2	2,4-Dinitrotoluene	SW8270C	10	330	5	
606-20-2	2,6-Dinitrotoluene	SW8270C	10	330	5	1000
91-58-7	2-Chloronaphthalene	SW8270C	10	330	10	
95-57-8	2-Chlorophenol	SW8270C	10	330		800
91-57-6	2-Methylnaphthalene	SW8270C	10	330		36400
95-48-7	2-Methylphenol	SW8270C	10	330		100
88-74-4	2-Nitroaniline	SW8270C	10	330	5	430
88-75-5	2-Nitrophenol	SW8270C	10	330		330
91-94-1	3,3'-Dichlorobenzidine	SW8270C	10	330	5	n/a
65794-96-9	3+4-Methylphenols	SW8270C	10	330		900
99-09-2	3-Nitroaniline	SW8270C	10	330	5	500
534-52-1	4,6-Dinitro-2-methylphenol	SW8270C	10	330		
101-55-3	4-Bromophenyl-phenyl ether	SW8270C	10	330		
59-50-7	4-Chloro-3-methylphenol	SW8270C	10	330		240
106-47-8	4-Chloroaniline	SW8270C	10	330	5	220
7005-72-3	4-Chlorophenyl-phenyl ether	SW8270C	10	330		
100-01-6	4-Nitroaniline	SW8270C	10	330	5	
100-02-7	4-Nitrophenol	SW8270C	10	330		100
83-32-9	Acenaphthene	SW8270C	10	330	20	50000
208-96-8	Acenaphthylene	SW8270C	10	330		41000
98-86-2	Acetophenone	SW8270C	10	330		
120-12-7	Anthracene	SW8270C	10	330	50	50000
1912-24-9	Atrazine	SW8270C	10	330	7.5	
56-55-3	Benzo(a)anthracene	SW8270C	10	330	0.002	224
50-32-8	Benzo(a)pyrene	SW8270C	10	330	ND	61
205-99-2	Benzo(b)fluoranthene	SW8270C	10	330	0.002	1100
191-24-2	Benzo(g,h,i)perylene	SW8270C	10	330		50000
207-08-9	Benzo(k)fluoranthene	SW8270C	10	330	0.002	1100
100-52-7	Benzaldehyde	SW8270C	10	330		

CAS No.	Analysis/Compound	Method	Quantitation Limits		State of New York Standards	
			Water (µg/L)	Soil (µg/kg)	Water (a) (µg/L)	Soil (b) (µg/kg)
111-91-1	bis(2-Chloroethoxy)methane	SW8270C	10	330	5	
111-44-4	bis(2-Chloroethyl)ether	SW8270C	10	330	1	
117-81-7	bis(2-Ethylhexyl)phthalate	SW8270C	10	330	5	50000
85-68-7	Butylbenzylphthalate	SW8270C	10	330	50	50000
105-60-2	Caprolactam	SW8270C	10	330		
86-74-8	Carbazole	SW8270C	10	330		
218-01-9	Chrysene	SW8270C	10	330	0.002	400
53-70-3	Dibenzo(a,h)anthracene	SW8270C	10	330		14
Semivolatile Organics (continued)						
132-64-9	Dibenzofuran	SW8270C	10	330		6200
84-66-2	Diethylphthalate	SW8270C	10	330	50	7100
131-11-3	Dimethylphthalate	SW8270C	10	330	50	2000
84-74-2	Di-n-butylphthalate	SW8270C	10	330	50	8100
117-84-0	Di-n-octyl phthalate	SW8270C	10	330	50	50000
206-44-0	Fluoranthene	SW8270C	10	330	50	50000
86-73-7	Fluorene	SW8270C	10	330	50	50000
118-74-1	Hexachlorobenzene	SW8270C	10	330	0.04	410
87-68-3	Hexachlorobutadiene	SW8270C	10	330	0.5	
77-47-4	Hexachlorocyclopentadiene	SW8270C	10	330	5	
67-72-1	Hexachloroethane	SW8270C	10	330	5	
193-39-5	Indeno(1,2,3-cd)pyrene	SW8270C	10	330	0.002	3200
78-59-1	Isophorone	SW8270C	10	330	50	4400
91-20-3	Naphthalene	SW8270C	10	330	10	13000
98-95-3	Nitrobenzene	SW8270C	10	330	0.4	200
621-64-7	N-Nitroso-di-n-propylamine	SW8270C	10	330		
86-30-6	N-Nitrosodiphenylamine	SW8270C	10	330	50	
87-86-5	Pentachlorophenol	SW8270C	10	330		1000
85-01-8	Phenanthrene	SW8270C	10	330	50	50000
108-95-2	Phenol	SW8270C	10	330		30
129-00-0	Pyrene	SW8270C	10	330	50	50000
Metals						
7429-90-5	Aluminum	6010B / 6020	50	5000	2000	SB
7440-36-0	Antimony	6010B / 6020	25	2500	6	SB
7440-38-2	Arsenic	6010B / 6020	10	1000	50	7500
7440-39-3	Barium	6010B / 6020	50	5000	2000	300000
7440-41-7	Beryllium	6010B / 6020	3	300	3	160
7440-43-9	Cadmium	6010B / 6020	3	300	5	1000
7440-70-2	Calcium	6010B / 6020	1000	100000		SB
7440-47-3	Chromium	6010B / 6020	5	500	100	10000
7440-48-4	Cobalt	6010B / 6020	15	1500	5	30000
7440-50-8	Copper	6010B / 6020	10	1000	1000	25000
7439-89-6	Iron	6010B / 6020	50	5000	600	2000000
7439-92-1	Lead	6010B / 6020	6	600	50	400 (c)
7439-95-4	Magnesium	6010B / 6020	1000	100000	35000	SB
7439-96-5	Manganese	6010B / 6020	10	1000	600	SB
7440-02-0	Nickel	6010B / 6020	20	2000	200	13000

CAS No.	Analysis/Compound	Method	Quantitation Limits		State of New York Standards	
			Water (µg/L)	Soil (µg/kg)	Water $^{(a)}$ (µg/L)	Soil $^{(b)}$ (µg/kg)
7440-09-7	Potassium	6010B / 6020	1000	100000		SB
7782-49-2	Selenium	6010B / 6020	10	1000	20	2000
7440-22-4	Silver	6010B / 6020	5	500	100	SB
7440-23-5	Sodium	6010B / 6020	1000	100000		SB
7440-28-0	Thallium	6010B / 6020	20	2000	0.5	SB
7440-62-2	Vanadium	6010B / 6020	20	2000		150000
7440-66-6	Zinc	6010B / 6020	20	2000	5000	20000
7439-97-6	Mercury	7471A	0.2	10	1.4	100
Inorganics						
n/a	Cyanide, Free	ASTM D4282-02 / 9013A		60		
n/a	Cyanide, Total	9012 / 9010A	10		400	
Pesticides						
72-54-8	4,4'-DDD	8081	0.05	1.7	0.3	2900
72-55-9	4,4'-DDE	8081	0.05	1.7	0.2	2100
50-29-3	4,4'-DDT	8081	0.2	1.7	0.2	2100
309-00-2	Aldrin	8081	0.05	1.7	ND	41
319-84-6	alpha-BHC	8081	0.05	1.7	0.01	110
319-85-7	beta-BHC	8081	0.2	1.7	0.04	200
319-86-8	delta-BHC	8081	0.05	1.7	0.04	300
58-89-9	gamma-BHC (Lindane)	8081	0.05	1.7	0.05	60
5103-71-9	alpha-Chlordane	8081	0.05	1.7		540
5566-34-7	gamma-Chlordane	8081	0.05	1.7		540
57-74-9	Chlordane	8081	0.5	17	0.05	540
60-57-1	Dieldrin	8081	0.05	1.7	0.004	44
959-98-8	Endosulfan I	8081	0.05	1.7		900
33213-65-9	Endosulfan II	8081	0.05	1.7		900
1031-07-8	Endosulfan sulfate	8081	0.05	1.7		1000
72-20-8	Endrin	8081	0.05	1.7	ND	100
7421-93-4	Endrin aldehyde	8081	0.05	1.7	5	
53494-70-5	Endrin ketone	8081	0.05	1.7	5	
76-44-8	Heptachlor	8081	0.05	1.7	0.04	100
1024-57-3	Heptachlor epoxide	8081	0.05	1.7	0.03	20
72-43-5	Methoxychlor	8081	0.05	1.7	35	
8001-35-2	Toxaphene	8081	0.5	17	0.06	
PCB's						
12674-11-2	Aroclor-1016	8082	0.5	17	0.09* Applies to the sum of the PCBs	1000 (total surface soil) 10000 (total subsurface soil)
11104-28-2	Aroclor-1221	8082	0.5	17		
11141-16-5	Aroclor-1232	8082	0.5	17		
53469-21-9	Aroclor-1242	8082	0.5	17		
12672-29-6	Aroclor-1248	8082	0.5	17		
11097-69-1	Aroclor-1254	8082	0.5	17		
11096-82-5	Aroclor-1260	8082	0.5	17		
37324-23-5	Aroclor-1262	8082	0.5	17		
11100-14-4	Aroclor-1268	8082	0.5	17		

CAS No.	Analysis/Compound	Method	Quantitation Limits		State of New York Standards	
			Water (µg/L)	Soil (µg/kg)	Water $^{(a)}$ (µg/L)	Soil $^{(b)}$ (µg/kg)
Herbicides						
93-72-1	2,4,5-TP (Silvex)	8151	2	67	0.26	700
93-76-5	2,4,5-T	8151	2	67		1900
94-75-7	2,4-D	8151	2	67		500
94-82-6	2,4-DB	8151	2	67		

Notes:

N/A - Not Applicable
SB - soil background
ND - not detected
(a) - Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, NYSDEC, October 1993, reissued June 1998
(b) - Determination of Soil Cleanup Objectives and Cleanup Levels, NYSDEC, January 24, 1994
(c) - EPA Guidance on Residential Lead-Based Paint, Lead Contaminated Dust, and Lead Contaminated Soil, July 14, 1994

Table 7-2 Practical Quantitation Limits (PQLs) for TCLP

Compound	SW-846 Analysis	Water (µg/L)
TCLP Volatile Organic Compounds		
Benzene	1311 / 8260B	25
Carbon Tetrachloride	1311 / 8260B	25
Chloroform	1311 / 8260B	25
1,2-Dichloroethane	1311 / 8260B	25
1,1-Dichloroethene	1311 / 8260B	25
2-Butanone	1311 / 8260B	125
Tetrachloroethene	1311 / 8260B	25
Trichloroethene	1311 / 8260B	25
Vinyl Chloride	1311 / 8260B	25
TCLP Semivolatile Organic Compounds		
2-Methylphenol	1311 / 3510 / 8270B	10
3 & 4-Methylphenol	1311 / 3510 / 8270B	10
1,4-Dichlorobenzene	1311 / 3510 / 8270B	10
2,4-Dinitrotoluene	1311 / 3510 / 8270B	10
Hexachlorobutadiene	1311 / 3510 / 8270B	10
Hexachloroethane	1311 / 3510 / 8270B	10
Hexachlorobenzene	1311 / 3510 / 8270B	10
Nitrobenzene	1311 / 3510 / 8270B	10
Pentachlorophenol	1311 / 3510 / 8270B	10
Pyridine	1311 / 3510 / 8270B	10
2,4,5-Trichlorophenol	1311 / 3510 / 8270B	10
2,4,6-Trichlorophenol	1311 / 3510 / 8270B	10
TCLP Metals		
Arsenic	1311 / 3010 / 6010B	10
Barium	1311 / 3010 / 6010B	50
Cadmium	1311 / 3010 / 6010B	3
Chromium	1311 / 3010 / 6010B	5
Lead	1311 / 3010 / 6010B	6
Selenium	1311 / 3010 / 6010B	10

Silver	1311 / 3010 / 6010B	5
Mercury	7470A	0.2
TCLP Pesticides		
Chlordane	1311 / 8081A	0.5
Endrin	1311 / 8081A	0.05
Heptachlor (and its hydroxide)	1311 / 8081A	0.05
Lindane	1311 / 8081A	0.05
Methoxychlor	1311 / 8081A	0.05
Toxaphene	1311 / 8081A	0.5
TCLP Pesticides		
2,4-D	1311 / 8151A	2
2,4,5-TP Silvex	1311 / 8151A	2

Notes:

ND - Not Determined

Table 7-3 Project Quantitation Limits for Air

Analysis / Compound	Method	Quantitation Limits Soil Gas/Air (µg/M^3)
Fixed Gases		
Helium	ASTM D1945 mod.	16360 (0.01%)
Volatile Organics [1]		
Freon 12	TO-15 Mod.	0.81
Freon 114	TO-15 Mod.	1.14
Chloromethane	TO-15 Mod.	0.34
Vinyl Chloride	TO-15 Mod.	0.42
Bromomethane	TO-15 Mod.	0.63
Chloroethane	TO-15 Mod.	0.43
Freon 11	TO-15 Mod.	0.92
1,1-Dichloroethene	TO-15 Mod.	0.64
Freon 113	TO-15 Mod.	1.26
Methylene Chloride	TO-15 Mod.	0.56
1,1-Dichloroethane	TO-15 Mod.	0.66
cis-1,2-Dichloroethene	TO-15 Mod.	0.64
Chloroform	TO-15 Mod.	0.81
1,1,1-Trichloroethane	TO-15 Mod.	0.89
Carbon Tetrachloride	TO-15 Mod.	1.03
Benzene	TO-15 Mod.	0.52
1,2-Dichloroethane	TO-15 Mod.	0.66
Trichloroethene	TO-15 Mod.	0.89
1,2-Dichloropropane	TO-15 Mod.	0.76
cis-1,3-Dichloropropene	TO-15 Mod.	0.74
Toluene	TO-15 Mod.	0.61
trans-1,3-Dichloropropene	TO-15 Mod.	0.74
1,1,2-Trichloroethane	TO-15 Mod.	0.89
Tetrachloroethene	TO-15 Mod.	1.11
1,2-Dibromoethane (EDB)	TO-15 Mod.	1.26
Chlorobenzene	TO-15 Mod.	0.76

Analysis / Compound	**Method**	**Quantitation Limits Soil Gas/Air ($\mu g/M^3$)**
Ethyl Benzene	TO-15 Mod.	0.71
m,p-Xylene	TO-15 Mod.	0.71
o-Xylene	TO-15 Mod.	0.71
Styrene	TO-15 Mod.	0.69
1,1,2,2-Tetrachloroethane	TO-15 Mod.	1.13
1,3,5-Trimethylbenzene	TO-15 Mod.	0.81
1,2,4-Trimethylbenzene	TO-15 Mod.	0.81
1,3-Dichlorobenzene	TO-15 Mod.	0.98
1,4-Dichlorobenzene	TO-15 Mod.	0.98
alpha-Chlorotoluene	TO-15 Mod.	0.85
1,2-Dichlorobenzene	TO-15 Mod.	0.98
1,2,4-Trichlorobenzene	TO-15 Mod.	6.12
Hexachlorobutadiene	TO-15 Mod.	8.69
Propylene	TO-15 Mod.	1.4
1,3-Butadiene	TO-15 Mod.	1.77
Acetone	TO-15 Mod.	1.93
Carbon Disulfide	TO-15 Mod.	2.58
trans-1,2-Dichloroethene	TO-15 Mod.	3.22
2-Butanone (MEK)	TO-15 Mod.	2.42
Hexane	TO-15 Mod.	2.9
Tetrahydrofuran	TO-15 Mod.	2.42
Cyclohexane	TO-15 Mod.	2.74
1,4-Dioxane	TO-15 Mod.	2.9
Bromodichloromethane	TO-15 Mod.	5.47
4-Methyl-2-pentanone	TO-15 Mod.	3.38
2-Hexanone	TO-15 Mod.	3.38
Dibromochloromethane	TO-15 Mod.	6.92
Bromoform	TO-15 Mod.	8.37
4-Ethyltoluene	TO-15 Mod.	4.03
Ethanol	TO-15 Mod.	1.55
Methyl tert-butyl ether	TO-15 Mod.	2.9

Analysis / Compound	**Method**	**Quantitation Limits Soil Gas/Air ($\mu g/M^3$)**
Heptane	TO-15 Mod.	3.38
Naphthalene	TO-15 Mod.	4.35
2-Methylpentane	TO-15 Mod.	2.9
Isopentane	TO-15 Mod.	2.42
2,3-Dimethylpentane	TO-15 Mod.	3.38
2,2,4-Trimethylpentane	TO-15 Mod.	3.86
Indene	TO-15 Mod.	3.86
Indane	TO-15 Mod.	3.86
Thiophene	TO-15 Mod.	2.74
2-Propanol	TO-15 Mod.	1.93

Notes

(1) The final quantitation limit (QL) is adjusted to reflect the initial pressurization step, dilution required to bring target analyte levels into the calibration range, and/or minimize matrix interferences

Final QL = QL * DF, DF was assumed to be 1.61 for a 6-L Canister, with 5 in. Hg Final Canister Pressure.

8.0 Data Reduction, Assessment, and Reporting

8.1 Data Reduction

Data collected in the field will be reduced in accordance with SW-846 protocols and reviewed by the laboratory QA personnel. The criteria used to identify and quantify the analytes will be those specified for the applicable methods in the USEPA SW-846 and subsequent updates.

8.2 Data Quality Assessment

NYSDEC recommends two levels of data review. The basic review is a Data Usability Summary Report (DUSR). Current NYSDEC policy is to require this level of review for analytical data on most sites. Full data validation is called for at sites where the data will be used in litigation, or where problems are expected with data quality (such as where matrix interference is expected to be significant). The laboratory deliverables (i.e., NYSDEC ASP Category B) are the same in both cases, and a DUSR can be upgraded to full validation at a later time if necessary. For this Site a DUSR will be performed.

Based on the results of data assessment, the validated analytical results reported by the laboratory will be assigned one of the following USEPA-defined data usability qualifiers:

- U – Not detected at given value,
- UJ – Estimated not detected at given value,
- J – Estimated value,
- N – Presumptive evidence at the value given,
- R – Result not useable,
- No Flag – Result accepted without qualification.

Trained and experienced data assessors, who meet NYSDEC approval criteria, will perform the data review. Résumés of people who will perform the data validation and prepare the DUSR will be provided to NYSDEC for review and approval, upon request.

8.2.1 Data Usability Summary Report

Data will be evaluated and qualification applied in accordance with the *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*, USEPA-540-R-07-003, July 2007 and *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA-540-R-04-004, October 2004, as they applied to the analytical methods employed. A DUSR will be generated in accordance with USEPA Region II guidelines.

The DUSR will include a review and an evaluation of all the analytical results. To ensure compliance with the analytical method protocols the following parameters will be reviewed:

- Chain-of-custody forms,
- Holding times,

- Initial and continuing calibrations,
- Blanks,
- Laboratory control standards and matrix spikes,
- Surrogate recoveries,
- Matrix interference checks,
- Field and laboratory duplicates,
- Sample data.

The DUSR will contain a description of the samples and parameters reviewed. Any deficiencies identified during the review will be noted and the effect on the generated data will be discussed. Any re-sampling or reanalysis recommendations will be then be made to the Project Manager. The DUSR will be electronically transmitted to the NYSDEC within 15 business days of validating the data and no later than 45 business days from receiving the laboratory data.

8.2.2 Data Validation

The determination to validate data will be made based on the presence of data anomalies, suspect data, or laboratory issues. Data will be validated and qualifications applied in accordance with *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*, USEPA-540-R-07-003, July 2007 and *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA-540-R-04-004, October 2004, as they applied to the analytical methods employed. If applicable, a data validation report will be prepared and reviewed by the Quality Assurance Office (QAO) before issuance. The data validation report will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and COC procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method. A detailed assessment of each sample delivery group will follow. For each of the organic analytical methods, the following parameters will be assessed:

- Holding times,
- Instrument tuning,
- Instrument calibrations,
- Blank results,
- System monitoring compounds or surrogate recovery compounds (as applicable),
- Internal standard recovery results,
- MS and MSD results,
- Field duplicate results,
- Target compound identification,

- Result calculations,
- Pesticide cleanup (if applicable),
- Compound quantitation and reported detection limits,
- System performance,
- Results verification.

For each of the inorganic compounds, the following will be assessed:

- Holding times,
- Calibrations,
- Blank results,
- Interference check sample,
- Laboratory check samples,
- Duplicates,
- Matrix Spike(s),
- Furnace atomic absorption analysis QC,
- ICP serial dilutions,
- Results verification and reported detection limits,
- Result calculations.

8.3 Data Reporting

The data package provided by the laboratory will contain all items discussed above in a NT ASP Category B “CLP-equivalent” format. Data quality issues will be discussed in a case narrative included with the data report. The completed copies of the COC records (both external and internal) accompanying each sample from time of initial bottle preparation to completion of analysis shall be attached to the analytical reports.

Two copies of the analytical data packages and an electronic data deliverable (EDD) will be provided by the laboratory approximately 30 days after receipt of a complete sample delivery group. The Project Manager will immediately arrange for filing one package. A second copy and the EDD will be used to generate summary tables. These tables will form the database for assessment of the site contamination condition.

The EDD format required is current format Earths of EQuIS® Environmental Data Management Software.

Each EDD must be formatted and copied using an MS-DOS operating system. To avoid transcription errors, data will be loaded directly into the ASCII format from the laboratory information management system (LIMS). If this cannot be accomplished, the consultant should be notified via letter of transmittal indicating that manual entry of data is required for a particular method of analysis. All EDDs must also undergo a QC check by the laboratory before delivery. The original data, tabulations, and electronic media are stored in a secure and retrievable fashion.

The Project Manager or Task Manager will maintain close contact with the QA reviewer to ensure all nonconformance issues are resolved prior to use of the data. The EDDs and data validation report will be electronically transmitted to the NYSDEC within 15 business days of validating the data and no later than 45 business days from receiving the laboratory data.

9.0 Internal Quality Control Checks

QC procedures and checks are used to evaluate the precision and accuracy of analytical data. Field QC checks are used to identify potential problems associated with sample collection procedures. Laboratory QC checks are used to identify problems associated with sample preparation and analysis.

9.1 Field Quality Control Checks

To check the quality of data from field sampling efforts, blanks and duplicate samples will be collected for analysis. Field duplicate and rinseate blank samples will be collected at a frequency of one in 20 samples. Trip blank samples will be analyzed at a frequency of one per each shipment of VOC samples. Field MS/MSD samples will be collected at a frequency of one in 20 samples. These samples will be treated as separate samples for identification, logging, and shipping purposes. Analytical results for blanks and duplicates will be reported with the field sample data.

9.2 Laboratory Quality Control Checks

The analytical laboratory must have an implemented QC program documented in a QA manual to ensure the reliability and validity of the analysis performed at the laboratory. All analytical procedures are documented in writing as standard operating procedures (SOPs) and each SOP must include a QC section that addresses the minimum QC requirements for the procedure. The internal QC checks differ slightly for each individual procedure, but in general the QC requirements include the following:

- Method blanks,
- Reagent/preparation blanks (applicable to inorganic analysis),
- Instrument blanks,
- MS/MSDs ,
- Surrogate spikes (organic methods only),
- Analytical spike (applicable to graphite furnace analysis),
- Laboratory control samples,
- Internal standard areas for GC/MS analysis,
- Mass tuning for GC/MS analysis,
- Endrin/4,4'-DDT degradation checks for pesticide analysis,
- Second, dissimilar column confirmation for pesticide and polychlorinated biphenyl (PCB) analysis.

All data obtained will be properly recorded. The data package will include a full deliverable package capable of allowing the recipient to reconstruct QC information and compare it to QC acceptance criteria. The laboratory will reanalyze any samples associated with nonconforming quality control checks, if sufficient volume is available. It is expected that sufficient volumes/weights of samples will be collected to allow for reanalysis when necessary.

10.0 Performance and System Audits and Frequency

Two types of audit procedures are conducted during any environmental work: performance and system audits. These audits are performed on the laboratory as well as field activities. The laboratory and field auditors will be independent of the function they will be auditing. Audits will be documented and maintained by the respective Laboratory or Contractor Project Manager.

10.1 Performance Audits

10.1.1 Laboratory Performance Audits

Laboratory performance audits are administered by the laboratory QA department on a periodic basis (e.g., semi-annually). The audit samples are used to monitor accuracy and identify and resolve problems in sample preparation and analysis techniques, which lead to the generation of nonconforming data.

The laboratory performance audits include verification of each analyst's record keeping, proper use and understanding of procedures, and accuracy evaluation. Corrective action will be taken for any performance failure noted.

10.1.2 Field Performance Audits

The QAO or designee will perform field performance audits of the field sample team on an annual basis at a minimum. The field team leader will review all field data. The analytical results of the field blanks and replicate samples are indirect audits of the level of performance of field activities. If a nonconformance is found in the evaluation of field QC data, corrective action will be taken to resolve the issue. The corrective action will be documented.

10.2 System Audits

10.2.1 Laboratory System Audits

Laboratory system audits will be conducted against the QA Manual and the administrative and method SOPs, by the laboratory QA department, on an annual basis. System audits are used to ensure that all aspects of the laboratory's QC program are implemented and effective. This involves a thorough review of all laboratory practices and documentation to confirm that work is performed according to project specifications.

Outside agency performance and system audits may be used to verify contract compliance or the laboratory's ability to meet requirements for analytical methods and documentation. Copies of current certifications and accreditations may be used in lieu of an audit by the Contractor Project Manager.

10.2.2 Field System Audits

The QAO or designee shall perform field system audits of the field sampling team on an annual basis at a minimum. All field activities will be audited to ensure that the field work is being performed according to the approved work plans, QAPP, and method procedures. Accuracy, precision, and documentation clarity will be evaluated. Any time a deficiency is noted during an ongoing systems audit, the project manager or designee will inform the field staff immediately so that corrective actions may be implemented.

11.0 Preventive Maintenance

11.1 Field Instrument Preventive Maintenance

Written procedures will establish the schedule for servicing critical items in order to minimize the downtime of the measurement system(s). Field instruments will be checked and calibrated daily before use. Calibration checks will be documented on the field calibration log sheets. Critical spare parts such as tape and batteries will be kept on-site to reduce potential downtime. Backup instruments and equipment will be available on-site or within 1-day shipment to avoid delays in the field schedule.

11.2 Laboratory Instrument Preventive Maintenance

Designated laboratory employees regularly perform routine scheduled maintenance and repair of all instruments. All maintenance that is performed is documented in the laboratory's operating records. All laboratory instruments are maintained in accordance with manufacturer's specifications. The laboratory's QA Manual specifies the typical frequency with which components of key analytical instruments or equipment will be serviced.

11.3 Records

Logs shall be established to record maintenance and service. All maintenance records will be controlled and traceable to the designated equipment, instruments, tools, or gauges. Records produced shall be reviewed, maintained, and filed by the operators at the laboratories. The QAO may audit the field maintenance records to verify complete adherence to these procedures.

12.0 Corrective Action

12.1 Introduction

The following procedures have been established to ensure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, and corrected.

12.2 Procedure Description

When a significant condition adverse to quality is noted at site, laboratory, or subcontractor location, the cause of the condition will be determined and corrective action will be taken to preclude recurrence. Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the QAO, Contractor Project Manager, Field Team Leader, and involved contractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action.

All project personnel have the responsibility, as part of the normal work duties, to promptly identify, report, and investigate conditions adverse to quality. Corrective actions will be initiated as follows.

- When predetermined acceptance standards are not attained
- When procedure or data compiled are determined to be deficient
- When equipment or instrumentation is found to be faulty
- When samples and analytical test results are not clearly traceable
- When quality assurance requirements have been violated
- When designated approvals have been circumvented
- As a result of system and performance audit findings
- As a result of a management assessment
- As a result of laboratory/field comparison studies
- As required by USEPA SW-846 and subsequent updates, or by the NYSDEC ASP

Project management and staff, such as field teams, remedial response planning personnel, and laboratory groups, will monitor on-going work performance in the normal course of daily responsibilities. Work may be audited at the sites, laboratories, or contractor locations. Activities or documents ascertained to be nonconforming with quality assurance requirements will be documented. Corrective actions will be mandated through audit finding sheets attached to the audit report. Audit findings are logged, maintained, and controlled by the Task Manager.

Personnel assigned to quality assurance functions will have the responsibility to issue and control Corrective Action Request (CAR) Forms (Figure 12-1 or similar). The CAR identifies the out-of-compliance condition, reference document(s), and recommended corrective action(s) to be administered. The CAR is issued to the personnel responsible for the affected item or activity. A copy is also submitted to the Contractor Project Manager. The individual to whom the CAR is addressed returns the requested response promptly to the QA personnel, affixing his/her signature and date to the corrective action block, after stating the cause of the conditions and corrective action to be taken. The QA personnel maintain the log for status of CARs, confirms the adequacy of the intended corrective action, and verifies its implementation. CARs will be retained in the project file.

Any project personnel may identify issues requiring corrective action; however, the QAO is responsible for documenting, numbering, logging, and verifying the closeout action. The Contractor Project Manager will be responsible for ensuring that all recommended corrective actions are implemented, documented, and approved.

Figure 12-1 Corrective Action Form

CORRECTIVE ACTION REQUEST

Number: ____________________________ Date: _____________

TO: ____

You are hereby requested to take corrective actions indicated below and as otherwise determined by you to (a) resolve the noted condition and (b) to prevent it from recurring. Your written response is to be returned to the project quality assurance manager by ________________

CONDITION:

REFERENCE DOCUMENTS:

RECOMMENDED CORRECTIVE ACTIONS:

___________	______	___________	_________	____________	_________
Originator	Date	Approval	Date	Approval	Date

RESPONSE

CAUSE OF CONDITION

CORRECTIVE ACTION

(A) RESOLUTION

(B) PREVENTION

(C) AFFECTED DOCUMENTS

C.A. FOLLOW-UP:

CORRECTIVE ACTION VERIFIED BY: ______________________________

DATE:______________

13.0 References

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USEPA, 1999a. Compendium Method TO-15, Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS). January 1999.

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