East 115th Street Former MGP

NEW YORK, NEW YORK

Conceptual Site Management Plan

NYSDEC Site Number: V00540-2

Prepared for:
Consolidated Edison Co. of New York, Astoria, New York

Prepared by:
AECOM, Inc.
2 Technology Park Drive, Westford, MA 01886
978-589-3000

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1.0 INTRODUCTION AND DESCRIPTION OF REMEDIAL PROGRAM

1.1 INTRODUCTION

This document is required as an element of the remedial program at Consolidated Edison, Former MGP, East 115th Street, New York, New York, NYSDEC Site #V00540-2 (hereinafter referred to as the "Site") under the New York State (NYS) Voluntary Cleanup Program (VCP) administered by New York State Department of Environmental Conservation (NYSDEC). The site is being remediated in accordance with the multi-site Voluntary Cleanup Agreement (VCA) Index No. D2-0003-02-08, Site #V00540-2, which was executed on August 25, 2002. This document is being prepared as a Conceptual Site Management Plan (SMP) in parallel with planned remedial work and will be revised as necessary as remedial work is approved by NYSDEC and is completed.

1.1.1 General

Consolidated Edison Company of New York, Inc. entered into a VCA with the NYSDEC to remediate all of its MGP sites including the East 115th Street, Former MGP, 5.5-acre property located in New York, New York. This VCA requires Consolidated Edison, to investigate and, if necessary, remediate contaminated media at the site. A map showing the site location of this 5.5-acre site is provided in Figure 1. The boundaries of the site will be fully described in the metes and bounds site description that accompanies the Environmental Easement, and, when completed, will be attached as Appendix A to this plan.

After completion of the remedial work described in the Remedial Design Work Plans, which will be completed following NYSDEC approval of the Alternatives Analysis Report (submitted to NYSDEC in April 2009), some contamination will be left in the subsurface at this site, which is hereafter referred to as 'remaining contamination." This Conceptual Site Management Plan (SMP) is being prepared to manage remaining

contamination at the site in perpetuity or until extinguishment of the Environmental Easement in accordance with ECL Article 71, Title 36. All reports associated with the site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State.

This Conceptual SMP was prepared by AECOM Environment, on behalf of Consolidated Edison Company of New York, Inc. (Con Edison), in accordance with the requirements in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, dated December 2002, and the guidelines provided by NYSDEC. This Conceptual SMP addresses the means for implementing the Institutional Controls (ICs) and Engineering Controls (ECs) that will be required by the Environmental Easement for the site.

1.1.2 Purpose

The site will contain remaining contamination after completion of the remedial action. ECs will be incorporated into the site remedy to provide proper management of remaining contamination in the future to ensure protection of public health and the environment. An Environmental Easement will be granted to the NYSDEC, and recorded with the New York City (Manhattan) County Clerk, that provides an enforceable legal instrument to ensure compliance with the SMP and all ECs and ICs placed on the site. The ICs will place restrictions on site use, and mandate operation, maintenance, monitoring and reporting measures for all ECs and ICs. This SMP specifies the methods necessary to ensure compliance with all ECs and ICs to be required by the Environmental Easement for contamination that remains at the site. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

This Conceptual SMP provides an overview of the procedures required to manage remaining contamination at the site after completion of the Remedial Action, including: (1) implementation and management of all ECs and ICs; (2) media monitoring; (3) operation and maintenance of all treatment, collection, containment, or recovery systems; (4) performance of periodic inspections, certification of results, and submittal of Periodic Review Reports; and (5) defining criteria for termination of treatment system operations. This Conceptual SMP will be updated with more detailed information following approval and implementation of the remedy.

To address these needs, this Conceptual SMP includes three plans: (1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs, which includes a reporting plan for the submittal of data, information, recommendations, and certifications to NYSDEC; (2) a Monitoring Plan for implementation of Site Monitoring; and (3) an Operation and Maintenance Plan for implementation of remedial collection, containment, treatment, and recovery systems (including, where appropriate, preparation of an Operation and Maintenance Manual for complex systems).

It is important to note that:

- This Conceptual SMP details the site-specific implementation procedures that are anticipated to be required by the Environmental Easement. Once the Easement is in place, failure to properly implement the SMP is a violation of Environmental Conservation Law and the environmental easement;
- Failure to comply with the SMP is also a violation of, 6NYCRR Part 375 and the VCA Index No. D2-0003-02-08, for the site, and thereby subject to applicable penalties.

At the time the Conceptual SMP was prepared, the Conceptual SMP and all site documents related to Remedial Investigation and Remedial Design (completed to date) were maintained at the NYSDEC office in Albany.

1.2 SITE BACKGROUND

The former East 115th Street MGP site consists of approximately 5.5 acres of land extending north to south from 116th Street to 114th Street, and generally west to east from Pleasant Avenue to the Harlem River (Figure 1).

1.2.1 Site Location and Description

The site is located in New York, New York and is identified as Block 1713 and Lot 1 on the New York City Tax Map. The site is an approximately 5.5-acre area bounded by East 116th Street to the north, Thomas Jefferson Park (and Former East 114th Street) to the south, FDR Drive and the Harlem River to the east, and Pleasant Avenue to the west (see Figure 1). The site is bounded to the north and west by residential and

commercial properties. The boundaries of the site will be more fully described in Appendix A – Metes and Bounds.

According to the directory of New York City Tax maps, the property is currently owned by the City of New York and currently used as a school: the Manhattan Center for Science and Mathematics and the Isaac Newton Junior High School for Science and Math. Over 1,500 students and the associated teachers and administrative staff routinely occupy the school. The eastern portion of the site consists of a major highway, known as FDR Drive, and an adjacent walkway.

1.2.2 Site History

From 1887 to 1936, the site was operated as an MGP by Standard Gas and Light Company of New York. The MGP covered two city blocks (115th Street was present between Pleasant Avenue and the Harlem River during MGP operation). During the approximate 40-year period of MGP operations, the plant used approximately 46,000 tons of coal, 9.4 million pounds of coke (for generating steam), 10.5 million pounds of gasoline, and 11,000 bushels (bu) of oxide per year. Figure 2 shows the locations of the former MGP operations and structures. In 1937, the site was turned over to Con Edison. According to Sanborn Insurance Maps and Brown's Directories, the site was not operated as MGP while under the ownership of Con Edison. A 1939 Sanborn Insurance Map shows the site as empty and vacated of all MGP facilities. No information is available regarding the construction or demolition of MGP structures. Although no records were found pertaining to site ownership from 1939 through 1951, it is likely that the City of New York has been the site owner since at last 1941, when a school (Benjamin Franklin High School) with a basement was erected on the property (over 115th Street); this school is now known as the Manhattan Center for Science and Mathematics and the Isaac Newton Junior High School for Science and Math.

1.2.3 Geologic Conditions

This section summarizes the hydrogeology of the site. This summary includes a description of the on-site soils, the presence of groundwater and confining units and the direction of groundwater flow. The information presented in this section includes published information, but relies mostly on site-specific information developed during the Remedial Investigation (RI) and Supplemental RI. Geologic sections are shown in Figures 3, 4 and 5. A groundwater flow map is shown in Figure 6.

Site Geology and Hydrogeology

According to a bedrock geologic map of the New York Metropolitan Area, bedrock in the area of the site consists of Early Paleozoic rock (mostly metamorphic). According to the Environmental Data Resources (EDR) report (EDR, 2002) for the site, the bedrock unit lies within the Paleozoic Era and part of the Ordovician system (Middle Ordovician Series). Due to Manhattan's tight metamorphic bedrock, aquifers are not abundant and the bedrock in this area is not used for potable water supplies. RI activities at the site were performed to bedrock.

Also according to the EDR report (EDR, 2002), the overburden deposits are generally of low permeability. As a result, overburden groundwater is not used as a potable water source in Manhattan. Instead, New York City obtains its water from the Catskill Mountains of New York.

Soil borings and sediment cores advanced during the RI provide information on the site hydrogeology. Three cross sections have been prepared using the RI soil boring and sediment core information and included as Figures 3, 4 and 5.

Site Geology

Based on the soil borings advanced at the site, the overburden ranges in thickness from 25.5 feet to 48 feet, with bedrock encountered at twelve borings. The overburden above bedrock consisted of a fill unit underlain by a sand unit. Over most of the Site this sand unit was underlain by a clay unit. In the central portion of the site, the clay unit was absent and, therefore, no confining unit exists above bedrock. In the eastern portion of the site, the clay was absent, but a peat and silt, and/or silty sand, layer was present. This silt/silty sand layer may not act as a confining unit, but where non-aqueous phase liquid (NAPL) is present in this area; it is only present within or above this layer.

Harlem River Geology

Based on the sediment cores advanced in the Harlem River, the sediment overburden thickness in the river ranges from 11 feet to 24 feet below the sediment surface. Overall the depth to bedrock in the river parallel to the site appears to be similar to that on site; however, the depth to bedrock appears to be deeper away from the site and further into the center of the River.

The sediment overburden consists of a generally thick layer of fluffy black marine sediment which is underlain by an overburden consisting of a silt layer with varying

amounts of sand and clay, which is generally followed by a sand layer, and then by a clay layer.

Site Hydrogeology

In general, groundwater 5-15 feet bgs). The nearest surface water body to the site is the Harlem River, which abuts the site to the east across FDR Drive. Figure 6 shows a water table elevation map constructed based on the fluid level measurements obtained from the five on-site monitoring wells. As this water table map shows, groundwater flow beneath the site is to the southeast toward the Harlem River.

Field parameters and analytical results from groundwater sampling show relatively elevated conductivity and elevated sodium concentrations. These elevated concentrations indicate that the groundwater at the site is brackish and would not be considered potable.

1.3 SUMMARY OF REMEDIAL INVESTIGATION FINDINGS

A Remedial Investigation (RI) was performed to characterize the nature and extent of contamination at the site. The results of the RI are described in detail in the following reports:

- ENSR, 2004. East 115th Street Former MGP Remedial Investigation. Document # 018690055-0400, dated June 2004. Consolidated Edison Company of New York, NY, Astoria, New York.
- ENSR, 2005. Supplemental Remedial Investigation Report, East 115th Street Former MGP, NYDEC Site #V00540-2, dated June 2005. Consolidated Edison Company of New York, NY, Long Island City, New York.

Generally, the RI determined that MGP residuals are present in soil, groundwater, and in the sediments of the Harlem River. Subsurface soil and groundwater impacts cover an approximately 2-acre area on the site and MGP impacts are present in deep sediments (between 14 and 27 feet below the sediment surface) over an approximately 2.8-acre area of the Harlem River. The primary dissolved phase constituents present in the groundwater and soil are organic compounds. Non-aqueous phase liquid (NAPL) is present primarily underneath the school building and, to a lesser extent, in the area between the southern portion of the school building and Harlem River. Indoor air testing has confirmed that under current conditions there appears to be no impact of MGP residuals on the indoor air quality inside the School building.

Potential sources include NAPL in one of the former gas holders, other potential NAPL sources associated with the MGP process in the general area of the gas holder, and purifier waste. NAPL was not observed until the water table depth (approximately 5-15 feet bgs) in areas of the site around and downgradient of the gas holder containing NAPL and, therefore, appears to have migrated to these areas (Figure 7) as subsurface flow. Dissolved phase and NAPL migration are potential transport mechanisms at the site. Groundwater at the site discharges to the Harlem River, which is located downgradient and adjacent to the site.

NAPL impacts were also observed at depth (14 to 27 feet) in sediments adjacent to the site. It appears that the NAPL migrated from the site to this area in the subsurface. NAPL and dissolved phase migration are potential transport mechanisms for NAPL within the sediments adjacent to the site, although on-going discharge of NAPL into the Harlem River is unlikely.

Below is a summary of site conditions when the RI was performed in 2003 and 2004. RI sample locations are provided in Figure 8.

1.3.1 Soil and Sediments

Surface soil sample results show low levels of polycyclic aromatic hydrocarbons (PAHs) and inorganics at concentrations above NYSDEC Recommended Soil Cleanup Objectives (RSCOs) (NYSDEC, 1994). These constituents appear to be related to urban background conditions and not related to former MGP operations.

Soils in the northeastern and northwestern portions of the property located between the school building and Pleasant Avenue and East 116th Street do not appear to have been significantly impacted by MGP residuals. Also, concentrations of total volatile organic compounds (VOCs) and total PAHs were below the NYSDEC RSCOs in the southwestern corner of the site

In the southern and eastern portions of the site, between the school building and the FDR Drive and downgradient of the large gas holder the analytical results indicate that there is a slight, primarily PAH impact present in the subsurface soils located above the water table. The absence of visual or olfactory impacts, i.e., sheen, odor, NAPL or elevated photo-ionization detector (PID) readings, in the soils above the water table, indicate that these impacts are likely associated with the historic fill that was found to be present across the site.

Figure 7 shows the approximate extent of NAPL observed at the site. NAPL has been observed between the school building and FDR Drive starting at the water table and extending to the first confining unit or bedrock. In the southern portion of the site where a clay layer is present and in the eastern portion of site where a peat/silty layer is present, NAPL is confined above these layers. In a limited area in the central portion of the site where a confining layer is not present, NAPL has been observed directly above bedrock. NAPL impacts also extend into the Harlem River. Soils beneath the school building in and near MGP structures (see Table 1) have been impacted by NAPL and show elevated levels of VOCs and semi-volatile organic compounds (SVOCs).

Concentrations of benzene, toluene, ethylbenzene and xylenes (BTEX) and PAHs in sediment samples collected below the visually impacted intervals were either below the NYSDEC Soil Screening Criteria (SSC), or significantly lower than those detected in the visually impacted zone, thus indicating that the vertical extent of the MGP impacts has generally been established. In addition, total PAH concentrations were below the Effects Range-Medium (ERM) guidance value (NYSDEC, 1999a) in most of the perimeter and deepest sediment samples with the exception of three perimeter locations and the three deepest samples.

The depth of the MGP impacts observed in the river sediments ranged from 14 feet to 27 feet below the sediment/water interface. The MGP impacts are, therefore, present below the biologically active zone and are not impacting potential ecological receptors and NAPL release to surface water is not anticipated under ambient conditions.

1.3.2 On-Site and Off-Site Groundwater

Groundwater in the area of the Site is not used for drinking water and, based on the conductivity of the water and elevated sodium concentrations, is brackish and would not be considered potable. Groundwater samples were collected from the five wells constructed at the site. Typical organic MGP constituents were not detected in the two upgradient wells MW- 1 and MW-5 at concentrations above the NYSDEC Water Quality Standards (WQS). However, non-MGP- related VOCs (1, 2-dichloroethene, acetone, carbon disulfide, chloroform, methylene chloride (MW-1 only), tetrachloroethene, and trichloroethene) were detected in both of these wells. Tetrachloroethene was detected in MW-1 at a concentration above the WQS. Cyanide was detected in only one of the upgradient wells at the WQS. Other inorganics (iron, manganese, and sodium) were also detected in these upgradient wells.

Organic constituents typically associated with former MGP operations, BTEX and PAHs were detected in all of the downgradient wells at concentrations above the WQS. Cyanide was detected in two of the downgradient wells, but at concentrations below the WQS. Additional inorganics (iron, magnesium, manganese and sodium) were also detected in one or more of the wells located downgradient of the former MGP operations.

The well gauging results to date indicate that NAPL has not accumulated in any of the on-site monitoring wells since they were installed in 2003. However, a NAPL sheen was observed during well development, and a small bead of NAPL was observed on the measuring tape during gauging of MW-2 on two occasions.

Visual MGP impacts (tar, sheen, globules, and stain) were observed in the sediments within a portion of the Harlem River adjacent to the site. These impacts are limited to an area approximately 180 feet by 680 feet beneath the western shoal of the river at depths ranging between 14 and 27 feet below the sediment surface. The thickness of NAPL-impacted sediments ranged from 0.25 feet at the downstream (southern) end of the area sampled to 4.3 feet at the upstream (northern) end of the area sampled.

1.3.3 On-Site and Off-Site Soil Vapor

Prior to and during the RI investigations, three rounds of indoor air sampling were conducted in the school building. Samples were collected in the school's basement and on the school's first floor. The results of the indoor air sampling indicate that low levels of VOCs were present in the indoor air and that the compounds detected appeared to have sources related to the routine cleaning and maintenance activities occurring within the building. Most of the VOCs that are possibly attributable to former MGP operations were detected in the indoor air samples at concentrations within the typical range of these compounds in indoor air (i.e., within the 90th percentile of NYSDOH background values). The results of the indoor air sampling events indicated no discernable MGP-related impacts in the indoor air in the school building.

Soil gas samples were collected during the RI in the western area of the site in the area of the former MGP gas holders. Four soil gas samples were collected inside the building, at approximately 2.5 feet below the slab, and one soil gas sample was collected outside the building, at approximately 5 feet bgs. Several hydrocarbons typically associated with petroleum products were present in the soil gas samples. Naphthalene, which may be typically (though not uniquely) associated with MGP sources, was notably absent or present in low concentrations in all of the soil gas samples. The soil gas

samples contained some VOCs that were clearly not MGP related and some VOCs that could be related to both non-MGP petroleum products and MGP-related materials. Some of the soil gas samples contained VOCs at concentrations (that could be related to both non-MGP petroleum products and MGP-related materials) that were an order of magnitude higher than typical values for indoor air.

Soil gas samples were also collected at four outdoor locations in order to evaluate the potential for MGP-impacted vapors to migrate off-site toward the residential buildings located along Pleasant Avenue to the northwest and East 116th Street to the northeast. The results of this soil gas sampling indicate that with the exception of naphthalene, soil gas samples did not contain any of the compounds included in the analysis that may be typically (though not uniquely) associated with MGP sources (naphthalene, indene, indan, or thiophene). Naphthalene was detected at low levels, below 6 $\mu g/m^3$ in both of the samples collected north of the building, along East 116th Street, and in one of the samples collected west of the building, along Pleasant Avenue. Other compounds that could be associated with MGP operations, including benzene, were detected in soil gas samples at low concentrations, close to the range of typical indoor air background values. Based on the low levels of the above compounds, and the distance to the buildings located across East 116th Street and Pleasant Avenue, the potential for subsurface MGP vapor intrusion into these buildings is considered low.

Additional indoor air and/or soil vapor sampling was conducted at the site during December 2007, February and August 2008, and February 2009 with the results and findings being consistent with past sampling events.

1.3.4 Underground Structures

The remaining underground structures related to the former MGP include two gas holders, remains of the purifier house, remains of tar wells, and various utilities (including a sewer main), see Figure 2. Removal of portions of these structures is planned as part of the overall site remedy.

1.4 SUMMARY OF PROPOSED REMEDIAL ACTIONS

The site will be remediated in accordance with NYSDEC-approved remedial design work plans (to be developed).

The following is a summary of the Remedial Actions proposed to be performed at the site:

1. Installation of a Barrier Wall (cut-off wall) and NAPL recovery system at the downgradient property boundary along the FDR Drive to contain NAPL.

2. Limited excavation in areas outside of the school building to remove NAPL and MGP structures above the water table. A general area in the southeast portion of the site has been identified for such excavation. The proposed excavation area will be further defined by test borings and/or test pits as part of the remedial design. In addition, any NAPL-impacted soils encountered during installation of the barrier wall would be excavated and removed off-site (limited excavation).

3. Installation of an active venting system for indoor air. After an active venting system has been installed and demonstrates effective depressurization of the sub-slab area, indoor air monitoring may be discontinued.

4. No action for sediments. Under current conditions, impacted sediments appear to be isolated and do not pose a risk to human or ecological receptors.

5. Establishment of ICs. These controls, among other things, assume implementation of a SMP. The SMP will include provisions to control any future development or maintenance activities requiring subsurface excavation or the extraction of groundwater at the site. These provisions, among other things, will include health and safety guidelines requiring that construction workers involved in this work have appropriate Occupational Safety and Health (OSHA) training as required in 29 CFR 1910.120 (Hazardous Waste Operation and Emergency Response) and that appropriate worker and community air monitoring be conducted. The SMP will include a soil management plan to govern future excavation activities at the site. The SMP will include a monitoring plan for groundwater, sediment, and indoor air (in the initial year of SSDS operation). An operation and maintenance plan for the engineering controls will also be part of the SMP to ensure that they are

functioning properly and have not been damaged so as to compromise its effectiveness. The SMP will also contain provisions for annual inspections of the site's ECs and ICs by a New York professional engineer or other designated environmental professional followed by filing annual certifications with the NYSDEC.

1.4.1 Engineering and Institutional Controls

Since remaining contamination is present at this site, ECs and ICs will be implemented (as described above) to protect public health and the environment for the applicable future use.

A series of ICs are required to implement, maintain and monitor these ECs. The Environmental Easement will require compliance with these ICs, to ensure that:

- All ECs must be operated and maintained as specified in the SMP;
- All ECs on the site must be inspected and certified at a frequency and in a manner defined in the SMP;
- Groundwater, soil vapor, and other environmental or public health monitoring must be performed as defined in the SMP;
- Data and information pertinent to Site Management for the Controlled Property must be reported at the frequency and in a manner defined in the SMP;
- On-site environmental monitoring devices, including but not limited to, groundwater monitoring wells and soil vapor probes, must be protected and replaced as necessary to ensure continued functioning in the manner specified in the SMP.

In addition, it is expected that the Environmental Easement will place the following restrictions on the property:

- Vegetable gardens and farming on the property will be prohibited except in facilities (e.g., greenhouses) that do not use site soil or groundwater;
- Use of groundwater underlying the property will be prohibited without treatment rendering it safe for the intended use;

- All future activities on the property that would disturb remaining contaminated material must be conducted in accordance with the Excavation Plan included in the SMP;
- The potential for vapor intrusion must be evaluated for any buildings developed on the site, and any potential impacts that are identified must be mitigated;
- The property may be used for its current use as a school, provided that the long-term ECs and ICs described in the SMP remain in use.

These EC/ICs are designed to:

- Prevent ingestion/direct contact with contaminated soil;
- Prevent inhalation of or exposure to contaminants volatilizing from contaminated soil;
- Prevent ingestion of groundwater with contaminant levels that exceed drinking water standards;
- Prevent contact with or inhalation of volatiles from contaminated groundwater;
- Restore groundwater to pre-disposal/pre-release conditions, to the extent practicable;
- Prevent the discharge of contaminants to surface water;
- Prevent contaminated groundwater from migrating off-site; and
- Prevent migration of contaminants that would result in off-site groundwater or surface water contamination.

2.0 ENGINEERING AND INSTITUTIONAL CONTROL PLAN

2.1 INTRODUCTION

2.1.1 General

Remedial activities completed at the site will be conducted in accordance with the NYSDEC-approved remedial design (RD) work plans for East 115th Street, Former MGP. The remedial goals included attainment of Track 4 Soil Cleanup Objectives (SCOs) for on-site soils for restricted use.

Since remaining contaminated soil, groundwater, soil vapor, and sediment will exist beneath/downgradient of the site, ECs and 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 proposed EC/ICs at the site. The EC/IC Plan is one component of the SMP and is subject to revision by NYSDEC.

2.1.2 Purpose

The purpose of this Plan is to provide:

- A description of all EC/ICs on the site;
- The basic operation and intended role of each implemented EC/IC;
- A description of the key components of the ICs created as to be stated in the Environmental Easement;
- A description of the features that should be evaluated during each periodic inspection and compliance certification period;
- A description of plans and procedures to be followed for implementation of EC/ICs, such as the implementation of an Excavation Plan for the safe handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site;

- Any other provisions necessary to identify or establish methods for implementing the EC/ICs required by the site remedy, as determined by the NYSDEC; and
- A description of the reporting requirements for these controls.

2.2 PROPOSED ENGINEERING CONTROLS

General remedial objectives of the proposed ECs are to provide protection of human health and the environment consistent with current and intended use of the property. Considering the use of the property as a school, conducting remedial activities and any intrusive work in the school area in a manner that will not endanger the public is of paramount importance. Two types of ECs are proposed: sub-slab depressurization system in the school basement and a barrier wall on the downgradient portion of the site.

2.2.1 Engineering Control Systems

2.2.1.1 Sub-slab Depressurization System (SSDS)

The SSDS remedial approach provides additional insurance that sub-slab vapors do not enter the building and that indoor air goals are met. The SSDS design contains the following elements:

- A series of extraction points to be installed beneath the basement floor;
- Piping runs from the extraction points to blowers;
- A series of pressure monitoring points beneath the basement floor;
- An automated control system and associated automated valves;
- An exhaust stack on the building roof; and
- A fully automated control, alarm, and reporting system.

General procedures for operating and maintaining the SSDS system are summarized in the Operation and Maintenance Plan (Section 4 of this SMP) and will be updated once the remedy is approved by NYSDEC and implemented. General procedures for monitoring the system are included in the Monitoring Plan (Section 3 of this SMP) and will be updated once the remedy is approved by NYSDEC and implemented. The Monitoring Plan will also address severe condition inspections in the event that a severe condition, which may affect controls at the site, occurs.

2.2.1.2. Barrier Wall and NAPL Recovery System

Installation of a Barrier Wall is a remedial technology capable of isolating the NAPL-impacted soils and containing the potential further migration of NAPL. A Barrier Wall (cut-off wall) and NAPL recovery system at the downgradient property boundary is proposed to be located along the FDR Drive as shown in Figure 9. This Barrier Wall would control the potential off-site migration of NAPL towards the Harlem River.

The technology includes vertical barriers, such as water-tight sheet piling or a slurry wall (cement wall), to form a barrier against migration. It is expected that the bottom of the wall would have to be keyed into a low permeability unit to prevent migration under the wall. The Barrier Wall would be approximately 520 feet long and 30 to 40 feet deep. NAPL recovery sumps completed to 30 to 40 feet deep would also be installed to collect NAPL. Any accumulated NAPL would be periodically removed from the NAPL collection wells and sent off-site for treatment at a permitted facility.

General procedures for operating and maintaining the Barrier Wall and NAPL Recovery Well System are briefly summarized in the Operation and Maintenance Plan (Section 4 of this SMP) and will be updated once the remedy is approved by NYSDEC and installed. General procedures for monitoring the system are included in the Monitoring Plan (Section 3 of this SMP) will be updated once the remedy is approved by NYSDEC and installed. The Monitoring Plan also addresses severe condition inspections in the event that a severe condition, which may affect controls at the site, occurs.

2.2.2.1 Sub-slab Depressurization System (SSDS) Duration

The active SSDS will not be discontinued unless prior written approval is granted by the NYSDEC. In the event that monitoring data indicates that the SSDS is no longer required, a proposal to discontinue the SSDS will be submitted by the system owner and/or operator to the NYSDEC and NYSDOH.

2.2.2.2. Barrier Wall and NAPL Recovery System Duration

Operation of NAPL Recovery Wells would not be discontinued until NAPL was no longer present. In the event that monitoring data indicates that NAPL Recovery is no longer required, a proposal to discontinue NAPL recovery will be submitted to the NYSDEC. The Barrier Wall is not expected to require inspections and will remain in place indefinitely.

2.3 PROPOSED INSTITUTIONAL CONTROLS

A series of ICs will be required by the Remedial Decision Document to: (1) implement, maintain and monitor EC systems; (2) prevent future exposure to remaining contamination by controlling disturbances of the subsurface contamination; and, (3) limit the use and development of the site to its current uses only. Adherence to these ICs on the site will be required by the Environmental Easement and will be implemented under the Site Management Plan. These ICs are expected to include:

- Compliance with the Environmental Easement by the Grantor and the Grantor's successors and assigns with all elements of the SMP;
- All ECs must be operated and maintained as specified in the SMP;
- All ECs on the Controlled Property must be inspected and certified at a frequency and in a manner defined in the SMP.
- Soil vapor and other environmental or public health monitoring must be performed as defined in the SMP;
- Data and information pertinent to Site Management for the Controlled Property must be reported at the frequency and in a manner defined in the SMP;
- On-site environmental monitoring devices, including but not limited to, groundwater monitoring wells and soil vapor probes, must be protected and replaced as necessary to ensure the devices function in the manner specified in this SMP.
- For impacted sediments, institutional controls may include dredging restrictions, and structural maintenance controls.
- ICs may not be discontinued without an amendment to or extinguishment of the Environmental Easement.

The site will have a series of ICs in the form of site restrictions. Adherence to these ICs will be required by the Environmental Easement. Site restrictions that are expected to apply to the Controlled Property are:

- Vegetable gardens and farming, including cattle and dairy farming, on the property will be prohibited; however, gardening in structures that do not contact site soil or groundwater are allowable;
- The use of the groundwater underlying the property will be prohibited without treatment rendering it safe for intended purpose;
- All future activities on the property that will disturb remaining contaminated material will be prohibited unless they are conducted in accordance with the SMP;
- The potential for vapor intrusion must be evaluated for any buildings developed on the site, and any potential impacts that are identified must be mitigated;
- The property may only be used for its current use as a school provided that the long-term ECs and ICs included in the SMP are employed.
- The property may not be used for a less restrictive use, such as unrestricted or restricted residential use without additional remediation and amendment of the Environmental Easement by the Commissioner of NYSDEC.
- The site owner or remedial party will submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls employed at the Controlled Property are unchanged from the previous certification 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 SMP. NYSDEC retains the right to access such Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow and will be made by an expert that the NYSDEC finds acceptable.

2.3.1 Soil Vapor Intrusion Evaluation

Prior to the construction of any enclosed structures over areas that contain remaining contamination, a soil vapor intrusion (SVI) evaluation will be performed to determine whether any mitigation measures are necessary to eliminate potential exposure

to volatile organic vapors in the proposed structure. Alternatively, an active sub-slab depressurization system could be installed as an element of the building foundation without first conducting an investigation. Any alternative system would need to be approved by the NYSDOH and NYSDEC. 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 will be forwarded to the NYSDEC and NYSDOH for initial review and interpretation. Upon validation, the final data will be transmitted to the agencies, along with a recommendation for follow-up action, such as mitigation. Validated SVI data will be transmitted to the property owner within 30 days of validation.

SVI sampling results, evaluations, and follow-up actions will also be summarized in the next Periodic Review Report.

2.4 SOIL MANAGEMENT PLAN

The proposed site remedy allows for the continued use of the site as a school. Any future intrusive work that will penetrate, encounter or disturb the remaining contamination will be performed in compliance with the Soil Management Plan. Intrusive construction work must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) to be prepared for the site. A sample HASP will be attached as Appendix B to this SMP that is in current compliance with DER-10, and 29 CFR 1910, 29 CFR 1926, and all other applicable Federal, State and local regulations once the proposed site remedy has been approved and implemented.

Intrusive activities include, but are not limited to:

- Any excavation work;
- Any work that involves pumping or handling of groundwater; and

- Any work that involves cutting thorough the basement floor of the existing building.

For all invasive projects, site workers and managers must be informed of the possible presence of MGP related materials and provided with instructions on identification of MGP materials. Based on the location and nature of the work planned, the property owner will determine if an OSHA-trained Site Supervisor and HAZWOPER workers are needed to complete the work.

Based on future changes to State and federal health and safety requirements, and specific methods employed by future contractors, the HASP and CAMP (to be developed) will be updated and re-submitted with the notification provided in Section 2.5 below. Any intrusive construction work will be performed in compliance with the Soil Management Plan, HASP and CAMP, and will be included in the periodic inspection and certification reports submitted under the Reporting Plan (see Section 2.6).

The property owner and associated parties preparing the remedial documents submitted to the State, and parties performing this work, are completely responsible for the safe performance of all invasive work, the structural integrity of excavations, and for structures that may be affected by excavations (such as building foundations and bridge footings).

The property owner will ensure that site development activities will not interfere with, or otherwise impair or compromise, remedial activities proposed in this Remedial Design Work Plan(s).

During excavation it is the responsibility of the contractor/property owner representative to identify potentially impacted materials. The contractor/property owner may contact Con Edison or NYSDEC during site work to assist in assessing material that may contain MGP impacts. MGP impacts typically consist of soil and/or groundwater impacted with VOCs, PAHs, and in some cases cyanide. One of the primary by-products of MGP operations was coal tar, which is similar in composition to asphalt. Coal tar typically has a high viscosity, may be solid or semi-solid and may be heavier or lighter than water. Tar is usually brown or black but may also have a reddish tint. Cinders/ash from coal combustion may also be present in some areas. A limited amount of lime filter material, which would appear as a white/grey material, is present in some areas. Other

filter materials such as wood chips and oxides may be present. Potential colors for filter materials include white, blue, and orange. Cinders, lime, and other filter materials may have elevated levels of metals. Lime may exhibit a high pH. MGP impacts at the site range from soil/groundwater impacted with free phase coal tar to minor soil impacts. Example photographs of MGP materials are provided as Appendix C.

There are several typical signs of the potential presence of MGP residuals within an open excavation, including: soil that is stained (black or bright blue), rainbow sheen on the surface of the groundwater, and/or a characteristic odor, which has been described as mothball-like. To be identified as MGP impacted, soil should exhibit both visual and olfactory signs. Also, soil can be placed in a glass jar or zip-lock bag and the headspace tested with a Photo-Ionization Detector (PID). While PID results may exceed 100 parts per million when MGP residuals are present, low PID readings should not be interpreted as an absence of MGP residuals. Soil should be placed on plastic sheeting if it appears to be impacted. Laboratory testing would then be used to confirm the presence of MGP materials.

Asbestos containing pipe materials have been previously identified at the site. Therefore, the contractor/property owner should be aware of the possible presence of asbestos. Asbestos identification, sampling and handling should be conducted in accordance with applicable regulations.

Each hotspot and structure requiring remediation during site development activities (USTs, vaults and associated piping, transformers, etc.) will be removed and end-point sampling completed for documentation purposes before excavations related to site development commence proximal to the hotspot or structure.

Mechanical processing of historical fill and contaminated soil on-site is prohibited.

All primary contaminant sources (including but not limited to tanks and hotspots) identified during site Characterization, Remedial Investigation, and Remedial Action will be surveyed by a surveyor licensed to practice in the State of New York. The survey information will be shown on maps to be reported in the Annual Periodic Review Report.

Soil management methods approved as part of the final Remedial Design Work Plans/Reports will be added to this section.

2.4.1 Notification

At least 10 days prior to the start of any activity that is reasonably anticipated to encounter remaining contamination, the site owner or their representative will notify the Department. Currently, this notification will be made to:

William Ottaway, P.E.

New York State Department of Environmental Conservation, Remedial Bureau C, 11th Floor, 625 Broadway, Albany, NY

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent, plans for site re-grading, intrusive elements or utilities to be installed below the soil cover, or any work that may impact an engineering control,
- 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 statement that the work will be performed in compliance with the Soil Management Plan and 29 CFR 1910.120,
- A copy of the contractor's health and safety plan, in electronic format,
- Identification of disposal facilities for potential waste streams,
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

2.4.2 Soil Screening Methods

Visual, olfactory and instrument-based soil screening will be performed by a qualified environmental professional during all remedial and development excavations

into known or potentially contaminated material (remaining contamination). Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the COC.

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 with MGP residuals derived from excavation or other invasive activities will be containerized in appropriate containers (55-gallon steel drums, 20-cubic yd roll off containers, Baker tanks, tanker trucks). Containers will be properly labeled. The property owner/contractor should coordinate with the shipping company and disposal facility to assure 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 debris (C&D) material, including PPE, which has been in contact with impacted soil and/or groundwater will be containerized, as well.

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

2.4.3 Stockpile Methods

Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by NYSDEC.

2.4.4 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 material.

The owner of the property and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan.

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

A truck decontamination pad will be operated on-site. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the site until the activities performed under this section are complete.

Loaded vehicles leaving the site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site soil tracking.

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. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

2.4.5 Materials Transport Off-Site

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

All truck tires and other potentially impacted surfaces will be washed prior to leaving the site. Truck wash waters will be collected and disposed of off-site in an appropriate manner.

Truck transport routes will be identified that will: (a) limit transport through residential areas and past sensitive sites; (b) use city-mapped truck routes; (c) minimize off-site queuing of trucks entering the facility; (d) limit total distance to major highways; and (e) promote safety in access to highways.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project site. Egress points for truck and equipment transport from the site will be kept clean of dirt and other materials during site remediation and development.

Due to limited available space at the site, some off-site queuing of trucks may be necessary. The number and duration of trucks lined up outside the site entrance will be minimized through efficient scheduling and staging at a remote location.

2.4.6 Materials Disposal Off-Site

All waste generated at the site will be transported and disposed of in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of soil/fill from this 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 site will not occur without formal NYSDEC approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation 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 Periodic Review 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 pursuant to 6NYCRR Part 360-1.2. Material that does not meet the lower of the SCOs for residential use or groundwater protection will not be taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility) without a beneficial use determination issued by NYSDEC.

2.4.7 Materials Reuse On-Site

Chemical criteria for on-site reuse of material will be approved by NYSDEC included in the SMP in following implementation of the remedy. The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for re-use on-site will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, 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.

2.4.8 Fluids Management

All groundwater extracted from the site should be presumed to be impacted with MGP residuals. Extracted water should be containerized. Laboratory testing of groundwater to determine an appropriate disposal method is necessary.

The depth from ground surface to groundwater ranges from 5 to 10 feet. Groundwater may be impacted with volatile organic compounds (primarily naphthalene, benzene, toluene, xylenes, tetrachloroethene, and dichlorobenzenes), semi-volatile compounds, and low levels of metals and cyanide. In some locations, a separate-phase oily liquid may be encountered. Soil excavation into the water table or other work that requires management of groundwater will require a groundwater management plan. Prior to the start of invasive work, the property owner/contractor must determine how groundwater will be extracted (pumps and transfer lines), how groundwater will be stored on site, and how groundwater will be disposed of. The proposed extraction system must be designed to minimize the potential for spills. Tanks to store extracted water must be in a secure location, inspected for leaks, and include spill containment. For most projects, water will be stored on site, tested, and sent for off-site disposal. The property owner/contractor is responsible for arranging appropriate off-site transport and disposal of impacted water.

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, but will be managed off-site.

Off-site disposal of liquids is the most likely approach for the site. However, if a large volume of groundwater is generated from a dewatering project and off-site disposal is impractical, discharge to surface waters (i.e. a local pond, stream or river) will be performed under a State Pollutant Discharge Elimination System (SPDES) permit. Such a discharge will likely require pretreatment of the groundwater before discharge.

2.4.9 Cutting into the Basement Floor

Vapors associated with MGP materials are present beneath the basement floor. The concrete floor is between 8 and 12 inches thick. The floor provides an effective vapor barrier. Construction projects that may compromise integrity of the floor should be avoided or conducted in a manner to assure the floor is resealed. The property owner/contractor should first try to design the project to avoid any cutting or perforation of the floor. If cutting thorough the floor is unavoidable, at a minimum the following procedures should be followed during the project.

Asbestos and/or lead paint may be present in tile, mastic and other flooring materials. The property owner/contractor is responsible for identifying asbestos and lead materials and taking appropriate abatement actions.

Prior to cutting into the floor the contractor should secure the work area. While work is on-going and until the floor has been resealed, no public access to the area should be allowed. The plan for cutting the floor should include dust control measures such as use of water for coring machines. Air monitoring using a PID should be conducted prior to, during, and after cutting into the basement floor. Ideally, any hole thorough the floor should be permanently sealed as quickly as possible. If holes cannot be permanently sealed right away, they should be temporarily plugged with an expansion plug or other means to prevent vapor intrusion.

Floor materials and any soil removed from underneath the floor should be immediately placed in air tight containers. These materials should be tested and then sent for off-site disposal.

Once the project is complete the floor must be repaired with a durable, long lasting/permanent and vapor tight seal.

2.4.10 Equipment Decontamination

All hand tools and heavy equipment that comes in contact with impacted material should be decontaminated at the end of the work shift, day, prior to 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 decontamination should be properly monitored.

2.4.11 Backfill from Off-Site Sources

All materials proposed for import onto the site will be approved by the qualified environmental professional and will be in compliance with provisions in the SMP, applicable regulations (6NYCRR 375-6.7(d)) and guidance (DER-10) prior to receipt at the site.

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

All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d). Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, the resulting soil quality standards for imported backfill are listed in Table 2. Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this site, will not be imported onto the site without prior approval by NYSDEC. Solid waste will not be imported onto the site.

Trucks entering the 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.

Specific procedures to be followed for the use of backfill from other sources will be developed upon approval and implementation of the remedy. The following topics will be covered:

- Source area approval process
    - Sources of backfill material
        - Past use of site
        - Source area background check

        - DOT Certification
    - Chemical sampling
        - Analytes
        - Frequency
    - Imported Soil Chemical Quality Standards
        - Applicability of protection of groundwater SCOs
        - Applicability of protection of ecological resources SCOs
- Procedure for determining if reuse is appropriate
    - Sampling (methods and analytical)
- Stockpile procedures for imported backfill material
    - Size of stockpiles, cover, etc.

Once the design work plans are approved by NYSDEC, these procedures will be added to this Conceptual SMP.

2.4.12 Stormwater Pollution Prevention

A Stormwater Pollution Prevention Plan will be developed for any future development activities and will conform to the requirements of NYSDEC Division of Water guidelines and NYS regulations and included as Appendix D. As part of the Stormwater Pollution Prevention Plan, the following measures will be implemented:

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. 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.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters

Silt fencing or hay bales will be installed around the entire perimeter of the remedial construction area.

2.4.13 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 sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment 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 (TAL metals; 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 this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified 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 NYSDEC spills hotline. These findings will be also included in daily and periodic electronic media reports.

2.4.14 Community Air Monitoring Plan

A Community Air Monitoring Plan (CAMP) will be developed prior to implementation of any post-remedial subsurface excavations. The CAMP will contain a map showing the locations of air sampling stations based on 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.

The Site Supervisor or their designee will be responsible for monitoring the workers for inhalation hazards as well as for the implementation of the CAMP. VOCs from MGP/petroleum impacted material may pose a health hazard to the workers and community. Proper worker and community air monitoring programs are necessary. Equipment typically used to detect VOCs is a PID equipped with a 10.2 or 10.6 eV lamp. The air monitoring program for worker and community protection will be included in the project-specific HASP.

The contractor will monitor air quality for VOCs and particulate matter within the excavation to document that conditions are appropriate for the safe operation of cutting tools/torches, and that concentrations of MGP/petroleum constituents are below the acceptable levels established by OSHA, as defined in the project-specific HASP. In the event that concentrations are found to be above acceptable limits, the Site Supervisor and contractor/property owner representative shall investigate and implement appropriate options for completing the work in a safe manner (e.g., use of engineering controls and/or respiratory protection).

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers.

2.4.15 Odor Control Plan

An odor control plan capable of controlling emissions of nuisance odors off-site and on-site will be developed prior to implementation of any post-remedial subsurface excavations. Specific odor control methods to be used on a routine basis will include reducing the exposed impacted area through sequenced excavation or plastic sheeting and use of available odor/vapor suppressant foams and sprays if airborne VOCs are found to be above acceptable levels.

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 project. Implementation of all odor controls, including the halt of work, is the responsibility of the property owner and/or contractor, and any measures that are implemented will be discussed in the Periodic Review Report.

All necessary means will be employed to prevent on- and off-site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

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 handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

2.4.16 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 though 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.

2.4.17 Other Nuisances

A plan will be developed and utilized by the contractor for any post-remedial excavation activities work to ensure compliance with local noise control ordinances.

2.5 INSPECTIONS AND NOTIFICATIONS

2.5.1 Periodic Inspections

Periodic inspections of all remedial components installed at the site will be conducted at the frequency specified in SMP Monitoring Plan schedule. A comprehensive site-wide inspection will be conducted annually, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of the SMP and the Environmental Easement;
- Achievement of remedial performance criteria;
- Sampling and analysis of appropriate media during monitoring events;
- 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 the SMP (Section 3), using the Site-Wide Inspection Form which will be developed following site remedy implementation and included in Appendix E. The reporting requirements are outlined in the Reporting Plan (Section 2.6).

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 to verify the effectiveness of the EC/ICs implemented at the site by a qualified environmental professional as determined by NYSDEC.

2.5.2 Notifications

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

- 60-day advance notice of any proposed changes in site use that are required under the terms of the 6NYCRR Part 375, and/or Environmental Conservation Law.
- 10-day advance notice of any proposed ground-intrusive activities.
- 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.
- Notice within 48-hours 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 site, including a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
- 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.

Notifications will be made to William Ottaway, P.E., 518-402-9686E-mail: wsottawa@gw.dec.state.ny.us, New York State Department of Environmental Conservation, Remedial Bureau C, 11th Floor, 625 Broadway, Albany, NY.

In the event that NYSDEC develops a centralized notification system, that system will be used instead.

2.5.3 Evaluation and Reporting

The results of the inspection and site monitoring 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;
- Operation and maintenance activities are being conducted properly; and, based on the above items,
- The site remedy continues to be protective of public health and the environment and is performing as designed in the Remedial Design Work Plan and Final Engineering Report (FER).

2.6 REPORTING PLAN

2.6.1 Introduction

A Periodic Review Report will be submitted to NYSDEC every year, beginning one year after the Certificate of Completion is issued. The Periodic Review Report will be prepared in accordance with NYSDEC DER-10 "Technical Guidance for Site Investigation and Remediation". The frequency of submittal of the Periodic Review Report may be modified with the approval of the NYSDEC.

This report will include the following:

- Identification of all EC/ICs required by the Remedial Design Work Plans for the site;
- An assessment of the effectiveness of all ICs and ECs for the site;
- An evaluation of the EC and IC Plan and the Monitoring Plan for adequacy in meeting remedial goals;
- Results of the required annual site inspections and severe condition inspections, if any;
- A compilation of all deliverables generated during the reporting period, as specified in Section 2 EC/IC Plans, Section 3 Monitoring Plan and Section 4 Operation and Maintenance Plan; and
- Certification of the EC/ICs.

2.6.2 Certification of Engineering and Institutional Controls

Inspection of the EC/ICs will occur at the frequency described in Section 3 (Monitoring Plan) and Section 4 (Operation and Maintenance Plan). After the last inspection of the reporting period, a Professional Engineer licensed to practice in New York State depending on the need to evaluate engineering systems will prepare a Periodic Review Report which certifies that:

- On-site ECs/ICs are unchanged from the previous certification;
- They remain in-place and are effective;

- The systems are performing as designed;
- Nothing has occurred that would impair the ability of the controls to protect the public health and environment;
- Nothing has occurred that would constitute a violation or failure to comply with any operation and maintenance plan for such controls;
- Access is available to the site by NYSDEC and NYSDOH to evaluate continued maintenance of such controls; and
- Site use is compliant with the environmental easement.

2.6.3 Periodic Review Report

A Periodic Review Report will be submitted every year, beginning one year after the Certificate of Completion is issued. The frequency of these reports may be reduced in subsequent years if approved by NYSDEC. The report will be submitted within 45 days of the end of each certification period. Other reports, such as validated indoor air, groundwater and soil vapor monitoring data, may be submitted, as determined by NYSDEC thereafter. Media sampling results will also incorporated into the Periodic Review Report. The report will include:

- EC/IC certification;
- All applicable inspection forms and other records generated for the site during the reporting period;
- 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 (indoor air, groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data sufficient for the Department to evaluate 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;

- A performance summary for all treatment systems at the site during the calendar year, including information such as:
    - The number of days the system was run for the reporting period;
    - A description of breakdowns and/or repairs along with an explanation for any significant downtime;
    - A description of the resolution of performance problems;
    - A summary of the performance and/or effectiveness monitoring; and
    - Comments, conclusions, and recommendations based on data evaluation.
- A site evaluation, which includes the following:
    - The compliance of the remedy with the requirements of the site-specific Decision Document;
    - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;
    - Any new conclusions or observations regarding site 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 Periodic Review Report will be submitted, in hard-copy format, to the NYSDEC Regional Office located closest to the site, and in electronic format to NYSDEC Central Office and the NYSDOH Bureau of Environmental Exposure Investigation.

3.0 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 contamination at the site. ECs at the site include: SSDS and Barrier Wall. This Monitoring Plan may only be revised with the approval of NYSDEC.

3.1.2 Purpose and Schedule

This Monitoring Plan describes the methods to be used for:

- Sampling and analysis of appropriate media (e.g., groundwater, indoor air, soil vapor);
- Assessing compliance with NYSDEC groundwater standards, Part 375 SCOs, and soil vapor intrusion guidelines;
- Assessing compliance with discharge or effluent limits;
- Assessing achievement of the remedial performance criteria;
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment; and
- Preparing the necessary reports for the various 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.

It is anticipated that monitoring of the performance of the remedy and overall reduction in contamination on-site and off-site will be conducted as provided in Table 3 below. The frequency will be determined by NYSDEC following approval and implementation of the remedy. Trends in contaminant levels and/or conditions of air, sediment, and/or groundwater in the affected areas, will be evaluated to determine if the remedy continues to be effective in achieving remedial goals. Monitoring programs for environmental media are summarized in Table 3 and outlined in detail in Sections 3.2 through 3.5 below.

Table 3: Media Monitoring Schedule

Monitoring Program	Frequency*	Matrix	Analysis
SSDS	Semi-annually for first year of system operation to verify effectiveness of system	Indoor Air/Soil Vapor	VOCs
Barrier Wall/NAPL Recovery Wells	For presence of NAPL: monthly for the first year. Subsequent frequency to be determined. For VOCs and SVOCs, annual sampling for first five years, Subsequent frequency to be determined.	Groundwater	Presence of NAPL (visual); VOCs/SVOCs

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

3.2 GROUNDWATER MONITORING PROGRAM

Groundwater monitoring will be performed on a periodic basis to assess the performance of the remedy.

3.2.1 Monitoring/NAPL Recovery System Design

A network of monitoring wells/NAPL recovery wells will be installed to supplement the existing site wells in order to monitor groundwater conditions up-gradient and down-gradient of the proposed Barrier Wall at the site and to recover NAPL upgradient of the Barrier Wall. The network of wells will be designed to show water levels and flow patterns following implementation of the proposed Barrier Wall remedy.

Monitoring well network and baseline post remedial groundwater conditions will be presented in figures and well construction logs will be included in Appendix F to the SMP following approval and implementation of the remedy.

3.2.2 Groundwater Monitoring Schedule

The monitoring frequency will be established that may be modified with the approval NYSDEC. It is anticipated that the monitoring wells and recovery wells will be monitored for water level elevations and presence or absence of NAPL monthly during the first year, and then at a frequency to be determine based on initial results. If NAPL is present it will be removed following the inspection/monitoring event.

The SMP will be modified to reflect changes in sampling plans approved by NYSDEC.

Deliverables for the groundwater monitoring program are specified below.

3.2.3 Monitoring Event Protocol

All groundwater monitoring activities will be recorded in a field book and groundwater sampling log presented in Appendix G. 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.

Well gauging will be conducted in accordance with the standard operating procedures included in Appendix G.

3.3 MONITORING WELL REPAIRS, REPLACEMENT AND DECOMMISSIONING

If biofouling or silt accumulation occurs in the monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced (as per the Monitoring Plan), if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed 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 available location, unless otherwise approved by the NYSDEC.

3.4 SEDIMENT MONITORING (NO ACTION)

MGP impacts to sediments are well below the sediment surface and present no likely exposures. Limited monitoring to confirm that current conditions do not change may be proposed as part of the final design. The sediment monitoring plan, if any, will be developed following approval and implementation of the remedy and included in the SMP.

3.5 INDOOR AIR/SOIL VAPOR MONITORING

The scope of work for the indoor air sampling will consist of a building inspection and associated observations and field measurements, followed by collection of indoor air samples, sub-slab vapor samples, and ambient air samples for laboratory analyses.

Sampling is anticipated to be conducted semi-annually during the first year after installation of the sub-slab depressurization system in order to confirm its effectiveness. In addition to this confirmation sampling, additional sampling of indoor air and soil vapor would be required if the slab or depressurization system are compromised or if activities on or near the site significantly impact soil vapor intrusion parameters. This additional sampling would be completed in accordance with NYSDOH and NYSDEDC guidance in effect at that time. All of the activities will be performed in accordance with the Work Plan for Additional Soil Vapor Intrusion Assessment (Con Edison, February 2008), the Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, October 2006), and the existing QAPP and Health and Safety Plan (HASP, as revised in 2005) originally presented in the Remedial Investigation 115th Street Former MGP Work Plan (ENSR, 2003). The Work Plan for Additional Soil Vapor Intrusion Assessment is provided in Appendix H.

Additionally, if damage to the basement floor is observed or activities that may promote subsurface vapor intrusion are planned, indoor air and, if appropriate, sub-slab vapor samples will be collected for laboratory analysis from the respective area.

3.6 MONITORING QUALITY ASSURANCE/QUALITY CONTROL

All sampling and analyses will be performed in accordance with the requirements of the QAPP which will be prepared for the site following approval and implementation of the remedy and included as Appendix I. Main components of the QAPP will include:

- QA/QC Objectives for Data Measurement;
- Sampling Program:
    - Sample containers will be properly washed, decontaminated, and appropriate preservative will be added (if applicable) prior to their use by the analytical laboratory. Containers with preservative will be tagged as such.
    - Sample holding times will be in accordance with the NYSDEC 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 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;
- Corrective Action Measures.

3.7 ENGINEERING CONTROL SYSTEM MONITORING

3.7.1. Building Slab Monitoring

The concrete building slab limits exposure to any existing remaining contamination under the building as described in the Engineering and Institutional Control Plans.

3.7.1.1 Inspection Schedule

Periodic inspections of the conditions of the interior concrete slab in the basement of the school will be conducted, with the frequency to be established following approval

and implementation of the remedy. These inspections/ walk-throughs may be conducted by the school custodian or some other site owner representative. The purpose of these walk-throughs is to identify any changes in the basement interior floor surfaces. Results of the walk-throughs will be documented in a logbook maintained at the school. In the event of a change of conditions, the custodian will log the information and immediately request an inspection from DOE. DOE will conduct a follow-up inspection and generate a report of findings and recommendations.

The inspections will address the following:

- Are there any projects that involve cutting into the basement floor being conducted? If so is this work being conducted under the supervision of a remediation engineer and in accordance with the Site Management Plan?

- Have new cracks or other obvious defects/damage to the floor appeared since the last inspection?

The custodian will be provided with appropriate training for these inspections. The custodian will have a point of contact at Department of School Facilities to call if there are questions or to report a change of conditions.

Inspection frequency, once established will be subject to change with the approval of the NYSDEC. Unscheduled inspections may take place when a suspected breach of the building slab has been reported or an emergency occurs that is deemed likely to affect the operation of the system. Monitoring deliverables for the cover inspections are specified later in this Plan.

3.7.2. Sub-slab Depressurization System

A sub-slab depressurization system (SSDS) will be installed to mitigate potential soil vapor intrusion into the building. The proposed system design is described in the Engineering and Institutional Control Plan, and as-built drawings will be included in Appendix J of the SMP following approval and implementation of the remedy.

3.7.2.1 Inspection Schedule

Inspections for various parts of the system are conducted as described in the Operations and Maintenance Plan included in Appendix J. Once the remedy is approved and implemented this Operations and Maintenance Plan will be updated as necessary.

The proposed SSDS is fully automated. Critical functions are continuously monitored in the event of event of a system malfunction. Operators, managers and remediation engineers are immediately notified electronically. The system also includes a warning light and audible alarm on site.

Inspection frequency will be subject to change with the approval of the NYSDEC. Unscheduled inspections may take place when a suspected failure of the SSDS has been reported or an emergency occurs that is deemed likely to affect the operation of the system. Monitoring deliverables for the SSDS are specified later in this Plan.

3.7.2.2 General Equipment Inspection

A visual inspection of the complete system will be conducted during the monitoring event. SSDS components to be monitored include, but are not limited to, the following:

Vacuum blower; and,

General system piping.

A complete list of components to be checked will be provided in the Inspection Checklist, in Appendix J following implementation of the system. If any equipment readings are not within their typical range, any equipment is observed to be malfunctioning, or the system is not performing within specifications, maintenance and repair as per the Operation and Maintenance Plan will be performed immediately, and the SSDS will be restarted.

3.7.2.3 System Monitoring Devices and Alarms

The SSDS will have a warning device to indicate that the system is not operating properly. Two warning devices consisting of a warning light and audible alarm on site and automated email notifications will be part of the SSDS.

In the event that the warning device is activated, applicable maintenance and repairs will be conducted, as specified in the Operation and Maintenance Plan, and the

SSDS will be restarted. Operational problems will be noted in the subsequent Periodic Review Report.

3.7.3. Barrier Wall and NAPL Recovery Well System

The Barrier Wall and NAPL Recovery Well system will be installed to mitigate possible NAPL migration and to facilitate NAPL recovery. The proposed system design is described in the Engineering and Institutional Control Plan and as-built drawings will be included in Appendix K of the SMP following approval and implementation of the remedy.

3.7.3.1 Inspection Schedule

The schedule for inspection of the NAPL recovery system will be included in the remedy design work plan to be submitted to NYSDEC. It is anticipated that inspections will occur monthly for the first year of operation based on the observed NAPL accumulation rate in the recovery wells. The inspection schedule may be changed after the first year.

If NAPL is found in a well it will be removed manually at first. If NAPL is found to be frequently present and in sufficient quantities, an automated removal system may be installed.

Inspection frequency is subject to change with the approval of the NYSDEC. Unscheduled inspections may take place when a suspected failure of the NAPL recovery system has been reported or an emergency occurs that is deemed likely to affect the operation of the system. Monitoring deliverables for the NAPL recovery system are specified later in this Plan.

3.7.3.2 General Equipment Inspection

The Barrier Wall will be fully underground and require no maintenance and minimal inspection. The wall alignment will be walked and inspected for soil subsidence, water ponding, and other surface effects. A visual inspection of the complete system will be conducted during the monitoring event. NAPL recovery system components to be monitored include, but are not limited to, the condition of the monitoring and recovery wells, road boxes, and concrete pads.

A complete list of components to be checked will be provided in the Inspection Checklist that will be developed following approval and implementation of the remedy and, presented in Appendix K. If any equipment requires maintenance or repair, this maintenance and repair will be performed immediately as per the Operation and Maintenance Plan.

3.7.3.3 Fluid Level Gauging Event Protocol

The protocol for gauging the monitoring wells and the NAPL recovery wells will be developed following approval and implementation of the remedy and included in the SMP. It is anticipated that NAPL recovery wells will be gauged for water level elevation and presence of NAPL monthly during the first year and may be further reduced thereafter

3.8 MONITORING REPORTING REQUIREMENTS

Forms and any other information generated during regular monitoring events and inspections will be kept on file on-site. All forms, and other relevant reporting formats used during the monitoring/inspection events, will be (1) subject to approval by NYSDEC and (2) submitted at the time of the Periodic Review Report, as specified in Section 2.6.3.

All media and engineering system monitoring results will be reported to NYSDEC on a periodic basis in the Periodic Review Report.

4.0 OPERATION AND MAINTENANCE PLAN

4.1 INTRODUCTION

This Operation and Maintenance Plan section describes the general measures necessary to operate and maintain the mechanical components of the proposed sub-slab depressurization system (SSDS) for the site. Once the SSDS has been installed, this Operation and Maintenance Plan will:

- Include the steps necessary to allow individuals unfamiliar with the site to operate and maintain the SSDS;
- Include an operation and maintenance contingency plan; and,
- Will be updated periodically to reflect changes in site conditions or the manner in which the SSDS is are operated and maintained.

Information on non-mechanical ECs is provided in Section 3 - Engineering and Institutional Controls. A copy of this Operation and Maintenance Plan, along with the complete SMP, will be kept at the site. This Operation and Maintenance Plan is not to be used as a stand-alone document, but as a component document of the SMP.

4.2 SUB-SLAB DEPRESSURIZATIONSYSTEM OPERATION AND MAINTENANCE

4.2.1.1 Scope

The operation and maintenance requirements for the SSDS system include procedures related to the following processes: start-up, routine operation, shutdown, general maintenance and monitoring requirements, and record keeping. A preliminary Operations and Maintenance Manual for the SSDS System is provided in Appendix J.

4.2.1.2 System Start-Up and Testing

The system testing will be conducted at the start-up and if, in the course of the system lifetime, significant changes are made to the system, and the system must be restarted.

4.2.1.3 System Operation: Routine Operation Procedures

The procedures for the routine operation of the system will be developed following NYSDEC approval of the remedy. The procedures will include:

- Manufacturer's recommendations;
- Troubleshooting Guide (to be included as part of Appendix J) following approval and implementation of the remedy;
- Adjustment and repairs;
- Operation schedule.

General procedures for the routine operation of the proposed system may be found in Appendix J.

4.2.1.4 System Operation: Routine Equipment Maintenance

The procedures for the routine equipment maintenance will be developed following NYSDEC approval of the remedy. The procedures will include:

- Manufacturer's recommendations;
- Inspections;
- Routine maintenance activities and minimum schedules (which will be included in Appendix J).

General procedures for the routine equipment maintenance for the proposed SSD system may be found in Appendix J.

4.2.1.5 System Operation: Non-Routine Equipment Maintenance

The procedures for the non-routine equipment maintenance will be developed following NYSDEC approval of the remedy. The procedures will include a description of:

- Warning devices initiated;
- Damage;
- Reduced effectiveness;
- System or component replacement.

General procedures for non-routine equipment maintenance for the proposed SSD system may be found in Appendix J.

4.3 MAINTENANCE REPORTING REQUIREMENTS

Maintenance reports and any other information generated during regular operations at the site will be kept on-file on-site. All reports, forms, and other relevant information generated will be available upon request to the NYSDEC and will be submitted as part of the Periodic Review Report, as specified in Section 2.6.3 of the SMP.

4.3.1 Routine Maintenance Reports

Checklists, or forms (see Appendix J for proposed checklists) will be completed during each routine maintenance event. Checklists/forms will include, but not be limited to the following information:

- Date;
- Name, company, and position of person(s) conducting maintenance activities;
- Maintenance activities conducted;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and,

- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

4.3.2 Non-Routine Maintenance Reports

During each non-routine maintenance event, a form will be completed which will include, but not be limited to, the following information:

- Date;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Presence of leaks;
- Date of leak repair;
- Other repairs or adjustments made to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and,
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

4.4 CONTINGENCY PLAN

Emergencies may include injury to personnel, fire or explosion, environmental release, loss of electrical power for an extended period or serious weather conditions.

4.4.1 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) should contact the appropriate party from the contact list below. This contact list may be revised and/or expanded following approval and implementation of the remedy. For emergencies, appropriate emergency response personnel should be contacted. These emergency contact lists must be maintained in an easily accessible location at the site.

Table 4: Emergency Contact Numbers

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

Table 5: Other Contact Numbers

Point of Contact at Con Edison	Environment, Heath and Safety 31-01 20th Avenue Long Island City, NY 11105-2048 Attention: Ms. Yelena Skorobogatov Telephone: 718-204-4295
Point of Contact at Department Environmental Health and Safety Of Education: Division of School Facilities	44-36 Vernon Blvd. Long Island City, NY 11101 Attention: Mr. Bernard Orlan Telephone: 718-361-3808

* Note: Emergency contact numbers are subject to change and will be updated whenever a change in personnel occurs

4.4.2 Map and Directions to Emergency Health Facility

Site Location: East 115th St

Nearest Hospital Name: New York- Presbyterian Hospital

Hospital Location: 525 East 68th Street - Manhattan

Hospital Telephone: 212-746-5454

Directions to the Hospital:

	1: Start out going NORTHWEST on E 115TH ST toward 1ST AVE.	0.1 mi
	2: Turn RIGHT onto 1ST AVE.	0.1 mi
	3: Turn RIGHT onto E 116TH ST.	0.2 mi
	4: Merge onto FDR DR S.	2.3 mi
	5: Take EXIT 13 toward E 71 ST.	0.0 mi
	6: Stay STRAIGHT to go onto FDR DR.	0.1 mi
	7: Turn RIGHT onto E 71ST ST.	0.1 mi
	8: Turn LEFT onto YORK AVE.	0.1 mi
	9: Turn LEFT onto E 68TH ST.	0.0 mi
	10: End at 525 E 68th St New York, NY 10065-4870	

Total Estimated Time: 6 minutes

Estimated Total Distance: 3.08 miles

Figure 10 **Map Showing Route from the site to the Hospital:**

Map from the Site to New York- Presbyterian Hospital
525 East 68th St - Manhattan

4.4.3 Response Procedures

As appropriate, the fire department and other emergency response group will be notified immediately by telephone of the emergency. The emergency telephone number list is found at the beginning of this Contingency Plan (Table 6). The list will also posted prominently at the site and made readily available to all personnel at all times.

- Detailed contingency plans and response procedures will be developed following implementation of the remedy. General procedures for spills and evacuation are provided below.
- Procedures for spills - The nature of the proposed remedial system presents very little danger of spills. If NAPL is removed from recovery wells, it will be double contained, for example, in a 55-gallon drum and overpack. Spill kits will be available on site in the event of a spill and, if necessary, a contractor will be dispatched to perform cleanup activities.
- Evacuation plans - the school evacuation plan will be implemented.

Amendments to the contingency plan will be made as required.

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Appendix I – Quality Assurance Project Plan (QAPP) (to be developed following implementation of the remedy)
Appendix J – Operation and Maintenance Manual SSD System and As-built Plans (to be added to SMP following implementation of the remedy)
Appendix K – Barrier Wall/NAPL Recovery Well Inspection Checklist and As-built Plans (to be added following implementation of the remedy)

AECOM

Table 1
Soil Data Summary near MGP Features
East 115th Street Former MGP
Consolidated Edison, New York, New York

MGP Feature	Location	Test Pits and Borings	Visual Observations (above or at water table)	Depth to Water Table (feet)	Max PID*	Max TVOCs*	Max TSVOC*
Small Gas Holder	West of main building	TP-1, SS-2 , MW-5	No visual evidence of impacts, minor amounts of brick, coal, and other debris. **No NAPL observed above water table**.	~12	13.2	<0.5	154
Purifying House/Generating House	Immediately east of main building, southern area	TP-2 SS-5, SB-28, SB-29	Debris, asphalt, white material, floor/walls of MGP structures (2 to 9 feet), ACM pipe (2 feet). **No NAPL observed above water table**.	~15	863	3	118
Tar Tank	East of main building, southern area	TP-3, SB-27, SB-10	Debris (0-6 feet), black staining (3 feet), black oily material (7 feet), sheen (at water table at 7 feet), white ash (4.5 feet).	~7-10	495	<0.5	17
Purifying House	East of main building, southern area	TP-4, MW-2, SB-21	Debris (0 to 4 feet), concrete structure (4 feet), white material (3 feet), pockets of black oil saturated stones (5 feet, TP-4a only), free product (5 feet TP-4a only).	~8	500	<0.5	249
Coal Bin/Shed/Generator House	East of main building, central and northern areas	TP-5, SB-14, SB-15, SB-23, SB-19, SB-18, SB-30, MW-3	Debris (2-5 feet), coal pieces (2-5 feet), brick structures (3 to 5 feet), slag (2 to 5 feet), white material (2 feet). **No NAPL observed above water table.**	~8	10.2	11.7	852

Notes:
PID - Photo-ionization detector
TVOCs – Total Volatile organic compounds
TSVOCs - Total Semi-volatile organic compounds

Table 2
NYSDEC Recommended Soil Clean-Up Objectives for Detected Constituents
East 115th Street Former MGP
Consolidated Edison, New York, New York

Compound	NYSDEC Recommended Soil Cleanup Objective	Units
BTEX Compounds		
BENZENE	0.06	mg/kg
ETHYLBENZENE	5.5	mg/kg
TOLUENE	1.5	mg/kg
XYLENES, TOTAL	1.2	mg/kg
Volatile Organic Compounds (VOCs)		
1,2-DICHLOROETHENE (TOTAL)	0.3	mg/kg
ACETONE	0.2	mg/kg
CARBON DISULFIDE	2.7	mg/kg
STYRENE	NA	--
TETRACHLOROETHENE	1.4	mg/kg
TRICHLOROETHENE	0.7	mg/kg
Total VOCs (Including BTEX)	10	mg/kg

Table 2 (Continued)

NYSDEC Recommended Soil Clean-Up Objectives for Detected Constituents
East 115th Street Former MGP
Consolidated Edison, New York, New York

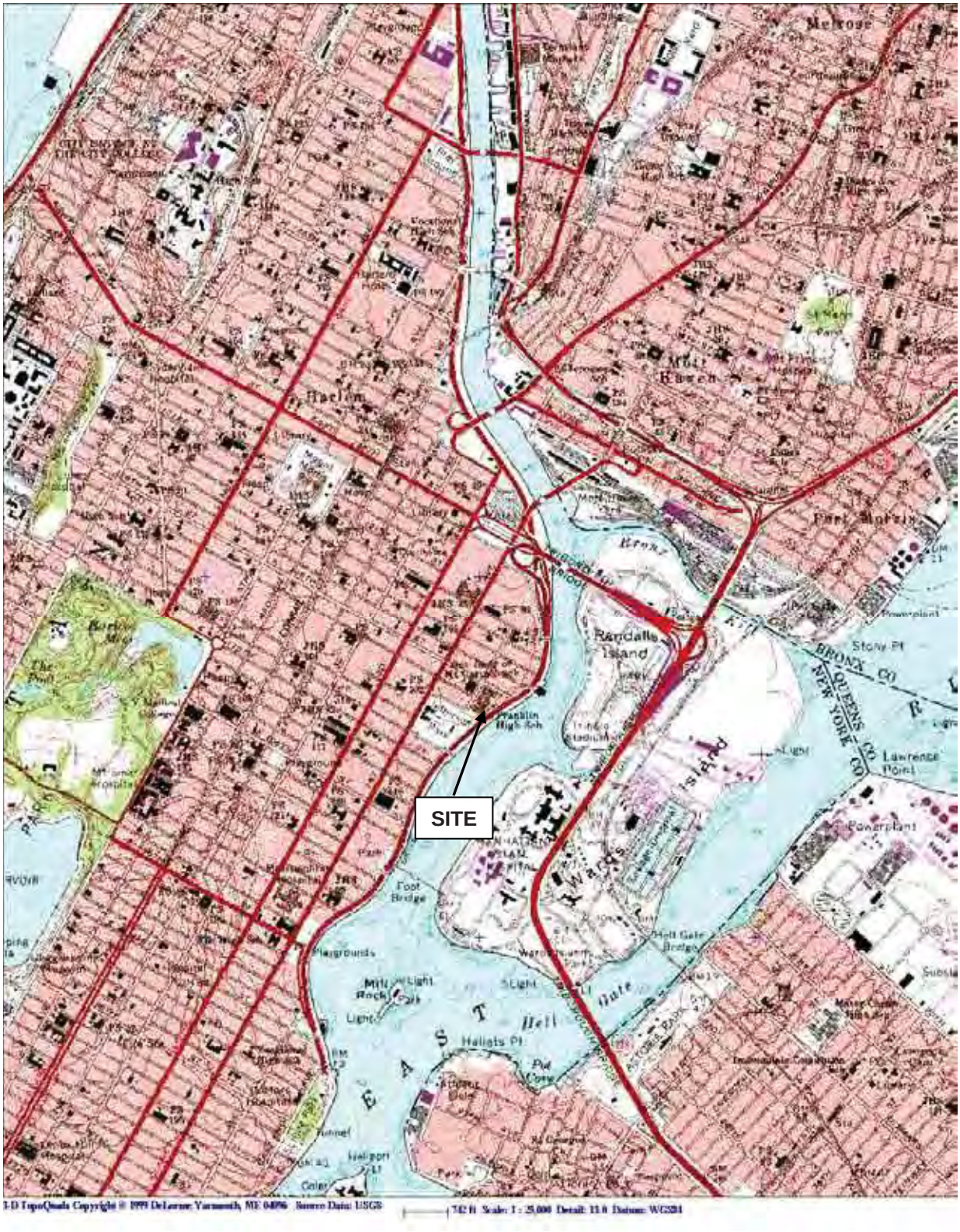
Compound	NYSDEC Recommended Soil Cleanup Objective	Units
Polycyclic Aromatic Hydrocarbons (PAHs)		
2-METHYLNAPHTHALENE	36.4	mg/kg
ACENAPHTHENE	50	mg/kg
ACENAPHTHYLENE	41	mg/kg
ANTHRACENE	50	mg/kg
BENZO(A)ANTHRACENE	0.224	mg/kg
BENZO(A)PYRENE	0.061	mg/kg
BENZO(B)FLUORANTHENE	1.1	mg/kg
BENZO(GHI)PERYLENE	50	mg/kg
BENZO(K)FLUORANTHENE	1.1	mg/kg
CHRYSENE	0.4	mg/kg
DIBENZO(A,H)ANTHRACENE	0.014	mg/kg
FLUORANTHENE	50	mg/kg
FLUORENE	50	mg/kg
INDENO(1,2,3-CD)PYRENE	3.2	mg/kg
NAPHTHALENE	13	mg/kg
PHENANTHRENE	50	mg/kg
PYRENE	50	mg/kg
Semi-Volatile Organic Compounds (SVOCs)		
2-NITROPHENOL	0.33	mg/kg
3,3'-DICHLOROBENZIDINE	NA	--
BIS(2-ETHYLHEXYL) PHTHALATE	50	mg/kg
DIBENZOFURAN	6.2	mg/kg
Total SVOCs (Including PAH compounds)	500	

Table 2 (Continued)

NYSDEC Recommended Soil Clean-Up Objectives for Detected Constituents
East 115th Street Former MGP
Consolidated Edison, New York, New York

Compound	NYSDEC Recommended Soil Cleanup Objective	Eastern USA Background	Units
Inorganics			
ALUMINUM	25000	33000	mg/kg
ANTIMONY	NA	NA	--
ARSENIC	7.5	12	mg/kg
BARIUM	300	600	mg/kg
BERYLLIUM	0.16	1.75	mg/kg
CADMIUM	1	1	mg/kg
CALCIUM	35000	35000	mg/kg
CHROMIUM	10	40	mg/kg
COBALT	30	60	mg/kg
COPPER	25	50	mg/kg
CYANIDE	NA	NA	--
IRON	2000	NA	mg/kg
LEACHABLE PH	NA	NA	--
LEAD	37	500	mg/kg
MAGNESIUM	4000	5000	mg/kg
MANGANESE	5000	5000	mg/kg
MERCURY	0.1	0.2	mg/kg
NICKEL	13	25	mg/kg
POTASSIUM	43000	43000	mg/kg
SELENIUM	2	3.9	mg/kg
SILVER	N/A	NA	--
SODIUM	8000	8000	mg/kg
THALLIUM	NA	NA	--
VANADIUM	150	300	mg/kg
ZINC	20	50	mg/kg

Note: NYSDEC has created additional clean-up values as part of 6 NYCRR PART 370. The PART 370 criteria include varying goals depending on site use (residential, residential restricted, industrial, etc). These goals may be applicable if site use changes in the future and alternative remediation approaches are considered.



AECOM
2 TECHNOLOGY PARK DRIVE
WESTFORD, MA 01886
PHONE: (978) 589-3000
FAX: (978) 589-3100
WEB: HTTP://WWW.AECOM.COM

SITE LOCATION MAP

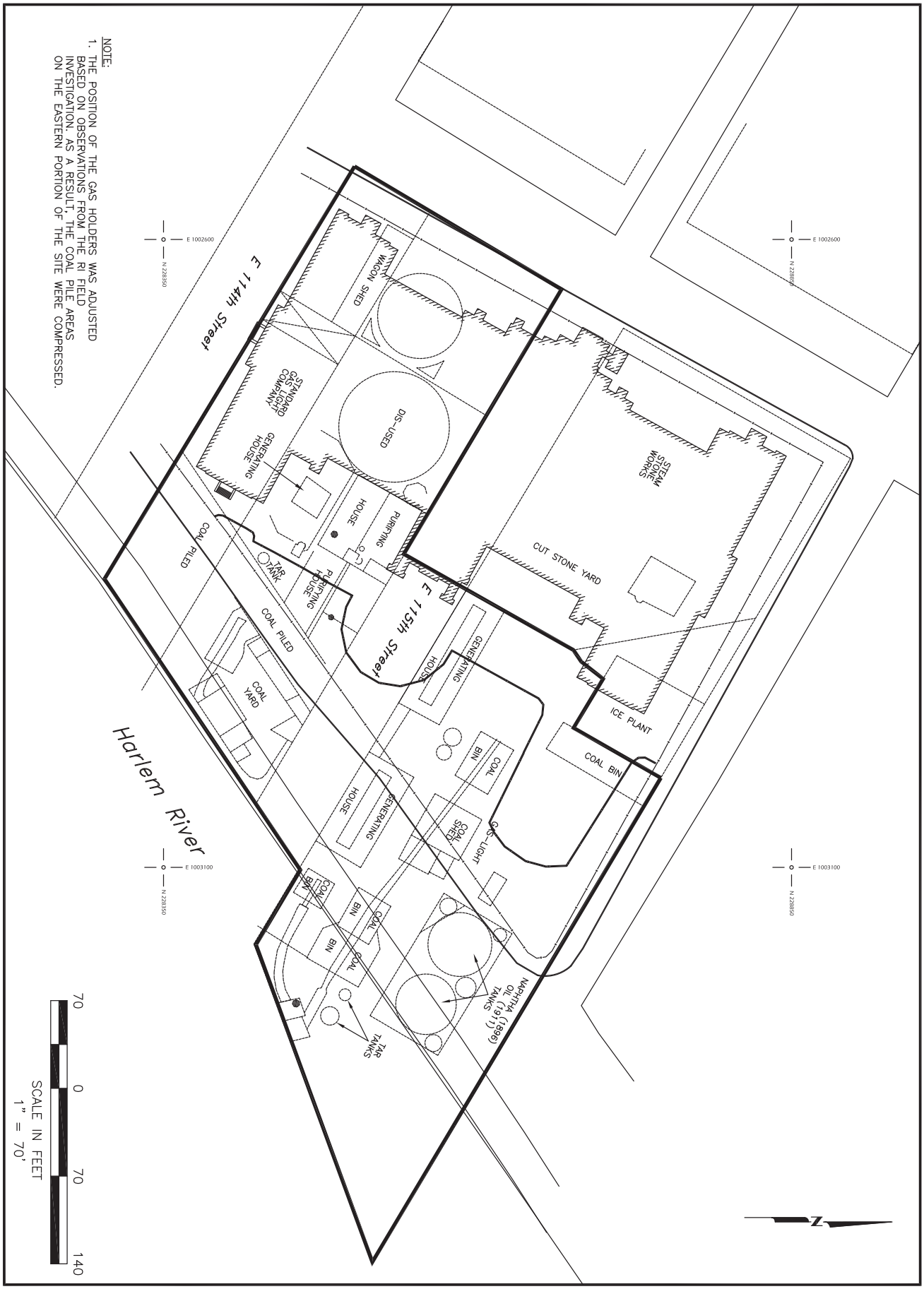
FORMER MGP SITE
EAST 115th STREET
NEW YORK, NEW YORK

DRAWN BY:	DATE:	PROJECT NUMBER:
KAG	07/19/02	01869-115

FIGURE NUMBER

1

FILENAME: 1869209B.DWG



SHEET NUMBER:	1
FIGURE NUMBER:	2

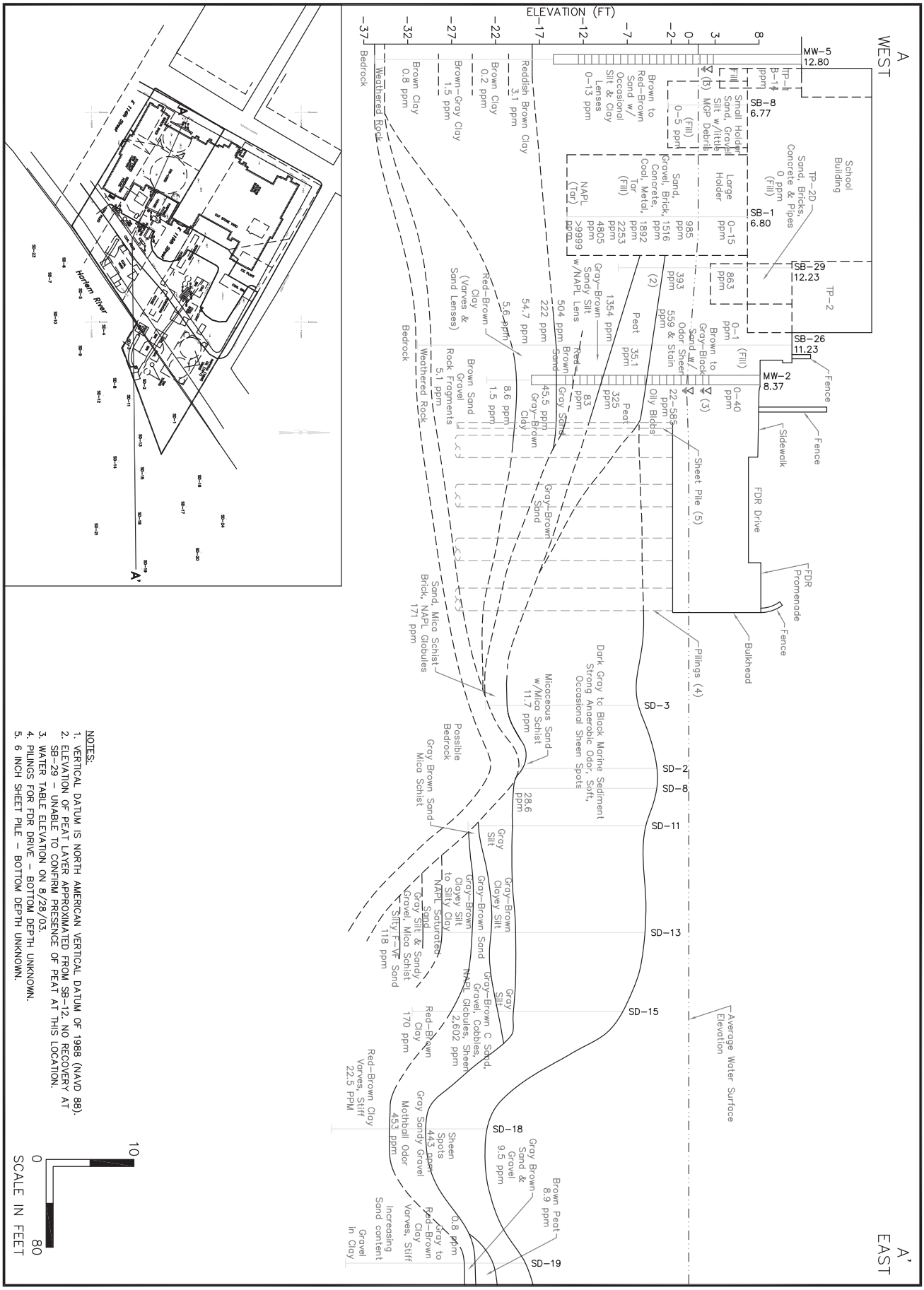
HISTORIC SITE FEATURES
CONSOLIDATED EDISON
EAST 115TH STREET FORMER MGP
NEW YORK, NY

SCALE:	DATE:	PROJECT NUMBER:
1" = 70'	10/03	01869-055-700

AECOM
2 TECHNOLOGY PARK DRIVE
WESTFORD, MASSACHUSETTS 01886
PHONE: (978) 589-3000
FAX: (978) 589-3100
WEB: HTTP://WWW.AECOM.COM

DESIGNED BY:	REVISIONS			
	NO.:	DESCRIPTION:	DATE:	BY:
DRAWN BY:				
J.E.B.				
CHECKED BY:				
D.S.				
APPROVED BY:				
D.S.				

FILENAME: 01869-089-10B.DWG



NOTES:
1. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
2. ELEVATION OF PEAT LAYER APPROXIMATED FROM SB-12. NO RECOVERY AT SB-29 - UNABLE TO CONFIRM PRESENCE OF PEAT AT THIS LOCATION.
3. WATER TABLE ELEVATION ON 8/28/03.
4. PILINGS FOR FDR DRIVE - BOTTOM DEPTH UNKNOWN.
5. 6 INCH SHEET PILE - BOTTOM DEPTH UNKNOWN.

SCALE IN FEET
0
80
10

FIGURE NUMBER: 3
SHEET NUMBER: 1

CROSS-SECTION A-A'
CONSOLIDATED EDISON
EAST 115th STREET FORMER MGP
NEW YORK, NY

SCALE:	DATE:	PROJECT NUMBER:
AS SHOWN	6/05	01869-089-0410

AECOM
2 TECHNOLOGY PARK DRIVE
WESTFORD, MASSACHUSETTS 01886
PHONE: (978) 589-3000
FAX: (978) 589-3100
WEB: HTTP://WWW.AECOM.COM

DESIGNED BY:	REVISIONS			
S.O.	NO.:	DESCRIPTION:	DATE:	BY:
DRAWN BY:				
K.P.B.				
CHECKED BY:				
S.O.				
APPROVED BY:				
X				

FILENAME: 01869-089-03B.DWG

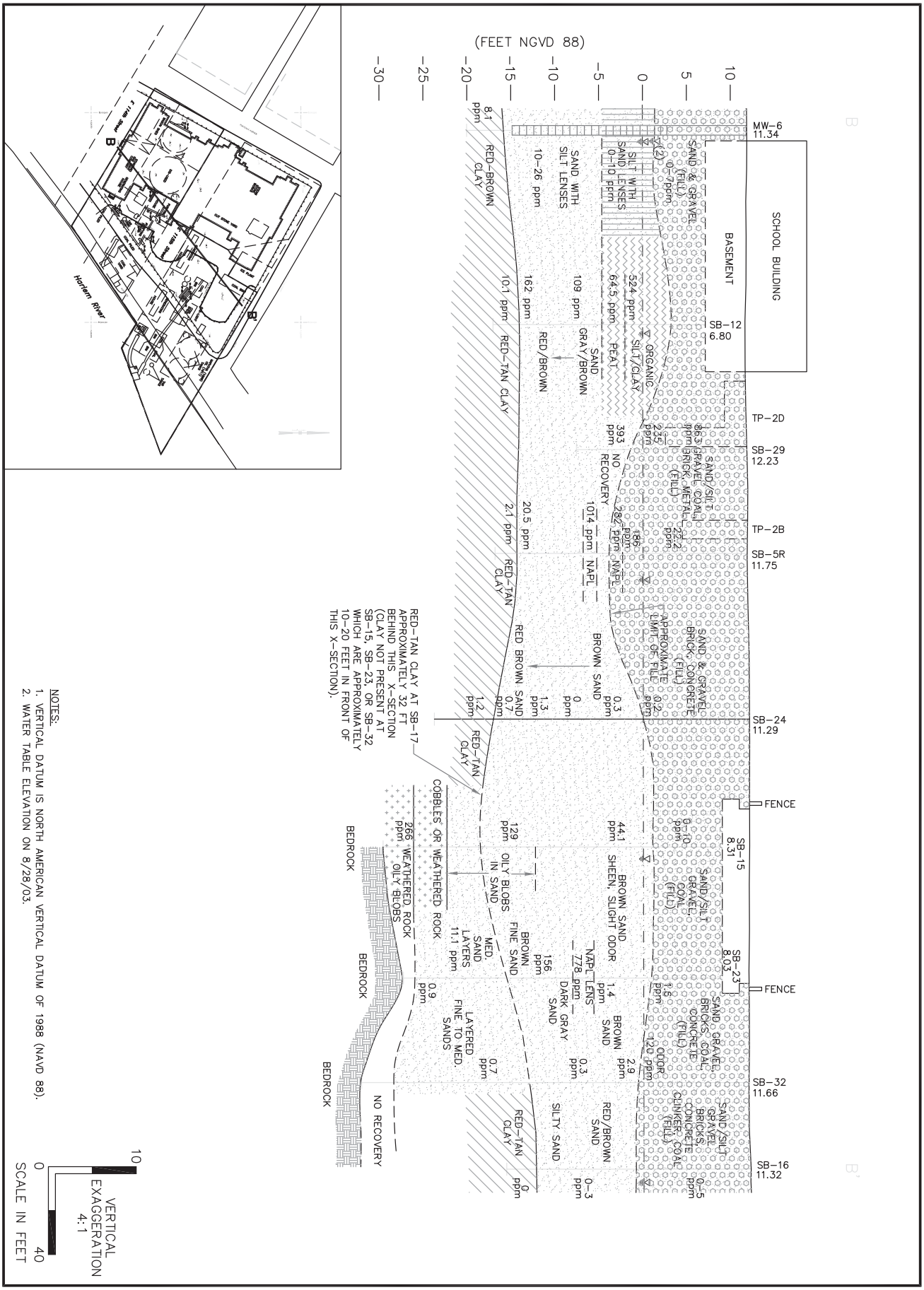


FIGURE NUMBER:	SHEET NUMBER:
4	1

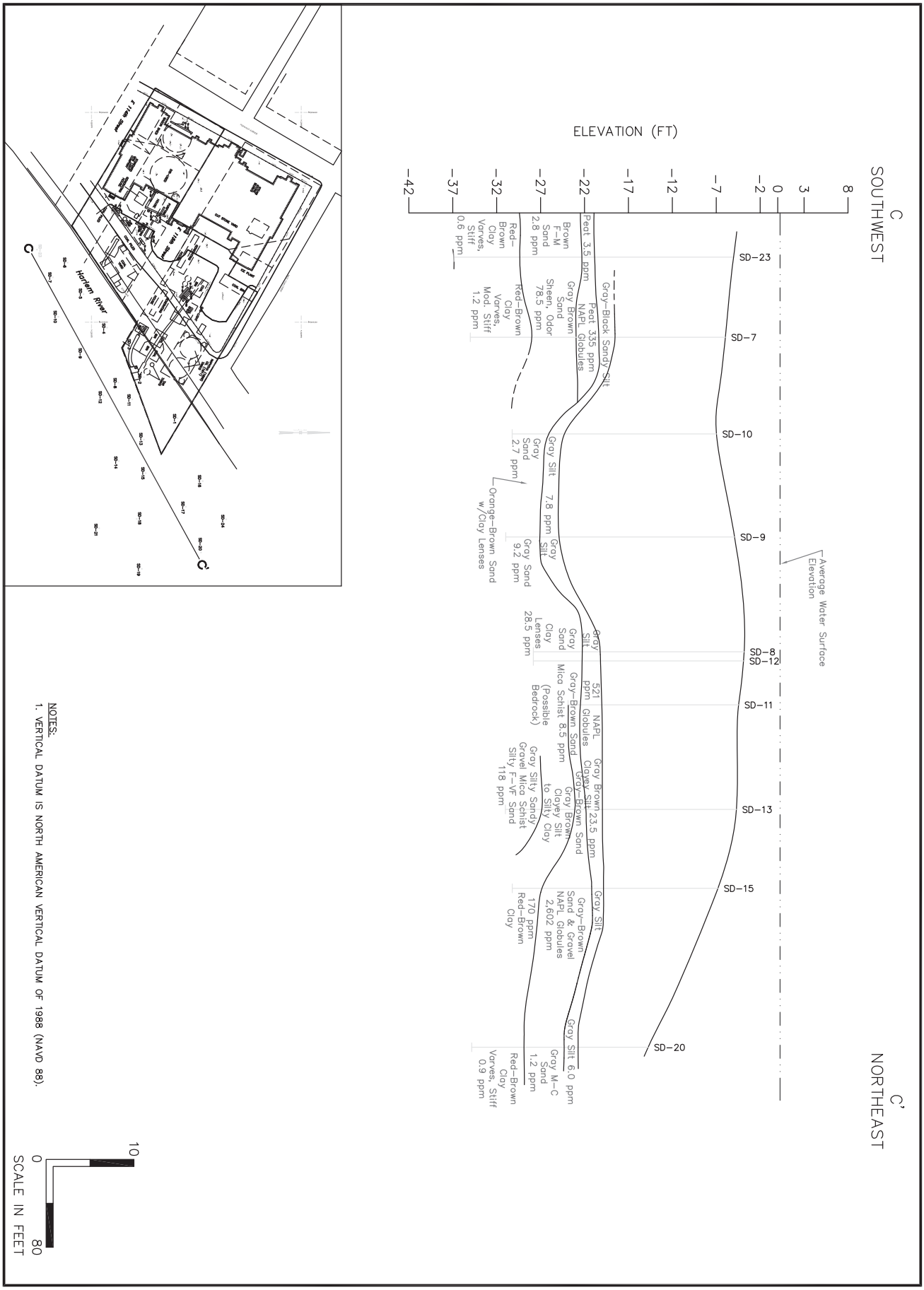
CROSS SECTION B-B'
CONSOLIDATED EDISON
EAST 115TH STREET FORMER MGP
NEW YORK, NY

SCALE:	DATE:	PROJECT NUMBER:
AS SHOWN	6/05	01869-089-0410

AECOM
2 TECHNOLOGY PARK DRIVE
WESTFORD, MASSACHUSETTS 01886
PHONE: (978) 589-3000
FAX: (978) 589-3100
WEB: HTTP://WWW.AECOM.COM

DESIGNED BY:	REVISIONS			
	NO.:	DESCRIPTION:	DATE:	BY:
DRAWN BY: K.P.B.				
CHECKED BY: S.O.				
APPROVED BY: D.S.				

FILENAME: 01869-089-11B.DWG



NOTES:
1. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).

SCALE IN FEET
0
10
80

SHEET NUMBER: 1	FIGURE NUMBER: 5	

SEDIMENT CORE CROSS-SECTION C-C'
CONSOLIDATED EDISON
EAST 115th STREET FORMER MGP
NEW YORK, NY

SCALE:	DATE:	PROJECT NUMBER:
AS SHOWN	6/05	01869-089-0410

AECOM
2 TECHNOLOGY PARK DRIVE
WESTFORD, MASSACHUSETTS 01886
PHONE: (978) 589-3000
FAX: (978) 589-3100
WEB: HTTP://WWW.AECOM.COM

DESIGNED BY:	REVISIONS			
S.O.	NO.:	DESCRIPTION:	DATE:	BY:
DRAWN BY:				
K.P.B.				
CHECKED BY:				
S.O.				
APPROVED BY:				
X				

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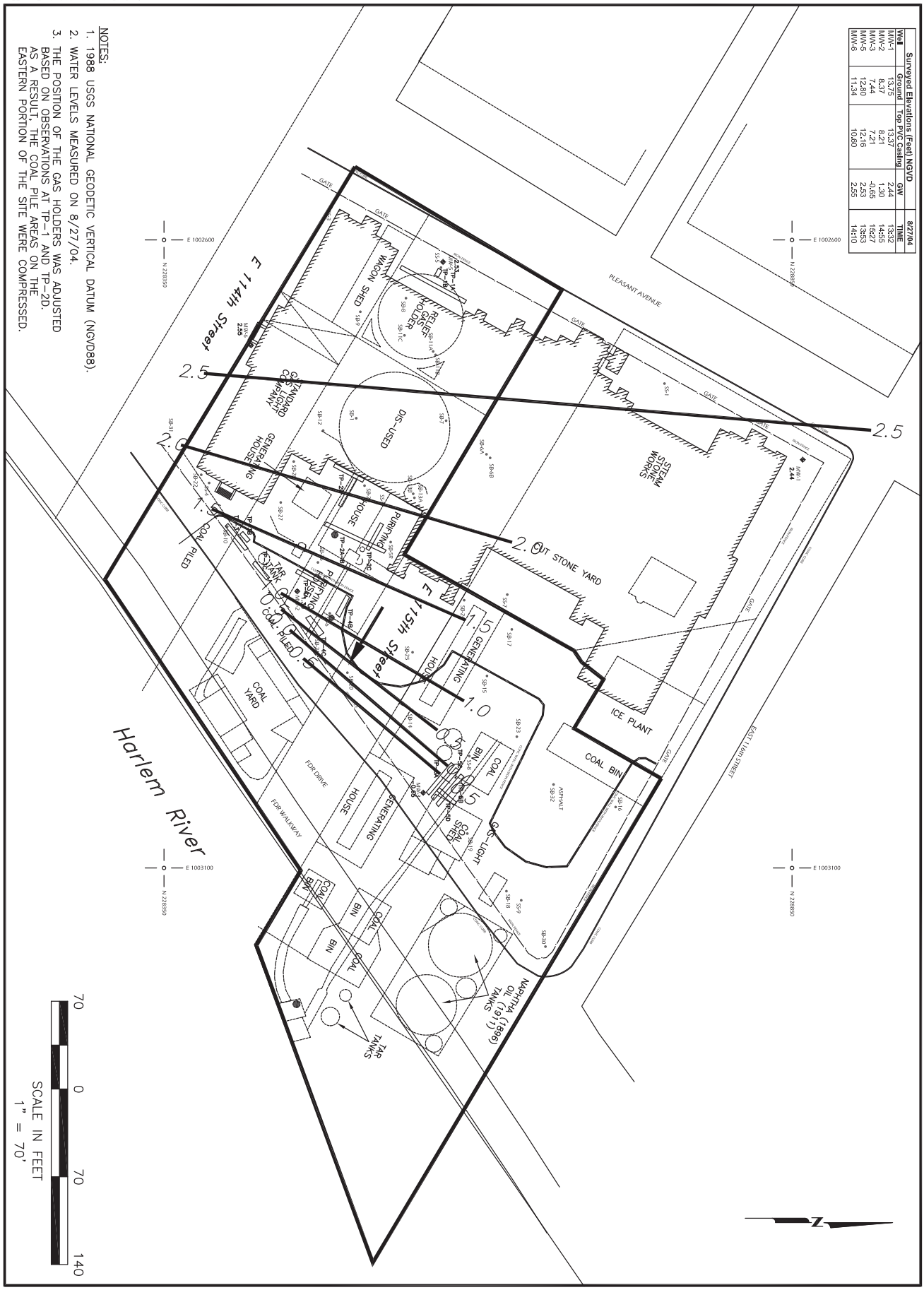


SHEET NUMBER: 1	FIGURE NUMBER: 6		

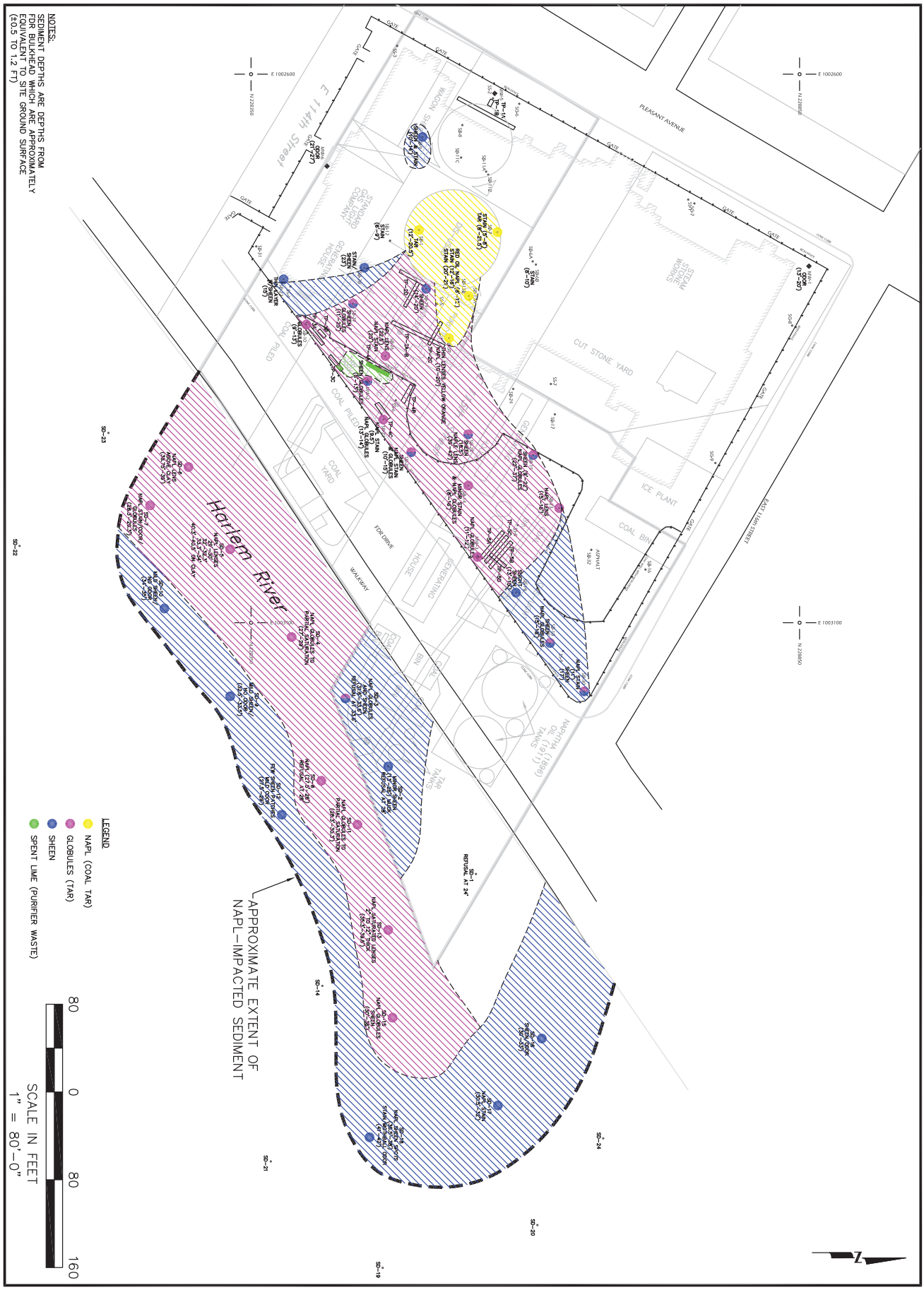
WATER TABLE MAP
CONSOLIDATED EDISON
EAST 115TH STREET FORMER MGP
NEW YORK, NY

SCALE:	DATE:	PROJECT NUMBER:
1" = 70'	6/05	01869-089-0410

AECOM
2 TECHNOLOGY PARK DRIVE
WESTFORD, MASSACHUSETTS 01886
PHONE: (978) 589-3000
FAX: (978) 589-3100
WEB: HTTP://WWW.AECOM.COM

DESIGNED BY:	REVISIONS			
	NO.:	DESCRIPTION:	DATE:	BY:
DRAWN BY: K.P.B.				
CHECKED BY: D.S.				
APPROVED BY: D.S.				

FILENAME: 01869-089-09BR.DWG



SHEET NUMBER: 1	7		FIGURE NUMBER:

EXTENT OF NAPL
CONSOLIDATED EDISON
EAST 115th STREET FORMER MGP
NEW YORK, NY

SCALE:	DATE:	PROJECT NUMBER:
1"=80'	6/05	01869-089-0410

AECOM
2 TECHNOLOGY PARK DRIVE
WESTFORD, MASSACHUSETTS 01886
PHONE: (978) 589-3000
FAX: (978) 589-3100
WEB: HTTP://WWW.AECOM.COM

DESIGNED BY:	REVISIONS			
X	NO.:	DESCRIPTION:	DATE:	BY:
DRAWN BY:				
K.P.B.				
CHECKED BY:				
S.O.				
APPROVED BY:				
X				

FILENAME: 01869-089-12B.DWG

SHEET NUMBER:	FIGURE NUMBER:
1	8

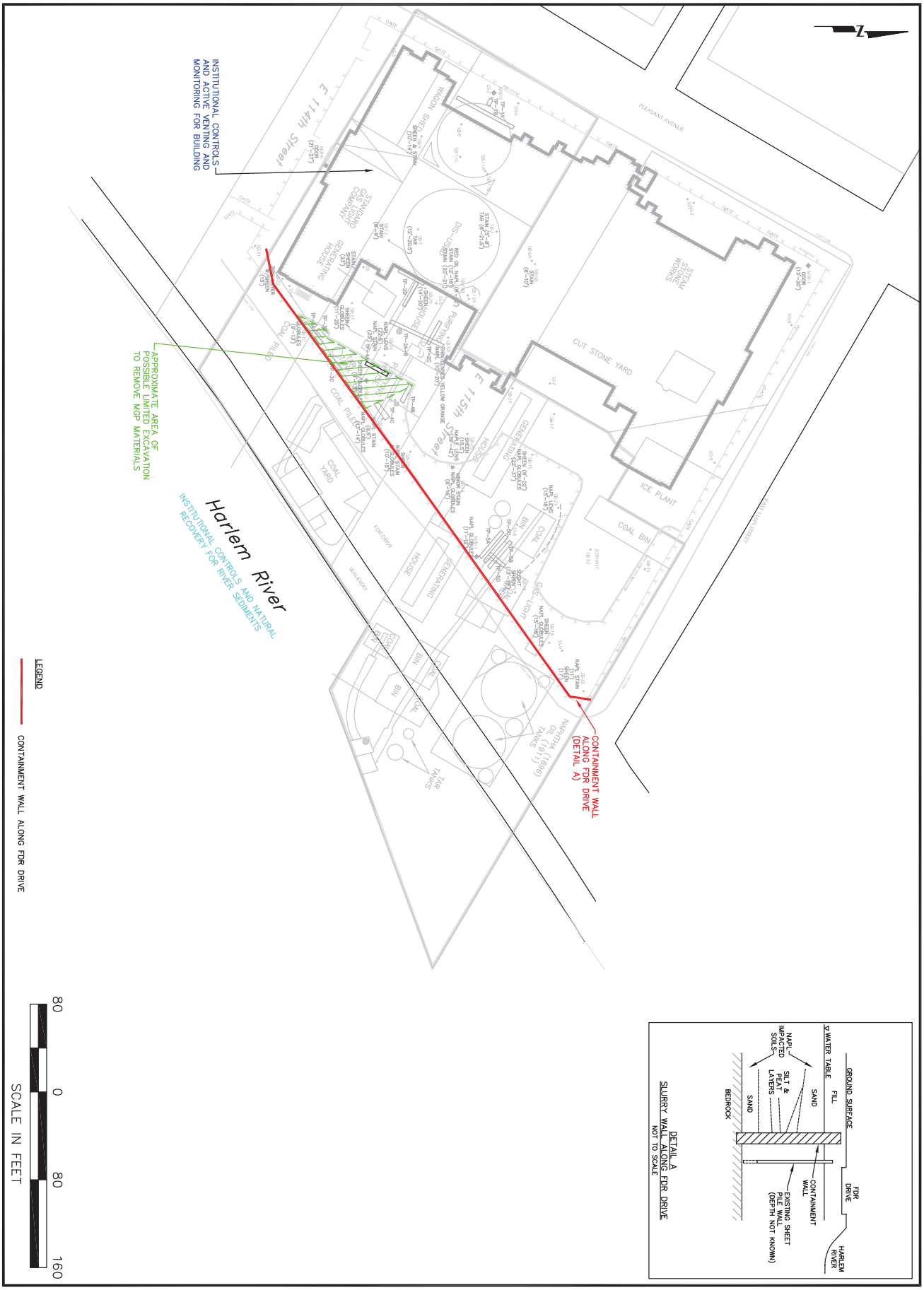
RI SAMPLING LOCATIONS
CONSOLIDATED EDISON
EAST 115TH STREET FORMER MGP
NEW YORK, NY

SCALE:	DATE:	PROJECT NUMBER:
1"=80'	6/05	01869-089-0410

AECOM
2 TECHNOLOGY PARK DRIVE
WESTFORD, MASSACHUSETTS 01886
PHONE: (978) 589-3000
FAX: (978) 589-3100
WEB: HTTP://WWW.AECOM.COM

DESIGNED BY:	REVISIONS			
	NO.:	DESCRIPTION:	DATE:	BY:
DRAWN BY: K.P.B.				
CHECKED BY: S.O.				
APPROVED BY: S.O.				

FILENAME: 01869-115-06B.DWG



DETAIL A
SLURRY WALL ALONG FDR DRIVE
NOT TO SCALE

SHEET NUMBER:	FIGURE NUMBER:
1	6

LOCATIONS FOR REMEDIAL OPTIONS
CONSOLIDATED EDISON
EAST 115th STREET FORMER MGP
NEW YORK, NY

SCALE:	DATE:	PROJECT NUMBER:
1"=80'	10/08	01869-115-200

AECOM
2 TECHNOLOGY PARK DRIVE
WESTFORD, MASSACHUSETTS 01886
PHONE: (978) 589-3000
FAX: (978) 589-3100
WEB: HTTP://WWW.AECOM.COM

DESIGNED BY:	REVISIONS			
C.W.M.	NO.:	DESCRIPTION:	DATE:	BY:
DRAWN BY:				
K.P.B.				
CHECKED BY:				
C.W.M.				
APPROVED BY:				
D.S.				

Appendix A – Metes and Bounds (to be developed for Environmental Easement and added to the SMP)

Appendix B – Health and Safety Plan and Community Air Monitoring Plan (to be developed following implementation of the remedy)

Appendix C - MGP Materials

Tar Like Material After Exposure to Sun

MacPhee, 1995

Tar Like Material Oozing Into Test Pit

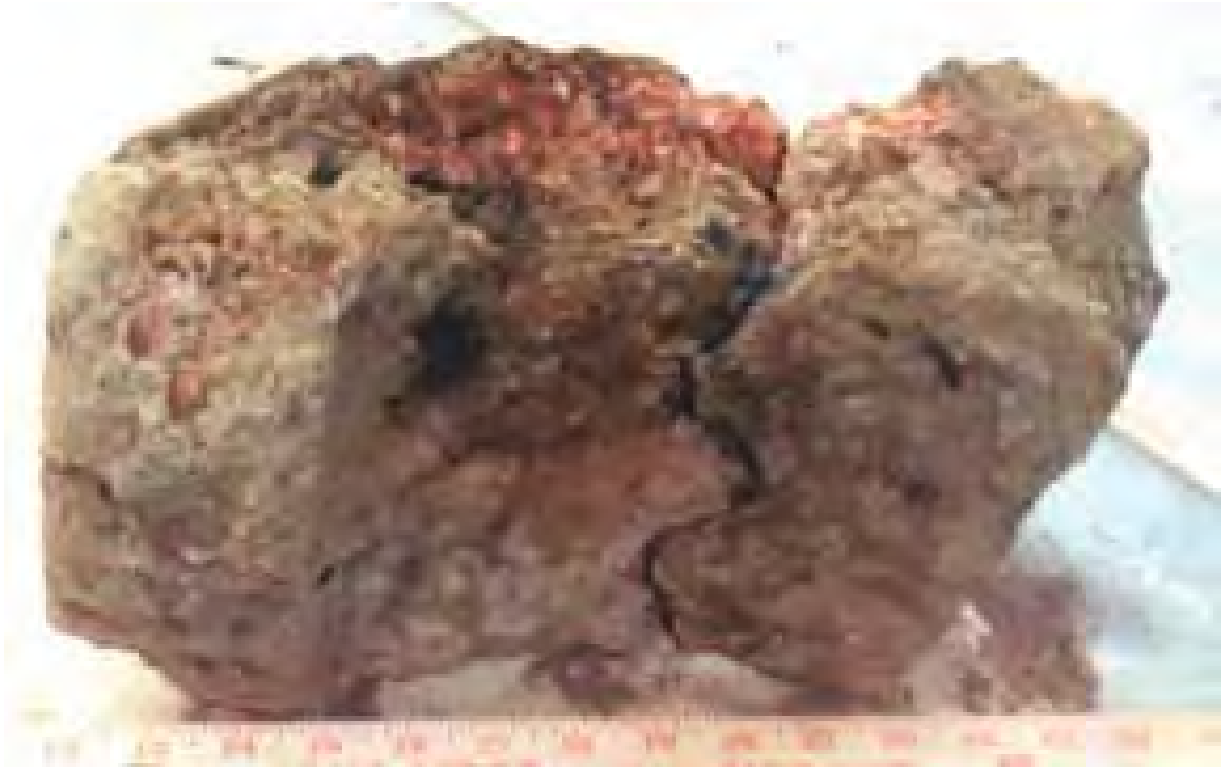
Tar Like Material Saturated Soil

Post Excavation

Tar Like Material - Weathered

Hathaway, 2003

Fragment of Broken Coal-Gas Retort



Hathaway, 2003

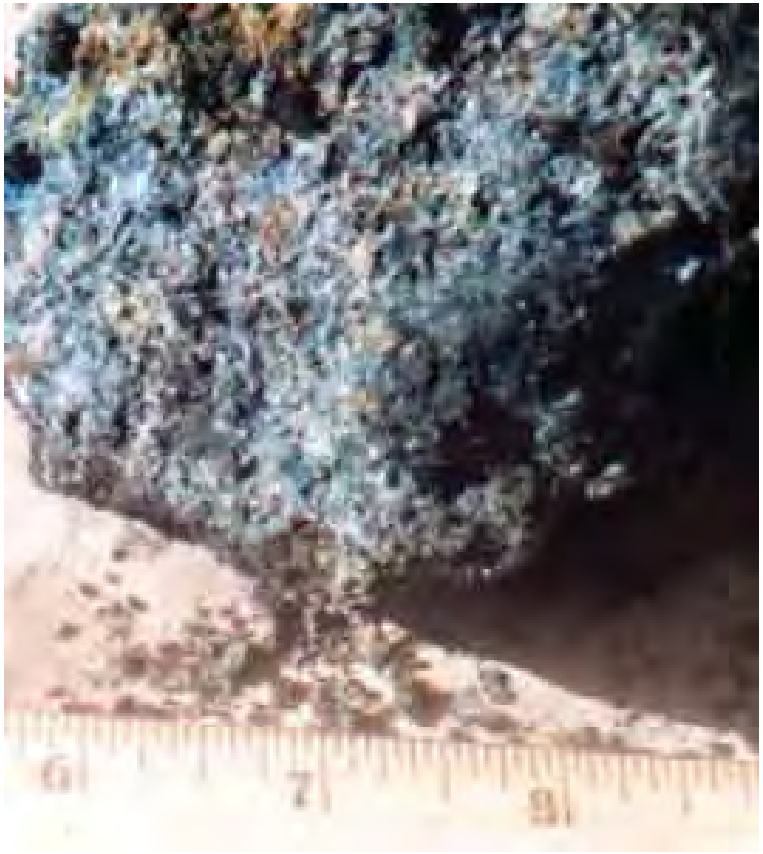
Fouled Wood-Shavings as “Box” Wastes

Hathaway 2003

Spent Lime

Hathaway, 2003

Spent Lime



Hathaway, 2003

Appendix D – Stormwater Pollution Prevention Plan (to be developed following implementation of the remedy)

Appendix E – Site Wide Inspection Form (to be developed following implementation of the remedy)

Appendix F – Post-Remedial Groundwater Conditions and Well Construction Logs (to be added following implementation of the remedy)

Appendix G - Groundwater Sampling Log and SOPs

ENSR

SOP NUMBER: 7130

Groundwater Sample Collection from Monitoring Wells

Date:	November, 1999
Revision Number:	2
Author:	Charles Martin
Discipline:	Geosciences

1.0 PURPOSE AND APPLICABILITY

1.1 Purpose and Applicability

This standard operating procedure (SOP) is concerned with the collection of valid and representative samples of groundwater from monitoring wells. The scope of this document is limited to field operations and protocols applicable during groundwater sample collection.

This SOP is written in a broad-based manner and considers the application of a variety of sampling equipment in the collection of representative groundwater samples. Respective state and/or federal agency regulations may require specific types of equipment to be used when applying this SOP to a particular project. The project manager should review the applicable regulatory requirements, if any, prior to the start of the field sampling program. Deviations from this SOP to accommodate regulatory requirements should be reviewed in advance of the field program and documented in the project work plan.

1.2 Quality Assurance Planning Considerations

Sampling personnel should follow specific quality assurance guidelines as outlined in the site-specific QAPP. Proper quality assurance requirements should be provided which will allow for collection of representative samples from representative sampling points. Quality assurance requirements typically suggest the collection of a sufficient quantity of quality control (QC) samples such as field duplicate, equipment and/or field blanks and matrix spike/matrix spike duplicate (MS/MSD) samples. These requirements should be outlined in the QAPP. Additional information regarding quality assurance sample collection relevant to groundwater sampling is contained in Section 5.0 of this SOP.

1.3 Health and Safety Considerations

Groundwater sampling may involve chemical hazards associated with the materials being sampled. Adequate health and safety measures must be taken to protect project sampling personnel from potential chemical exposures or other hazards.

These measures must be addressed in the project Health and Safety Plan (HASP). This plan must be approved by the project Health and Safety Officer before work commences, must be distributed to all personnel performing sampling, and must be adhered to as field activities are performed.

2.0 RESPONSIBILITIES

2.1 Project Manager

The project manager is responsible for ensuring that project-specific requirements are communicated to the project team and for providing the materials, resources, and guidance necessary to perform the measurements in accordance with this SOP and the project-specific work plan.

2.2 Sampling Technician

It is the responsibility of the sampling technician to be familiar with the sampling procedures outlined within this SOP and with specific sampling, quality assurance, and health and safety requirements outlined within project-specific work plans (Sampling Plan, HASP, QAPP). The sampling technician is responsible for collection of groundwater samples and for proper documentation of sampling activities as samples are being collected.

3.0 REQUIRED MATERIALS

Groundwater sampling objectives may vary significantly between projects. Project objectives should be defined within the project-specific work plans. The list of required materials below identifies the types of equipment which may be used for a range of groundwater sampling applications. From this list, a project-specific equipment list should be selected based upon project objectives and other factors such as the depth to groundwater, well construction, required purge volumes, and analytical parameters, among others. The various types of sampling equipment which may be used include:

<u>Well Purging Equipment</u>

- Bailers
- Bladder pumps
- Submersible pumps
- Peristaltic pumps
- Centrifugal Pumps
- Waterra™ pumps

Field Instruments

- Individual or multi-parameter meter(s) to measure temperature, pH, specific conductance, dissolved oxygen (DO) oxidation reduction potential (ORP), and/or turbidity
- Water level measuring device
- Interface probe or product detection paste

Sampling Equipment

- Reusable or disposable bailers
- Peristaltic pump
- Bladder pump

Sample Preparation Equipment

- Filtration equipment
- Intermediate containers
- Sample kit (i.e., bottles, labels, preservatives, custody records, cooler)

General Equipment

- Project-specific sampling plans (SAP, QAPP, HASP)
- Sample collection records
- Field notebook/pen
- Waterproof marker pens
- Deionized water dispenser bottler
- Sample cup
- Buckets
- Coolers, or sample shuttles
- Instrument calibration solutions
- Power source (generator of 12V marine battery)
- Equipment decontamination supplies (refer to SOP 7600)
- Health and safety supplies
- First-Aid kit
- Tool box

Expendable Materials

- Deionized water supply

- Disposable bailer string (nylon or polypropylene)
- 0.45 micron filters
- Paper towels
- Plastic sheeting
- Ice/blue ice for sample preservation
- Disposable latex powder-free glove liners
- Disposable nitrile gloves
- Plastic trash bags
- Ziplock® bags

This equipment list was developed to aid in field organization and should be used in preparation for each sampling event. Depending on the site-specific sampling plan, additional material and equipment may be necessary and should be determined before the scheduled sampling event. Similarly, not all of the items shown in this list may be necessary for any one sampling event.

Additional SOPs are also available which provide procedures for different aspects of groundwater sampling. These SOPs include:

- ENSR SOP 7121, Field and Laboratory Measurement of pH
- ENSR SOP 7122, Field and Laboratory Measurement of Dissolved Oxygen
- ENSR SOP 7123, Field and Laboratory Measurement of Temperature
- ENSR SOP 7124, Field and Laboratory Measurement of Specific Conductance
- ENSR SOP 7125, Field and Laboratory Measurement of Turbidity
- ENSR SOP 7131, Field Filtration of Water Samples for Inorganics
- ENSR SOP 7510, Packaging and Shipment of Samples
- ENSR SOP 7600, Decontamination of Equipment

4.0 METHOD

4.1 Instrument Calibration

Field instruments will be calibrated according to the requirements of the project-specific plan and water quality SOPs (see Section 3.0).

4.2 Sampling Preparation

Before opening the well, a clean working surface shall be set up around the well head using a plastic sheet with slit cut in the middle. Prior to opening the well, the required health and safety gear (as specified in the HASP) shall be donned. This, at a minimum, usually means wearing gloves to limit the potential for exposure to contaminants as well as reduce the potential for handling-induced contamination of sampling equipment.

4.3 Well Security and Condition

At each monitoring well location, observe the conditions of the well and surrounding area. The following information shall be noted on the Groundwater Sample Collection Record (Attachment 1 or 2) or in the field notebook:

- Condition of the wells identification marker
- Condition of the well lock and associated locking cap
- Integrity of the well - protective outer casing, obstructions or kinks in the well casing, presence of water in the annular space, and the top of the interior casing
- Condition of the general area surrounding the well

4.4 Measuring Point Determination

Before collecting a water level measurement, check for an existing measuring point (notch, or other visible mark) established either at the time of well installation or by the latest survey. Generally, the measuring point is referenced from the top of the well casing (TOC), not the protective casing. If no measuring point exists, a measuring point should be established, clearly marked, and identified on the Groundwater Sample Collection Record or the field logbook. The same measuring point should be used for subsequent sampling events.

4.5 Free Product Determination

Wells that may potentially contain free product should be assessed for product with an interface probe or product detection paste. Interface probes generally operate on the same principle as a water level tape although they are designed to register water and product levels usually with different audible tones. Product paste generally is used in combination with some type of measuring tape which is lowered into the well with a coating of paste applied to it. Wells containing free product are generally not used for groundwater sampling, since the concentration of contaminants present in the free product can adversely effect the quality of the water sample, lending to a non-representative water sample.

4.6 Water Level Measurement

To obtain a water level measurement, lower the probe of a water level measuring device into the well until the audible sound of the unit is detected or the light on an electronic sounder illuminates. At this time the precise measurement should be determined (to nearest 0.01 feet) by repeatedly raising and lowering the tape to converge on the exact measurement. Obtain the reading of the TOC measuring point. The water level measurement should be entered on the Groundwater Sample Collection Record or in the field records.

The measurement device shall be decontaminated immediately after use with a non-phosphatic detergent and rinsed with distilled water. Generally, only that portion of the tape which enters the water table should be cleaned. It is important that the measuring tape is never placed directly on the ground surface or allowed to become kinked. Measuring devices, including interface probes, which come into contact with free product will likely require more thorough decontamination (see SOP 7600).

4.7 Purge Volume Calculation

Wells designated for sampling require purging to remove stagnant water in the well. A single casing volume of groundwater will be calculated after measuring the length of the water column and checking the well casing diameter. The Groundwater Sample Collection Record provides information used to compute the casing volume, which includes: a diagram, a numerical conversion table, and the standard calculation. The volume of standing water in the well (ie., one purge volume) should be entered on the Groundwater Sample Collection Record.

4.8 Well Purging Methods and Procedures

4.8.1 Objectives

Prior to sample collection, purging must be performed for all groundwater monitoring wells to remove stagnant water from within the casing and gravel pack and to ensure that a representative groundwater sample is obtained.

There are three general types of non-dedicated equipment used for well purging and include: bailers, surface pumps and down-well pumps. The purge method and equipment selected should be specified in the project-specific work plans.

NOTE: This SOP only describes the most common equipment and methods used for purging. Other purging equipment, as well as dedicated equipment,

can be used provided that the method employed does not have an adverse affect on the overall quality of the groundwater.

Regardless of the purge method, purge water temperature, pH, and specific conductance will be monitored at predetermined purge volumes and recorded on the Groundwater Sample Collection Record. Additional water quality parameters may be required by the project-specific sampling plan. In general, purging will be considered complete following the withdrawal of at least 3 to 5 well volumes of groundwater and when all field parameters have stabilized to within 10% of their preceding measurements.

Purging a well to dryness may occur under some low-yield conditions. When the well recovers, a cascading effect may occur within the screened zone which can volatilize some organic compounds. This may be considered inappropriate by regulatory agencies when volatile organic compounds (VOC) are the target analyte of interest. Purging a well to dryness, then sampling after it has recovered may be acceptable for other target analytes, however. Under low yield conditions, low-flow sampling pumps such as bladder pumps may be required for VOC sample collection.

4.8.2 Bailing

General

Bailing is often the most convenient method for well purging especially if only a small volume of purge water is required during the purge routine. Bailers are constructed using a variety of materials including PVC, polyethylene, stainless steel, and Teflon®. Teflon® bailers are generally most "inert" and are available in reusable and disposable form. Disposable polyethylene bailers are relatively inert and inexpensive. Reusable stainless steel and PVC bailers must be decontaminated between uses. Most commercially available bailers are constructed to fit into a 2-inch diameter well, although other bailer diameters are available.

Waterra™ foot valves are essentially bailer check valves which manually thread onto the bottom of standard pump tubing (polyethylene, teflon). The foot valves are commercially available in a variety of diameters in stainless steel, Teflon®, and high-density plastic (Delrin). The foot valves operate by manually or mechanically raising and lowering the valve assembly within the water column which raises the water level within the discharge tube. Flow rates usually in the vicinity of 1 gallon per minute can be achieved with these devices.

Measurements of the pumping rate, temperature, pH, and specific conductance (and/or other parameters as required) should be made after each purge volume is removed and documented on the Groundwater Sample Collection Record or in the field logbook. Samples may be collected after the required purge volume has been withdrawn and the field parameters have stabilized to within 10% of their preceding measurement. Project-specific sampling objectives may require that the sample be collected with a bailer.

Bailing presents two potential problems with well purging. First, increased suspended solids may be present in samples as a result of the turbulence caused by raising and lowering the bailer through the water column. High solids concentrations may affect sample representativeness. Second, bailing may be less feasible for deep wells or wells which require a large volume of water to be removed during purging because of the time involved with continuous insertion and removal/emptying of the bailer.

Bailing Procedure

Obtain a clean bailer and a spool of clean polypropylene or nylon bailer cord. Uncover the top end of the bailer and tie a bowline knot, or equivalent, through the bailer loop. Test the knot and the bailer itself to ensure that all knots and parts are secure prior to inserting the bailer into the well.

Remove the protective wrapping from the bailer, and lower the bailer to the bottom of the monitoring well and cut the cord at a proper length. Bailer rope should never touch the ground surface at any time during the purge routine. Tie a hand loop at the end of the bailer cord.

Raise the bailer by grasping a section of cord using each hand alternatively in a "rocking" action. This method requires that the sampler's hands be kept approximately 2-3 feet apart and that the bailer rope is alternately looped onto or off each hand as the bailer is raised and lowered.

Grab the bailer with one hand as it emerges from the well. Pour the bailed groundwater from the bailer into a graduated bucket to measure the purged water volume. Repeat this procedure until one complete purge volume of water is removed from the well.

At the end of one complete well purge volume, place a small of purged water into a sample cup. Measure temperature, pH and specific conductance (and for other assigned parameters) and record the results on the Groundwater Sample Collection Record or in the field logbook. Samples may be collected

after the required purge volume has been withdrawn and the specific field parameters have stabilized to within 10% of their preceding measurement.

4.8.3 Surface Pumps

General

Well purging using pumps located at the ground surface can be performed with peristaltic or centrifugal pumps if the water level in the well is within approximately 20 feet of the top of the well.

Peristaltic pumps provide a low rate of flow typically in the range of 0.02-0.2 gallons/minute (75-750 ml/min). For this reason, peristaltic pumps are not particularly effective for well purging. Peristaltic pumps are suitable for purging situations where disturbance of the water column must be kept minimal for particularly sensitive analyses.

Centrifugal pumps are designed to provide a high rate of pumping, in the range of 5 to 40 gallons/minute (gpm), depending on pump capacity. Discharge rates can also be regulated somewhat, provided the pump has an adjustable throttle. These pumps also require polyethylene or teflon-lined polyethylene tubing as suction line. The pump may also require priming to initiate flow.

Peristaltic Pump Procedure

Attach a new suction and discharge line to the peristaltic pump. Silicon tubing must be used through the pump head and must meet the pump head specifications. A second type of tubing may be attached to the silicon tubing for use as the suction and discharge lines. The secondary tubing material, usually consisting of polyethylene or teflon-lined polyethylene, should be compatible with the target analytes. The suction line must be long enough to extend to the static groundwater surface and reach further should drawdown occur during pumping.

Measure the length of the suction line and lower it down the monitoring well until the end is in the upper foot or more of the water column. Start the pump and direct the discharge into a graduated bucket. Adjust the pumping rate with the speed control knob so that a smooth flowing discharge is attained.

Measure the pumping rate in gallons per minute by recording the time required to fill a calibrated bucket. The pumping shall be monitored to assure

continuous discharge. If drawdown causes the discharge to stop, the suction line will be lowered very slowly further down into the well until pumping restarts.

Measurements of temperature, pH and specific conductance (and/or other assigned parameters) should be made after each well purge volume and documented on the Groundwater Sample Collection Record or in the field logbook. Samples may be collected after the required purge volume has been removed and the specific field parameters have stabilized to within 10% of their preceding measurement. Project-specific sampling objectives may require that the sample be collected with a bailer.

Centrifugal Pump Procedure

Attach a new suction and discharge line to the centrifugal pump. Start the pump and record the stabilized rate of discharge. As with other well purging systems, measurement of temperature, pH, and specific conductance (or other parameters as required) will be made after each well purge volume has been removed. These measurements shall be recorded on the Groundwater Sample Collection Record or in the field logbook. Samples may be collected after the required purge volume has been removed and the field parameters have stabilized to within 10% of their preceding measurement. Project-specific sampling objectives may require that the sample be collected with a bailer.

4.8.4 Down-Well Pumps

General

Groundwater withdrawal using non-dedicated down-well pumps may be performed with a submersible pump or a bladder pump.

Electric submersible pumps provide an effective means for well purging and in some cases sample collection. Submersible pumps are particularly useful for situations where the depth to water table is greater than 20 feet and where the depth or diameter of the well requires that a large purge volume be removed before sample collection.

Commonly available submersible pumps include the Johnson-Keck pump model SP-82, the Grunfos Ready-Flow 2 pump, and disposable marine galley pumps, all of which are suited for operation in 2-inch or larger internal diameter wells.

Recently, the use of bladder pumps (positive gas-displacement pumps) has been promoted by the EPA for use in well purging and sampling primarily because the pumps can be operated at low flow rates (less than 1 liter per minute). Bladder pumps generally reduce the potential turbidity of the sample and theoretically reduce the potential for loss of VOC constituents, ultimately providing a more representative groundwater sample. Use of bladder pumps may require additional time for purging and sampling because of the low flow rate. Please note, however, that when using bladder pumps, it may not be necessary to purge an entire well volume of water prior to each check of the water quality parameters. Well purging is accomplished at such a low rate that, theoretically, the influent flow into the pump represents groundwater flow through the well screen, thereby eliminating the requirement for purging several entire well volumes of water before sample collection.

Bladder pumps usually consist of a stainless steel pump housing with an internal teflon or polyethylene bladder. Discharge tubing is generally made from teflon, polyethylene, or teflon-lined polyethylene. The pump is operated by lowering it into the water column within the well screen, then pulsing air into the bladder with an air compressor and pump controller unit. Pumps and controllers are often not interchangeable between manufacturers, therefore, it is usually necessary to have both items provided by the same manufacturer. Pump bladders are generally field-serviceable and replaceable.

A check of well condition may be required prior to inserting any down-well pump if the well has not been sampled for some time or if groundwater quality conditions are not known. The well condition check should include a check of casing plumbness as a bent well casing could cause a pump to get stuck. Casing plumbness can be checked by lowering a clean cylindrical tube with the approximate pump dimensions into the well. If the well casing is not plumb then an alternative purging method should be used.

The well inspection should also include a check of air quality or headspace conditions within the well for potentially explosive gasses and a check for free product which could foul the pump. Well casing headspace conditions can be monitored with a photoionization detector (PID) and/or an explosimeter for the presence of potentially explosive gasses. If potentially hazardous conditions exist, then an alternative purging method should be used. In general, it is rare for explosive conditions to be present.

The presence of free product should be determined before inserting the submersible pump into the well because free product may contaminate the pump's internal mechanisms making it extremely difficult to decontaminate.

An interface probe should be used to check for free product. Refer to Section 4.5 of this SOP for additional information on free product determination.

Electric Submersible Pump Procedure

Once the above well conditions have been assessed, and assuming its safe to proceed, slowly lower the submersible pump with attached discharge line into the monitoring well taking notice of any roughness or restriction within the well riser pipe. The pump should be placed in the uppermost section of the static water column of the monitoring well. The power cord should be attached to the discharge line with an inert material (i.e., zip-ties) to prevent the power cord from getting stuck between the pump, discharge line, and the well casing. Secure the discharge line and power cord to the well casing, using tape or a clamp, taking care not to crimp or cut either the discharge line or power cord.

Connect the power cord to the power source (i.e., rechargeable battery pack, auto battery, or generator) and turn the pump on. Voltage and amperage meter readings on the pump controller (if provided) should be monitored closely during purging. The operations manual for the specific pump used should be reviewed regarding changes in voltage/amperage and the potential impacts on pump integrity. Pumping should be discontinued if warning conditions occur and/or if the well is pumped to where drawdown falls below the pump's intake level.

If drawdown continues to the extent that the well is pumped dry, the pump should be shut off and the well allowed to recharge. This on/off cycle may be necessary in order to purge the well properly.

Measurements of the pumping rate, temperature, pH, and specific conductance (and/or other required parameters) should be made after each purge volume is removed and documented on the Groundwater Sample Collection Record or in the field logbook. Samples may be collected after the required purge volume has been withdrawn and the field parameters have stabilized to within 10% of their preceding measurement. Project-specific sampling objectives may require that the sample be collected with a bailer.

Bladder Pump Procedure

To operate the bladder pump system, the pump and discharge line should be lowered into the well close to the bottom of the well screen, then secured to

the well casing with a clamp. The air compressor should then be turned on to activate pumping. The pump controller is used to vary the discharge rate to the required flow.

Measurements of the pumping rate, temperature, pH, and specific conductance (and/or other required parameters) should be made at periodic intervals while water is removed and documented on the Groundwater Sample Collection Record or in the field logbook. Samples may be collected after the required field parameters have stabilized to within 10% of their preceding measurement. Generally, because of the low flow rate, samples are usually obtained from the bladder pump discharge line.

4.9 Sample Collection Methods and Procedures

4.9.1 Objectives

Groundwater samples can be collected using similar methods employed for purging, provided these methods do not adversely affect the quality of the groundwater. These methods include bailing, surface pumping and down-well pumping.

In most cases during sampling, groundwater will be transferred to the appropriate containers directly for the discharge source. During transfer, discharge tubing and other equipment shall not contact the inside of the sample containers. In addition, a clean pair of nitrile or latex gloves will be worn during sample collection and handling.

As a general rule of thumb, samples should be collected in order of decreasing volatilization of the target parameters. The preferred order of sample collection is as follows: volatile organic compounds, extractable organic compounds (e.g., semivolatile organic compounds, PCBs, pesticides), metals, and general water chemistry (ions and turbidity).

4.9.2 Bailers

The methods and procedures described in Section 4.9.2 also apply to collecting groundwater samples with a bailer. If a bailer was used to purge the well, the same bailer may be used for sampling. If other well purging equipment was used, a decontaminated or new disposable bailer should be used for sampling.

When volatile organic compounds are the target sampling parameter, a bottom discharge tip should be used during sample transfer. A discharge tip restricts the outflow of the sample from the bailer and diminishes the potential for volatilization. Reusable bailers may require a special screw-on tip fitted with a bottom discharge top. Disposable bottom discharge tips are usually supplied with disposable bailers.

Bailer cord shall be discarded after sampling is completed. Disposable bailers should only be used in one well. Reusable bailers should be appropriately decontaminated between uses.

4.9.3 Surface Pumps

The methods and procedures described in Section 4.9.3 for peristaltic and centrifugal pumps also apply to groundwater sample collection.

Peristaltic Pumps

Peristaltic pumps equipped with the appropriate type tubing will be used to collect groundwater from wells in which the water resides at a depth less than 20 feet. Sample bottles shall be filled directly from the pump's discharge line and care shall be taken to keep the discharge tube from contacting the sample container.

Groundwater samples requiring filtration prior to placement in sample containers can be placed in intermediate containers for subsequent filtration, or may be filtered directly with in-line disposable 0.45-micron filters, as described in SOP 7131.

After sampling is complete, all used tubing and filters shall be disposed of appropriately.

Centrifugal Pumps

Centrifugal pumps are generally not recommended for use in sample collection, especially when volatile organic compounds are the target analyte of interest. Samples for other analytes, however, may be obtained with use of an in-line sample trap. It is suggested that if samples cannot be obtained before going through the pump, that samples be obtained by using a bailer once purging is complete and pumping has ceased. Collecting samples from the pump discharge is not recommended.

After sampling is complete, all suction line tubing should be disposed of properly.

4.9.4 Down-Well Pumps

Electric Submersible Pump

Using the pump methods described in Section 4.9.4, groundwater samples can be collected directly from the pump discharge line, provided the discharge line is composed of inert material. Sample bottles will be filled directly from the discharge line of the pump. This method is generally not recommended for collection of volatile organic samples.

After sampling is complete, the pump, discharge line and power cord shall be decontaminated according to the procedures contained in SOP 7600 and/or disposed of as required by the project-specific work plan.

Bladder Pumps

Groundwater samples, including those collected for VOC analysis, may be collected directly from the pump discharge tubing under active pumping conditions. Sample bottles will be filled directly from the discharge line of the pump.

After sampling is complete, the pump, discharge line and power cord shall be decontaminated according to the procedures outlined in SOP 7600 and/or disposed of as required by the project-specific work plan.

4.10 Sample Filtration

The filtration of groundwater samples will be performed in accordance with SOP 7131. Groundwater samples collected for total dissolved metals analyses will be filtered prior to being placed in sample containers and properly preserved. Groundwater filtration will be performed using a peristaltic pump and a 0.45-micron in-line water filter. Disposable filters are commonly available in 0.45-micron size. Low-capacity or high-capacity cartridges are available and may be selectively used based on sample turbidity.

The filtration of groundwater samples shall be performed either directly from the pump discharge line or from laboratory-supplied intermediate containers. In either case, well purging shall be performed first. Fresh groundwater shall then be filtered directly into sample containers.

4.11 Sample Handling

All samples collected should be packaged and handled according to SOP 7510 and the project-specific sampling plan. Preservatives should be used where analytical methods require preservation. The QAPP will indicate the type of sample preservation necessary.

5.0 QUALITY CONTROL

5.1 Field Blank/Equipment Blank Sample Collection

Field blank samples serve as a quality assurance check of equipment and field conditions at the time of sampling. Field blank samples are usually prepared by transferring analyte-free water into a clean set of sample containers, then analyzing it as a sample. Sometimes, the analyte-free water is transferred over or through the sampling device before it is placed into the sample containers. This type of field blank sample is known as an equipment blank. The QAPP contains specific information regarding the type and number of field blanks or equipment blanks required for collection.

5.2 Field Duplicate Sample Collection

Field duplicate samples are collected for the purpose of providing two sets of results for comparison. These samples are used to assess precision. Duplicate samples are usually prepared by splitting the sample into two sets of sample containers, then analyzing each set as a separate sample. The QAPP contains specific information regarding the type and number of duplicate samples for collection.

5.3 MS/MSD Sample Collection

MS/MSDs provide information about the effect of the sample matrix on digestion and measurement methodology. For samples submitted for MS/MSD analysis, triple sample volume is generally required (contact the analytical laboratory for information specific to the project analytical parameters). The QAPP contains specific information regarding the frequency of MS/MSD samples.

6.0 DOCUMENTATION

Specific information regarding sample collection should be documented in several areas: the sample chain-of-custody record, sample collection record, field notebook, and sample

labels, tags. Additional information regarding each form of documentation is presented in the following paragraphs:

6.1 Sample Chain-of-Custody Record

This ENSR standard form requires input of specific information regarding each collected sample for laboratory analytical purposes. The information requested includes site name and location, project number, field notebook reference, collection date and type of analysis requested. Each sample submitted for analysis is also listed individually using its field identification number, number and type of container, and requested analyses (see SOP 7510).

6.2 Groundwater Sample Collection Record

This form (Attachment 1 or 2) requires input of specific information regarding the collection of each individual sample including sample identification, water quality parameters, collection method, and containers/preservation requirements.

6.3 Field Logbook

This logbook should be dedicated to the project and should be used by field personnel to maintain a general log of activities throughout the sampling program. This logbook should be used in support of, and in combination with, the sample collection record. Documentation within the logbook should be thorough and sufficiently detailed to present a concise, descriptive history of the sample collection process.

6.4 Sample Labels/Tags

Sample labels shall be completed at the time each sample is collected and attached to each sample container. Labels will include the information listed below.

- Client or project name/project number
- Sample number
- Sample designation
- Analysis type
- Preservative
- Sample collection date
- Sample collection time
- Sampler's name

The project-specific work plan may also require the use of sample tags which generally contain the same information as the sample labels. Sample tags, if used, should be tied to each sample bottle with wire ties.

7.0 TRAINING/QUALIFICATIONS

Groundwater sample collection is a relatively involved procedure requiring formal training and a variety of equipment. It is recommended that initial sampling attempts be supervised by more experienced personnel. Sampling technicians should be health and safety certified as specified by OSHA (29 CFR 1910.120(e)(3)(i)) to work on sites where hazardous waste materials are considered to be present.

8.0 REFERENCES

EPA, Handbook for Sampling and Sample Preservation of Water and Wastewater, EPA-600/4-82-029, September 1982.

EPA, RCRA Groundwater Monitoring Technical Enforcement Guidance, November 1992.

Geotrans, Inc., RCRA Permit Writer's Manual, Groundwater Protection, prepared for the U.S. EPA, Contract No. 68-01-6464, October 1983.

Code of Federal Regulations, Chapter 40 (Section 261.4(d)).

Attachment 1 Ground Water Sample Collection Record
Attachment 2 Low Flow Ground Water Sample Collection Record

Attachment 1
Groundwater Sample Collection Record

ENSR

Well/Piezo ID:

Ground Water Sample Collection Record

Client: _____ Date: _____
Project No: _____ Time: Start _____ am/pm
Site Location: _____ Finish _____ am/pm
Weather Conds: _____ Collector(s) _____

WATER LEVEL DATA: (measured from Top of Casing) Well ☐ Piezometer ☐

a. Total Well Length _____ c. Casing Material _____ e. Length of Water Column _____

b. Water Table Depth _____ d. Casing Diameter _____ f. Calculated Well Volume (see back) ____

WELL PURGING DATA

a. Purge Method _____

b. Acceptance Criteria defined (from workplan)
- Minimum Required Purge Volume (@ _____ well volumes) _____
- Maximum Allowable Turbidity _____ NTUs
- Stabilization of parameters _____ %

c. Field Testing Equipment Used: Make Model Serial Number

_____
_____

d. Field Testing Equipment Calibration Documentation Found in Field Notebook # _____ Page #_____

Time	Volume Removed (gal)	T° (C/F)	pH	Spec. Cond (umhos)	Turbidity (NTUs)	DO	Color	Odor	Other

e. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☐	☐	☐
Has required turbidity been reached	☐	☐	☐
Have parameters stabilized	☐	☐	☐

If no or N/A - Explain below.

_____
_____

SAMPLE COLLECTION: Method: _____

Sample ID	Container Type	No. of Containers	Preservation	Analysis	Time

Comments _____

Signature _____ Date _____

Attachment 2
Low Flow Ground Water Sample Collection Record

ENSR

Well ID:

Low Flow Ground Water Sample Collection Record

Client: _____ Date: _____ Time: Start _____ am/pm
Project No: _____ Finish _____ am/pm
Site Location: _____
Weather Conds: _____ Collector(s): _____

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length _____ c. Length of Water Column _____ (a-b)

Casing Diameter/Material _____

b. Water Table Depth _____ d. Calculated System Volume (see back) _____

2. WELL PURGE DATA

a. Purge Method: _____

b. Acceptance Criteria defined (see workplan)

- Temperature	3%	-D.O.	10%
- pH	± 1.0 unit	- ORP	± 10mV
- Sp. Cond.	3%	- Drawdown	< 0.3'

c. Field Testing Equipment used: Make Model Serial Number

_____
_____

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☐	☐	☐
Has required turbidity been reached	☐	☐	☐
Have parameters stabilized	☐	☐	☐

(continued on back)

If no or N/A - Explain below.

_____

3. SAMPLE COLLECTION: Method: _____

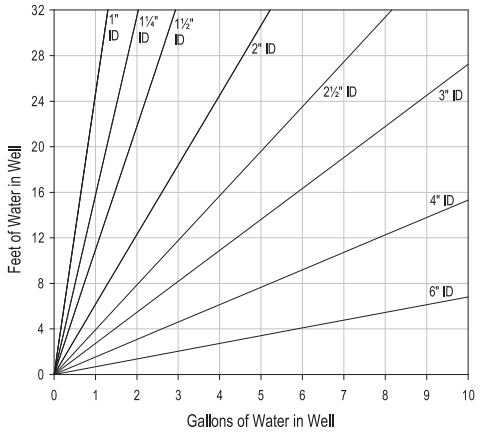
Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time

Comments _____

_____
_____
_____

Signature _____ Date _____

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (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
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

(continued from front)

Time (24 hr)	Volume Removed (Liters)	Temp (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (ft)	Color/Odor

ENSR | AECOM

Standard Operating Procedure

Water Level Measurements

Procedure Number: 7721

Revision No.: 0

Revision Date: February 2008

SOP Contributors: Robert C. Berry, PG; Margaret Bonaker; Paul Clemow; Carmen Caceres-Schnell, PG; Caryn DeJesus; Michael Flack, PG, CEG; Jason Kopanic; Scott G. Olson, PG; Jason Perry, PG; Scott E. Ross, PG; Dott. Daniele Susanni; Tom Waller, PE; Sonya Y. Ward, PG; Jerry Williams, PG; Bob Wyrick

A. Elizabeth Perry, PG
SOP Team Leader

Date: 6 February 2008

Todd Schwendeman,
Stakeholder/Service Line Leader

Date: 2/18/08

Robert C. Weber,
President and Chief Executive Officer

Date: 18 February 2008

Annual review of this SOP has been performed and the SOP still reflects current practice.

Initials: _____ Date: _____

Initials: _____ Date: _____

Standard Operating Procedure

Water Level Measurements

Contents

1.0 Scope and applicability

1.1 This Standard Operating Procedure (SOP) defines the methods to be used for measuring the depth to groundwater and total depth of groundwater monitoring wells and piezometers. Similar procedures can also be used to measure the depth to water in other structures such as catch basins or cisterns or in surface water bodies from fixed structures such as bridges, culverts, or piers.

Water level and well depth measurements collected from monitoring wells or piezometers may be used for the following purposes, among others:

- To evaluate the well condition (potential silt accumulation, height of water column, etc.);
- To establish sampling requirements, such as purge volumes and drawdown during purging;
- To calculate the horizontal hydraulic gradient and the direction of groundwater flow;
- To calculate the vertical hydraulic gradient, if well nests are used (i.e., the direction of groundwater flow in the vertical plane);
- To evaluate the effects of manmade and natural stresses on the groundwater system; and
- To calculate other important hydrogeologic characteristics (e.g., measuring drawdown during slug tests or aquifer pumping tests).

This information, when combined with other location-specific information, is important in understanding the current distribution of constituents in groundwater and their potential for migration in the future. Hydrogeologic characterization is important not only in evaluating potentially contaminated groundwater but also in evaluating non-contaminated groundwater resources.

1.2 Some wells may contain a light non-aqueous phase liquid (LNAPL) floating on the water surface. The procedures outlined in this SOP may be used to measure water levels in such wells, but the results may not be representative of the hydraulic head/potentiometric level. For measurement of LNAPL in wells, refer to ENSR SOP No. 7722.

1.3 There are other methods for measuring water depths than those described in this SOP, for example, a weighted tape with or without a sounding device ("plopper"), pressure transducers, air line pressure, strip recorders, etc. This SOP addresses the methods in most common and regular use.

1.4 This SOP is to be utilized to conduct the work identified in the title of this SOP. In the event the Project Manager of Project Team determines that the protocols and procedures listed in this SOP are not applicable to the project, there is the option to either adapt this SOP or to develop a site-specific SOP to more closely match the requirements of the project. Refer to SOP 1011, Preparation and Control of Standard Operating Procedures, for SOP modification and Project Operating Procedure (POP) development procedures.

2.0 Health and safety considerations

2.1 The health and safety considerations for the work associated with this SOP, including both potential physical and chemical hazards, will be addressed in the site specific Health and Safety Plan (HASP). In the absence of a site-specific HASP, work will be conducted according to the ENSR Health and Safety Policy and Procedures Manual and/or direction from the Regional Health and Safety Manager.

3.0 Interferences

3.1 Potential interferences could result in inaccurate readings if the sensor on the water level meter is wet or dirty, or if the cable cannot be kept vertically upright (for example, from a well that is not plumb or from a bridge in windy conditions). Care shall be taken to keep the probe clean, and to take appropriate measures to reduce these interferences when measuring water levels. The probe may also be shaken to remove water or other fluids that may adhere to the probe. If there is any concern that a particular reading may not be accurate, this shall be noted in the field log book.

3.2 If LNAPL is present in a well, the measured depth to water may not be representative of the hydraulic head/potentiometric level. If the LNAPL thickness and specific gravity are known, an accurate hydraulic head can be calculated (see ENSR SOP No. 7722).

3.3 Some water level meters (especially oil/water interface probes) may rely on optical technology for readings. In these cases, the readings may be influenced by the presence of light. While this is not an issue in wells, it may be at surface water bodies.

3.4 The measured depth to water is not always representative of the hydraulic head in the aquifer. Interferences may include barometric pressure effects, timing during tidal cycles, well construction details, confined/artesian aquifers, well efficiency, etc. Where such influences may be important, the project-specific work plan should specify any corrective measures or additional data to be collected. Interpretation and use of water level data should be performed by a trained specialist.

4.0 Equipment and materials

4.1 Electronic Water Level Meter - Electronic water level meters consist of a spool of small-diameter cable (or tape) with a weighted probe attached to the end. The cable (or tape) is marked with measurement increments in feet (ft) or meters (m) (accurate to 0.01 ft/0.01m), with the zero point being the sensor of the probe. When the probe comes in contact with the water, an electrical circuit is closed, and a light and/or buzzer within the spool will signal the contact. The cable must be of sufficient length the reach to the expected depth of the water to be measured. The probe shall be tested (using water containing dissolved ions) at the start of the field program to ensure proper operation.

An oil/water interface probe may be used to measure water depths. However, in some cases, there may be increased risk of cross-contamination using a probe that is regularly placed in separate-phase liquids. Where such risks are considered significant, project-specific requirements will specify that oil-water interface probes are not to be used in wells where no separate-phase liquids are expected.

4.2 Other Materials - Other materials that may be required:

- Health and safety supplies (as required by the HASP)
- Equipment decontamination materials, including absorbent pads if appropriate
- Plastic sheeting or bucket for resting instrument off the ground
- Water level field form (if applicable)
- Well construction records
- Approved plans (e.g., Field Sampling Plan, Quality Assurance Plan, HASP)
- Field project logbook/waterproof pen
- Appropriate hand tools and keys to access monitoring wells

5.0 Procedures

5.1 Summary of method

Measurements will involve measuring the depth to water and/or total well depth to the nearest 0.01 ft/0.01m using an electronic water level meter. The depths within wells will be measured from the top of casing (typically the inner casing) at the surveyed elevation point. This reference point should be marked so that readings are consistently taken from the same reference point. Depths to surface water may be similarly measured from a marked reference point on the fixed structure (e.g., bridge, culvert, pier, wharf) passing over or bordering the surface water body.

5.2 General preparation

5.2.1 Well records review: Well completion diagrams should be reviewed to determine well construction characteristics, including the location of the reference point and the total depth of the well. Historic static water level measurements and survey information may also be reviewed.

5.2.2 Well access: Many wells may be locked for security reasons. The necessary procedures and equipment to access the wellhead shall be identified prior to entering the site.

5.2.3 Equipment: There are many different water level meters available. Field personnel should make sure the appropriate equipment is used based on well construction details (e.g., well diameter, anticipated depth to water). The specific equipment to be used should be inspected. Field personnel should be sure the equipment is in proper working order, and the measurement increment marks are legible. The type of power supply (e.g., type of batteries) should be determined so that an appropriate back-up supply can be obtained if needed. Sometimes water level meters may be repaired by removing a length of cable near the sensor and re-splicing the cable to the sensor. If this kind of repair has taken place, the measurement markings on the cable are no longer accurate. This condition should be observed and noted, and if appropriate, a replacement water level meter may be obtained as an alternative to correcting the water level measurement for the length of the splice.

5.2.4 Calibration: Manufacturer's instructions, if any, for calibrating or maintaining the accuracy of the instrument shall be followed. If there are project-specific requirements for calibration, these shall also be implemented as outlined in project-specific plans.

5.2.5 Equipment decontamination: All down-hole equipment should be decontaminated prior to and after use and between well locations in accordance with project-specific requirements. Note that some water level probes may be made of materials that are incompatible with certain decontamination solvents.

5.2.6 Order of measurement: For some projects, there may be a specific order in which measurements are to be collected, for example, from the least to most contaminated wells. Any such requirements will be specified in the project-specific plans.

5.2.7 Opening the well: Prior to accessing the well, the wellhead should be cleared of debris and/or standing water. For example, it is common to find standing water in flush mount wellheads that, if not removed, will enter the monitoring well, potentially causing inaccurate water level measurements and/or contamination of the groundwater. Nothing from the ground surface should be allowed to enter the well. Once the wellhead is clear, open the well to obtain the measurements. In some cases, it may be necessary to allow the water level to equilibrate prior to measurement (e.g., wells with fully submerged screened intervals).

5.3 Measurement procedures

5.3.1 At each location (well, piezometer, bridge/culvert, pier/wharf, etc.), determine the location of the surveyed elevation mark. For wells, general markings may include either a notch in the riser pipe or a permanent ink mark on the riser pipe. Some projects may specify a consistent reference point for all wells, for example, the highest point on the riser or the northernmost point. For monitoring surface water levels, there may be a painted mark on an existing structure or the reference point must be known if not marked.

5.3.2 If the reference point is not marked, a point may be selected and clearly and permanently marked to be used for future measurements. If this is done, the project manager must be notified to arrange for the elevation of the new reference point to be surveyed.

5.3.3 To obtain a water level measurement, lower the probe of the water level meter down into the water in the well until the audible sound of the unit is detected or the light on an electronic sounder illuminates. In wells, the probe shall be lowered slowly into the well to avoid disruption of formation water and creation of turbulent water within the well. At this time, the precise measurement should be determined (to the nearest 0.01 ft/0.01m) by repeatedly raising and lowering the tape to converge on the exact measurement. Obtain the reading from the stadia-marked cable where it crosses the surveyed reference point. If the cable is not marked to the nearest 0.01ft/0.01m, a manual rule may be used to interpolate between marked measurements.

5.3.4 Record the water level measurement as well as the location identification number, measuring point (surveyed elevation point), date, time, and weather conditions in the field logbook and/or field form. Any problems with the condition of the well should be noted so that appropriate maintenance can be performed.

5.3.5 To measure the total depth of a well, lower the probe (turn down signal as appropriate) slowly to the bottom of the well. For deep wells or wells with a soft or silty base, the depth may be difficult to determine. It may be helpful to lower the probe until there is slack in the tape, and

gently pull up until it feels as if there is a weight at the end of the tape. Obtain the depth reading (to the nearest 0.01 ft/0.01m) from the cable where it crosses the surveyed reference point. If the cable is not marked to the nearest 0.01ft/0.01m, a manual rule may be used to interpolate between marked measurements.

5.3.6 Record the total well depth in the field logbook and/or field form.

5.3.7 The meter will be decontaminated in accordance with appropriate project-specific requirements and equipment use and care requirements. If the probe was in contact with separate-phase liquids, the potential for cross-contamination is greater, so appropriate care should be taken during decontamination, as specified in project-specific requirements. It is important to avoid placing the measuring tape and probe directly on the ground surface (to minimize potential cross-contamination) or allowing the cable to become kinked (which affects the accuracy of the measured depths).

5.4 Special conditions

5.4.1 Wells containing pumps or other equipment. It may be difficult to obtain accurate water level depths in wells where down-hole equipment is present. There may not be sufficient space within the well for the water level meter, or the meter cable may become bound up in the tubing, cables, or other equipment in the well. It is preferable to remove down-hole equipment when feasible. If removal of the equipment is not feasible and there is a reasonable chance of getting the meter caught in the well and not being able to remove it, it may be preferable to avoid collecting water level data.

5.4.2 Drinking water wells. The water level meter represents a potential source of surface contamination when introduced into drinking water wells, particularly for bacteriological contamination. If it is necessary to measure water level depths in drinking water wells using the procedures in this SOP, appropriate disinfection procedures should be performed.

6.0 Quality assurance / quality control

6.1 Field personnel will follow site-specific quality assurance guidelines. Where measured depths are not consistent with well records or previously measurements, the depths should be re-measured, verified, and documented in the field records.

6.2 Field duplicates of the depth-to-water measurements will be obtained if required by and at the frequency specified in project-specific requirements. To collect a field duplicate measurement, the water level probe will be fully withdrawn from the well, then re-lowered to obtain a second reading of the depth to water. No more than a few minutes should elapse between the two measurements. Field duplicates will not be obtained if water levels are changing rapidly, for example, during pumping tests.

6.3 Manufacturer's instructions, if any, for calibrating or maintaining the accuracy of the instrument shall be followed.

7.0 Data and records management

7.1 All field information will be recorded in the field logbook or on a field collection form by field personnel. Recording of field data will follow the guidance presented in ENSR SOP 7515, Recording of Field Data.

7.2 Unanticipated changes to the procedures or materials described in this SOP (deviations) will be appropriately documented in the project records.

7.3 Records associated with the activities described in this SOP will be maintained according to the document management policy for the project.

8.0 Personnel qualifications and training

8.1 Qualifications and training

8.1.1 The individual executing these procedures must have read, and be familiar with, the requirements of this SOP.

8.1.2 Collecting water level measurements is a relatively simple procedure requiring minimal training and a relatively small amount of equipment. It is recommended that the collection of water level measurements be initially supervised by more experienced personnel.

8.1.3 Field personnel must be health and safety trained as required by the project conditions and local/national standards.

8.2 Responsibilities

8.2.1 The project manager is responsible for providing the project team with the materials, resources and guidance necessary to properly execute the procedures described in this SOP.

8.2.2 The individual performing the work is responsible for implementing the procedures as described in this SOP and any project-specific work plans.

8.2.3 Field personnel are responsible for the proper use, maintenance, and decontamination of all equipment used for obtaining water level measurements, as well as proper documentation in the field logbook or field forms (as appropriate).

9.0 References

American Society for Testing Materials. 1993. ASTM Standard D4750, Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well).

Driscoll, Fletcher G. 1986. Groundwater and Wells. St. Paul Minnesota: The Johnson Division.

ENSR SOP 1011 – Preparation and Control of Standard Operating Procedures.

ENSR SOP 7515 – Recording of Field Data.

ENSR SOP 7722 – Measurement of Non-Aqueous Phase Liquids (NAPL) in Wells.

United States Environmental Protection Agency. 2001. Guidance for Preparing Standard Operating Procedures (SOPs). EPA QA/G-6. EPA/240/B-01/004. USEPA Office of Environmental Information, Washington, DC. March 2001.

10.0 Revision history

Revision	Date	Changes
0	February 2008	NA

Appendix H – Work Plan for Additional Soil Vapor Intrusion Assessment

conEdison
a con Ed Inc. company

Consolidated Edison Company
of New York, Inc.
31-01 20th Avenue
Long Island City NY 11105-2048
www.conEd.com

February 9, 2008

By e-mail and overnight mail

Mr. William Ottaway
New York State Department of Environmental Conservation
Remedial Bureau C, 11th Floor
625 Broadway
Albany, NY 12233 7017

Subject: **Work Plan for Additional Soil Vapor Intrusion Assessment**
East 115th Street Gas Works
New York, New York
NYSDEC Site # V00540

Dear Ms. Ottaway:

This letter presents a work plan for performing additional soil vapor intrusion assessment activities at the Manhattan Center for Science and Mathematics school during 2008. In general, work will be consistent with the previous sampling conducted in 2002 and 2004. Methods and procedures have been updated as necessary to comply with *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH, October 2006).

Pre-sampling Survey
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 NYSDOH guidance. 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 ppb RAE.

Indoor Air Sampling
Indoor air sampling is proposed for seven locations in the basement and six locations on the first floor. Sample locations are depicted in Figures 1 and 2. Ambient outdoor air samples will be collected at two locations (see Figure 1). The proposed sampling locations are essentially the same as those sampled in 2004.

Samples will be collected in certified clean, 6-liter, stainless steel SUMMA canisters over a two-hour period. Calibrated valves will be used during samples collection. Samples will be collected during evening hours, on weekends and/or during school breaks. Samples collection forms will be used to document canister and valve identification numbers, sample locations, and periodic pressure readings from the summa canisters.

The laboratory will perform the analyses according to methods and procedures specified in the New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocols (ASP). The data package provided by the laboratory will meet the specifications of a full ASP Category B deliverable package. The methods and data package provided by the laboratory will be consistent with the specifications of the most current version of the ASP (July 2005). The laboratory performing the analyses will have current NYSDOH Environmental Laboratory Approval Program (ELAP) certification for all analyses performed. A NYSDEC Data Usability Summary Report (DUSR) will be prepared by a qualified chemist.

The samples will be analyzed for volatile organic compounds (VOCs), including naphthalene, by U.S. EPA Method TO-15. The minimum reporting limit for the analyses will be at least 1 part per billion (1 to 7 micrograms per cubic meter depending on the molecular weight for each compound). The helium analysis will be performed using modified method ASTM D1945. In addition to the standard TO-15 list of compounds, several additional compounds will be analyzed for, including: indane, indene, thiophene, styrene, 2-methyl pentane, isopentane, 2, 3-dimethyl pentane, isooctane, and methyl tert butyl ether (MTBE). 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.

At each sampling location, a test will be conducted for the presence of cyanide in air. An Accuro Drager hand held pump (or equivalent) and a Drager tube model 6728791 (or similar) will be used to test for cyanide.

Sub-slab Vapor Sampling

Installation of permanent sub-slab vapor sampling points is proposed to be used for repeated sub-slab vapor samples collection. These points may also be used as monitoring points during potential future remedial actions. Proposed locations for sub-slab monitoring points are shown in Figure 3. Although a total of seven locations have been identified, it is anticipated that installation of vapor points at some locations may not prove to be feasible due to subsurface building supports. Thus, the total number of points installed may be less than seven. The proposed sub-slab sampling locations were selected and marked-out during a site visit on December 17, 2007 attended by a NYSDOH Project Manager Dawn Hettrick. Where floor tiles are present, asbestos sampling and abatement will be conducted prior to installation of the points. Where paint is present on the floor, measures will be taken (tape will be applied) to avoid the generation of dust (should the paint contain lead). All points will be completed with vapor-tight seals that are flush to the floor. Low traffic areas have been selected for the points.

A construction diagram for a typical sub-slab vapor monitoring point is provided as Figure 4. The points are designed in accordance with the recommendations of the NYSDOH guidance. To the extent possible, sampling of the sub-slab points will occur at least 24 hours after they are installed. Each point will be leak-tested using helium gas as a tracer prior to sampling. At least three system volumes will be purged from the sub-slab points and tubing prior to sampling. Sub-slab vapor samples will be collected in

stainless steel SUMMA canisters and analyzed by method TO-15 as described for the indoor air samples. Sub-slab vapor samples will be collected concurrent with indoor air samples over a two-hour period.

Reporting and Schedule

Sampling analytical results will be available approximately four to six weeks after each sampling event. Upon receipt of analytical results, a report on the sampling will be issued and submitted to the NYSDEC. In addition to documenting the pre-survey results and analytical results, the reports will compare results to applicable standards. At this time sampling is expected to occur during the winter and summer of 2008. Tentative schedule for work during the winter break is as follows:

February 19: 8 am to 6 pm - install soil vapor points
February 20: 8 am to 6 pm – complete installation of points, leak test
February 21: 8 am to 6 pm - soil vapor and indoor air sampling

If you have any questions or require further information, please do not to hesitate to contact me at (718) 204-4205 or via e-mail at skorobogatovy@coned.com.

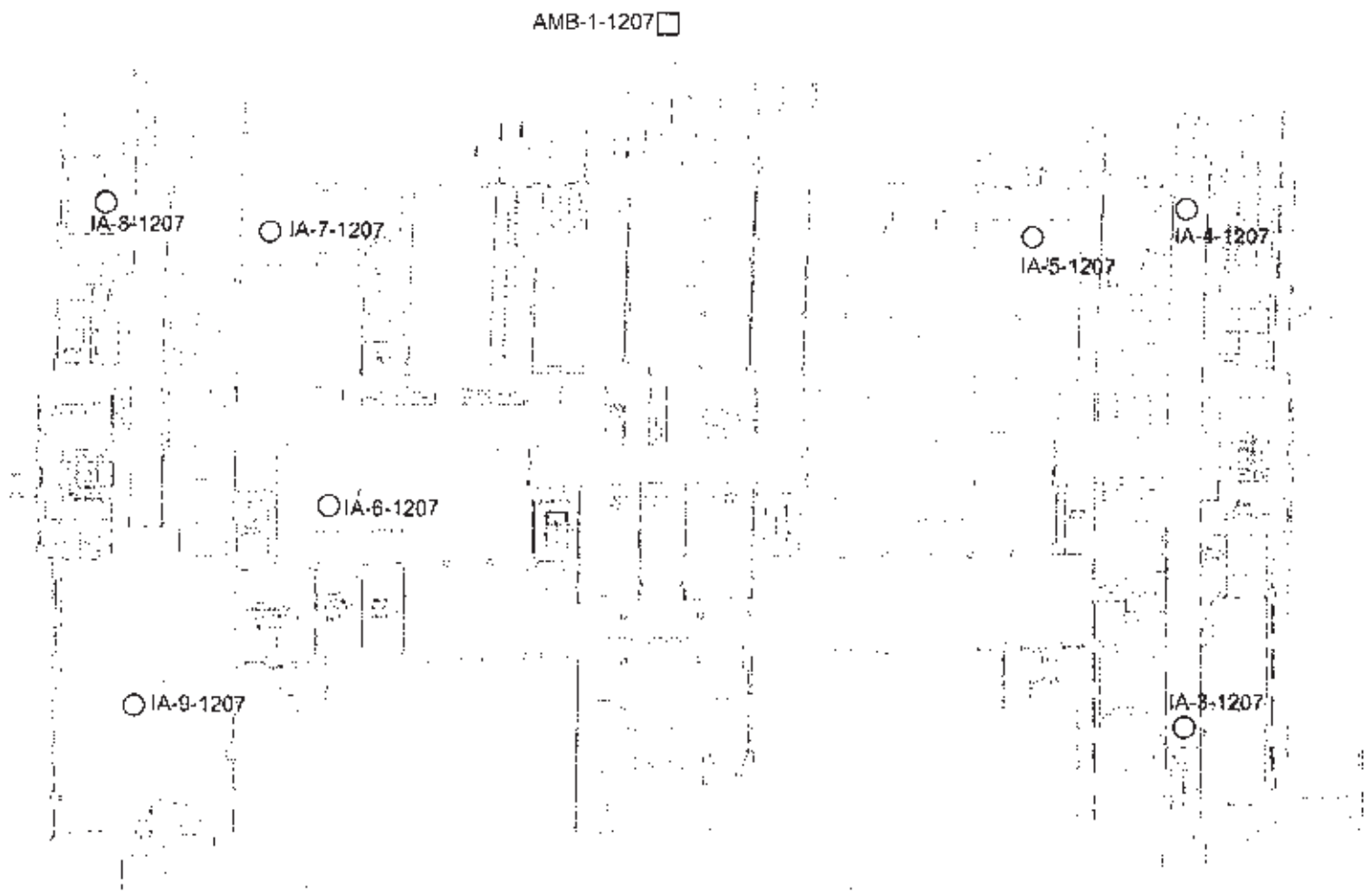
Sincerely yours,

Yelena Skorobogatov
Technical Specialist
MGP Remediation
Environment, Health and Safety

Enc.

cc: Ms. Dawn Hettrick, NYSDOH
Larry S. Eckhaus, Esq., NYSDEC w/o enc.
Ms. Jane O'Connell, NYSDEC, Region 2 w/o enc.

Bcc: Eddy Louie, Con Edison
Laura Mascuch, Con Edison
Craig MacPhee, ENSR



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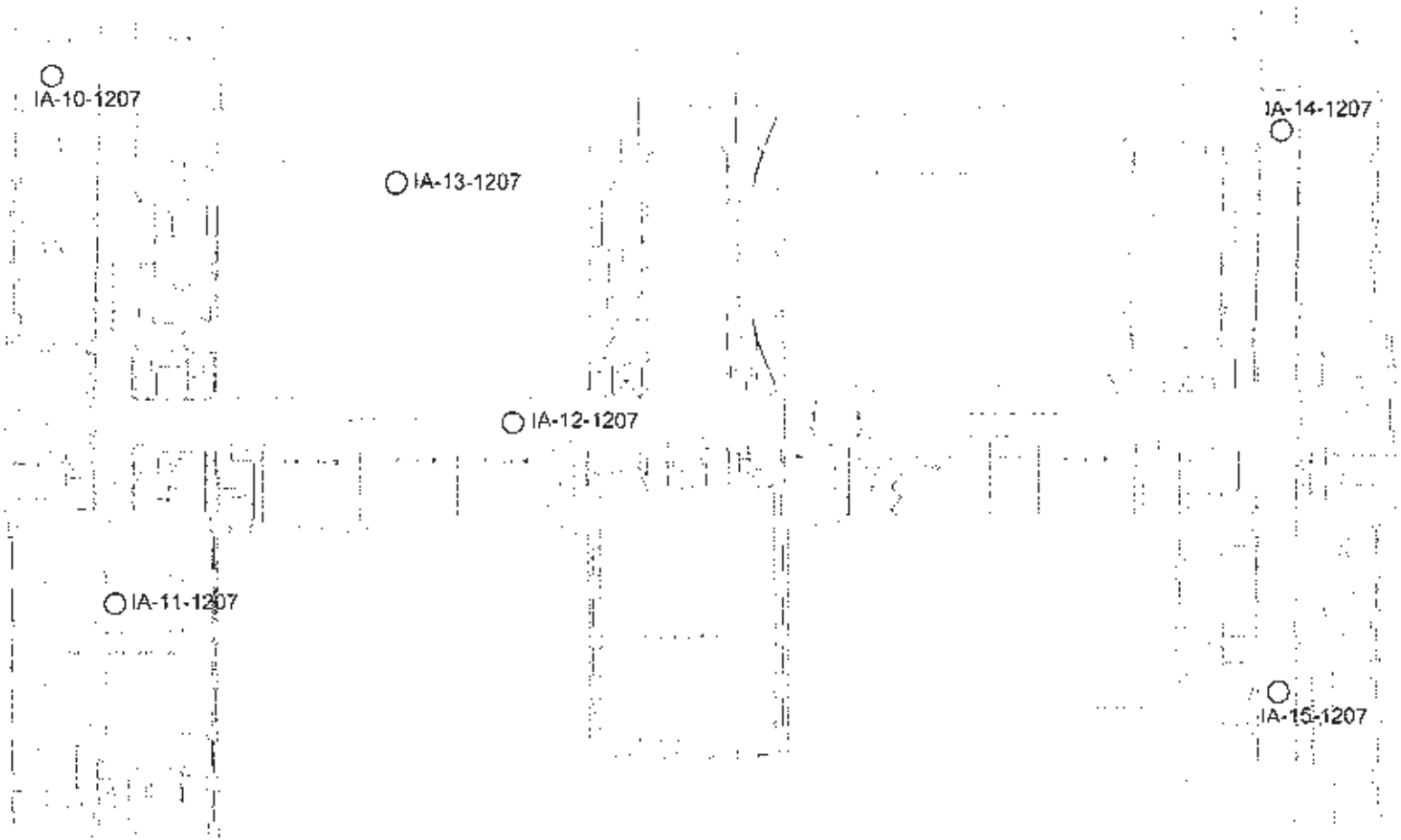
Floor Plan - Basement
Manhattan Center for Science and Mathematics
Pleasant Avenue - East 115th Street
New York, New York

DATE 12/16/07	CLCN3-19393	Figure 1



ENSR

Floor Plan - First Floor
Manhattan Center for Science and Mathematics
Pleasant Avenue - East 115th Street
New York, New York

0411 12/15/07	CEON3-19391	Figure 2

⊗ Proposed Permanent Sub-Slab Vapor Monitoring Points

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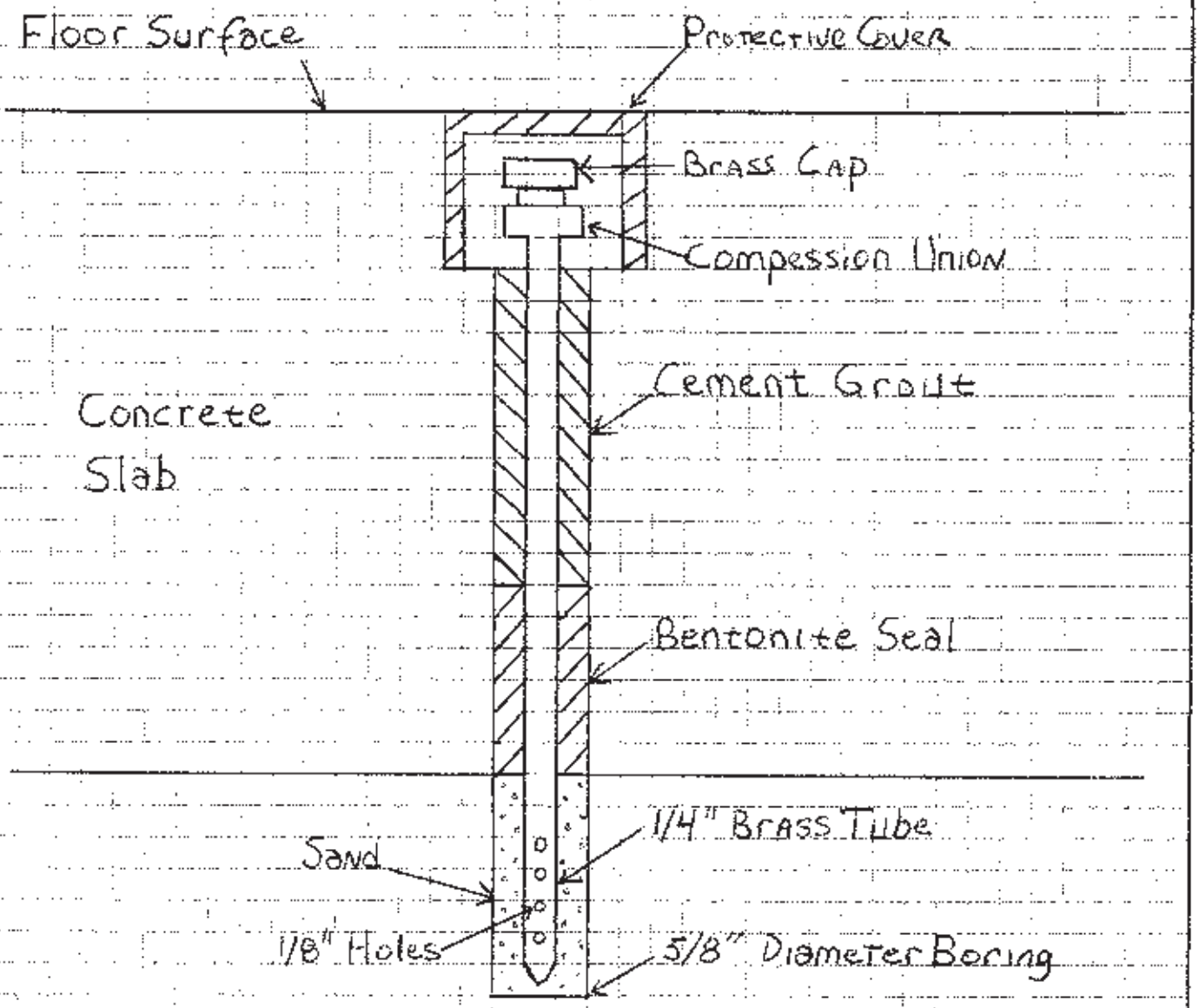
Floor Plan - Basement
Manhattan Center for Science and Mathematics
Pleasant Avenue - East 115th Street
New York, New York

DATE: 12/19/07 | (illegible) | Figure 3

Figure 4 SubSlab Vapor Point



Air Toxics LTD.
180 Blue Ravine Road, Suite B Folsom, CA 95630

December 18, 2007
Sent via e-mail

Ms. Waverly Braunstein
ENSR International
2 Technology Drive
Westford, MA 01886-3140

RE: **ANALYTICAL LABORATORY SERVICES FOR CONED TO-15 ANALYSIS**
AIR TOXICS QUOTE NO. 071210451

Dear Ms. Braunstein:

AIR TOXICS LTD, a woman-owned small business, is pleased to provide a quote for laboratory services. Our level of experience, integrity, expertise, and capacity make us uniquely qualified to support ENSR International in this effort.

For this project, we understand that samples will be submitted for analysis by Modified EPA TO-15 Low Level, and Modified ASTM D-1946. Air Toxics will provide data to you as a Level II report by e-mail in .pdf format within 10 business days of sample receipt. If required, we can also provide your data as an EDD in our standard ATL format or in a specified format within 15 business days of sample receipt. Level IV electronic Comprehensive Validation Packages (eCVP) are available via the web within 15 business days of sample receipt.

In the absence of a QAPP or SOW Air Toxics intends to follow the method procedures as outlined by our Standard Operating Procedures (SOPs). Please note all pricing is based upon sample analysis for the target compound list(s) enclosed. Any project-specific requirements that vary from this may result in a revision of this pricing.

Please note that reporting limits cited do not take into account sample dilution due to canister pressurization nor do they take into account sample dilution due to matrix interference. In general, the dilution factor from pressurization will raise reporting limits approximately 1.5 to 1.7 times for 6L canisters and 2.4 to 2.5 times for 1L canisters.

Air Toxics is among a select number of environmental laboratories to receive accreditation from the National Environmental Laboratory Accreditation Program (NELAP). Air Toxics is certified by California DHS, New York DOH, Utah DOH, Florida DOH, Louisiana DEQ, and New Jersey DEP. We are validated by the U.S. Army Corps of Engineers and U.S. Navy Facilities Engineering Service Center. Air Toxics is WBE certified in the states of California and New York.

We appreciate the opportunity to provide this quote, and look forward to working with you on this project. Please call me if you have questions regarding our submittal or need any additional information.

Sincerely,

Bryanna Langley
Client Services Representative
800-985-5955 x1027

Air Toxics LTD.
180 Blue Ravine Road, Suite B Folsom, CA 95630

Method: Modified TO-15-LL (Sp)/TICs (10)-The Retec (Con-Ed Indoor Air)

Compound	Rpt. Limit (ppbv)
Freon 12	0.10
Freon 114	0.10
Chloromethane	0.10
Vinyl Chloride	0.10
Bromomethane	0.10
Chloroethane	0.10
Freon 11	0.10
1,1-Dichloroethene	0.10
Freon 113	0.10
Methylene Chloride	0.10
1,1-Dichloroethane	0.10
cis-1,2-Dichloroethene	0.10
Chloroform	0.10
1,1,1-Trichloroethane	0.10
Carbon Tetrachloride	0.10
Benzene	0.10
1,2-Dichloroethane	0.10
Trichloroethene	0.10
1,2-Dichloropropane	0.10
cis-1,3-Dichloropropene	0.10
Toluene	0.10
trans-1,3-Dichloropropene	0.10
1,1,2-Trichloroethane	0.10
Tetrachloroethene	0.10
1,2-Dibromoethane (EDB)	0.10
Chlorobenzene	0.10
Ethyl Benzene	0.10
m,p-Xylene	0.10
o-Xylene	0.10
Styrene	0.10
1,1,2,2-Tetrachloroethane	0.10
1,3,5-Trimethylbenzene	0.10
1,2,4-Trimethylbenzene	0.10
1,3-Dichlorobenzene	0.10
1,4-Dichlorobenzene	0.10
alpha-Chlorotoluene	0.10
1,2-Dichlorobenzene	0.10
1,2,4-Trichlorobenzene	0.50
Hexachlorobutadiene	0.50
Propylene	0.50
1,3-Butadiene	0.50

Reporting limits cited do not take into account sample dilution due to canister pressurization.

Toll Free: 1-800-985-5955 Phone: 1-916-985-1000 Fax: 1-916-985-1020 email: atl@airtoxics.com www.airtoxics.com

Air Toxics LTD.
180 Blue Ravine Road, Suite B Folsom, CA 95630

Method: Modified TO-15-LL (Sp)/TICs (10)-The Retec (Con-Ed Indoor Air)

Acetone	0.50
Carbon Disulfide	0.50
trans-1,2-Dichloroethene	0.50
2-Butanone (Methyl Ethyl Ketone)	0.50
Hexane	0.50
Tetrahydrofuran	0.50
Cyclohexane	0.50
1,4-Dioxane	0.50
Bromodichloromethane	0.50
4-Methyl-2-pentanone	0.50
2-Hexanone	0.50
Dibromochloromethane	0.50
Bromoform	0.50
4-Ethyltoluene	0.50
Ethanol	0.50
Methyl tert-butyl ether	0.50
Heptane	0.50
Naphthalene	0.50
2-Methylpentane	0.50
Isopentane	0.50
2,3-Dimethylpentane	0.50
2,2,4-Trimethylpentane	0.50
Indene	0.50
Indan	0.50
Thiophene	0.50
2-Propanol	0.50

Surrogate	Method Limits
1,2-Dichloroethane-d4	70-130
4-Bromofluorobenzene	70-130
Toluene-d8	70-130

Reporting limits cited do not take into account sample dilution due to canister pressurization.

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Method: Modified ASTM D-1946 (Sh)-He only (New RL 0.05)

Compound	Rpt. Limit (%)
Helium	0.050

Reporting limits cited do not take into account sample dilution due to canister pressurization.

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Appendix I – Quality Assurance Project Plan (QAPP) (to be developed following implementation of the remedy)

Appendix J – Operation and Maintenance Manual SSD System and As-built Plans (to be added to SMP following implementation of the remedy)

Appendix K – Barrier Wall/NAPL Recovery Well Inspection Checklist and As-built Plans (to be added following implementation of the remedy)