Appendix C

Field Sampling and Analytical Plan (FSAP)

Prepared for:
National Grid
Brooklyn, New York

Field Sampling and Analytical Plan

Metropolitan Former MGP Site
Brooklyn, New York
NYSDEC Site No.: 224046
Order on Consent Index #: A2-0552-0606

AECOM, Inc.
May 2009
Project No.: 01787-075

AECOM

Prepared for:
National Grid
Brooklyn, New York

Field Sampling and Analytical Plan

Metropolitan Former MGP Site
Brooklyn, New York
NYSDEC Site No.: 224046
Order on Consent Index #: A2-0552-0606

__________________________________ **for**
Prepared By: Caryn DeJesus, Project Scientist

____
Reviewed By: Peter S. Cox, PG, Senior Geologist

AECOM, Inc.
May 2009
Project No.: 01787-075

AECOM

Contents

List of Appendices

List of Tables

List of Figures

1.0 Introduction

This Field Sampling and Analytical Plan (FSAP) presents the methods and procedures to be used for performing the Remedial Investigation (RI) at the Metropolitan former manufactured gas plant (MGP) site located at 124-136 2nd Avenue in Brooklyn, New York.

1.1 Overview of field activities

The following field activities will be performed as part of the RI:

- Test Pit Excavation – Two test pits will be excavated at the site.
- Soil Boring Installation – There will be approximately 17 soil borings (including 9 borings converted for monitoring well installation) with approximately 51 soil samples collected.
- Monitoring Well Installation and Groundwater Sampling – Approximately 20 monitoring wells will be installed at varying depths (shallow, intermediate, and deep). Groundwater samples will be collected from the new wells in addition to select existing wells.
- Aquifer Testing – Slug tests will be performed at select well locations.
- Soil Vapor Intrusion/Indoor Air Evaluation – Four co-located sub-slab soil vapor and indoor air samples will be collected in two buildings overlying the footprint of the former MGP (2 sample locations in each building).
- Surveying – The locations and elevations of the RI data points and important site features will be surveyed.

2.0 General field guidelines

2.1 Site hazards

Potential on-site surface hazards, such as sharp objects, overhead power lines, energized areas, vehicular traffic, and building hazards will be identified prior to initiation of the fieldwork. Generally, potential hazards at the site will be identified during a site reconnaissance by the project team on the first day of the investigation field activities. Additional safety measures to be undertaken for the work performed during the investigation are addressed in the Site-Specific Health and Safety Plan (HASP).

2.2 Underground utilities

Underground utilities, including electric lines, gas lines, storm and sanitary sewers, and communication lines will be identified prior to initiation of drilling and other subsurface work. Underground utility location will be accomplished as follows:

- All RI data points will be flagged or marked out with white paint.
- Dig Safely of New York (800) 272-4480 will be contacted to initiate the locating activities. New York State law requires that Dig Safely of New York be notified at least two working days, and not more than 10 working days, before subsurface work is conducted.
- Companies with subsurface utilities present will locate and mark out all subsurface utility lines.
- Geophysical methods will be used to further evaluate the potential presence of underground utilities in the area of each proposed investigation location.
- Subsurface investigation locations will be hand cleared to five feet below ground surface (bgs) prior to advancing borings with mechanized equipment.

2.3 Field log books

All field activities will be carefully documented in field log books. Entries will be of sufficient detail that a complete daily record of significant events, observations, and measurements is developed. The field log book will provide a legal record of the activities conducted at the site. Accordingly:

- Field books will be assigned a unique identification number.
- Field books will be bound with consecutively numbered pages.
- Field books will be controlled by the Site Manager while fieldwork is in progress.
- Entries will be written with waterproof ink.
- Entries will be signed and dated at the conclusion of each day of fieldwork.
- Erroneous entries made while fieldwork is in progress will be corrected by the field person that made the entries. Corrections will be made by drawing a line through the error, entering the correct information, and initialing the correction.
- Corrections necessary after departing the field will be made by the person who entered the original information. Corrections will be made by drawing a line through the error, entering the correct information, and initialing and dating the time of the correction.

At a minimum, daily field book entries will include the following information:

- Location of field activity;
- Date and time of entry;
- Names and titles of field team members on site and site contacts;
- Names, titles of any site visitors, as well as the date and time entering and leaving the site;
- Weather information, for example: temperature, cloud coverage, wind speed, and direction;
- Purpose of field activity;
- A detailed description of the fieldwork conducted;
- Sample media (soil, sediment, groundwater, etc.);
- Sample collection method;
- Number and volume of sample(s) taken;
- Description of sampling point(s);
- Volume of groundwater removed before sampling;
- Preservatives used;
- Analytical parameters;
- Date and time of collection;
- Sample identification number(s);
- Sample distribution (e.g., laboratory);
- Field observations;
- All field measurements made, such as volatile organic compounds (VOCs) using a PID, pH, temperature, conductivity, water level, etc.;
- References for all maps and photographs of the sampling site(s); and
- Information pertaining to sample documentation such as:
  - Bottle lot numbers;
  - Dates and method of sample shipments;
  - Chain-of-custody (COC) record numbers; and
  - Federal Express air bill number.

3.0 Field equipment decontamination and management of investigation-derived residuals

3.1 Decontamination area

A temporary decontamination area lined with polyethylene sheeting will be constructed on site for use during decontamination of the drilling and test pitting equipment. Water collected from the decontamination of activities will be collected in 55-gallon drums or a bulk tank and managed as described in Section 3.3.

3.2 Equipment decontamination

The following procedures will be used to decontaminate equipment used during the RI activities.

- All drilling equipment including the backhoe, bucket, and drilling rig; augers; bits; rods; tools; split-spoon samplers; and tremie pipes will be cleaned with a high-pressure, hot water pressure washing unit between investigation locations.
- Tools, drill rods, and augers will be placed on polyethylene plastic sheets following pressure washing. Direct contact with the ground will be avoided.
- The back of the drill rig and all tools, augers, and rods will be decontaminated at the completion of the work and prior to leaving the site.

3.2.1 Sampling equipment decontamination

Suggested Materials:

- Potable water;
- Phosphate-free detergent (such as Alconox™ or Simple Green™);
- Distilled water;
- Aluminum foil;
- Plastic/polyethylene sheeting;
- Plastic buckets and brushes; and
- Personal protective equipment (PPE) in accordance with the HASP.

Procedures:

- Prior to sampling, all non-dedicated sampling equipment (bowls, spoons, interface probes, etc.) will be washed with potable water and a phosphate-free detergent (such as Alconox™). Decontamination may take place at the sampling location as long as all liquids are contained in pails, buckets, etc.
- The sampling equipment will then be rinsed with potable water followed by a de-ionized water rinse.
- Between rinses, equipment will be placed on polyethylene sheets or aluminum foil, if necessary. At no time will washed equipment be placed directly on the ground.
- Equipment will be wrapped in polyethylene plastic or aluminum foil for storage or transportation from the designated decontamination area to the sampling location.

3.3 Management of investigation-derived residuals

3.3.1 Decontamination fluids

Hot water pressure wash and decontamination fluids will be collected in 55-gallon drums or a bulk tank. The storage drums or tank will be labeled as “pending analysis – investigation-derived residual decon water” and temporarily stored in a plastic-lined containment area pending characterization and proper disposal.

3.3.2 Drill cuttings

Drill cuttings will be contained in 55-gallon drums. The drums will be labeled as “pending analysis – investigation-derived residual – soil from drill cuttings” and temporarily stored in a plastic-lined containment area pending characterization and proper disposal.

3.3.3 Development and purge water

All development and purge water will be contained in 55-gallon drums or a bulk tank. The drums or tank will be labeled as “pending analysis - investigation derived residual development and purge water” and temporarily stored in a plastic-lined containment area pending characterization and proper disposal.

3.3.4 Personal protective equipment

All PPE will be placed in 55-gallon drums or a lined cardboard yard box for proper disposal.

3.3.5 Dedicated sampling equipment

All dedicated groundwater sampling equipment will be placed in 55-gallon drums for disposal.

4.0 Soil sampling procedures

4.1 Introduction

Surface and subsurface investigation activities to be conducted at the Metropolitan former MGP site will consist of exploratory test pit excavation; the advancement of soil borings; and the installation of monitoring wells. These activities will require the use of the following equipment and material:

- Field book;
- Project plans;
- PPE in accordance with the HASP;
- Stakes, flagging and marking paint;
- Plastic bags for soil screening samples;
- Tape measure;
- Steel shovel and stainless steel spoons or disposable polyethylene trowels (surface soil);
- Decontamination supplies;
- Water level indicator;
- Electronic oil/water interface probe
- Clear polyethylene disposable bailers (NAPL confirmation in wells);
- Polyethylene disposable bailers (well development);
- Polypropylene rope (well development);
- Waterra™ pump or other purge pump (well development);
- Submersible electric pump (well development);
- Stainless steel or glass beakers (well development);
- Turbidity meter (well development);
- Temperature, conductivity, pH meter (well development).
- PID with a 10.2 or 10.6 eV lamp;
- Camera;
- Clear tape, duct tape;
- Laboratory sample bottles;
- Coolers and ice; and
- Shipping supplies.

Procedures for these activities are described in the following sections.

4.2 Soil Sampling

4.2.1 Test pit excavation

Test pits will be excavated using a rubber-tired or track backhoe. In the event deep excavations are anticipated, a track hoe will be utilized. Locations of test pits are specified in the RI Work Plan, and will be finalized in the field, based on the location of existing underground utilities. If the prospective test pit location is covered by concrete, the area will be saw-cut prior to excavation.

During test pit investigation activities, personnel will stand upwind of the excavation area to the extent possible. Air monitoring and odor mitigation (if necessary) will be conducted in accordance with the Community Air Monitoring Project (CAMP) and HASP. Test pit materials will be photographed and logged for future reference. Material removed from the test pit will be placed on polyethylene sheeting. The location and size of the test pit will be measured and described in the field logbook.

Visually clean soils, such as surface soils, will be segregated from soils that may be impacted. The visually clean soils will be used to cover the impacted soils/source materials when placed back in the excavation. At a minimum, the top 2 feet of backfilled soil will be visually clean. The test pit will be backfilled as soon as possible after completion and in general prior to the cessation of activities at the end of the day. Following restoration of the excavation, the test pit will be staked/marked to facilitate subsequent location by surveying crews.

4.2.2 Surface soil

Approximately three surface soil samples will be collected from identified areas of the Site containing exposed surface soil. One sample (SS-1) will be collected from proposed SB-9/MW-9 location in the vegetated parcel between Hamilton Plaza and the Gowanus Canal. The locations of the remaining two samples (SS-2 and SS-3) will be determined pending identification of additional areas of surface soil within the defined Site boundary. In the event that the parcel between Hamilton Plaza and the Gowanus Canal is the only area of identified surface soil, it is proposed that the remaining two samples (SS-2 and SS-3) be collected in this parcel. At each surface soil sampling location, vegetation will be cleared from the location, and the surface soil samples will be collected from 0 to 2 inches bgs using a steel shovel and a stainless steel spoon or disposal polyethylene trowel. A portion of the sample from each location will be collected directly into the sample container designated for volatile organic compound (VOC) analysis. The remaining soils will be homogenized in a stainless steel or disposable mixing bowl prior to transfer to the sample container for the remaining analyses (semi-volatile organic compounds [SVOCs]) using USEPA Method 8270C, RCRA 8 metals using USEPA Methods 6010 and 7000-series, and free cyanide (extraction by EPA method 9013A and analysis by Microdiffusion, ASTM International method D4282-02). Visual descriptions of the surface soil and field screening of the soils using a PID will be performed prior to homogenization. One sample (SS-1) will be analyzed for the full Target Compound List (TCL) VOCs, SVOCs, pesticides (USEPA Method 8081A), herbicides (USEPA Method 8151A), PCBs (as Aroclors; USEPA Method 8082), Target Analyte List (TAL) metals, and free cyanide ASTM International method D4282-02.

4.2.3 Subsurface soil

Soil borings will be advanced and sampled with a combination of either rotosonic drilling methods equipped with 4-inch diameter sampling cores or hollow-stem augers (HSAs) equipped with 2-inch or 3-inch diameter split-spoon samplers. In some instances, a direct-push (Geoprobe™) drilling rig equipped with 4-foot long, 2-inch diameter Macro-Core™ samplers may be used if there are access limitations. All drilling equipment will be decontaminated between each boring in accordance with methods specified in Section 3.2.

All locations will be properly abandoned following the collection of samples. Boreholes for the direct-push borings will be filled with bentonite chips. All rotosonic or auger soil borings not used for the construction of monitoring wells will be tremie grouted to the ground surface following the completion of the soil sampling to prevent cross-contamination of permeable zones. The borings will be filled using a cement/bentonite grout mixture with the following specifications:

- Bentonite will be powdered sodium montmorillonite furnished in moisture resistant sacks without additives.
- Cement shall be a low-alkaline Portland cement, Type I in conformance with ASTM C-150 and without additives.
- The cement/bentonite grout mixture shall be to the following proportion:
  - Three sacks (94 pounds) of Type I Portland cement;
  - 14 pounds of granular bentonite (5% mix); and
  - 25 gallons of water.

The cement will be mechanically mixed, above ground, with water from a potable water source. Bentonite will be added to ensure a lump-free consistency. The mixture will be pumped through a tremie pipe as the drill is being withdrawn.

4.2.4 Geologic logging methods

The field geologist will log borehole geology and headspace measurements, and any other observations (e.g., odors, NAPL, soil staining, etc.), in the field book and the Drilling Record shown in Figure 4-1, or similar form.. Soil samples retrieved from the borehole/test pit will be visually described for: 1) percent recovery, 2) soil type, 3) color, 4) moisture content, 5) texture, 6) grain size and shape, 7) consistency, 8) visible evidence of staining or other hydrocarbon-related impacts, and 9) any other relevant observations. The descriptions will be in accordance with the Unified Soil Classification System (USCS) and the American Society for Testing and Materials (ASTM) guidelines. Descriptions will also follow National Grid's internal field description guidance (KeySpan, 2005) included in Appendix A.

Immediately after describing the core/test pit wall, a representative soil sample will be placed in a re-sealable plastic (e.g., "ziplock") bag filled approximately half full. The bag will be labeled with the boring number and interval sampled. After allowing the bagged soil to warm the tip of the sample probe attached to the PID will be inserted into the bag to measure the headspace for organic vapors. Soil remaining after completion of sample description, collection, and field screening will be disposed of properly.

4.2.5 Collection of samples

The number and frequency of samples to be collected from each boring and the associated analytical parameters are summarized on Table 3-1 in the RI Work Plan. The sample locations, descriptions, and depths will be recorded on the boring logs in the field book.

Samples for laboratory analyses will be collected directly from the sampling spoon (test pits), acetate liners, split-spoons, or core barrel and placed into appropriate containers (for VOC analyses); homogenized (for non-VOC analyses); and compacted to minimize headspace and pore space. Samples for VOC analysis will be collected directly from the acetate liners, split-spoons, or core barrel and placed into appropriate containers. Soil used for headspace analysis will not be used for laboratory VOC analysis. The sampling equipment will be decontaminated between samples in accordance with procedures described in Section 3. Soil remaining after completion of sample description, collection, and field screening will be disposed of properly.

The sample containers will be labeled, placed in a laboratory-supplied cooler, and packed with ice. The coolers will then be shipped to the laboratory for analysis. COC procedures will be followed as outlined in the QAPP. If there is a delay of sample shipment due to insufficient samples to warrant overnight delivery, the samples will be stored in a cool, secure place with sufficient ice to maintain a temperature of 4˚ C.

4.3 Monitoring well installation and development

The following methods will be used for drilling, installing, and developing the monitoring wells;

4.3.1 Overburden monitoring well installation

Figure 4-2 illustrates the construction details for a typical overburden monitoring well. Specific details regarding the depth and anticipated screened interval of proposed monitoring wells is provided in Table 3-1 of the RI Work Plan. In general, monitoring wells will be installed according to the following specifications:

- The monitoring well borings will be advanced with either 4.25-inch inner diameter (ID) hollow-stem augers or 4-inch ID flush casing.
- Wells will be constructed with 2-inch ID, threaded, flush-joint, PVC casings and screens.
- Screens will be 10-feet long with 0.01-inch or 0.02-inch slot openings (in NAPL present) with a 2-foot DNAPL sump at the base. Alternative screen lengths up to 20' long may be used at the discretion of the field geologist and with the approval of NYSDEC, based on site conditions.
- The annulus around the screens will be backfilled with clean silica sand having appropriate size (e.g., Morie No. 1) to a minimum height of 2 feet above the top of the screen. Auger flights or casing will be withdrawn as sand is poured in a manner that will minimize hole collapse and bridging.
- A bentonite chip seal with a minimum thickness of 2 feet will be placed above the sand pack. The bentonite seal will be hydrated with clean, potable water before placement of grout above the seal layer.
- The remainder of the annular space will be filled with cement-bentonite grout to ground surface. The grout will be allowed to set for a minimum of 24 hours before wells are developed.
- Each monitoring well will be a flush-mounted installation with a locking cap.
- The concrete seal or pad will be sloped to channel water away from the well, and be deep enough to remain stable during freezing and thawing of the ground.
- The top of the PVC well casing and ground surface will be marked and surveyed to 0.01 foot, and the elevation will be determined relative to a fixed benchmark or datum.
- The measuring point on all wells will be on the innermost PVC casing.
- Monitoring well construction details will be recorded in the field book and on the Construction Log shown in Figure 4-3, or similar form.
- If commercially available nested wells are considered to sample multiple aquifer depth zones in the same borehole, they will be discussed with NYSDEC prior to installation.

4.3.2 Monitoring well development

- After a minimum of 24 hours after installation, the monitoring wells will be developed by surging and pumping. Surging will be performed periodically, across the lengths of screen in 2-foot increments prior to, at interim periods of pumping, and immediately before the final pumping. Pumping methods may include using a centrifugal, submersible, or peristaltic pump and dedicated polyethylene tubing, using a Waterra™ positive displacement pump and dedicated polyethylene tubing, or other methods at the discretion of the field geologist.
- Water levels will be measured in each well to the nearest 0.01 foot prior to development.
- The wells will be developed until the water in the well is reasonably free of visible sediment (50 NTU if possible or until pH, temperature, and specific conductivity stabilize). A portable nephelometer will be used to make the turbidity measurement.

- Development water will be contained in and properly disposed of.
- Following development, wells will be allowed to recover for at least 14 days before groundwater is purged and sampled. All monitoring well development will be performed or overseen by a field geologist and recorded in the field book.

5.0 Groundwater sampling procedures

5.1 Introduction

Procedures for obtaining samples of groundwater are described in this section. Groundwater samples will be collected using low-flow, low-stress purge and sampling methods.

5.2 Groundwater sampling

The number and frequency of the samples that will be collected for laboratory analysis from each well and the analytical parameters are listed in Table 3-1 in Section 3 of the RI Work Plan.

The following method will be used to collect groundwater samples from monitoring wells:

5.2.1 Required Equipment and Supplies

- Field book
- Project plans
- PPE in accordance with the HASP
- Electronic oil/water interface probe
- Disposable polyethylene bailers and low-flow sampling pump
- Polypropylene rope
- Temperature, conductivity, and pH meter
- Turbidity meter
- Flow-through cell
- Decontamination supplies
- Peristaltic or submersible pump capable of achieving low-flow rates (i.e., 0.5 liters per minute or less)
- Plastic tubing
- Plastic sheeting
- PID
- Clear tape, duct tape
- Coolers and ice
- Laboratory sample bottles
- Federal Express labels

5.2.2 Groundwater sampling method

5.2.2.1 Purging

- Prior to sampling, the static water level and thickness of any light non-aqueous phase liquid (LNAPL) or dense non-aqueous phase liquid (DNAPL) will be measured to the nearest 0.01 foot from the surveyed well elevation mark on the top of the PVC casing with a decontaminated oil/water interface probe. NAPL thickness will be confirmed using a clear bailer or a weighted string. The measurement will be recorded in the field book.

- The probe will be decontaminated between uses.
- Groundwater from the well will be purged until field parameters stabilize, up to three well volumes are removed, or 1 hour of continuous purging is performed. Field parameters are considered to be stable when three consecutive readings are within the stabilization criteria for that parameter. The stabilization criteria are as follows: 10% or below 10 NTUs for turbidity, 3% for conductivity and temperature, 0.1 standard unit for pH, and 10 mV for ORP. Purging will be conducted using the low-flow sampling technique specified by the USEPA Region 1 in its guidance document entitled "Low-Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells".
- The flow rate measurement will be approximately 0.5 liter per minute or less.
- If a well goes dry before the required volumes are removed, it will be allowed to recover, purged a second time until dry or the required parameters are met, and sampled when it recovers sufficiently, in accordance with low-flow sampling protocol.
- Purge water will be managed and disposed of properly.

5.2.2.2 Sampling

- Samples will be collected using dedicated 1/4- or 3/8-inch polyethylene tubing and/or bailers.
- Prior to filling the sample bottles, the temperature, pH, conductivity, and oxidation reduction potential (ORP) will be measured within a flow-through cell. Turbidity will be measured with a hand-held turbidity meter. All measurements will be recorded in the field book.
- Three 40-ml VOA vials with Teflon™ lined septa and hydrochloric acid as a preservative will be filled for analysis of VOCs. The VOA vials will be filled to ensure that no bubbles are in the sample. Two 1-liter amber glass sample bottles for SVOC analysis and two 1-liter amber glass bottles for PCB analysis will then be filled followed by a 500 milliliter (mL) plastic bottle preserved with nitric acid for the total metals analysis. An opaque, 500 mL plastic bottle, with sodium hydroxide added for preservative to achieve a pH of >12 will then be filled for the analysis of total cyanide.
- The sample containers will be labeled, placed in a laboratory-supplied cooler, and packed on ice (to maintain a temperature of 4˚ C). The cooler will be shipped overnight or delivered to the laboratory for analysis.
- COC procedures will be followed as outlined in the QAPP.
- Well sampling data will be recorded on the Groundwater Sampling Record shown in Figure 5-1, or similar form.

6.0 Sub-slab soil vapor/indoor air/ambient air sampling

A soil vapor intrusion survey will be performed at the Site since MGP-related compounds have been detected in soil vapor, soil, and groundwater samples collected from the Site. The work will be performed in accordance with *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH, 2006) and the USEPA document entitled *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils, Office of Solid Waste and Emergency Response* (US EPA, 2002). The sampling event will be conducted in a one-time event during the heating season between November 1 and March 31 and will require two days to complete. The proposed sampling plan consists of the collection of a total of 10 samples, with two sub-slab soil vapor samples and matching indoor air samples collected in each of two buildings (eight total) plus one ambient outdoor air sample and one sample duplicate.

The indoor/ambient air and sub-slab vapor sampling will require two days to complete. On the first day, a chemical inventory check will be performed within each of the two site buildings to document current conditions with the regard to the storage of chemicals at each facility. On the second day, the ambient air sample, indoor air samples and sub-slab vapor samples will be collected concurrently.

The methods to be used for the collection of the sub-slab soil vapor samples, indoor air samples, and the ambient air sample are summarized as follows:

- All sub-slab soil vapor samples will be collected from immediately below the concrete floor slabs of each building, in accordance with NYSDEC Guidance.
- The sub-slab sampling implants will be installed by drilling a ¾-inch diameter hole through the concrete slab and placing Teflon tubing in the hole. An air-tight seal will be created by filling the space between the tubing and the concrete with hydrated bentonite clay or modeling clay.
- The integrity of the seals around the implants will be confirmed by placing a helium-filled “shroud” around the insertion points. One to three volumes of air will be purged at a rate not to exceed 0.2 liters per minute, and helium concentrations will be monitored using a portable helium meter (MARK Model 9822 Helium Detector, or equivalent), which will be pre-calibrated by the supplier according to the manufacturer’s instructions. If helium is detected in the purged air from the sampling assembly at concentrations greater than 5% of the concentration in the shroud, the probe will either be resealed, or replaced, as appropriate. Figure 6-1 illustrates the equipment to be used during the helium gas testing.
- Indoor air samples will be collected at locations co-located with the sub-slab soil vapor samples, and they will be collected from a minimum of two-feet above the floor surface.
- The ambient air sample will be collected at a location determined to be upwind of the buildings at time of sampling.
- Each sub-slab soil vapor, indoor air, and ambient air sample will be collected as an integrated (not grab) sample. A laboratory-provided flow controller fixed to a negative pressure vessel (a batch certified clean 6-liter Summa™ canister) will be used to collect the integrated sample. The controller will be a fixed-rate flow controller and the approximate length of the sample time will be set by the laboratory. The flow controllers are fitted with an internal filter to prevent particulates from entering the Summa™ Canister.
- The sample time for the canisters will be set to 8 hours. The collection of the samples in 6-liter canisters over an approximate 8-hour interval will ensure that the samples are collected at the rate specified by the NYSDOH (less than 0.2 liters per minute).
- The sample tubing will be attached to the sampling canister with Swagelok™ fittings.

- Prior to sampling, the initial vacuum in each canister will be checked prior to use to ensure mechanical integrity of the canister. The initial vacuum should be approximately 30 inches mercury (in. Hg).
- To start sampling, the canister ball valve is opened and the initial time and vacuum is recorded.
- The final vacuum should be between 10 and 4 in. Hg, with a target of 5 in. of Hg. The initial and final vacuum in each canister will be recorded on the laboratory chain-of-custody form to be returned to the laboratory with the samples. The gauges provided with the canisters are accurate only for “indication of change”, and are not sufficiently accurate to provide gauge-to-gauge comparisons. The final vacuum will also be measured in the laboratory.
- Following collection of the sample, the canister will be sealed by closing the ball valve and fitting on the canister inlet. The inlet will then be capped with a laboratory-provided threaded end cap.
- Following collection of the sample, the PID will be used to obtain a final reading from the probe assembly or tubing for the concentration of total organic vapors.
- The site name, sample identification, canister number, canister certification number, samplers name, sample times and date will be recorded on a tag that is attached to each canister.
- The air and soil vapor samples will be shipped overnight to a NY ELAP-certified laboratory for analysis.
- After the laboratory sample is collected, the sub-slab soil vapor sampling assembly will be removed and the concrete coring holes will be sealed and patched to match the existing grade.

All sampling equipment will be decontaminated between uses with rinses of Alconox™ (detergent) and water with a final rinse of laboratory-provided analyte-free water. The equipment will be stored in plastic sleeves when ever they are not being used.

The field sampling team will record all information regarding the sampling on field forms. Copies of the field forms that will be used are included as Figures 6-2 and 6-3. Information that will be recorded will include the following: sample identification, date and times of sample collection, sampling depth, identity of the field personnel, sampling methods and equipment, purge volumes and rates, tracer test results, and any other relevant observations made during the sampling. A NYSDOH indoor air quality questionnaire and building inventory form will also be filled out prior to indoor air sampling (Figure 6-4).

7.0 Air monitoring

7.1 Introduction

Two types of air monitoring will be performed during the site investigation: 1) work zone monitoring for protection of the workers performing the site investigation, and 2) community air monitoring at the perimeter of the work site for protection of the local community.

7.2 Breathing zone air monitoring during drilling and sampling

Monitoring of air in the breathing zone within the work site will be conducted periodically during all drilling and sampling activities.

- An organic vapor meter (OVM) equipped with a PID will be used to monitor for VOCs or other organic vapors in the breathing zone and borehole, and to screen the samples.
- Additional air monitoring may be required as specified in the site-specific HASP.

The PID readings will be recorded in the field book and on the boring log during drilling activities. The procedure for the PID operation and calibration is included in the HASP. Note that equipment calibration will be performed as often as needed to account for changing conditions or instrument readings. The minimum frequency of calibration is specified in the HASP; more frequent calibration will be performed if spurious readings are observed or there are other problems with the instruments.

7.3 Community air monitoring

Community air monitoring requires real-time monitoring for VOCs, particulates (i.e., dust), and MGP-related odors at the downwind perimeter of each designated work area when certain activities are in progress at impacted sites. The community air monitoring is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels for community air monitoring require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, community air monitoring helps to confirm that work activities do not spread contamination off site through the air.

The procedures and action levels for community air monitoring are presented in the CAMP that has been prepared for the RI at the Metropolitan MGP Site.

8.0 Field instruments and calibration

All field analytical equipment will be calibrated immediately prior to each day's use and more frequently if required. The calibration procedures will conform to manufacturer's standard instructions. This calibration will ensure that the equipment is functioning within the allowable tolerances established by the manufacturer and required by the project. All instrument calibrations will be documented in the project field book and in an instrument calibration log. Records of all instrument calibration will be maintained by the Field Team Leader. Copies of all of the instrument manuals will be maintained on site by the Field Team Leader. All changes to instrumentation will be noted in the field log book.

The following field instruments will be used during the investigation:

- PID
- Particulate monitors
- Multi-parameter meter (pH, specific conductivity, dissolved oxygen, oxidation reduction, and temperature meter)
- Turbidity meter

8.1 Portable photo-ionization detector (PID)

- The photo-ionization detector will be equipped with either a 10.2 or 10.6 eV lamp. In this configuration, the PID is capable of ionizing and detecting compounds that account for over 70% of the VOCs on the USEPA Target Compound List.
- Calibration must be performed at the beginning of each day of use with a standard calibration gas having a concentration of 100 parts per million of isobutylene. If the unit experiences abnormal perturbation or erratic readings, more frequent or additional calibration will be required.
- All calibration data must be recorded in the project field notebooks.
- A battery check must be completed at the beginning and end of each working day.
- All changes to the PID will be noted in the field notes (such as lamp or filter cleaning or replacement or change of instrument).

8.2 Multi-parameter meter

- Calibration of the meter (YSI or equivalent) must be performed at the start of each day of use, and after very high or low readings as required by this Plan, according to manufacturer's instructions.
- National Institute of Standards and Technology - traceable standard calibration solutions will be used (where applicable). At least one backup meter will also be present on-site in the event of a malfunction.
- The calibration data must be recorded in the project field book each time it is performed.

8.3 Turbidity meter

- The turbidity meter must be checked at the start of each day of use according to manufacturer's instructions.

9.0 Analytical program

9.1 Environmental sample analyses

The laboratory samples for each media and the chemical analyses to be performed are summarized in Table 3-1 of the RI Work Plan.

9.1.1 Soil analyses

The majority of the soil samples will be analyzed for the following parameters:

- VOC compounds by USEPA Method 8260B;
- Semi-volatile organic compounds (SVOCs) by USEPA Method 8270C;
- RCRA 8 metals by USEPA Method 6000-7000 Series; and
- Free Cyanide with extraction by USEPA Method 9013A and analysis by ASTM Method D4282-02 (microdiffusion).

A subset (approximately 20%) of the total number of soil samples will be analyzed for an expanded list of the following parameters:

- Full TCL VOCs by USEPA Method 8260B;
- Full TCL SVOCs by USEPA Method 8270C;
- TAL Metals by USEPA Method 6000-7000 Series;
- Free Cyanide with extraction by USEPA Method 9013A and analysis by ASTM Method D4282-02 (microdiffusion);
- TCL Pesticides by USEPA Method 8081A;
- TCL Herbicides by USEPA Method 8151A; and
- PCBs (as Aroclors) by USEPA Method 8082.

9.1.2 Groundwater analyses

Similar to soils, the majority of groundwater samples will be analyzed for the following parameters:

- VOC compounds by USEPA Method 8260B;
- SVOC compounds by USEPA Method 8270C;
- TAL Metals by USEPA Method 6000-7000 Series; and
- Total Cyanide by USEPA Method 9012.

A subset (approximately 20%) of the total number of groundwater samples will be analyzed for an expanded list of the following parameters:

- Full TCL VOCs by USEPA Method 8260B;
- Full TCL SVOCs by USEPA Method 8270C;
- TAL Metals by USEPA Method 6000-7000 Series;

- Total Cyanide by USEPA Method 9012;
- TCL Pesticides by USEPA Method 8081A;
- TCL Herbicides by USEPA Method 8151A; and
- PCBs (as Aroclors) by USEPA Method 8082.

9.1.3 Sub-slab soil vapor/indoor air/ambient air analyses

The sub-slab soil vapor, indoor air, and ambient air samples will be analyzed for VOCs by USEPA Method TO-15 (including naphthalene). The sub-slab soil vapor samples will also be analyzed for helium by ASTM Method ASTM D-1945. In addition to the standard TO-15 list of compounds, several additional compounds will be analyzed for, including: indane, indene, thiophene, styrene, 2-methyl pentane, isopentane, 2,3-dimethyl pentane, isooctane, and methyl tert-butyl ether (MTBE).

9.1.4 Waste characterization/profiling

Sufficient samples (a minimum of two) will be collected during the investigation and analyzed for full RCRA Hazardous Characteristics testing to determine if materials exhibiting hazardous characteristics may be present at the site and to support waste disposal profiling purposes. The analyses to be performed may include, but not be limited to, the following, depending on the medium and the selected disposal facility:

- Total Metals by USEPA Method 6010B (Mercury 7470A);
- Total Petroleum Hydrocarbons (DRO and GRO) by USEPA Method 8015 modified;
- PCBs by USEPA Method 8082;
- TCLP ZHE Extraction by USEPA Method 1311;
- TCLP VOC by USEPA Method 8260B;
- TCLP SVOC by USEPA Method 8270C;
- TCLP RCRA Metals by USEPA Method 6010B (Mercury 7470A);
- Corrosivity by USEPA Method 9045C;
- Ignitability/Flashpoint by USEPA Method 1010A;
- Reactive Cyanide and Reactive Sulfide by USEPA SW-846 Chapter 7, Sections 7.3.3.2 and 7.3.4.2; and
- Total Organic Halogens – USEPA Method 9020B.

9.2 Field quality control samples

Field quality control samples will be collected and analyzed to document the accuracy and precision of the samples. The quality control samples are described as follows:

- Trip Blank: One trip blank will accompany each shipment of samples for VOC analysis sent to the laboratory. The trip blank will be analyzed to test for any contaminants introduced while samples are being stored or transported to the laboratory. The trip blanks will be analyzed for volatiles only.
- Field Equipment Blanks: The purpose of the equipment blank is to detect any contamination from sampling equipment, cross-contamination from previously sampled locations, and contamination caused by conditions at sampling locations (e.g., airborne contaminants). One equipment blank will be collected for every 20 samples collected during sampling. The samples will be collected by pouring

analyte-free water, prepared in the laboratory, over decontaminated sampling equipment and collecting it in sample jars. The blanks will be collected in the vicinity of a sample location. This field blank will be analyzed for VOCs, SVOCs, PCBs, total or free cyanide (depending if the blank is from groundwater or soil sampling equipment), and TAL metals. An equipment blank will not be collected if sampling is conducted with dedicated sampling equipment.

- Field Duplicates: Field duplicates are collected to determine the precision of the soil samples collected. This is achieved by homogenizing soil (for non-VOC analyses) and splitting it evenly between separate sample jars. Duplicate samples will be collected and analyzed for VOC, SVOCs, PCBs, total or free cyanide (depending if the duplicate sample is from groundwater or soil), and TAL metals. The minimum required number of field duplicates is one for every 20 samples.
- Matrix Spikes, and Matrix Spike Duplicates: These samples are laboratory quality control samples and will be completed as part of the laboratory analytical batch quality control. These samples will be collected in the same manner as the field duplicates. Both the matrix spike and matrix spike duplicate will be collected at the same sample location.

9.3 Sample location numbering system

- Surface soil samples will be numbered consecutively beginning with SS1 (if applicable).
- Subsurface soil borings will be numbered consecutively beginning with SB1 (soil borings) or MW1 (monitoring well borings). Individual samples will also be designated with a depth code (see below).
- Monitoring wells will be numbered consecutively beginning with MW1. An “S” suffix will designate water table wells, an “I” suffix will designate intermediate zone wells, and a “D” suffix will designate deeper zone wells, as defined in the RI Work Plan.

9.4 Sample identification

Each sample will be given a unique alphanumeric identifier in accordance with the following classification system:

Table 9-1 Sample Identification

LL* Sample Type	NN* Sample Number	N-N Depth Code	LL QC Identifier

Sample Type:	MW – Monitoring Well Boring SB – Soil Boring SS – Surface Soil	MW – Monitoring Well SV – Soil Vapor IA – Indoor Air, AMB – Ambient Air
Sample Number:	Number referenced to a sample location map.	
Depth Code:	Depth in feet of sample interval (0-0.5, 2-4, 10-12, etc.)	
QC Identifier:	TB – Trip Blank EB – Equipment Blank	MS – Matrix Spike MSD–Matrix Spike Duplicate MB – Matrix Blank

* L = Letter
* N = Number

Field duplicate samples will be assigned identifiers that do not allow the laboratory to distinguish them as field duplicates. Each sample container will be labeled prior to packing for shipment. The sample identifier, site name, date and time of sampling, and analytical parameters will be written on the label in waterproof ink and recorded in the field book.

9.5 Chain-of-custody

- A Chain-of-Custody (COC) record (Figure 9-1 or similar) will accompany the sample containers during selection and preparation at the laboratory, during shipment to the field, and during return shipment to the laboratory.
- The COC will include the sample identities of each sample container and the analytical parameters for each, and will list the field personnel that collected the samples, preservation method, the project name and number, the name of the analytical laboratory that will receive the samples, and the method of sample shipment.
- If samples are split and sent to different laboratories, such as to a specialty laboratory for fingerprint analysis, a copy of the COC record will be sent with each sample shipment.
- The COC will be completed by field personnel as samples are collected and packed for shipment.
- Erroneous markings will be crossed-out with a single line and initialed by the author.
- The REMARKS space will be used to indicate if the sample is a matrix spike, matrix spike duplicate, or matrix duplicate.
- Trip and field blanks will be listed on separate rows.
- After the samples have been collected and sample information has been listed on the COC form, the method of shipment, the shipping cooler identification number(s), and the shipper airbill number will be entered on the COC.
- Finally, a member of the sampling team will write his/her signature, the date, and time on the first RELINQUISHED BY space.
- One copy of the COC will be retained by sampling personnel. The other copy and the original will be sealed in a plastic bag and taped inside the lid of the shipping cooler.
- Sample shipments will be refrigerated at 4˚C, typically by packing with bagged ice, to preserve the samples during shipment.
- After the shipping cooler is closed, custody seals provided by the laboratory will be affixed to the latch and across the front and back of the cooler lid, and signed by the person relinquishing the samples to the shipper.
- The seal will be covered with clear tape, and the cooler lid will be secured by wrapping with packing tape.
- The cooler will be relinquished to the shipper, typically an overnight carrier.
- The COC seal must be broken to open the container. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the Project Manager, and the samples will not be analyzed until directed to do so.
- The samples must be delivered to the laboratory within 48 hours of collection.

9.6 Sample documentation

The field team leader will retain a copy of the COC, and, in addition, the field team leader will ensure that the following information about each sample is recorded in the field book:

- Sample identifier;
- Identification of sampled media (e.g., soil, sediment, groundwater);
- Sample location with respect to known reference point;
- Physical description of sample location;
- Field measurements, (e.g., pH, temperature, conductivity, and water levels);
- Date and time of collection;
- Sample collection method;
- Volume of groundwater purged before sampling;
- Number of sample containers;
- Analytical parameters;
- Preservatives used; and
- Shipping information:
  - Dates and method of sample shipments;
  - COC Record numbers;
  - Federal Express Air Bill numbers; and
  - Sample recipient (e.g., laboratory name).

Figures

AECOM

Figure 4-1

Boring/Well ID:________________

Page _______ of ________

Project Name:	Drilling Company:	Surface Comp:
Project Number:	Drilling Method:	Grout (bgs):
Date Pre-Cleared:	Rig Type:	Filter Pack (bgs):
Date Started Drilling:	Casing ID:	Riser (bgs):
Date Finished Drilling:	Water Level While Drilling (bgs):	Well Screen (bgs):
Logged By:	Total Depth of Boring (bgs):	Sump (bgs):

(Note: bgs = below ground surface)

Depth Range	Blow per 6 Inch	Re-covery ft/ft	PID	Lab Sample ID	USCS	Geologic Description Method:________________

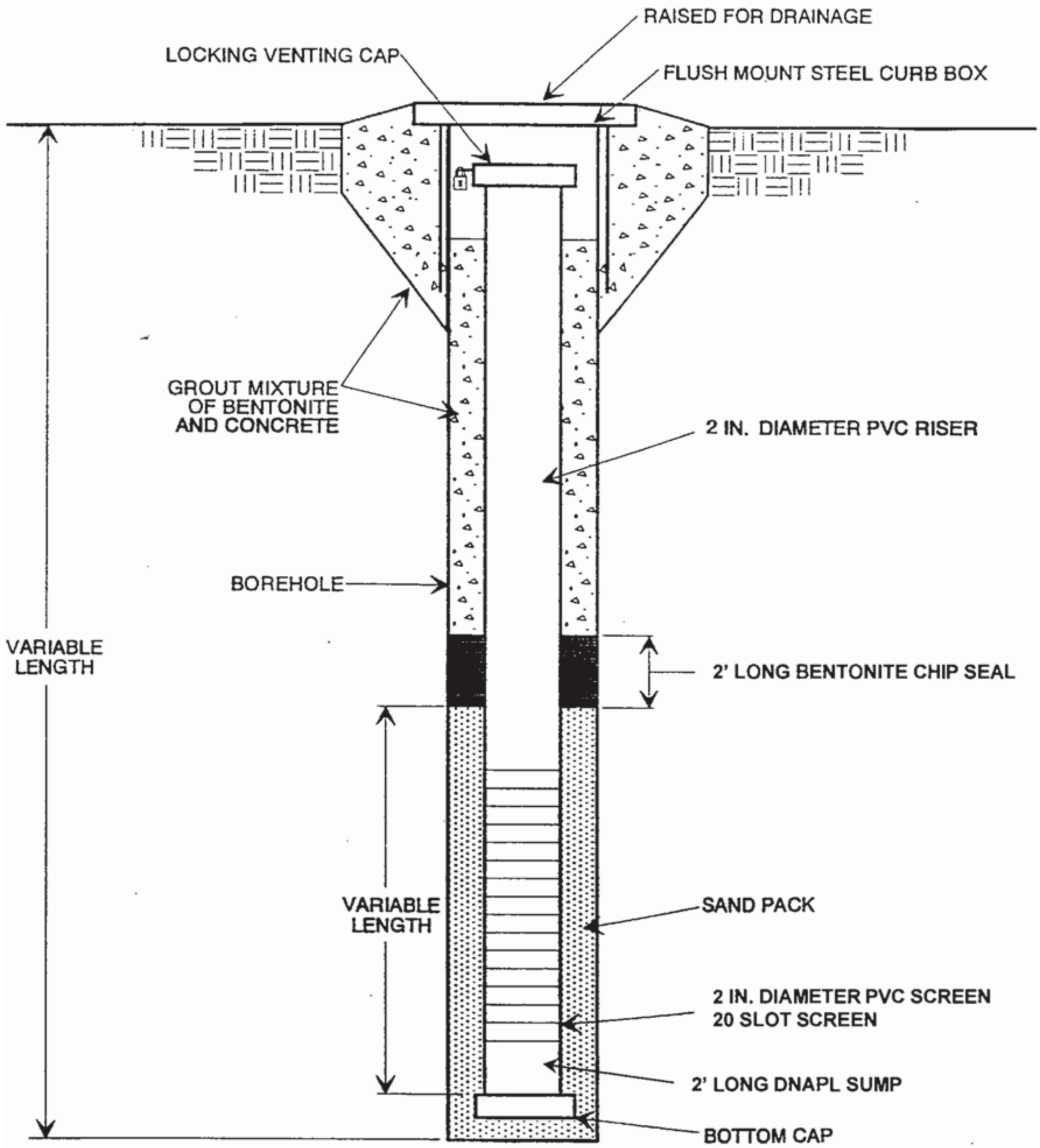
Lithology:

1.)	5.)
2.)	6.)
3.)	7.)
4.)	8.)

Comments:

Figure 4-2

TYPICAL MONITORING WELL CROSS SECTION



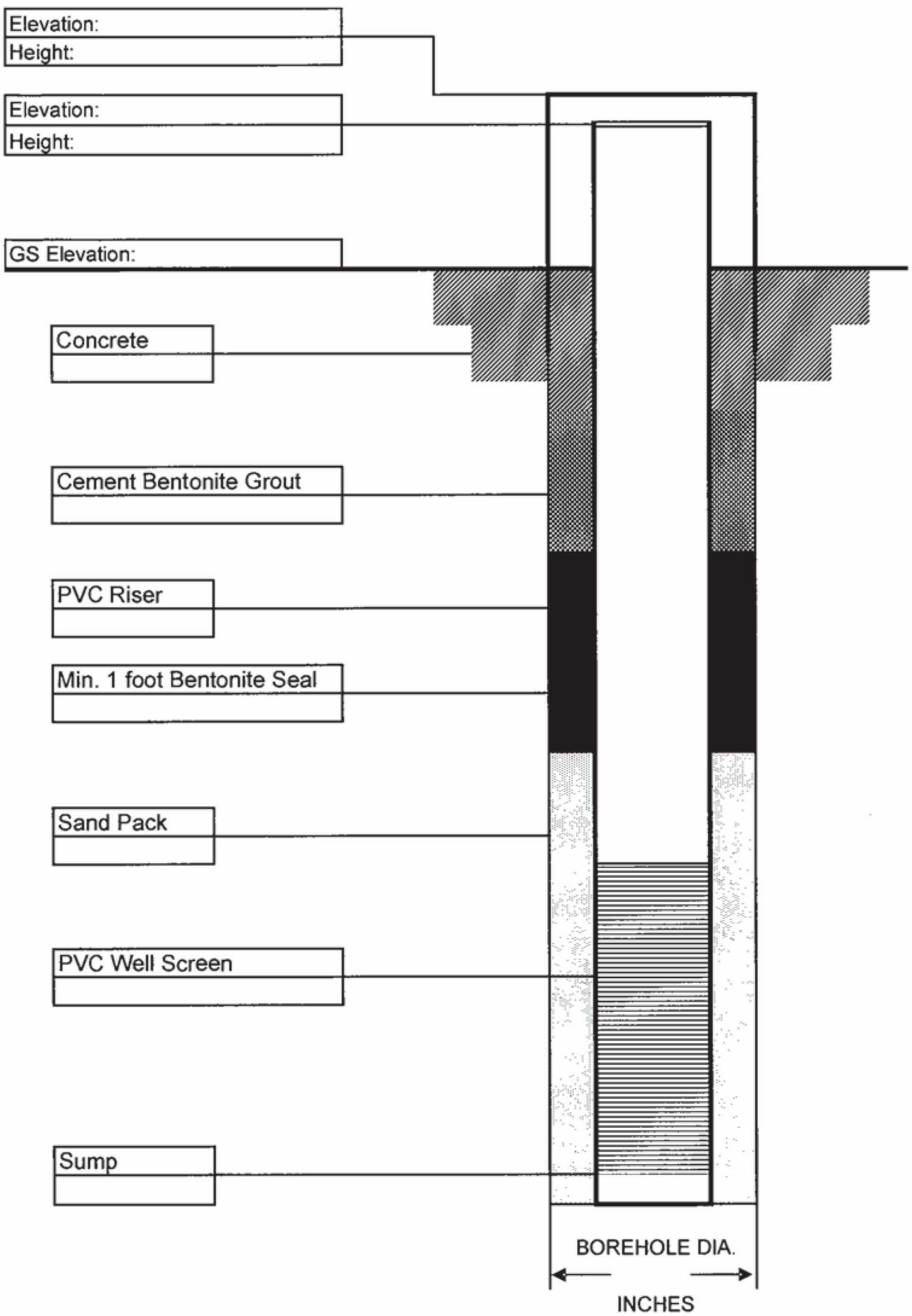
NOT TO SCALE

AECOM

Figure 4-3

WELL CONSTRUCTION LOG

WELL NO.:	FACILITY/SITE NAME:
PROJ. NO.:	CLIENT:
INSPECTOR:	DRILLING CONTACTOR:
DATE START:	DATE END:
LOCATION:	DRILLING METHOD:



PROTECTIVE CASING

Material:
Diameter:
Depth BGS:
Water Tight Seal:
Flushmount:
Weep hole:

GUARD POSTS

Material:
No. & Size:

SURFACE PAD

Composition:
Size:

RISER PIPE

Material:
Schedule:
Joint Type:
O-ring:
Diameter:

GROUT

Amt cement:
Amt bentonite:
Amt water:
Tremied:
Interval:

SEAL

Material:
Type:
Amount Used:
Interval:

FILTER PACK

Material:
Brand Name:
Amount Used:
Grain Size Dist.:
Interval:
Tremied:

SCREEN

Material:
Diameter:
Slot Size & Type:
Interval BGS:

SUMP

Interval BGS:
Bottom Cap:

BACKFILL PLUG

Material:
Setup/Hydration Time:

AECOM

Figure 5-1

LOW-STRESS GROUND WATER SAMPLING FORM

Project Number: ______________________
Project Name: ______________________
Date: ______________________
Weather: ______________________

Well ID: ______________________
Sample ID: ______________________
Permit Number: ______________________
Well Condition: ______________________

PRE-PURGE INFORMATION

Protective Casing Diameter (inch): ______________
Inner Casing Diameter (inch): ______________
Inner Casing Material: ______________
Purge/Sample Method: ______________
Pump Intake Setting* (feet): ______________
PID/FID Reading of Well Headspace (ppm)
Before Cap Removal: ______________
After Cap Removal: ______________

Depth to Product* (feet): ______________
Initial Depth to Water* (feet): ______________
Product Thickness (feet): ______________
Depth to Top of Screen* (feet): ______________
Total Depth* (feet): ______________
Water Column (feet): ______________
Casing Volume (gal): ______________
DTW After Pump Installed: ______________

PURGING/SAMPLING INFORMATION

Time	Rate (gpm)	Gallons Purged	pH (SI Units)	Conductivity (μohms/cm)	Temp (°C)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mv)	Depth to Water (ft)	Comments

Start Purge Date/Time: ______________
End Purge Date/Time: ______________
Total Volume Purged (gal): ______________
Depth to Water After Purge* (feet): ______________

Pre-Sample Depth to Water* (feet): ______________
Start Sample Date/Time: ______________
End Sample Date/Time: ______________
Sampler Names: ______________

Observations During Sampling (e.g. slow recharge, turbidity, odor, sheen, PID/FID readings):

AECOM

Figure 5-1

LOW-STRESS GROUND WATER SAMPLING FORM

Sampling Sequence:

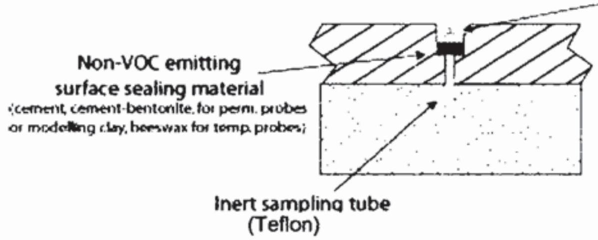
Analysis	Method	Container	Number of Bottles	Preservative	Comments
Volatile Organics					
Base/neutrals					
TPH					
Total Metals					
Dissolved Metals					
Cyanide					
Sulfate and Chloride					
Nitrate and Ammonia					
Preserved Inorganics					
Non-Preserved Inorg					
Bacteria					

Complete those analyses that apply.

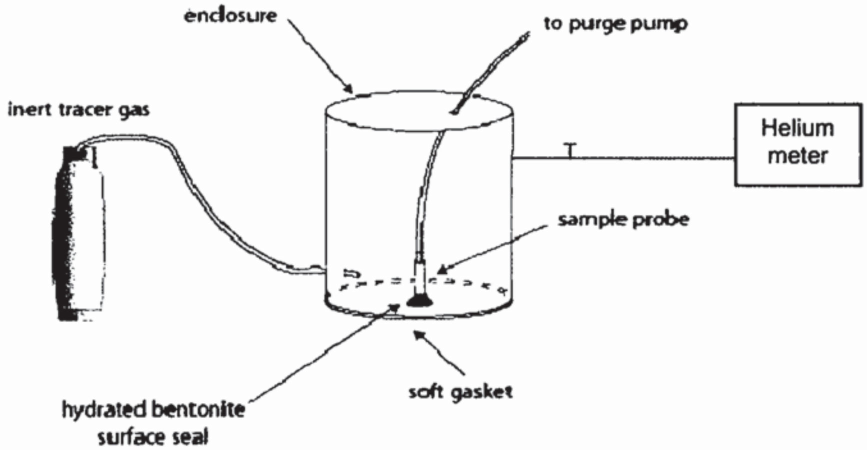
Stabilization Ranges
Dissolved Oxygen: +/- 10%
Turbidity: +/- 10%
Specific Conductance: +/- 3%
Temperature: +/-3 %
pH: +/- 0.1 unit
Redox Potential: +/- 10mv

* = Measured from top of inner casing
DTW - Depth to Water
Thermo Environmental Instruments Model 580s OVM w/ 10.2 ev bulb
Water Levels Measured with an Electronic Water Level Meter
Field parameter meter calibration results are recorded in the field book.

AECOM



TYPICAL SUB-SLAB SAMPLING PROBE SET UP



TYPICAL HELIUM TRACER TEST SET UP

AECOM

DATE. 9/5/06 DRWN. MLR	TYPICAL HELIUM TRACER AND SUB-SLAB
	FIGURE 6-1

FIGURE 6-2

Soil Gas Sampling Log Sheet
Sample ID________________

Client:____________________
Project Name:_____________
Project Number:___________
Date:______________
Sampler:___________________

Location:____
Canister Number:________________
Core Diameter:_______________ Core Material:__________________
Core Length:_________________
Magnehelic Measurement: (Positive number indicates higher pressure in Core)________
Depth of Hand Auguring:______________
Soil Type:____
Method of Probe Advancement:_______________________________
Depth of Probe Advancement:________ Length Probe is Retracted:_________

Time of Purging	PID Reading	Time of Purging	PID Reading
__________	__________	____________	__________
__________	__________	____________	__________
__________	__________	____________	__________
__________	__________	____________	__________
__________	__________	____________	__________

Starting Time:_______________ Starting Pressure:_________
Finish Time:_________________ Final Pressure:___________

Room Dimensions: Length:______ Width:_____ Height:_____

Comments:

Indoor Air/Ambient Air Sample
Sample ID__________________

Location:____
Sample ID:_________________
Canister Number:____________
Starting Time:_______________ Starting Pressure:_________
Finish Time:_________________ Final Pressure:___________

Comments:

General Weather Conditions:____
Chemical Inventory:

AECOM

FIGURE 6-3

FIELD SAMPLING DATA SHEET
(One Sample Per Data Sheet)

GENERAL:

PROJECT: ____________________ DATE(S) SAMPLED: ____________________

SITE: ____________________

LOCATION: ____________________ OPERATOR: ____________________

PID INSTRUMENT MODEL NO.: ____________________ CALIBRATED BY: ____________________
CGI INSTRUMENT MODEL NO.: ____________________ CALIBRATED BY: ____________________

TIME	CGI READING (%)	PID READING (ppm)	DRAGER TUBE (ppm)	LOCATION
1)				
2)				
3)				
4)				
5)				
6)				
7)				
8)				
9)				
10)				

CANISTER #	LOCATION	TIME

DATE/TIME	AMBIENT TEMPERATURE°	BAROMETRIC PRESSURE mm Hg	RELATIVE HUMIDITY %	COMMENTS

Data from meteorological station*

AECOM

FIGURE 6-4

OSR-3

NEW YORK STATE DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH ASSESSMENT
BUREAU OF TOXIC SUBSTANCE ASSESSMENT

INDOOR AIR QUALITY QUESTIONNAIRE AND BUILDING INVENTORY

This form must be completed for each residence involved in indoor air testing.

Preparer's Name ______________________________ Date Prepared ______________

Preparer's Affiliation ______________________________ Phone No. ______________

1. **OCCUPANT**

Name: ______________________________

Address: ______________________________

County: ______________________________

Home Phone No. ____________ Office Phone No ____________

2. **OWNER OR LANDLORD:**
(If different than occupant)

Name: ______________________________

Address: ______________________________

____

Phone No. ______________________________

A. Building Construction Characteristics

Type (circle appropriate responses): Single Family Multiple Dwelling Commercial Public School

Ranch
Raised Ranch
Split Level
Colonial
Mobile Home

2-Family
Duplex
Apartment House ____________ Units
Number of floors ____________
Other specify ____________________

Residence Age __________ General Description of Building Construction Materials ____________________

Is the building insulated? Yes / No How air tight is the building? ______________________________

____

____

OSR-3 (continued)

B. **Basement construction characteristics (circle all that apply):**

1. Full basement, crawlspace, slab on grade, other ___________
2. Basement floor: concrete, dirt, other ________
3. Concrete floor: unsealed, painted, covered, with _________
4. Foundation walls: poured concrete, block, laid up stone, other ___________
5. The basement is: wet, damp, dry___ Sump present? y / n ______ Water in sump? y / n ______
6. The basement is: finished, unfinished ______________
7. Identify potential soil vapor entry points (e.g., cracks, utility ports, etc.)
   ____
8. Describe how air tight the basement is ____
   ____

C. **HVAC (circle all that apply):**

1. The type of heating system(s) used in this residence is/are:

Hot Air Circulation	Heat Pump
Hot Water Radiation	Unvented Kerosene Heater
Steam Radiation	Wood stove
Electric Baseboard	Other (specify)_______________________________

2. The type(s) of fuel(s) used is/are: Natural Gas, Fuel Oil, Electric, Wood, Coal Solar

   Other (specify)______________________________
3. Is the heating system's power plant located in the basement or another area? ________________
4. Is there air-conditioning? Yes / No Central Air or Window Units?

   Specify the location ____________________________
5. Are there air distribution ducts present? Yes / No
6. Describe the supply and cold air return duct work in the basement including whether there is a cold air return, the tightness of duct joints
   ____
   ____

OSR-3 (continued)

D. Potential Indoor Sources of Pollution

1. Has the house ever had a fire? Yes / No
2. Is there an attached garage? Yes / No
3. Is a vehicle normally parked in the garage? Yes / No
4. Is there a kerosene heater present? Yes / No
5. Is there a workshop, hobby or craft area in the residence? Yes / No
6. An inventory of all products used or stored in the home should be performed. Any products that contain volatile organic compounds or chemicals similar to the target compounds should be listed. The attached product inventory form should be used for this purpose.
7. Is there a kitchen exhaust fan? Yes / No Where is it vented? ____________________
8. Has the house ever been fumigated? If yes describe date, type and location of treatment.

____

E. Water and Sewage (Circle the appropriate response)

Source of Water

Public Water Drilled Well Driven Well Dug Well Other (Specify)______________

Water Well Specifications:

Well Diameter ______________________ Grouted or Ungrouted ________________

Well Depth ________________________ Type of Storage Tank _________________

Depth to Bedrock ____________________ Size of Storage Tank __________________

Feet of Casing ______________________ Describe type(s) of Treatment ___________

____

Water Quality:

Taste and/or odor problems? y / n If so, describe ________________________________

How long has the taste and/or odor been present? ________________________________

Sewage Disposal: Public Sewer Septic Tank Leach Field Other (Specify) ____________________

Distance from well to septic system___________Type of septic tank additive ____________________

OSR-3 (continued)

F. Plan View

Draw a plan view sketch for each floor of the residence and if applicable, indicate air sampling locations, possible indoor air pollution sources and PID meter readings.

G. Potential Outdoor Sources of Pollution

Draw a sketch of the area surrounding the residence being sampled. If applicable, provide information on the spill location (if known), potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s) and PID meter readings.

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and septic system if applicable, and a qualifying statement to help locate the site on a topographical map.

Household Products Inventory

Occupant / residence ____

Investigator: ______________________________ Date: ____________________

Product description (dispenser, size, manufacturer …)	**VOC Ingredients**

Chain of Custody Record № 0476

AECOM

FIGURE 9-1

Project Name:	Project Number:	Analysis Requested	Page ____ of ____
Send Report To:	Sampler (Print Name):		
Address:	Sampler (Print Name):		
	Shipment Method:		
	Airbill Number:		
Phone:	Laboratory Receiving:		Purchase Order #:________________
Fax:			

Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers												Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)

Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:

Sample Custodian Remarks (Completed By Laboratory):

QA/QC Level		Turnaround		Sample Receipt	
Level I	☐	Routine	☐	Total # Containers Received?	
Level II	☐	24 Hour	☐	COC Seals Present?	
Level III	☐	1 Week	☐	COC Seals Intact?	
Other	☐	Other ______		Received Containers Intact?	
				Temperature?	

White: Lab Copy Yellow: PM Copy Pink: Field Copy Gold: PM/QA/QC Copy

Appendix A

Field Descriptions of Samples for Former Manufactured Gas Plant (MGP) Sites

Field Descriptions of Samples for Former Manufactured Gas Plant (MGP) Sites

Soil Sample Descriptions

It is important that descriptive qualifiers are consistently used to characterize degree and nature of contaminant impacts and visual-manual soil classification. The following presents some examples of descriptive qualifiers.

Soil Logging

- All soils are to be logged using the **Unified Soil Classification** (ASTM D 2488 field descriptions)
- **PID or FID** used to screen all soil samples (Jar Headspace method) – maximum readings should be recorded and included on the logs. PID/FID to be calibrated daily at a minimum
- **Moisture terms** are: Dry, Moist, and Wet
- **Color terms** - use geotechnical color charts - colors may be combined: e.g. red-brown. Color terms should be used to describe the "natural color" of the sample as opposed to staining caused by contamination (see below)
- **Log of each sample interval** should be prepared as follows:
  - **[Coarse Grained Example]** NARROWLY GRADED SAND (SP); mostly fine sand; <5% fines; red-brown, moist, environmental/depositional/geologic descriptions.
  - **[Fine Grained Example]** SANDY SILT (ML); heterogeneous till structure, nonplastic, ~30% fine to coarse, subangular sand; ~10% subangular fine gravel, max. size ~ 10 mm; brown; environmental/depositional/geologic descriptions.
- **Representativeness** – Soil logs should include particular notes if the field representative believes that there is a possibility the soil sample being described is not representative of the interval sampled.
- **Intervals for Description** – if using a 2' (split spoon) or 4' (Macro-core) long sampler – the field description should not necessarily be for the entire sample interval. It is important to look for, identify, and describe small-scale units and changes within each sample interval.

Description Of Contaminants

Visible Contamination Descriptors

- **Sheen** - iridescent petroleum-like sheen. Not to be used to describe a "bacterial sheen" which can be distinguished by its tendency to break up on the water surface at angles whereas petroleum sheen will be continuous and will not break up. A field test for sheen is to put a soil sample in a jar of water and shake the sample (jar shake test) , then observe the presence/absence of sheen on the surface of the water in the jar.
- **Stained** - used w/ color (i.e. black or brown stained) to indicate that the soil matrix is stained a color other than the natural (unimpacted) color of the soil.
- **Coated** - soil grains are coated with tar/free product – there is not sufficient free-phase material present to saturate the pore spaces.

- **Blebs** - observed discrete sphericals of tar/free product - but for the most part the soil matrix was not visibly contaminated or saturated. Typically this is residual product.
- **Saturated** - the entirety of the pore space for a sample is saturated with the tar/free product. Care should be taken to ensure that you're not observing water saturating the pore spaces if you use this term. Depending on viscosity, tar/free-phase saturated materials may freely drain from a soil sample.
- **Oil**. Used to characterize free and/or residual product that exhibits a distinct fuel oil or diesel fuel like odor; distinctly different from MGP-related odors/impacts.
- **Tar**. Used to describe free and/or residual product that exhibits a distinct "coal tar" type odor (e.g. naphthalene-like odor). Colors of product can be brown, black, reddish-brown, or gold.
- **Solid Tar**. Used to describe product that is solid or semi-solid phase. The magnitude of the observed solid tar should be described (e.g. discrete granules or a solid layer).
- **Purifier Material**. Purifier material is commonly brown/rust or blue/green wood chips or granular material. It is typically associated with a distinctive sulfur-like odor. Other colors may be present.

Olfactory Descriptors

Use terms such as " tar-like odor" or "naphthalene-like odor" or "fuel oil-like odor" that provide a qualitative description (opinion) as to the possible source of the odor.

Use modifiers such as strong, moderate, faint to indicate intensity of the observed odor.

DNAPL/LNAPL

A jar shake test should be performed to identify and determine whether observed tar/free-phase product is either denser or lighter than water. In addition, MGP residues can include both light and dense phases - this test can help determine if both light and dense phase materials are present at a particular location.

Viscosity of Free-Phase Product

If free-phase product/tar is present a qualitative description of viscosity should be made. Descriptors such as:

- Highly viscous (e.g. taffy-like)
- Viscous (e.g. No. 6 fuel oil or bunker crude like)
- Low viscosity (e.g. No. 2 fuel oil like)

Groundwater Sampling Observations

Any observations of sheen, blebs, free-phase product/tar, staining or coating of the sampling equipment, odor, etc. that made during sampling of groundwater are to be included in the groundwater sample collection log.