AECOM Environment

Prepared for:
New York State Electric and Gas Corp
18 Link Drive
P. O. Box 5224
Binghamton, NY 13902

Prepared by:
AECOM
Latham, NY
Project 60215637
July 2011

Remedial Design Work Plan
Ithaca Court Street Former MGP Site
OU-2
Ithaca, New York
NYSDEC Site # 7-55-008

AECOM Environment

Prepared for:
New York State Electric and Gas Corp
18 Link Drive
P. O. Box 5224
Binghamton, NY 13902

Prepared by:
AECOM
Latham, NY
Project 60215637
July 2011

Remedial Design Work Plan
Ithaca Court Street Former MGP Site
OU-2
Ithaca, New York
NYSDEC Site # 7-55-008

Patrick Gratton

Prepared By: Patrick Gratton

Scott Underhill

Reviewed By: Scott Underhill, P.E.

Contents

List of Figures

List of Appendices

ENGINEERING CERTIFICATION

I hereby certify that the Remedial Design Work Plan for the Ithaca Court Street Manufactured Gas Plant was prepared in accordance with all applicable statues and regulations and in substantial conformance with the New York State Department of Environmental Conservation Division of Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER10).

Respectfully submitted,
AECOM Technical Services, Inc.

July 8, 2011
Scott A. Underhill Date
Registered Professional Engineer
New York License No. 075332

1.0 Purpose and Objectives

On behalf of New York State Electric and Gas Corporation (NYSEG), AECOM Environment has prepared this remedial design work plan (RDWP) for the land based remediation of impacted soils and groundwater for Areas 1A, 1B and 1C at Operable Unit 2 (OU-2), which is the off-site area at the Court Street Manufactured Gas Plant (MGP) site (Site) located in Ithaca, Tompkins County, New York (Figure 1). Areas 1A, 1B (excavation), and 1C (in situ chemical oxidation) are shown on Figure 2. This RDWP provides the guidelines to implement the remedy selected by the New York State Department of Environmental Conservation (NYSDEC) in accordance with the Record of Decision (ROD) for OU-2 at the Site [ROD, OU-2, NYSDEC, 2011] and the Administrative Order on Consent [CO, Index No. D0-0002-9309, (NYSDEC, 1994)] between the NYSDEC and NYSEG.

This RDWP presents the approach by which the design will be completed in order to satisfy the remedial objectives for the Site. The components of the remedy covered by this RDWP, as defined in the ROD, are as follows:

- Excavation of off-site soils in Areas designated as 1A and 1B. Excavation will be preceded by a pre-design investigation (PDI) in Areas 1A and 1B and their immediate vicinity to determine off-site treatment and disposal facility options. Soil which is not visibly impacted will be used as backfill in the right-of-way portion of OU-2.
- If backfill materials are used in the right-of-way portion of Areas 1A and 1B, which do not meet residential soil cleanup objectives, a soil or pavement cover will be provided to prevent exposure to underlying soils.
- In-situ chemical oxidation (ISCO) of impacted soils in Area 1C. This remedy will be preceded by a treatability study to identify the appropriate oxidant(s) and catalyzing agent(s).
- Monitoring wells with sumps will be installed to collect and remove flowable NAPL if present in Area 1C.
- To the extent practicable, green remediation and sustainability in accordance with DER-31, will be considered in the design and implementation of the remedy.

This RDWP provides the basis of design and outlines the design documents to be prepared for each component of remediation mentioned above. Additional detail is provided for the basis of the work, including: site preparation, excavation, ISCO, waste management, water management, site restoration, traffic control, and community protection activities to be undertaken during the work.

This RDWP also includes the details of the PDI activities that will provide necessary site-specific information to support the remedial design. The PDI Field Sampling and Analytical Plan is provided in Appendix A and the ISCO Treatability Work Plan is provided in Appendix B.

DER-10 requirements

A copy of the ROD has been included as Appendix C of this document to satisfy the following requirements of Section 5.2 (b) of the DER-10:

- Summary of the Remedial Investigation Report, provided in Section 5.1 of the ROD;
- Summary of sampling results collected up to the date of the publication of the ROD;
- Identification of all applicable Standards, Criteria, and Guidance (SCGs);
- Figures identifying all areas where the remedial action will be conducted; and
- Figures showing the vertical and horizontal extent of the area to be remediated.

In accordance with the CO and the Technical Guidance for Site Investigation and Remediation [(DER-10); NYSDEC, 2010], the remedial design program will include the preparation/submittal of the following information:

Remedial Design Work Plan (this document):

- Remedial Design Report (this RDWP is submitted in lieu of the Remedial Design Report);
- Schedule to implement the remedial design;
- Protocols to determine the effectiveness of the remedial design; and
- Description of PDI activities. Note that a Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) for the investigation portions of the work will be developed prior to commencement of any field activities.

50% design submittals will include drafts of the following:

- Remedial Design specifications and drawings; and
- Contingency Plan.

The remedial design will also include a Citizen Participation Plan to be developed and provided by NYSEG.

100% design submittals will include biddable quality design documents for the remedial design, consisting of specifications and drawings, complete and in final form.

The following additional documents are not explicitly required by the CO, but are integral to the remedial design program. They will be provided with the 100% design submittal:

- Construction Storm Water Pollution Prevention Plan (SWPPP);
- Community Air Monitoring Plan (CAMP);
- Remedial Action Monitoring Plan (RAMP);
- Construction Quality Control Plan;
- Odor, Vapor, and Dust Control Plan (OVDCP);
- Transportation Plan;
- Traffic Management Plan; and
- Erosion Control Plan.

1.1 Site History

1.1.1 Operational/Disposal History

The MGP operated at this site between 1853 and 1927. The site-related contamination is coal tar, which was a condensate from the gas manufacturing process. A number of conduits located beneath West Court Street conveyed coal tar from the plant site to a barge loading facility located on Cayuga Inlet (Site #7-55-007). Tar escaped from several subsurface structures on the plant site and also from the conduits, creating an extensive area of subsurface tar contamination.

1.1.2 Remedial History

The former gas plant site was initially investigated by NYSEG in 1986. For remediation purposes, areas affected by the former gas plant operations have been separated into two different operable units. A full remedial investigation was initiated in October 2001. During the investigation, coal tar and associated contamination were identified beyond the boundaries of the site and tar conduits in West Court Street. The site was then organized into two Operable Units, OU-1 is the plant site and the conduits, and OU-2 is the off-site areas where contamination had migrated through the subsurface, away from the OU-1 area and into the surrounding residential community.

The remediation of the conduits in West Court Street started in the fall of 2002 and was completed in the fall of 2010. Remediation of the OU-1 gas plant site began in the fall of 2008 and was completed in January 2010, with the exception of the Markles Flats building. The construction completion report for that work was approved in December 2010. The Remedial Investigation Report for OU-2 was finalized in February 2011 and is currently available for public review in the document repositories established for this site, as is the Feasibility Study.

Based on communication between NYSEG and NYSDEC, it was acknowledged that a combination of remediation processes would likely be implemented for OU-2 due to the variability in the concentrations and distribution of site contamination. Several subareas were identified, and remediation alternatives have been developed and evaluated for each subarea. Area 1 is located at the intersection of North Plain Street and Esty Street with an area of approximately 47,425 square feet (~1.1 acre) to be addressed by remediation. Area 1 contains 3 subareas that are the focus of this RDWP (see Figure 2).

- Area 1A is located immediately north of OU-1 on Esty Street with an area of approximately 7,400 square feet.
- Area 1B is approximately 7,400 square feet in area located on North Plain Street, west of OU-1, and immediately south of Esty Street. The most grossly contaminated soil and groundwater in OU-2 is located in this subarea.
- Area 1C is approximately 6,400 square feet in area located on North Plain Street, northwest of OU-1, and immediately north of Esty Street.
- The Remainder of Area 1 has an area of approximately 26,225 square feet and is considered outside of Areas 1A, 1B, and 1C for this RDWP.

1.1.3 Enforcement Status

New York State Electric & Gas (NYSEG) entered into a multi-site Consent Order on March 30, 1994. The Order (#D0-0002-9309) obligates the responsible parties to implement a full remedial program for 33 former MGP sites across New York State, including the Ithaca Court Street site.

The Potentially Responsible (PRPs) for the site, documented to date, include only NYSEG.

In September 2003, NYSDEC issued a ROD for OU-1, which established a remedial action for the on-site impacted materials. (i.e., excavation of contaminated subsurface soils and conduits locate in West Court Street and the gas plant site). An interim remedial measures engineering report for OU-1 was submitted to the NYSDEC in April 2007.

In March 2011, NYSDEC issued a ROD for OU-2, which established a remedial action for the off-site impacted materials. (i.e., excavation and in-situ chemical oxidation of contaminated subsurface soils in the off-site area). The purpose of the RDWP is to finalize the remedial design for OU-2.

2.0 Site Contamination

Between 1986 and 2011, the site has been subject to several investigations. The latest of these are the Remedial Investigation Report for OU-2 (AECOM, 2011a) and a Feasibility Study for OU-2 (AECOM, 2011b) to evaluate the remedial alternatives for addressing the significant threats to human health and the environment.

2.1 Summary of the Remedial Investigation

The purpose of the RI was to determine whether the contaminants identified in various media were present at levels of concern when compared to the media-specific SCGs and define the nature and extent of any contamination resulting from previous activities at the site. The RI was conducted in 2009 and 2010. The following investigative activities were conducted during the RI:

- Subsurface utility clearance;
- Subsurface soil boring installation and subsurface soil sampling;
- Monitoring well installation and development;
- Groundwater sampling;
- DNAPL baildown testing;
- Soil Vapor Intrusion (SVI) sampling;
- Site Surveying;
- Management of investigation-derived wastes; and
- Reporting of data collected in 2010 as well as previous investigations

2.1.1 Standards, Criteria, and Guidance

To determine whether the soil, groundwater, or indoor air contain contamination at levels of concern, data from the investigations were compared to the following SCGs:

- Groundwater, drinking water, and surface water SCGs are based on NYSDEC's "Ambient Water Quality Standards and Guidance Values" and Part S of the New York State Sanitary Code.
- Soil SCGs are based on NYSDEC's Cleanup Objectives ("Technical and Administrative Guidance Memorandum [TAGM] 4046; Determination of Soil Cleanup Objectives and Cleanup Levels" and 6 NYCRR Subpart 375-6 - Remedial Program Soil Cleanup Objectives).
- Concentrations of VOCs in air were compared to typical background levels of VOCs in indoor and outdoor air using the background levels provided in the State's guidance document titled "Guidance for Evaluating Soil Vapor Intrusion in the State of New York," dated October 2006. The background levels are not SCGs and are used only as a general tool to assist in data evaluation.

Based on the RI results, in comparison to the SCGs and potential public health and environmental exposure routes, certain media and areas of the site require remediation. These are summarized in Section 2.1.2. More complete information can be found in the RI report.

2.1.2 Nature and Extent of Contamination

As described in the RI report, numerous soil, groundwater, and soil vapor samples were collected to characterize the nature and extent of contamination. The main categories of contaminants that exceed their SCGs are volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) found in the groundwater and soil.

The VOCs of concern are benzene, toluene, ethylbenzene and xylene. These compounds are referred to as BTEX in this document, and are a common component of coal and MGP related tar. Of these compounds, benzene, which is a known human carcinogen, is the most significant.

SVOCs of concern are primarily a group of chemicals commonly referred to as polycyclic aromatic hydrocarbons (PAHs). The specific compounds of concern at this site, which are typically found at MGP sites, are:

- acenaphthene
- *dibenzo(a,h)anthracene*
- acenaphthylene
- fluoranthene
- anthracene
- fluorine
- *benzo(a)anthracene*
- *indeno(1,2,3-cd)pyrene*
- *benzo(a)pyrene*
- 2-methylnaphthalene
- *benzo(b)fluoranthene*
- naphthalene
- benzo(g,h,i)perylene
- phenanthrene
- *benzo(k)fluoranthene*
- pyrene
- *chrysene*

Total PAHs concentrations referred to in this plan are the summation of the individual PAHs listed above. The italicized PAHs are probable human carcinogens. The summation of the italicized PAHs is referred to in this document as carcinogenic polycyclic aromatic hydrocarbons (cPAHs).

A dense oily liquid that does not readily dissolve in water is also typically found at MGP sites. This site-related contamination known as “coal tar” was a condensate from the gas manufacturing process. This liquid, however, does not have the sticky, viscous consistency of other materials commonly labeled as “tar.” The tar found at this site has a consistency similar to used motor oil, and is consequently able to migrate as a liquid through the subsurface. The tar is slightly denser than water, and thus tends to sink through the subsurface until it reaches a geologic unit which will not allow it to pass.

The primary inorganic contaminant of concern at this site is cyanide. Cyanide is commonly found at MGP sites where waste from gas purification is present. Cyanide has been found in site soils

and site groundwater; however, the cyanide levels are generally below SCGs for both media. Where cyanide exceeds its SCGs, it is commingled with other site contaminants of concern.

The following are the media which were investigated and a summary of the findings of the investigation.

Waste Materials

Waste materials consist of coal tar or NAPL which contain organic contaminants. NAPL refers to contaminants that remain undiluted as their original bulk form in the subsurface. The majority of the coal tar originally present at this site was removed as part of the OU-1 remedy. Significant amounts of coal tar remain in three distinct areas to the north and west of the site: Area 1A to the north of the plant site, Area 1B to the west of the plant site, and Area 1C within North Plain Street north of Esty Street. In each of these areas, the heaviest contamination is found within a layer of gravel at a depth typically ranging from 10 to 13 feet below the ground surface.

The source of the BTEX and PAH contamination previously found in OU-2 was the result of coal tar or NAPL found in and around the subsurface structures and conduits and migrating through a thin seam of gravel. This gravel is highly permeable to the flow of liquids and appears to be the primary conduit for off-site migration of MGP tar. Both of these conditions generally coincide with BTEX and PAH concentrations several orders of magnitude greater than the SCOs in adjacent soils, and typically results in significant impacts to the groundwater as well.

Areas of significant waste disposal have been termed “source areas” and are defined as: free tar and tar-saturated soils. In the off-site area, these source areas appear to be directly associated with several subsurface structures on the plant site and also from the conduits, creating an extensive area of subsurface tar contamination.

PAHs account for a majority of the SVOCs present in site soils. These compounds are widespread and occur in higher concentrations in close proximity to the tar from which they are derived.

Surface Soil

Several surface soil samples and background samples found PAHs present at levels exceeding unrestricted SCGs for individual PAH compounds. The PAHs appear to share a common source with those of the background samples and there does not appear to be a reasonable connection between these chemicals and the MGP related contamination. Therefore, surface soil PAHs are not considered site specific contaminants of concern.

Subsurface Soil

During the RI, numerous subsurface soil samples were collected and analyzed. The results indicate that soils that are visibly impacted by coal tar exceed the unrestricted SCG for volatile and semi-volatile organics. The principal volatile organic chemicals of concern are the BTEX compounds, and the principal semi-volatile organic chemicals of concern are the PAH compounds. The BTEX compounds are generally co-located with the PAHs. At this site, elevated PAHs are collocated with visible evidence of MGP tar. PAHs levels in subsurface soils range from non-detect to 6,300 mg/kg. BTEX levels in subsurface soils range from non-detect to 390 mg/kg.

Groundwater

The RI identifies groundwater contamination at the site with BTEX being the primary contaminants of concern. This groundwater contamination originates in the area of the former MGP structures under the on-site building and has been observed along Washington Street (Remedial Area 1), at the limits of the excavation previously completed on that street. Groundwater in close proximity to the coal tar present north and west of the plant site would be expected to contain site related contamination at levels above SCGs; sampling completed to date has not demonstrated this idea.

Soil Vapor/Sub-Slab Vapor/Air

The evaluation of the potential for soil vapor intrusion resulting from the presence of site related soil or groundwater contamination was evaluated by the sampling of soil vapor, sub-slab soil vapor under structures, and indoor air inside structures.

Over the course of several years, soil vapor samples were collected from the sub-slab of structures located near the plant site, along West Court Street, and along Washington Street. Indoor air and outdoor air samples were also collected. The samples were collected to assess the potential for soil vapor intrusion.

Based on the information collected, and in comparison with the NYSDOH Soil Vapor Intrusion Guidance, no site-related soil vapor contamination of concern was identified in OU-2 during the RI. Therefore, no remedial alternatives need to be evaluated for soil vapor.

2.2 Summary of Human Exposure Pathways

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the human exposure pathways can be found in Section 8 of the RI report. An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a site. An exposure pathway has five elements: [1] a contaminant source, [2] contaminant release and transport mechanisms, [3] a point of exposure, [4] a route of exposure, and [5] a receptor population.

The source of contamination is the location where contaminants were released to the environment (any waste disposal area or point of discharge). Contaminant release and transport mechanisms carry contaminants from the source to a point where people may be exposed. The exposure point is a location where actual or potential human contact with a contaminated medium may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (e.g., ingestion, inhalation, or direct contact). The receptor population is the people who are, or may be, exposed to contaminants at a point of exposure.

An exposure pathway is complete when all five elements of an exposure pathway exist. An exposure pathway is considered a potential pathway when one or more of the elements currently does not exist, but could in the future. At this site the potential exposure pathways are:

- Dermal contact with NAPL, contaminated soil or groundwater;
- Incidental ingestion of contaminated soils or groundwater; and
- Inhalation of contaminated soil vapors or dust, but not vapor intrusion into buildings.

Subsurface Soil

During the RI, subsurface soil samples were collected and analyzed and show that certain areas of the site are heavily impacted by MGP tar and related constituents, while other areas had more discrete impacts.

Subsurface soil samples indicate that soils that are visibly impacted by coal tar exceed the unrestricted SCG for volatile and semi-volatile organics. Primarily BTEX compounds (VOCs) and PAHs (SVOCs), which are generally located with each other. At this site, elevated PAHs are collocated with visible evidence of MGP tar.

PAH levels in subsurface soils range from non-detect to 6,300 mg/kg. BTEX levels in subsurface soils range from non-detect to 390 mg/kg.

The potential for exposure to contaminated soil and NAPL is unlikely since the majority of the contamination has either been removed during previous remedial actions or exists beneath the ground surface. However, redevelopment, subsurface utility work or building maintenance work in the future could bring workers into contact with contaminated material or bring contaminated soils to the surface.

Groundwater

The RI identified groundwater contamination at the site. This groundwater contamination originates in the area of the former MGP structures under the on-site building and has been observed along Washington Street (Remedial Area 1), at the limits of the excavation previously completed on that street. Groundwater in close proximity to the coal tar present north and west of the plant site would be expected to contain site related contamination at levels above SCGs, sampling completed to date has not demonstrated this idea.

The BTEX compounds are the most mobile of the groundwater contaminants and have been found above their individual groundwater quality standards in the off-site wells. Exposure to contaminated groundwater is unlikely since the area is served by public water. However, the potential for exposure to contaminated groundwater in the future exists if a well were installed or construction was to occur below the shallow groundwater table.

Air

During the RI, air samples were collected using summa canisters to assess potential impacts to indoor air quality and soil vapor. Soil vapor samples were collected from the sub-slab of structures located near the plant site, along West Court Street, and along Washington Street. Indoor air and outdoor air samples were also collected. The samples were collected to assess the potential for soil vapor intrusion. Based on the information collected, and in comparison with the NYSDOH Soil Vapor Intrusion Guidance, no site-related soil vapor contamination of concern was identified in OU-2 during the RI.

MGP-related impacts were not observed in OU-2 surface soils. As such, the potential for exposure to indoor occupants in this area is considered to be low. Results from SVI sampling indicate that soil vapor intrusion is not a concern for OU-2 residences.

2.3 Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts include existing and potential future exposure pathways to natural resources such as aquifers.

Site contamination at the Site has negatively impacted the groundwater resource in the shallow, unconfined aquifer in the fill and upper silty sands. The site presents an environmental threat due to the ongoing presence of coal tar in the subsurface and the release of tar-related contamination into the groundwater.

3.0 Design Basis

The following section first describes the elements of the design basis that apply to the remedial design. The specific design basis of the work is then described.

3.1 Common design basis elements

3.1.1 Remedial goals

The remedial goals for the Site have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. As stated in the ROD, "The selected remedy is protective of human health and the environment, complies with state and federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. The remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element." (NYSDEC, 2011).

In accordance with the ROD, the remedial objectives for this site are:

Public Health Protection

Groundwater

- Prevent people from drinking groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with contaminated groundwater.

Soil

- Prevent ingestion/direct contact with contaminated soil.

Environmental Protection

Groundwater

- Remove the source of ground water contamination
- Restore the groundwater aquifer to meet ambient groundwater quality criteria, to the extent feasible.

Soil

- Prevent migration of contaminants that would result in groundwater contamination.
- Remove the source of ground water contamination;

3.1.2 Site remedy

To achieve the remedial goals, the NYSDEC, in consultation with the New York State Department of Health (NYSDOH), has selected a specific remedial approach for the Site which is specified in the

ROD. Specific portions of this remedial approach which will be addressed as part of this RDWP are as follows:

- Remedial design program to provide necessary details for construction, operation, maintenance, and monitoring of the selected remedy.
- Excavation of soil containing visible MGP impacts in areas designated as Areas 1A and 1B, along with off-site treatment and disposal at a permitted facility.
- Native soil that is not impacted will be used as backfill for the remedial excavation areas. Backfill on residential properties must meet residential SCGs.
- If backfill materials are used in the right-of-way portion of Areas 1A and 1B, which do not meet residential soil cleanup objectives, a soil or paving/concrete cover will be provided to prevent exposure to underlying soils in vegetated and non-vegetated areas.
- The clean soil cover will include a demarcation layer and will be a minimum of 24 inches thick for soil in vegetated areas and 6 inches thick for pavement/concrete in non-vegetated areas. The finished surface over most of the site will be pavement, with some areas receiving vegetation.
- In-situ chemical oxidation (ISCO) treatment of the gravel seam containing MGP tar in area 1C. This will be accompanied by a treatability study prior to injections to determine the appropriate oxidant(s) and catalyzing agent(s).
- Monitoring wells with sumps will be installed to collect and remove flowable NAPL if present in Area 1C.

Additional future actions will also be required as part of the NYSDEC selected remedy, but are not part of the work covered by this RDWP. These future additional actions will include: monitored natural attenuation and periodic groundwater monitoring, a site management plan, an institutional control in the form of an environmental easement, and periodic certifications of institutional and engineering controls.

3.1.3 Property access

The vast majority of the excavation and ISCO work will take place within the city street right-of-ways. However, Area 1B does include some property outside the right-of-way and the scope of the overall remediation activities may involve other temporary construction traffic and/or impacts to adjacent private properties. NYSEG will attain all necessary permits and access agreements to perform work within these areas. A temporary traffic control plan and restoration plan will be developed for work in North Plain Street and Esty Street. This plan will be reviewed and accepted by the City of Ithaca prior to site mobilization.

3.1.4 Utilities

NYSEG will coordinate with Dig Safely New York to identify and verify the location of subsurface utilities within the work limits. Following mark-out, proposed boring or excavation/ISCO locations will be staked out to ensure that the locations will be free and clear of underground utilities. A subsurface utility locating contractor will be used to evaluate for the presence of subsurface utilities. Proposed sampling locations may be shifted to avoid subsurface and overhead utilities as appropriate.

3.1.5 Environmental monitoring and controls

Environmental controls will ensure that the work activities do not spread impacted soils and MGP waste outside the impacted areas and maintain the protection of human health and the environment throughout the remedial operations. These items will be covered in more detail in the Transportation Plan, CAMP, HASP, and OVDCP for the Site. These items will be submitted as appendices to the 100% final design report.

3.1.6 Green Remediation

NYSDEC DER-31: Green Remediation (DER-31) provides some examples of best practices and techniques that could be applied during all phases of remediation (see Attachment 1 of DER-31). In addition, NYSDEC expects that the techniques identified below will be implemented at sites unless a site-specific evaluation demonstrates impracticability or favors an alternative green approach:

Practice/Technique	Potential Benefits[1]	Applicable to this Remedy
Use renewable energy where possible or purchase Renewable Energy Credits (RECs)	Reduce/supplement purchased energy use	
Use of remediation technologies with an intermittent energy supply (i.e., energy use during peak energy generation only)	Reduce energy use	
Incorporate green building design	Reduce future use impacts	
Reuse existing buildings and infrastructure to reduce waste	Reduce waste and material use	
Reuse and Recycle construction and demolition (C&D) debris and other materials (i.e., grind waste wood and other organics for on-site use)	Reduce waste and material use	X
Design cover systems to be usable (i.e., habitat or recreation)	Reduce construction impacts of future development	X
Reduce vehicle idling	Reduce air emissions and fuel use	X
Use of Low Sulfur Diesel Fuel (LSDF) or alternate fuels (i.e., biodiesel or E85)	Reduce air emissions	X
Sequence work to minimize double-handling of materials	Reduce construction impacts	X
Use energy efficient systems and office equipment in the job trailer	Reduce energy use	X

1. Potential benefits listed are not all inclusive and will vary dependent upon the site and implementation of the practice or technique.

Detailed plans and specifications for the entire remedy will be prepared in accordance with DER-31 as part of the design activities. DER-31 compliant practices and requirements will be clearly identified and provided to NYSDEC in the 50% and 100% design submittals. In addition, DER-31 reporting requirements will be further defined and provided to NYSDEC in the 50% and 100% design submittals.

3.2 Design basis for excavation (Areas 1A and 1B)

3.2.1 Excavation performance criteria

Excavation performance will be measured by the safe and efficient removal of contaminated soil in the appropriate areas. Other additional areas of performance include:

- Short term goal of reducing MGP waste mass and a long term goal of meeting groundwater quality standards;
- Meeting the soil RAOs related to protecting human health and the environment over the long term;
- Dewatering under this alternative would also result in the capture, removal, and treatment of impacted groundwater;
- Reduce the potential for vapor intrusion into nearby residential houses by the removal of the MGP contaminated media; and
- Incorporate green remediation principals into the site remediation approach by utilizing soil that is not visibly impacted as backfill in the right-of-way portion of OU-2.

Detail regarding quality assurance/quality control is provided in Section 5.

The anticipated excavation limits are shown in Figure 2. The actual horizontal and vertical limits of excavation will be determined during the remedial design, following a pre-design investigation. The result of this evaluation will be provided in a PDI Report to be prepared following the PDI field activities.

3.2.2 Excavation Pre-design investigation

During PDI activities, the following information in Areas 1A, 1B, and their immediate vicinity will be collected to aid in the final design:

- Pre-excavation waste characterization of the soil to be removed and disposed of off-site;
- Pre-excavation soil reuse analytical data for soil anticipated to be reused;
- Focused supplemental horizontal and vertical delineation of impacted areas; and
- Geotechnical testing to collect data for the project sheeting and dewatering design work.

The excavation PDI will be performed as follows:

1. Perform a site visit.
2. Perform a field utility location mark-out in Areas 1A and 1B to select soil boring locations.
3. Procure subcontractor(s) to perform hand-clearing of soil boring locations.

4. Procure a drilling subcontractor for installation of soil borings within these areas.

5. Coordinate with local official to manage traffic in the area during the soil boring activities.

6. Install approximately eight soil borings within Area 1A, approximately seven soil borings within Area 1B, and a total of approximately eight additional soil borings along the perimeters of Areas 1A and 1B. Soil borings will be installed approximately 1 to 2 feet into the underlying silty-clay layer (average depth of approximately 20 feet deep for each boring).

7. Collect up to 12 soil samples representative of the soil from soil borings within Areas 1A and 1B, which does not contain visible MGP impacts to evaluate this material's suitability for reuse. Soil samples will be submitted for laboratory analysis of the following soil reuse evaluation parameters: VOCs, SVOCs, metals, pesticides and PCBs.

8. For soil within street right-of-way use careful visual examination in the field and log all observations for all soil borings to further refine the delineation between the soil which does and does not contain visible MGP impacts in the soil borings. For soil outside of the street right-of-way collect up to 8 soil samples to assist with delineation of MGP impacts. Soil samples will be submitted for laboratory analysis of the following parameters: VOCs, SVOCs, and cyanide.

9. Collect up to 15 soil samples representative of the soil from soil borings within Areas 1A and 1B, which contains visible MGP impacts to characterize this material for waste disposal purposes. Soil samples will be submitted for laboratory analysis of the following waste disposal parameters: VOCs, SVOCs, RCRA metals, total cyanide, total petroleum hydrocarbons (TPH), total PCBs, % sulfur, BTU Content, TCLP VOCs, TCLP SVOCs, TCLP metals, TCLP herbicides, TCLP pesticides, ignitability, corrosivity (pH), reactive cyanide, reactive sulfide, % solids and paint filter.

10. Tar-Specific Green Optical Screening Tool (TarGOST®), a field screening system used to detect the presence of NAPL, may also be used to assist with supplemental delineation of impacted subsurface materials (if available and feasible for this investigation).

11. Install up to four soil borings (two for each area) to an approximate depth of 60 feet each for geotechnical evaluation to support the sheeting and dewatering design. These soil borings will include blow counts to assess soil strength and Shelby tubes will be collected for laboratory analysis of geotechnical parameters. These soil borings will be located in the close proximity to Areas 1A and 1B, but outside of areas containing NAPL to protect the underlying aquifer.

12. Geotechnical analysis of soil samples will be performed by a subcontracted materials testing laboratory. Up to eight samples of the fine grained cohesive materials will be collected from soil borings and submitted for analysis of gradation, Atterberg limits and moisture content. In addition, Shelby tube samples will be collected of the clayey soils from representative soil borings and depths. Up to six of the Shelby tube samples will be submitted for analysis of soil strength using Unconsolidated-Undrained (UU) triaxial compression tests and up to three of these samples will also be analyzed for hydraulic conductivity.

13. The results of this investigation will be compiled into a PDI Letter Report. This letter report will document the activities performed and will summarize and evaluate the information and

analytical results collected.

The PDI Field Sampling and Analytical Plan is provided in Appendix A. This document shows the sampling locations, rationale, methods, and duration for the PDI. The results of the PDI will be provided in a PDI report at the conclusion of this work and prior to the submittal of the 50% design submittal documents.

3.2.3 Excavation Design

This alternative will address impacted soils located above and below the water table through removal by means of excavation. The removal will be performed within a 15,000 square foot (sf) area to depths of approximately 17 feet below ground surface (bgs), depending on location. The approximate soil removal volume is 9,500 cubic yards (cy). Soil not visibly impacted will be stockpiled, sampled, and depending on results of the sampling either reused as backfill or sent for off-site disposal (see section 3.2.11).

Excavation processes, including temporary sheet pile shoring, relocation of underground and aboveground utilities, confirmation sampling with laboratory characterization, dewatering, and off-site disposal of contaminated soil will also be provided.

3.2.4 Site preparation

The Site will be prepared for the required remedial actions and restoration work. The Site preparation activities include: mobilization; installation of security fencing; installation of erosion and sedimentation controls; installation of temporary site facilities; surveying to establish baseline conditions and grades in Areas 1A and 1B; utility location, protection, and relocation if necessary; and implementation of traffic controls.

Any monitoring wells that will be damaged during the remedy implementation will be removed in their entirety or abandoned per the NYSDEC guidance and policies during the site preparation activities. Documentation required for the abandonment and removal of these wells will be included in the remedial design.

Engineering controls to control odors, erosion, and storm water will be mobilized, setup and installed prior to the start of intrusive activities.

3.2.5 Utility relocation

During the excavation work, protection and relocation of underground and aboveground utilities will be needed within the areas of excavation (i.e. Areas 1A and 1B). The overall plan and specific phasing for the most cost effective and efficient manner to deal with these utilities will be completed during the remedial design.

3.2.6 Temporary sheet pile shoring

During the excavation work, temporary sheet piles will be placed along the excavation sidewalls in Areas 1A and 1B. This approach is necessary as the approximate depth of excavation is 17 feet and there is limited space to bench the excavation walls. The temporary sheet piles will be toed into the confining clay layer and will act as a barrier while excavating and dewatering in both areas. The temporary sheet piles will either be installed using a hydraulic press or by vibratory installation. The feasibility of both of these methods will be evaluated during the design.

3.2.7 On-site waste management

To the extent possible, all excavated soils and spoil material will be loaded directly into trucks for off-site transportation to a NYSEG-approved disposal facility. However, because of construction sequencing and off-site disposal facility scheduling issues, and in order to consolidate large amounts of waste material for bulk truck shipments, waste material may be stored on-site prior to loading and shipment. In addition, soil that is not visibly impacted should be stockpiled and used as backfill in the right-of-way portion of OU-2, following the completion of the excavation. Backfill on the residential property must meet residential SCGs. In these instances, excavated soil will be transported by loader or on-site haul truck from the excavation areas to the stockpile area. To the extent practicable stockpile areas will be located on NYSEG property within OU-1. If stockpile areas are placed in unimpacted or restored areas, berms and liners will be used to protect underlying materials from becoming impacted. The design will include the provision that all stockpiled soils be protected with soil erosion controls and dust controls. Impacted soils will be staged in bermed areas to collect runoff and dewatered fluids (constructed soil staging areas with gravity sumps) and covered/anchored properly to control odor. If necessary, material stockpiles will be sprayed with odor suppressing foam and covered in an attempt to mitigate the potential for odors in the surrounding community.

While large debris is not anticipated, if large boulders or concrete are excavated, they may require decontamination to meet facility acceptance requirements. Decontamination will take place using brushes, steam cleaners, and/or pressure washers. Residues from decontamination operations will be collected and managed with impacted soils. Excavation debris may potentially be decontaminated and sent to an off-site facility for disposal. Decontamination water, as well as residuals from dewatering activities will be temporarily stored in appropriate drums or tanks prior to treatment and management in the temporary water treatment system or transported to an appropriate off-site disposal facility as required.

It is assumed that the composition of the excavated soils will meet the requirements of the NYSDEC guidance, Management Of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment [(DER-4), NYSDEC, 2002], and can be managed as solid wastes at permitted off-site disposal facilities. The soils within the Site will be pre-characterized during the PDI. Pre-characterization will facilitate the profiling and pre-acceptance of the materials to the NYSEG-approved disposal facilities. Depending upon the results of the characterization sampling, the drummed soils may be re-used on site as backfill, or they may be disposed off site at a facility permitted to accept such material. Excavation below the water table will be necessary to remove MGP contaminated soil. Therefore, the design will address contingency dewatering requirements including use of a staging area with a gravity sump to collect fluids, or local dewatering to draw groundwater levels below the excavation limit, with appropriate water management. If required, the soils will be amended with a facility accepted drying agent such as cement kiln dust or absorbent polymer to facilitate transport to the off-site disposal facility (Quick lime or lime kiln dust greater than 50% available CaO and MgO is no longer acceptable to the NYSDEC for this purpose).

3.2.8 Waste characterization

All wastes at the Site that have been impacted by MGP residues will be classified as non-hazardous industrial waste unless they are determined to exhibit the characteristics of ignitability, corrosivity, reactivity, or toxicity characteristics leaching procedure (TCLP) benzene, as determined by laboratory testing. If they do exhibit one or more of these characteristics, they will be classified as hazardous wastes. The exception to this will be soils that exhibit only the TCLP benzene characteristic which will be sent for thermal treatment – such soils will be designated as Conditionally Exempt MGP Remediation Waste per DEC TAGM 4061.

The soils within these Areas (1A and 1B) will be pre-characterized during the PDI. Pre-characterization will facilitate the profiling and pre-acceptance of the materials to disposal facilities permitted to accept such material. Once the soils are pre-characterized and accepted they can be direct loaded from the excavation into transport trucks or stockpiled on the Site to expedite the excavation process.

3.2.9 Off-site transportation

Excavated materials will be transported off site in dump trucks to a disposal facility permitted to accept such material. Transportation of impacted materials from the Site will be performed in accordance with all regulatory requirements and in accordance with the Transportation Plan with a trucking route, provided by the Engineer as part of the final design documentation.

All haul trucks will have poly bed liners that fully line the bed of the truck and can be overlapped to cover the top of the load to manage odors during transportation. All loads must also be tarped; no mesh covers will be allowed. Depending on loading practices, full decontamination of trucks may be required prior to leaving the site. However, the design will specify that the vehicles will be loaded in such a way as to avoid contamination of their exteriors, including tires.

Waste shipments will be documented using the required waste manifests. Other materials that have no specific documentation requirements will be documented using waste tracking forms, bills of lading, and receipts. All shipments of waste from the Site will be documented, describing the type and amount of material and the receiving facility.

3.2.10 Excavation dewatering and water management

The excavations will take place above and below the ground water table, but efforts will be made to minimize the amount of construction water requiring treatment and/or disposal. Construction water generated during the excavation process, including dewatered groundwater, decontamination water, and storm water that comes in contact with open excavations, will be collected and transported to an off-site wastewater treatment and disposal facility licensed to accept such material, or treated and discharged into the sanitary sewer for treatment by the local POTW. Frac tanks may be necessary on site for water management purposes.

3.2.11 Site restoration

Following excavation, the affected areas will be backfilled to finish grade with clean imported fill or reusable native excavated materials, subject to the NYSDEC approval. A backfill and grading plan, as well as detailed specifications for fill materials will be presented in the 100% design submittal. All disturbed areas will be re-graded and restored to match the surrounding areas or to the requirements of any entity that will be developing the site following remediation, should one be identified prior to site restoration.

Pursuant to the ROD, if backfill material is used in the right-of-way portion of Areas 1A and 1B, which does not meet residential soil cleanup objectives, a soil cover will be provided over all vegetated areas to prevent exposure to underlying soils. The two foot thick layer will consist of clean soil underlain by a demarcation layer to delineate the cover soil from the subsurface soil. The top six inches of soil must be of sufficient quality to support vegetation. Clean soil is soil that is tested and meets the Division of Environmental Remediation's criteria for backfill. For non-vegetated areas (buildings, roadways, parking lots, etc.) this cover will consist of either a paving system or concrete at least 6 inches thick. These materials will meet the commercial requirements for cover material set forth in 6 NYCRR Part 375-6.7(d), and will be placed over a demarcation layer At Areas 1A and 1B, the clean

soil cover will be underlain by a demarcation layer (e.g., orange plastic snow fence). The purpose of the demarcation layer is to distinguish between the cover soils, and soils exceeding the requirements for clean cover soils.

Surface drainage will be evaluated as part of the restoration design.

3.2.12 Odor, vapor, and dust control

Odor, vapor, and dust control will be conducted for this project due to the sensitive location of the Site and immediate proximity to residential and commercial buildings.

A variety of engineering controls will be available to control odors, vapors, and dust. Those controls will include, but will not necessarily be limited to, wetting soils with water to control dust, limiting the size of excavations, covering contaminated soils with plastic sheeting or foam, and spraying soils with Biosolve™.

3.2.13 Air monitoring

Community and work zone air monitoring will be performed per the NYSDOH and the Occupational Safety and Health Administration (OSHA) requirements, and according to the site-specific HASP and CAMP (to be provided following completion of the 50% design). The contaminants of concern are VOCs and particulates.

Community air monitoring will be continuous during activities capable of generating dust or releasing odors or vapors, such as site clearing, soil boring installation, sheet pile installation, soil erosion fencing installation, excavation and handling of impacted soils, and backfilling and grading. Monitoring will be periodic during non-intrusive activities such as mobilization and site clearing.

Summaries of all air monitoring data will be provided on a weekly basis to facilitate the transfer of information related to protection of the local community.

3.2.14 Noise and vibration evaluation

The planned remediation activities, including soil boring investigation, excavation and sheet pile installation, have the potential to generate noise and vibrations. The potential for noise and vibration impacts associated with the remediation process will be evaluated following the pre-design activities.

3.2.15 Erosion and sediment control

The remediation activities will disturb an area greater than one acre in size. Therefore, the SPDES General Construction Stormwater Permit GP—0-08-001 from Construction Activity (GP-02-01, April 2008) will be required. Erosion will be prevented and sediment will be controlled during all on-site earthwork activities in accordance with the applicable New York State guidance. Storm water run-off will be controlled in a manner to prevent contact with impacted soils. Any storm water that does contact impacted soils will be collected and transported off-site to an approved water handling facility or to the on-site water treatment plant and discharged to the sanitary sewer. Hay bales, silt fence, stone, and/or rip rap will be used as necessary to prevent erosion of exposed soils. The erosion control structures will be inspected a minimum of once per week and after significant rainfall events, greater than ½ inch per day. Additional erosion control materials will be kept on site to immediately repair any deficiencies that are discovered during the inspections.

On-site decontamination pads will be used to remove mud from truck tires and prevent tracking of mud and impacted soil onto the streets. Detailed plans and specifications for erosion and sediment control will be provided with the 100% design submittal.

3.2.16 Decontamination

During and upon completion of the investigation and excavation phases of the project, decontamination of equipment will be performed in order to prevent contaminated material from being spread off site during waste hauling activities, and to prevent the spreading of impacted material to un-impacted areas of the site. Trucks used for transport of excavated material will be decontaminated using dry decontamination methods (i.e., removal of loose material with a broom or brush) to limit the volume of decontamination water which will require treatment and disposal. These methods, along with parking of trucks on plastic sheeting during loading, will effectively prevent the spread of contaminated materials onto roadways during transport to disposal facilities. Decontamination of the soil boring installation and earth-moving equipment will occur as appropriate for the drilling activities and at the completion of the PDI. This includes, but is not limited to beginning a new boring and mobilization off-site. The method of equipment decontamination will consist of pressure washing to remove any impacted soil. Decontamination water generated during cleaning of tools and equipment will be collected in on-site surge tanks and disposed of at an approved water handling facility or treated on-site. Water generated from decontaminating personnel will be minimal due to the availability of disposable personal protective equipment (PPE) such as Tyvek coveralls, booties, and nitrile gloves. The volume of decontamination water is assumed to be negligible compared to equipment decontamination water and stormwater removal in the disturbed areas of the Site.

3.3 Design basis for In-situ chemical oxidation (Area 1C)

3.3.1 In-situ chemical oxidation performance criteria

In-situ chemical oxidation performance will be measured by the following parameters:

- Meet the soil RAOs related to protecting human health and the environment over the long term;
- Achieve a short term goal of reducing MGP waste mass and a long term goal of meeting groundwater quality standards within Area 1C;
- Accelerate time to reach groundwater quality standards by removing high concentrations of MGP contamination (for example the endpoint of the ISCO program can be terminated once a 75% reduction in groundwater concentrations has been reached for contaminants of concern as measured from baseline conditions for selected wells within the treatment area);
- Optimize the delivery and distribution of the oxidant within Area 1C;
- Reduce the potential for vapor intrusion into nearby residential houses by the destruction of MGP contaminated media;
- Contain and reduce the mass and overall mobility of the NAPL within Area 1C;
- Implement remediation safely while minimizing disturbance to nearby properties and utilities; and
- Incorporate green remediation principals into the site remediation approach in comparison to ex-situ treatment options by treating contaminated media in-place.

Details regarding quality assurance/quality control are provided in Section 5.

The anticipated ISCO limits are shown in Figure 2. The actual horizontal and vertical limits of the injections will be determined during the remedial design based on the results and observations of the PDI. The results of this evaluation will be provided in the PDI Report.

3.3.2 In-situ chemical oxidation pre-design investigation

The following objectives of the PDI in Area 1C will aid in the final design:

- Evaluate potential ISCO treatment options via bench scale testing;
- Quantify baseline contaminant concentrations in soil and groundwater in Area 1C; and
- Perform focused supplemental horizontal and vertical delineation of the impacted area.

Activities common to both the ISCO and excavation PDIs, such as utility mark-outs and clearing, drilling, and field sampling will be combined to the extent possible to minimize overall costs.

The ISCO PDI will be performed as follows.

1. Perform a site visit.

2. Perform a field utility location mark-out in Area 1C to select monitoring and injection well locations.

3. Procure subcontractor(s) to perform hand-clearing of boring locations.

4. Procure a drilling subcontractor for installation of soil borings and monitoring well installation within these areas.

5. Coordinate with local officials to manage traffic in the area during the investigation activities.

6. Install, develop and sample up to seven new groundwater monitoring wells (approximate depth of 20 feet) in Area 1C. The monitoring wells will include sumps to allow for collection of potential NAPL, although free flowing NAPL is not anticipated in the area. Collect soil and groundwater samples required for conducting chemical oxidation bench scale testing at the time of monitoring well installation. The necessary volume of site groundwater for the bench scale testing will be collected from existing wells (MW-14S and/or MW-11S).

7. Collect up to 14 soil samples during monitoring well installation to establish baseline soil conditions. Submit soil samples for laboratory analysis of VOCs, SVOCs, TPH diesel range organics (DRO), TPH gasoline range organics (GRO), and cyanide.

8. Perform chemical oxidation bench scale testing. Bench scale tests will evaluate both hydrogen peroxide (Modified Fenton's Reagent or MFR) and activated sodium persulfate as oxidants. A summary of the various projects in which AECOM has successfully implemented the oxidants noted above can be found in Appendix B. The specific objectives of these tests include:
    a. Quantify natural oxidant demand of site soils;
    b. Demonstrate chemical oxidation of impacted soil in laboratory environment;
    c. Determine the appropriate oxidant(s) and dosage for field injection;
    d. Evaluate pH buffer capacity of site soils to evaluate activation and catalyst chemistries of the selected oxidant; and
    e. Laboratory analyses of up to 14 bench scale soil samples and up to 14 bench scale groundwater samples will be performed for VOCs, SVOCs, TPH DRO, TPH GRO,

cyanide (on a subset of samples), and select metals on groundwater only (on a subset of samples).

9. Conduct baseline groundwater sampling from new monitoring wells while bench scale tests are underway. Check wells for measureable NAPL. Laboratory analyses will be performed on up to seven groundwater samples for VOCs, SVOCs, TPH DRO, TPH GRO, cyanide, and select metals (on a subset of samples).

10. Install a total of 3 soil borings (approximate depth 20 feet) in Area 1C in order to perform additional focused contamination delineation to the south of Area 1C, with up to 6 soil samples collected from these soil borings and analyzed for VOCs, SVOCs, and cyanide. Based on the observations of the initial 3 borings, up to 3 additional borings may be advanced with soil samples collected and analyzed for VOCs, SVOCs, and cyanide.

11. Prepare an ISCO Pre-Design Summary Report presenting results of the bench scale pilot testing and recommendations for full-scale ISCO implementation.

The PDI ISCO Treatability Study is provided in Appendix B. This document presents the rationale, objectives, methods, and sampling for the bench-scale testing to develop the ISCO activities for the site. The results of the PDI ISCO Treatability Study will be provided in a PDI report at the conclusion of this work and prior to the submittal of the 50% design submittal documents.

3.3.3 In-situ chemical oxidation design

The objective for the ISCO design will be the destruction of MGP contaminants to non-hazardous or more stable compounds through chemical oxidation within the ISCO footprint specified in the ROD, beneath North Plain Street north of Esty Street. The treatment area is for Area 1C is approximately 6,000 sf. The Feasibility Study for OU-2 (AECOM, 2011b) assumed that the vertical treatment zone is generally 10 ft. thick from approximately 6-16 ft bgs, with the contamination primarily within more conductive soils (gravel seam). This estimated treatment volume is approximately 2,200 cy. The ISCO design treatment thickness will be finalized using observations and results from the ISCO pre-design investigation. The assumed interval would straddle the water table to treat the “smear” zone located between the high and low water table elevations.

Injection grid spacing will be determined during the remedial design based on measured contaminant concentrations and geologic observations, and will take into account any encountered site constraints.

If any mobile tar is observed during the pre-design investigations (i.e., tar collected in the sumps of the newly installed monitoring wells), efforts will be made to remove tar which is recoverable prior to implementing ISCO.

The oxidant amendment selected will either be hydrogen peroxide (Modified Fenton’s Reagent or MFR) and/or activated sodium persulfate dependent on the results of the PDI. The treatability study conducted during the PDI will aid to determine the appropriate oxidant(s), dosage needed, and catalyzing agent(s) to treat the affected area. The bench scale testing shall use MGP contaminated site soils and groundwater collected from the ISCO area. Field and laboratory quality assurance/quality control testing will be performed to ensure that the remedial goals for the ISCO process are achieved, as further described in Section 5.

AECOM will utilize the information collected during the ISCO PDI to prepare a Remedial Design for Chemical Oxidation in Area 1C. This design will include a summary of remedial action objectives and remediation target criteria, detailed design plans with injection locations and depths, oxidant

dosages and volumes, and a performance monitoring plan. This Remedial Design will be included as a supporting document in the final ISCO remedial action design package.

3.3.4 Site preparation

The ISCO site preparation for Area 1C will follow the same requirements as the excavation site preparation for Areas 1A and 1B with the exception of utility relocation, which is not needed in Area 1C.

3.3.5 On-site waste management

The ISCO on-site waste management for Area 1C will follow the same requirements as the excavation on-site waste management for Areas 1A and 1B. Waste materials for disposal will consist of soil cuttings, purge water and decontamination water generated from the installation of monitoring wells, soil borings, groundwater sampling, and equipment decontamination. The soil cuttings and purge/decontamination water will be drummed in Area 1C temporarily and then moved to OU-1, where they will be properly shipped and disposed of at a NYSEG-approved disposal facility. Depending upon the results of the characterization sampling, the drummed soils may be re-used on site as backfill, or they may be disposed off site at a facility permitted to accept such material.

3.3.6 Waste Characterization

Waste soils generated as part of the ISCO implementation will be disposed of with the soils generated from remedial activities in Areas 1A and 1B.

3.3.7 Off-site transportation

The ISCO off-site transportation for Area 1C will follow the same requirements as the excavation off-site transportation for Areas 1A and 1B.

3.3.8 Site restoration

Following the ISCO pre-design investigation activities (soil borings and installation of monitoring wells), the boreholes will be completed as flush-mounted monitoring wells with appropriate roadboxes to withstand vehicle traffic or will be backfilled to finish grade with clean imported fill or reusable on-site materials, subject to the NYSDEC approval. A backfill and grading plan, as well as detailed specifications for fill material will be presented in the remedial design submittal.

3.3.9 Odor, vapor, and dust control

The ISCO odor, vapor and dust control for Area 1C will follow the same requirements as the excavation odor, vapor and dust control for Areas 1A and 1B. The ISCO work will generate minimal amounts of soil from soil borings and monitoring well installation.

3.3.10 Air Monitoring

The ISCO air monitoring for Area 1C will follow the same requirements as the excavation air monitoring for Areas 1A and 1B, but will also include the intrusive activities of monitoring well installation and oxidant amendment injection. The oxidant reaction may cause wisps of steam to occur, which have the potential to contain VOCs. The contaminants of concern are VOCs and particulates.

3.3.11 Noise and vibration evaluation

The planned remediation activities, including soil boring and monitoring well installation, have the potential to generate noise and vibrations. The potential for noise and vibration impacts associated with the remediation process will be evaluated following the pre-design activities.

3.3.12 Decontamination

The ISCO decontamination for Area 1C will follow the same requirements as the excavation decontamination for Areas 1A and 1B. Decontamination of the soil boring and monitoring well installation equipment will occur as appropriate for the drilling activities, including but not limited to beginning a new monitoring well and mobilization off-site.

4.0 Permitting and Regulatory Requirements

4.1 Permitting

In addition to performance requirements established to ensure that the design of the remedial action meets the remedial action objectives set in the ROD (NYSDEC, 2011), the design will also be prepared to meet permitting and other regulatory requirements of local, state, and federal laws and regulations. As specified in Appendix 7B of the DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC, May 2010), the NYSDEC may grant exemption from most state permits required for completion of this remedial action, provided the substantive requirements of the permit programs are followed. The remediation activities will disturb an area greater than one acre in size. Therefore, the substantive requirements of the SPDES General Construction Stormwater Permit GP—0-08-001 from Construction Activity (GP-02-01, April 2008) will be need to be met. Also, a SPDES permit or local WWTP approval will be required for the project dewatering discharge. Additionally the work to be completed in the right-of-way of North Plain Street and Esty Street will require a Road Work Permit to be obtained from the City of Ithaca. The Engineer will obtain all required permits prior to the mobilization of the Contractor.

4.2 Regulatory requirements

Compliance with regulatory requirements applicable to this work was discussed in Section 3, including the following work activities:

- Wastewater handling, treatment, and discharge requirements;
- Hazardous and non-hazardous waste management; and
- Air quality maintenance and monitoring.

A contingency plan will be developed and submitted as an addendum following completion of the 50% design. The contingency plan will be implemented if any element of the RD Work Plan fails to achieve any of its objectives or otherwise fails to protect human health. Additionally, a Citizens Participation Plan (CPP) will also be developed to incorporate appropriate activities outlined in 6 NYCRR Part 375 (NYSDEC, 2006) and any subsequent revisions thereto.

4.2.1 Occupational safety and health regulations

Regulations promulgated by OSHA specify health and safety requirements for work procedures at all work places, and specifically, at construction sites and hazardous waste sites.

Industry standards for work at hazardous waste sites presented in 29 CFR 1910.120 describe specific requirements, including the following:

- Preparation of a site-specific HASP;
- Training and medical monitoring of personnel who may be exposed to hazardous substances; and
- Air monitoring, respiratory protection and PPE.

A site-specific HASP will be produced prior to any remedial activity. Procedures outlined in the site-specific HASP will provide requirements for daily health and safety review meetings, proper use of safety equipment, proper mechanical equipment use, and other policies. At a minimum, the PPE to

be worn on site will include safety glasses, hard hat, and steel-toed shoes or boots. The subjects covered in the HASP will include:

- Health and safety risk analysis;
- PPE;
- OSHA air monitoring and action levels;
- Site control;
- Decontamination;
- Emergency response plan;
- Lockout/tagout;
- Heavy equipment operations;
- Excavation and trenching;
- Material safety data sheets; and
- Health and safety records and reports.

4.3 Transportation requirements

The federal Department of Transportation (DOT) has developed requirements that regulate the transportation of hazardous materials by road and rail. Among the hazardous materials identified in these regulations are coal tar distillates. In addition, as discussed above, hazardous waste regulations specify that shipments of hazardous wastes must meet certain requirements presented in the DOT regulations. Specific requirements for hazardous material shipments include the following:

- Shipping papers must include a description of hazardous materials included in the shipment along with the DOT designated identification number and hazard class. Hazardous wastes may not be shipped without a manifest (49 CFR 172.200).
- Each container, package, or vehicle containing a hazardous material must be marked or labeled with the DOT shipping name, technical name, identification number, and hazard class (49 CFR 172.300 and .400).
- Each vehicle or container containing a hazardous material must be appropriately placarded (49 CFR 172.500).
- When hazardous materials are transported, emergency response information must be available at the point of loading, unloading, and during transport.

Truck routes to and from the Site will comply with the Transportation Plan that will be developed as part of the remedial design.

5.0 Quality Assurance Procedures

5.1 General quality assurance procedures

The following quality assurance procedures and tests apply to the PDI, excavation (Areas 1A and 1B) and ISCO (Area 1C) portions of the remedy:

- Utilization of properly licensed personnel including professional engineers and licensed surveyors to perform the relevant portions of the work;
- Use of pre-qualified subcontractors who have been evaluated and approved based on their performance and health and safety records;
- Submittal by the Contractor of weigh tickets for all earthen materials transported to or from the Site;
- Submittal by the Contractor, prior to the work, of sieve analyses for all imported earthen materials;
- Evaluation by the Engineer of the Contractor's proposed borrow source(s) for imported earthen materials. The Contractor will provide to the Engineer analytical data indicating that imported material is non-contaminated;
- Surveying of the work limits; and
- Field verification by the Engineer of excavation, ISCO injection volumes, and placed material depths, areas, and volumes.

5.1.1 Laboratory quality assurance

Field and laboratory quality control samples for the investigation will be collected and analyzed to document the accuracy and precision of the samples. The QA/QC samples include trip blanks, field duplicates and matrix spikes, and matrix spike duplicates. The data quality level for the investigation will be consistent with procedures outlined in the NYSDEC Analytical Services Protocol (ASP) July 2005 methodologies. A full ASP Category B data package will be prepared by the laboratory for all samples. The data will be reviewed, and a Data Usability Summary Report (DUSR) will be prepared by a qualified chemist. The pre-design investigation will also consist of one field duplicate, matrix spike, and matrix spike duplicate per every 20 baseline characterization and delineation samples will also be collected. In addition, a trip blank will be shipped with all VOC samples for VOC analysis. For the ISCO treatability tests, total oxidant demand will be performed in duplicate and base demand tests will be performed in triplicate.

6.0 Remedial Design Deliverables

The design will consist of the following documents to be submitted for the NYSDEC review:

- RDWP (this document).
- PDI Report
- ISCO treatability study report
- 50% remedial design submittals
- 100% remedial design submittals and associated supporting documents

6.1 Design deliverables

The preliminary list of specifications for the 50% draft design and 100% final design is as follows:

Division 2 Specifications – Site work

- Protection of Existing Site Infrastructure
- Construction Water Collection and Disposal
- Excavation
- Temporary Sheet Pile Shoring
- In-Situ Chemical Oxidation
- Off-site Transportation and Disposal
- Decontamination
- Odor and Vapor Control
- Backfilling and Grading
- Parking Lot Pavement
- Planting and Seeding

The preliminary list of drawings for 100% design is:

- Title Sheet and Index
- Legend and General Notes
- Site Preparation, and Erosion and Sediment Control (Site layout and infrastructure)
- Transportation Plan
- Existing Conditions, Extent of Excavation, and Extent of ISCO
- Utility Relocation Plan
- Erosion and Sediment Control Details (silt fence, construction entrance, stockpiling, and decontamination pad construction)
- Excavation Limits Areas 1A and 1B
- Excavation Cross Section Area 1A
- Excavation Cross Section Area 1B
- Sheeting and shoring
- ISCO Limits Area 1C
- ISCO Cross Section Area 1C
- Excavation and ISCO Details
- Groundwater Treatment System P&ID
- Dewatering and Water Treatment
- Site Restoration and Grading
- Restoration Cross Sections

This list is preliminary and subject to change as the design process proceeds. Additional drawings may be submitted as an addendum to the 100% design. Note that in keeping with the typical format of NYSEG design packages, these design details and remedial requirements may be documented in design report(s), associated management plan(s) and relevant attachment(s), in lieu of indivual specifications or drawings.

7.0 Public Information

NYSEG intends to keep the City of Ithaca and its residents informed through implementation of a CPP, which will be submitted to the NYSDEC with the 100% design documents. The CPP will, at a minimum, identify interested stakeholders and outline a mechanism for keeping them informed regarding the status of the project.

8.0 Schedule

The anticipated schedule for the PDI, design, and implementation of the remedy is shown in Figure 3. Updates to this schedule will be submitted to the NYSDEC periodically when and if changes occur. The schedule for the excavation and ISCO work will be defined in the remedial design.

9.0 References

AECOM. 2011a. Remedial Investigation Report, Operable Unit 2, NYSEG's Court Street Former MGP Site, Ithaca, New York. February 2011.

AECOM, 2011b. Feasibility Study Report, Operable Unit 2, NYSEG's Ithaca Court Street Former MGP Site, Ithaca, New York, February 2011.

Crain, L.J., 1974. Groundwater Resources of the Western Oswego River Basin, New York. State of New York Department of Environmental Conservation, Basin Planning Report ORB-5.

E.C. Jordan Co., 1986. Investigation of the Former Coal Gasification Site at West Court Street Ithaca, New York; Task 1 Report, Preliminary Site Evaluation. April 1986.

E.C. Jordan Co., 1987. Investigation of the Former Coal Gasification Site at West Court Street Ithaca, New York; Task 2 Report, Initial Field Investigation Program. February 1987.

MWH Americas, Inc., 2002. Interim Draft Supplemental Remedial Investigation Report for Operable Unit-2, Ithaca Court Street MGP Site; NYSEG RFP#02-063. August 27, 2002.

NYSDEC, 1990. Division Technical and Administrative Guidance Memorandum [TAGM 4030]: Selection of Remedial Actions At Inactive Hazardous Waste Sites Division of Environmental Remediation, Albany, New York, May 15, 1990.

NYSDEC, 1994. Division Technical and Administrative Guidance Memorandum [TAGM 4046]: Determination of Soil Cleanup Objectives and Cleanup Levels. Division of Hazardous Waste Remediation, Albany, New York, January 24, 1994.

NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values, Division of Water Technical and Operational Guidance Series (TOGS 1.1.1), October, and addendums added: January, 1999, April 2000, and June 2004.

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

NYSDEC, 2010b. Draft DER-31 Green Remediation. March 17, 2010.

NYSDEC 2011. Record of Decision, Operable Unit 2, NYSEG's Ithaca Court Street MGP, Site No. 755008, Ithaca, New York, March 2011.

NYSEG, 1999. Interim Remedial Measures Final Engineering Report for Activities at Ithaca Cayuga Inlet Coal Tar Site, City of Ithaca, Tompkins County, New York. NYSEG, June 1999.

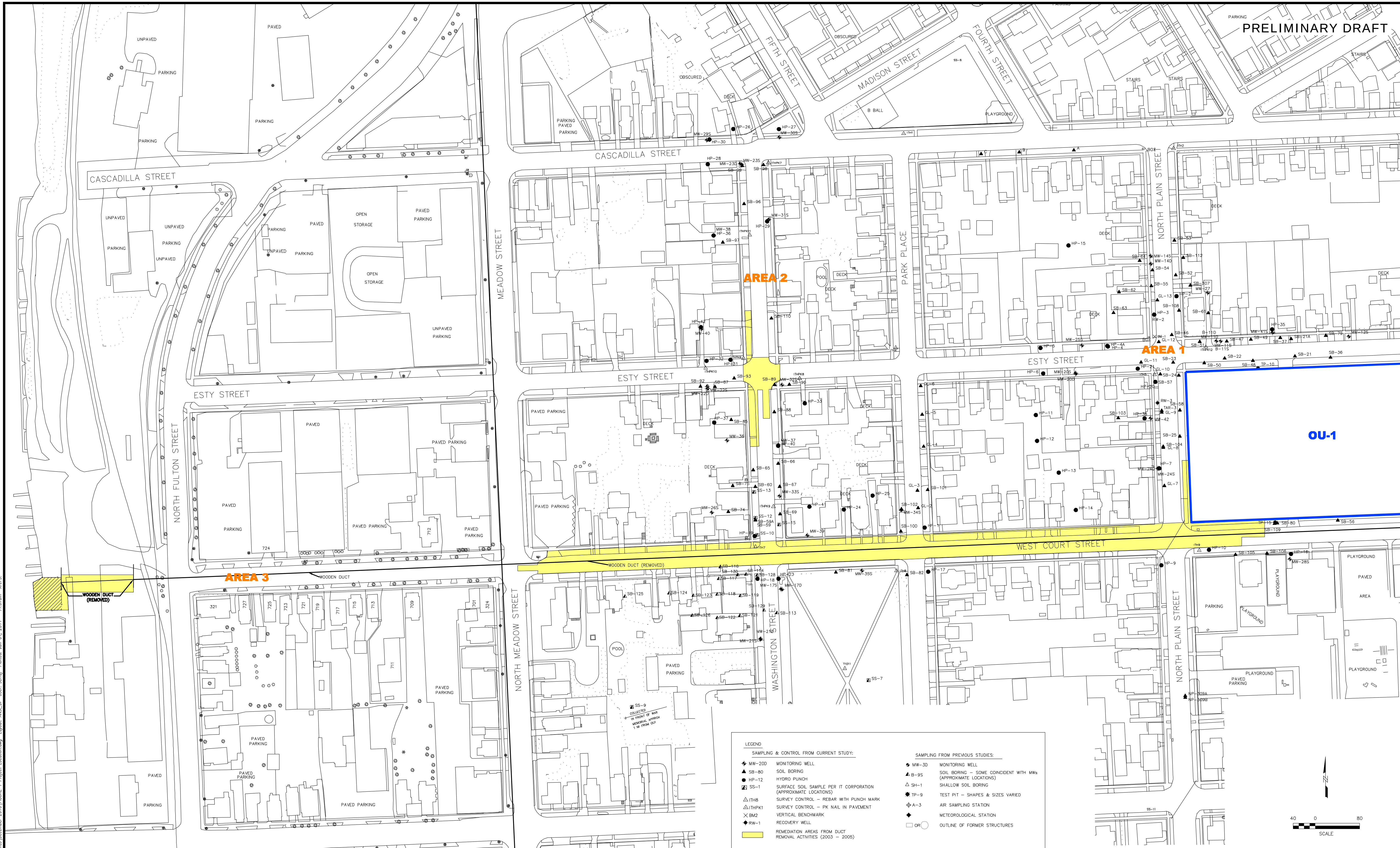
NYSEG, 2007. Interim Remedial Measures Final Engineering Report; Removal of the Subsurface Wooden Duct and Removal of Coal Tar Impacted Soil on Washington Street Between W. West Court and Cascadilla Streets, Associated with Ithaca Court Street Former Manufactured Gas Plant Site, City of Ithaca, Tomkins County, New York. NYSEG, April 2007.

URS, October 2010. Construction Completion Report Operable Unit 1 (OU-1) Remediation. Ithaca Court Street Former Manufactured Gas Plant Ithaca, New York.

U.S. Department of Agriculture, Soil Conservation Service (USDA-SCS), 1965. Soil Survey for Tompkins County, New York. Prepared in cooperation with Cornell University Experiment Station, Series 1961, No. 25, Ithaca, New York.

United States Environmental Protection Agency. April 1999. Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites Directive No. 9200.4-17P.

Figures



NOTES:

1. HORIZONTAL SURVEY CONTROL WAS ESTABLISHED USING SURVEY GRADE RTK GPS AND IS REFERENCED TO THE NORTH AMERICAN DATUM OF 1983 (NAD83). THE PRIMARY MONUMENT USED IN SETTING SITE CONTROL WAS T1011 OF THE TOMPKINS COUNTY GPS GEODETIC CONTROL SURVEY DATED JULY 1992 BY MICHAEL BAKER JR., INC., BEAVER, PA. THIS WAS CHECKED INTO T1002.
2. THE SITE VERTICAL DATUM IS REFERENCED TO NGS FIRST ORDER, CLASS II, NAVD 88 BENCHMARKS, V463 AND Y463 AND WAS SET BY MULTIPLE RTK GPS OBSERVATIONS.
3. BASE MAPPING WAS PRODUCED BY DIGITIZING AERIAL PHOTOS DATED APRIL 1992 BY MICHAEL BAKER JR., INC, BEAVER, PA., AND HAS BEEN UPDATED USING AERIAL PHOTOS DATED APRIL 1999.
4. SAMPLING LOCATIONS FROM PREVIOUS STUDIES ARE APPROXIMATE AND ARE SHOWN BASED ON FIGURE 4 IN THE TASK 3 REPORT PREPARED BY E.C.JORDAN CO., DATED MARCH 1988.
5. SURFACE SOIL SAMPLES, SS-1 – SS-10 WERE LOCATED BY THE IT CORPORATION AND HAVE BEEN TRANSFERRED DIRECTLY ONTO THIS SITE DRAWING FROM IT CORP GRAPHICS. SS-8 AND SS-9 ARE OUTSIDE THE LIMITS OF THIS DRAWING. SS-11 – SS-15 ARE SHOWN AT LOCATIONS SURVEYED ON 6/27/02.
6. COORDINATE VALUES FOR MONITORING WELLS, SOIL BORINGS, AND HYDRO PUNCH LOCATIONS WERE LOCATED BY NYSEG USING A COMBINATION OF RTK GPS AND CONVENTIONAL SURVEYING. MONITORING WELL ELEVATIONS WERE ESTABLISHED USING DIFFERENTIAL LEVELING.

AECOM

NYSEG - OU2
ITHACA/COURT STREET SITE
ITHACA, NEW YORK

PROJECT LOCATION MAP

DATE: 06/12/09	DRWN: DLS/PGH	PROJECT No 60215637	FIGURE 1

LEGEND

- MW-20D — MONITORING WELL
- SB80 — SOIL BORING
- HP-12 — HYDRO PUNCH
- SS-1 — SURFACE SOIL SAMPLE PER IT CORPORATION (APPROXIMATE LOCATIONS)
- RW-1 — RECOVERY WELL
- TEST PIT
- CONFIRMATION SAMPLE
- 106(7) — CONFIRMATION SAMPLE ID(DEPTH)
- STRONG HYDROCARBON-LIKE ODOR, LIGHT STAIN OR SHEEN
- HEAVY COAL TAR STAIN, SHEEN, OR COAL TAR BLEBS
- COAL TAR PRESENT OR COAL TAR STRINGERS, LAYERS, OR SATURATED SOIL
- NA — NOT ANALYZED
- HISTORIC FEATURE
- WATER LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- OU-1 BOUNDARY
- INSTITUTIONAL CONTROLS AND MNA
- SUB AREAS WITH REMEDIATION AREAS 1A AND 1B (EXCAVATION), AREA 1C (ISCO)

NOTES:

1. HORIZONTAL SURVEY CONTROL WAS ESTABLISHED USING SURVEY GRADE RTK GPS AND IS REFERENCED TO THE NORTH AMERICAN DATUM OF 1983 (NAD83). THE PRIMARY MONUMENT USED IN SETTING SITE CONTROL WAS T1011 OF THE TOMPKINS COUNTY GPS GEODETIC CONTROL SURVEY DATED JULY 1992 BY MICHAEL BAKER JR., INC., BEAVER, PA. THIS WAS CHECKED INTO T1002.
2. THE SITE VERTICAL DATUM IS REFERENCED TO NGS FIRST ORDER, CLASS II, NAVD 88 BENCHMARKS, V463 AND Y463 AND WAS SET BY MULTIPLE RTK GPS OBSERVATIONS.
3. BASE MAPPING WAS PRODUCED BY DIGITIZING AERIAL PHOTOS DATED APRIL 1992 BY MICHAEL BAKER JR., INC, BEAVER, PA., AND HAS BEEN UPDATED USING AERIAL PHOTOS DATED APRIL 1999.
4. SAMPLING LOCATIONS FROM PREVIOUS STUDIES ARE APPROXIMATE AND ARE SHOWN BASED ON FIGURE 4 IN THE TASK 3 REPORT PREPARED BY E.C.JORDAN CO., DATED MARCH 1988.
5. SURFACE SOIL SAMPLES, SS-1 – SS-10 WERE LOCATED BY THE IT CORPORATION AND HAVE BEEN TRANSFERRED DIRECTLY ONTO THIS SITE DRAWING FROM IT CORP GRAPHICS. SS-8 AND SS-9 ARE OUTSIDE THE LIMITS OF THIS DRAWING. SS-11 – SS-15 ARE SHOWN AT LOCATIONS SURVEYED ON 6/27/02.
6. COORDINATE VALUES FOR MONITORING WELLS, SOIL BORINGS, AND HYDRO PUNCH LOCATIONS WERE LOCATED BY NYSEG USING A COMBINATION OF RTK GPS AND CONVENTIONAL SURVEYING. MONITORING WELL ELEVATIONS WERE ESTABLISHED USING DIFFERENTIAL LEVELING.

AECOM

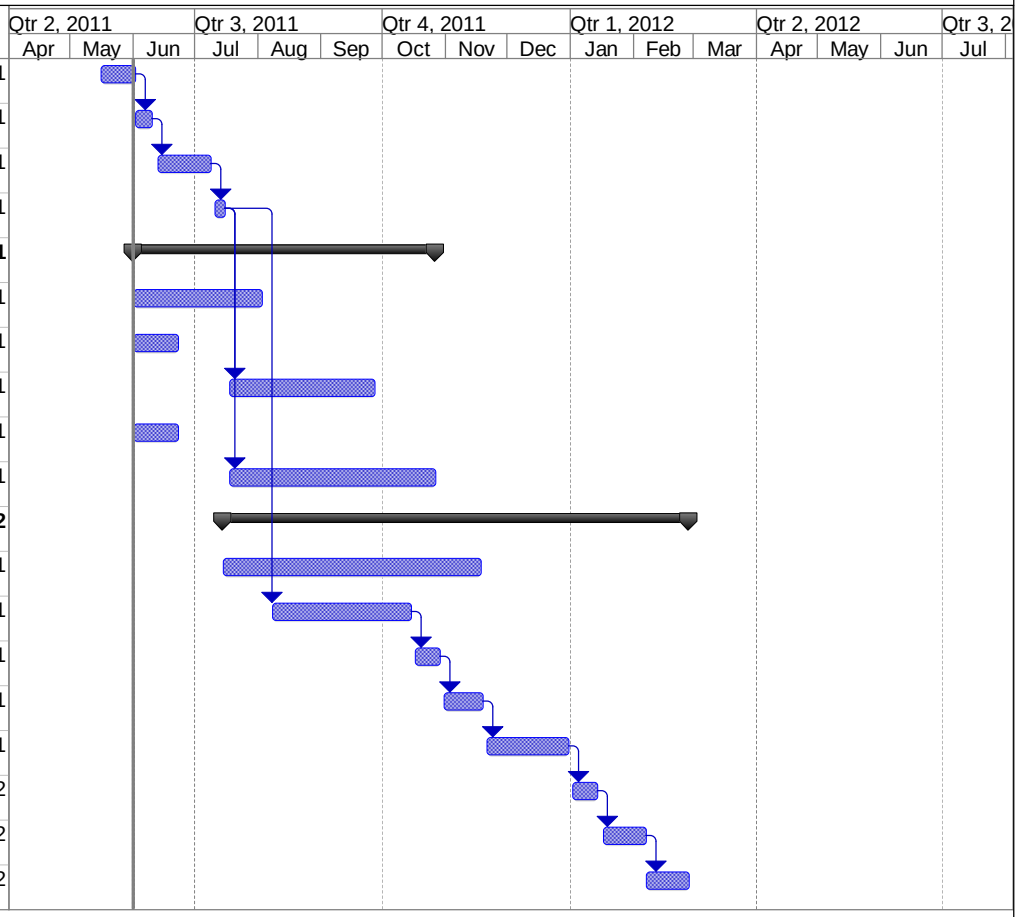
ISCO
EXCAVATION
1C
1A
1B
OU-1
RELIEF GAS HOLDER
DISTRIBUTION GAS HOLDER
GASOLINE STORAGE TANK
OIL TANK
OIL TANK
GASOLINE PUMP
SCHOOL DISTRICT GARAGE AND MAINTENANCE SHOP
BOX
N
15 0 30
1"=30'

NYSEG - OU2 ITHACA/COURT STREET SITE ITHACA, NEW YORK				REMEDIATION AREA LOCATIONS AND REMEDIES	
DATE: 5/24/2011	DRWN: JJS	CHKD: PD		PROJECT No 60215637	FIGURE 2

File: P:\60143048-NOP\FS-RA Figures\December 2010\Ithaca Area 1a 1b 1c.dwg Layout: Fig 2 User: serroj Plotted: Jun 01, 2011 - 11:03am Xref's:

Figure 3
Remedial Design Schedule

ID	Task Name	Duration	Start	Finish
1	Draft Remedial Design Work Plan	13 days	Mon 5/16/11	Wed 6/1/11
2	NYSEG Review of RDWP	6 days	Thu 6/2/11	Thu 6/9/11
3	NYSDEC Review of RDWP	20 days	Mon 6/13/11	Fri 7/8/11
4	Final Remedial Design Work Plan	5 days	Mon 7/11/11	Fri 7/15/11
5	**Field Work**	**106 days**	**Wed 6/1/11**	**Wed 10/26/11**
6	Base Map Preparation	45 days	Wed 6/1/11	Tue 8/2/11
7	Excavation PDI (Prep)	16 days	Wed 6/1/11	Wed 6/22/11
8	Excavation PDI	51 days	Mon 7/18/11	Mon 9/26/11
9	ISCO PDI (Prep)	16 days	Wed 6/1/11	Wed 6/22/11
10	ISCO PDI	73 days	Mon 7/18/11	Wed 10/26/11
11	**Remedial Design**	**162 days**	**Fri 7/15/11**	**Mon 2/27/12**
12	Permits and Approvals	90 days	Fri 7/15/11	Thu 11/17/11
13	50% Remedial Design	50 days	Mon 8/8/11	Fri 10/14/11
14	NYSEG Review of 50% Design	10 days	Mon 10/17/11	Fri 10/28/11
15	NYSDEC Review of 50 % Design	15 days	Mon 10/31/11	Fri 11/18/11
16	100% Remedial Design	30 days	Mon 11/21/11	Fri 12/30/11
17	NYSEG Review of 100% Design	10 days	Mon 1/2/12	Fri 1/13/12
18	NYSDEC Review of 100% Design	15 days	Tue 1/17/12	Mon 2/6/12
19	Final Design	15 days	Tue 2/7/12	Mon 2/27/12



Remedial Design Schedule
Date: Wed 6/1/11

Task		Inactive Task		Manual Summary	
Split		Inactive Task		Start-only	
Milestone		Inactive Milestone		Finish-only	
Summary		Inactive Summary		Progress	
Project Summary		Manual Task		Deadline	
External Tasks		Duration-only			
External Milestone		Manual Summary Rollup			

Appendix A

Pre-Design Investigation Field Sampling and Analytical Plan

AECOM Environment

Prepared for:
New York State Electric and Gas Corp
18 Link Drive
P. O. Box 5224
Binghamton, NY 13902

Prepared by:
AECOM
Latham, NY
Project 60215637
July 2011

Appendix A

Pre-Design Investigation Field Sampling and Analytical Plan
Ithaca Court Street Former MGP Site
OU-2
Ithaca, New York
NYSDEC Site # 7-55-008

AECOM Environment

Prepared for:
New York State Electric and Gas Corp
18 Link Drive
P. O. Box 5224
Binghamton, NY 13902

Prepared by:
AECOM
Latham, NY
Project 60215637
July 2011

Appendix A

Pre-Design Investigation Field Sampling and Analytical Plan
Ithaca Court Street Former MGP Site
OU-2
Ithaca, New York
NYSDEC Site # 7-55-008

Prepared By: Helen Jones

Reviewed By: Scott Underhill, P.E.

Contents

Figure

List of Appendices

1.0 Introduction

This Field Sampling and Analytical Plan (FSAP) presents the sampling locations, rationale, field methods, and laboratory methods to be used for the pre-design investigation (PDI) to support the design of the excavation program in Areas 1A and 1B and in-situ chemical oxidation (ISCO) activities in Area 1C planned as the first phase of the remedy at OU-2 of the Ithaca Court Street former manufactured gas plant (MGP) site (Site), located in Ithaca, New York. Soil samples will be collected to provide waste characterization data for soils to be removed, to further refine the extent of MGP impacts and also to provide soil to be used in the ISCO bench scale testing. Additionally, groundwater monitoring wells will be installed for the collection of groundwater samples to characterize groundwater baseline conditions and to be used in the ISCO bench scale testing.

1.1 Overview of Field Activities

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

- A utility survey will be conducted. This may include supplementing existing mapping and survey information by inspecting and field surveying the locations and depths of subsurface (gas, electric, water, and sewer) and overhead (electric) utilities.
- Soil Boring Installation – There will be approximately 8 soil borings advanced in Area 1A, approximately 7 soil borings advanced in Area 1B, approximately 8 soil borings advanced in the immediate vicinity of Areas 1A and 1B, 4 geotechnical soil borings in the general vicinity of Areas 1A and 1B, and 6 soil borings advanced south of Area 1C. Soil samples will be collected for waste characterization and preliminary soil reuse characterization. ISCO baseline characterization and bench scale testing samples will also be collected.
- Monitoring Well Installation – Seven groundwater monitoring wells will be installed in Area 1C to support the ISCO design. Groundwater and soil samples for ISCO baseline characterization and bench scale testing will be collected from these well locations.
- Surveying – The locations and elevations of the PDI sampling points and monitoring wells will be surveyed.

The remainder of this document is organized as follows:

Section 2 describes the general field guidelines to be followed during the work.

Section 3 describes the field sampling rationale, protocol, and methods.

Section 4 describes the laboratory methods for analytical samples.

Section 5 describes sample tracking and custody procedures.

2.0 General Field Guidelines and Activities

2.1 Site Hazards

Potential on-site surface hazards, such as sharp objects, overhead power lines, energized areas, 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.

2.2 Underground and Overhead Utilities

Underground and overhead 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 boring locations will be flagged or marked out with white paint.
- Dig Safely of New York (800) 272-4480 will be contacted to initiate the locating activities. New York State law requires that Dig Safely of New York be notified at least two working days, and not more than 10 working days, before subsurface work is conducted.
- Companies with subsurface utilities present will locate and mark out all subsurface utility lines.
- Precautions regarding safe distance from the overhead electrical lines will be reviewed and equipment offset distances flagged and marked out in accordance with the NYSEG guidance.

2.3 Community Air Monitoring

Community air monitoring requires real-time monitoring for volatile organic compounds (VOCs), and particulates (i.e., dust), at the upwind and downwind perimeter of each designated PDI work area when certain activities are in progress at the Site. The community air monitoring is intended to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigation work activities.

Real time monitoring will be performed at upwind and downwind stations for VOCs and particulates during drilling activities.

VOC monitoring will be performed using a field photo-ionization detector (RAE Systems MiniRAE™ or equivalent) located within the work zone. If the concentration of total VOCs exceeds 5 ppm above background, then work activities will be temporarily halted. If the total VOC level then decreases below 5 ppm over background, work activities will resume. If the total VOC levels persist at levels in excess of 5 ppm, work activities will be halted, the source of the vapors identified, and corrective actions taken to abate the emissions until the concentrations drop below the action levels.

Particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. Each particulate monitor will be calibrated daily with a filtered air sample. Each air monitoring instrument will be continuously downloaded and saved electronically to a dedicated computer located on-site.

The table below describes the action levels for perimeter particulate air monitoring and the associated responses to each level.

Action Level	Response
Downwind particulate concentrations 100 ug/m^3 greater than upwind particulate monitor sustained over 15 minute average	Dust suppression techniques are employed
Downwind particulate concentrations 150 ug/m^3 greater than upwind particulate monitor sustained over 15 minute average	Work halted and dust suppression techniques evaluated. Work continues once dust suppression techniques are proven successful

2.4 Investigation-derived Waste Management

All investigation-derived waste (IDW) generated during the PDI will be collected in properly labeled 55-gallon drums. Drill cuttings will be contained in 55-gallon drums. Drums of soil will be labeled as "pending analysis – investigation-derived residual – soil from drill cuttings" and temporarily stored pending characterization and proper disposal. Depending upon the results of the characterization sampling, the drummed soils may be re-used on site as backfill, or they may be disposed off site at a facility permitted to accept such material.

All personal protective equipment (PPE) will be placed in 55-gallon drums or roll-off containers for proper disposal.

2.5 Site Survey

In conjunction with the PDI, a field survey will be conducted to assist with the preparation of a base map suitable for the project design work. The survey work will include field data collection and compilation of information from available mapping (city and utility companies) to establish the location and elevation of the following items within the project limits:

- The horizontal location and vertical elevation of all utilities (underground and overhead);
- The existing topographic features (including all surface utility structures, utility poles, overhead utilities, limits of street pavement, curbs, sidewalks, driveways, buildings and structures, existing steel sheeting at OU-1, and existing monitoring and recovery wells); and
- The existing street right of way property lines.

In addition, all PDI boring locations will be surveyed for elevation and location. This information, as well as previous sample locations throughout the project area, will be incorporated on the site base map.

3.0 Field Investigation Methods

3.1 Required Equipment and Standard Procedures

- Field book;
- Project plans;
- PPE in accordance with the HASP;
- Stakes, flagging, and marking paint;
- Plastic bags for soil screening samples;
- Tape measure;
- Decontamination supplies;
- Water level indicator;
- Photo ionization detector (PID) with a 10.2 or 10.6 eV lamp;
- Camera;
- Clear tape, duct tape;
- Laboratory sample bottles, Shelby tubes, and ISCO bulk sample containers with plastic liners;
- Coolers and ice; and
- Shipping supplies.

The soil sampling program will use one of the following methodologies; direct push geoprobe, hollow stem auger (HSA)/split spoon sampling equipment or sonic drilling. Generally accepted procedures for soil sampling, equipment decontamination, sample labeling, chain-of-custody (COC), and shipping procedures will be followed, as detailed in the Standard Operating Procedures.

3.2 Soil Boring and Monitoring Well Installation

The field investigation will include the installation of approximately 33 soil borings across the three areas at the Site and the installation of 7 monitoring wells in Area 1C in order to:

- Evaluate soil without visible MGP impacts for possible reuse as backfill on the Site;
- Characterize the soil with visible MGP impacts for off-site disposal in accordance with the requirements of the receiving facility;
- Further refine the extent of the subsurface impacts requiring excavation or ISCO;
- Collect sample volume for the ISCO bench scale testing;
- Evaluate baseline contaminant concentrations in soil and groundwater in Area 1C; and
- Collect additional information on the subsurface geology at the Site to aid in the excavation and ISCO design.

The proposed boring locations are presented on Figure A1. These locations may be moved based on field observations. Locations selected for the geotechnical evaluation will not be finalized until all of the delineation borings are complete. This is vital in the design evaluation so as to avoid selecting a

location that is impacted, thus creating a preferential pathway below the confining clay layer into the intermediate aquifer.

A majority of the borings will be completed using either direct push, hollow stem auger, or sonic drilling technologies. Continuous samples will be collected from ground surface to at least 2 feet into the top of the underlying confining silty clay.

Several of the soil borings will be used to collect geotechnical data (blow counts) in support of the remedial design as well as collecting soil samples for laboratory analysis. Split spoon sampling will be conducted to a depth of approximately 60 ft in order to support the sheeting and dewatering design. Available geotechnical data from previous work at the site will also be reviewed. Continuous sampling will also be conducted in Area 1C to collect sufficient soil volume for treatability testing as well as for installation of two-inch diameter monitoring wells.

The soil samples will be logged, recording such data as the presence of fill material or subsurface obstructions, the nature of each geologic unit encountered, observations regarding moisture content, the PID readings, and visual and olfactory observations regarding the presence of hydrocarbon-like residuals. Blow counts will be recorded for the geotechnical borings. The soil cores will be screened for volatile organic vapors using a PID.

3.2.1 Areas 1A and 1B: Soil Reuse Sampling

Samples representative of soil without visible MGP impacts will be collected from borings within Areas 1A and 1B to evaluate the soil's suitability for reuse as backfill on the Site.

At each boring location, a single, discrete sample for volatiles analysis will be selected from the section of the macrocores considered most representative of the soil in the boring without any visible MGP impacts.

For all other (non-volatiles) samples, several different depth intervals will be composited into one representative sample. Subsamples will be collected from various depth intervals to be representative of the overall soil volume with no visible MGP impacts. The subsamples will be placed in a clean ziplock bag and thoroughly mixed. A representative sample of the mixed soil will then be collected for non-volatiles laboratory analysis.

Up to 12 soil samples will be collected for this initial soil reuse evaluation. The samples will be sent to the contract laboratory for analysis as indicated in Section 4.0.

3.2.2 Areas 1A and 1B: Waste Characterization Sampling

Samples representative of soils with visible MGP impacts will be collected from borings within Areas 1A and 1B to characterize these soils for disposal. Disposal sampling and analysis will be in accordance with the requirements of the receiving facility. The receiving facility will be an off-site disposal or treatment facility licensed and approved to accept the soils from the Ithaca site. Up to 15 waste characterization soil samples will be collected to satisfy disposal facility requirements and to assess for disposal characterization variability.

At each boring location, a single, discrete sample for volatiles analysis will be selected from the section of the macrocores with visible MGP impacts and the highest PID reading. The presence of NAPL or tar-like residuals encountered in the selected sample will be noted on the chain of custody in consideration of laboratory instrument limitations, and the sample will be submitted for analysis.

For all other (non-volatiles) samples, subsamples from several different depth intervals will be collected for homogenization into one representative sample. Subsamples will be collected from the most impacted portion of the intervals based on the PID screening and field observations (visual and olfactory) regarding the presence of MGP-related residuals. The subsamples will be placed in a clean zip lock bag and thoroughly mixed. A representative sample of the mixed soil will then be collected for non-volatiles laboratory analysis.

The samples will be sent to the contract laboratory for analysis as indicated in Section 4.0.

3.2.3 Areas 1A and 1B: Supplemental Delineation

In addition to the soil borings to be installed within Areas 1A and 1b for material characterization purposes, approximately 8 additional soil borings will be installed around the immediate perimeter of each of these areas to further refine the horizontal and vertical delineation of impacted materials. For each of these areas, supplemental delineation of soil containing visible MGP impacts within the street right-of-way will be based on visual observations. Materials from each boring within and around the area will be closely examined in the field for the presence and depth interval(s) of visible MGP impacts and these observations will be carefully noted on the boring logs.

Supplemental delineation of impacted soil at Area 1B that is outside the street right-of-way (on the adjacent residential property) will involve collection and laboratory analysis of soil samples. Two soil borings are proposed in this vicinity. Up to 4 soil samples will be collected from each of these borings for supplemental delineation of impacts on the private property.

In general, one delineation sample will be collected from the portion of the boring that contains the most heavily impacted material based on PID screening and field observations (visual and olfactory) regarding the presence of MGP-related residuals. A second sample will then be collected from the portion immediately above the most impacted interval that appears to be free of impacted material. Up to two additional samples may be collected at each boring if further vertical or horizontal delineation of impacts is warranted based on the field personnel's discretion. For each of these samples, a single, discrete sample for volatiles analysis will be selected from the material with the highest PID reading. If NAPL or tar-like residuals are encountered in the selected sample, this will be noted on the chain of custody in consideration of laboratory instrument limitations, and submitted for analysis.

With the exception of the discrete samples for volatiles analysis, each of the other samples will be placed in a separate plastic bag and thoroughly mixed. A representative sample of the mixed soil will then be collected for laboratory analysis.

In addition to, or in lieu of certain supplemental soil borings, TarGOST may also be used to help define the extent of MGP impacts present at Areas 1A and 1B. Tar-specific Green Optical Screening Tool (TarGOST) is a proprietary system offered by Dakota Technologies that utilizes laser induced fluorescence to detect NAPL. This system is deployed via a direct push platform in the field and provides real-time in-situ information on the presence of subsurface NAPL. The system does not involve soil sampling or off-site laboratory analysis and does not generate any investigation derived waste. The availability and suitability of this system for this site and contamination are being evaluated to determine if TarGOST will be appropriate for this investigation.

3.2.4 Areas 1A and 1B: Geotechnical Samples

Four geotechnical borings will be advanced in the vicinity, but not within, Areas 1A and 1B (2 in each area) for the purposes of collecting geotechnical data to support the sheeting and dewatering design.

Geotechnical soil borings will include blow counts to assess soil strength and Shelby tubes will be collected for laboratory analysis of geotechnical parameters. These soil borings will be located in the close proximity to Areas 1A and 1B, but outside of areas containing NAPL to protect the underlying aquifer. The exact locations of these borings will be decided after delineation sampling has occurred.

Up to eight samples of the fine grained cohesive materials will be collected from the geotechnical borings and submitted for analysis of gradation, Atterberg limits and moisture content. In addition, Shelby tube samples will be collected of the clayey soils from representative depths. Up to six of the Shelby tube samples will be submitted for analysis of soil strength using Unconsolidated-Undrained (UU) triaxial compression tests and up to three of these samples will also be analyzed for hydraulic conductivity.

3.2.5 Area 1C: In-situ Chemical Oxidation Pre-Design Investigation

The ISCO pre-design investigation including a bench scale treatability study will be used to prepare the full-scale remedial design. Bench scale tests will evaluate both hydrogen peroxide (Modified Fenton's Reagent or MFR) and activated sodium persulfate as oxidants. The specific objectives of the ISCO investigations are to:

- quantify natural oxidant demand of site soils;
- demonstrate chemical oxidation of impacted soil in a laboratory environment;
- determine the appropriate oxidant(s) and dosage for field injection;
- evaluate pH buffer capacity of site soils to evaluate activation and catalyst chemistries of the selected oxidant;
- determine baseline characterization of site soil samples from 4 locations and groundwater samples from 7 monitoring wells for VOCs, semivolatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), cyanide, and select metals (on a subset of groundwater samples); and
- perform treatability bench scale testing on site soil samples from approximately 3 soil borings and groundwater samples from 2 existing monitoring wells.

Additional details regarding the ISCO treatability bench scale study are provided in Appendix B of the Remedial Design Work Plan.

3.2.5.1 Area 1C: In-situ Chemical Oxidation Bench Scale Study Soil and Groundwater Sampling Locations and Methods

Seven groundwater monitoring wells will be installed in Area 1C with up to 12 soil samples collected from 4 borings for laboratory analysis to quantify contaminant concentrations in Area 1C to establish baseline soil conditions. In addition, site soil will be collected for performance of ISCO treatability bench scale studies. At the time of well installation, groundwater samples will be collected from up to 2 existing monitoring wells for use in the ISCO bench scale study testing.

The soil samples will be logged, recording such data as the presence of fill material or subsurface obstructions, the nature of each geologic unit encountered, observations regarding moisture content, the PID readings, and visual and olfactory observations regarding the presence of MGP residuals. Each soil core will be screened for volatile organic vapors using a PID.

For the treatability bench scale testing, bulk soil samples will be collected from 3 well locations, with 2 from the most impacted portion of the intervals and 1 from lesser impacted soil based on PID screening and field observations (visual and olfactory) regarding the presence of MGP-related residuals. Bulk groundwater samples will be collected from 2 locations at the time of monitoring well installation for use in the treatability bench scale testing. Containerized bulk soil and groundwater samples will be shipped to the ISCO treatability laboratory for analysis.

After monitoring well installation, 7 groundwater samples will also be collected to establish baseline conditions. Wells will be installed with sumps and will also be checked for measureable NAPL following installation.

3.2.6 Area 1C: Supplemental Delineation

A total of 3 soil borings in Area 1C will be advanced in order to perform additional focused contamination delineation to the south of Area 1C, with the option of 3 additional borings based on the results of the initial points. The purpose of the borings is to identify the potential for additional source mass that could re-contaminate treated soil zones. Up to 12 soil samples could be collected with a minimum of 6 required from these direct push soil borings and analyzed for VOCs, SVOCs, and cyanide. Characterization will be based on two samples per boring. In general, one sample will be collected from the portion of the boring that contains the most impacted material based on PID screening and field observations (visual and olfactory) regarding the presence of MGP-related residuals. A second sample will then be collected from the portion immediately above the most impacted interval that appears to be free of impacted material. VOC samples will be collected from the portion of the sampled interval containing the most impacted material while SVOC and cyanide samples will be collected from a thoroughly mixed composite of the sampled interval.

4.0 Analytical Program for Characterization Sampling

The laboratory chemical analyses to be performed are summarized in the following tables:

Table 4-1

Areas 1A and 1B
Sample Analytical Summary

Sample Type	Matrix	Holding Time	Method
Waste Characterization Samples (15 Samples)			
VOCs TCL	Soil	7 days	U.S. EPA Method 8260B
SVOCs TCL	Soil	14 days	U.S. EPA Method 8270C
Metals (8 RCRA)	Soil	180 days	U.S. EPA Method 6010B/7471A
Total Cyanide	Soil	14 days	U.S. EPA Method 9012A
TPH	Soil	14 days	U.S. EPA Method 8100 or 8015DRO
Total PCBs	Soil	14 days for extraction/40 days for analysis	U.S. EPA Method 8082
% Sulfur	Soil	28 days	ASTM D129-64
BTU Content	Soil	28 days	ASTM D240-87
TCLP VOCs	Soil	14 days (TCLP extraction); 7 days (after extraction)	U.S. EPA Method 1311/8260B
TCLP SVOCs	Soil	14 days (extraction); 40 days (after extraction)	U.S. EPA Method 1311/8270C
TCLP Metals	Soil	180 days (TCLP extraction)	U.S. EPA Method 1311/6010B
TCLP Herbicides	Soil	14 days (TCLP extraction); 7 days (preparative extraction); 40 days (after extraction)	U.S. EPA Method 1311/8151A
TCLP Pesticides	Soil	14 days (TCLP extraction); 7 days (preparative extraction); 40 days (after extraction)	U.S. EPA Method 1311/8081A
Ignitability (Flashpoint)	Soil	N/A	U.S. EPA Method 1010

Sample Type	Matrix	Holding Time	Method
Waste Characterization Samples (15 Samples)			
Corrosivity (as pH)	Soil	7 days	U.S. EPA Method 9045C
Reactive Sulfide	Soil	7 days	U.S. EPA Method 8030B/9034
Reactive Cyanide	Soil	14 days	U.S. EPA Method 9012A
Paint Filter		180 days	SW-846 Method 9095A
% Solids		28 days	SM20 2540G
Soil Reuse Characterization Samples (12 Samples)			
VOCs	Soil	7 days	U.S. EPA Method 8260B
SVOCs	Soil	14 days	U.S. EPA Method 8270C
Metals	Soil	180 days	U.S. EPA Method 6010B
Pesticides	Soil	14 days for extraction/40 days for analysis	U.S. EPA Method 8081A
PCBs	Soil	14 days for extraction/40 days for analysis	U.S. EPA Method 8082
Supplemental Delineation Samples (Up to 8 Samples)*			
VOCs	Soil	7 days	U.S. EPA Method 8260B
SVOCs	Soil	14 days	U.S. EPA Method 8270C
Cyanide	Soil	14 days	U.S. EPA Method 9012A

*QA/QC samples are not included. One field duplicate, matrix spike, and matrix spike duplicate per every 20 delineation samples will also be collected. In addition, a trip blank will be shipped with all VOC samples for VOC analysis.

Table 4-2
Area 1C
Sample Analytical Summary

Sample Type	Matrix	Holding Time	Method
Bench Scale Testing Samples			
VOCs (14 samples)	Soil	7 days	USEPA Method 8260B
SVOCs (14 samples)	Soil	14 days	USEPA Method 8270C
TPH (DRO) (14 samples)	Soil	14 days	USEPA Method 8100 or 8015 DRO
TPH (GRO) (14 samples)	Soil	14 days	USEPA 8015 GRO
Cyanide (14 samples)	Soil	14 days	USEPA 9012A
VOCs (14 samples)	Aqueous	7 days	USEPA Method 8260B
SVOCs (14 samples)	Aqueous	14 days	USEPA Method 8270C
TPH (DRO) (14 samples)	Aqueous	14 days	USEPA Method 8100 or 8015 DRO
TPH (GRO) (14 samples)	Aqueous	14 days	USEPA 8015 GRO
Select Metals: As, Fe, Cr (10 samples)	Aqueous	180 Days	USEPA Method 6010B
Cyanide (10 samples)	Aqueous	14 days	USEPA Method 9012A
Baseline Characterization Samples*			
VOCs (12 samples)	Soil	7 days	USEPA Method 8260
SVOCs (12 samples)	Soil	14 days	USEPA Method 8270C
Cyanide (12 samples)	Soil	14 Days	USEPA Method 9012A
TPH DRO (12 samples)	Soil	14 days	USEPA Method 8100 or 8015 DRO
TPH GRO (12 samples)	Soil	14 days	USEPA 8015 GRO

Sample Type	Matrix	Holding Time	Method
VOCs (7 samples)	Aqueous	7 days	USEPA Method 8260
SVOCs (7 samples)	Aqueous	14 days	USEPA Method 8270C
Select Metals: As, Fe, Mn, Cr (4 samples)	Aqueous	180 Days	USEPA Method 6010B
Cyanide (7 samples)	Aqueous	14 Days	USEPA Method 9012A
TPH DRO (7 samples)	Aqueous	14 Days	USEPA Method 8100 or 8015 DRO
TPH GRO (7 samples)	Aqueous	14 days	USEPA 8015 GRO
Supplemental Delineation Samples*			
VOCs (up to 12 samples)	Soil	14 days	USEPA Method 8260
SVOCs (up to 12 samples)	Soil	14 days	USEPA Method 8270C
Cyanide (up to 12 samples)	Soil	14 days	USEPA Method 9012A

*QA/QC samples are not included. One field duplicate, matrix spike, and matrix spike duplicate per every 20 baseline characterization and delineation samples will also be collected. In addition, a trip blank will be shipped with all VOC samples for VOC analysis.

At least 15 samples representative of the soil with visible MGP impacts will be analyzed for waste characterization data in accordance with the requirements of the receiving facility. These samples will be analyzed for full RCRA Hazardous Characteristics testing. The objective of the sampling will be to profile the soil for waste disposal. The samples will be chosen from the most impacted soil collected during the investigation as determined by the field geologist. The hazardous characteristics testing will include the analyses as indicated in Table 4-1 above. In addition, up to 12 samples will be collected of soils without visible MGP impacts for evaluation of possible reuse of soil as backfill on the Site and analyzed for VOCs, SVOCs, metals, pesticides, and PCBs.

Supplemental delineation of MGP impacts within the street right-of-ways will be based on soil borings and visual observations. TarGOST® may also be used to assist with this supplemental delineation. Up to 8 samples will be collected for the supplemental delineation and characterization of soil within Area1B outside the street right-of-way. The soil samples will be analyzed for VOCs, SVOCs, and cyanide as indicated Table 4-1.

Bulk soil and groundwater samples will be collected from the locations of the newly installed groundwater monitoring wells in Area 1C for ISCO bench scale testing. These samples will be analyzed for VOCs, SVOCs, TPH GRO, TPH DRO, and cyanide for soil and groundwater and select metals for groundwater (As, Fe, and Cr), as indicated in Table 4-2 above. An additional 12 soil samples and 7 groundwater samples will be analyzed for VOCs, SVOC, TPH GRO, TPH DRO, and cyanide for soil and groundwater and select metals (As, Fe, Mn, and Cr) on a subset of groundwater samples for a baseline characterization as detailed in Table 4-2.

Also in Area 1C, up to12 soil samples with a minimum of 6 required will be collected from an additional 6 soil borings (3 soil borings required and 3 optional based on initial results) as a supplemental delineation. These samples will be analyzed for VOCs, SVOCs, and cyanide as indicated in Table 4-2.

The chosen laboratory for the project will be certified, and maintain certification, under the NYSDEC Environmental Laboratory Approval Program (ELAP) and the NYSDOH ELAP Contract Laboratory Program (CLP) for analyses of solid and hazardous waste.

All sampling equipment will be properly decontaminated before being reused. Samples will be collected in pre-cleaned sample containers provided by the laboratory performing analysis with any necessary preservations added to the sample containers at the laboratory prior to sample collection. Coolers with ice will be used to store samples at 4 degrees Centigrade until delivered to and analyzed by the laboratory.

Holding times for the samples are given in Tables 4-1 and 4-2. COC procedures will be followed to document that contamination of samples has not occurred during container preparation, shipment, and sampling.

Field and laboratory quality control samples for the supplemental delineation and ISCO baseline characterization samples will be collected and analyzed to document the accuracy and precision of the samples. QA/QC samples will be collected in conjunction with supplemental delineation samples, and will include trip blanks, field duplicates and matrix spikes, and matrix spike duplicates. The data quality level for the PDI will be consistent with procedures outlined in the NYSDEC Analytical Services Protocol (ASP) July 2005 methodologies. A full ASP Category B data package will be prepared by the laboratory for all samples. The data will be reviewed, and a Data Usability Summary Report (DUSR) will be prepared by a qualified chemist.

5.0 Sample Tracking and Custody

5.1 Introduction

This section presents sample custody procedures for both the field and laboratory. Implementation of proper custody procedures for samples generated in the field is the responsibility of field personnel. Both laboratory and field personnel involved in the COC and transfer of samples will be trained on the purpose of the COC and specific procedures prior to implementation.

Evidence of sample traceability and integrity is developed by implementation of, and adherence to, the COC procedures. These procedures document the sample traceability from the selection and preparation of the sample containers by the laboratory, to sample collection, to sample shipment, to laboratory receipt and analysis. A sample is considered to be in a person's custody if the sample is:

- In a person's possession;
- Maintained in view after possession is accepted and documented;
- Locked and tagged with Custody Seals so that no one can tamper with it after having been in physical custody; or
- In a secured area which is restricted to authorized personnel.

5.2 Field sample custody

A COC record accompanies the sample containers from selection and preparation at the laboratory, during shipment to the field for sample containment and preservation, and during return to the laboratory. Triplicate copies of the COC must be completed for each sample set collected.

The COC lists the field personnel responsible for taking samples, the project name and number, the name of the analytical laboratory to which the samples are sent, and the method of sample shipment. The COC also lists a unique description of every sample bottle in the set. If samples are split and sent to different laboratories, a copy of the COC record will be sent with each sample.

The REMARKS space on the COC is used to indicate if the sample is an MS/MSD, or any other sample information for the laboratory. Since they are not specific to any one sample point, trip and equipment blanks are indicated on separate rows. Once all bottles are properly accounted for on the form, a sampler will write his or her signature and the date and time on the first RELINQUISHED BY space. The sampler will also write the method of shipment, the shipping cooler identification number, and the shipper air bill number on the top of the COC. Errors will be crossed out with a single line in ink and initialed and dated by the author.

One copy of the COC is retained by sampling personnel and the other two copies are put into a sealable plastic bag and taped inside the lid of the shipping cooler. The cooler lid is closed, custody seals provided by the laboratory are affixed to the latch and across the back and front lids of the cooler, and the person relinquishing the samples signs their name across the seal. The seal is taped, and the cooler is wrapped tightly with clear packing tape. It is then relinquished by field personnel to personnel responsible for shipment, typically an overnight carrier. The COC seal must be broken to open the container. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the Project Manager, and the sample(s) will not be analyzed.

5.3 Laboratory sample custody

The Project Manager or Field Team Leader will notify the laboratory of upcoming field sampling activities and the subsequent shipment of samples to the laboratory. This notification will include information concerning the number and type of samples to be shipped as well as the anticipated date of arrival.

The following laboratory sample custody procedures will be used:

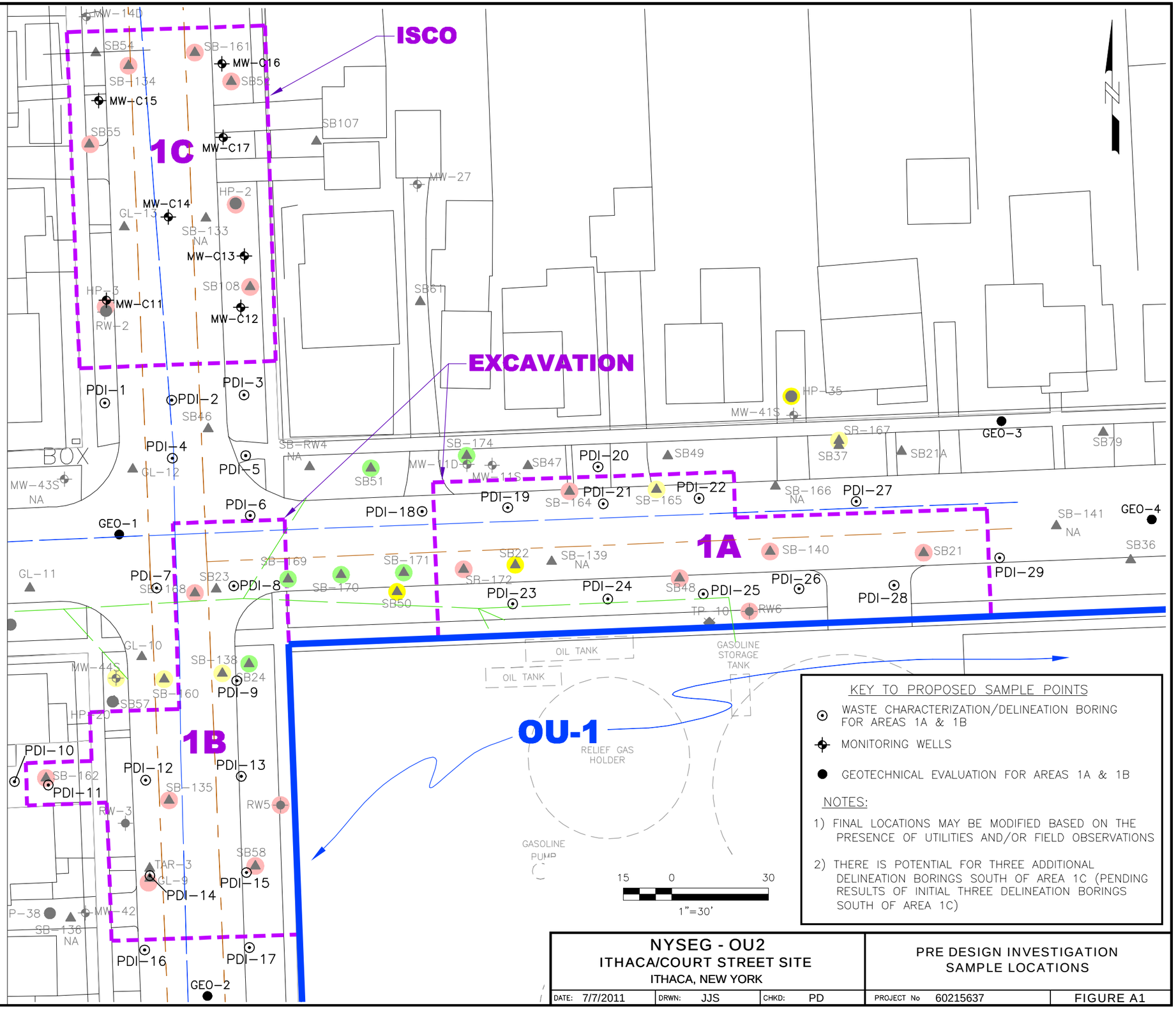
- The laboratory will designate a sample custodian who will be responsible for maintaining custody of the samples and for maintaining all associated records documenting that custody.
- Upon receipt of the samples, the custodian will check cooler temperature, and check the original COC documents and compare them with the labeled contents of each sample container for correctness and traceability. The sample custodian will sign the COC record and record the date and time received.
- Care will be exercised to annotate any labeling or description errors. In the event of discrepant documentation, the laboratory will immediately contact the Project Manager or Field Team Leader as part of the corrective action process. A qualitative assessment of each sample container will be performed to note any anomalies, such as broken or leaking bottles. This assessment will be recorded as part of the incoming COC procedure.
- The samples will be stored in a secured area and, if required, stored at a temperature of 4°± 2° C.
- A laboratory tracking record will accompany the sample or sample fraction through final analysis and final storage for control.
- A copy of the tracking record will accompany the laboratory report and will become a permanent part of the project records.

LEGEND

- MW–20D — MONITORING WELL
- SB80 — SOIL BORING
- HP–12 — HYDRO PUNCH
- SS–1 — SURFACE SOIL SAMPLE PER IT CORPORATION (APPROXIMATE LOCATIONS)
- RW–1 — RECOVERY WELL
- TEST PIT
- CONFIRMATION SAMPLE
- 106(7) — CONFIRMATION SAMPLE ID(DEPTH)
- STRONG HYDROCARBON–LIKE ODOR, LIGHT STAIN OR SHEEN
- HEAVY COAL TAR STAIN, SHEEN, OR COAL TAR BLEBS
- COAL TAR PRESENT OR COAL TAR STRINGERS, LAYERS, OR SATURATED SOIL
- NA — NOT ANALYZED
- HISTORIC FEATURE
- WATER LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- OU–1 BOUNDARY
- SUB AREAS WITH REMEDIATION AREAS 1A AND 1B (EXCAVATION), AREA 1C (ISCO)

1. HORIZONTAL SURVEY CONTROL WAS ESTABLISHED USING SURVEY GRADE RTK GPS AND IS REFERENCED TO THE NORTH AMERICAN DATUM OF 1983 (NAD83). THE PRIMARY MONUMENT USED IN SETTING SITE CONTROL WAS T1011 OF THE TOMPKINS COUNTY GPS GEODETIC CONTROL SURVEY DATED JULY 1992 BY MICHAEL BAKER JR., INC., BEAVER, PA. THIS WAS CHECKED INTO T1002.
2. THE SITE VERTICAL DATUM IS REFERENCED TO NGS FIRST ORDER, CLASS II, NAVD 88 BENCHMARKS, V463 AND Y463 AND WAS SET BY MULTIPLE RTK GPS OBSERVATIONS.
3. BASE MAPPING WAS PRODUCED BY DIGITIZING AERIAL PHOTOS DATED APRIL 1992 BY MICHAEL BAKER JR., INC, BEAVER, PA., AND HAS BEEN UPDATED USING AERIAL PHOTOS DATED APRIL 1999.
4. SAMPLING LOCATIONS FROM PREVIOUS STUDIES ARE APPROXIMATE AND ARE SHOWN BASED ON FIGURE 4 IN THE TASK 3 REPORT PREPARED BY E.C.JORDAN CO., DATED MARCH 1988.
5. SURFACE SOIL SAMPLES, SS–1 – SS–10 WERE LOCATED BY THE IT CORPORATION AND HAVE BEEN TRANSFERRED DIRECTLY ONTO THIS SITE DRAWING FROM IT CORP GRAPHICS. SS–8 AND SS–9 ARE OUTSIDE THE LIMITS OF THIS DRAWING. SS–11 – SS–15 ARE SHOWN AT LOCATIONS SURVEYED ON 6/27/02.
6. COORDINATE VALUES FOR MONITORING WELLS, SOIL BORINGS, AND HYDRO PUNCH LOCATIONS WERE LOCATED BY NYSEG USING A COMBINATION OF RTK GPS AND CONVENTIONAL SURVEYING. MONITORING WELL ELEVATIONS WERE ESTABLISHED USING DIFFERENTIAL LEVELING.

AECOM



KEY TO PROPOSED SAMPLE POINTS

- WASTE CHARACTERIZATION/DELINEATION BORING FOR AREAS 1A & 1B
- MONITORING WELLS
- GEOTECHNICAL EVALUATION FOR AREAS 1A & 1B

NOTES:

1) FINAL LOCATIONS MAY BE MODIFIED BASED ON THE PRESENCE OF UTILITIES AND/OR FIELD OBSERVATIONS
2) THERE IS POTENTIAL FOR THREE ADDITIONAL DELINEATION BORINGS SOUTH OF AREA 1C (PENDING RESULTS OF INITIAL THREE DELINEATION BORINGS SOUTH OF AREA 1C)

NYSEG - OU2
ITHACA/COURT STREET SITE
ITHACA, NEW YORK

PRE DESIGN INVESTIGATION
SAMPLE LOCATIONS

DATE: 7/7/2011	DRWN: JJS	CHKD: PD	PROJECT No 60215637	FIGURE A1

File: P:\60143048–NOR\FS–RA Figures\December 2010\Ithaca Area 1a 1b 1c.dwg Layout: Fig A1 User: Serraj Plotted: Jul 07, 2011 – 5:06pm Xref's:

Appendix A1

Health and Safety Plan

Prepared for:
New York State Electric and Gas




Appendix A1

HEALTH AND SAFETY PLAN

Pre-Design Investigation
NYSEG's Ithaca Court St. Former MGP Site
Operable Unit 2
Ithaca, New York

July 2011

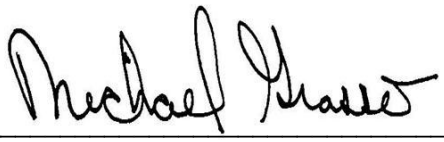
AECOM

Appendix A1

HEALTH AND SAFETY PLAN

Pre-Design Investigation
NYSEG's Ithaca Court St. Former MGP Site
Operable Unit 2
Ithaca, New York

Prepared By: Keith Stahle, Project Geologist



Reviewed By: Michael Grasso, Regional Health and Safety Manager

July 2011

AECOM

Contents

Attachments

List of Figures

1.0 Introduction

1.1 Health and Safety Plan applicability

This site-specific Health and Safety Plan (HASP) has been developed by AECOM Environment (AECOM). It establishes the health and safety procedures required to minimize potential risk to AECOM and contractor personnel involved with implementing the Pre-Design Investigation (PDI) of the off-site portion (i.e., Operable Unit 2 (OU-2) of the Ithaca Court Street Former Manufactured Gas Plant (MGP) Site located in the City of Ithaca, New York. AECOM is performing this work on behalf of New York State Electric and Gas (NYSEG).

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

This HASP has been written to comply with the requirements of OSHA's Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120). All activities covered by this HASP must be conducted in complete compliance with this HASP, and with all applicable federal, state, and local health and safety regulations. Personnel covered by this HASP who cannot or will not comply will be excluded from site activities.

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

This HASP only pertains to the tasks described in Section 3.0 of this document. A task-specific HASP or addendum to this HASP will be developed at a later date for any other subsequent investigations/remedial activities at the site.

1.2 Health and safety expectations

1.2.1 AECOM safety policy

As a leading global provider of environmental, health, and safety (EHS) engineering and consulting services, AECOM is committed in the conduct of our operations to protecting the environment as well as the health and safety of our employees, clients, subcontractors, suppliers, and the communities which we serve. To demonstrate and support this steadfast commitment, AECOM has adopted nine EHS Guiding Principles. It is the expectation and responsibility of each AECOM employee to understand and fully support these Principles in the performance of all work activities.

1.2.2 Zero accident goal

The safety goal for this project is zero incidents and zero accidents, with work tasks designed to minimize or eliminate hazards to personnel, equipment, the environment and the general public. No individuals shall perform tasks that may endanger their own safety and health or that of others.

1.2.3 Stop work authority

Commitment to safety, health, and environmental excellence requires that all work proceed only after it is safe and environmentally sound. The responsibility for ensuring that this takes place rests with every AECOM employee working at this project location. Effectively meeting these responsibilities depends upon open communication between individuals and their supervisors prior to work beginning, and – in certain cases – after safety, health and/or environmental issues are identified.

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

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

1.3 Organization/responsibility

The implementation of health and safety at this project location will be the shared responsibility of the AECOM project manager (PM), the AECOM Regional Health and Safety Manager (RHSM), the AECOM project site safety officer (SSO), other AECOM personnel implementing the proposed scope of work and AECOM's contractors.

1.3.1 AECOM project manager

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

- Interfacing with NYSEG representatives regarding safety requirements for working within the NYSEG property and the adjacent areas and staging equipment and IDW at the OU1 Site;
- Assuring that all personnel to whom this HASP applies, including AECOM subcontractors, have received a copy of it;
- Verifying that all contractors selected by AECOM to work on this program have completed AECOM's environmental, health and safety questionnaire (AHSQ) form within the past year and have been deemed acceptable for the proposed scope of work;
- Providing the RHSM with updated information regarding conditions at the site and the scope of site work;
- Providing adequate authority and resources to the onsite SSO to allow for the successful implementation of all necessary safety procedures;
- Supporting the decisions made by the SSO and RHSM;
- Maintaining regular communications with the SSO and, if necessary, the RHSM; and
- Coordinating the activities of all AECOM subcontractors and ensuring that they are aware of the pertinent health and safety requirements for this project.

1.3.2 AECOM Regional Health and Safety Manager

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

- Writing, approving and amending the HASP for this project;
- Advising the PM and SSO on matters relating to health and safety on this site;

- Recommending appropriate personal protective equipment (PPE) and safety equipment to protect personnel from potential site hazards;
- Conducting accident investigations; and
- Maintaining regular contact with the PM and SSO to evaluate site conditions and new information which might require modifications to the HASP.

1.3.3 AECOM site safety officer

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

- Assuring that all personnel to whom this HASP applies, including all subcontractors, have submitted a completed copy of the HASP receipt and acceptance form;
- Assuring that all personnel to whom this HASP applies have attended, and actively participated in, a pre-entry briefing and any subsequent safety meetings that are conducted during the implementation of the program;
- Maintaining a high level of health and safety consciousness among employees implementing the proposed activities;
- Performing the required air monitoring as described in this HASP;
- Procuring and distributing the PPE and safety equipment needed for this project for AECOM employees;
- Verifying that all PPE and health and safety equipment used by AECOM is in good working order;
- Verifying that AECOM contractors are prepared with the PPE and safety equipment required for this program;
- Stopping work in the event that an immediate danger situation is perceived;
- Notifying the PM of all noncompliance situations and stopping work in the event that an immediate danger situation is perceived;
- Monitoring and controlling the safety performance of all personnel within the established restricted areas to ensure that required safety and health procedures are being followed;
- Conducting accident/incident investigations and preparing accident/incident investigation reports;
- Conducting the pre-entry briefing prior to beginning work and subsequent safety meetings as necessary; and
- Initiating emergency response procedures in accordance with Section 11.0 of this HASP.

1.3.4 AECOM and contractor personnel

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

- Reading the HASP in its entirety prior to the start of onsite work;
- Submitting a completed HASP Acceptance Form to the AECOM SSO prior to the start of work;

- Attending, and actively participating in, the required pre-entry briefing prior to beginning onsite work and any subsequent safety meetings that are conducted during the implementation of the program;
- Bringing forth any questions or concerns regarding the content of the HASP to the PM or the SSO prior to the start of work;
- Stopping work in the event that an immediate danger situation is perceived;
- Reporting all accidents, injuries and illnesses, regardless of their severity, to the AECOM SSO; and
- Complying with the requirements of this HASP and the requests of the SSO.

1.3.5 Contractors

Additionally, subcontractors hired by AECOM are responsible for:

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

1.4 Management of change/modification of the Health and Safety Plan

1.4.1 Management of change

The procedures in this HASP have been developed based on a review of previous site investigations and the proposed scope of work. Every effort has been made to address the chemical and physical hazards that may be encountered during the implementation of the proposed program. However, unanticipated site-specific conditions or situations may occur during the implementation of this project. Also, AECOM and/or the contractors may elect to perform certain tasks in a manner that is different from what was originally intended due to a change in field conditions. As such, this HASP must be considered a working document that is subject to change to meet the needs of this dynamic project.

AECOM and/or AECOM's contractors will complete a Job Hazard Analysis (JHA) when new tasks or different investigative techniques not addressed in the HASP are proposed. The use of new techniques will be reviewed and if new hazards are associated with the proposed changes, they will be documented on the JHA form. An effective control measure must also be identified for each new hazard. JHA forms will be reviewed by the SSO prior to being implemented. Once approved, the completed forms will be reviewed with all field staff during the daily safety meeting. A blank JHA form is presented as Attachment B.

1.4.2 Health and Safety Plan modification

Should significant information become available regarding potential onsite hazards, it may be necessary to modify this HASP. All proposed modifications to this HASP must be reviewed and approved by the AECOM RHSM before such modifications are implemented. Any significant modifications must be incorporated into the written document as addenda and the HASP must be reissued. The AECOM PM will ensure that all personnel covered by this HASP receive copies of all issued addenda. Sign-off forms will accompany each addendum

and must be signed by all personnel covered by the addendum. Sign-off forms will be submitted to the AECOM PM. The HASP addenda should be distributed during the daily safety meeting so that they can be reviewed and discussed. Attendance forms will be collected during the meeting.

2.0 Site description

2.1 Site location and history

The Court Street site is located in Tompkins County in the City of Ithaca, New York. The location of the site is shown on Figure 1. NYSEG's predecessors operated a coal gasification plant at the site from 1853 to 1927. The plant occupied the western portion of the block bound by Esty Street on the north, North Plain Street on the west, and Court Street on the south. The gas plant had two coal sheds, a gas house containing three horizontal retorts, purifiers, two steel gas holders, two underground coal tar storage vessels, a tar separator, and two oil tanks. A subsurface wooden duct system, consisting of two wooden ducts and clay tile lines was formerly used to transport coal tar from the MGP site to the Cayuga Inlet for collection and disposal.

NYSEG acquired the plant in 1929 and operated an electric operation center until 1964, when the property was sold to the Ithaca City School District. In April 2002, the site was divided into two Operable Units to facilitate further investigations at portions of the site while evaluating remedial options at other portions. Operable Unit 1 (OU-1) consists of the former MGP property. OU-1 is bound by steel sheet piling and remediation of the site is currently in progress. Operable Unit 2 (OU-2) consists of any properties outside of the sheet piling that may have been impacted by the migration of MGP materials directly from the site. OU-2 also includes the remaining portions of the wooden duct system and any properties that may have been impacted by potential tar releases from the ducts. As shown on Figure A1, the PDI will occur in three areas within OU-2: Areas 1A, 1B, and 1C.

Areas 1A, 1B, and 1C of OU-2 are located within residential areas that consist of residential buildings, grass-covered areas, asphalt-covered areas, and overhead and subsurface utilities. The locations of the subsurface utilities in OU-2 are shown on Figure 2.

3.0 Scope of work

3.1 Purpose of program

AECOM will perform a PDI at the Ithaca Court Street site in preparation of the design of excavation and in-situ chemical oxidation remedial activities. The PDI will include waste characterization, supplemental delineation, and bench scale study sampling.

3.2 Specific field tasks

The specific field tasks being implemented under the PDI include:

- Performing a field survey using a surveyor and/or AECOM staff to collect topographical and subsurface utility information.
- Installing soil borings at various locations within OU-2. Direct-push, sonic drilling and/or hollow stem auger (HSA) drilling methods may be used for this project.
- Collecting continuous Macro-Core® or split-spoon samples from each boring for field screening and subsequent laboratory analyses;
- Installing overburden monitoring wells in selected soil borings to evaluate groundwater;
- Developing newly installed wells;
- Gauging newly installed and existing wells for the presence of non-aqueous phase liquids (NAPLs) prior to groundwater sampling;
- Collecting groundwater samples from newly installed and existing wells for laboratory analyses;
- Surveying the new investigation sample points; and
- Performing a lab ISCO treatability study.

The chemical oxidation treatability studies will be performed following health and safety guidance outlines in the Orlando Treatability Studies Laboratory Chemical Hygiene Plan (AECOM, 2011).

4.0 Chemical hazard assessment and control

4.1.1 Site impacts

The constituents of concern (COC) associated with the former MGP operations include volatile organic compounds (VOCs) such as benzene, toluene, ethylbenzene and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), purifier box residuals (potentially containing cyanide complexes or compounds), and certain trace metals associated with historic fill materials including ash, clinkers, coal etc.

4.1.2 Volatile organic compounds

The VOCs associated with MGP residuals include benzene, toluene, ethylbenzene and xylenes. Exposure to the vapors of BTEX above their respective OSHA permissible exposure limits (PELs) may produce irritation of the mucous membranes of the upper respiratory tract, nose and mouth. Overexposure may also result in the depression of the central nervous system. Symptoms of such exposure include drowsiness, headache, fatigue and drunken-like behaviors. Prolonged overexposure to benzene vapors has detrimental effects on the blood-forming system ranging from anemia to leukemia.

The PEL for benzene is 1 ppm, as an 8-hour, time-weighted average (TWA). The American Conference of Governmental Industrial Hygienists (ACGIH) recommends a threshold limit value (TLV) of 0.5 ppm. The OSHA PEL for ethylbenzene is 100 ppm. The PEL for toluene is 200 ppm. However, the ACGIH recommends a TLV of 50 ppm for toluene. Xylene is a flammable, colorless liquid with an OSHA PEL of 100 ppm as an 8-hour TWA. Inhalation of xylene vapors above the PEL may result in motor activity changes, irritability and drunken-like behaviors. Xylene vapors are also irritating to the eye.

VOC of Concern	OSHA PEL (8-hr TWA) (ppm)	ACGIH TLV (8-hr TWA) (ppm)
Benzene	1	0.5
Toluene	200	50
Ethylbenzene	100	100
Xylene	100	100

4.1.3 Polycyclic aromatic hydrocarbons

Coal gasification byproduct constituents including coal tar contain polycyclic aromatic hydrocarbon (PAH) compounds. PAH compounds are a family of multiple ring aromatic compounds commonly found in fossil fuels and formed from the incomplete combustion of organic materials. Repeated contact with PAH compounds may cause photosensitization of the skin, producing skin burns after subsequent exposure to ultra-violet light. Certain PAHs as a group are considered potential human carcinogens (CaPAH). OSHA regulates PAHs as coal tar pitch volatiles (CTPV) and has established a PEL for CTPV of 0.2 mg/m^3, as an 8-hr TWA.

Of the PAH compounds typically present at MGP sites, naphthalene is typically present at higher concentrations than the other compounds. Naphthalene is easily detected due to its characteristic moth-ball like odor. The inhalation of high concentrations of naphthalene vapor may result in nausea, vomiting,

abdominal pain and irritation of the bladder. Prolonged overexposure may result in renal shut down. The OSHA PEL for naphthalene, as an 8-hr TWA, is 10 ppm.

4.1.4 Purifier box residuals

Blue staining is the characteristic associated with the presence of oxide box residuals (ferrocyanide). Therefore, the presence of this material is easily identified during field investigations. The cyanides associated with oxide box residuals are present in a form that is generally unavailable or complexed with metals such as iron, which makes the cyanide more stable. Thus, the reported effects of free cyanide are not applicable. OSHA has not established a PEL for ferro/ferri cyanide compounds. Similarly, the ACGIH has not recommended a TLV for these compounds.

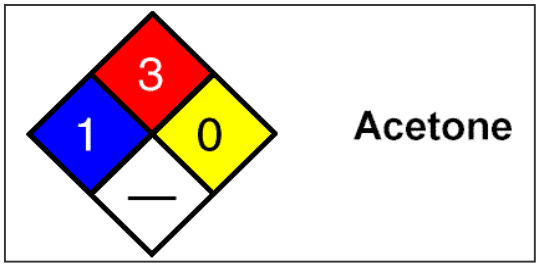
4.1.5 Metals

Lead is typically found at MGP sites and is associated with ash-like materials. In general, the inhalation of metal dusts is irritating to the upper respiratory tract and nasal mucous membranes. Most metal dusts cause dermatitis and/or eye irritation. The early symptoms of lead poisoning, as a result of overexposure (either through ingestion or inhalation) include fatigue, sleep disturbance, headache, aching bones and muscles, digestive irregularities, abdominal pains, and decreased appetite. Chronic overexposures to lead affect the central nervous system and male and female reproductive systems. Lead has also been identified as a fetotoxin. The OSHA PEL for inorganic lead is 50 ug/m^3.

4.2 Hazardous substances brought onsite by AECOM or contractors

A material safety data sheet (MSDS) must be available for each hazardous substance that AECOM or AECOM contractors bring on the property. This includes solutions/chemicals that will be used to decontaminate sampling equipment, equipment fuels, and calibration gases for air monitoring instrumentation.

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



4.3 Chemical exposure and control

4.3.1 Chemical exposure potential

The COCs may have impacted soils and/or groundwater at the areas being investigated.

The VOCs associated with MGP residuals are volatile enough that vapors may be a concern particularly when rotary drilling techniques are used. Where possible, direct-push drilling techniques will be used to advance soil borings to minimize the potential for exposure to VOCs.

PAHs and metals are non-volatile, so it is the dusts of these contaminants that are of concern. Again, the primary task that may generate dusts is auger drilling. The generation of dusts is expected to be minimal when advancing soil borings via direct-push drilling methods.

Direct dermal contact with contaminated soils and groundwater is another possible route of exposure. This exposure route is more of a concern if coal tar NAPL is encountered.

4.3.2 Hazard control

The hazards associated with the implementation of the proposed scope of work can be controlled in several ways, including:

- AECOM will perform air monitoring (Section 6.1) in the worker's breathing zone to determine exposure to VOC vapors during the drilling and test pitting programs. If exposures exceed the action levels, respiratory protection as discussed in Section 7.2, will be donned.
- Inhalation of PAH and metal dusts is not expected to be a concern. However, if dusts are generated, a light mist of water can be applied over the drilling or excavation area to minimize the potential for dust inhalation.
- To avoid direct dermal contact with contaminated media, protective clothing, as described in Section 7.1, will be required when collecting samples or decontaminating equipment that has come in contact with the contaminants of concern.
- Although highly unlikely, exposure to all of the COCs may occur via ingestion (hand-to-mouth transfer). The decontamination procedures described in Section 9.0 address personal hygiene issues that will limit the potential for contaminant ingestion.

5.0 Physical hazards and control

The general procedures in this HASP have been developed based on the proposed activities for the PDI. While every effort has been made to address the potential hazards that may be encountered during the implementation of the proposed investigative activities, unanticipated site-specific conditions or situations may occur. Also, AECOM and their selected contractors may elect to perform certain tasks in a manner that is different from what was originally intended due to a change in field conditions. As such, the contractor will complete a JSA when new tasks or different techniques not addressed in the HASP are proposed. The use of new techniques will be reviewed and if new hazards are associated with the proposed changes, they will be documented on the JSA form.

5.1 Access to work areas

The areas addressed by this work plan are located in a mixed residential and commercial area. AECOM and contractors can access the investigation points with the heavy machinery needed to implement the proposed investigation via public roadways. Grass covered areas and private driveways may be used to access investigation points located on residential properties. Though the vast majority of the excavation and ISCO work will take place within the city street right-of-ways, access agreements will be in place prior to initiating any field work outside of city street right-of-ways on private properties.

5.2 Utility hazards

5.2.1 Underground utility hazards

Based on the extensive investigations previously performed at the site, there are known subsurface utilities in the PDI area. To identify the locations of the utilities prior to the start of the PDI field activities, the following steps will be performed:

- New York law requires that a utility clearance be performed at least two (2) days prior to initiation of any subsurface work. The earthwork and drilling contractor and AECOM will contact DIG SAFELY NEW YORK (1-800-272-4480) to request a mark-out of natural gas, electric, telephone, cable television, water and sewer lines in the proposed work locations. Work will not begin until the required utility clearances have been performed.

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

- Obtaining as-built drawings for the areas being investigated from NYSEG and the property owners;
- Visually reviewing each proposed soil boring/well and test pit location with the property owner or knowledgeable site representative;
- Using a subsurface utility location subcontractor to locate subsurface utilities;
- Identifying a no-dig zone; or
- Hand digging in the proposed work locations if insufficient data is available to accurately determine the location of the utility lines.

If it is determined that underground utilities are located in the subsurface sampling areas, the sampling locations will be changed to ensure that no utilities are struck during the proposed investigation.

5.2.2 Overhead utility hazards

Prior to drilling, each soil boring location will be visited to evaluate the presence of any overhead utility lines. Any vehicle or mechanical equipment capable of having parts of its structure elevated (drill rig, crane, etc.) near energized overhead lines shall be operated so that a clearance of at least 10 feet is maintained. If the voltage is higher than 50kV, the clearance shall be increased 4 inches for every 10kV over that voltage.

If the required clearance cannot be maintained at any work area at the site, additional precautions must be taken to ensure contact with the overhead lines does not occur. Options include, but may not be limited to, de-energizing the line or placing an insulating barrier over the line. Both of these options will require coordination with the owner of the lines in question.

5.3 Traffic hazards

If any of the proposed activities are being performed in a high traffic area, the following precautions should be followed. All are designed to draw attention to you and to warn other people of your presence:

- Notify the property owner of your work location, dates of work, and the anticipated work times. Suggest the possibility of a detour around the work area.
- Wear an ANSI-approved Class II safety vest.
- Set up traffic cones 50 feet in front of the work area. "Men at Work" signs should also be placed in a conspicuous area to warn others of your presence.

When working on site with heavy machinery, AECOM staff should wear an ANSI-approved Class II safety vest to make themselves more visible to equipment operators. Additionally, all staff working at the site should use the established access paths. Do not take shortcuts through the site which allow you to enter into a work area from a direction that an equipment operator would not expect.

5.4 Drilling hazards

A variety of drilling methods are being used to advance the soil borings. The method selected is dependent upon the location of the particular boring or monitoring well.

5.4.1 Drilling

The drilling rig anticipated for this project will be capable of drilling using auger and/or direct-push drilling methods. It is anticipated that the majority of the sampling will be performed using Macro-Core® samplers; however, auger methods and split spoon samplers may also be utilized as necessary. The auger equipment is located side by side on the truck mounted drilling rig. Use of the drill rig to advance soil borings and install monitoring wells will require all personnel in the vicinity of the operating rig to wear steel-toed boots, hardhats, hearing protection and safety eyewear. Personnel shall not remain in the vicinity of operating equipment unless it is required for their work responsibilities. Additionally, the following safety requirements must be adhered to:

- All drill rigs and other machinery with exposed moving parts must be equipped with an operational emergency stop device. Drillers and geologists must be aware of the location of this device. This device must be tested prior to job initiation and periodically thereafter. The driller and helper shall not simultaneously handle augers unless there is a standby person to activate the emergency stop.
- The driller must never leave the controls while the tools are rotating unless all personnel are kept clear of rotating equipment.

- A long-handled shovel or equivalent must be used to clear drill cuttings away from the hole and from rotating tools. Hands and/or feet are not to be used for this purpose.
- A remote sampling device must be used to sample drill cuttings if the tools are rotating or if the tools are readily capable of rotating. Samplers must not reach into or near the rotating equipment. If personnel must work near any tools which could rotate, the driller must shut down the rig prior to initiating such work.
- Drillers, helpers, and geologists must secure all loose clothing when in the vicinity of drilling operations.
- Only equipment which has been approved by the manufacturer may be used in conjunction with site equipment and specifically to attach sections of drilling tools together. Pins that protrude excessively from augers shall not be allowed.
- No person shall climb the drill mast while tools are rotating.
- No person shall climb the drill mast without the use of ANSI-approved fall protection (approved belts, lanyards and a fall protection slide rail) or portable ladder which meets the requirements of OSHA standards.
- The wheels of all heavy machinery and support vehicles must be chocked when the machine is placed in position and/or parked for the night.

5.5 Hand and power tool use

A variety of hand and power tools may be used during the proposed investigation. The use of each can pose serious safety hazards to the user.

5.5.1 Hand tools

The greatest hazards posed by hand tools result from misuse and improper maintenance.

- When using hand tools, be sure you have selected the right tool for the job. If a chisel is used as a screwdriver, the tip of the chisel may break or fly off, hitting the user or others.
- Inspect tools for damage such as mushroomed chisel heads or broken hammer handles. If jaws of a wrench are sprung, the wrench may slip. If a wooden handle is loose, splintered or cracked, the head of the tool may fly off.
- Do not use damaged tools.
- Be sure you know how to use the tool you are working with.

5.5.2 Using knives or blades

Geoprobe™ soil samples are contained within an acetate liner that must be cut open in order to retrieve the sample. As such, employees are at an increased risk of cutting themselves since a knife or blade is typically used to open the liner and the liner is often placed on an irregular or unstable work surface (i.e., the back of the Geoprobe™ van or the ground). Additionally, tubing may need to be cut to facilitate groundwater sampling. Tube-cutters are available and should be used to eliminate this hazard. If it is necessary to use knives or blades, follow the safety precautions listed below:

- Keep your free hand out of the way.
- Secure the acetate liner so it won't roll or move while you're cutting.
- Use only sharp blades; dull blades require more force which results in less knife control.
- Pull the knife toward you; pulling motions are easier to manage.
- Don't put your knife in your pocket.

- Use a hooked knife (i.e. linoleum knife) or a utility knife with a self-retracting blade.
- Wear leather or Kevlar gloves when using knives or blades.

5.5.3 Power tools

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

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

5.5.4 Electric tools

When using portable tools that are electrically powered, follow the safety precautions listed below:

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

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

5.5.5 Pneumatic tool use

Pneumatic power tools shall be secured to the hose or whip in a positive manner to prevent accidental disconnection. Safety clips shall be securely installed and maintained on impact tools. The manufacturer's safe operating pressure for all fittings shall not be exceeded. Proper PPE as determined by the SSO will be used for all such operations.

5.6 Noise exposure

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

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

Since personal noise monitoring will not be conducted during the proposed activities, employees must follow this general rule of thumb: If the noise levels are such that you must shout at someone 5 feet away from you, you need to be wearing hearing protection. Employees can wear either disposable earplugs or earmuffs but all hearing protection must have a minimum noise reduction rating (NRR) of 27 dB.

5.7 Back safety

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

- Use mechanical devices, such as a drum dolly or hand cart, to move objects, such as drums of IDW, which are too heavy to be moved manually.
- Use carts to transport sampling equipment from the access point to the wooded area where soil borings are being installed.
- If mechanical devices are not available, ask another person to assist you.
- Bend at the knees, not the waist. Let your legs do the lifting.
- Do not twist while lifting.
- Bring the load as close to you as possible before lifting.
- Be sure the path you are taking while carrying a heavy object is free of obstructions and slip, trip and fall hazards.

5.8 Slip, trip and fall hazards

5.8.1 Site conditions

On any work area, it is expected that the ground may be uneven. The ground surface may be unreliable due to settling. Surface debris may be present and wet or swampy areas may exist. AECOM staff will be bringing a large amount of sampling equipment into the different work areas. Therefore, it is essential that the team identify a path that is clear of obstructions. While the path of least resistance may be quicker, it may not be

safer. For this program, it may be necessary to remove obstacles to create a smooth, unobstructed access point to the work areas on site.

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

5.8.2 Good housekeeping

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

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

5.9 Biological hazards

There are biological hazards that need to be considered when working at this site. Each is discussed in detail below.

5.9.1 Mosquito- borne disease - West Nile virus

West Nile encephalitis is an infection of the brain caused by the West Nile virus, which is transmitted by infected mosquitoes. Following transmission from an infected mosquito, West Nile virus multiplies in the person's blood system and crosses the blood-brain barrier to reach the brain. The virus interferes with normal central nervous system functioning and causes inflammation of the brain tissue. However, most infections are mild and symptoms include fever, headache and body aches. More severe infections may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis and rarely, death. Persons over the age of 50 have the highest risk of severe disease.

Prevention centers on public health action to control mosquitoes and on individual action to avoid mosquito bites. To avoid being bitten by the mosquitoes that cause the disease, use the following control measures:

- If possible, stay inside between dusk and dark. This is when mosquitoes are most active.
- When outside between dusk and dark, wear long pants and long-sleeved shirts.
- Spray exposed skin with an insect repellent, preferably containing DEET.

5.9.2 Wasps and bees

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

Wasps and bees inject a venomous fluid under the skin when they sting. The venom causes a painful swelling that may last for several days. If the stinger is still present, carefully remove it with tweezers. Some people may develop an allergic reaction (i.e. anaphylatic shock) to a wasp or bee sting. If such a reaction develops, **seek medical attention at once**.

5.10 Sun exposure

Employees are encouraged to liberally apply sunscreen, with a minimum sun protection factor (SPF) of 15, when working outdoors to avoid sunburn and potential skin cancer, which is associated with excessive sun exposure to unprotected skin. Additionally, employees should wear safety glasses that offer protection from UVA/UVB rays.

5.11 Thermal stress

This investigative program is scheduled to begin in September and extend into the late fall. As such, the hazards of both heat and cold stress are addressed in this HASP.

5.11.1 Heat stress

Types of heat stress

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

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

Early symptoms of heat-related health problems:

- decline in task performance
- excessive fatigue
- incoordination
- reduced vigilance
- decline in alertness
- muscle cramps
- unsteady walk
- dizziness

Susceptibility to heat Stress Increases due to:

- lack of physical fitness
- obesity
- lack of acclimation
- drug or alcohol use
- increased age
- sunburn

- dehydration
- infection

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

The effect of personal protective equipment

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

Measures to avoid heat stress

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

- Establish work-rest cycles (short and frequent are more beneficial than long and seldom).
- Identify a shaded, cool rest area.
- Rotate personnel, alternative job functions.
- Water intake should be equal to the sweat produced. Most workers exposed to hot conditions drink fewer fluids than needed because of an insufficient thirst. DO NOT DEPEND ON THIRST TO SIGNAL WHEN AND HOW MUCH TO DRINK. For an 8-hour workday, 50 ounces of fluids should be drunk.
- Eat lightly salted foods or drink salted drinks such as Gatorade to replace lost salt.
- Save most strenuous tasks for non-peak heat hours such as the early morning or at night.
- Avoid alcohol during prolonged periods of heat. Alcohol will cause additional dehydration.
- Avoid double shifts and/or overtime.

The implementation and enforcement of the above mentioned measures will be the joint responsibility of the project manager, onsite field coordinator, and health and safety officer. Potable water and fruit juices should be made available each day for the field team.

Heat stress monitoring techniques

Site personnel should regularly monitor their heart rate as an indicator of heat strain by the following method: Check radial pulse rates by using fore-and middle fingers and applying light pressure to the pulse in the wrist for one minute at the beginning of each rest cycle. If the pulse rate exceeds 110 beat/minute, shorten the next work cycle by one-third and keep the rest period the same. If, after the next rest period, the pulse rate still exceeds 110 beats/minute, shorten the work cycle by one-third.
Cold Stress

Types of cold stress

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

The likelihood of developing frostbite occurs when the face or extremities are exposed to a cold wind in addition to cold temperatures. The freezing point of the skin is about 30^{o} F. When fluids around the cells of

the body tissue freeze, skin turns white. This freezing is due to exposure to extremely low temperatures. As wind velocity increases, heat loss is greater and frostbite will occur more rapidly.

Symptoms of cold stress

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

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

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

Methods to prevent cold stress

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

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

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

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

5.12 Inclement weather

As work continues through the late summer and fall, it is important to have a response plan in place that dictates what actions AECOM employees will take in the event of severe weather, specifically severe thunderstorms.

When a severe thunderstorm is coming, employees will only have a short amount of time to make important decisions. AECOM employees do not have access to consistent and current news information via the television or radio when working in the field. To ensure that onsite staff is alerted to the onset of severe

weather, the project team will be issued a battery-operated National Oceanic and Atmospheric Administration (NOAA) weather radio. The radio will be equipped with an alarm that will automatically broadcast any pertinent information from NOAA's National Weather Service.

Via the radio, the field technician will be aware of any severe thunderstorm watches or warnings that have been issued for their work area by the National Weather Service. It is important for field team members to understand the difference between a "watch" and a "warning".

If a severe thunderstorm ***watch*** is issued for your work or travel area, it means that a severe thunderstorm is ***possible***. If a severe thunderstorm ***warning*** is issued, it means that ***a severe thunderstorm has actually been spotted or is strongly indicated on radar and it is time to seek safe shelter immediately***.

Weather broadcasts are typically issued for specific counties, not individual towns. It is important for all field team members to know what county they are performing survey work. Additionally, employees should become familiar with the names of the counties through which they must travel when mobilizing/demobilizing from their assigned work location, in the event that a broadcast is issued for those counties.

If a ***severe thunderstorm watch*** is issued, employees must remain alert for approaching storms and review the procedures for seeking refuge in the event that a warning is issued. If a ***severe thunderstorm warning*** is issued, AECOM employees will take the following measures:

- If you hear thunder, you are close enough to a storm to be struck by lightning.
- Cease all work and seek shelter, either a sturdy building or car, immediately.
- Do not take shelter in small sheds, under isolated tress or in convertible automobiles.
- Avoid trees as they are targets for lightning.
- If in a car, keep the windows up.

If you are caught outside during a thunderstorm and no shelter is available, find a low spot away from trees, fences and poles. Squat low to the ground on the balls of your feet; place your hands on your knees with head between them. Make yourself the smallest target possible and minimize your contact with the ground.

6.0 Air monitoring

6.1 Direct reading instrumentation

Instrument 1 - RaeSystems Mini-Rae 2000 PID with a 10.6 ev lamp

A RaeSystems Mini-Rae 2000 PID (or similar) with a 10.6 ev lamp or equivalent will be used to monitor the breathing zone of personnel during all activities. When the PID indicates sustained (15 minute) breathing zone vapor concentrations in excess of 1 ppm, respiratory protection, as described in Section 7.2 of this document, will be donned. This action level is based on the PEL of benzene and its reported response to the selected instrumentation.

6.2 Personal air sampling

Personal air sampling will not be conducted by AECOM during the activities covered by this HASP.

6.3 Calibration and recordkeeping

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

6.4 Community Air Monitoring Plan

AECOM has incorporated the generic requirements of New York State Department of Health (NYSDOH) Community Air Monitoring Plan (CAMP) within the remedial design (RD) work plan. All the requirements of the CAMP will be implemented by AECOM during the proposed investigations.

7.0 Personal protective equipment

PPE will be worn during these activities to prevent onsite personnel from being injured by the safety hazards posed by the site and/or the activities being performed. In addition, chemical protective clothing will be worn to prevent direct dermal contact with the site's chemical contaminants. The following table describes the PPE and chemical protective clothing to be worn for general site activities and for certain specific tasks.

7.1 Chemical protective clothing

PPE Item	Install Soil Borings and Monitoring Wells	Collect Soil Samples from Borings	Develop, gauge and sample existing and newly installed wells
Hard Hat	✓	✓	✓
Steel Toed Safety Shoes	✓	✓	✓
Safety Glasses with Sideshields	✓	✓	✓
ANSI-approved Class II Traffic Vest	✓	✓	✓
Nitrile gloves		✓	✓
Kevlar gloves	When handling drill tools		When cutting tubing
Hearing Protection	✓	If machinery is still operating	

7.2 Respiratory protection

7.2.1 General site work

If the PID indicates sustained (15 minute) breathing zone VOC concentrations in excess of 1 ppm or more, Level C respiratory protection will be donned.

Level C specification: Half-mask air-purifying respirator with organic vapor cartridges.

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

7.3 Other safety equipment

The following additional safety items should be available at the site:

- Portable, hand-held eyewash bottles
- First aid kit
- Type A-B-C fire extinguisher (located on machinery)
- Portable phones

8.0 Site control/decontamination

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

8.1 Designation of zones

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

- Exclusion or "Hot" Zone
- Contamination Reduction Zone (CRZ)
- Support Zone

8.1.1 Exclusion zone

Access to the work area is accessible to the public. Therefore formal exclusion zones must be established around each work area. Zones can be demarcated with traffic cones and tape or traffic barriers to prevent members of the general public from entering an active work area.

If an excavation must be left open, its perimeter must be marked with "Caution-Open Test Pit" tape or surrounded with barricade fencing. The tape and fencing must be capable of withstanding current weather conditions and be highly visible to prevent accidental entry into the excavation.

All personnel entering the active work areas must be trained in accordance with the requirements defined in Section 10.2 of this HASP and must wear the prescribed level of personal protective equipment.

8.1.2 Contamination reduction zone

A mini-decontamination zone will be established adjacent to each work area. Personnel will remove contaminated gloves and other disposable items in this area and place them in a plastic bag until they can be properly disposed of. Further information regarding the decontamination of field equipment and machinery is addressed in Section 9.0.

8.1.3 Support zone

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

8.2 General site safety practices

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

The Buddy System will be used at all times by field personnel at the Site. No one is to perform fieldwork alone unless approved by the office Health and Safety Coordinator and/or the PM. The Buddy System includes maintaining visual, voice, and/or radio communication at all times.

- Eating, drinking, chewing gum or tobacco, smoking or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials is prohibited in the immediate work area and the decontamination zone.

- Smoking is prohibited in all work areas. Matches and lighters are not allowed in these areas.
- Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking or any other activities.
- The use of alcohol or illicit drugs is prohibited during the conduct of field operations.
- All equipment must be decontaminated or properly discarded before leaving the site in accordance with the project work plan.

8.3 Tobacco free work site

This facility is a tobacco-free work site. As such, employees will only be permitted to smoke or chew tobacco inside their vehicles.

8.4 Weapons-free site

Possessing firearms or unauthorized weapons on the project premises is expressly prohibited. Therefore, all AECOM employees, sub-contractors and their employees must ensure that they do not bring weapons onto the project premises (including in cars). Weapons include but are not limited to guns, knives and explosives, but exclude knives that are used as tools and that are required for project work.

9.0 Decontamination

9.1 Equipment decontamination

A temporary decontamination area lined with polyethylene sheeting will be constructed on site for use during the decontamination of the drilling rig and test pitting equipment. All drilling equipment including augers, bits, rods, tools, split-spoon samplers and tremie pipes will be cleaned with a high-pressure hot water pressure washing unit before beginning work. All augers, rods and tools will be decontaminated between each drilling location as described above. The back of the rig and equipment will be decontaminated at the completion of the work and prior to leaving the site.

9.2 Sampling tool decontamination

Prior to sampling, all non-dedicated sampling equipment will be washed with potable water and a phosphate-free detergent. 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 sheeting or aluminum foil, if necessary. Equipment will be wrapped in polyethylene or aluminum foil for storage or transportation from the designated decontamination area to the sampling location.

9.3 Personal decontamination

Proper decontamination is required of all personnel before leaving the exclusion zone. Decontamination will occur within the contamination reduction zone. Disposable PPE, such as gloves, will be removed in the decontamination reduction zone and placed in garbage bags for disposal as general refuse.

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

9.4 Management of investigation-derived wastes

Investigation-derived wastes (IDW) will include decontamination fluids, drill cuttings, development and purge water, PPE and dedicated sampling equipment. Decontamination fluids, drill cuttings and development and purge water will be placed in 55-gallon drums and labeled as “pending analysis – investigation-derived residuals” and placed in a plastic-lined containment area pending characterization and proper disposal. PPE and dedicated sampling equipment will be placed in 55-gallon drums for disposal. All IDW will be placed within a fenced and locked area within OU1 of the site.

10.0 Medical monitoring and training requirements

10.1 Medical monitoring

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

10.2 Health and safety training

10.2.1 HAZWOPER

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

10.2.2 First aid and CPR

At least one member of the AECOM field team must be currently trained to provide First aid and CPR.

10.2.3 Pre-entry briefing

Prior to the commencement of onsite activities, a pre-entry briefing will be conducted by the SSO to review the specific requirements of this HASP. Attendance of the pre-entry meeting is mandatory for all personnel covered by this HASP and must be documented on the attendance form provided in Attachment C. HASP sign-off sheets should also be collected at the time of the pre-entry briefing. All documentation should be maintained in the project file.

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

- Discussion of site history;
- Discussion of work scope;
- Review of the potential hazards associated with contaminants of concern and how these potential hazards will be controlled;
- Review of air monitoring requirements and action limits;
- Review of PPE and engineering control requirements;
- Discussion of the potential physical hazards associated with implementing scope of work;
- Review of emergency egress and hospital location/directions; and
- Review of decontamination procedures.

10.3 Daily safety meetings

Daily meetings will also be held by the SSO to ensure that all workers are prepared for and knowledgeable of that day's scope of work. Safety concerns will also be discussed at these meetings. All AECOM and contractor field employees must be present and sign the attendance sheet.

Any JSAs that were prepared due to a change in work procedure and/or the identification of a new hazard will be discussed during the daily safety meetings.

11.0 Emergency response

OSHA defines emergency response as any "response effort by employees from outside the immediate release area or by other designated responders (i.e., mutual-aid groups, local fire departments, etc.) to an occurrence which results, or is likely to result in an uncontrolled release of a hazardous substance". According to AECOM policy, AECOM personnel shall not participate in any emergency response where there are potential safety or health hazards (i.e., fire, explosion, or chemical exposure). AECOM response actions will be limited to evacuation and medical/first aid as described within this section below. As such this section is written to comply with the requirements of 29 CFR 1910.38 (a).

The basic elements of an emergency evacuation plan include:

- Employee training;
- Alarm systems;
- Escape routes;
- Escape procedures;
- Critical operations or equipment;
- Rescue and medical duty assignments;
- Designation of responsible parties;
- Emergency reporting procedures; and
- Methods to account for all employees after evacuation.

11.1 Employee training

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

11.2 Alarm system/emergency signals

11.2.1 Immediate work area

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

Verbal communications will be adequate to warn employees of hazards associated with the immediate work area. The areas where the investigations are taking place are currently vacant. Therefore, AECOM will bring a portable phone to the site to ensure that communications with the NYSEG operating center and local emergency responders is maintained, when necessary.

11.3 Escape routes and procedures

The escape route from the parcels that comprise the Ithaca Court Street MGP site will consist of leaving the site via the public roadways. The escape routes and assembly areas will be reviewed during the pre-entry briefing. All personnel on site are responsible for knowing the escape route from the site and where to assemble after evacuation. In case of an emergency, all personnel will be directed to meet at the gate of the OU1 site.

11.4 Rescue and medical duty assignments

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

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

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

11.5 Designation of responsible parties

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

11.6 Employee accounting method

The SSO is responsible for identifying all AECOM personnel onsite at all times. On small, short duration jobs this can be done informally as long as accurate accounting is possible.

11.6.1 Near Miss

A *Near Miss Incident* is defined as any undesired event that, under slightly different circumstances (e.g., timing, distance, chance, etc.) could have resulted in personal harm, property damage, an environmental release or any undesired loss of resources. In other words, a *Near Miss Incident* is a situation in which an accident almost occurred. The purpose of reporting, and following up on, Near Miss Incidents is the same as that for incidents that result in injuries, illnesses, property damage or environmental releases: to prevent their reoccurrence. By reporting and following up on Near Miss Incidents, thereby theoretically reducing their frequency, corporations can reduce the frequency of more serious accidents and incidents. All Near Miss Incidents be reported as soon as possible after their occurrence using the process described below.

11.6.2 HSE observation

Situations in which a hazard is identified and corrected before an incident occurs do not necessarily meet the definition of a *Near Miss Incident* and are referred to as *HSE (Health Safety and Environmental) Observations*. Reporting and following up on *HSE Observations* can also provide opportunities for learning and improvement in the same manner as reporting and following up on *Near Miss Incidents*. Therefore, all HSE observations will also be reported.

To facilitate reporting during this project, Near Miss and HSE Observation report pads have been created. Pads will be handed out to field staff during the project kick-off meeting. All reports will be submitted to the PM and RHSM for review and discussion during the follow day's safety meeting.

11.7 Accident reporting and investigation

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

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

Emergency Reference Sheet

EMERGENCY REFERENCES

Ambulance:	911
Fire:	911
Police:	911
NYSDEC Spill Hotline	800-457-7362
Medical Services:	**(607) 274-4321**
	Cayuga Medical Center
	101 Dates Drive – Ithaca, NY

1:	Start South on N. PLAIN ST.	440 ft
2:	Turn RIGHT onto BUFFALO ST.	0.6 mi
3:	Continue on CLIFF ST./NY-96	2.2 mi
4:	Turn RIGHT on DATES DR.	259 ft
5:	Turn LEFT to stay on DATES DR.	0.4 mi
6:	Slight RIGHT on DATES DR.	0.3 mi

10: End at 101 Dates Drive Ithaca, NY 14850

Estimated Time: 9 minutes

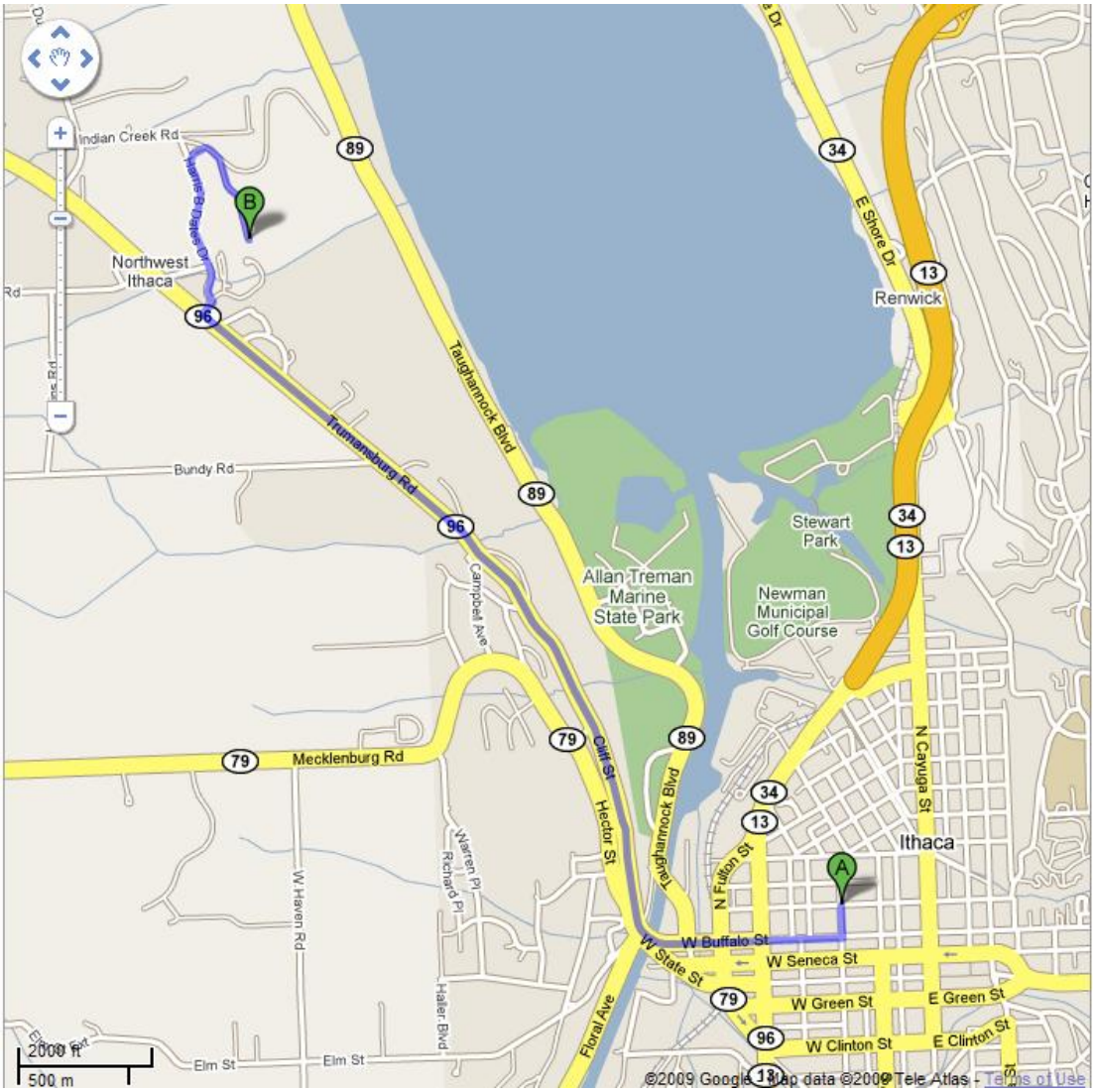
Estimated Distance: 3.7 miles

On Site Telephone:	Property is unoccupied. Bring portable communications.
Underground Utility Location Service:	800-962-7962

AECOM Project Representatives:

AECOM/Ithaca, NY -Michael Grasso (RHSM)	607-277-5716
AECOM/Latham, NY -Scott Underhill (PM)	607-277-5716
AECOM/Rocky Hill, CT -Lucas Hellerich (Consultant)	860-263-5800

Map and Directions from Site to Cayuga Medical Center
101 Dates Drive – Ithaca



Attachment A

Health and Safety Plan Receipt and Acceptance Form

Health and Safety Plan Receipt and Acceptance Form

Pre-Design Investigation

Ithaca Court Street Former Manufactured Gas Plant Site

Ithaca, New York

I have received a copy of the Health and Safety Plan prepared for the above referenced site, I have read and understand its content and I agree that I will abide by its requirements.

Name	Signature	Company	Date

Attachment B

Job Safety Analysis Forms

Job Safety Analysis
Driver Safety

JSA Type: ☐ Monitoring ☒ Transport ☐ Office ☐ Construction	☒ New ☐ Revised	Date: 6/1/2011
Work Type: Driving - Personal, Rental or Company Vehicles	Work Activity: Travel to and from site location.	

Personal Protective Equipment (PPE):

☒ First Aid Kit ☐ Hearing Protection ☐ Air Purifying Respirator ☐ Gloves _____
☐ Face Shields ☐ Hard Hat ☐ Welding/Pipe Clothing ☒ Other Sunglasses, Safety Belts
☐ Safety Glasses ☐ Safety Shoes ☐ Welding Mask/Goggles ☐ Other _____
☐ Lifeline/Body Harness ☐ Supplied Respirator ☐ Life Vest

Development Team	Position/Title	Reviewed By	Position/Title	Date
Keith Stahle	SSO			

Processing

☒ OE process and tenants used during the development of this JSA

☒ JSA reviewed at least daily and modified and reissued as needed.

☒ All workers reminded of the Stop Work Authority

❶ Job Steps	❷ Potential Hazard	❸ Critical Actions
PRE-TRIP - Review JSA in vehicle	Consider worst case outcome of vehicle operation (blowout, breakdown, collision, injury or death, lost on journey)	Assess the potential hazards to performing this task. Analyze how to reduce the risks. Act to ensure safe operation of the vehicle. Review directions to planned location.
Perform perimeter walk around of vehicle for damage or unusual conditions.	Low air pressure, flat tire, blowout, impaired vision, collision, injury or death, vehicle is not adequate for trip.	Assure tires are properly inflated and there is sufficient tread (including spare). Assure there are no cuts or bulges in the sidewalls, all wheels/rims are in good condition. Assure windshield and window glass is clean and free from obstructions. Lift wiper arms and check wiper blades for damage or deterioration. Check to see that all lights work. Check for fluid leaks under vehicle. Check behind vehicle for obstructions.
Check and adjust seat steering wheel and headrest, mirrors. Check to see that headlamps turn signals, backup lights, hazard lights are working properly, washer/wipers.	Back or body strain. Blind spots. Inability to signal intentions, other vehicles cannot see you. Streaking windshield, impaired vision.	Adjust seat, steering wheel height and headrest so body is fully supported, upper arms close to body, pedals within easy reach. Lower steering wheel so hands are below shoulders and shoulders are relaxed. Check mirror adjustments each time vehicle is re-started. Test operations of headlights, front and rear turn signals, backup lights. Locate and test operation of headlamp, wiper and washer switches. Check oil, radiator, brake and washer fluid levels.
Fasten seat belts. Make sure passenger air bag is turned on.	Increased risk of more serious injury or death in collision. Ejection from vehicle in collision.	Assure seat belt is in good condition and fastened. Assure all passenger seat belts are in good condition, fastened and working. Turn on passenger air bag if necessary.
Lock doors.	Ejection from vehicle in collision. Unwanted intrusion.	Manually lock all doors to vehicle.
Start engine.	Unexpected movement.	Assure that transmission is in 'Park' and that parking brake is set. Ensure foot is on brake.
Check gauges and warning lights while engine is warming up.	Overheated engine or breakdown due to lack of critical fluids. Brake failure. Stranding.	Assure there is sufficient gas, oil, and other critical fluids, by checking warning lights and previously checking fluid reservoirs. Turn on headlights.
Slowly pull out of parking space.	Collision with other vehicles, pedestrians, or stationary objects.	Release parking brake. Check mirrors and over shoulder in all directions prior to slowly pulling out of parking space. Signal if parallel parked along a street.

DURING TRIP - Keep your eyes moving.	Collision, injury or death to occupants or other parties.	DRIVE DEFENSIVELY. Move eyes at least every 2 seconds. Scan major and minor intersections before entry (left-right-left). Check mirrors when slowing or stopping vehicle. Scan mirrors frequently, at least one mirror every 5-8 seconds. Avoid staring while evaluating road conditions. Do not use cell phones or perform other distraction activities while car is in motion. If necessary, pull off the roadway and park prior to performing other activities.
Aim high in steering.	Collision, injury or death to occupants or other parties.	Maintain 15 second eye lead time (1 1/2 blocks in city traffic, 1/4 mile in highway traffic). Assess information from distant objects (i.e., flashers on?). Adjust eye lead distance to speed.
Leave yourself an out.	Collision, injury or death to occupants or other parties.	Maintain safety cushion around vehicle (front, sides, rear). Adjust vehicle space and speed to avoid unsafe intrusion by other drivers. At signal controlled intersections, stop 10 ft. behind crosswalk or other vehicle. At stop sign controlled intersections, approach stop sign cautiously and ascertain if cross traffic has to stop. Stop at or just behind limit line or crosswalk. When stopped, allow vehicle in front to move for 2 seconds before accelerating. Observe approaching merge areas and choose lane of least resistance. Cede right of way and allow other vehicles to merge, change lanes, make turns, etc.
Get the big picture.	Collision, injury or death to occupants or other parties.	Avoid being unnecessarily boxed in. Avoid sudden acceleration and deceleration. Maintain a minimum of 4 second following distance, adjust speed to traffic conditions, scan immediate and adjacent lanes before merging.
Make sure they see you.	Collision, injury or death to occupants or other parties.	Seek eye contact with other drivers or pedestrians. Cover or use horn when conditions warrant. Before changing lanes, signal well in advance, check mirrors and over shoulder, and allow adequate space before changing lanes. Break early to activate brake lights. Stay out of other vehicle blind spots. Gently sound horn or flash lights if unsure other driver or pedestrian sees you. Turn on headlamps in high traffic areas, at dusk, and in inclement weather.
Backing up.	Collision, injury or death to occupants or other parties.	Make all backing maneuvers slowly and cautiously. Check mirrors and over shoulders. When parking, look for pull-through parking space away from traffic to avoid backing out of a parking space. Use a spotter when backing up.
Parking.	Collision, injury or death to occupants or other parties.	Park away from other cars and traffic. Back into parking spot when possible and safe. Use drive through spaces when available. Maintain cushion of safety from fixed objects. Set parking brake.
POST-TRIP - Report maintenance or mechanical problems upon returning vehicle.	Conditions worsen leading to mechanical failure resulting in accident, injury or death.	Report vehicle problems immediately to company representative or rental car agency.

Job Safety Analysis
Direct Push Drilling

JSA Type: ☒ Investigation ☐ Transport ☐ Office ☐ Construction	☒ New ☐ Revised	Date: 6/1/2011
Work Type: Sampling: Geoprobe/Hydropunch	Work Activity: **Direct Push Drilling**	

Personal Protective Equipment (PPE):

☒ First Aid Kit	☐ Hearing Protection	☐ Air Purifying Respirator	☒ Gloves: Nitrile
☐ Face Shields	☒ Hard Hat	☐ Welding/Pipe Clothing	☒ Other: Sunscreen, Bug repellant
☒ Safety Glasses	☒ Safety Shoes	☐ Welding Mask/Goggles	☒ Other: Leather Work Gloves
☐ Lifeline/Body Harness	☐ Supplied Respirator	☐ Life Vest	☒ Other: Snake Chaps

Development Team	Position/Title	Reviewed By	Position/Title	Date
Keith Stahle	SSO			

Processing

Tenets of Operational Excellence used during the development of this JSA

☐ Always operate within design or environmental limits.
☒ Always operate in a safe and controlled condition.
☐ Always ensure safety devices are in place and functioning.
☒ Always follow safe work practices and procedures.
☐ Always meet or exceed customers' requirements.
☐ Always maintain integrity of dedicated systems.
☐ Always comply with all applicable rules and regulations.
☒ Always address abnormal conditions.
☐ Always follow written procedures for high risk or unusual situations.
☐ Always involve the right people in decisions that affect procedures and equipment.

☒ Safe Performance Self Assessment (SPSA) performed for all job tasks.

☒ JSA reviewed at least daily and modified and reissued as needed.

☒ All workers reminded of the Stop Work Authority Process

❶ Job Steps	❷ Potential Hazard	❸ Critical Actions	❹ Personnel Responsible for Actions
Check the weather.	Unexpected storm – lightning, rain, snow (slip hazard), wind.	Check local weather forecast, have a weather radio for remote sites, observation and communication among team members. Discuss weather issues during tailgate safety meeting. At the first sign of lightning, thunder or strong winds, immediately move away and take shelter. Do not resume work until 30 minutes have passed without signs of storm.	SSO and Field Team
	Heat and cold stress.	Know the symptoms of heat and/or cold stress, and the potential for their occurrence based on expected weather conditions. Take precautions to avoid them. Refer to the HASP or ask your supervisor if you have questions.	
Mobilize with equipment and supplies for sampling.	Vehicle accident.	Follow safe driving procedures (refer to driving JSA). Always use the buddy system when moving vehicles. Plan your travel path ahead of time using a Journey Management Plan. Use maps and known construction zones to make your selection. Consult with the other team members before making any changes to travel path.	Vehicle Driver and passengers
	Incidents caused by use of improper equipment/tools.	Use an equipment checklist to verify you have the appropriate equipment/tools for your tasks. Consult appropriate JSAs or SOPs.	

	Injuries caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.	
	Damage to equipment/tools and/or accidents with loose objects.	Stow all materials in vehicle properly, use appropriate cases and bags. Secure equipment in bed of truck with netting or straps. Do not leave any equipment loose in the cab or bed or the truck. It can cause property damage or serious injuries to others or yourself by falling-off from vehicle.	
	Fixed facilities	When parked near a fixed facility (building, monitoring well, bollards, etc…) evaluate and plan route prior to mobilization. Use the buddy system when backing-up vehicle.	
Conduct tailgate safety meeting and site walk (reconnaissance).	Biologic hazards such as insects, poison ivy, spiders, and snakes.	Check immediate area for potential hazards such as poison ivy, spiders, wasps, snakes, etc. Use bug repellent and sunscreen as necessary. Use snake chaps or shin guards. Use a bar to clear out objects and/or vegetation from spiders and/or snakes (do not use your hands or feet).	SSO and Field Team
	Damage to equipment or vehicles due to surface/subsurface obstructions. and Slips, trips, falls.	Inspect area before driving and/or walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. Contact site manager immediately and do not proceed if any conditions are observed that could make driving/walk in the area unsafe and that cannot be fixed with the equipment or personnel onsite.	
	Dehydration.	Use this opportunity to begin hydrating yourself. Being thirsty is a sign of dehydration (warning you that you are already dehydrated).	
Driving and/or walking to drilling locations.	Damage to equipment or vehicles due to surface/subsurface obstructions. and Slips, trips, falls.	Inspect area before driving and/or walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. Contact site manager immediately and do not proceed if any conditions are observed that could make driving/walking in the area unsafe and that cannot be fixed with the equipment or personnel onsite.	Field Team
	Fixed facilities	When parked near a fixed facility (building, monitoring well, bollards, etc…) evaluate and plan route prior to mobilization. Use the buddy system when backing-up vehicle.	
Setting up equipment.	Pinch points.	Use SPSA to help identify pinch points before beginning any task. If possible, use hand safety stickers to remind everyone that may come into contact with the equipment where pinch points are located.	Field Team
	Biological hazards.	Check immediate area for potential hazards such as poison ivy, spiders, wasps, snakes, etc. Use bug repellent and sunscreen as necessary. Use snake chaps or shin guards. Use a bar to clear out objects and/or vegetation from spiders and/or snakes (do not use your hands or feet).	
	Cuts/lacerations.	Use leather gloves over your nitrile gloves when handling equipment to prevent hand slipping.	

	Sharp materials.	Wear leather gloves to avoid sharp edges. Use the proper hand tools that are ergonomically designed with safety guards in place as appropriate.	
	Injuries caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.	
	Striking others.	Before picking up tools, look around and ensure proper clearance. Identify and communicate to other workers within striking distance.	
	Mechanical failure.	Inspect all hydraulic hoses and lines for cracks, bulges, and general wear and tear. Do not use the machine if any of this is identified. Notify your supervisor and repair or replace the part before use.	
Advancing split spoon or continuous sampler.	Contaminants.	Always wear nitrile gloves when handling equipment that comes into contact with potential contaminants. Double glove if you know you are prone to glove breakage.	Field Team
	Pinch points.	Use SPSA to help identify pinch points before beginning any task. If possible, use hand safety stickers to remind everyone that may come into contact with the equipment where pinch points are located.	
	Injuries caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.	
	Mechanical failure.	Inspect all hydraulic hoses and lines for cracks, bulges, and general wear and tear. Do not use the machine if any of this is identified. Notify your supervisor and repair or replace the part before use.	
	Dust.	Dust particles may become airborne during activity. If dust becomes excessive, use a dust mask.	
	Sharp materials.	Wear leather gloves to avoid sharp edges. Use the proper hand tools that are ergonomically designed with safety guards in place as appropriate.	
	Slips, trips, and falls.	Inspect area before walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. Contact site manager immediately and do not proceed if any conditions are observed that could make walking in the area unsafe and that cannot be fixed with the equipment or personnel onsite.	
	Spark hazard or electric shock.	When advancing the split spoon, be aware that friction against certain materials could cause sparks. Wear appropriate PPE to	

		minimize potential skin exposure.	
	Handling equipment.	Be familiar with all equipment before use. Use good care of all equipment, do not drop or shake it. Use security tethers when available.	
Retracting split spoon or continuous sampler.	Contaminants.	Always wear nitrile gloves when handling equipment. Double glove if you know you are prone to glove breakage.	Field Team
	Pinch points.	Use SPSA to help identify pinch points before beginning any task. If possible, use hand safety stickers to remind everyone that may come into contact with the equipment where pinch points are located.	
	Injuries caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.	
	Mechanical failure.	Inspect all hydraulic hoses and lines for cracks, bulges, and general wear and tear. Do not use the machine if any of this is identified. Notify your supervisor and repair or replace the part before use.	
	Dust.	Dust particles may become airborne during activity. If dust becomes excessive, use a dust mask.	
	Sharp materials.	Wear leather gloves to avoid sharp edges. Use the proper hand tools that are ergonomically designed with safety guards in place as appropriate.	
	Slips, trips, and falls.	Inspect area before walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. Contact site manager immediately and do not proceed if any conditions are observed that could make walking in the area unsafe and that cannot be fixed with the equipment or personnel onsite.	
	Spark hazard or electric shock.	When advancing the split spoon, be aware that friction against certain materials could cause sparks. Wear appropriate PPE to minimize potential skin exposure.	
	Handling equipment.	Be familiar with all equipment before use. Use good care of all equipment, do not drop or shake it. Use security tethers when available.	

Opening split spoon and/or removing acetate liner.	Flying “cutting shoe” from split spoon	Backpressure can be present within the split spoon tool and expel the “cutting shoe” (split spoon cap) if unscrewed quickly. Caution should be taken, slow and small turns are necessary. If resistance is observed when unscrewing the cap, worker must leave some of the threading left so that the soil can expand and release some of the backpressure. A tool (spoon) can be used to remove some of the soil from the end of the split spoon so that any remaining backpressure can be released.	Field Team
	Sharp materials.	Wear leather gloves to avoid sharp edges. Use the proper hand tools that are ergonomically designed with safety guards in place as appropriate.	
	Pinch points.	Use SPSA to help identify pinch points before beginning any task. If possible, use hand safety stickers to remind everyone that may come into contact with the equipment where pinch points are located.	
	Injuries caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.	
	Slips, trips, and falls.	Inspect area before walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. Contact site manager immediately and do not proceed if any conditions are observed that could make walking in the area unsafe and that cannot be fixed with the equipment or personnel onsite.	
	Handling equipment.	Be familiar with all equipment before use. Use good care of all equipment, do not drop or shake it. Use security tethers when available.	
	Contaminants.	Always wear nitrile gloves when handling equipment. Double glove if you know you are prone to glove breakage.	
	Cuts/lacerations.	Use leather gloves over your nitrile gloves when handling equipment to prevent hand slipping.	
	Hand/back strain.	Use an appropriate tool to pull the acetate liner out of the sleeve. Ask for assistance if you cannot move the liner without bracing yourself and pulling with your back rather than your arms.	

Decontaminating equipment.	Contaminants.	Always wear nitrile gloves when handling equipment. Double glove if you know you are prone to glove breakage.	Field Team
	Cuts or lacerations.	Use the proper hand tools that are ergonomically designed with safety guards in place as appropriate.	
	Injuries caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.	
	Cross Contamination.	Triple rinse using distilled or deionized water and alconox for first rinse and distilled or deionized water for second and third rinses. Always clean materials between locations and at the site. Do not bring equipment back to the office without proper decontamination.	
Adding rod to split spoon.	Contaminants.	Always wear nitrile gloves when handling equipment that comes into contact with potential contaminants. Double glove if you know you are prone to glove breakage.	Field Team
	Pinch points.	Use SPSA to help identify pinch points before beginning any task. If possible, use hand safety stickers to remind everyone that may come into contact with the equipment where pinch points are located.	
	Injuries caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.	
	Mechanical failure.	Inspect all hydraulic hoses and lines for cracks, bulges, and general wear and tear. Do not use the machine if any of this is identified. Notify your supervisor and repair or replace the part before use.	
	Dust.	Dust particles may become airborne during activity. If dust becomes excessive, use a dust mask.	
	Sharp materials.	Wear leather gloves to avoid sharp edges. Use the proper hand tools that are ergonomically designed with safety guards in place as appropriate.	
	Slips, trips, and falls.	Inspect area before walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. Contact site manager immediately and do not proceed if any conditions are observed that could make walking in the area unsafe and that cannot be fixed with the equipment or personnel onsite.	
	Spark hazard or electric shock.	When advancing the split spoon, be aware that friction against certain materials could cause sparks. Wear appropriate PPE to minimize potential skin exposure.	
		Be familiar with all equipment before use. Use good care of all	

	Handling equipment.	equipment, do not drop or shake it. Use security tethers when available.	
Breakdown of equipment.	Contaminants.	Always wear nitrile gloves when handling equipment. Double glove if you know you are prone to glove breakage.	Field Team
	Cuts and lacerations.	Use leather gloves over your nitrile gloves to breakdown equipment to help grip and prevent cuts or slips on the equipment.	
	Pinch points	When disconnecting equipment, be aware that it may be difficult to twist. When possible, ask for assistance. Wear leather gloves to help protect your hands.	
	Striking others.	Before disassembling tools, look around and ensure proper clearance. Identify and communicate to other workers within striking distance.	
Secure equipment in vehicle.	Damage to equipment/tools and/or accidents with loose objects.	Stow all materials in vehicle properly, use appropriate cases and bags. Secure equipment in bed of truck with netting or straps. Do not leave any equipment loose in the cab or bed or the truck. It can cause property damage or serious injuries to others or yourself by falling-off from vehicle.	Vehicle Driver and Field Team
	Pinch points.	When securing equipment, watch for pinch points. Straps and netting can get caught on objects and snap back as well as trap a finger if hand placement is not correct. Use a buddy to help secure equipment when possible.	
Demobilize from site.	Vehicle accident.	Follow safe driving procedures (refer to driving JSA). Always use the buddy system when moving vehicles. Plan your travel path ahead of time using a Journey Management Plan. Use maps and known construction zones to make your selection. Consult with the other team members before making any changes to travel path.	Vehicle Driver and Passengers
	Fixed facilities	When parked near a fixed facility (building, monitoring well, bollards, etc…) evaluate and plan route prior to mobilization. Use the buddy system when backing-up vehicle.	

Job Safety Analysis
Hollow Stem Auger Drilling

JSA Type: ☒ Investigation ☐ Transport ☐ Office ☐ Construction	☒ New ☐ Revised	Date 6/1/2011
Work Type: Sampling	Work Activity: **Hollow Stem Auger Drilling**	

Personal Protective Equipment (PPE):

☒ First Aid Kit	☒ Hearing Protection	☐ Air Purifying Respirator	☒ Gloves Nitrile
☐ Face Shields	☒ Hard Hat	☐ Welding/Pipe Clothing	☒ Other Sunscreen, Bug repellant
☒ Safety Glasses	☒ Safety Shoes	☐ Welding Mask/Goggles	☒ Other Leather Work Gloves
☐ Lifeline/Body Harness	☐ Supplied Respirator	☐ Life Vest	

Development Team	Position/Title	Reviewed By	Position/Title	Date
Keith Stahle	SSO			

Processing

Tenets of Operational Excellence used during the development of this JSA

☐ Always operate within design or environmental limits.
☒ Always operate in a safe and controlled condition.
☒ Always ensure safety devices are in place and functioning.
☒ Always follow safe work practices and procedures.
☐ Always meet or exceed customers' requirements.
☐ Always maintain integrity of dedicated systems.
☐ Always comply with all applicable rules and regulations.
☒ Always address abnormal conditions.
☐ Always follow written procedures for high risk or unusual situations.
☐ Always involve the right people in decisions that affect procedures and equipment.

☒ Safe Performance Self Assessment (SPSA) performed for all job tasks.

☒ JSA reviewed at least daily and modified and reissued as needed.

☒ All workers reminded of the Stop Work Authority Process

❶ Job Steps	❷ Potential Hazard	❸ Critical Actions	❹ Personnel Responsible for Actions
Check the weather.	Unexpected storm – lightning, rain, snow (slip hazard), wind.	Check local weather forecast, have a weather radio for remote sites, observation and communication among team members. Discuss weather issues during tailgate safety meeting. At the first sign of lightning, thunder or strong winds, immediately move away and take shelter. Do not resume work until 30 minutes have passed without signs of storm.	SSO and Field Team
	Heat and cold stress.	Know the symptoms of heat and/or cold stress, and the potential for their occurrence based on expected weather conditions. Take precautions to avoid them. Refer to the HASP or ask your supervisor if you have questions.	
Mobilize with equipment and supplies for sampling.	Vehicle collision.	Follow safe driving procedures (refer to driving JSA). Always use the buddy system when moving vehicles. Plan your travel path ahead of time. Use maps and known construction zones to make your selection. Consult with the other team members before making any changes to travel path.	Vehicle Driver and passengers
	Incidents caused by use of improper equipment/tools.	Use an equipment checklist to verify you have the appropriate equipment/tools for your tasks. Consult appropriate JSAs or SOPs.	
		Use proper bending/lifting techniques by bending and lifting with	

	Incidents caused by improper lifting techniques.	legs and not with back.	
	Damage to equipment/tools and/or accidents with loose objects.	Stow all materials in vehicle properly, use appropriate cases and bags. Secure equipment in bed of truck with netting or straps. Do not leave any equipment loose in the cab or bed or the truck. It can cause property damage or serious injuries to others or yourself by falling-off from vehicle.	
	Fixed facilities	When parked near a fixed facility (building, monitoring well, bollards, etc…) evaluate and plan route prior to mobilization. Use the buddy system when backing-up vehicle.	
Conduct tailgate safety meeting and site walk (reconnaissance).	Biologic hazards such as insects, poison ivy, spiders, and snakes.	Check immediate area for potential hazards such as poison ivy, spiders, wasps, snakes, etc. Use bug repellent and sunscreen as necessary. Use snake chaps or shin guards. Use a bar to clear out objects and/or vegetation from spiders and/or snakes (do not use your hands or feet).	ENSR SSO and Field Team
	Damage to equipment or vehicles due to surface/subsurface obstructions. and Slips, trips, falls.	Inspect area before driving and/or walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. Contact site manager immediately and do not proceed if any conditions are observed that could make driving/walk in the area unsafe and that cannot be fixed with the equipment or personnel onsite.	
	Dehydration.	Use this opportunity to begin hydrating yourself. Being thirsty is a sign of dehydration (warning you that you are already dehydrated).	
Driving and/or walking to drilling locations.	Damage to equipment or vehicles due to surface/subsurface obstructions. and Slips, trips, falls.	Inspect area before driving and/or walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. Contact site manager immediately and do not proceed if any conditions are observed that could make driving/walking in the area unsafe and that cannot be fixed with the equipment or personnel onsite.	Field Team
	Fixed facilities	When parked near a fixed facility (building, monitoring well, bollards, etc…) evaluate and plan route prior to mobilization. Use the buddy system when backing-up vehicle.	
Setting up equipment.	Pinch points.	Identify pinch points before beginning any task. If possible, use hand safety stickers to remind everyone that may come into contact with the equipment where pinch points are located.	Field Team
	Biological hazards.	Check immediate area for potential hazards such as poison ivy, spiders, wasps, snakes, etc. Use bug repellent and sunscreen as necessary. Use snake chaps or shin guards. Use a bar to clear out objects and/or vegetation from spiders and/or snakes (do not use your hands or feet).	
	Cuts/lacerations.	Use work gloves over your nitrile gloves when handling equipment to prevent hand slipping.	
		Wear work gloves to avoid sharp edges. Use the proper hand tools	

	Sharp materials.	that are ergonomically designed with safety guards in place as appropriate.	
	Incidents caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.	
	Striking others.	Before picking up tools, look around and ensure proper clearance. Identify and communicate to other workers within striking distance.	
	Mechanical failure.	Inspect all hydraulic hoses and lines for cracks, bulges, and general wear and tear. Do not use the machine if any of this is identified. Notify your supervisor and repair or replace the part before use.	
	Overhead utilities	Look-up for any potential obstruction, power lines, or any cables, before raising the drill rig mast. Always maintain at least a 10-foot distance from any overhead utility or obstruction.	
Advancing auger and sampler.	Contaminants.	Always wear nitrile gloves when handling equipment that comes into contact with potential contaminants. Double glove if you know you are prone to glove breakage.	Field Team
	Pinch points.	Identify pinch points before beginning any task. If possible, use hand safety stickers to remind everyone that may come into contact with the equipment where pinch points are located.	
	Incidents caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.	
	Mechanical failure.	Inspect all hydraulic hoses and lines for cracks, bulges, and general wear and tear. Do not use the machine if any of this is identified. Notify your supervisor and repair or replace the part before use.	
	Dust.	Dust particles may become airborne during activity. If dust becomes excessive, use a dust mask.	
	Sharp materials.	Wear work gloves to avoid sharp edges. Use the proper hand tools that are ergonomically designed with safety guards in place as appropriate.	
	Slips, trips, and falls.	Inspect area before walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. Contact site manager immediately and do not proceed if any conditions are observed that could make walking in the area unsafe and that cannot be fixed with the equipment or personnel onsite.	

	Spark hazard or electric shock.	When advancing the split spoon, be aware that friction against certain materials could cause sparks. Wear appropriate PPE to minimize potential skin exposure.	
	Handling equipment.	Be familiar with all equipment before use. Use good care of all equipment, do not drop or shake it. Use security tethers when available.	
	Noise	Always monitor for noise level and don appropriate PPE if needed. Refer to HASP for hearing protection requirements.	
Retracting sampler.	Contaminants.	Always wear nitrile gloves when handling equipment. Double glove if you know you are prone to glove breakage.	Field Team
	Pinch points.	Identify pinch points before beginning any task. If possible, use hand safety stickers to remind everyone that may come into contact with the equipment where pinch points are located.	
	Incidents caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.	
	Mechanical failure.	Inspect all hydraulic hoses and lines for cracks, bulges, and general wear and tear. Do not use the machine if any of this is identified. Notify your supervisor and repair or replace the part before use.	
	Dust.	Dust particles may become airborne during activity. If dust becomes excessive, use a dust mask.	
	Sharp materials.	Wear work gloves to avoid sharp edges. Use the proper hand tools that are ergonomically designed with safety guards in place as appropriate.	
	Slips, trips, and falls.	Inspect area before walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. Contact site manager immediately and do not proceed if any conditions are observed that could make walking in the area unsafe and that cannot be fixed with the equipment or personnel onsite.	
	Spark hazard or electric shock.	When advancing the split spoon, be aware that friction against certain materials could cause sparks. Wear appropriate PPE to minimize potential skin exposure.	
	Handling equipment.	Be familiar with all equipment before use. Use good care of all equipment, do not drop or shake it. Use security tethers when available.	

	Pulley systems	Always inspect the pulley systems on the hollow stem auger, including the cable. Communicate to field team before raising any equipment. Ensure a secure connection between the cable hook and the equipment being lifted before the equipment leaves the ground.	
Opening sampler.	Flying “cutting shoe” from split spoon	Backpressure can be present within the split spoon tool and expel the “cutting shoe” (split spoon cap) if unscrewed quickly. Caution should be taken, slow and small turns are necessary. If resistance is observed when unscrewing the cap, worker must leave some of the threading left so that the soil can expand and release some of the backpressure. A tool (e.g. spoon) can be used to remove some of the soil from the end of the split spoon so that any remaining backpressure can be released.	Field Team
	Sharp materials.	Wear work gloves to avoid sharp edges. Use the proper hand tools that are ergonomically designed with safety guards in place as appropriate.	
	Pinch points.	Identify pinch points before beginning any task. If possible, use hand safety stickers to remind everyone that may come into contact with the equipment where pinch points are located.	
	Incidents caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.	
	Slips, trips, and falls.	Inspect area before walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. Contact site manager immediately and do not proceed if any conditions are observed that could make walking in the area unsafe and that cannot be fixed with the equipment or personnel onsite.	
	Handling equipment.	Be familiar with all equipment before use. Use good care of all equipment, do not drop or shake it. Use security tethers when available.	
	Contaminants.	Always wear nitrile gloves when handling equipment. Double glove if you know you are prone to glove breakage.	
	Cuts/lacerations.	Use work gloves over your nitrile gloves when handling equipment to prevent hand slipping.	
	Hand/back strain.	Use an appropriate tool to pull the acetate liner out of the sleeve. Ask for assistance if you cannot move the liner without bracing yourself and pulling with your back rather than your arms.	

Decontaminating equipment.	Contaminants.	Always wear nitrile gloves when handling equipment. Double glove if you know you are prone to glove breakage.	Field Team
	Cuts or lacerations.	Use the proper hand tools that are ergonomically designed with safety guards in place as appropriate.	
	Incidents caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.	
	Cross Contamination.	Triple rinse using distilled or deionized water and alconox for first rinse and distilled or deionized water for second and third rinses. Always clean materials between locations and at the site. Do not bring equipment back to the office without proper decontamination.	
Adding rod to sampler and adding augers.	Contaminants.	Always wear nitrile gloves when handling equipment that comes into contact with potential contaminants. Double glove if you know you are prone to glove breakage.	Field Team
	Pinch points.	Identify pinch points before beginning any task. If possible, use hand safety stickers to remind everyone that may come into contact with the equipment where pinch points are located.	
	Incidents caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.	
	Mechanical failure.	Inspect all hydraulic hoses and lines for cracks, bulges, and general wear and tear. Do not use the machine if any of this is identified. Notify your supervisor and repair or replace the part before use.	
	Dust.	Dust particles may become airborne during activity. If dust becomes excessive, use a dust mask.	
	Sharp materials.	Wear work gloves to avoid sharp edges. Use the proper hand tools that are ergonomically designed with safety guards in place as appropriate.	
	Slips, trips, and falls.	Inspect area before walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. Contact site manager immediately and do not proceed if any conditions are observed that could make walking in the area unsafe and that cannot be fixed with the equipment or personnel onsite.	

	Spark hazard or electric shock.	When advancing the split spoon, be aware that friction against certain materials could cause sparks. Wear appropriate PPE to minimize potential skin exposure.	
	Handling equipment.	Be familiar with all equipment before use. Use good care of all equipment, do not drop or shake it. Use security tethers when available.	
	Pulley system	Always inspect the pulley systems on the hollow stem auger, including the cable. Communicate to field team before raising any equipment. Ensure a secure connection between the cable hook and the equipment being lifted before the equipment leaves the ground.	
Breakdown of equipment.	Contaminants.	Always wear nitrile gloves when handling equipment. Double glove if you know you are prone to glove breakage.	Field Team
	Cuts and lacerations.	Use work gloves over your nitrile gloves to breakdown equipment to help grip and prevent cuts or slips on the equipment.	
	Pinch points	When disconnecting equipment, be aware that it may be difficult to twist. When possible, ask for assistance. Wear leather gloves to help protect your hands.	
	Striking others.	Before disassembling tools, look around and ensure proper clearance. Identify and communicate to other workers within striking distance.	
Secure equipment in vehicle.	Damage to equipment/tools and/or accidents with loose objects.	Stow all materials in vehicle properly, use appropriate cases and bags. Secure equipment in bed of truck with netting or straps. Do not leave any equipment loose in the cab or bed or the truck. It can cause property damage or serious injuries to others or yourself by falling-off from vehicle.	Vehicle Driver and Field Team
	Pinch points.	When securing equipment, watch for pinch points. Straps and netting can get caught on objects and snap back as well as trap a finger if hand placement is not correct. Use a buddy to help secure equipment when possible.	
Demobilize from site.	Vehicle incident.	Follow safe driving procedures (refer to driving JSA). Always use the buddy system when moving vehicles. Plan your travel path ahead of time. Use maps and known construction zones to make your selection. Consult with the other team members before making any changes to travel path.	Vehicle Driver and Passengers
	Fixed facilities	When parked near a fixed facility (building, monitoring well, bollards, etc…) evaluate and plan route prior to mobilization. Use the buddy system when backing-up vehicle.	

Job Safety Analysis
Well Development

JSA Type: ☒ Monitoring ☐ Transport ☐ Office ☐ Construction	☒ New ☐ Revised	Date: 6/1/2011
Work Type: Sampling	Work Activity: **Well Development**	

Personal Protective Equipment (PPE):

☒ First Aid Kit	☐ Hearing Protection	☐ Air Purifying Respirator	☒ Gloves Nitrile
☐ Face Shields	☐ Hard Hat	☐ Welding/Pipe Clothing	☒ Other Sunscreen, Bug repellant
☒ Safety Glasses	☒ Safety Shoes	☐ Welding Mask/Goggles	☒ Other Leather Work Gloves
☐ Lifeline/Body Harness	☐ Supplied Respirator	☐ Life Vest	

Development Team	Position/Title	Reviewed By	Position/Title	Date
Keith Stahle	SSO			

Processing

Tenets of Operational Excellence used during the development of this JSA

☐ Always operate within design or environmental limits.
☒ Always operate in a safe and controlled condition.
☐ Always ensure safety devices are in place and functioning.
☒ Always follow safe work practices and procedures.
☐ Always meet or exceed customers' requirements.
☐ Always maintain integrity of dedicated systems.
☐ Always comply with all applicable rules and regulations.
☒ Always address abnormal conditions.
☐ Always follow written procedures for high risk or unusual situations.
☐ Always involve the right people in decisions that affect procedures and equipment.

☐ Safe Performance Self Assessment (SPSA) performed for all job tasks.
☐ JSA reviewed at least daily and modified and reissued as needed.
☐ All workers reminded of the Stop Work Authority Process

❶ Job Steps	❷ Potential Hazard	❸ Critical Actions	❹ Personnel Responsible for Actions
Check the weather.	Unexpected storm – lightning, rain, snow (slip hazard), wind.	Check local weather forecast, have a weather radio for remote sites, observation and communication among team members. Discuss weather issues during tailgate safety meeting. At the first sign of lightning, thunder or strong winds, immediately move away and take shelter. Do not resume work until 30 minutes have passed without signs of storm.	SSO and Field Team
	Heat and cold stress.	Know the symptoms of heat and/or cold stress, and the potential for their occurrence based on expected weather conditions. Take precautions to avoid them. Refer to the HASP or ask your supervisor if you have questions.	
Mobilize with equipment and supplies for development.	Vehicle collision.	Follow safe driving procedures (refer to driving JSA). Always use the buddy system when moving vehicles. Plan your travel path ahead of time. Use maps and known construction zones to make your selection. Consult with the other team members before making any changes to travel path.	Vehicle Driver and passengers
	Incidents caused by use of improper equipment/tools.	Use an equipment checklist to verify you have the appropriate equipment/tools for your tasks. Consult appropriate JSAs or SOPs.	
	Incidents caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.	

	Damage to equipment/tools and/or accidents with loose objects.	Stow all materials in vehicle properly, use appropriate cases and bags. Secure equipment in bed of truck with netting or straps. Do not leave any equipment loose in the cab or bed or the truck. It can cause property damage or serious injuries to others or yourself by falling-off from vehicle.	
	Fixed facilities.	When parked near a fixed facility (building, monitoring well, bollards, etc…) evaluate and plan route prior to mobilization. Use the buddy system when backing-up vehicle.	
Conduct tailgate safety meeting and site walk (reconnaissance).	Biologic hazards such as insects, poison ivy, spiders, and snakes.	Check immediate area for potential hazards such as poison ivy, spiders, wasps, snakes, etc. Use bug repellent and sunscreen as necessary. Use snake chaps or shin guards. Use a bar to clear out objects and/or vegetation from spiders and/or snakes (do not use your hands or feet).	ENSR SSO and Field Team
	Damage to equipment or vehicles due to surface/subsurface obstructions. and Slips, trips, falls.	Inspect area before driving and/or walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. Contact site manager immediately and do not proceed if any conditions are observed that could make driving/walk in the area unsafe and that cannot be fixed with the equipment or personnel onsite.	
	Dehydration.	Use this opportunity to begin hydrating yourself. Being thirsty is a sign of dehydration (warning you that you are already dehydrated).	
Driving and/or walking to well locations.	Damage to equipment or vehicles due to surface/subsurface obstructions. and Slips, trips, falls.	Inspect area before driving and/or walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. Contact site manager immediately and do not proceed if any conditions are observed that could make driving/walk in the area unsafe and that cannot be fixed with the equipment or personnel onsite.	Field Team
	Fixed facilities	When parked near a fixed facility (building, monitoring well, bollards, etc…) evaluate and plan route prior to mobilization. Use the buddy system when backing-up vehicle.	
Opening Well Casings/Flush-mount Covers	Pinch points.	Identify pinch points before beginning any task. If possible, use hand safety stickers to remind everyone that may come into contact with the equipment where pinch points are located.	Field Team
	Biological hazards.	Check immediate area for potential hazards such as poison ivy, spiders, wasps, snakes, etc. Use bug repellent and sunscreen as necessary. Use snake chaps or shin guards. Use a bar to clear out objects and/or vegetation from spiders and/or snakes (do not use your hands or feet).	
	Cuts/lacerations.	Use work gloves over your nitrile gloves when opening well casings to help grip and prevent cuts or slips on the casing. Use a lubricant such as WD-40 to help opening rusted locks – do not use a hammer to break the lock open. If necessary, use bolt cutters to open a lock.	

Gauging static water level.	Contaminants.	Always wear nitrile gloves when handling equipment that comes into contact with groundwater. Double glove if you know you are prone to glove breakage.	Field Team
	Pinch points.	Identify pinch points before beginning any task. If possible, use hand safety stickers to remind everyone that may come into contact with the equipment where pinch points are located.	
	Incidents caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.	
Decontaminating water level meter or interface probe.	Cross contamination.	Triple rinse using distilled or deionized water and alconox for first rinse and distilled or deionized water for second and third rinses. Always clean materials between locations and at the site. Do not bring equipment back to the office without proper decontamination.	Field Team
	Contaminants.	Always wear nitrile gloves when handling equipment. Double glove if you know you are prone to glove breakage.	
Set up development equipment at each well site.	Sharp materials.	Wear work gloves to avoid sharp edges. Use the proper hand tools that are ergonomically designed with safety guards in place as appropriate.	Field Team
	Pinch points.	Identify pinch points before beginning any task. If possible, use hand safety stickers to remind everyone that may come into contact with the equipment where pinch points are located.	
	Incidents caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.	
	Slips, trips, and falls.	Inspect area before walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. Contact site manager immediately and do not proceed if any conditions are observed that could make walking in the area unsafe and that cannot be fixed with the equipment or personnel onsite.	
	Spark hazard or electric shock.	Always place the battery source in a dry safe place on level ground. Do not touch the terminals of the battery except with the appropriate equipment. Do not connect positive to negative and vice versa.	
	Handling equipment.	Be familiar with all equipment before use. Use good care of all equipment, do not drop or shake it. Use security tethers when available.	

Lower tubing and submersible pump down well casing. - may also use bailers and surge blocks.	Contaminants. Cuts or lacerations. Incidents caused by improper lifting techniques. Siphon action.	Always wear nitrile gloves when handling equipment. Double glove if you know you are prone to glove breakage. Use the proper hand tools that are ergonomically designed with safety guards in place as appropriate. Use proper bending/lifting techniques by bending and lifting with legs and not with back. Eliminate siphon action by attaching purge tubing above expected high water line in bucket or drum.	Field Team
Turn on equipment.	Electric shock.	Always place the battery source in a dry safe place on level ground. Do not touch the terminals of the battery except with the appropriate equipment. Do not connect positive to negative and vice versa.	Field Team
Develop water from well casing.	Contaminants. Spills.	Always wear nitrile gloves when handling equipment. Double glove if you know you are prone to glove breakage. Place buckets or drums on a level surface to avoid potential for the bucket to tip over. Secure tubing in bucket or drum to prevent spills.	Field Team
Breakdown and decontaminate equipment.	Contaminants. Cuts and lacerations. Cross contamination Pinch points Striking others.	Always wear nitrile gloves when handling equipment. Double glove if you know you are prone to glove breakage. Use work gloves over your nitrile gloves to breakdown equipment to help grip and prevent cuts or slips on the equipment. Triple rinse using distilled or deionized water and alconox for first rinse and distilled or deionized water for second and third rinses. Always clean materials between locations and at the site. Do not bring equipment back to the office without proper decontamination. When disconnecting cords or tubing from equipment, be aware that it may be difficult to twist off. When possible, ask for assistance. Wear leather gloves to help protect your hands. Before disassembling tools, look around and ensure proper clearance. Identify and communicate to other workers within striking distance.	Field Team
Secure equipment in vehicle.	Damage to equipment/tools and/or accidents with loose objects. Pinch points.	Stow all materials in vehicle properly, use appropriate cases and bags. Secure equipment in bed of truck with netting or straps. Do not leave any equipment loose in the cab or bed or the truck. It can cause property damage or serious injuries to others or yourself by falling-off from vehicle. When securing equipment, watch for pinch points. Straps and netting can get caught on objects and snap back as well as trap a finger if hand placement is not correct. Use a buddy to help secure equipment when possible.	Vehicle Driver and Field Team
Transport purge water to disposal container/area.	Spills.	Secure buckets or drums filled with purge water in bed of truck. Do not overfill buckets or drums. Secure lid on buckets or drums. If necessary, place buckets or drums in secondary containment when	Vehicle Driver and Field Team

		transporting.	
	Pinch points.	When snapping lid on buckets, wear leather gloves to protect your hands. Use lids designed for that particular bucket or drum.	
	Damage to equipment or vehicles due to surface/subsurface obstructions. and Slips, trips, falls.	Inspect area before driving and/or walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. Contact site manager immediately and do not proceed if any conditions are observed that could make driving/walk in the area unsafe and that cannot be fixed with the equipment or personnel onsite.	
	Fixed facilities	When parked near a fixed facility (building, monitoring well, bollards, etc…) evaluate and plan route prior to mobilization. Use the buddy system when backing-up vehicle.	
Set up fluid transfer equipment at disposal container/area.	Sharp materials.	Wear work gloves to avoid sharp edges. Use the proper hand tools that are ergonomically designed with safety guards in place as appropriate.	Field Team
	Pinch points.	Identify pinch points before beginning any task. If possible, use hand safety stickers to remind everyone that may come into contact with the equipment where pinch points are located.	
	Incidents caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.	
	Slips, trips, and falls.	Inspect area before walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. Contact site manager immediately and do not proceed if any conditions are observed that could make walking in the area unsafe and that cannot be fixed with the equipment or personnel onsite.	
	Spark hazard or electric shock.	Always place the battery source in a dry safe place on level ground. Do not touch the terminals of the battery except with the appropriate equipment. Do not connect positive to negative and vice versa.	
	Handling equipment.	Be familiar with all equipment before use. Use good care of all equipment, do not drop or shake it. Use security tethers when available.	
Transfer fluids. Lower tubing and submersible pump into containers. - may also use 5-gallon buckets.	Contaminants.	Always wear nitrile gloves when handling equipment. Double glove if you know you are prone to glove breakage.	Field Team
	Cuts or lacerations.	Use the proper hand tools that are ergonomically designed with safety guards in place as appropriate.	
	Incidents caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.	
	Siphon action.	Eliminate siphon action by attaching purge tubing above expected high water line in bucket or drum.	
Turn on equipment.	Electric shock.	Always place the battery source in a dry safe place on level ground.	Field Team

		Do not touch the terminals of the battery except with the appropriate equipment. Do not connect positive to negative and vice versa.	
Breakdown and decontaminate equipment.	Contaminants.	Always wear nitrile gloves when handling equipment. Double glove if you know you are prone to glove breakage.	Field Team
	Cuts and lacerations.	Use work gloves over your nitrile gloves to breakdown equipment to help grip and prevent cuts or slips on the equipment.	
	Cross contamination	Triple rinse using distilled or deionized water and alconox for first rinse and distilled or deionized water for second and third rinses. Always clean materials between locations and at the site. Do not bring equipment back to the office without proper decontamination.	
	Pinch points	When disconnecting cords or tubing from equipment, be aware that it may be difficult to twist off. When possible, ask for assistance. Wear work gloves to help protect your hands.	
	Striking others.	Before disassembling tools, look around and ensure proper clearance. Identify and communicate to other workers within striking distance.	

Job Safety Analysis
Low Flow Groundwater Sampling

JSA Type: ☒ Monitoring ☐ Transport ☐ Office ☐ Construction	☒ New ☐ Revised	Date: 6/1/2011
Work Type: Sampling	Work Activity: **Low Flow Groundwater Sampling**	

Personal Protective Equipment (PPE):

☒ First Aid Kit	☐ Hearing Protection	☐ Air Purifying Respirator	☒ Gloves Nitrile
☐ Face Shields	☐ Hard Hat	☐ Welding/Pipe Clothing	☐ Other Sunscreen, Bug repellant
☒ Safety Glasses	☒ Safety Shoes	☐ Welding Mask/Goggles	☐ Other Work Gloves
☐ Lifeline/Body Harness	☐ Supplied Respirator	☐ Life Vest	

Development Team	Position/Title	Reviewed By	Position/Title	Date
Keith Stahle	SSO			

❶ Job Steps	❷ Potential Hazard	❸ Critical Actions
Check the weather.	Unexpected storm – lightning, rain, snow (slip hazard), wind.	Check local weather forecast, have a weather radio for remote sites, observation and communication among team members. Discuss weather issues during tailgate safety meeting. At the first sign of lightning, thunder or strong winds, immediately move away and take shelter. Do not resume work until 30 minutes have passed without signs of storm.
	Heat and cold stress.	Know the symptoms of heat and/or cold stress, and the potential for their occurrence based on expected weather conditions. Take precautions to avoid them. Refer to the HASP or ask your supervisor if you have questions.
Mobilize with equipment and supplies for sampling.	Vehicle collision.	Follow safe driving procedures. Always use the buddy system when moving vehicles. Plan your travel path ahead of time. Use maps and known construction zones to make your selection. Consult with the other team members before making any changes to travel path.
	Incidents caused by use of improper equipment/tools.	Use an equipment checklist to verify you have the appropriate equipment/tools for your tasks.
	Incidents caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.
	Damage to equipment/tools and/or accidents with loose objects.	Stow all materials in vehicle properly, use appropriate cases and bags. Secure equipment in bed of truck with netting or straps. Do not leave any equipment loose in the cab or bed or the truck. It can cause property damage or serious injuries to others or yourself by falling-off from vehicle.
	Fixed facilities	When parked near a fixed facility (building, monitoring well, bollards, etc…) evaluate and plan route prior to mobilization. Use the buddy system when backing-up vehicle.
	Generator	Fill generator with gasoline prior to starting first time
Conduct tailgate safety meeting and site walk (reconnaissance).	Biologic hazards such as insects, poison ivy, spiders, and snakes.	Check immediate area for potential hazards such as poison ivy, spiders, wasps, snakes, etc. Use bug repellent and sunscreen as necessary. Use a bar to clear out objects and/or vegetation from spiders and/or snakes (do not use your hands or feet).

	Dehydration	Use this opportunity to begin hydrating yourself. Being thirsty is a sign of dehydration (warning you that you are already dehydrated).	
Driving and/or walking to well locations.	Damage to equipment or vehicles due to surface/subsurface obstructions. and Slips, trips, falls. Fixed facilities	Inspect area before driving and/or walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. When parked near a fixed facility (building, monitoring well, bollards, etc…) evaluate and plan route prior to mobilization. Use the buddy system when backing-up vehicle.	
Opening Well Casings/Flush-mount Covers	Pinch points. Biological hazards. Cuts/lacerations.	Identify pinch points before beginning any task. If possible, use hand safety stickers to remind everyone that may come into contact with the equipment where pinch points are located. Check immediate area for potential hazards such as poison ivy, spiders, wasps, snakes, etc. Use bug repellent and sunscreen as necessary. Use snake chaps or shin guards. Use a bar to clear out objects and/or vegetation from spiders and/or snakes (do not use your hands or feet). Use work gloves over your nitrile gloves when opening well casings to help grip and prevent cuts or slips on the casing. If necessary, use bolt cutters to open a lock.	
Gauging static water level.	Contaminants. Pinch points. Incidents caused by improper lifting techniques.	Always wear nitrile gloves when handling equipment that comes into contact with groundwater. Double glove if you know you are prone to glove breakage. Identify pinch points before beginning any task. If possible, use hand safety stickers to remind everyone that may come into contact with the equipment where pinch points are located. Use proper bending/lifting techniques by bending and lifting with legs and not with back.	
Decontaminating water level meter or interface probe.	Cross contamination. Contaminants.	Triple rinse using distilled or deionized water and Alconox for first rinse and distilled or deionized water for second and third rinses. Always clean materials between locations and at the site. Do not bring equipment back to the office without proper decontamination. Always wear nitrile gloves when handling equipment. Double glove if you know you are prone to glove breakage.	

Set up low-flow equipment at each well site.	Sharp materials.	Wear work gloves to avoid sharp edges. Use the proper hand tools that are ergonomically designed with safety guards in place as appropriate.	
	Pinch points.	Identify pinch points before beginning any task. If possible, use hand safety stickers to remind everyone that may come into contact with the equipment where pinch points are located.	
	Incidents caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back. Use caution when lifting the generator and pump.	
	Slips, trips, and falls.	Inspect area before walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground.	
	Spark hazard or electric shock.	If a battery is used, always place the battery source in a dry safe place on level ground. Do not touch the terminals of the battery except with the appropriate equipment. Do not connect positive to negative and vice versa.	
	Handling equipment.	Be familiar with all equipment before use. Use good care of all equipment, do not drop or shake it. Use security tethers when available.	
Lower tubing and submersible pump into well casing	Contaminants	Always wear nitrile gloves when handling equipment. Double glove if you know you are prone to glove breakage.	
	Cuts or lacerations.	Use the proper hand tools that are ergonomically designed with safety guards in place as appropriate.	
	Incidents caused by improper lifting techniques.	Use proper bending/lifting techniques by bending and lifting with legs and not with back.	
	Generator	Check fuel level, fill tank if necessary	
Turn on equipment.	Electric shock.	If a battery is used, always place the battery source in a dry safe place on level ground. Do not touch the terminals of the battery except with the appropriate equipment. Do not connect positive to negative and vice versa.	
	Generator exhaust	Place generator down wind from sample location	
Purge water from well casing.	Contaminants.	Always wear nitrile gloves when handling equipment. Double glove if you know you are prone to glove breakage.	
	Spills.	Place buckets on a level surface to avoid potential for the bucket to tip over. Secure tubing in bucket to prevent spills.	
Collect samples from well.	Contaminants.	Always wear nitrile gloves when handling equipment used in well sampling. Double glove if you know you are prone to glove breakage.	
	Cuts and lacerations.	When removing and/or placing the lids on bottles (jars or VOAs), do not twist the bottle's body, only the cap. Do not over tighten lids.	

	Spills.	Fill bottles over a bucket to collect any spilled purge water.	
Breakdown and decontaminate equipment.	Contaminants.	Always wear nitrile gloves when handling equipment. Double glove if you know you are prone to glove breakage.	
	Cuts and lacerations.	Use work gloves over your nitrile gloves to breakdown equipment to help grip and prevent cuts or slips on the equipment.	
	Cross contamination	Triple rinse using distilled or deionized water and Alconox for first rinse and distilled or deionized water for second and third rinses. Always clean materials between locations and at the site. Do not bring equipment back to the office without proper decontamination.	
	Pinch points	When disconnecting cords or tubing from equipment, be aware that it may be difficult to twist off. When possible, ask for assistance. Wear leather gloves to help protect your hands.	
	Striking others.	Before disassembling tools, look around and ensure proper clearance. Identify and communicate to other workers within striking distance.	
Secure equipment in vehicle.	Damage to equipment/tools and/or accidents with loose objects.	Stow all materials in vehicle properly, use appropriate cases and bags. Secure equipment in bed of truck with netting or straps. Do not leave any equipment loose in the cab or bed or the truck. It can cause property damage or serious injuries to others or yourself by falling-off from vehicle.	
	Pinch points.	When securing equipment, watch for pinch points. Straps and netting can get caught on objects and snap back as well as trap a finger if hand placement is not correct. Use a buddy to help secure equipment when possible.	
Transport purge water to disposal container/area	Spills.	Secure buckets filled with purge water in bed of truck. Do not overfill buckets. Secure lid on buckets. If necessary, place buckets in secondary containment when transporting.	
	Pinch points.	When snapping lid on buckets, wear leather gloves to protect your hands. Use lids designed for that particular bucket.	
	Damage to equipment or vehicles due to surface/subsurface obstructions. and Slips, trips, falls.	Inspect area before driving and/or walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. Contact site manager immediately and do not proceed if any conditions are observed that could make driving/walk in the area unsafe and that cannot be fixed with the equipment or personnel onsite.	
	Fixed facilities	When parked near a fixed facility (building, monitoring well, bollards, etc…) evaluate and plan route prior to mobilization. Use the buddy system when backing-up vehicle.	

Demobilize from site.	Vehicle collision.	Follow safe driving procedures (refer to driving JSA). Always use the buddy system when moving vehicles. Plan your travel path ahead of time. Use maps and known construction zones to make your selection. Consult with the other team members before making any changes to travel path.	
	Fixed facilities	When parked near a fixed facility (building, monitoring well, bollards, etc…) evaluate and plan route prior to mobilization. Use the buddy system when backing-up vehicle.	

Job Safety Analysis
Site Restoration

JSA Type: ☒ Investigation ☐ O&M ☐Office ☒ Construction	☒ New ☐ Revised	**Date**: 6/1/2011

Work Activity: Site Restoration

Personal Protective Equipment (PPE):

☐ Goggles ☒ Hearing Protection ☐ Air Purifying Respirator
☐ Face Shields ☒ Hard Hat ☒ Work Gloves ☒ Other First Aid Kit
☒ Safety Glasses ☒ Safety Shoes ☒ Nitrile Exam Gloves ☐ Decontamination Equipment
☐ Lifeline/Body Harness ☒ Traffic Vests

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

Development Team	Position/Title	Reviewed By	Position/Title	Date
Keith Stahle	SSO			

❶ Job Steps[1]	❷ Potential Hazards[2]	❸ Critical Actions[3]
1. Gather Equipment and Load Truck	Heavy Lifting Pinch Points Minor Cuts and Bruises	• Use proper lifting techniques when lifting heavy objects such as concrete/asphalt bags and equipment. Use two or more personnel to lift into truck • Use appropriate work gloves and equipment for the tasks. • Ensure first aid kit is in good order
2. Driving	Vehicle Traffic	• Observe other vehicles, avoid backing up whenever possible, use spotter as necessary, wear traffic vests, radio & cell phone use prohibited while driving • Watch for oncoming traffic, traffic poles and structures • Help guide driver if necessary • Driver shall verify location of obstructions while backing up • Be aware road hazards (e.g. dust and pebbles).
3. Site Restoration Activities	Slips, Trips and Falls Minor Cuts and Bruises Traffic	• Check for possible slip, trip, and fall hazards • Pay attention to surroundings • Visualize tasks and hazards before doing the job • Use appropriate work gloves, tools, and equipment for the tasks. • Follow the traffic control plan • Use traffic control devices when needed.
6. Gather Equipment and Load Truck	Heavy Lifting Pinch Points Minor Cuts and Bruises	• Use proper lifting techniques when lifting heavy objects and equipment. Use two or more personnel to lift into truck • Use appropriate work gloves for the task to protect hands • Ensure first aid kit is in good order

7. Site clean up	Debris or Equipment Left Onsite or Unsecured Can Cause Tripping Hazards	• Make a careful visual sweep of site • Check for tools and debris left on site • Good housekeeping is required • Site cleanup is required prior to leaving the site

Attachment C

Health and Safety Plan Pre-Entry Briefing Attendance Form

Health and Safety Plan Pre-Entry Briefing Attendance Form

Pre-Design Investigation

Ithaca Court Street Former Manufactured Gas Plant Site

Ithaca, New York

Conducted by:		**Date Performed:**	
Topics Discussed:	1. Review of the content of the HASP (Required)		
	2.		
	3.		
	4.		

Printed Name	Signature	Representing

Attachment D

Supervisor's Report of Incident Form

AECOM

Supervisor's Report of Incident

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

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

Section 1 - Organization Information

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

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

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

Section 3 – Contact/Incident Information

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

Supervisor Description of Incident: (*Supervisor signs in Section 7*) (*use additional paper if necessary*)

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

Witness Signature:	***Date and time:***

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

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

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

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

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

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

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

Section 7- Signatures

Supervisor

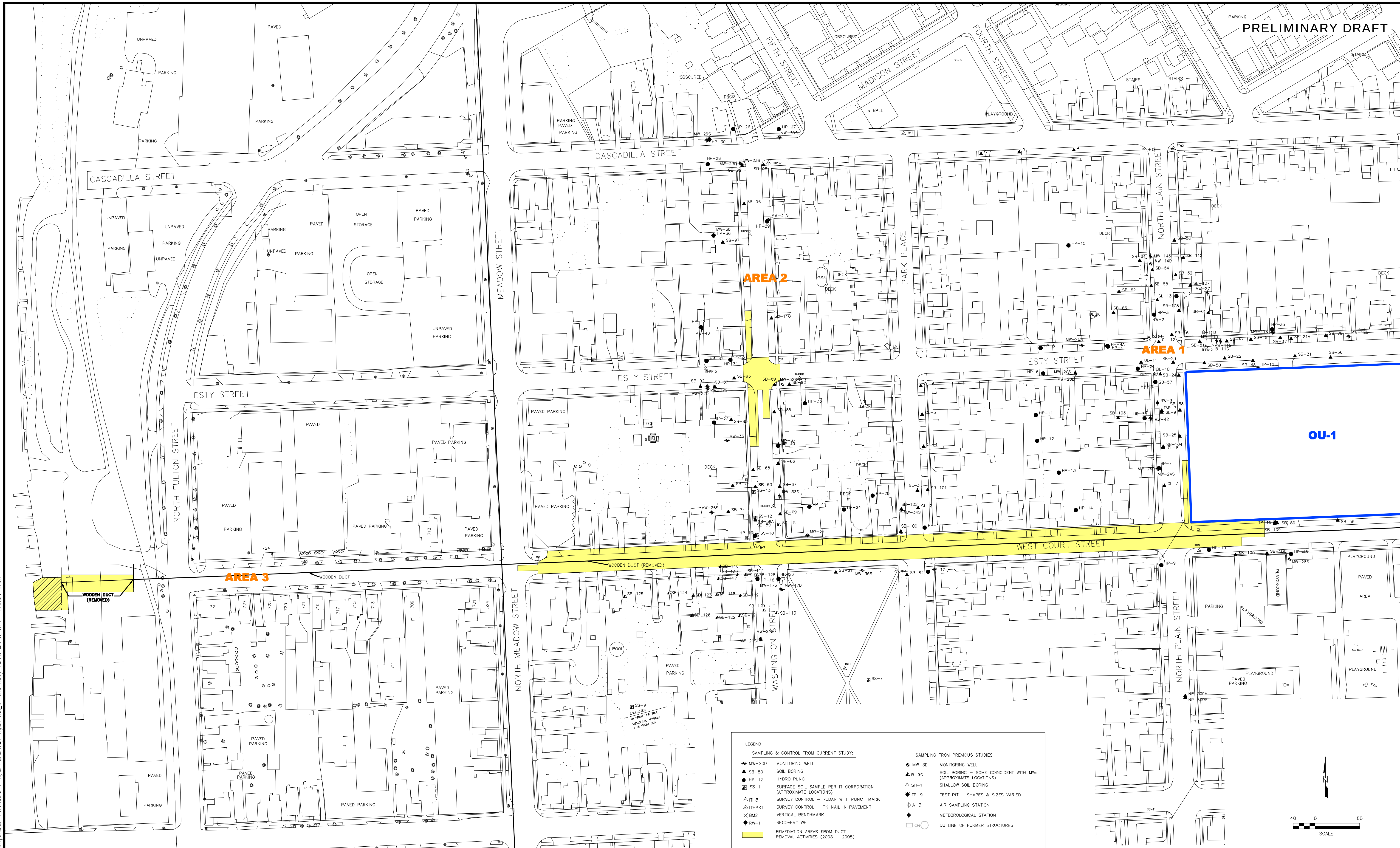
Print Name:	Signature:	Date:	Telephone:

Office/Location Manager

Print Name:	Signature:	Date:	Telephone:

Regional SH&E Manager

Print Name:	Signature:	Date:	Telephone:
Comments:			



AECOM

NOTES:

1. HORIZONTAL SURVEY CONTROL WAS ESTABLISHED USING SURVEY GRADE RTK GPS AND IS REFERENCED TO THE NORTH AMERICAN DATUM OF 1983 (NAD83). THE PRIMARY MONUMENT USED IN SETTING SITE CONTROL WAS T1011 OF THE TOMPKINS COUNTY GPS GEODETIC CONTROL SURVEY DATED JULY 1992 BY MICHAEL BAKER JR., INC., BEAVER, PA. THIS WAS CHECKED INTO T1002.
2. THE SITE VERTICAL DATUM IS REFERENCED TO NGS FIRST ORDER, CLASS II, NAVD 88 BENCHMARKS, V463 AND Y463 AND WAS SET BY MULTIPLE RTK GPS OBSERVATIONS.
3. BASE MAPPING WAS PRODUCED BY DIGITIZING AERIAL PHOTOS DATED APRIL 1992 BY MICHAEL BAKER JR., INC, BEAVER, PA., AND HAS BEEN UPDATED USING AERIAL PHOTOS DATED APRIL 1999.
4. SAMPLING LOCATIONS FROM PREVIOUS STUDIES ARE APPROXIMATE AND ARE SHOWN BASED ON FIGURE 4 IN THE TASK 3 REPORT PREPARED BY E.C.JORDAN CO., DATED MARCH 1988.
5. SURFACE SOIL SAMPLES, SS-1 – SS-10 WERE LOCATED BY THE IT CORPORATION AND HAVE BEEN TRANSFERRED DIRECTLY ONTO THIS SITE DRAWING FROM IT CORP GRAPHICS. SS-8 AND SS-9 ARE OUTSIDE THE LIMITS OF THIS DRAWING. SS-11 – SS-15 ARE SHOWN AT LOCATIONS SURVEYED ON 6/27/02.
6. COORDINATE VALUES FOR MONITORING WELLS, SOIL BORINGS, AND HYDRO PUNCH LOCATIONS WERE LOCATED BY NYSEG USING A COMBINATION OF RTK GPS AND CONVENTIONAL SURVEYING. MONITORING WELL ELEVATIONS WERE ESTABLISHED USING DIFFERENTIAL LEVELING.

NYSEG - OU2
ITHACA/COURT STREET SITE
ITHACA, NEW YORK

PROJECT LOCATION MAP

DATE: 06/12/09 | DRWN: DLS/PGH | PROJECT No 60215637 | FIGURE 1

PRELIMINARY DRAFT

OU-1

CASCADILLA STREET
ESTY STREET
WEST COURT STREET
MEADOW STREET
NORTH MEADOW STREET
NORTH FULTON STREET
NORTH PLAIN STREET
PARK PLACE
WASHINGTON STREET
FIFTH STREET
FOURTH STREET
MADISON STREET

WOODEN DUCT (REMOVED)

LEGEND

SAMPLING & CONTROL FROM CURRENT STUDY:

- MW-20D MONITORING WELL
- SB-80 SOIL BORING
- HP-12 HYDRO PUNCH
- SS-1 SURFACE SOIL SAMPLE PER IT CORPORATION (APPROXIMATE LOCATIONS)
- ITH8 SURVEY CONTROL – REBAR WITH PUNCH MARK
- ITHPK1 SURVEY CONTROL – PK NAIL IN PAVEMENT
- BM2 VERTICAL BENCHMARK
- RW-1 RECOVERY WELL
- REMEDIATION AREAS FROM DUCT REMOVAL ACTIVITIES (2003 – 2005)
- SEWER MAIN
- STORM SEWER
- WATER LINE
- CATCH BASINS
- HYDRANT

SS-9 COLLECTED IN FRONT OF BAR APPROX 1'W FROM CUT

SAMPLING FROM PREVIOUS STUDIES:

- MW-3D MONITORING WELL
- B-9S SOIL BORING – SOME COINCIDENT WITH MWs (APPROXIMATE LOCATIONS)
- SH-1 SHALLOW SOIL BORING
- TP-9 TEST PIT – SHAPES & SIZES VARIED
- A-3 AIR SAMPLING STATION
- METEOROLOGICAL STATION
- OR OUTLINE OF FORMER STRUCTURES

SOURCE:
UTILITY LINES, CATCH BASIN, AND HYDRANT LOCATIONS PROVIDED BY CITY OF ITHACA, WATER AND SEWER DIVISION, 2008

N

40 0 80
1"=80'

NOTES:

1. HORIZONTAL SURVEY CONTROL WAS ESTABLISHED USING SURVEY GRADE RTK GPS AND IS REFERENCED TO THE NORTH AMERICAN DATUM OF 1983 (NAD83). THE PRIMARY MONUMENT USED IN SETTING SITE CONTROL WAS T1011 OF THE TOMPKINS COUNTY GPS GEODETIC CONTROL SURVEY DATED JULY 1992 BY MICHAEL BAKER JR., INC., BEAVER, PA. THIS WAS CHECKED INTO T1002.
2. THE SITE VERTICAL DATUM IS REFERENCED TO NGS FIRST ORDER, CLASS II, NAVD 88 BENCHMARKS, V463 AND Y463 AND WAS SET BY MULTIPLE RTK GPS OBSERVATIONS.
3. BASE MAPPING WAS PRODUCED BY DIGITIZING AERIAL PHOTOS DATED APRIL 1992 BY MICHAEL BAKER JR., INC, BEAVER, PA., AND HAS BEEN UPDATED USING AERIAL PHOTOS DATED APRIL 1999.
4. SAMPLING LOCATIONS FROM PREVIOUS STUDIES ARE APPROXIMATE AND ARE SHOWN BASED ON FIGURE 4 IN THE TASK 3 REPORT PREPARED BY E.C.JORDAN CO., DATED MARCH 1968.
5. SURFACE SOIL SAMPLES, SS-1 – SS-10 WERE LOCATED BY THE IT CORPORATION AND HAVE BEEN TRANSFERRED DIRECTLY ONTO THIS SITE DRAWING FROM IT CORP GRAPHICS. SS-8 AND SS-9 ARE OUTSIDE THE LIMITS OF THIS DRAWING. SS-11 – SS-15 ARE SHOWN AT LOCATIONS SURVEYED ON 6/27/02.
6. COORDINATE VALUES FOR MONITORING WELLS, SOIL BORINGS, AND HYDRO PUNCH LOCATIONS WERE LOCATED BY NYSEG USING A COMBINATION OF RTK GPS AND CONVENTIONAL SURVEYING. MONITORING WELL ELEVATIONS WERE ESTABLISHED USING DIFFERENTIAL LEVELING.

AECOM

NYSEG - OU2
ITHACA/COURT STREET SITE
ITHACA, NEW YORK

SUBSURFACE UTILITY LOCATION MAP

DATE: 06/12/09 | DRWN: DLS/PGH | PROJECT No 60215637 | FIGURE 2

File: P:\60143048-NORTS-R4 Figures\December 2010\FIGURE 2 UTILITY LOCATION MAP.dwg Layout: ANSI_D1 (User: aerraj) Plotted: Jun 01, 2011 - 11:08am XrefS:

Appendix B

In-Situ Chemical Oxidation Treatability Study Work Plan

AECOM Environment

Prepared for:
New York State Electric and Gas Corp
18 Link Drive
P. O. Box 5224
Binghamton, NY 13902

Prepared by:
AECOM
Latham, NY
Project 60215637
July 2011

Appendix B

In-Situ Chemical Oxidation Treatability Study Work Plan
Ithaca Court Street Former MGP Site OU-2
Ithaca, New York
NYSDEC Site # 7-55-008

AECOM Environment

Prepared for:
New York State Electric and Gas Corp
18 Link Drive
P. O. Box 5224
Binghamton, NY 13902

Prepared by:
AECOM
Latham, NY
Project 60215637
July 2011

Appendix B

In-Situ Chemical Oxidation Treatability Study Work Plan
Ithaca Court Street Former MGP Site OU-2
Ithaca, New York
NYSDEC Site # 7-55-008

Prepared By: Paul M. Dombrowski

Reviewed By: Scott Underhill, P.E.

Contents

1.0 Introduction

This Treatability Study Work Plan (TSWP) presents the rationale, objectives, methods, and sampling for the bench-scale testing of soil and groundwater samples from the Ithaca Court Street manufactured gas plant (MGP) OU-2 site (Site), located in Ithaca, New York, to develop the basis for the in-situ chemical oxidation (ISCO) activities planned as the selected remedy for Area 1C, an area of approximately 6,000 square feet located on North Plain Street immediately north of Esty Street. Soil and groundwater samples to be used in the treatability study will be collected in accordance with a companion document, the Pre-Design Investigation (PDI) Field Sampling and Analytical Plan (FSAP), presented as Appendix A to the Remedial Design Work Plan (RDWP).

1.1 Overview of treatability study activities

The ISCO treatability study will evaluate two different oxidants for selecting the most appropriate oxidant(s) and activating/catalyst agents for in-situ application at the site.

The initial phase of the ISCO treatability study will consist of short-term (four to seven day) tests to estimate natural oxidant demand and evaluate buffer capacity of the site soil to aid in selecting dosages for the oxidant and activation and catalyst chemistries. The second phase of the treatability study will involve soil slurry bench-scale tests evaluating chemical oxidation effectiveness using different dosages and combinations of oxidants. The treatability studies will be performed following health and safety guidance outlines in the Orlando Treatability Studies Laboratory Chemical Hygiene Plan (AECOM, 2011). The results of the treatability study and recommendations for the full-scale ISCO will be assembled in an ISCO Pre-Design Summary Report which will be appended to the ISCO Remedial Design Report.

1.2 Background and treatability study rationale

The ISCO treatability study will be used to demonstrate the ability of chemical oxidation to reduce both mass and concentrations of MGP contaminants using actual soils and groundwater obtained from the Site.

Treatability testing will evaluate two different chemical oxidants: hydrogen peroxide (Modified Fenton's Reagent or MFR) and activated sodium persulfate. Hydrogen peroxide (H_2O_2) is a strong chemical oxidant with very fast reaction kinetics and therefore short persistence in the subsurface (hours to days). Fenton's reaction involves reaction of peroxide with ferrous iron (Fe(II)) in order to generate a range of powerful oxidizing free radicals including hydroxyl free radical ($\bullet OH$) and the superoxide radical ($\bullet O_2^-$). For ISCO applications using Fenton's Reagent, groundwater pH is often lowered to maintain iron in the dissolved phase. Sodium persulfate is another strong chemical oxidant that persists significantly longer (weeks to months). For remediation applications, sodium persulfate needs to be activated (catalyzed) in order to form powerful free radicals, including sulfate radicals ($\bullet SO_4^-$), which are more powerful oxidants than persulfate. Activating agents include elevated temperatures, ferrous iron (Fe(II)), elevated pH (base), and peroxide.

MFR has been successfully implemented in the field by AECOM at MGP sites in Nyack, NY and Macon, Georgia. The Nyack site was one of the first bedrock ISCO applications in New York State and closure was achieved for the bedrock unit with the New York State Department of Environmental Conservation (NYSDEC). Peroxide and iron activated persulfate has been implemented for organic contaminants by AECOM at sites in Kingston, NH and Clear Air Force Station in Alaska. A case study of implementing peroxide and persulfate at an MGP site has been presented by FMC (the manufacturer of remediation grade sodium persulfate) [FMC, 2011]

ISCO remediation can be applied to aqueous, sorbed, and non-aqueous phases of contaminants, but ISCO is most effective at reducing aqueous-phase contaminant concentrations. However, the gas generation and some of the free radicals generated associated with reaction of peroxide has been demonstrated to enhance desorption of sorbed contaminants and mobilization of non-aqueous phase liquids. The treatability tests will be conducted to evaluate and quantify the effectiveness of using different dosages and combinations of peroxide and persulfate to develop a field-scale ISCO design for use in Area 1C. The specific objectives of the treatability study include:

- Quantify natural oxidant demand of site soils;
- Evaluate pH buffer capacity of site soils to evaluate activation and catalyst chemistries of the selected oxidant;
- Demonstrate chemical oxidation of impacted soil in a laboratory environment; and
- Determine the appropriate oxidant(s) and dosage for field injection.

Within Area 1C, MGP contamination is primarily located within a thin layer (6 inches to 3 feet) of medium to coarse gravel with some fine to medium sand that is between firm silty clay above and below. The treatability testing will be conducted on soil collected from the coarse layer of gravel and sand with observable MGP impacts (visual and olfactory). Soil samples for the treatability testing will be collected from boreholes advanced for installation of monitoring wells. Groundwater for treatability testing will be collected at the time of monitoring well installation from existing monitoring wells near Area 1C (i.e., MW-11S and/or MW-14S). For initial phase evaluations, testing will be completed on discrete samples to assess variability in pH buffer capacity and total oxidant demand within the proposed full-scale treatment area. The slurry test bench-scale studies will be conducted using a homogenized soil mass to evaluate effectiveness of different dosages of two oxidants on a similar baseline soil sample.

2.0 In-situ Chemical Oxidation Treatability Study Program

The treatability study will be conducted in two phases. Phase 1 will consist of titration tests to obtain site-specific reaction information regarding the interaction between site soils with oxidants and their catalyzing agents. Phase 2 will consist of soil slurry reactor experiments to select oxidant(s) and dosages for field scale application. The treatability study testing program, including the estimated number of tests in each phase, is summarized on Tables 2-1, 2-2, and 2-3. To the extent feasible, all treatability study testing will be performed on soil collected from the coarser layer of sand and gravel where the contamination has been observed to be most prevalent and future field ISCO injections will be targeted.

2.1 Phase I: Titration Testing

Three different titration tests will be conducted to assist in determining dosages for the oxidants and their appropriate activating/catalyzing agents. Table 2-1 summarizes the number of tests, number of replicates, and the quantities of soil and groundwater required for each of these tests.

2.1.1 Phase IA: Base Buffer Capacity Test

Alkaline (or base) activation is one of the more commonly applied approaches for persulfate activation. The base buffer capacity test will quantify the amount of base as sodium hydroxide (NaOH) required to raise the pH above 10.5 standard units (s.u.) for greater than one hour in a vessel with a known quantity of site soil and groundwater. The pH will be measured after two days of reaction, and then additional NaOH (if needed) will be titrated to again raise the pH to greater than 10.5 s.u. for one hour. The vessels will then be allowed to react for two more days (total reaction time of four days), at which time a final pH reading will be taken. Base buffer capacity testing will be completed in triplicate, using a single homogenized soil sample.

2.1.2 Phase IB: Acid Buffer Capacity Test

In order to generate a range of powerful oxidizing free radicals for in-situ remediation, modified Fenton's reaction involves reaction of peroxide with ferrous iron (Fe(II)). With the oxidizing conditions created by the addition of a strong oxidant, Fe(II) precipitates as Fe(III), becoming unavailable for reaction with peroxide. In order to extend the reaction time between dissolved iron and peroxide, groundwater pH can be lowered or a chelating agent can be added. The acid buffer capacity test will quantify the amount of acid as hydrochloric acid (HCl) required to lower the pH below 3.5 s.u. for greater than one hour in a vessel with a known quantity of site soil and groundwater. The pH will be measured after two days of reaction, and then additional HCl (if needed) will be titrated to again raise the pH to less than 3.5 s.u. for one hour. The vessels will then be allowed to react for 2 more days (total reaction time of four days), at which time a final pH reading will be taken. Acid buffer capacity testing will be completed in triplicate, using a single homogenized soil sample.

2.1.3 Phase IC: Total Oxidant Demand

A wide range of naturally occurring reactants other than the target contaminant(s), including organic matter and reduced metals species, also react with chemical oxidants. Oxidant demand attributed to soil and organic matter within soil (also termed non-target, natural, or background demand) is typically greater than the demand from target contaminants. Where free phase product is present (either observed or inferred based on groundwater concentration), the contaminant oxidant demand typically exceeds the background oxidant demand. Total oxidant demand estimates the combined effects of non-target and contaminant demand.

Soil oxidant demand can be highly variable, and analysis for Total Oxidant Demand (TOD,) will be completed in duplicate on soil collected from two different soil borings: one soil boring that is observed to be heavily impacted by MGP contamination and one soil boring that is observed to have a lesser amount of MGP contamination. These tests are designed to quantify variability in TOD results spatially as well as to estimate the relative contributions from MGP contamination and natural oxidant demand.

TOD reactors will be prepared with a known quantity of site soil and groundwater and will be dosed with sodium persulfate. TOD will be comparatively evaluated using sodium persulfate alone, and with alkaline activation. This evaluation is recommended as the activation chemistry exerts a demand on the oxidant; this demand factor varies according to the selected activation chemistry, but TOD of activated persulfate is always greater than for persulfate alone. The final persulfate concentration in the vessel will be determined after seven days, and subtracted from the initial persulfate concentration. The TOD value represents the total persulfate mass consumed per unit mass of soil.

2.2 Phase II: Soil Slurry Oxidation Reactor Testing

The Phase 2 testing will evaluate reduction in MGP mass from different oxidant dosages and combinations of oxidants to aid in developing the full-scale ISCO approach for field implementation. Phase 2 tests will consist of a control (no oxidants added) and four different test reactors in duplicate as summarized in Table 2-2. Each of the four oxidation test reactors will receive three different chemical oxidant applications. Individual reactors will be sequentially sampled over the course of the study, rather than implementing sacrificial time series reactors, Prior to any chemical oxidation testing, baseline sampling will be performed with analysis for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH) diesel range organics (DRO), TPH gasoline range organics (GRO), and cyanide from reactor soil and VOCs, SVOCs, TPH DRO, TPH GRO, cyanide, and select metals (iron, arsenic, and chromium) from reactor water (Table 2-3). Chemical oxidation can cause temporary changes in aquifer pH and oxidation-reduction potential (ORP), which can impact mobility of metals. The bench scale tests will monitor for changes in metals mobility.

NAPL associated with MGP contamination has been visually observed in soil borings advanced in Area 1C. Therefore, all four ISCO reactors will first receive an initial dosage of Modified Fenton's Reagent (hydrogen peroxide with ferrous iron and acid quantity determined by Phase 1C testing). Two reactor sets will receive a lower dosage (approximately 5%) of hydrogen peroxide, and the other two reactor sets will receive a higher dosage (approximately 12%) of hydrogen peroxide. Due to the highly reactive nature of hydrogen peroxide, the higher dosage will allow for the rapid generation of many free radicals and fast oxidation kinetics. Conversely, the lower concentration peroxide slows down the oxidation reactions allowing slower oxidation kinetics, thus longer oxidation times. Approximately one day after addition of Fenton's Reagent, measurements will be made of pH, ORP, peroxide persistence using test kits, and VOCs in headspace using a photo ionization detector (PID) from one duplicate of each reactor, and photographs will be taken to document visual changes to MGP impacts in the slurry reactors.

The second chemical oxidation application will be completed approximately two days after the initial dosage with Fenton's Reagent. Two reactors will receive the same Fenton's Reagent dosage applied (low and high) during the first application, and one each of the low and high peroxide dosage reactors will be dosed with base-activated sodium persulfate (approximately 15%). The NaOH will be added to the sodium persulfate solution, such that the persulfate solution will have a pH greater than 12 s.u., prior to application to the soil slurry reactor. Approximately one day and seven days after the second oxidant addition (Day 3 and Day 9 of the overall soil slurry reactor testing), measurements will be made of pH, ORP, oxidant persistence using appropriate test kits, and VOCs in headspace using a PID from one duplicate of each reactor. Photographs will be taken to document visual changes to MGP impacts in the slurry reactors at

these times. Soil and water samples for laboratory analysis will be collected on Day 9 for VOCs, SVOCs, TPH DRO, and TPH GRO to quantify reduction in contaminant concentration and mass as a result of varying dosages of peroxide and persulfate. These samples will be analyzed by the same lab which analyzed the PDI samples.

It is currently estimated that completing the future field ISCO injection into Area 1C can be completed in 10 to 14 days dependent on the oxidant(s) selected, the volumes proposed for injection, and the field injection flow rates which are achievable. Therefore the third chemical oxidant application will be completed on Day 10 of the soil slurry testing. Each reactor will receive the same Fenton's Reagent dosage applied (low and high) during the first application. Approximately one day and four days after the third oxidant addition (Day 11 and Day 14 of the overall soil slurry reactor testing), measurements will be made of pH, ORP, peroxide persistence using test kits, and VOCs in headspace using a PID from one duplicate of each reactor; both persulfate and peroxide persistence will be measured if persulfate was applied as the second application. For the reactors where persulfate will be applied, note that peroxide is a potential activator for sodium persulfate. Soil and water samples for laboratory analysis will be collected on Day 14 for VOCs, SVOCs, cyanide, TPH DRO, and TPH GRO to quantify reduction in contaminant concentration and mass and overall performance of the three applications of chemical oxidation. Samples for select metals (iron, arsenic, chromium) will be collected from reactor water only. Sampling for laboratory analysis may be modified based on measurements of pH, ORP, and oxidant persistence, as well as visual observations.

Table 2-1
ISCO Testing Program, Ithaca, NY
Phase 1 – Titration Testing

Test	Number of Samples	Replicates	Field Media Required
Base Buffer Demand	1 (homogenized at the lab)	3	Total of 0.5 kg of soil 0.5 liter of groundwater
Acid Buffer Demand	1 (homogenized at the lab)	3	Total of 0.5 kg of soil 0.5 liter of groundwater
Total Oxidant Demand	2 (1 heavily impacted & 1 less impacted)	2	0.5 kg of soil each from 2 borings 1 liter of groundwater
Total Volume for Phase 1 Testing			0.5 kg heavily impacted soil 1 kg impacted soil 0.5 kg low impact soil 2 liters of groundwater

Table 2-2
ISCO Testing Program, Ithaca, NY
Phase 2 – Soil Slurry Reactors

Reactor	First Oxidant Application	Second Oxidant Application	Third Oxidant Application	Replicates	Field Media Required
#1	Fenton's Reagent (5% peroxide)	Fenton's Reagent (5% peroxide)	Fenton's Reagent (5% peroxide)	2	Sequentially Sampled Reactors (Replicate 1): 3 kg of soil and 8 liters of groundwater Monitored Only Reactors (Replicate 2): 2 kg of soil and 2.6 liters of groundwater
#2	Fenton's Reagent (5% peroxide)	Base-Activated Sodium Persulfate (15%)	Fenton's Reagent (5% peroxide)	2	
#3	Fenton's Reagent (12% peroxide)	Fenton's Reagent (12% peroxide)	Fenton's Reagent (12% peroxide)	2	
#4	Fenton's Reagent (12% peroxide)	Base-Activated Sodium Persulfate (15%)	Fenton's Reagent (12% peroxide)	2	
#5 (Control)	DI Water	DI Water	DI Water	2	
Total Volume for Phase 2 Testing			25 kg soil 53 liters (14 gallons) groundwater		

Table 2-3
ISCO Testing Program, Ithaca, NY
Phase 2 – Soil Slurry Reactor Testing Process

Test Day	Replicate 1	Replicate 2
0	• Create soil-groundwater slurry • Photograph reactor • Collect samples for laboratory analysis for baseline VOCs, SVOCs, cyanide, TPH DRO, TPH GRO, and metals (groundwater only) • Apply first oxidant dosage	• Create soil-groundwater slurry • Photograph reactor • Measure pH, ORP, and headspace VOCs • Confirm oxidant zero baseline: Measure peroxide and persulfate persistence in untreated reactor water • Apply first oxidant dosage
1	• Photograph reactor	• Photograph reactor • Measure pH, ORP, and headspace VOCs • Measure peroxide persistence in reactor water
2	• Photograph reactor • Apply second oxidant dosage	• Photograph reactor • Apply second oxidant dosage
3	• Photograph reactor	• Photograph reactor • Measure pH, ORP, and headspace VOCs • Measure peroxide or persulfate persistence in reactor water
7	• Photograph reactor	• Photograph reactor
9	• Photograph reactor • Collect samples for laboratory analysis for VOCs, SVOCs, TPH DRO, TPH GRO	• Photograph reactor • Measure pH, ORP, and headspace VOCs • Measure peroxide or persulfate persistence in reactor water
10	• Photograph reactor • Apply third oxidant dosage	• Photograph reactor • Apply third oxidant dosage
11	• Photograph reactor	• Photograph reactor • Measure pH, ORP, and headspace VOCs • Measure peroxide persistence in reactor water (and persulfate for Reactors #2 and #4)
14	• Photograph reactor • Collect samples for laboratory analysis for VOCs, SVOCs, cyanide, TPH DRO, TPH GRO, and metals (groundwater only)	• Photograph reactor • Measure pH, ORP, and headspace VOCs • Measure peroxide persistence in reactor water (and persulfate for Reactors #2 and #4)

3.0 Reporting of Results

The results of the treatability testing will be provided in a report, which will include a description of the testing methods, the results from each phase of the study, the rationale for dosage selection for oxidants and activating/catalyzing agents, and the conclusions and recommendations for design specifications and field implementation of the ISCO remedy at Area 1C at the Ithaca site. This report will be included in the remedial design package to be submitted to NYSDEC.

4.0 References

AECOM. Orlando Treatability Studies Laboratory Chemical Hygiene Plan. March 2011.

FMC, 2011. *Pilot Study at a Former MGP Site Using Klozur Activated Persulfate.* Accessed May 31, 2011. http://www.envsolutions.fmc.com/Portals/fao/Content/Docs/ERM%20Case%20Study%20-%20BTEX,%20Naphthalene%20in%20MD.pdf

Appendix C

Record of Decision Amendment (March 2011)

RECORD OF DECISION

NYSEG - Ithaca Court St. MGP
Operable Unit Number: 02
Ithaca, Tompkins County
Site No. 755008
March 2011

Prepared by
Division of Environmental Remediation
New York State Department of Environmental Conservation

DECLARATION STATEMENT - RECORD OF DECISION

NYSEG - Ithaca Court St. MGP
Operable Unit Number: 02
Ithaca, Tompkins County
Site No. 755008
March 2011

Statement of Purpose and Basis

This document presents the remedy for Operable Unit Number: 02 of the NYSEG - Ithaca Court St. MGP site. The remedial program was chosen in accordance with the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375, and is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300), as amended.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (the Department) for Operable Unit Number: 02 of the NYSEG - Ithaca Court St. MGP site and the public's input to the proposed remedy presented by the Department. A listing of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Description of Selected Remedy

The elements of the selected remedy are as follows:

1. A remedial design program would be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program. Green remediation principals and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:
a. Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
b. Reducing direct and indirect greenhouse gas and other emissions;
c. Increasing energy efficiency and minimizing use of non-renewable energy;
d. Conserving and efficiently managing resources and materials;
e. Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
f. Maximizing habitat value and creating habitat when possible;
g. Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
h. Integrating the remedy with the end use where possible and encouraging green and sustainable re-development

2. Soil containing visible MGP impacts in areas designated as 1A and 1B will be excavated for off-site treatment and disposal at a permitted facility. Area 1A is located within Esty Street, north the plant site, approximately 40 to 200 feet east of North Plain Street. Area 1B is located west the plant site, beginning within the intersection of North Plain Street and Esty, and extending approximately 150 feet to the south. Area 1B includes some property outside the right-of-way. Excavation on that property will remove all soil impacted with site-related contamination above applicable SCGs based on the zoning of that property at the time of excavation. The Department encourages that soil that is not visibly impacted be stockpiled and used as backfill in the right-of–way portion of OU-2, following the completion of the excavation. Backfill on the residential property must meet residential SCGs.

3. If backfill material is used in the right-of–way portion of areas 1A and 1B which does not meet residential soil cleanup objectives, a soil cover will be provided over all vegetated areas to prevent exposure to underlying soils. The two foot thick cover will consist of clean soil underlain by a demarcation layer to delineate the cover soil from the subsurface soil. The top six inches of soil must be of sufficient quality to support vegetation. Clean soil is soil that is tested and meets the Division of Environmental Remediation's criteria for backfill. Non-vegetated areas (buildings, roadways, parking lots, etc.) are covered by either a paving system or concrete at least 6 inches thick.

4. The gravel seam in area 1C, which is beneath North Plain Street, north of Esty Street, which contains MGP tar will be treated using in-situ chemical oxidation (ISCO). Any tar which is recoverable will first be removed using extraction wells. A treatability study will be performed to identify the oxidizing chemical which will most effectively treat the contamination.

5. Following remediation of source areas, groundwater quality will be monitored for site-related contamination. This applies to the areas described in paragraph 3 and 4 above, the areas addressed in OU1, and the IRMs on Washington Street and West Court Street. Any groundwater contamination identified will be addressed with monitored natural attenuation (MNA). Groundwater will be monitored for MGP-related contamination and also for MNA indicators which will provide an understanding of the biological and abiotic activity breaking down the contamination. It is anticipated that BTEX contamination will decrease by an order of magnitude (i.e. 90 percent) in a reasonable period of time (5 to 10 years). Reports of the attenuation will be provided at 5 and 10 years, and active remediation will be proposed if it appears that natural processes alone will not address the contamination. The contingency remedial action will depend on the information collected, but it is currently anticipated that oxygen injection would be the expected contingency remedial action.

6. The remedy selected for OU1 included the imposition of an institutional control. The following updates the requirements for that institutional control to be consistent with current regulations and guidance and address the necessary site management activities in OU2. An institutional control, in the form of an environmental easement will:

a) require the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3).

b) allow the use and development of the controlled property for restricted residential, commercial and industrial uses as defined by Part 375-1.8(g), though land use is subject to local zoning laws;
c) restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the Department, NYSDOH or County DOH;
d) prohibit agriculture or vegetable gardens on the controlled property;
e) require compliance with the Department approved Site Management Plan;

7. The remedy selected for Operable Unit 1 required a Site Management Plan (SMP). The following updates the requirements for that plan to be consistent with current regulations and guidance and address the necessary site management activities in OU2. To the extent that these provisions are in conflict with the OU1 ROD, then the provisions in this paragraph shall control. The SMP shall include the following:
a) an Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the Environmental Easement discussed in Paragraph 5 above remain in place and effective. This plan includes, but may not be limited to: (i)an excavation plan which details the provisions for management of future excavations in areas of remaining contamination; (ii) descriptions of the provisions of the environmental easement including any land use, and groundwater use restrictions; (iii) a provision for evaluation of the potential for soil vapor intrusion for any buildings developed on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion. (iv) maintaining site access controls and Department notification; and (v) the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls;
b) a Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to: monitoring of groundwater to assess the performance and effectiveness of the remedy; a schedule of monitoring and frequency of submittals to the Department; monitoring for vapor intrusion for any buildings occupied or developed on the site, as may be required pursuant to item 6.a.iii. above.

New York State Department of Health Acceptance

The New York State Department of Health (NYSDOH) concurs that the remedy for this site is protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

MAR 3 1 2011

Date

Dale A. Desnoyers, Director
Division of Environmental Remediation

RECORD OF DECISION

NYSEG - Ithaca Court St. MGP
Ithaca, Tompkins County
Site No. 755008
March 2011

SECTION 1: SUMMARY AND PURPOSE

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), has selected a remedy for the above referenced site. The disposal of hazardous wastes at the site has resulted in threats to public health and the environment that would be addressed by the remedy. The disposal or release of hazardous wastes at this site, as more fully described in this document, has contaminated various environmental media. The remedy is intended to attain the remedial action objectives identified for this site for the protection of public health and the environment. This Record of Decision (ROD) identifies the selected remedy, summarizes the other alternatives considered, and discusses the reasons for selecting the remedy.

The Department has issued this document in accordance with the requirements of New York State Environmental Conservation Law and 6 NYCRR Part 375. This document is a summary of the information that can be found in the site-related reports and documents.

SECTION 2: SITE DESCRIPTION AND HISTORY

Location: The Ithaca Court Street Manufactured Gas Plant (MGP) is located in a residential area of Ithaca, Tompkins County, NY. The site is bounded by North Plain Street, West Court Street and Esty Street. The site is currently owned by the Ithaca City School District. The surrounding area consists primarily of single family homes, but also includes private and public schools, a city pool, and an activity center.

Site Features: The original gas house is still in place at the southwest corner of the site. This building was christened the Markles Flats building by students when the building was briefly used as a school. While this is the only remaining evidence of the former MGP aboveground, subsurface tanks and foundations were the key site features during the investigation of this site. These included tar tanks, the foundations of gas holders, and a series of conduits within West Court Street that ran from the east side of the Markles Flats building to Cayuga Inlet.

Current Zoning: The site property is zoned P-1 (Community Services), which could include schools or public recreation. The surrounding area is zoned residential, and is occupied primarily by single family and multi-family housing.

Historic Uses: The MGP operated at this site between 1853 and 1927. The site-related

contamination is coal tar, which was a condensate from the gas manufacturing process. A number of conduits located beneath West Court Street conveyed coal tar from the plant site to a barge loading facility located on Cayuga Inlet (site #7-55-007). Tar escaped from several subsurface structures on the plant site and also from the conduits, creating an extensive area of subsurface tar contamination.

The former gas plant site was initially investigated by NYSEG in 1986.

Operable Units: An operable unit represents a portion of a remedial program for a site that for technical or administrative reasons can be addressed separately to investigate, eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination

A full remedial investigation was initiated in October 2001. During the investigation, coal tar and associated contamination were identified beyond the boundaries of the site and tar conduits in West Court Street. The site was then organized into two Operable Units, OU1 is the plant site and the conduits, and OU2 is the off-site areas where contamination had migrated through the subsurface, away from the OU1 area and into the surrounding residential community.

The remediation of the conduits in West Court Street started in the fall of 2002 and was completed in the fall of 2005. Remediation of the gas plant site began in the fall of 2008 and was completed in January 2010, with the exception of the Markles Flats building. The construction completion report for that work was approved in December 2010.

The Remedial Investigation Report for OU2 was finalized in 2011 and is currently available for public review in the document repositories established for this site, as is the Feasibility Study.

Site Geology and Hydrogeology: The soils in the area of the site are composed of a layer of fill material that is generally 1-2 feet thick, but was observed to be a thick as 11 feet in areas where underground utilities have been installed. Underlying the fill, the soil is generally a silty sand. A thin seam of gravel is present below the silty sand in some portions of OU2. This gravel is highly permeable to the flow of liquids and appears to be the primary conduit for off-site migration of MGP tar. Below the sand and below the gravel seam is a clay layer that appears to prevent any further downward migration of contamination.

Operable Unit (OU) Number 02 is the subject of this document.

A Record of Decision was issued previously for OU 01.

A site location map is attached as Figure 1.

SECTION 3: LAND USE AND PHYSICAL SETTING

The Department may consider the current, intended, and reasonably anticipated future land use of the site and its surroundings when evaluating a remedy for soil remediation. For this site, alternatives (or an alternative) that restrict(s) the use of the site to restricted-residential use (which allows for commercial use and industrial use) as described in Part 375-1.8(g) is/are being

evaluated in addition to an alternative which would allow for unrestricted use of the site.

A comparison of the results of the investigation to the appropriate standards, criteria and guidance values (SCGs) for the identified land use and the unrestricted use SCGs for the site contaminants is included in the Tables for the media being evaluated in Exhibit A.

SECTION 4: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The PRPs for the site, documented to date, include:

New York State Electric and Gas (NYSEG)

The Department and NYSEG entered into a multi-site Consent Order (index number DO-0002-9309) on March 30, 1994, which obligates NYSEG to implement a full remedial program for 33 former MGP sites across the State, including the Ithaca, Court Street site.

SECTION 5: SITE CONTAMINATION

5.1: Summary of the Remedial Investigation

A Remedial Investigation (RI) has been conducted. The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site. The field activities and findings of the investigation are described in the RI Report.

The following general activities are conducted during an RI:

- Research of historical information,
- Geophysical survey to determine the lateral extent of wastes,
- Test pits, soil borings, and monitoring well installations,
- Sampling of waste, surface and subsurface soils, groundwater, and soil vapor,
- Sampling of surface water and sediment,
- Ecological and Human Health Exposure Assessments.

5.1.1: Standards, Criteria, and Guidance (SCGs)

The remedy must conform to promulgated standards and criteria that are directly applicable or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, Criteria and Guidance are hereafter called SCGs.

To determine whether the contaminants identified in various media are present at levels of concern, the data from the RI were compared to media-specific SCGs. The Department has developed SCGs for groundwater, surface water, sediments, and soil. The NYSDOH has developed SCGs for drinking water and soil vapor intrusion. The tables found in Exhibit A list the applicable SCGs in the footnotes. For a full listing of all SCGs see: http://www.dec.ny.gov/regulations/61794.html

5.1.2: RI Information

The analytical data collected on this site includes data for:

- groundwater
- soil
- soil vapor
- indoor air

The data have identified contaminants of concern. A "contaminant of concern" is a hazardous waste that is sufficiently present in frequency and concentration in the environment to require evaluation for remedial action. Not all contaminants identified on the property are contaminants of concern. The nature and extent of contamination and environmental media requiring action are summarized in Exhibit A. Additionally, the RI Report contains a full discussion of the data. The contaminant(s) of concern identified for this Operable Unit at this site is/are:

coal tar	benzene, toluene, ethylbenzene and xylenes (BTEX)
polycyclic aromatic hydrocarbons (PAHs), total	

As illustrated in Exhibit A, the contaminant(s) of concern exceed the applicable SCGs for:

- groundwater
- soil

5.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before issuance of the Record of Decision.

The following IRM(s) has/have been completed at this site based on conditions observed during the RI.

IRM Duct Removal - West of Fulton

The IRM conducted in March 2000 included removal of a portion of the wooden tar duct, from Route 13 to the Cayuga Inlet, approximately 140 feet. The duct ran below Court Street from the

Ithaca Court Street MGP site to the Cayuga Inlet site. The structure and contaminated material were excavated and sent off-site for disposal.

IRM Duct Removal - West Court Street: Meadow to Fulton

This IRM was conducted from October through December 2010, and included the removal of wooden ducts and a clay tile pipe located below the pavement of West Court Street. This project extended from Meadow Street (aka Route 13N) to Fulton Street (aka Route 13S) approximately 500 feet. Within that area, the clay tile pipe was replaced by a metal pipe, consistent with reports from the earlier removals completed to the west.

Washington Street IRM

Coal tar and coal tar contaminated soil were excavated and disposed off-site between July and August 2005. Excavation started at the intersection of Washington Street and Esty Street, where the contamination was heaviest. The distribution of tar is consistent with a historic release at this location. An area of approximately 6,000 square feet was excavated, extending 100 feet north and south of the intersection. All significant visible contamination was removed, but some residual contamination remained in place: fine rootlets of tar were observed in the excavation on the western edge of the intersection; a thin seam of MGP tar was left in place at the southern extent of the excavation at a depth of greater than 10 feet, and; PAHs above 500 ppm were reported in documentation samples east of the intersection.

5.3: Summary of Human Exposure Pathways

This human exposure assessment identifies ways in which people may be exposed to site-related contaminants. Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as *exposure.*

Direct contact with contaminants in the soil is unlikely because the majority of the contamination has either been removed during previous remedial actions or exists beneath the ground surface. Persons who dig below the ground surface may come into contact with contaminants in subsurface soil. Soil vapor intrusion sampling has not identified impacts to indoor air quality at structures surrounding the site. People are not drinking contaminated groundwater associated with the site because the area is served by a public water supply that obtains its water from a different source.

5.4: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts may include existing and potential future exposure pathways to fish and wildlife receptors, wetlands, groundwater resources, and surface water.

Based upon the resources and pathways identified and the toxicity of the contaminants of ecological concern at this site, a Fish and Wildlife Resources Impact Analysis (FWRIA) was deemed not necessary for OU 02.

The primary contaminant of concern at this site is coal tar (a condensate from the gas manufacturing process). Coal tar contains benzene toluene ethylbenzene and xylene (BTEX) and polycyclic aromatic hydrocarbons (PAHs).

The coal tar present on the site has been removed and treated or disposed off-site as part of OU1. A significant amount of coal tar migrated off-site and remains in OU2, north and west of the site, under the city streets and a residential property. This contamination is primarily within a layer of gravel at a depth ranging from 10 to 13 feet below the ground surface.

The site presents a significant environmental threat due to the ongoing presence of coal tar in the subsurface as described above and the release of tar-related contamination into the groundwater.

SECTION 6: SUMMARY OF THE EVALUATION OF ALTERNATIVES

To be selected the remedy must be protective of human health and the environment, be cost-effective, comply with other statutory requirements, and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. The remedy must also attain the remedial action objectives identified for the site, which are presented in Exhibit B. Potential remedial alternatives for the Site were identified, screened and evaluated in the feasibility study (FS) report.

A summary of the remedial alternatives that were considered for this site is presented in Exhibit C. Cost information is presented in the form of present worth, which represents the amount of money invested in the current year that would be sufficient to cover all present and future costs associated with the alternative. This enables the costs of remedial alternatives to be compared on a common basis. As a convention, a time frame of 30 years is used to evaluate present worth costs for alternatives with an indefinite duration. This does not imply that operation, maintenance, or monitoring would cease after 30 years if remediation goals are not achieved. A summary of the Remedial Alternatives Costs is included as Exhibit D.

6.1: Evaluation of Remedial Alternatives

The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375. A detailed discussion of the evaluation criteria and comparative analysis is included in the FS report.

The first two evaluation criteria are termed "threshold criteria" and must be satisfied in order for an alternative to be considered for selection.

1. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

2. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other

standards and criteria. In addition, this criterion includes the consideration of guidance which the Department has determined to be applicable on a case-specific basis.

The next six "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

4. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

5. Short-term Impacts and Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

7. Cost-Effectiveness. Capital costs and annual operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision.

8. Land Use. When cleanup to pre-disposal conditions is determined to be infeasible, the Department may consider the current, intended, and reasonable anticipated future land use of the site and its surroundings in the selection of the soil remedy.

The final criterion, Community Acceptance, is considered a "modifying criterion" and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

9. Community Acceptance. Concerns of the community regarding the investigation, the evaluation of alternatives, and the PRAP are evaluated. A responsiveness summary will be prepared that describes public comments received and the manner in which the Department will address the concerns raised. If the selected remedy differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

6.2: Elements of the Remedy

The basis for the Department's remedy is set forth at Exhibit E.

The estimated present worth cost to implement the remedy is $12,811,000. The cost to construct the remedy is estimated to be $9,744,000 and the estimated average annual cost is $153,000.

The elements of the selected remedy are as follows:

1. A remedial design program would be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program. Green remediation principals and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:
a. Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
b. Reducing direct and indirect greenhouse gas and other emissions;
c. Increasing energy efficiency and minimizing use of non-renewable energy;
d. Conserving and efficiently managing resources and materials;
e. Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
f. Maximizing habitat value and creating habitat when possible;
g. Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
h. Integrating the remedy with the end use where possible and encouraging green and sustainable re-development

2. Soil containing visible MGP impacts in areas designated as 1A and 1B will be excavated for off-site treatment and disposal at a permitted facility. Area 1A is located within Esty Street, north the plant site, approximately 40 to 200 feet east of North Plain Street. Area 1B is located west the plant site, beginning within the intersection of North Plain Street and Esty, and extending approximately 150 feet to the south. Area 1B includes some property outside the right-of-way. Excavation on that property will remove all soil impacted with site-related contamination above applicable SCGs based on the zoning of that property at the time of excavation. The Department encourages that soil that is not visibly impacted be stockpiled and used as backfill in the right-of–way portion of OU-2, following the completion of the excavation. Backfill on the residential property must meet residential SCGs.

3. If backfill material is used in the right-of–way portion of areas 1A and 1B which does not meet residential soil cleanup objectives, a soil cover will be provided over all vegetated areas to prevent exposure to underlying soils. The two foot thick cover will consist of clean soil underlain by a demarcation layer to delineate the cover soil from the subsurface soil. The top six inches of soil must be of sufficient quality to support vegetation. Clean soil is soil that is tested and meets the Division of Environmental Remediation's criteria for backfill. Non-vegetated areas

(buildings, roadways, parking lots, etc.) are covered by either a paving system or concrete at least 6 inches thick.

4. The gravel seam in area 1C, which is beneath North Plain Street, north of Esty Street, which contains MGP tar will be treated using in-situ chemical oxidation (ISCO). Any tar which is recoverable will first be removed using extraction wells. A treatability study will be performed to identify the oxidizing chemical which will most effectively treat the contamination.

5. Following remediation of source areas, groundwater quality will be monitored for site-related contamination. This applies to the areas described in paragraph 3 and 4 above, the areas addressed in OU1, and the IRMs on Washington Street and West Court Street. Any groundwater contamination identified will be addressed with monitored natural attenuation (MNA). Groundwater will be monitored for MGP-related contamination and also for MNA indicators which will provide an understanding of the biological and abiotic activity breaking down the contamination. It is anticipated that BTEX contamination will decrease by an order of magnitude (i.e. 90 percent) in a reasonable period of time (5 to 10 years). Reports of the attenuation will be provided at 5 and 10 years, and active remediation will be proposed if it appears that natural processes alone will not address the contamination. The contingency remedial action will depend on the information collected, but it is currently anticipated that oxygen injection would be the expected contingency remedial action.

6. The remedy selected for OU1 included the imposition of an institutional control. The following updates the requirements for that institutional control to be consistent with current regulations and guidance and address the necessary site management activities in OU2. An institutional control, in the form of an environmental easement will:

a) require the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3).

b) allow the use and development of the controlled property for restricted residential, commercial and industrial uses as defined by Part 375-1.8(g), though land use is subject to local zoning laws;

c) restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the Department, NYSDOH or County DOH;

d) prohibit agriculture or vegetable gardens on the controlled property;

e) require compliance with the Department approved Site Management Plan;

7. The remedy selected for Operable Unit 1 required a Site Management Plan (SMP). The following updates the requirements for that plan to be consistent with current regulations and guidance and address the necessary site management activities in OU2. To the extent that these provisions are in conflict with the OU1 ROD, then the provisions in this paragraph shall control. The SMP shall include the following:

a) an Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the Environmental Easement discussed in Paragraph 5 above remain in place and effective. This plan includes, but may not be limited to: (i)an excavation plan which details the provisions for management of future excavations in areas of remaining contamination; (ii)

descriptions of the provisions of the environmental easement including any land use, and groundwater use restrictions; (iii) a provision for evaluation of the potential for soil vapor intrusion for any buildings developed on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion. (iv) maintaining site access controls and Department notification; and (v) the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls;

b) a Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to: monitoring of groundwater to assess the performance and effectiveness of the remedy; a schedule of monitoring and frequency of submittals to the Department; monitoring for vapor intrusion for any buildings occupied or developed on the site, as may be required pursuant to item 6.a.iii. above.

Exhibit A

Nature and Extent of Contamination

The principal waste product produced at the former MGP site was coal tar, which is an oily, dark colored liquid with a strong, objectionable odor. Unlike most materials labeled as "tar", this is not a semi-solid, viscous material. Rather, it has a physical consistency similar to motor oil, which enables it to move through the subsurface. Coal tar is referred to as a dense non-aqueous phase liquid or DNAPL since it is slightly heavier than water and will not readily dissolve in water. When released into the subsurface, it will sink through the groundwater until it reaches some less permeable material which it cannot penetrate. It can, under certain conditions, move laterally away from the point where it was initially released.

The tar contains high levels of volatile and semi-volatile organic compounds (VOCs and SVOCs). The principal VOCs are benzene, toluene, ethylbenzene, and xylenes. These compounds, collectively known as BTEX, are slightly soluble in water. Groundwater which comes into contact with tar or tar-contaminated soils will become contaminated with BTEX compounds. This contaminated groundwater can then move through the subsurface along with the ordinary groundwater flow.

The principal SVOCs in the tar are a group of compounds known as polycyclic aromatic hydrocarbons, commonly abbreviated as PAHs. PAH compounds are generally less soluble than BTEX, and are consequently less likely to dissolve in groundwater. This makes PAH compounds less mobile in the subsurface, so the highest levels of PAHs are normally found in close proximity to the tar from which they are derived. The specific semivolatile organic compounds of concern in soil and groundwater are the following polycyclic aromatic hydrocarbons (PAHs):

acenaphthene	acenaphthylene	anthracene	benzo(a)anthracene
benzo(a)pyrene	benzo(b)fluoranthene	benzo(g,h,i)perylene	benzo(k)fluoranthene
dibenzo(a,h)anthracene	chrysene	fluoranthene	fluorene
indeno(1,2,3-cd) pyrene	2-methylnaphthalene	naphthalene	phenanthrene
pyrene			

In this document, PAH concentrations are referred to as total PAHs (TPAHs). The TPAH concentration is the sum of the concentrations of each PAH listed above.

All of the BTEX and PAH contaminants which dissolve in groundwater are subject to degradation by natural processes. Common soil bacteria are capable of using these chemical compounds as a food source, converting them to carbon dioxide and water. This degradation process takes place more rapidly when abundant oxygen is present in the groundwater, and can in many cases be expedited by the introduction of additional oxygen. However, contaminants which still remain in the tar itself, undissolved in water, remain beyond the reach of bacteria and can remain in their undegraded state indefinitely.

Figures 2 through 5 summarize the degree of contamination for the contaminants of concern in soil, groundwater and soil vapor, and compare the data with the SCGs for the site. The following are the media which were investigated and a summary of the findings of the investigation.

Waste/Source Areas

Wastes are defined in 6 NYCRR Part 375-1.2 (aw) and include solid, industrial and/or hazardous wastes. Source Areas are defined in 6 NYCRR Part 375 (au). Source areas are areas of concern at a site were substantial quantities of contaminants are found which can migrate and release significant levels of contaminants to another environmental medium. Wastes and Source areas were identified at the site include locations where coal tar NAPL is present in subsurface soils.

The majority of the coal tar originally present at this site was removed as part of the OU1 remedy. Significant amounts of coal tar remain in three distinct areas to the north and west of the site which are shown in Figure 2: Area 1A to the north of the plant site, Area 1B to the west of the plant site, and Area 1C within North Plain Street north of Esty Street. In each of these areas, the heaviest contamination is found within a layer of gravel at a depth typically ranging from 10 to 13 feet below the ground surface. These source areas will be addressed by the remedy selection process.

Groundwater

The primary groundwater contaminants are benzene, toluene, ethylbenzene and xylene (BTEX) associated with the former MGP. The extent of groundwater contamination is shown on Figure 4. The most significant groundwater contamination has been observed along Washington Street (Remedial Area 1), at the limits of the excavation previously completed on that street by the IRM. In Remedial Area 1, groundwater in close proximity to the coal tar present north and west of the plant site would be expected to contain site related contamination at levels above SCGs, sampling to date has not demonstrated this.

Table 1 - Groundwater

Detected Constituents	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)	Frequency Exceeding SCG
Benzene	ND – 1,300	1	6 of 38
Toluene	ND - 74	5	4 of 38
Ethylbenzene	ND – 1,100	5	2 of 38
Xylene	ND – 630	5	2 of 38
Acenaphthene	ND – 82	20	6 of 38
Phenol	ND – 2.3	1	1 of 38
Naphthalene	ND – 1,500	10	6 of 38
Cyanide	ND – 384	200	1 of 38

ND – Not detected above the detection limit.
a - ppb: parts per billion, which is equivalent to micrograms per liter, ug/L, in water.
b- SCG: Standard Criteria or Guidance - Ambient Water Quality Standards and Guidance Values (TOGs 1.1.1), 6 NYCRR Part 703, Surface water and Groundwater Quality Standards, and Part 5 of the New York State Sanitary Code (10 NYCRR Part 5).

Based on the findings of the RI, the disposal of hazardous waste has resulted in the contamination of groundwater. The site contaminants that are considered to be the primary contaminants of concern which

will drive the remediation of groundwater to be addressed by the remedy selection process are: benzene, toluene, ethylbenzene and xylene (BTEX).

Surface Soil

Subsurface soil samples were collected at the site during the RI. Several surface soil samples, including background samples, found PAHs present at levels exceeding unrestricted SCGs for individual PAH compounds. Based on the forensic analysis, the PAHs appear to share a common source with those identified in the background samples and do not appear to be MGP-related. Although the wooden duct removal project did not specifically target surface soil, all surface soil along the north side of West Court Street between the sidewalk and the street was excavated and replaced with clean fill as a result of the wooden duct removal.

Table 2 - Surface Soil

Detected Constituents	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG	Residential SCG[c] (ppm)	Frequency Exceeding Restricted SCG
SVOCs: PAHs					
Benzo(a)anthracene	ND-12	1	18/53	1	18/53
Benzo(a)pyrene	ND-20	1	27/53	1	27/53
Benzo(b)fluoranthene	ND-21	1	19/53	1	19/53
Benzo(k)fluoranthene	ND-12	0.8	19/53	3.9	14/53
Chrysene	ND-13	1	19/53	3.9	10/53
Dibenzo(a,h)anthracene	ND-4.6	0.33	19/53	0.33	19/53
Indeno(1,2,3-cd)pyrene	ND-9.7	0.5	28/53	0.5	28/53

a - ppm: parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil.
b - SCG: Part 375-6.8(a), Unrestricted Soil Cleanup Objectives.
c - SCG: Part 375-6.8(b), Restricted Residential Soil Cleanup Objectives.
ND – Not detected above the detection limit.

Any incomplete combustion process generates PAHs. Some levels of PAHs are expected in any urban area, and levels above the SCGs are not uncommon. Sources of PAHs can include exhaust from furnaces and automobiles, ash or exhaust from fireplaces, and structural fires. While some surface soil samples exhibit levels of PAHs higher than typical background levels, there does not appear to be a reasonable connection between these chemicals and the MGP related contamination. Therefore, surface soil PAHs are not considered site-specific contaminants of concern.

Soil

Subsurface soil samples were collected at the site during the RI. The results indicate that soils that are visibly impacted by coal tar exceed the unrestricted SCG for volatile and semi-volatile organics. The principal volatile organic chemicals of concern are the BTEX compounds, and the principal semi-volatile organic chemicals of concern are the PAH compounds. The BTEX compounds are generally co-located with the PAHs. At this site, elevated PAHs are collocated with visible evidence of MGP tar.

Table 3 - Soil					
Detected Constituents	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG	Residential SCG[c] (ppm)	Frequency Exceeding Restricted SCG
VOCs:					
Benzene	ND-93	0.06	12/151	.06	12/151
Acetone	ND-0.24	0.05	30/92	.05	30/92
Toluene	ND-2.6	0.7	2/151	0.7	2/151
Ethylbenzene	ND-360	1	11/151	1	11/151
Xylene	ND-390	0.26	14/151	1.6	10/151
SVOCs: Total PAHs					
2-Methylnaphthalene					
Acenaphthene	ND-1600	20	2/151	98	1/151
Acenaphthylene	ND-240	100	1/151	100	1/151
Anthracene	ND-550	100	2/151	100	2/151
Benzo(a)anthracene	ND-510	1	9/151	1	9/151
Benzo(a)pyrene	ND-510	1	8/151	1	8/151
Benzo(b)fluoranthene	ND-490	1	6/151	1	6/151
Benzo(k)fluoranthene	ND-140	0.8	5/151	1	4/151
Chrysene	ND-350	1	8/151	1	8/151
Dibenzo(a,h)anthracene	ND-48	0.33	5/151	0.33	5/151
Fluoranthene	ND-1200	100	2/151	100	2/151
Fluorene	ND-830	30	2/151	100	2/151
Indeno(1,2,3-cd)pyrene	ND-210	0.5	5/151	0.5	5/151
Naphthalene	ND-6300	12	6/151	12	6/151
Phenanthrene	ND-3100	100	2/151	100	2/151
Pyrene	ND-1700	100	2/151	100	2/151
Benzo(ghi)perylene	ND-300	100	1/151	100	1/151
Inorganics					
Total Cyanide	ND-23.4	27	0/135	27	0/135

a - ppm: parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil.
b - SCG: Part 375-6.8(a), Unrestricted Soil Cleanup Objectives.
c - SCG: Part 375-6.8(b), The lower of: Residential Soil Cleanup Objectives and Protection of Groundwater soil cleanup objective.
ND – Not detected above the detection limit.

The primary soil contaminants are polycyclic aromatic hydrocarbons (PAHs) and benzene, toluene, ethylbenzene, and xylene (BTEX) associated with residues from the operation of the former MGP. As noted on Figure 5, the primary soil contamination is co-located with soils which are visually impacted by coal tar NAPL.

Based on the findings of the Remedial Investigation, the disposal of hazardous waste has resulted in the contamination of soil. The site contaminants identified in soil which are considered to be the primary contaminants of concern, to be addressed by the remedy selection process are PAHs and BTEX.

Soil Vapor Intrusion

The evaluation of the potential for soil vapor intrusion resulting from the presence of site related soil or groundwater contamination was evaluated by the sampling of soil vapor, sub-slab soil vapor under structures, and indoor air inside structures.

Soil vapor samples were collected from the sub-slab of structures located near the plant site, along West Court Street, and along Washington Street. Indoor air and outdoor air samples were also collected. The samples were collected to assess the potential for soil vapor intrusion. The sampling point locations are shown on Figure 5.

Based on the information collected, and in comparison with the NYSDOH Soil Vapor Intrusion Guidance, no site-related soil vapor contamination of concern was identified in OU-2 during the RI. Therefore, no remedial alternatives need to be evaluated for soil vapor. It is noted that soil vapor-related remediation of one on-site building (the Markles Flats building) was required as part of OU1.

Exhibit B

SUMMARY OF THE REMEDIATION OBJECTIVES

The objectives for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. The goal for the remedial program is to restore the site to pre-disposal conditions to the extent feasible. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified at the site through the proper application of scientific and engineering principles.

The remedial objectives for this site are:

Public Health Protection

Groundwater

- Prevent people from drinking groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with contaminated groundwater.

Soil

- Prevent ingestion/direct contact with contaminated soil.

Environmental Protection

Groundwater

- Remove the source of ground water contamination.
- Restore the groundwater aquifer to meet ambient groundwater quality criteria, to the extent feasible.

Soil

- Prevent migration of contaminants that would result in groundwater contamination.

Exhibit C

Description of Remedial Alternatives

The following alternatives were considered based on the remedial action objectives (see Exhibit B) to address the contaminated media identified at the site as describe in Section 5:

Alternative 1: No Further Action

The No Further Action Alternative (FS Alternative 1) recognizes the remediation of the site completed by the IRM described in Section 5.2, as well as OU1. This alternative leaves OU2 in its present condition and does not provide any additional protection of the environment.

Alternative 2: Restoration to Unrestricted Conditions

This alternative (FS Alternative 2) achieves all of the SCGs discussed in Section 5.1.1 and soil meets the unrestricted soil cleanup objectives listed in Part 375-6.8 (a). This alternative would include: excavation of approximately 22,000 CY of soil to a depth of up to 17 feet below ground surface. Excavations would likely be supported by sheet piling, and odors and vapors would be controlled by the use of spray foam or other vapor control measures. Areas where excavation is not practical (e.g. under occupied homes) will be addressed using in-situ chemical oxidation (ISCO). This remedy does not rely on any new institutional or engineering controls to prevent future exposure, and no new site management or periodic review is proposed. This remedy will have no annual cost, only the capital cost.

Present Worth:..... *$17,807,000*
Capital Cost:..... *$17,807,000*
Annual Costs:..... *$0*

Alternative 3: In-Situ Solidification and Monitored Natural Attenuation

This alternative (FS Alternative 3B/4A) would include in-situ solidification (ISS) of the tar impacted soil in sub-areas 1A and 1B (north and west of the plant site, as shown in PRAP Figure 2). ISS is a process whereby contaminated soils are converted in-place into a stable cement-type matrix in which contaminants are bound or trapped and become immobile. The groundwater contamination on Washington Street, in sub-area 1C (North Plain Street, north of Esty Street, as shown on PRAP Figure 2) and in the remainder of Area 1 would be addressed using Monitored Natural Attenuation (MNA).

Present Worth:..... *$8,673,000*
Capital Cost:..... *$6,249,000*
Annual Costs:..... *$121,200*

Alternative 4: In-Situ Solidification and Monitored Natural Attenuation with In-Situ Chemical Oxidation

This alternative (FS Alternative 3B/4C) would be similar to Alternative 3 except that sub-area 1C would be treated using In-Situ Chemical Oxidation (ISCO) instead of MNA. ISCO is a process where a chemical oxidant is injected into the contaminated soil. The oxidant reacts with the contamination, breaking down the chemicals to decrease the contaminant concentration and decrease the likelihood that chemicals would dissolve or volatilize from the area of contamination. Prior to implementing ISCO, NAPL extraction wells will be used to remove any flowable coal tar. The groundwater contamination on Washington Street would be addressed using Monitored Natural Attenuation (MNA).

Present Worth:..... *$10,181,000*
Capital Cost:..... *$7,114,000*
Annual Costs:..... *$153,350*

Alternative 5: Excavation, In-Situ Chemical Oxidation and Monitored Natural Attenuation

This alternative (FS Alternative 3C/4C) would be similar to Alternative 4 except that sub-areas 1A and 1B would be excavated rather than solidified. Area 1C would be treated using ISCO, and the groundwater contamination on Washington Street would be addressed using Monitored Natural Attenuation (MNA).

Present Worth:..... *$12,811,000*
Capital Cost:..... *$9,744,000*
Annual Costs:..... *$153,350*

Alternative 6: Containment, NAPL recovery, and Monitored Natural Attenuation

This alternative (FS Alternative 3A/4C) would be similar to Alternative 5 except that it would prevent further migration of MGP tar in sub-areas 1A and 1B by constructing a low permeability subsurface barrier wall around those areas of potentially mobile MGP tar. For purposes of this document, this barrier is represented as a slurry wall, which would have a permeability of less than 1x 10-6 cm/sec. However, the actual material used for the barrier and construction techniques would be addressed as part of the remedial design. Potentially mobile coal tar inside the barrier wall would be extracted to the extent possible using NAPL collection wells. The groundwater contamination on Washington Street would be addressed using Monitored Natural Attenuation (MNA).

Present Worth:..... *$10,038,000*
Capital Cost:..... *$6,525,000*
Annual Costs:..... *$176,650*

Exhibit D

Table 3
Remedial Alternative Costs

Remedial Alternative	Capital Cost ($)	Annual Costs ($)	Total Present Worth ($)
1. No Action	0	0	0
2. Restoration to Unrestricted Conditions	$17,807,000	0	$17,807,000
3. In-Situ Solidification and Monitored Natural Attenuation	$6,249,000	$121,200	$8,673,000
4. In-Situ Solidification and Monitored Natural Attenuation with In-Situ Chemical Oxidation	$7,114,000	$153,350	$10,181,000
5. Excavation, In-Situ Chemical Oxidation and Monitored Natural Attenuation	$9,744,000	$153,350	$12,811,000
6. Containment, NAPL recovery, and Monitored Natural Attenuation	$6,525,000	$175,650	$10,038,000

Exhibit E

SUMMARY OF THE PROPOSED REMEDY

The Department is proposing Alternative 5, Excavation, In-Situ Chemical Oxidation and Monitored Natural Attenuation as the remedy for this site. The elements of this remedy are described in Section 7.2 and shown on Figure 6.

Basis for Selection

The proposed remedy is based on the results of the RI and the evaluation of alternatives.

Justification Area 1A and 1B:

MGP tar is present in the subsurface at this site in a number of different configurations. In some areas closest to the plant site, MGP tar has saturated the spaces between soil particles for a significant thickness. This condition exists in areas 1A and 1B at this site. The remedial technologies evaluated at this site which are capable of addressing these tar saturated areas are excavation, in-situ solidification (ISS), and containment with NAPL recovery. We would not expect the other available technologies to be effective.

Creating a containment barrier alone would leave the MGP tar in place as a mobile fluid which could move horizontally or vertically over time, potentially creating new exposures. That is the reason for combining containment with NAPL recovery. If sufficient NAPL can be removed, this combination of technologies should be as reliable as ISS. In practice, however, the effectiveness of NAPL recovery is not sufficiently consistent and predictable to be able to make that case convincingly, and ISS is generally viewed as more reliable at the present time. At this site, since ISS can be implemented at a lower cost with greater long-term effectiveness, ISS would be preferred over containment.

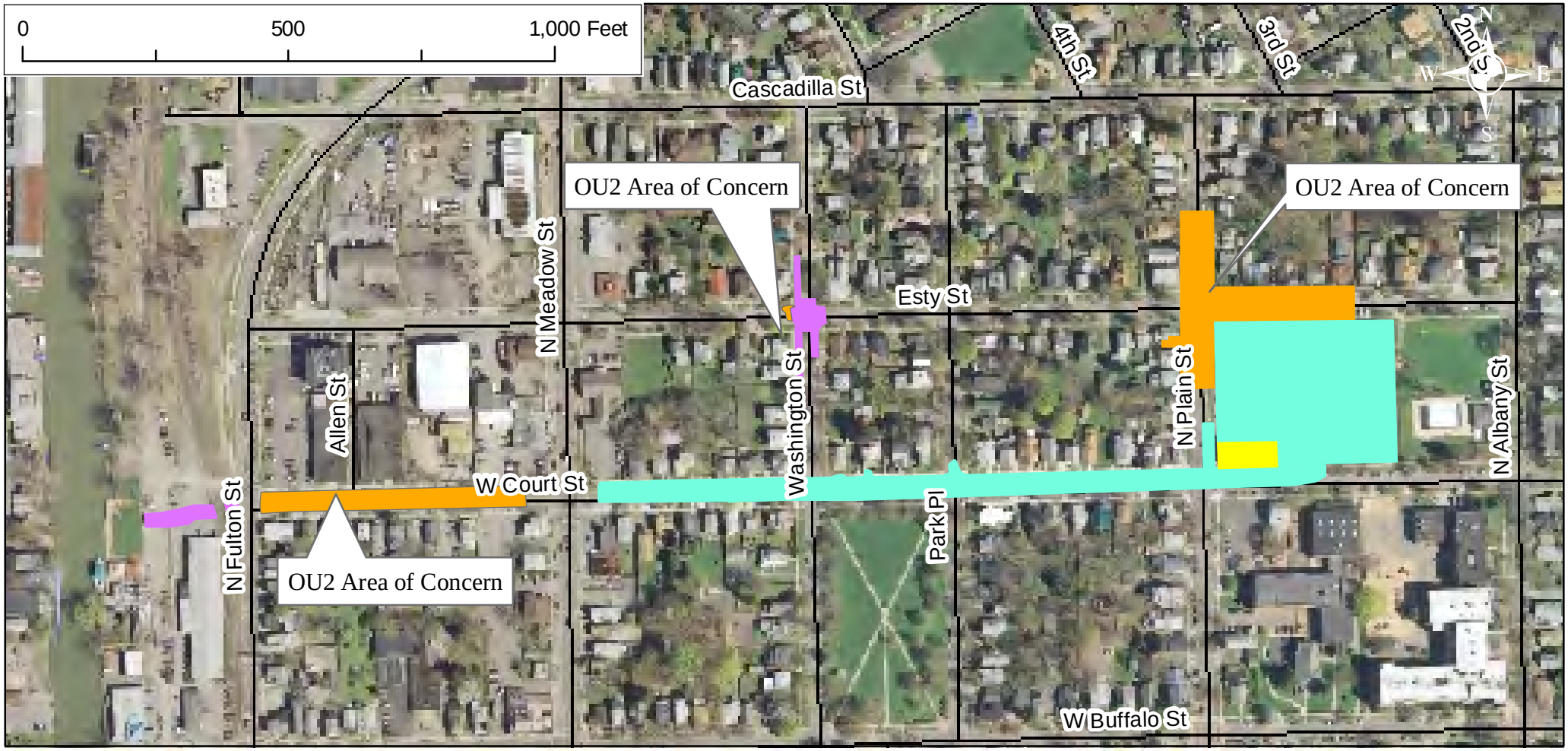
The Department generally has a preference for excavation over ISS, since excavation permanently removes the contamination. In contrast, ISS leaves the contamination in place, and the remedy would rely of institutional controls to prevent exposure. ISS is often selected at sites where excavation is difficult to implement (e.g., very deep contamination) or where it can be implemented in a way that is less disruptive. Since the contamination at this site is relatively shallow, and ISS would be nearly as disruptive to the community, these advantages are not as pronounced at this site. In comparing the cost of excavation to the cost for ISS, the costs for site preparation, treatment and restoration are quite similar. The cost for the two alternatives differs primarily by the cost of sheeting proposed for excavation support (approximately $1.5 million). While this is not an insignificant cost, it is not sufficient, in itself to offset the advantages of excavation over ISS, to wit: a) excavation is more effective in the long term; b) excavation is more effective in reducing toxicity, mobility and volume; c) excavation is more effective at eliminating potential human health exposure; and d) by viewing the sidewall of the excavation, we would have less likelihood of missing an area of contamination, and a greater understanding of subsurface conditions following remediation.

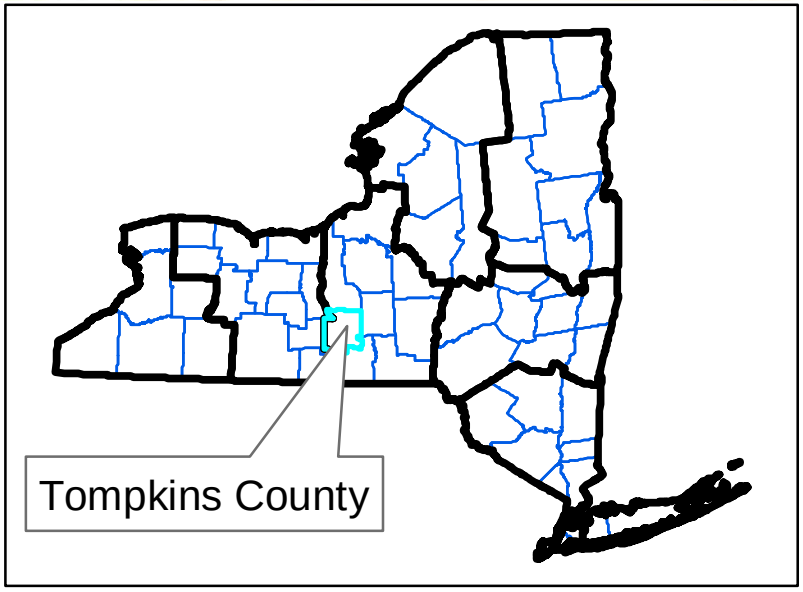
It is possible that the remedial contractor would be able to use alternate techniques to support the excavation (benching, trench boxes, etc.) which could significantly reduce the cost of excavation support. However, the selection of this remedy is based on the excavation alternatives as presented in the FS and does not rely on that savings.

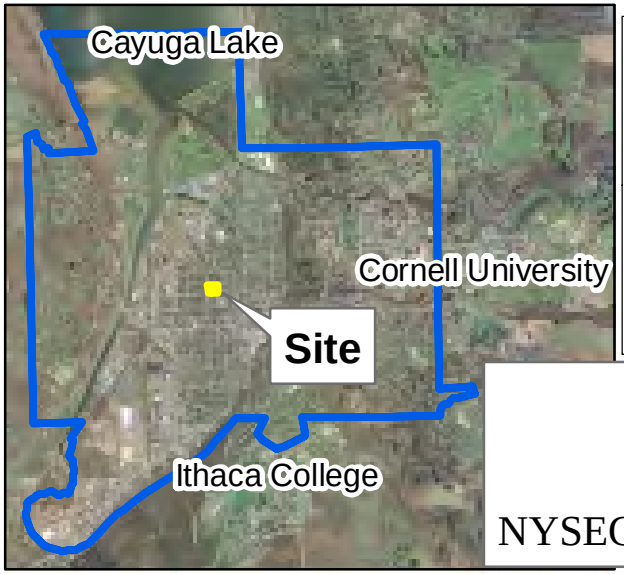
Justification Area 1C:

As MGP tar moves away from the tar-saturated areas, it tends to follow thin seams of more permeable material, frequently sand and/or gravel. This is the condition that exists in area 1C. In addition to the above listed technologies, these seams of tar saturation in Area 1C can also be treated using in-situ chemical oxidation (ISCO), if the seams are thin enough to allow the oxidizing chemical to fully contact the tar. The Department does not believe that MNA or enhanced biological treatment would be effective in this area without addressing the tar seams ahead of time. While enhanced biological treatment would be expected to bring down groundwater contamination concentrations in the short term, those concentrations would be expected to rebound to original levels if the source material were not adequately addressed. In evaluating the available technologies, the Department recognizes that both ISCO and excavation could potentially permanently eliminate the contamination from Area 1C. This makes both of these options preferable to ISS, since they would be more effective in the long term, more effective in reducing toxicity and volume, and more effective at eliminating potential human health exposure. If ISCO can be effectively implemented in Area 1C, then it would be preferable to excavation because it could be implemented with less disruption of the community. The Department supports the use of ISCO in this area since it would permanently destroy the contamination with the minimum impact to the community.

Beyond the saturated tar seams, tar may be present as individual "blebs" or droplets of tar or in very fine "rootlets". Contamination may also be present in soil where there is no separate phase tar but there is other evidence of contamination including odors, sheens, staining, and elevated levels of organic chemicals either recorded by field instruments or from laboratory analysis. All of area 2 and area 1 exclusive of 1A, 1B, and 1C fall into this category. Under ideal conditions, these impacts would naturally attenuate by a number of mechanisms, particularly digestion by naturally occurring bacteria. If conditions are not ideal, that process can be helped along by enhancing the process. For MGP related chemicals, this most commonly involves adding oxygen. A program of monitored natural attenuation (MNA) is proposed which sets definite goals for natural degradation, and requires enhancement of the process if these goals are not met. This program will achieve the remedial goals for this site with the least amount of disruption to the community, with the least impact to the environment and at the lowest cost.







Legend

Remediation Status

- OU-1 Remediation Complete
- OU-1 Markles Flats Remediation Pending
- OU-2 Remediation Complete
- OU-2 Not remediated

Figure 1
Location Map
NYSEG Ithaca Court Street MGP 755008

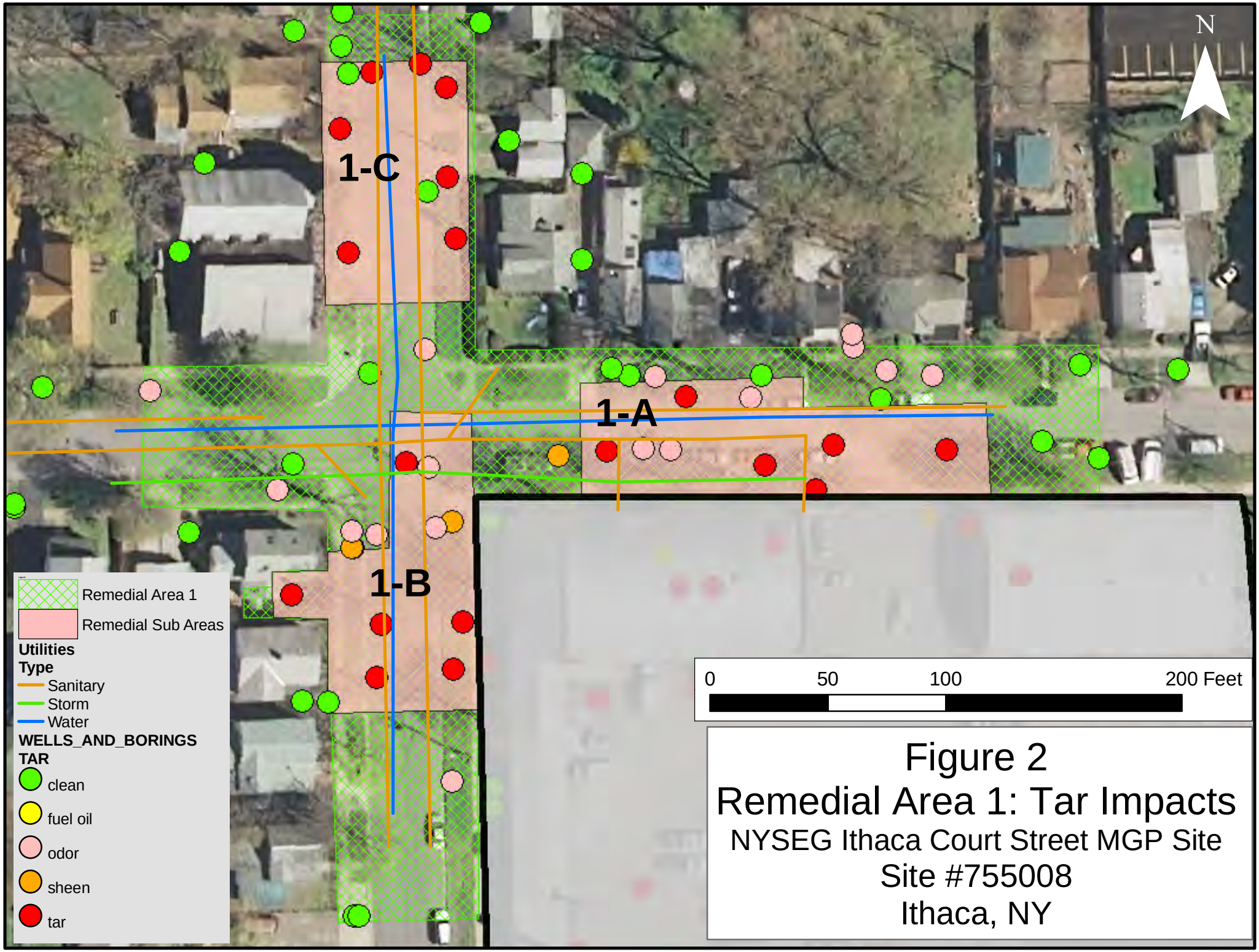


Figure 2
Remedial Area 1: Tar Impacts
NYSEG Ithaca Court Street MGP Site
Site #755008
Ithaca, NY

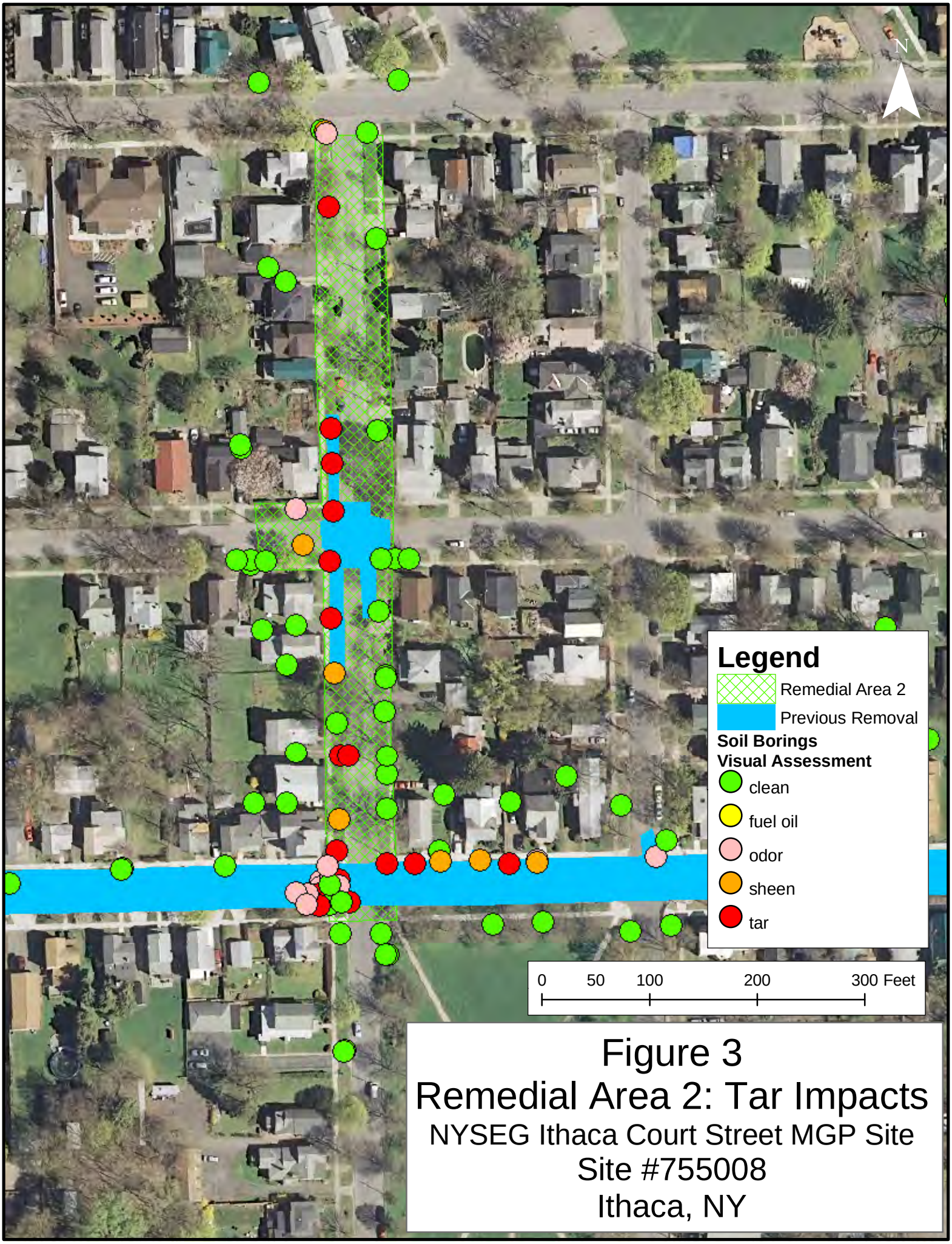


Figure 3
Remedial Area 2: Tar Impacts
NYSEG Ithaca Court Street MGP Site
Site #755008
Ithaca, NY

N

Acenaphthene = 1.6
Naphthalene = 1.9

Benzene = 620
Toluene = 74
Ethylbenzene = 1100
Xylene = 550
Acenaphthene = 76
Naphthalene = 1200

Cyanide = 16.4

Cyanide = 25.2

Benzene = 5
Ethylbenzene = 0.79
Acenaphthene = 82
Naphthalene = 1.6
Cyanide = 24.4

Cyanide = 384

Benzene = 12
Ethylbenzene = 1.3
Acenaphthene = 14
Naphthalene = 4.6

Benzene = 1300
Toluene = 42
Ethylbenzene = 1000
Xylene = 630
Acenaphthene = 51
Naphthalene = 1500
Phenol = 2.3

Benzene = 10
Ethylbenzene = 1.4
Xylene = 0.77
Acenaphthene = 51
Naphthalene = 15
Cyanide = 23.4

Legend

Wells

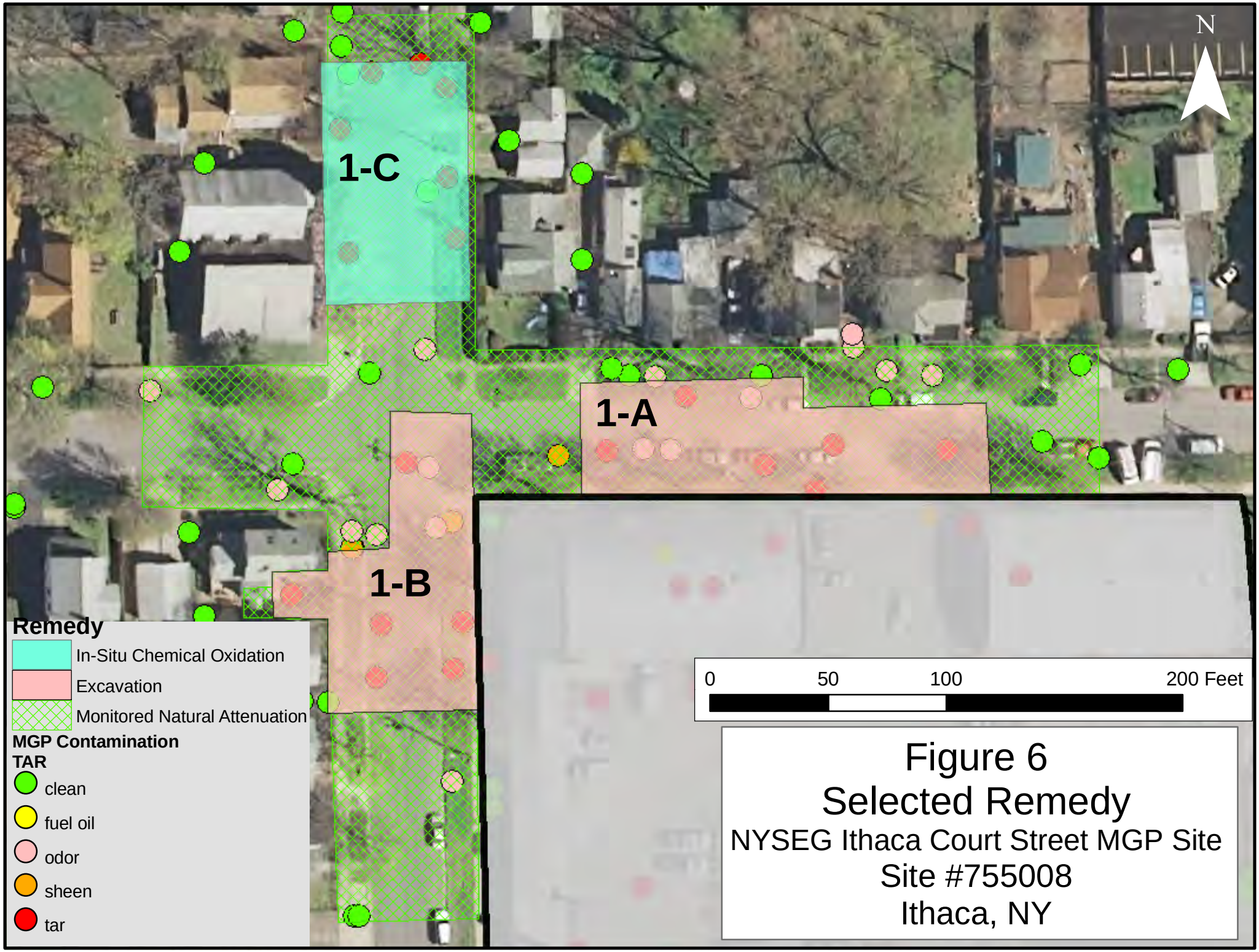
Benzene

- 0.000000 - 5.000000
- 5.000001 - 12.000000
- 12.000001 - 1300.000000

Figure 4
Groundwater Results
NYSEG Ithaca Court Street MGP Site
Site #755008
Ithaca, NY

Figure 5
Locations Surveyed for Potential Soil vapor Intrusion

NYSEG Ithaca Court Street MGP Site
Site #755008
Ithaca, NY


N
1-C
1-A
1-B
Remedy
In-Situ Chemical Oxidation
Excavation
Monitored Natural Attenuation
MGP Contamination
TAR
clean
fuel oil
odor
sheen
tar
0
50
100
200 Feet
Figure 6
Selected Remedy
NYSEG Ithaca Court Street MGP Site
Site #755008
Ithaca, NY

APPENDIX A

Responsiveness Summary

RESPONSIVENESS SUMMARY

NYSEG - Ithaca Court Street MGP
Operable Unit No. 2
Ithaca, Tompkins County, New York
Site No. 755008

The Proposed Remedial Action Plan (PRAP) for the NYSEG - Ithaca Court Street MGP site, was prepared by the New York State Department of Environmental Conservation (the Department) in consultation with the New York State Department of Health (NYSDOH) and was issued to the document repositories on March 31, 2011. The PRAP outlined the remedial measure proposed for the contaminated soil and groundwater at the NYSEG - Ithaca Court Street MGP site.

The release of the PRAP was announced by sending a notice to the public contact list, informing the public of the opportunity to comment on the proposed remedy.

A public meeting was held on March 11, 2011, which included a presentation of the remedial investigation, feasibility study (RI/FS) for the NYSEG - Ithaca Court Street MGP site as well as a discussion of the proposed remedy. The meeting provided an opportunity for citizens to discuss their concerns, ask questions and comment on the proposed remedy. These comments have become part of the Administrative Record for this site. The public comment period for the PRAP ended on March 31, 2011.

This responsiveness summary responds to all questions and comments raised during the public comment period. The following comments were provided by citizens at a public meeting held at the Greater Ithaca Activities Center (GIAC) on March 11, 2011:

COMMENT 1: When was groundwater monitoring with high results done on Washington Street?

RESPONSE 1: The first round of sampling was completed in 2002. Sampling was also completed in 2004, 2007 and 2010. BTEX concentrations at the intersection of Washington and Esty Streets have consistently been elevated.

COMMENT 2: What is the definition of groundwater? Is anything that comes into your basement groundwater? How do you know if it is contaminated? If that groundwater is pumped into a garden, could that cause a problem with produce grown there?

RESPONSE 2: Groundwater is defined as any water below the ground surface. If a basement has water entering it only during and shortly following a rain event, then this is likely to be surface runoff from the roof or the ground surface, which has not come into contact with MGP contaminants. However, if a basement has a sump pump in the vicinity of impacted groundwater that runs most of the time, then it may be drawing impacted groundwater into the house. That should be brought to the Department's attention. We do not believe that any discharge of contaminated water is taking place. If any discharge is brought to our attention, we will evaluate potential exposure

concerns at that time. Produce from a garden would not represent an exposure concern, because plants do not take up the BTEX chemicals.

COMMENT 3: What chemicals will be used for the proposed chemical oxidation? How is it delivered?

RESPONSE 3: The chemicals will be selected during the remedial design. Options include ozone, peroxides (including Fenton's Reagent), persulfates and permanganates. These chemicals would be dissolved in water and injected into the ground using temporary or permanent injection points. The preference is to use temporary injection points to minimize disruption of the street surface.

COMMENT 4: Will State budget cuts impact schedule?

RESPONSE 4: The Department doesn't expect any significant delays**.**

COMMENT 5: Can we enhance the biological process? Is bioremediation an option for coal tar?

RESPONSE 5: Oxygen injection, as discussed in the PRAP, will enhance the biological process. But this is only applicable to contamination once it is dissolved in water. Organisms that can live in the tar itself have not been identified.

COMMENT 6: Does ISCO create vapors that you would want people to stay away from?

RESPONSE 6: No.

COMMENT 7: Have you tested far enough out from the contamination?

RESPONSE 7: Yes. We started the investigation at known sources and moved out until we established the extent of contamination.

COMMENT 8: When will the excavation in Areas 1A & 1B and the ISCO at Area 1C begin?

RESPONSE 8: We expect the design to be completed in 6 to 12 months (late 2011 or early 2012). Excavation is expected to start later in 2012. The in-situ oxidation of Area 1C would likely be completed following removal of Areas 1A and 1B.

COMMENT 9: Can these chemical methods be used under Markles Flats building?

RESPONSE 9: No, this is a source area with a thicker amount of tar. See Response 5. The only technology available that would not require demolition is containment (which is proposed if the building remains). The other available technologies (excavation and ISS) would require demolition.

COMMENT 10: Will you be around in 10 years to monitor and assess contamination?

RESPONSE 10: Yes. The institutional control and the consent order between NYSEG and NYSDEC create legal obligations to provide site management; including monitoring and confirming that the remedy remains effectively in place.

COMMENT 11: Is there a public comment period on the remedial design?

RESPONSE 11: There is no formal comment period for the remedial resign (RD), but the final RD will be available to the public before construction starts. In addition, the Department will issue a fact sheet and hold a meeting to present the RD to the public.

COMMENT 12: You are proposing multiple applications of ISCO, will they be done until you reach SCGs?

RESPONSE 12: Yes. The idea would be to conduct one round of injections, then evaluate the impact. A subsequent injection event(s) would be planned in any area(s) where contamination was still above SCGs. If multiple rounds were ineffective, the Department would consider other alternatives.

COMMENT 13: What about contamination on private property, since the remedy focuses on the street?

RESPONSE 13: The contamination has only been identified beneath the street, except for the one property that NYSEG is purchasing.

COMMENT 14: It appears that NYSEG has been a responsive and responsible partner in this effort.

RESPONSE 14: NYSEG has been responsive relative to this site.

COMMENT 15: We note that arsenic and lead were detected, but that these chemicals are not described as site related chemicals of concern. Why not?

RESPONSE 15: Neither of these elements is typically associated with MGP byproducts. Arsenic is a naturally occurring element. Some lead is naturally occurring, but lead has also been introduced into the environment over the years through leaded gasoline, lead paint, and other sources. Consequently, detection of lead above background levels is not uncommon. Lead in the immediate vicinity of a gas holder could be associated with lead paint that was once on that structure, but that is not the case at this site.

COMMENT 16: Scheduling a Friday night meeting was not a good idea.

RESPONSE 16: NYSDEC generally avoids holding meetings on Friday, but scheduling restrictions required an exception for this meeting.

COMMENT 17: There is a water sample with elevated cyanide (300 ug/l) on Esty Street near North Plain Street. What will be done?

RESPONSE 17: It is assumed that the cyanide is dissolved into the water from the MGP tar. That tar is being removed, and with that removal, we would expect the cyanide levels to decrease over time and eventually meet groundwater standards. The water quality will be monitored. It should be noted that the cyanide compounds typically found at MGP sites are chemically bound to iron, which greatly reduces their toxicity.

COMMENT 18: Why not dig up the contamination in Area 1C as well?

RESPONSE 18: The situation in Area 1C is significantly different from the other two areas. The contamination in Area C is less extensive, which makes in situ treatment more likely to succeed. It is also located deeper in the ground, which makes it more challenging to reach with conventional excavation. Combined, these two factors tip the balance in favor of in situ treatment versus excavation.

Jutta Dotterweich, a Member of the Coal Tar Advisory Committee submitted an e-mail dated March 28, 2011, which included the following comments:

COMMENT 19: My first comment is regarding the proposal to treat the Area 1-C (Figure 6 in the Proposed Remedial Action Plan) using in-situ chemical oxidation (ISCO). Given the residential character of this neighborhood I am very concerned about the safety risks of this intervention. From the discussion at the public meeting on March 11, I understand that the chemical reaction that will occur when injecting chemicals into the coal tar this is very unpredictable. It has to be done very efficiently and precisely. And even then it is hard to control. There is always the potential of an overreaction that could push coal tar back to the surface or spill the chemicals injected. Or it could push the coal tar into the sub soil and into residents' basements. Consequently, I request to use excavation as the remedy of choice - as you have done for treatment area 1-A and 1-B.

RESPONSE 19: Based on our experience at other sites, we believe that ISCO can be implemented in a way that will be both safe and effective. The relatively open access to the ISCO area greatly contributes to our ability to control the treatment process and efficiently target the contamination for treatment without introducing excess chemical into the ground. During our review of the Remedial Design Work Plan, the Department will make sure that the appropriate precautions are in place to ensure that ISCO is applied safely or evaluate other options.

COMMENT 20: My second comment is regarding the 200 block of Washington St and the intersection of Washington and Esty Streets. I am very concerned about the high levels of certain VOC and SVOC (Benzene, Ethylbenzene, Naphthalene et al) in the ground water. They are much higher than in some other areas that have not been remediated (the coal tar on Washington was largely excavated 5-6 years ago). The suggested remediation is to monitor the ground water and let the natural, organic break down of coal tar take its course (even if it is very slow). How certain is it that there is no larger amount of coal tar left in the ground? Do we know for sure that we do not have similar toxic or high levels in the subsurface soil, potentially in residents' basements? Do we have any recent soil or basement measures? At what point in time do you decide to do more than just monitor the ground water levels (how many years)? When do you decide to intervene and use

additional remedies such as oxidation? And if you do, how do you make sure that this intervention does not push the toxic elements into the sub soil and into residents' home?

I would like to have these issues addressed before the remedial work plan is put together. I request the work plan to include a clear time line and decision points along with clearly outlined interventions that need to occur when the natural break down process is not progressing.

RESPONSE 20: NYSEG will continue to collect water quality and attenuation parameters in this area. If concentrations do not appreciably decrease, it may be reasonable to move up the decision to apply appropriate active remediation. The exact timing of that decision will be made based on the sampling results. Prior to any treatment in this area, we will refine the delineation of the contamination to ensure we know where the contaminated groundwater is and that there has been no change in potential exposures to the contamination. Based on our investigation and efforts during the removal action, we are not aware of any remaining source areas. Should this assessment identify a remaining source area(s) during the assessment of this area, it will be addressed appropriately.

Matt Hoffberg submitted an e-mail dated March 29, 2011, which included the following comments:

COMMENT 21: I'm a resident of the 300 block of Esty St., near the corner of Washington St. I have read the materials corresponding to the OU2 treatment areas and have corresponded with others who attended the public meeting held a couple of weeks ago (which I was unable to attend). I also attended the previous public meeting held a year or so ago to discuss the Court St. cleanup between Fulton and Meadow.

I am concerned about the high levels of VOC and SVOC in the groundwater near Esty and Washington. My understanding is that there is no active remediation planned for this area. In our residence, the second one in from the SE corner, we have an exposed basement such that any vapors coming up from the groundwater and/or surrounding soil will permeate our house. As a father of a 2-year old daughter with another child on the way, I'm particularly concerned about the possibilities of harmful toxins in the ground in our location, especially since young children are the most vulnerable to such toxins.

I realize that groundwater moves very slowly in these parts, but given how long the toxins have been in this area near Washington St., I request that more soil and basement samples near this intersection be tested prior to finalizing the remedy for the site.

RESPONSE 21: Contamination at this intersection is limited to the western side of Washington Street. Soil vapor has been tested at each house along the eastern side of Washington Street near the intersection, with no elevated levels of site related contamination. Groundwater was sampled immediately to the west of this area (HP-33) and BTEX compounds were not present in that analysis. Based on these investigations, the residence in question is outside the area impacted by site-related contamination. Due to the need for active remediation of the nearby groundwater contamination, additional monitoring wells will be needed to more precisely know the extent of this contamination and the effectiveness of the treatment. As such, we will continue to closely observe these impacts and protect against potential exposures.

Ken and Regina Deschere, members of the Ithaca City Community Advisory Group (CAG) on Cleanup Sites submitted an e-mail dated March 31, 2011, which included the following comments:

COMMENT 22: Much of the Court Street OU-2 PRAP requires continuing monitoring of area soil and groundwater to determine the effectiveness of the implemented remedies. We hope these tests will continue until a record of "clean" results is clearly established.

RESPONSE 22: Groundwater monitoring will continue until the remedial action objectives have been achieved.

COMMENT 23: Given the uncertainty about the thickness of the "coal tar seam" in Area 1-C, and the knowledge that ISCO will only treat the outer surfaces of that seam, it seems clear that the results of the ISCO remedy will take years to determine. In addition, ISCO does not address any of the heavy metal contaminants present. To allow the long-besieged neighborhoods to be demonstrably cleaned up, so they may put these episodes behind them, excavation to below the coal tar seam in Area 1-C seems far more desirable. This could be performed along with the excavation of Areas 1-A and 1-B, and would remove the source material and prevent the need for further disruption in the future. We believe that the source excavation techniques used effectively in OU-1 should be employed again in the highly contaminated areas in OU-2, including Areas 1-A, 1-B, and 1-C.

RESPONSE 23: The Department believes that ISCO can effectively treat the tar in this area in a time frame similar to excavation (likely a single field season) while causing less disruption in the surrounding neighborhood. The gravel seam in which the tar resides is thin and highly permeable. The uncluttered street surface offers the opportunity to space the injection points close together, thus providing for good contact between the injected oxidizing chemicals and the existing tar. The street also offers good access for verifying the effectiveness of the injections by probing between injection locations and re-injecting in locations found to have been incompletely treated during the first round.

None of the contaminants of concern related to this site are heavy metals. Cyanide is a contaminant of concern. We expect the cyanide in groundwater to be iron-complexed cyanides, which are far less toxic than free cyanide. If, however, any free cyanide is present, it would also be treated by ISCO. See also Response 19.

COMMENT 24: We also hope that excavation of the site under the Markles Flats building will be carried out ASAP, following the building demolition.

RESPONSE 24: Comment noted.

Jennifer Dotson, First Ward Alderperson, and member of the Ithaca City Community Advisory Group (CAG) on Cleanup Sites submitted an e-mail dated March 31, 2011, which included the following comments:

COMMENT 25: Continuing monitoring of area soil and groundwater is necessary to determine the effectiveness of the implemented remedies, and this testing should continue until a record of "clean" results is clearly established.

RESPONSE 25: Refer to Response 22.

COMMENT 26: Given that it seems clear that the results of the ISCO remedy will take years to determine, and ISCO does not address any of the heavy metal contaminants present, I agree that excavation to below the coal tar seam in Area 1-C is far more desirable. This could be performed along with the excavation of Areas 1-A and 1-B, and would remove the source material and prevent the need for further disruption in the future. The source excavation techniques that were used effectively in OU-1 should be used again in the highly contaminated areas in OU-2, including Areas 1-A, 1-B, and 1-C.

RESPONSE 26: Refer to Response 23.

Eric Rosario, a member of the City of Ithaca's Community Advisory Group (CAG) and the Alder person for the 2nd Ward in which these sites are located submitted an e-mail dated March 31, 2011, which included the following comments:

COMMENT 27: Much of the Court Street OU-2 PRAP requires continuing monitoring of area soil and ground water to determine the effectiveness of the implemented remedies. We hope these tests will continue until a record of "clean" results is clearly established.

RESPONSE 27: Refer to Response 22.

COMMENT 28: Given the uncertainty about the thickness of the "coal tar seam" in Area 1-C, and the knowledge that ISCO will only treat the outer surfaces of that seam, it seems clear that the results of the ISCO remedy will take years to determine. In addition, ISCO does not address any of the heavy metal contaminants present. To allow the long-besieged neighborhoods to be demonstrably cleaned up, so they may put these episodes behind them, excavation to below the coal tar seam in Area 1-C seems far more desirable. This could be performed along with the excavation of Areas 1-A and 1-B, and would remove the source material and prevent the need for further disruption in the future. We believe that the source excavation techniques used effectively in OU-1 should be employed again in the highly contaminated areas in OU-2, including Areas 1-A, 1-B, and 1-C.

RESPONSE 28: Refer to Response 23.

COMMENT 29: We also hope that excavation of the site under the Markles Flats building will be carried out ASAP, following the building demolition.

RESPONSE 29: Refer to Response 24.

APPENDIX B

Administrative Record

Administrative Record

NYSEG - Ithaca Court St. MGP
Operable Unit No.2
Ithaca, Tompkins County, New York
Site No. 755008

Proposed Remedial Action Plan for the NYSEG Ithaca Court St. MGP site, Operable Unit No. 2, dated February 2011, prepared by the Department.

Order on Consent, Index No. DO-0002-9309, between the Department and New York State Electric and Gas (NYSEG), executed on March 30, 1994.

"Interim Remedial Measures Final Engineering Report for Activities at Ithaca Court Street Former Manufactured Gas Plant Site Subsurface Wooden Duct Extension, City of Ithaca, Tompkins County, New York" August 2001, prepared by NYSEG.

"Ithaca Court Street MGP Site, Interim Draft Supplemental Remedial Investigation Report for Operable Unit-2" August 27, 2002, prepared by MWH.

"Interim Remedial Measures Work Plan for Removal of Coal Tar Impacted Soil on Washington Street Between W. Court and Cascadilla Streets Associated with Ithaca Court Street Former Manufactured Gas Plant Site City of Ithaca, Tompkins County, New York" March 2005, prepared by NYSEG Environmental Compliance Site Investigation and Remediation.

"Final Engineering Report Removal of the Subsurface Wooden Duct and Removal of Coal Tar Impacted Soil of Washington Street Between W. Court and Cascadilla Streets Associated with Ithaca Court Street Former manufactured Gas Plant Site, City of Ithaca, Tompkins County, New York" April 2007, prepared by NYSEG Environmental Compliance Site Investigation and Remediation.

"OU2 Interim Remedial Measure Work Plan for Wooden Duct Removal Project on W. Court Street Between Meadow and Fulton Streets, Ithaca Court Street Former manufactured Gas Plant Site, City of Ithaca, Tompkins County, New York, October 2010, prepared by NYSEG.

"Remedial Investigation Report Operable Unit 2 NYSEG's Court Street Former MGP Site, Ithaca, New York" February 2011, prepared by AECOM.

"Feasibility Study Report Operable Unit 2 NYSEG's Court Street Former MGP Site, Ithaca, New York, NYSDEC Site No: 7-55-008, Index No. D0-00029309" February 2011, prepared by AECOM.