AECOM Environment

Prepared for:
New York State Electric and Gas Co.

Prepared by:
AECOM
Buffalo, NY
60543583
April 2019

Feasibility Study Report
Final

NYSEG Auburn Green Street Former Manufactured Gas Plant Holder Site
City of Auburn, Cayuga County, New York

NYSDEC Site No: # 7-06-009

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CERTIFICATION

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

STATE OF NEW YORK
MATTHEW THOMAS THORPE
090842
LICENSED PROFESSIONAL ENGINEER

04/05/19

Matthew T. Thorpe, P.E.
New York State Licensed Professional
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Date

Executive Summary

This Feasibility Study (FS) Report presents the results of the remedial action selection process for a former manufactured gas plant (MGP) gas holder (NYSDEC Site No. 7-06-009) located in the City of Auburn, Cayuga County, New York. The FS has been prepared for New York State Electric & Gas Corporation (NYSEG) by AECOM. The purpose of the FS is to present remedial action goals and objectives, available remedial action methods, and a selection of the most appropriate methods to address the environmental conditions encountered at the Site. The FS has been prepared in accordance with the most recent and applicable guidelines of the NYSDEC including Division of Environmental Remediation's *Technical Guidance for Site Investigation and Remediation* (DER-10) (NYSDEC, 2010).

Site Conditions

The Site is located on Green Street in the City of Auburn, Cayuga County, New York. The Site is comprised of two parcels of land, which are summarized as follows:

- NYSEG substation Parcel 115.52-1-37 – The parcel is currently used as an active substation for NYSEG. As shown on Figure 1-3, this parcel is the location of the former gas holder. This parcel is covered with gravel.

- Adjacent NYSEG Parcel 115.52-1-38 – Northeast – To the northeast of the NYSEG substation parcel is a separate parcel of land also currently owned by NYSEG. This parcel is vacant and covered with grass and trees.

The Site is surrounded by a mix of commercial and residential properties and is located in the downtown section of Auburn. The Site is bounded by Hulbert Street to the west, Water Street to the north, Green Street to the east, and a parking lot to the south. Farther to the north is the New York State Route 5 and 20 corridor, a railroad right-of-way with rail tracks, the Owasco Outlet River, and the Auburn Correctional Facility. East of Green Street is a hotel followed by commercial properties. Commercial properties followed by residential properties are located to the west and south of the Site.

Several environmental investigations have been performed at the Site between 1981 and 2014. These investigations were documented in the Site Characterization (SC) Report (AECOM, 2016). The SC indicated that volatile organic compounds (VOCs, including benzene), semi-volatile organic compounds (SVOCs, including polycyclic aromatic hydrocarbons (PAHs)), cyanide, and metals are present in surface soil, subsurface soil, and groundwater at the Site. Constituents of Concern (COC) considered to be MGP-related include: arsenic in surface soil; VOCs, PAHs, and arsenic in subsurface soil; and VOCs, PAHs, phenols, and total cyanide in groundwater.

The Site is located in the Ontario Lowlands physiographic province, which is characterized as a poorly drained and fairly level previously glaciated plain. Three subsurface units were identified during the investigations:

- Fill - Comprised of brown silt and fine to medium sand, some fine to coarse gravel, and trace wood, coal slag, brick fragments, ash, and/or cinders. Fill was found in all areas of the Site, with thicknesses generally ranging from 5 to 7 feet (ft), although fill materials were observed as deep as 22 ft below ground surface (bgs) within the footprint of the former gas holder.

- Sandy Silt - Beneath the fill is a sandy silt/silt unit that is composed of brown sandy silt with some fine to medium gravel. The thickness of the sandy silt unit generally ranges from 3 to 8 ft.
- Silty Clay/Clayey Silt - Beneath the sandy silt/silt where present, lies a red-brown silty clay/clayey silt unit. The top of this unit ranges from approximately 9 to 18 ft bgs. The observed thickness of the unit ranges from approximately 3 to 8 ft.

Groundwater level measurements collected from the Site wells in 2013 and 2014 indicated that the groundwater table is generally between 5 and 14 ft bgs across the Site with groundwater flow toward the northeast. Monitoring well MW-5 had water levels consistently lower than other Site wells. The water level in this well is believed to represent a different water layer with a lower hydraulic head compared to the other Site wells and could be indicative of local groundwater mounding near the former gas holder.

The qualitative human health exposure assessment was performed to identify potential sources, migration routes for Site-related impacts, potential human receptors and potential exposure pathways at, and in the vicinity of, the Site. The sources of environmental impacts for the investigation area are residuals associated with the former MGP-related structures. The nature and extent of MGP residual-related impacts, as described above, were used as the basis to determine the potential for exposure to human receptors on the NYSEG and adjoining properties.

Potential human receptors associated with the NYSEG property were found to include outdoor maintenance workers, construction workers, and the public. Outdoor maintenance workers may potentially be exposed to COC in surface soil via incidental ingestion or direct contact through maintenance activities (e.g., lawn care). The public (i.e., pedestrians) or lawn maintenance workers may potentially be exposed to COC in surface soil via incidental ingestion or direct contact through recreation in the western adjoining public right-of-way (i.e., Hulbert Street) outside of the fenced NYSEG property. Construction workers may potentially be exposed to COC in subsurface soil and groundwater via incidental ingestion, direct contact, and inhalation of volatiles or particulates during deep (~5 ft below ground surface) intrusive activities (e.g., excavation, drilling, underground utility installation, etc.).

A Fish and Wildlife Impact Analysis (FWIA) was not performed during the SC or FS because the Site is an urban electrical substation and the parcels around the Site are used for commercial purposes and a significant high-value habitat for wildlife does not exist. Therefore, the potential for an ecological receptor to be exposed to MGP Site-related COC is considered to be low.

Remedial Action Objectives and Criteria

The SC Report included a qualitative assessment of potential risks associated with contamination at the Site. Addressing those potential risks would be required in order for a remedial action to meet the “protectiveness” requirement of the remedial action. The risk assessment identified the following potential exposure pathways related to past MGP operations:

- Surface Soil – Exposures of maintenance workers, construction workers, and the public to contaminants through incidental ingestion and direct contact.
- Subsurface Soil – Exposures of construction workers to contaminants through incidental ingestion, direct contact, and inhalation.

- Groundwater – Exposures of construction workers to contaminants through incidental ingestion, direct contact, and inhalation.

The first step in the remedy selection process described in DER-10 is establishment of remedial action objectives and criteria to be used to evaluate the expected performance of remedial technologies to be applied at the Site. These factors are then used to determine areas on-site where specific media need to be remediated. Remedial Action Objectives (RAOs) are site- and medium-specific objectives established to ensure that the remedial action will be protective of human health. RAOs for impacted media identified at the Site including surface soil, subsurface soil, and groundwater are presented in Section 3.

Remedial Action Criteria are medium- and contaminant-specific numerical or qualitative standards that can be compared directly to the results or predicted results of remedial actions to verify compliance with RAOs. Criteria have been established for each impacted medium and compared with data collected during the SC and other investigations to determine the areas on-site where criteria are exceeded. Figures 2-6, 2-7, and 2-8 show the areas of exceedances for surface soil, subsurface soil, and groundwater, respectively.

Evaluation of Remedial Technologies and Alternatives

Once on-site areas where remedial criteria are exceeded are established, a range of remedial technologies are evaluated which may be effective in meeting RAOs in those areas. The technology evaluation for each affected medium at the Site is summarized in Tables 4-4 through 4-6.

Following the technology evaluation, technologies that were retained have been combined into site-wide remedial alternatives that address the remedial goals for all of the media of concern. The following alternatives were developed for the Site:

- Alternative 1 – No Action
- Alternative 2 – Surface Soil Removal, Monitored Natural Attenuation (MNA), Institutional Controls/Engineering Controls (ICs/ECs)
- Alternative 3 – Surface Soil Removal, Enhanced Aerobic Biodegradation, MNA, ICs/ECs
- Alternative 4 – Soil and Gas Holder Excavation with Substation Relocation, MNA, ICs/ECs

The components of these alternatives are shown in Figures 5-1 through 5-3.

DER-10 establishes eight criteria by which remedial alternatives must be evaluated. A summary of the evaluation is presented in Table 5-1. A comparison of the relative performance of the alternatives on the eight criteria is summarized in Table 5-2.

Recommended Remedial Alternative

Based on the evaluation, a recommended remedial alternative for the Site has been selected as providing the best all-around performance on all of the evaluation criteria. Community acceptance was not evaluated as part of the FS. It will be addressed during the public hearing process. The recommended remedy, shown in Figure 5-3, is Alternative 3 – Surface Soil Removal, Enhanced Aerobic Biodegradation, MNA, and ICs/ECs.

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List of Acronyms

AES	Atlantic Environmental Services, Inc.
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene and xylene
CAMP	Community Air Monitoring Plan
COC	constituents of concern
CY	cubic yards
DER	Division of Environmental Remediation
DER-10	Technical Guidance for Site Investigation and Remediation
DNAPL	dense non-aqueous phase liquid
EC	Engineering Control
ECL	Environmental Conservation Law
FS	Feasibility Study
ft	feet/foot
FWIA	Fish and Wildlife Impact Analysis
GAC	granular activated carbon
GW	groundwater
HASP	Health and Safety Plan
IC	Institutional Control
ISCO	In-Situ Chemical Oxidation
LNAPL	light non-aqueous phase liquid
LTTD	Low-temperature Thermal Desorption
mg/kg	milligrams per kilogram
MGP	Manufactured Gas Plant
MNA	Monitored Natural Attenuation
NA	Natural Attenuation
NAPL	non-aqueous Phase Liquid
NAVD88	North American Vertical Datum of 1988
NYCRR	New York Codes, Rules, and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSEG	New York State Electric & Gas Corporation
O&M	operation and maintenance
OM&M	operations, maintenance and monitoring
ORCs	oxygen-releasing compounds
PAHs	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
POTW	Publicly Owned Treatment Works
PPE	personal protective equipment

ppm	parts per million
RAGs	Remedial Action Goals
RAOs	Remedial Action Objectives
RI	Remedial Investigation
ROW	right-of-way
SC	Site Characterization
SCGs	Standards, criteria and guidance
SCOs	Soil Cleanup Objectives
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SVOCs	semi-volatile organic compounds
TAL	Target Analyte List
TBC	to be considered
TCL	Target Compound List
TOGS	Technical Operational Guidance Series
μg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
VOCs	volatile organic compounds

1 Introduction

This Feasibility Study (FS) Report presents the results of the remedial action selection process for a former manufactured gas plant (MGP) gas holder (New York State Department of Environmental Conservation [NYSDEC] Site No. 7-06-009) located in the City of Auburn, Cayuga County, New York (hereinafter referred to as the Site). The Site location is illustrated in Figure 1-1. The FS has been prepared for New York State Electric & Gas Corporation (NYSEG) by AECOM.

The FS has been prepared pursuant to a Multi-site Order on Consent between NYSEG and NYSDEC and in accordance with NYSDEC's Division of Environmental Remediation (DER) *Technical Guidance for Site Investigation and Remediation* (DER-10) (NYSDEC, 2010).

1.1 Purpose

As requested by NYSDEC, this FS Report has been prepared following the completion of the Site Characterization (SC) Report for the Site (AECOM, 2016). DER-10 specifies that the FS Report should be prepared by the party responsible for conducting remediation and submitted to the NYSDEC's DER for approval prior to implementation of the remedy. The purpose of the FS Report is to develop remedial alternatives for the Site, evaluate the alternatives based on established criteria, and make a recommendation for an appropriate final remedy. DER-10 specifies that the FS Report should document the completion of the following activities:

- Identify the goal of the remedial program;
- Define the nature and extent of the MGP-related residuals to be addresses by the developed alternatives;
- Develop Remedial Action Objectives (RAOs) for the Site;
- Implement the specified decision-making process outlined in DER-10 to identify and evaluate appropriate remedial options;
- Complete an initial screening and detailed analysis of the identified alternatives;
- Implement the decision process identified in DER-10, to identify and evaluate remedial options;
- Develop a set of remedial action alternatives;
- Develop and provide a detailed description of the recommended remedy; and
- Demonstrate that the recommended remedy can achieve the cleanup objectives for the Site.

1.2 Report Organization

DER-10 identifies eight specific elements that should be included in a FS. Those elements, and the locations in this report where they are presented, include the following:

- Purpose — Section 1.1
- Site Description and History — Section 1.3
- Summary of Site Characterization and Exposure/Risk Assessment — Section 2.0

- Remedial Goals and Remedial Action Objectives Section 3.0
- General Response Actions Section 4.1
- Identification and Screening of Technologies Sections 4.2 and 4.3
- Development and Analysis of Alternatives Section 5.0
- Recommended Remedy Section 6.0

Cost estimates for the remedial alternatives are provided in Appendix A. Volume estimates for impacted media are presented in Section 3.

1.3 Site Description and History

This section presents a description of the Site and information regarding Site ownership and operational history.

1.3.1 Site Description

The Site is located in the City of Auburn, Cayuga County, New York. The location of the Site and the surrounding features are shown on Figure 1-2. The Site is surrounded by a mix of commercial and residential properties in the downtown section of Auburn. The Site is bounded by Hulbert Street to the west, Water Street to the north, Green Street to the east, and a parking lot to the south. Farther to the north is NY Route 5 and 20 West, a railroad right-of-way with rail tracks, the Owasco Outlet River, and the Auburn Correctional Facility. East of Green Street is a hotel followed by commercial properties. Commercial properties followed by residential properties are located to the west and south of the Site.

The Site is comprised of two parcels of land. The parcels are summarized as follows:

- Parcel 115.52-1-37 – NYSEG substation - This parcel is currently used as an active substation for NYSEG. As shown on Figure 1-3, the majority of the former gas holder was located on this parcel. The parcel is covered with gravel and is surrounded by a chain-link fence with secure access.
- Parcel 115.52-1-38 – Adjacent northeast NYSEG parcel – This parcel is also owned by NYSEG and is located immediately adjacent to and northeast of the NYSEG substation parcel. This parcel is vacant and covered with grass and trees. There is no fence surrounding this parcel.

Parcels neighboring the Site include:

- Parcel 115.52-1-17 – Owner – AIDA and Community Computer Service, Inc. This property is located to the west of the Site across Hulbert Street and consists of a single building commercial business with paved parking.
- Parcel 115.52-1-36 – Owner - Community Computer Service, Inc. This parcel is a paved parking lot immediately south of the Site.
- Parcel 115.52-1-50.1 – Owner – Empower Federal Credit Union. This property is located to the east of the Site across Green Street and consists of a single building commercial business with paved parking.
- Parcel 115.52-1-46.1 – Owner – Goose Hollow, LLC. This property is located to the northeast of the Site across Water Street and consists of a single building commercial business with paved parking.

The Site and adjoining parcels fall within a “central commercial” zoning district identified by the City of Auburn (Appendix B).

The nearest residence to the former MGP gas holder is approximately 300 feet (ft) to the west. The City of Auburn receives its potable water supply from Owasco Lake, with its intake located approximately 3.5 miles upstream (south) of the Site (AES, 1991).

1.3.2 Site History and Former Structures

A review of the historical information available for the Site was presented in the SC Report and was based on a report prepared by Atlantic Environmental Services, Inc. (AES) titled *Manufactured Gas Plant Site Screening Report, Green Street Site, Auburn, NY*, dated September 1991 (AES, 1991). The report included a review of historical Sanborn Fire Insurance maps for the City of Auburn in addition to historical information from NYSEG’s records. A summary of the historical information obtained from these sources is presented in Table 1-1.

The gas holder was constructed in 1890 for gas produced by the nearby McMaster Street MGP and possibly the Clark Street MGP. The gas holder existed until sometime between 1931 and 1941. The gas holder was owned and used by the Auburn Gas Light Company from 1890 to 1911, the Empire Gas and Electric Company from 1911-1936, and NYSEG from 1936 until it was demolished between 1931 and 1941. From 1946 to 1950, a nearby lumber yard expanded into the Site. In 1950, NYSEG constructed the substation currently present at the Site. The locations of the former gas holder and other buildings are shown on Figure 1-3.

The historical research identified various former Site features which could have been potential source areas for MGP residuals and were targeted during the SC investigation. The key former MGP features are:

- A 100,000-cubic foot capacity gas holder with a brick-and-mortar foundation in the center portion of the Site.
- A gas governor house located on the eastern side of the Site.
- A shed located along the southern side of the Site.

Previous investigations, physical setting, site geology, and site hydrogeology are discussed in Section 2.

2 Summary of Site Characterization Investigation and Exposure/Risk Assessment

2.1 Summary of Previous Investigations

Previous investigation work performed at the Site is summarized as follows:

- In 1981, NYSEG collected one surface soil sample from the area of the former gas holder. The results of this sample are unknown.
- In 1987, the United States Environmental Protection Agency (USEPA) conducted a Potential Hazardous Waste Site Preliminary Assessment. The results of the assessment were presented in the document titled *Potential Hazardous Waste Site Preliminary Assessment, NYSEG Auburn Gas Plant*, dated December 7, 1987 (USEPA, 1987).
- In 1988, NYSEG conducted a Site inspection that revealed the presence of a few clinkers and small quantities of demolition debris.
- In 1991, AES performed an assessment of Site conditions that included historical research, a Site reconnaissance, and surface soil sampling and analysis. The results of the assessment were presented in the document titled *Manufactured Gas Plant Site Screening Report, Green Street Site, Auburn, NY*, dated September 1991 (AES, 1991). The locations of the surface soil samples are shown on Figure 2-1.
- In 2013 and 2014, AECOM performed additional assessments of the property during an SC and a Supplemental SC, respectively (AECOM, 2016). Surface soil, subsurface soil, and groundwater sample locations are shown on Figure 2-1.

Relevant information pertaining to the Site area from the above-mentioned reports is summarized below.

2.2 Geology and Hydrogeology

This section describes the regional geologic setting of the Auburn area, and presents a summary of the field measurements and observations of the physical environment of the Site. Included is a discussion of the topography, geology, and hydrology of the Site.

2.2.1 Regional Geology

The Site is located in the Ontario Lowlands physiographic province which is characterized as a poorly drained and fairly level plain previously glaciated. Associated overburden deposits consist of gravel, sand, silt, and clay. Bedrock dips regionally to the south at approximately 40 ft per mile (Isachsen, Y.W., et al., 2000). Area undisturbed soils are mapped as Cazenovia Silt Loam which are derived from a loamy till that contains limestone with an admixture of reddish lake-laid clays or reddish clay shale. These soils tend to be well-drained silt loam to silty clay loam (USDA, 2012).

2.2.2 Site Geology

Observations regarding the geology of the Site were obtained during the SC. A cross section location map is provided as Figure 2-2. Cross-sections A-A’ and B-B’ are included as Figures 2-3 and 2-4, respectively. As shown in the cross sections, three subsurface units were identified during the characterization activities, which are further described in the following subsections. Although not shown in the cross sections, the ground surface at the Site is covered with gravel or grass and topsoil.

2.2.2.1 Fill

The fill material at the Site is comprised of brown silt and fine to medium sand, some fine to coarse gravel, and trace wood, coal slag, brick fragments, ash, and/or cinders. As shown in the cross-sectional views, fill is present in all areas of the Site. Fill thicknesses generally range from 5 to 7 ft, although in soil boring SB-02 fill materials were observed as deep as 22 ft below ground surface (ft bgs) within the footprint of the former gas holder (Figure 2-3).

2.2.2.2 Sandy Silt

Beneath the fill is a sandy silt/silt unit that is composed of brown sandy silt with some fine to medium gravel. The unit becomes denser and finer-grained with depth. The highest silt content was observed at the bottom of the unit, where traces of clay were sometimes identified. The sandy silt unit was identified in most, but not all of the soil borings installed at the Site. Where present, the thickness of the sandy silt unit ranges from approximately 3 to 8 ft.

2.2.2.3 Silty Clay/Clayey Silt

Beneath the sandy silt/silt where present, lies a red-brown silty clay/clayey silt unit. This unit tends to grade to a glacial till-like material including some gravel. The boundary between the overlying sandy silt unit and the silty clay/clayey silt unit varies across the Site. The top of the silty clay/clayey silt unit ranges from approximately 9 to 18 ft bgs. Where present, the observed thickness of the silty clay/clayey silt unit ranges from approximately 3 to 8 ft.

2.2.2.4 Bedrock

Although not penetrated during site investigations, bedrock underlying the Site is the Middle Devonian Onondaga Formation. The Onondaga Formation is estimated to be approximately 65 ft thick in the Auburn area and is comprised in descending order of the Seneca, Moorehouse, Nedrow, and Edgecliff Members (Rickard and Fisher, 1970). The units are characterized as fine to coarse grained limestone with occasional ash beds and clayey seams in the upper portions, and generally coarser grained with fossiliferous and cherty zones in deeper units. Bedding planes dip to the south at approximately 40 ft per mile and two predominant regional vertical joint sets are present in the area that strike approximately N 15 degrees W and N 75 degrees E.

2.2.2.5 Site Topography and Drainage

The ground surface at the Site is relatively flat with an elevation of approximately 667 ft North American Vertical Datum 1988 (NAVD88). The ground surface gently slopes to the north/northeast toward the Owasco Outlet River (approximately 657 ft NAVD88) located approximately 500 ft to the north. Although the overall flow of the Owasco Outlet River is from the south to the north, the river flows east to west north of the Site. The river is classified as a NYSDEC Class D surface water body. The designated uses for a Class D water body include activities such as fishing and primary and secondary contact recreation.

2.2.3 Site Hydrogeology

Water level measurements collected from the Site wells on May 8, 2013, August 6, 2013, and May 12, 2014 indicated that the groundwater table is generally between 5 and 14 ft bgs across the Site. As shown on Figure 2-5, shallow groundwater flows toward the northeast across the Site. Monitoring well

MW-5 had water levels consistently lower than other Site wells. The water level in this well is believed to represent a different water layer with a lower hydraulic head compared to the other Site wells and could be indicative of local groundwater mounding near the former gas holder. This well was not included in the groundwater contour mapping, but the water level is listed.

The horizontal hydraulic gradient in the vicinity of the former gas holder is approximately 0.053. Vertical hydraulic gradients are anticipated to be low, based upon the silty clay/clayey silt layer encountered at most boring locations immediately above the bedrock.

Hydraulic conductivity of the subsurface units likely vary, with estimates ranging from 1 x 10^{-2} to 1 x 10^{-4} centimeters per second for the fill and silty sand units to1 x 10^{-5} and 1 x 10^{-6} centimeters per second for the silty clay/clayey silt unit.

2.3 Nature and Extent of Contamination

This section provides a summary of the SC results. The SC and Supplemental SC sample locations, as well as locations of samples collected during previous investigations, are shown on Figure 2-1.

As shown in Table 2-1, SC surface soil, subsurface soil, and groundwater samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and polychlorinated biphenyls (PCBs), Target Analyte List (TAL) metals, and total cyanide.

The surface soil analytical results are summarized in Table 2-2 and Figure 2-6; the subsurface soil analytical results are summarized in Table 2-3 and Figure 2-7; and the groundwater analytical results are summarized in Tables 2-4A and 2-4B and Figure 2-8.

The surface and subsurface soil results are compared to Unrestricted Use, Commercial Use, and Protection of Groundwater Soil Cleanup Objectives (SCOs) provided in 6 New York Codes, Rules, and Regulations (NYCRR) Part 375 (NYSDEC, 2006). Where a result is greater than the respective SCO, the result has been circled in the tables and included on Figure 2-6 (Surface Soil) or Figure 2-7 (Subsurface Soil).

Groundwater results were compared to the guidance or standard values provided in the NYSDEC Technical and Operational Guidance Series 1.1.1 *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations* (TOGS 1.1.1) (NYSDEC, 1998 and addenda). Where a result is greater than the respective standard or guidance value, the result has been circled in the tables and included on Figure 2-8 (Groundwater).

2.3.1 Test Pit Excavations

Five test pits were excavated in and around the location of the former gas holder during the SC to evaluate the construction and size of the gas holder foundation and to evaluate subsurface conditions in the vicinity of the former gas holder (Figure 2-1). No apparent MGP-related impacts were observed in any of the test pits.

Three test pits (i.e., TP01, TP02, and TP04) were excavated to evaluate the size and construction of the gas holder foundation. The test pits were excavated to depths of 7 to 10 ft bgs. The wall portions of the gas holder foundation observed in TP01 and TP04 were constructed of brick and mortar. The foundation walls were approximately 2 ft thick. Based on the locations of the foundation walls identified in the test pits, the diameter of the gas holder foundation is approximately 70 ft and extends beneath the substation transformer area.

The gas holder foundation was not encountered in TP02 as the boring appears to have been located inside the gas holder foundation. Concrete was encountered in the southwestern portion of TP02 at 3 ft bgs and 5.5 ft bgs. A 1-inch diameter steel pipe was encountered 4 ft bgs in the northern portion of TP02. The pipe was not disturbed and no further evaluation of the pipe was conducted during the test pit excavation.

A definitive bottom of the gas holder was not identified. However, in test pit TP-01, the brick wall of the foundation ended at a depth of 9 ft. Material below this depth consisted of fine to medium sand with some gravel. Based on the depth of the brick wall, the bottom of the gas holder foundation may have been at 9 ft bgs.

TP03 was excavated west of the high-voltage transformer. A concrete slab was encountered 2 ft bgs in the southern portion of the test pit. This test pit may have been in the footprint of a former residence according to historical drawings.

TP05 was excavated in the grassy area northeast of the substation. The material from 0 to 5 ft bgs contained loose bricks, but no structures were encountered. This test pit was likely located in the footprint of a historical structure used previously as a garage, warehouse, and then paint business before being demolished.

2.3.2 Surface Soil

Three surface soil samples (SS-1 through SS-3) were collected by AES in 1991. Sample locations are shown on Figure 2-1. AES reported that the sample results for total benzene, toluene, ethyl benzene, and xylene (BTEX); total polycyclic aromatic hydrocarbons (PAHs, a group of SVOCs); and total cyanide were generally consistent with typical urban surface soil conditions and did not exceed current SCOs.

Six surface soil samples (SS-4 through SS-9) were collected during the 2013 SC at the locations shown on Figure 2-1. As shown on Table 2-2, no VOCs were detected at concentrations exceeding Unrestricted Use, Commercial Use, or Protection of Groundwater SCOs.

PAH compounds were detected in all surface soil samples collected from the Site but none were detected above the Unrestricted Use, Commercial Use, or Protection of Groundwater SCOs.

No PCB compounds were detected in any of the surface soil samples collected.

Several metals were detected in the surface soil samples. Arsenic was detected at concentrations slightly above the Unrestricted Use, Commercial Use, and Protection of Groundwater SCOs in samples SS-4, SS-6, and SS-10 along the western perimeter of the substation parcel (Figure 2-6). Calcium, iron, lead, mercury, and/or zinc were detected at concentrations above Unrestricted Use SCOs at several locations; however, these detections are considered to be representative of typical urban soil and considered not attributable to former MGP operations.

Total cyanide was detected in the three soil samples at concentrations less than the Unrestricted Use, Commercial Use, and Protection of Groundwater SCOs. Total cyanide was not detected in any other surface soil samples.

2.3.3 Subsurface Soil

Twenty-four subsurface soil samples from soil borings and test pits were collected and analyzed during the 2013 SC and three subsurface soil samples from soil borings were collected during the April 2014 Supplemental SC.

As shown in Table 2-3 and Figure 2-7, BTEX compounds were detected in 11 of the 27 subsurface soil samples collected from the borings and test pits. Benzene was detected in six samples at concentrations greater than the Unrestricted Use and Protection of Groundwater SCO, ethylbenzene and toluene exceeded the SCOs in one sample, and xylenes exceeded the SCO in two samples. The sample from SB-04, within the former gas holder, contained the highest concentrations of VOCs.

Acetone was detected in 16 samples with six of the samples having acetone at concentrations above Unrestricted Use and Protection of Groundwater SCOs. However, acetone is a common laboratory contaminant.

Of the 27 samples analyzed, as many as five samples had one or more PAH compound detected above the Unrestricted Use, Commercial Use, and/or Protection of Groundwater SCOs. Figure 2-7 shows all SVOC concentrations in exceedance of SCOs.

No PCB compounds were detected at concentrations greater than the laboratory reporting limits in any of the subsurface soil samples.

Several metals, including aluminum, arsenic, barium, cadmium, calcium, iron, lead, mercury, nickel, and zinc, were detected in the subsurface soil samples at concentrations higher than the Unrestricted Use SCOs. Arsenic was detected at concentrations above the Unrestricted Use SCOs in nine samples with seven of those samples exceeding Commercial Use and Protection of Groundwater SCOs. Barium was detected in one sample at a concentration exceeding the Commercial Use and Protection of Groundwater SCOs.

Total cyanide was detected in five subsurface soil samples but at concentrations less than the Unrestricted Use, Commercial Use, and Protection of Groundwater SCOs.

2.3.4 Groundwater

Groundwater samples were collected in 2013 from MW-1 through MW-6 and in 2014 from wells MW-1 through MW-8. Analytical results are summarized in Table 2-4A (2013), Table 2-4B (2014), and Figure 2-8.

All wells were checked for the presence of light non-aqueous phase liquid (LNAPL) and dense non-aqueous phase liquid (DNAPL); neither were observed.

Detected VOCs included benzene in five of six wells in 2013 and in two of eight wells in 2014 at concentrations greater than the groundwater standard. Ethylbenzene, toluene, and xylenes were detected at concentrations greater than the groundwater standard values in MW-4 in 2013 and 2014. Acetone was detected in MW-5 at a concentration greater than the guidance value. Acetone is a common laboratory contaminant and was detected in several other wells at concentrations less than the guidance value.

PAH compounds were detected above the method reporting limits in three of six wells in 2013 and one of eight wells in 2014. One PAH compound, naphthalene, was detected above the groundwater guidance value in one location (MW-4, located within the former gas holder) in both 2013 and 2014. Phenol, 2-methylphenol, and 4-methylphenol were detected at concentrations greater than the groundwater standard in MW-4 in 2013 and/or 2014. No SVOCs were detected in wells MW-1 and MW-6 in 2013 or from wells MW-1, MW-2, MW-6, and MW-8 in 2014.

No PCBs were detected in the monitoring wells at the Site during the May 2013 sampling. The May 2014 groundwater monitoring analyses did not include PCBs.

Iron, sodium, magnesium, and manganese were detected at concentrations in exceedance of the respective groundwater standards in one or more wells. The sample from MW-5 in 2013 contained arsenic, barium, beryllium, chromium, copper, lead, mercury, nickel, and selenium at concentrations greater than the respective groundwater standard or guidance values; and the sample from MW-3 in 2014 contained barium at a concentration above the groundwater standard value.

Total cyanide was detected in four of six wells in 2013 and four of eight wells in 2014, with only one location (MW-4) exceeding the groundwater standard in each year.

2.3.5 Surface Water and Sediments

Surface water and sediment sampling was not performed during the SC as there was no pathway for migration to any nearby surface water feature. As a result, discussion of surface water and sediment remedial action goals, objectives, or alternatives are not carried forward in this FS.

2.3.6 Soil Vapor / Vapor Intrusion

There are no occupied buildings on Site. Therefore, the current potential for human exposure to soil vapor constituents of concern (COC) is non-existent. However, while the remedial action is expected to reduce contaminant concentrations to acceptable levels, a potential exists for soil vapor intrusion and human exposure if Site conditions change and occupied structures are built on or adjacent to the Site before the remediation goals are met.

2.4 Fate and Transport in the Unsaturated Zone

2.4.1 Migration

In general, propagation of contaminants in the unsaturated zone is typically dominated by three processes: migration of dissolved phase contaminants with infiltrating precipitation; migration of volatilized contaminants in the soil vapor; and migration of the sorbed contamination with fugitive dust emissions or surface runoff. Contaminants present as separate-phase liquid within the soil or sorbed to the soil may dissolve as precipitation percolates through the unsaturated zone. This occurs during wet weather periods, when the water content exceeds the field capacity of the soil matrix. The flow is mostly gravity-driven and directed downward. Such downward migration through the unsaturated zone may constitute a source of contamination of the saturated zone below.

The surface of the substation area is entirely covered with crushed limestone and is completely fenced. Immediately adjacent to the western perimeter of the fenced substation as well as the northeast parcel owned by NYSEG, the ground surface is covered with grass. There is little to no potential for fugitive dust emissions from the Site in its current state. Therefore, contaminants that are sorbed to soil in the unsaturated zone have virtually no ability to migrate off-site via erosional processes.

VOCs can enter the soil vapor from soil and/or groundwater through the process of volatilization. Volatilization of VOCs to the soil vapor in the unsaturated zone may occur at the Site but since there are no occupied on-site or nearby structures or buildings, the soil vapor medium is not a concern at in its current state. Other contaminants present in the unsaturated zone (PAHs, phenols, metals) are not readily volatile. As a result, the migration of non-VOC contaminants through the gas phase is of little significance.

2.4.2 Degradation

Generally, the occurrence and rates of unsaturated zone biodegradation have to be determined by means of field studies, such as respiration tests. However, vadose zone biodegradation is limited by the amount of moisture present in the soil and transport processes between bacteria and contaminants. Sufficient moisture for active biological growth may not be present at all locations where contamination is elevated.

While some VOCs and lighter fraction SVOCs are subject to biodegradation, some SVOCs detected at the Site area are generally relatively persistent (PAHs). Phenolic compounds are relatively biodegradable in anaerobic conditions. Metals are recalcitrant. Overall, it is likely that natural degradation of the non-VOC contaminants detected in the Site area would not be significant.

2.5 Fate and Transport in the Saturated Zone

2.5.1 Migration

Contaminant migration in the saturated zone takes place predominantly by means of the transport of the dissolved-phase contamination in groundwater. The controlling factors are the direction of the groundwater flow within the aquifer, the hydraulic gradient, the hydraulic conductivity of the aquifer material, contaminant aqueous solubility, and the chemical composition of the soil matrix. VOCs also migrate from the groundwater/soil to the soil vapor in the unsaturated zone.

Groundwater in the overburden generally flows toward the northeast at the Site with a moderate hydraulic gradient. However, the subsurface materials have a wide range of permeability. VOCs, SVOCs, and cyanide were detected in MW-4, located within the former gas holder, at relatively elevated levels. However, the only MGP-related compound detected in groundwater samples collected outside the former gas holder was benzene and it was present at significantly lower concentrations than what was detected within the gas holder in MW-4. Based on the significant decrease in benzene concentrations outside the gas holder, off-site migration is expected to be minimal.

2.5.2 Degradation

VOCs can degrade in both aerobic and anaerobic processes, and phenolic compounds can degrade in anaerobic environments. SVOCs (particularly PAHs) and metals are generally recalcitrant, therefore, degradation of these contaminants is expected to be minimal or insignificant. Cyanide salts can be aerobically biodegradable and cyanide complexes are not readily volatile, however, hydrogen cyanide as an anion can migrate as a gas.

2.6 Baseline Risk Assessment Summary

An exposure assessment evaluating exposures to COC by human receptors was completed as part of this FS.

2.6.1 Human Health Exposure Assessment

The qualitative human health exposure assessment was performed to identify potential sources, migration routes for Site-related impacts, potential human receptors, and potential exposure pathways at, and in the vicinity of, the Site. The sources of environmental impacts for the investigation area are residuals associated with the former MGP-related structures. The nature and extent of MGP residual-related impacts, as described above, were used as the basis to determine the potential for exposure to human receptors on the NYSEG and adjoining properties. COC considered to be MGP-related include: arsenic in surface soil; VOCs, PAHs, and arsenic in subsurface soil; and VOCs, PAHs, cresols, phenol, and total cyanide in groundwater. There are other compounds and analytes detected above respective criteria in subsurface soil and groundwater, but they are either not considered to be MGP-derived and/or are representative of typical urban background concentrations.

Potential human receptors associated with the NYSEG property were found to include outdoor maintenance workers, construction workers, and the public. Outdoor maintenance workers may potentially be exposed to COC in surface soil via incidental ingestion or direct contact through maintenance activities (e.g., lawn care). The public (i.e., pedestrians) or lawn maintenance workers may potentially be exposed to COC in surface soil via incidental ingestion or direct contact through recreation in the western adjoining public right-of-way (i.e., Hulbert Street) outside of the fenced NYSEG property. Construction workers may potentially be exposed to COC in surface soil, subsurface soil, and groundwater via incidental ingestion, direct contact, and inhalation of volatiles or particulates during intrusive activities (e.g., excavation, drilling, underground utility installation, etc.).

2.6.2 Potential Ecological Impact Evaluation

A Fish and Wildlife Impact Analysis (FWIA) was not performed during the SC or FS to evaluate the potential for ecological impacts from Site-related impacts. Because the Site is an urban electrical substation, and the parcels around the Site are used for commercial purposes, a significant high-value habitat for wildlife does not exist at the Site. Therefore, the potential for an ecological receptor to be exposed to MGP Site-related COC is considered to be low.

3 Remedial Goals and Remedial Action Objectives

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

3.1 Standards, Criteria and Guidance

An evaluation of whether or not a remedy will meet applicable environmental laws, regulations, standards, and guidance is required during this remedy selection process. Standards, criteria, and guidance values (SCGs) for the Site are listed in Tables 3-1, 3-2, and 3-3, which list chemical-specific, action-specific, and location-specific SCGs, respectively. Also included are other documents which are to be considered (TBC) when evaluating remedial objectives, technologies, and alternatives.

3.2 Remedial Action Goals

Remedial Action Goals (RAGs) are general, non-site specific standards, established by the State, which are used to help develop site-specific remedial action objectives (RAOs). RAGs have been established for remedial actions implemented under NYSDEC's Inactive Hazardous Waste Disposal Site Remedial Program and include the following:

- At a minimum, to eliminate or mitigate all potential threats to human health and the environment presented by contaminants at the site, to the extent feasible.
- To restore the site, to the extent feasible.

3.3 Remedial Action Objectives

RAOs are site- and medium-specific objectives established to help meet the RAGs described in the previous section. The SC Report included a qualitative assessment of potential risks associated with contamination at the Site. Addressing those potential risks would be required in order for a remedial action to meet the "protectiveness" requirement of the RAGs. The risk assessment identified the following potential exposure pathways related to past MGP operations:

- Surface Soil – Exposure of outdoor maintenance workers, construction workers, and the public to contaminants through incidental ingestion and direct contact.
- Subsurface Soil – Exposure of construction workers to contaminants through incidental ingestion, direct contact, and inhalation.
- Groundwater – Exposure of construction workers to contaminants through incidental ingestion, direct contact, and inhalation.

In order to address risks associated with these potential exposures to MGP impacts and to meet the remedial action goal for protection and/or restoration, RAOs have been developed.

RAOs were established for all contaminated media as presented below.

Soil: The RAOs for soil are:

Public Health Protection:

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation exposure to contaminants volatilizing from soil.

Environmental Protection:

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

Groundwater: The RAOs for groundwater are:

Public Health Protection:

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.

Environmental Protection:

- Restore groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Prevent the discharge of contaminants to the surface water.
- Remove the source of groundwater contamination to the extent practicable.

Soil Vapor: The RAOs for soil vapor are:

Public Health Protection:

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

Surface Water: Not applicable.

Sediment: Not applicable.

3.4 Remedial Action Criteria

Remedial Action Criteria are medium- and contaminant-specific numerical or qualitative standards that can be compared directly to the results or predicted results of remedial actions to verify compliance with RAOs. This section presents Remedial Action Criteria developed for each of the RAOs.

3.4.1 Soil Criteria

Soil criteria will be used to verify compliance with RAOs for prevention of ingestion and direct contact with MGP-impacted surface soil and for prevention of ingestion, direct contact, and inhalation with MGP-impacted subsurface soil. NYSDEC policy, CP-51 – Soil Cleanup Guidance, establishes procedures for determining SCOs.

The substation area is completely covered with gravel; surface soil is absent. According to NYSEG substation construction specifications, the gravel is approximately 24 inches thick, consisting of 18 inches of gravel base and 6 inches of stone topping.

Surface soil is present in mowed lawn areas along the western substation perimeter and north and northeast of the substation fence. NYSEG owns the parcel immediately northeast of the substation and the current zoning is for Commercial Use with the current land use expected to remain as a commercial substation for the foreseeable future. The surface soil to the northeast of the substation is not impacted with MGP residuals. The surface soil along the western property perimeter is impacted with low levels of arsenic, and a portion of that area lies adjacent to the City of Auburn Right-of-Way (ROW) and is accessible by the public.

Based upon the potential for public access to impacted surface soil along the western property perimeter, and as specified in CP-51, the need for remediation of surface soil will be determined based on 6 NYCRR 375-6 – Unrestricted Use, Commercial Use, and Protection of Groundwater SCOs for Protection of Public Health. CP-51 allows establishment of SCOs for PAHs for subsurface soil based on a total PAH concentration of 500 milligrams per kilogram (mg/kg) at sites where current and future site uses are restricted for commercial or industrial purposes. In order to implement this SCO, future Site use would have to be restricted through the use of an environmental easement including a Site Management Plan (SMP). Based on this provision of the guidance, an SCO of 500 mg/kg for total PAHs in subsurface soil at the Site will be used.

The FS also considers regulatory soil standards for Unrestricted Use included in Subpart 375-6 even though, based on current or expected future Site use being commercial, they are not applicable. At least one remedial alternative will be evaluated which is capable of remediating soil at the Site to these Unrestricted Use levels.

3.4.2 Groundwater Quality Criteria

Groundwater quality criteria will be used to verify compliance with RAOs for prevention of ingestion and direct contact with groundwater. NYSDEC's TOGS 1.1.1 (NYSDEC, 1998 and addenda) will be used as the source of groundwater quality criteria. Ambient water quality standards and guidance values from TOGS 1.1.1 will be used as cleanup criteria for groundwater based on a GA groundwater classification, although groundwater is not used as a drinking water source near the Site.

3.5 Limits and Volumes of Media Requiring Remediation

The previous section identified numerical and qualitative criteria to be applied to the selected remedial action to demonstrate that RAOs will be achieved. In this section, those criteria are applied to the Site to identify areas where remediation will be performed. Table 3-4 summarizes the estimated volumes for each medium.

3.5.1 Surface Soil

As discussed in Section 2, arsenic concentrations in surface soil samples exceed applicable SCOs along the western perimeter. The impacted area is estimated to be approximately 80 square ft (Figure 2-6). This FS includes a provision for impacted surface soil removal in the affected area to a depth of 1 ft. Based upon the area and depth of 1 ft, the volume of surface soil requiring remediation totals approximately 27 cubic yards (CY).

3.5.2 Subsurface Soil

Figure 2-7 shows the horizontal limits of the area where impacts to subsurface soil exceed criteria for BTEX and individual PAHs. The figure establishes the limits of BTEX and individual PAH impacts based on exceedances of standards for subsurface soil described in Section 2. None of the subsurface soil samples reported concentrations of PAHs above 500 mg/kg. Subsurface soil samples reporting VOCs, SVOCs, and metals exceeding Unrestricted Use, Commercial Use, and Protection of Groundwater SCOs are situated within and nearby the footprint of the former gas holder at variable depths. As Figure 2-7 shows, the area where subsurface soil needs to be addressed includes the area around the footprint of the former gas holder. Subsurface soils with only metals (i.e., arsenic) exceedances at greater distances from the former gas holder would be addressed through institutional controls.

For the purposes of estimating subsurface soil excavation volume for this report, it has been assumed that subsurface soil remediation would be required within the area shaded red on Figure 2-7 to the elevation of the bedrock surface, which is estimated to be approximately 20 ft bgs. Based on the estimated area and depths, the preliminary volume of subsurface soil that requires remediation to the standards established in this report totals approximately 5,300 CY.

3.5.3 Groundwater

Figure 2-8 shows the estimated area at the Site where groundwater is impacted by COC. The limits shown were established based on the distribution of BTEX and PAH compounds in groundwater samples collected during past monitoring events. Based upon the area shown, the approximate 13 ft saturated thickness of the aquifer, an estimated overburden thickness of 20 ft, and an assumed porosity of 30 percent, the volume of water requiring remediation totals approximately 370,000 gallons.

3.6 Other Factors

DER-10 also identifies other factors that should be considered during selection of a remedial action. It identifies two factors as “baseline considerations.” The first of these considerations is protection of human health and the environment. All remedial actions considered must address identified risks to human health and the environment. The second baseline consideration is NYSDEC’s specified hierarchy of preference for addressing sources of contamination. In order of preference, the hierarchy includes the following remedial approaches:

- Removal or treatment
- Containment
- Elimination of exposure
- Treatment of the source at the point of exposure

In addition, DER-10 has identified sustainability as an important goal to be considered. Sustainability is achieved by taking into account the impact of the remedial action on environmental conditions outside of the site itself. Such impacts may include the following:

- Short and long-term energy use
- Water use

- Impacts to human and environmental land use and habitat
- Discharges of contaminants to air and water
- Waste generation

4 Identification and Screening of Remedial Technologies

4.1 General Response Actions

DER-10 outlines the remedy selection process and states that feasibility studies should include evaluations of "general response actions," "remedial technology types", and "technology process options". General response actions are broad classifications of remedial technologies which describe general strategies for addressing constituents and media of interest. General response actions that will be considered for the Site include the following:

- Soil
  - No Action
  - Institutional Controls/Engineering Controls (ICs/ECs)
  - Removal
  - Treatment
  - Containment
  - Waste Management
- Groundwater
  - No Action
  - ICs/ECs
  - Removal
  - Treatment
  - Containment
  - Discharge

4.2 Initial Identification and Screening of Remedial Technologies

Remedial technology types are more specific, although still general, classifications of technologies. Technology process options are very specific applications of technology types using particular equipment, processes, and materials. Remedial technology types and technology process options associated with the general response actions listed above that will be evaluated for the Site are shown on Tables 4-1, 4-2, and 4-3, which summarize the initial identification and screening process for surface soil, subsurface soil, and groundwater, respectively.

The goal of the initial identification and screening of remedial technologies is development from a list of technology process options which show promise for addressing the particular environmental conditions at the Site. In particular, the listing should include representative technology process options for each remedial technology type and general response action. To achieve this goal, a broad list of technology process options has been developed based on literature sources. Sources used to develop this list include the following:

- DER-15: Presumptive/Proven Remedial Technologies for New York State's Remedial Programs (NYSDEC, 2007)
- clu-in.org, sponsored by USEPA Office of Superfund Remediation and Technology Innovation (https://clu-in.org/remediation/)
- Federal Remediation Technologies Roundtable, Remediation Technologies Screening Matrix and Reference Guide, Version 4.0 (https://frtr.gov/matrix2/section3/table3-2.pdf)
- Technologies for Cleaning Up Contaminated Sites Webpage (USEPA, 2017)
- Citizen's Guides Series (USEPA, 2001)

The technology process options identified were then screened based on their technical implementability and applicability.

4.3 Evaluation of Representative Remedial Technologies

Following completion of the initial identification and screening of remedial technologies, the technologies and process options that have not been eliminated from consideration are subjected to a more formal evaluation. The remaining process options are described in sufficient detail to allow for a more detailed evaluation. The process options are then evaluated in terms of their effectiveness and implementability.

The effectiveness criterion includes factors related to the ability of a remedial technology to meet project objectives, including the following:

- The short-term and long-term effectiveness and performance of the technology to protect human health and the environment.
- The ability of the technology and process option to achieve Site-specific RAOs.
- The ability of the technology to reduce the toxicity, mobility, or volume of Site contaminants.

The implementability criterion includes factors related to the ease and predictability of implementation including the following:

- Technical feasibility - includes difficulty of construction, consideration of unusual Site conditions/limitations, technology-specific regulations, and operations and maintenance (O&M) considerations.
- Administrative feasibility - includes the ability to satisfy regulatory and permit requirements, availability and capacity of treatment, storage, and disposal services, and availability of required equipment and subcontractors.

The goal of the evaluation of representative remedial technologies is the selection of at least one representative process option for each remedial technology type, if possible. The process option selected for each technology type should exhibit the best overall balance of the above criteria. When two or more process options are considered equivalent, one may be selected as representative. In that case, although the eliminated process options are not considered further in the FS, they may be reconsidered during remedy selection or remedial design. The following subsections present separate evaluations for technologies related to surface soil, subsurface soil, and groundwater. Tables 4-4, 4-5, and 4-6 summarize the evaluations for surface soil, subsurface soil, and groundwater, respectively.

4.3.1 Surface Soil

4.3.1.1 No Action

No Action

Description

The No Action technology would require no further effort at the Site to reduce concentrations of COC in the surface soil to meet the RAOs, or to reduce exposure pathways to impacted surface soil. Evaluation of this technology is required in accordance with DER-10 as a baseline to which other remedial technologies can be compared.

Effectiveness

This technology would not be effective because it would not achieve any of the Site's surface soil RAOs. No Action would not reduce or eliminate exposure pathways (i.e., incidental ingestion, direct contact) to COC in the surface soil in an acceptable timeframe. This alternative would not reduce the concentration, toxicity, mobility, or volume of COC.

Implementability

Since no activities would be occurring on the Site, this option would be readily implemented.

Evaluation

The No Action option is retained for use as a comparison tool for other remedial technologies.

4.3.1.2 Institutional Controls/Engineering Controls

ICs/ECs achieve their effect by preventing human or environmental exposure to COC using administrative or physical restrictions on behavior. ICs are typically legal or institutional restrictions regarding site access or use. ECs prevent exposure by eliminating physical access to the contaminants.

Environmental Easement

Description

An environmental easement is an IC and is a legally binding document which can place limits on future site activities or uses (New York State Environmental Conservation Law (ECL) Article 71, Title 36). An environmental easement accompanies the title of a property to restrict certain activities such as excavation. It can also be used to restrict site redevelopment and use where post-remediation soil exceeds cleanup criteria.

An SMP is a document required whenever ICs/ECs are in place and describes procedures to be utilized in order to manage remaining impacts on-site and off-site following the completion of the chosen remedy. The SMP discusses all aspects of any anticipated future work related to the site, including monitoring, inspections, reporting, and O&M. The NYSDEC has created a template document for the development of site-specific SMPs (NYSDEC, DER-10, 2010).

This technology would require inspections to ensure that all restrictions are being followed. Restrictions may also be utilized to ensure that other elements of the selected remedy remain intact.

Effectiveness

An environmental easement alone would not achieve the RAOs for surface soil in an acceptable timeframe. It would not provide protection from exposures to outdoor maintenance workers, construction workers, and the public from incidental ingestion or direct contact to COC. An environmental easement does nothing to reduce the concentration, toxicity, mobility, or volume of COC in the surface soil.

An environmental easement may be effective in meeting RAOs for surface soil when implemented in conjunction with removal or a containment system, such as a soil cover. An SMP enforced by an environmental easement requiring ongoing inspection and maintenance would need to be in place to ensure that the remedy is effective.

Implementability

This option is readily implemented. On portions of the Site which are not within the NYSEG property boundaries (i.e., Hulbert Street and Water Street public right-of-ways), approval from other parties may be required.

Evaluation

This option is retained because of its potential effectiveness in combination with other technologies (i.e., removal).

4.3.1.3 Removal and Treatment

Removal remedies for surface soil provide protection to human and environmental receptors by removing COC from locations where exposures can occur. Removal technologies are used in combination with on-site or off-site management technologies. Excavation will be the only removal technology considered for surface soil.

Treatment at such a shallow depth (i.e., 0-12 inches bgs) is not practical considering the near surface location of the contaminants and the presumed feasibility of excavation/removal for this media.

<u>Excavation</u>

Description

Implementation of this remedial technology would require removal of surface soil identified as contributing to unacceptable risk. Soil would be excavated to a depth of 12 inches bgs with an excavator, and then backfilled with approved material. Any remedial alternative that includes this technology would also have to include additional off-site waste management technologies such as disposal and/or treatment.

Effectiveness

Excavation is one component of a potentially effective surface soil remedy that would also include off-site treatment or disposal. The remedy would achieve the RAOs for prevention of ingestion and direct contact with surface soil, and permanently reduce concentration, toxicity, mobility, and volume of COC at the Site. However, the excavated material would be transported and disposed at a landfill where mobility is controlled but toxicity and volume would remain. Management would be required during implementation to minimize exposure to construction workers.

Implementability

Excavation is a readily implemented option. Because only the top 12 inches of soil would be excavated, complications such as dewatering, shoring, and slope stability that are often encountered with deeper excavations will not be of concern.

Landscape trees along the NYSEG fence and within the excavation areas would need to be removed and replaced. Protection of the fence surrounding the primary NYSEG substation parcel, and the sidewalks bordering Hulbert Street and Water Street, would need to be ensured during excavation/backfilling activities.

Evaluation

Excavation is retained because it would provide an effective and permanent remedy when performed in conjunction with disposal or treatment and surface soil cover.

4.3.1.4 Containment

Containment remedies for surface soil provide protection by preventing human and environmental exposure using a physical barrier. Barriers can prevent ingestion and direct contact with COC and also prevent migration of COC in surface water or as dust.

<u>Soil Cover</u>

Description

To implement this technology, surface soil areas that pose a risk to outdoor maintenance workers, construction workers, and the public would be covered with a layer of topsoil and/or gravel to provide a barrier against ingestion and direct human contact with COC. Implementation of this technology would also require grading, storm water runoff management, seeding, and maintenance of the surface cover and its vegetation. Maintenance requirements for the soil cover would include scheduled inspections, mowing and fertilizing of the grass, reseeding of areas where the grass dies, and repair of erosion damage. An SMP would address maintenance and inspection of the soil cover. An environmental easement may be utilized to prevent excavation and/or disturbance of the cover.

Effectiveness

When maintained properly, a soil cover would prevent ingestion and/or direct contact with COC in soil. Once construction is completed, this option would meet the RAOs for surface soil by preventing exposures to on-site workers and pedestrians through ingestion and/or direct contact. A regularly maintained soil cover in conjunction with ICs (e.g., environmental easement) to prevent future disruption of the soil cover would provide suitable long-term protection.

Implementability

Placing a soil cover over the impacted surface soil is readily implemented. The equipment and contractors necessary to perform this task are readily available. Ongoing maintenance would be required, but would be limited in scope, coordination, and cost. As previously mentioned, additional long-term protection would be required by combining this option with ICs.

Evaluation

It is likely that NYSEG will choose to maintain the existing ground surface elevation at the Site to maintain drainage characteristics. In such situations, excavation of the existing surface soil would be required. For that reason, surface soil cover is equivalent to excavation. The technology will not be retained for further consideration.

4.3.1.5 Waste Management

<u>Off-site Landfill</u>

Description

Landfill disposal refers to the off-site transportation and permanent disposal of soil at an approved non-hazardous waste landfill. Soil that contains low to moderate concentrations of COC may be disposed of at a landfill.

Effectiveness

In conjunction with excavation, landfill disposal would be effective in meeting the RAOs for surface soil containing low to moderate concentrations of contaminants.

Implementability

Landfill disposal of waste generated at the Site would be readily implemented. Excavation and off-site disposal is a commonly selected remedy for MGP sites in New York State with low concentrations of COC. There are multiple permitted non-hazardous landfill facilities located within a reasonable distance from the Auburn Green Street MGP Site. Precautions must be taken during transportation to prevent exposures to Site workers or off-site migration of constituents from dust or tracked soil. These issues can be addressed with management during excavation/loading/transportation.

Evaluation

Landfill disposal is retained for further consideration as an adjunct to excavation.

4.3.2 Subsurface Soil

4.3.2.1 No Action

<u>No Action</u>

Description

The No Action technology would require no further effort at the Site to reduce concentrations of COC in the subsurface soil to meet the RAOs, or to reduce exposure pathways to impacted subsurface soil. Evaluation of this technology is required, in accordance with DER-10, as a baseline to which other remedial technologies can be compared.

Effectiveness

This technology would not achieve any of the subsurface soil RAOs and is therefore not considered effective. No Action would not reduce or eliminate exposure pathways (i.e., incidental ingestion, direct contact, inhalation) to COC in the subsurface soil in an acceptable timeframe. This alternative would not reduce the concentration, toxicity, mobility, or volume of COC.

Implementability

Since no activities would be occurring on the Site, this option would be readily implemented.

Evaluation

The No Action option is retained for use as a comparison tool for other remedial technologies.

4.3.2.2 Institutional Controls/Engineering Controls

ICs and ECs achieve their effect by preventing human or environmental exposure to COC using administrative or physical restrictions on behavior. ICs are typically legal or institutional restrictions regarding site access or use. ECs prevent exposure by eliminating physical access to the contaminants.

Environmental Easement

Description

An environmental easement is an IC and is a legally binding document which can place limits on future Site activities or uses (New York State Environmental Conservation Law (ECL) Article 71, Title 36). An environmental easement/deed restriction accompanies the title of a property to restrict certain intrusive activities such as excavation or drilling. It can also be used to restrict site redevelopment and use where post-remediation soil exceeds cleanup criteria.

An SMP is required whenever ICs/ECs are in place and describes work procedures to be utilized in order to manage remaining impacts on-site and off-site following the completion of the chosen remedy. The SMP discusses all aspects of any anticipated future work related to the site, including monitoring, inspections, reporting, and O&M. The NYSDEC has created a template document for the development of site-specific SMPs (NYSDEC, DER-10, 2009).

This technology would require inspections to ensure that all restrictions are being followed. Restrictions may also be utilized to ensure that other elements of the selected remedy remain intact.

Effectiveness

An environmental easement alone would not achieve the RAOs for subsurface soil in an acceptable timeframe. It would not provide protection from exposures to on-site workers from incidental ingestion, direct contact, or inhalation to COC. An environmental easement plan does nothing to reduce the concentration, toxicity, mobility, or volume of COC in the subsurface soil.

An environmental easement may be effective in meeting RAOs for subsurface soil when implemented in conjunction with removal or in-situ treatment. An SMP enforced by an environmental easement requiring ongoing inspection and maintenance would need to be in place to ensure that the remedy is effective.

Implementability

This option is readily implemented. On portions of the Site which are not within the NYSEG property boundaries (i.e., Hulbert Street and Water Street public ROW), approval from other parties may be required.

Evaluation

This option is retained because of its potential effectiveness in combination with other technologies (i.e., removal or in-situ treatment).

<u>Temporary Barriers/Fencing and Signage</u>

Description

Temporary fencing and/or signage is installed around a site during intrusive activities (i.e., excavation, subsurface utility installation, drilling, etc.) to prevent/deter incidental ingestion, direct contact, or inhalation of volatiles from subsurface soil. Chain-link fencing at least 6 ft high with locking gates is typically used.

Effectiveness

Fencing is typically used to prevent exposures by casual by-passers and trespassers, but these were not identified as significant receptors on the site. The most likely exposure is to construction workers, but fencing would not prevent that exposure.

Implementability

Installation of chain-link fencing is a very common site improvement activity performed by local contractors using readily available materials. Implementation of an excavation plan would be necessary to provide for specifications and maintenance of the fence during construction.

Evaluation

This technology is retained for further evaluation because it does address temporary exposures for construction workers, on-site maintenance workers, and the public during remedial activities.

4.3.2.3 Removal

Excavation is the only removal option considered for subsurface soil.

<u>Excavation</u>

Description

This remedial technology would be implemented by removing subsurface soil impacted by COC. As discussed in Section 2, COC is present primarily within, and in the immediate vicinity of, the former gas holder to depths of 18 to 20 ft bgs. Excavation to these depths would require the use of standard excavation equipment and the installation of shoring (e.g., temporary steel sheet piling). Due to the relatively shallow groundwater table (average 7 ft bgs), an excavation dewatering system would be required including pumps/sumps and a water treatment/discharge system. Excavated soil would be transported off-site for disposal or treatment.

Effectiveness

Excavation is one component of a potentially effective subsurface soil remedy that would also include decommissioning/dismantling/replacing of the substation and off-site disposal or treatment. The remedy would achieve the RAOs for prevention of ingestion, direct contact, and inhalation after implementation.

Implementability

Excavation would be readily implementable at the Site for subsurface soil in accessible areas. Decommissioning/dismantling/relocating the substation would be required to access COC-impacted soil underneath the substation. Due to the relatively shallow groundwater table, the requirements for water management may require a significant effort (e.g., steel sheet piling, dewatering, multi-stage treatment, discharge permitting, etc.).

Evaluation

Excavation is retained because it would provide an effective and permanent remedy when performed in conjunction with decommissioning/dismantling/relocating the substation and off-site disposal or treatment, but the overall expense is expected to be significant.

4.3.2.4 In-Situ Treatment

In-situ treatment for subsurface soil provides protection to human and environmental receptors by direct treatment of COC adsorbed to soil which act as an ongoing source of contamination.

<u>In-situ Bioremediation/Aerobic Biodegradation</u>

Description

In-situ bioremediation/aerobic biodegradation provides treatment for COC by optimizing subsurface conditions to support the growth of microorganisms which are capable of metabolizing organic compounds, including VOCs and SVOCs. For non-chlorinated compounds such as those at the Site, this is typically accomplished by adding oxygen via oxygen-releasing compound (ORC) and nutrients which the microorganisms require to live and reproduce. Sometimes specially produced microorganisms are injected to further enhance biodegradation, although generally naturally occurring organisms are used.

Oxygen (e.g., ORC), nutrients, and microorganisms can be added into permanently installed wells or temporary injection points, either vertical, angled, or horizontal. The network of wells or injection points would be installed in a spacing determined based on the characteristics of the subsurface soil, concentration of COC, and the materials and equipment being used. It is not unusual for wells/injection points to be installed at a spacing of 10 to 15 ft.

Effectiveness

In the saturated zone, in-situ bioremediation/aerobic biodegradation may be effective in treating organic constituents, including SVOCs, when concentrations of COC are low or moderate. It is not as effective in the unsaturated zone or in treating areas within the saturated zone with high concentrations of COC. Under the right conditions, it could be effective in meeting the RAOs for subsurface soil. Bioremediation is most effective against low molecular weight compounds such as VOCs and naphthalene.

Implementability

Implementation of in-situ bioremediation/aerobic biodegradation is accomplished using drill rigs, injection wells/points, direct push rigs, and other common equipment. Proprietary mixtures of ORC and nutrients and equipment are commonly available and widely used. Groundwater monitoring would be required to document that reduction of COC is occurring over time. Monitoring equipment is readily available and routinely used by properly trained personnel. The frequency of monitoring would be established during remedial design. It may be necessary to install permanent wells/injection points to periodically supplement ORC, nutrients, and microorganisms and additional monitoring wells to document the progression of treatment over time.

Evaluation

In-situ bioremediation/aerobic biodegradation may be an effective technology for meeting subsurface soil RAOs at the Site, where accessible. Concentrations of COC are relatively low outside the former gas holder indicating relatively limited migration of COC. This technology has been successfully implemented at many sites across New York State. This technology is retained for further evaluation outside the former gas holder.

This technology is not retained for further evaluation inside the former gas holder because, in addition to volume of source material to be treated and health and safety concerns associated with working within or in close proximity to the substation, this technology has limited implementability and thus, limited effectiveness for the following reasons:

- The distribution of ORC, nutrients, and microorganisms in the subsurface by injection is most effective in high-permeability soils. The predominance of low-permeability silt and fine sand in the saturated zone of the former gas holder will result in a low radius of influence of the injected materials. A low radius of influence will require a large number of injection points.
- Access to the COC-impacted fill within the former gas holder is significantly limited by the presence of the substation and, coupled with the low permeability fill, the injected ORC, nutrients, and microorganisms will not be able to be applied to the entire volume of COC-impacted fill within the former gas holder, even with horizontal and/or angled injection approaches.
- If only the norther portion of the former gas holder is treated with ORC, nutrients, and microorganisms, untreated fill will remain in the southern portion (beneath the substation) and that fill will continue to be a source of dissolved-phase groundwater contamination.
- Groundwater flow at the site is to the north-northeast. The sub-station lies over the southern, upgradient portion of the former gas holder. Therefore, if only the northern portion of the former gas holder receives ORC, nutrients, and microorganism treatment, COC-impacted groundwater will migrate from the untreated fill to the north-northeast, re-contaminating the treated portion of the former gas holder.

<u>In-Situ Chemical Oxidation</u>

Description

In-situ chemical oxidation (ISCO) involves injection of chemical oxidants into the contaminated media to treat COC. Typical oxidants include ozone, hydrogen peroxide, magnesium peroxide, sodium persulfate, and potassium permanganate; however, the actual chemical oxidant would be evaluated during a pilot and/or bench scale test. Typically, the oxidant is applied as a liquid and delivered to the subsurface through a series of injection points/wells, either vertical, angled, or horizontal, often spaced from 10 to 15 ft apart under suitable soil conditions.

Effectiveness

In the saturated zone, ISCO is most effective in situations where concentrations of COC are moderate and delivery to the subsurface is accessible. When COC concentrations are low, the technology may not be cost effective. When COC concentrations are too high, it may not be effective even with multiple injection events. It is less effective in the unsaturated zone because following injection, the chemical oxidants flow down to the saturated zone, thus resulting in a limited duration of contact with the contaminants.

Site geologic and hydrogeologic characteristics have a significant influence on the effectiveness of in-situ technologies. Implementation in heterogeneous and low-permeability materials is less effective than in homogeneous and higher permeability materials due to difficulties achieving consistent delivery of the oxidants to the affected materials. This is especially true in shallow depths of fill soils where various sized pockets of loose brick exist with little in-fill soils. Factors such as soil pH, temperature, concentration of oxidant, organic carbon, and reducing minerals also influence effectiveness.

Implementability

Readily implementable for accessible areas using vertical injection points/wells. One of the difficulties with implementation of ISCO can be delivering oxidants to inaccessible locations in the subsurface where COC are found. For COC-impacted soil underneath the substation, a combination of angled or horizontal injection points/wells would be required. It may be necessary to install permanent wells/injection points to periodically supplement oxidant over time. In addition, there can be significant health and safety and environmental concerns with ISCO since some of the oxidants are highly reactive.

Evaluation

ISCO may be an effective technology for meeting subsurface soil RAOs at the Site, where accessible. Concentrations of COC are relatively low outside the former gas holder indicating relatively limited migration of COC. This technology has been successfully implemented at many sites across New York State. This technology is retained for further evaluation outside the former gas holder.

ISCO is considered a viable, cost-effective alternative in lieu of other options (e.g., excavation) associated with decommissioning/dismantling/relocating the substation. However, this technology is not retained for further evaluation as a remedy because, in addition to volume of source material to be treated within the former gas holder and health and safety concerns associated with ISCO and with working within or in close proximity to the substation, this technology has limited implementability and thus, limited effectiveness for the following reasons:

- The distribution of ISCO materials in the subsurface by injection is most effective in high-permeability soils. The predominance of low-permeability silt and fine sand in the saturated zone of the former gas holder will result in a low radius of influence of the injected materials. A low radius of influence will require a large number of injection points.
- Access to the COC-impacted fill within the former gas holder is significantly limited by the presence of the substation and, coupled with the low permeability fill, the injected ISCO oxidants will not be able to be applied to the entire volume of COC-impacted fill within the former gas holder, even with horizontal and/or angled injection approaches. Pockets of loose brick fill serve to further complicate reliably consistent application.
- If only the norther portion of the former gas holder is treated with ISCO, untreated fill will remain in the southern portion (beneath the substation) and that fill will continue to be a source of dissolved-phase groundwater contamination.
- Groundwater flow at the site is to the north-northeast. The sub-station lies over the southern, upgradient portion of the former gas holder. Therefore, if only the northern portion of the former gas holder receives ISCO treatment, COC-impacted groundwater will migrate from the untreated fill to the north-northeast, re-contaminating the treated portion of the former gas holder.

In-Situ Soil Flushing

Description

This technology uses surfactant to dissolve the contaminants from soil and collects the wash by extraction. Hence, the technology uses injection of surfactant solution and extraction simultaneously to flush out the contaminants and capture them.

Effectiveness

The technology may be effective in removing soil contamination, especially at sites where subsurface geology is fairly homogeneous. Injecting into soil which is not homogenous may lead to short circuiting of surfactant through preferential pathways. Injection of surfactant can have a significant potential for mobilizing COC in groundwater and increasing concentrations. Effective extraction would have to be maintained to prevent migration of the contaminants off-site. It is uncertain whether this technology would achieve the SCOs for subsurface soil identified in Section 3.

Implementability

This technology would be implemented by installing injection and extraction wells throughout the area impacted by COC. Surfactant would be injected and the mixture of surfactant and groundwater would be extracted, treated, and discharged. Contact between the surfactant and COC and capture of the COC mobilized by the surfactant is key to successful implementation of this technology. A treatment system would also be needed to treat the extracted solution.

Evaluation

Because of uncertainty about the ability of this technology to meet SCOs, the potential for mobilizing COC, and potential accessibility issues due to the active substation, it is not retained for further evaluation.

4.3.2.5 Waste Management

Off-Site Landfill

Description

Landfill disposal refers to the off-site transportation and permanent disposal of soil at an approved non-hazardous waste landfill. Soil that contains low concentrations of COC may be disposed of at a landfill.

Effectiveness

In conjunction with excavation, landfill disposal would be effective in meeting the RAOs for subsurface soil containing low to moderate concentrations of contaminants.

Implementability

Landfill disposal of waste generated at the Site would be readily implemented. Excavation and off-site disposal is a commonly selected remedy for MGP sites in New York State with low to moderate concentrations of COC. There are multiple permitted non-hazardous landfill facilities located within a reasonable distance from the Site. Precautions must be taken during transportation to prevent exposures to Site workers or off-site migration of constituents from dust or tracked soil. These issues can be addressed with management during excavation, loading, and transportation.

Evaluation

Landfill disposal is retained for further consideration as an adjunct to excavation.

Thermal Desorption

Description

Thermal desorption refers to the volatilization of chemical constituents adsorbed to soil and other solid material with heat. In general, soil containing less than 2 percent organic contamination and 20 percent moisture are well suited to treatment using direct-fired equipment. Thermal desorption facilities typically accept soil with particles of less than 4-6 inches, and reduce the size of the material further (to under 2 inches) to meet the mechanical limitations of the treatment equipment. For that reason thermal treatment facilities may also be used for management of some impacted debris.

Soil that is thermally treated off-site may be reused as backfill on the Site or put to other beneficial use, making this option more sustainable than landfill disposal. NYSDEC policy DER-4, *Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment from Former Manufactured Gas Plants* (NYSDEC, 2002) requires thermal treatment of MGP wastes which do not meet regulatory limits for the toxicity characteristic for benzene in order for the soil to not have to be handled as a D018 characteristic waste.

Effectiveness

In conjunction with excavation, thermal desorption would be effective in meeting the RAOs for removal of COC. The organic COC at the Site should be effectively treated using thermal desorption. Historical data from treatment of contaminated soil at similar sites have demonstrated reductions of greater than 99% for individual BTEX and PAH constituents.

Implementability

Off-site thermal desorption of waste generated at the Site would be readily implemented. Excavation and off-site thermal desorption is a commonly selected remedy for MGP sites in New York State. There are permitted thermal desorption facilities located within a reasonable distance from the Site.

Evaluation

Off-site thermal desorption is retained for further consideration as an adjunct to excavation.

4.3.3 Groundwater

4.3.3.1 No Action

Description

The No Action technology would require no further effort at the Site to reduce concentrations of COC in groundwater to meet the RAOs, or to reduce/eliminate exposure pathways to impacted groundwater. No further groundwater monitoring would be conducted and no access or use restrictions would be imposed. Evaluation of this technology is required in accordance with DER-10 as a baseline to which other remedial technologies can be compared.

Effectiveness

This technology would not achieve any of the groundwater RAOs and is therefore not considered effective. No Action would not reduce or eliminate exposure pathways (e.g., incidental ingestion, direct contact, inhalation) to COC in groundwater in an acceptable timeframe. The alternative would not reduce the concentration, toxicity, mobility, or volume of COC.

Implementability

Since no activities would be occurring on the Site, this option would be readily implemented.

Evaluation

The No Action option is retained for use as a comparison tool for other remedial technologies.

4.3.3.2 Institutional Controls/Engineering Controls

ICs and ECs achieve their effect by preventing human or environmental exposure to COC using administrative or physical restrictions on behavior. ICs are typically legal or institutional restrictions regarding site access or use. ECs prevent exposure by eliminating physical access to the contaminants.

<u>Environmental Easement</u>

Description

An environmental easement is an IC and is a legally binding document which can place limits on future site activities or uses (New York State Environmental Conservation Law (ECL) Article 71, Title 36). Such a restriction would be placed on the future use of groundwater at the Site as a source for drinking water.

An SMP is a document required whenever ICs/ECs are in place and describes procedures to be utilized in order to manage remaining impacts on-site and off-site following the completion of the chosen remedy. The SMP discusses all aspects of any anticipated future work related to the site, including monitoring, inspections, reporting, and O&M. The NYSDEC has created a template document for the development of site-specific SMPs (NYSDEC, DER-10, 2010).

This technology would require inspections to ensure that all restrictions are being followed. Restrictions may also be utilized to ensure that other elements of the selected remedy remain intact.

Effectiveness

An environmental easement alone would not achieve the RAOs for groundwater in an acceptable timeframe. It would not provide protection from exposures to on-site workers from incidental ingestion, direct contact, or inhalation of volatiles from COC of impacted groundwater during intrusive activities such as excavation, subsurface utility installation, drilling, etc. An environmental easement does nothing to reduce the concentration, toxicity, mobility, or volume of COC in groundwater.

An environmental easement may be effective in meeting RAOs for groundwater when implemented in conjunction with source material removal and/or in-situ treatment. An SMP enforced by an environmental easement requiring ongoing inspection and maintenance would need to be in place to ensure that the remedy is effective.

Implementability

This option is readily implemented.

Evaluation

The City of Auburn has a public water supply available to neighboring businesses and residents; therefore, it is unlikely that groundwater would ever be used for drinking water. However, this option is retained because of its potential effectiveness in combination with other technologies (i.e., removal and/or in-situ treatment).

Local Ordinance

Description

In order to implement this technology, a local ordinance would be passed by the City of Auburn restricting installation of extraction wells on the properties.

Effectiveness

Preventing future use of groundwater for potable or other uses would only partly meet the RAOs for on-site ingestion of, direct contact with, and inhalation of volatiles of, impacted groundwater.

Implementability

Implementation of a local ordinance is potentially feasible. Because such an ordinance is not currently in place, implementation would require approval by the municipality. Because implementation is not under NYSEG's control, this technology is considered less implementable than other ICs.

Evaluation

This technology is not retained for further consideration because more reliable technologies are available to achieve the same goals.

Temporary Barriers/Fencing and Signage

Description

Temporary fencing and/or signage is installed around a site during intrusive activities (i.e., excavation, subsurface utility installation, drilling, etc.) to prevent/deter incidental ingestion, direct contact, or inhalation of volatiles from impacted groundwater. Chain-link fencing at least 6 ft high with locking gates is typically used.

Effectiveness

Fencing is typically used to prevent exposures by casual by-passers and trespassers, but these were not identified as significant receptors on the site. The most likely exposure is to construction workers, but fencing would not prevent that exposure.

Implementability

Installation of chain-link fencing is a very common site improvement activity performed by local contractors using readily available materials. Implementation of an excavation plan would be necessary to provide for specifications and maintenance of the fence during construction.

Evaluation

This technology is not retained for further evaluation because it does address temporary exposures for construction workers, on-site maintenance workers, and the public during remedial activities.

4.3.3.3 Removal

Removal remedies for soil and groundwater provide protection to human and environmental receptors by removing the source of COC to groundwater, or by removing the impacted groundwater. Removal technologies are used in combination with on-site and/or off-site management technologies.

Excavation

Description

This remedial technology would be implemented by removing subsurface soil impacted by COC, which is a source of groundwater contamination. COC is present primarily within and in the immediate vicinity of the former MGP gas holder, to depths of 18-20 ft bgs. Excavation to these depths would require the use of standard excavation equipment and the installation of temporary shoring (e.g., steel sheet piling). Due to the relatively shallow (average 7 ft bgs) groundwater table an excavation dewatering system would be required including pumps/sumps and a water treatment/discharge system. Excavated soil would be transported off-site for disposal or treatment.

Effectiveness

Excavation is one component of a potentially effective subsurface soil and groundwater remedy that would also include decommissioning/dismantling/replacing the substation and off-site disposal or treatment. The remedy would achieve the RAOs for prevention of ingestion, direct contact, and inhalation for subsurface soil, but not necessarily for groundwater in the short-term.

Implementability

Excavation would be readily implementable at the Site for subsurface soil in accessible areas. Decommissioning/dismantling/relocating the substation would be required to access COC-impacted soil underneath the substation. Due to the relatively shallow groundwater table, the requirements for water management may require a significant effort (e.g., steel sheet piling, dewatering, multi-stage treatment, discharge permitting, etc.).

Evaluation

Excavation is retained because it would provide an effective and permanent remedy when performed in conjunction with decommissioning/dismantling/relocating the substation and off-site disposal or treatment, but the overall expense is expected to be significant.

Groundwater Recovery

Description

In order to implement this technology, extraction wells and pumps would be installed and used to recover groundwater from the Site. As impacted water is removed, un-impacted water from outside the area would flow into the area. COC absorbed to soil in the area where the wells are installed would leach into groundwater for removal and treatment. Over time, concentrations of COC in subsurface soil would be reduced. Groundwater extraction can also be used to maintain groundwater levels as part of implementation of containment remedies and is a required component for excavation remedial actions below the water table elevation. In order to implement this technology, it would also be necessary to implement water treatment, permitting, and discharge.

Effectiveness

Experience at numerous sites has shown that groundwater recovery and treatment alone are not effective in meeting groundwater objectives when high concentrations of COC in soil represent an ongoing source of contamination. This technology may not be effective in meeting RAOs for prevention of exposure to contaminants in groundwater, removal of the source of contamination to groundwater, or off-Site migration of contaminants which may impact groundwater. Use of extraction wells can be effective for lowering or maintaining groundwater elevations to allow excavation to take place under dry conditions and to support containment remedies. Use of dewatering wells would be necessary in order to implement excavation of subsurface soil.

Implementability

The technology for installing and operating groundwater extraction wells is well established and readily available. Installation and pumping of wells is readily implementable in accessible (non-substation) areas.

Evaluation

The effectiveness of this technology alone is uncertain and would likely require extended periods of O&M to remove a significant volume of COC from soil. For that reason, it is not retained for use to treat groundwater. It is retained for use to supplement containment and to dewater excavations, and is therefore retained for further evaluation.

4.3.3.4 In-Situ Treatment

In-situ treatment for groundwater provides protection to human and environmental receptors by removing impacted groundwater itself or by removing COC adsorbed to soil which act as an ongoing source of contamination.

<u>Monitored Natural Attenuation</u>

Description

Monitored Natural Attenuation (MNA) of groundwater refers to the monitoring of natural processes that act to reduce concentration, toxicity, mobility, and volume of COC as the groundwater flows through a porous media. At this Site, the constituents found above remedial criteria in groundwater are primarily BTEX, PAH, and phenol compounds. The amount of COC that can dissolve in the groundwater is a function of their individual solubility. Typically, lower molecular weight and polar compounds have higher solubility. Other factors affecting solubility include the temperature, pH, and ionic strength of the groundwater. In general, BTEX compounds are much more soluble than most of the PAHs.

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

MNA would involve the sampling of on-site wells at regular intervals. Samples would be analyzed for VOCs, SVOCs, and natural attenuation parameters. The results of the sampling events would be used to document any changes in Site conditions.

Effectiveness

Based on data collected during the SC, groundwater impacted by COC is present within a limited area on-site, within the immediate vicinity of the former gas holder. The highest concentrations are within the former gas holder and concentrations decrease significantly away from the gas holder. This provides evidence that natural attenuation mechanisms are already active in preventing migration of COC in groundwater. It is expected that natural attenuation, in conjunction with other remedial technologies, would continue to meet the RAOs for preventing ingestion, direct contact, or inhalation of volatiles from impacted groundwater in areas outside of the former gas holder. Within the limits of the former gas holder, where the COCs are most concentrated, MNA would not meet RAOs for groundwater by itself. On-site ingestion of groundwater is not prevented with this option, but it could be controlled with an environmental easement as discussed previously. Natural attenuation would reduce the toxicity, mobility, and volume of COC in the groundwater over time. Monitoring the process of natural attenuation provides long-term protection and minimizes risk. It would not provide short-term protection. Monitoring the groundwater over time would quantify the rate and effectiveness of MNA and would be useful for understanding changes in Site conditions. It would be used to determine when COC concentrations meet cleanup criteria.

Implementability

MNA is readily implemented and can be combined with other technologies. Groundwater monitoring would be essential to document that attenuation is actually occurring over time. Monitoring equipment is readily available and routinely used by properly trained personnel. The frequency of monitoring would be established during remedial design. It may be necessary to install additional monitoring wells to document the progression of MNA over time.

Evaluation

Because it has the potential to reduce the risk of off-site migration and to treat residual concentrations of COC, MNA is retained. This option could be combined with ICs and other technologies to achieve groundwater RAOs.

<u>In-Situ Bioremediation/Aerobic Biodegradation</u>

Description

In-situ bioremediation/aerobic biodegradation provides treatment for COC by optimizing subsurface conditions to support the growth of microorganisms which are capable of metabolizing organic compounds, including VOCs and SVOCs. For non-chlorinated compounds such as those at the Site, this is typically accomplished by adding oxygen via air sparging or ORC and nutrients which the microorganisms require to live and reproduce. Sometimes specially produced microorganisms are injected to further enhance biodegradation, although generally naturally occurring organisms are used.

Oxygen (e.g., ORC), nutrients, and microorganisms can be added into permanently installed wells or temporary well points, either vertical, angled, or horizontal. Oxygen can also be provided by installing oxygen diffusers in permanent wells. The network of wells or injection points would be installed in a spacing determined based on the characteristics of the subsurface soil, concentration of COCs, and the materials and equipment being used. It is not unusual for injection points to be installed at a spacing of 10 to 15 ft.

Effectiveness

In-situ bioremediation/aerobic biodegradation may be effective in treating organic constituents, including SVOCs, when concentrations of COC are low or moderate. It is not effective in treating areas with heavy staining, sheens, or high concentrations of COC. Under the right conditions, it could be effective in meeting the RAOs for preventing exposures to COC in groundwater. It would not normally be expected to address materials which provide a source of COC to groundwater. Bioremediation is most effective against low molecular weight compounds such as VOCs and naphthalene.

Implementability

Implementation of in-situ bioremediation/aerobic biodegradation is accomplished using drill rigs, injection wells/points, direct push rigs and other common equipment. Proprietary mixtures of ORC and nutrients and equipment capable of diffusing oxygen into the subsurface are commonly available and widely used. Groundwater monitoring would be required to document that reduction of COC is occurring over time. Monitoring equipment is readily available and routinely used by properly trained personnel. The frequency of monitoring would be established during remedial design. It may be necessary to install permanent wells/injection points to periodically supplement ORC, nutrients, and microorganisms and additional monitoring wells to document the progression of treatment over time.

Evaluation

In-situ bioremediation/aerobic biodegradation may be an effective technology for meeting groundwater RAOs at the Site, where accessible. Concentrations of COC are relatively low outside the former gas holder indicating relatively limited migration of COC and more appropriate use of this technology as compared to within the former gas holder where COC concentrations are greater. This technology has been successfully implemented at many sites across New York State. This technology is retained for further evaluation outside the former gas holder.

This technology is not retained for further evaluation inside the former gas holder because, in addition to volume of source material to be treated and health and safety concerns associated with working within or in close proximity to the substation, this technology has limited implementability and thus, limited effectiveness for the following reasons:

- The distribution of ORC, nutrients, and microorganisms in the subsurface by injection is most effective in high-permeability soils. The predominance of low-permeability silt and fine sand in the saturated zone of the former gas holder will result in a low radius of influence of the injected materials. A low radius of influence will require a large number of injection points.
- Access to the COC-impacted fill within the former gas holder is significantly limited by the presence of the substation and, coupled with the low permeability fill, the injected ORC, nutrients, and microorganisms will not be able to be applied to the entire volume of COC-impacted fill within the former gas holder, even with horizontal and/or angled injection approaches. Pockets of loose brick fill serve to further complicate reliably consistent application.
- If only the norther portion of the former gas holder is treated with ORC, nutrients, and microorganisms, untreated fill will remain in the southern portion (beneath the substation) and that fill will continue to be a source of dissolved-phase groundwater contamination.
- Groundwater flow at the site is to the north-northeast. The sub-station lies over the southern, upgradient portion of the former gas holder. Therefore, if only the northern portion of the former gas holder receives ORC, nutrients, and microorganism treatment, COC-impacted groundwater will migrate from the untreated fill to the north-northeast, re-contaminating the treated portion of the former gas holder.

In-Situ Chemical Oxidation

Description

ISCO involves injection of chemical oxidants into the contaminated media to treat COC. For this FS, ISCO is being considered for the direct treatment of COC in source area groundwater (i.e., within the former gas holder). Typical oxidants include ozone, hydrogen peroxide, and potassium permanganate; however, the actual chemical oxidant would be evaluated during a pilot and/or bench scale test. Typically, the oxidant is applied as a liquid and delivered to the subsurface through a series of injection points/wells, either vertically, angled, or horizontally depending on site conditions and obstructions. ISCO may be a good choice in situations where subsurface soil has a medium to high permeability.

Effectiveness

ISCO can be very effective in treating organic COC in groundwater in-situ. The technology is most effective in situations where concentrations of COC are moderate in groundwater. When COC concentrations are low, such as observed outside the former gas holder, the technology may not be cost effective. When COC concentrations are too high, it may not be effective even with multiple injection events. Site geologic and hydrogeologic characteristics have a significant influence on the effectiveness of in-situ technologies. Implementation in heterogeneous and low-permeability materials is less effective than in homogeneous and higher permeability materials due to difficulties achieving consistent delivery of the oxidants to the affected materials. Factors such as soil pH, temperature, the concentration of oxidant, organic carbon, and reducing minerals also influence effectiveness.

Implementability

Chemical oxidation would be applied to groundwater using injection wells. Addition of the oxidant to the groundwater may temporarily increase the solubility and mobility of COC and cause an increase in the extent of the dissolved-phase plume. One of the difficulties with implementation of ISCO can be delivering oxidants to inaccessible locations in the subsurface where COC are found. For COC-impacted soil underneath the substation, a combination of angled or horizontal injection points/wells would be required. It may be necessary to install permanent wells/injection points to periodically supplement oxidant and additional monitoring wells to monitor progress of treatment over time. In addition, there can be significant health and safety and environmental concerns with ISCO since some of the oxidants are highly reactive.

Evaluation

Due to the low concentrations of COC outside the former gas holder and thus, low cost effectiveness, this technology is not retained for further evaluation as a remedy in the downgradient area. This technology is also not retained for further evaluation as a remedy inside the former gas holder because, in addition to the greater volume of source material to be treated and health and safety concerns associated with ISCO and with working within or in close proximity to the substation, this technology has limited implementability and thus, limited effectiveness for the following reasons:

- The distribution of ISCO materials in the subsurface by injection is most effective in high-permeability soils. The predominance of low-permeability silt and fine sand in the saturated zone of the former gas holder will result in a low radius of influence of the injected materials. A low radius of influence will require a large number of injection points.
- Access to the COC-impacted fill within the former gas holder is significantly limited by the presence of the substation and, coupled with the low permeability fill, the injected ISCO oxidants will not be able to be applied to the entire volume of COC-impacted fill within the former gas

holder, even with horizontal and/or angled injection approaches. Pockets of loose brick fill serve to further complicate reliably consistent application.

- If only the norther portion of the former holder is treated with ISCO, untreated fill will remain in the southern portion (beneath the substation) and that fill will continue to be a source of dissolved-phase groundwater contamination.
- Groundwater flow at the site is to the north-northeast. The sub-station lies over the southern, upgradient portion of the former gas holder. Therefore, if only the northern portion of the former gas holder receives ISCO treatment, COC-impacted groundwater will migrate from the untreated fill to the north-northeast, re-contaminating the treated portion of the former gas holder.

4.3.3.5 Groundwater Treatment and Discharge

Any remedial alternative which includes groundwater extraction or excavation dewatering may also require treatment and discharge of the extracted groundwater.

<u>Organic Treatment</u>

Description

Treatment addressing organic COCs would be required for use in conjunction with groundwater removal technologies. A number of technologies are available for the treatment of VOCs and SVOCs in groundwater including the following:

- filtration
- air stripping (VOCs only)
- granular activated carbon (GAC)
- chemical/UV oxidation
- aerobic biological treatment

The organic treatment process would be used as part of a treatment train to treat groundwater removed from excavation areas.

Effectiveness

This technology would be effective at meeting the RAOs for prevention of exposure to COC in groundwater after treatment. There would be exposure risk for maintenance or construction workers for the pre-treatment portion of the technology.

Experience at similar MGP sites with organic constituents in groundwater have shown that all of these technologies except air stripping are capable of meeting stringent discharge standards. Air stripping would not be effective for SVOCs. The selection of the most cost-effective approach to groundwater treatment would depend on the final design configuration and discharge criteria.

Implementability

Systems for treatment of organic COC in extracted groundwater are readily constructed and operated. Provisions for discharge of treated groundwater would have to be made with the local municipality and NYSDEC.

Evaluation

Groundwater treatment for organic COC is retained because it has been proven effective in treating organic COC in collected groundwater to water quality standards and because it may be needed in order to implement excavation dewatering or containment technologies.

<u>Inorganic Treatment</u>

Description

Treatment addressing inorganic COC would be required for use in conjunction with groundwater technologies. A number of technologies are available for the treatment of inorganic parameters, including cyanide, in water including the following:

- chemical precipitation
- ion exchange/adsorption
- filtration
- sequestration
- peroxide oxidation

The inorganic treatment process would be used as part of a treatment train to treat groundwater removed from excavation areas.

Effectiveness

This technology would be effective at meeting the RAOs for prevention of exposure to COC in groundwater after treatment. There would be exposure risk for maintenance or construction workers for the pre-treatment portion of the technology.

Experience at similar MGP sites with inorganic constituents in groundwater have shown that these technologies are capable of meeting stringent discharge standards. The selection of the most cost-effective approach to groundwater treatment would depend on the final design configuration and discharge criteria.

Implementability

Systems for treatment of inorganic COC in extracted groundwater are readily constructed and operated. Provisions for discharge of treated groundwater would have to be made with the local municipality and NYSDEC.

Evaluation

Groundwater treatment for inorganic COC is retained because it has been proven effective in treating inorganic COC in water generated during excavation dewatering to water quality standards and may be required in order to implement excavation dewatering or containment technologies.

<u>Discharge to Publicly Owned Treatment Works</u>

Description

With appropriate prior approvals impacted groundwater can be extracted during remedial action and piped into the sanitary sewer system either directly or after undergoing pre-treatment. The viability of this option would be dependent on approval by the Publicly Owned Treatment Works (POTW), which would establish maximum acceptable effluent concentrations for COC. Also, a maximum daily discharge volume would be dictated, and discharge would have to be metered.

Effectiveness

Discharging to the POTW could be one component of an excavation dewatering remedy. Because any groundwater that is removed is subject to water quality standards, it may be required to undergo treatment prior to discharge. If not pre-treated at the Site, groundwater may be effectively treated at the POTW, where COC would be removed both physically during sedimentation and biologically during aerobic degradation processes.

Implementability

Discharging extracted groundwater into the sanitary sewer system can be implemented with appropriate approvals. Appropriate piping as well as metering and sampling ports are often required, and can readily be obtained and installed. Administrative coordination and permitting would be necessary to receive approval for discharge and to demonstrate compliance with discharge requirements over time.

Evaluation

This alternative is considered similar to discharge to surface water, described below, as a discharge technology for treated groundwater. Discharge to a POTW is not retained for further evaluation in the FS, but it will be considered during remedial design if groundwater treatment and discharge is required.

<u>Discharge to Surface Water via Storm Sewer</u>

Description

With appropriate approvals, treated water from the Site would be discharged directly to the nearest surface water body via the nearest storm sewer. A discharge pipe would be constructed from the on-site treatment system effluent to the storm sewer. This would require a State Pollutant Discharge Elimination System (SPDES) permit to be issued by NYSDEC. The SPDES permit would include provisions for discharge limitations, including chemical concentrations and daily discharge rates.

During operation, constituent concentration and flow monitoring would be required, consistent with the provisions of the NYSDEC SPDES permit to demonstrate that treated water meets discharge requirements. The discharge requirements under a SPDES permit are typically more stringent than for discharge into a POTW, but the technology has been successfully implemented at other MGP sites in New York State.

Effectiveness

This option would be effective for the management of impacted groundwater when included in a system including groundwater recovery, effective treatment, and discharge.

Implementability

The technology is implementable upon obtaining an NYSDEC SPDES permit for discharge and meeting the more stringent discharge requirements.

Evaluation

This alternative is retained because it will help in the management of treated groundwater, although it does not directly achieve the RAOs for groundwater. As indicted above, both discharge to surface water and to the POTW will be considered during remedial design.

4.3.3.6 Containment

Containment groundwater remedial technologies achieve their effect by restricting migration of COC in groundwater away from the area where the source of COC to groundwater is located. As described below, this can be accomplished by stopping the movement of water with a hydraulic or physical barrier or by treating the water to remove COC before it leaves the site. For the purposes of this FS, technologies that serve to contain migration of COCs beyond a physical barrier are also considered “containment”, these include biological and chemical containment, passive reactive barrier wall, and funnel-and-gate technologies.

Biological Containment - In-Situ Bioremediation/Aerobic Biodegradation

Description

Containment is provided by installing application wells in the form of a barrier around or downgradient of areas identified as sources of contamination to groundwater. In-situ bioremediation/aerobic biodegradation provides treatment for COC by optimizing subsurface conditions to support the growth of microorganisms which are capable of metabolizing organic compounds, including VOCs and SVOCs. For non-chlorinated compounds such as those at the Site, this is typically accomplished by adding oxygen via air sparging or ORC and nutrients which the microorganisms require to live and reproduce. Sometimes specially produced microorganisms are injected to further enhance biodegradation, although generally naturally occurring organisms are used.

Oxygen, nutrients, and microorganisms can be added by injecting into permanently installed wells or temporary well points. Oxygen can also be provided by installing oxygen diffusers in permanent wells. A network of wells or well points are installed in a spacing determined based on the characteristics of the subsurface soil, concentration of COCs, and the materials and equipment being used. It is not unusual for injection points to be installed at a spacing of 10 to 15 ft.

Effectiveness

In-situ bioremediation/aerobic biodegradation may be an effective biological containment barrier in treating organic constituents, including SVOCs, when concentrations of COC are low or moderate. However, it is not effective in treating areas with heavy staining, sheens, or high concentrations of COC. Under the right conditions, it could be effective in meeting the RAOs for preventing exposures to COC in groundwater. It would not normally be expected to address materials which provide a source of COC to groundwater. Bioremediation is most effective against low molecular weight compounds such as VOCs and naphthalene.

Implementability

Implementation of in-situ bioremediation/aerobic biodegradation is accomplished using drill rigs, injection wells, direct push rigs and other common equipment. Proprietary mixtures of ORCs and nutrients and equipment capable of diffusing oxygen into the subsurface are commonly available and widely used. Groundwater monitoring would be required to document that reduction of COC is occurring over time. Monitoring equipment is readily available and routinely used by properly trained personnel. The frequency of monitoring would be established during remedial design. It may be necessary to install additional monitoring wells to monitor downgradient conditions over time.

Evaluation

In-situ bioremediation/aerobic biodegradation may be an effective biological treatment containment technology for meeting RAOs at the Site. This technology has been successfully implemented at many sites across New York State. It is a proven technology and site conditions are favorable. This technology is retained for further evaluation.

Chemical Containment – In-Situ Chemical Oxidation Barrier

Description

Containment is provided by installing application wells in the form of a barrier around or downgradient of areas identified as sources of contamination to groundwater. Contaminants in groundwater are chemically degraded using an oxidant (e.g., ozone, hydrogen peroxide, potassium permanganate). This technology treats contaminated water as it migrates through the barrier reducing exposure to areas beyond the barrier.

Effectiveness

Chemical containment is potentially effective in meeting the RAOs to prevent ingestion, direct contact, or inhalation of COC in groundwater in off-site areas by preventing migration. However, it may not be effective at meeting the RAOs for restoring the on-site aquifer or removing the source of groundwater impacts. As discussed previously, monitoring data shows that off-site migration of all COC except for benzene is already being effectively prevented by natural attenuation processes.

Implementability

This technology is readily implementable in accessible areas. However, there can be significant health and safety and environmental concerns with ISCO since some of the oxidants are highly reactive.

Evaluation

Because this technology is not considered more effective as a containment barrier than biological containment and because it has more safety concerns, it is not retained for further evaluation.

Permeable Reactive Barrier

Description

Containment is provided by installing the permeable reactive barrier around or downgradient of areas identified as sources of contamination to groundwater. In order to implement this technology, treatment chemicals potentially including zero valent iron, carbon, or organoclay would be mixed with permeable soil to form a barrier to treat COC in groundwater before it can migrate outside of areas where impacted groundwater and contaminated soil exist. If site soils are sufficiently permeable, mixing can be accomplished using excavators or augers to mix the materials in place. Alternatively, treatment chemicals can be mixed with sand and then put in place using slurry wall technology or shoring.

Effectiveness

A permeable reactive barrier is potentially effective to prevent off-site migration of COC in groundwater. However, it would not be effective to meet the RAOs for preventing ingestion, direct contact or inhalation of groundwater; restoring the groundwater aquifer; or removing the source of groundwater impact in source area.

Implementability

Implementation of this technology would require excavation of a trench and backfilling with soil mixed with treatment chemicals. This could be accomplished using excavations and shoring or trenching technology both of which are generally available.

Evaluation

Because of its limited effectiveness in meeting RAOs and because of the limited extent of dissolved phase groundwater COC, this technology is not retained for further evaluation.

Hydraulic Containment

Description

For this technology, containment is provided by installing extraction wells or trenches around areas identified as sources of contamination to groundwater. Groundwater is pumped to a treatment system before it is discharged to surface water (via the storm sewer) or the local POTW. This technology captures (and treats) contaminated water before it migrates off-site.

Effectiveness

Hydraulic containment is potentially effective in meeting the RAOs to prevent off-site migration. However, it may not be effective at meeting the RAOs for restoring the aquifer or removing the source of groundwater impacts. As discussed previously, monitoring data shows that off-site migration is already being effectively prevented for all COC except benzene by natural attenuation processes.

Implementability

This technology is readily implementable in accessible areas.

Evaluation

Because this technology is not considered more effective than naturally occurring attenuation processes which are already working effectively, it is not retained for further evaluation.

Funnel and Gate

Description

This technology is implemented by installation of steel sheet piling or other barrier technology with gates. The contaminated groundwater would be discharged through gates consisting of a highly permeable zone of reactive porous media, where contaminants are treated using in-situ bioremediation or adsorption. The cut-off wall would isolate the contaminants from the surrounding aquifer, preventing groundwater with concentrations of COC greater than remedial action criteria from leaving the Site without treatment through the gates.

Effectiveness

As long as there is a low permeability soil layer into which it can be driven, the funnel walls would provide an effective barrier against migration of contaminated groundwater off-site. Strategically located gates provide treatment. But the footprint of the groundwater plume at the Site is similar to that of the soil contamination, which suggests that contamination is not rapidly traveling off-site, and the groundwater contamination would be addressed while addressing soil contamination. Using gates would eliminate the need to dewater the containment.

Implementability

Funnel and gate can be easily constructed in accessible areas of the Site using generally available equipment, materials, and contractors. Installing sheet pile within and in close proximity to the active substation is not feasible.

Evaluation

As discussed with the other groundwater containment technologies, none appear to be more effective than naturally occurring attenuation processes that are already present at the Site. For that reason, funnel and gate is not retained for further evaluation as a groundwater technology.

<u>Sheet Pile Wall</u>

Description

This technology would make use of a low-permeability steel sheet pile wall around the perimeter of the area where impacted groundwater is found. The wall would isolate the contaminants from the surrounding aquifer, preventing groundwater with concentrations of COC greater than remedial action criteria from leaving the Site. The base of the sheeting would be keyed into the low-permeability silt layer present at the Site and a sealant would be installed in the joints between sheets, limiting groundwater flow beneath or through the wall. A permanent groundwater extraction and treatment system is likely to be required to maintain a negative hydraulic gradient across the sheeting.

Effectiveness

Installation of a sheet pile wall would not be effective in meeting any of the RAOs for groundwater within the limits of MGP residues on the Site itself because it would not reduce concentrations of COC. Barrier walls are sometimes used to prevent migration of COC impacts to areas outside the source of impacts.

Implementability

Barrier wall construction is performed routinely, with readily available equipment and subcontractors. Steel sheet pile walls could be readily implemented at this Site. Installing sheet pile within and in close proximity to the active substation is not feasible. Installation of a groundwater extraction and treatment system would require extensive ongoing O&M.

Evaluation

Because of its limited effectiveness in meeting RAOs and its ongoing requirements for O&M, this technology is not retained for further evaluation as a remedial technology for groundwater.

5 Development and Detailed Analysis of Alternatives

Remedial technologies potentially capable of meeting the RAOs established in Section 3 were screened on a media-specific basis and are presented in Section 4. In this section, those technologies will be developed into remedial alternatives potentially capable of achieving remedial goals and objectives. These alternatives will then be evaluated to provide a basis for the selection of a remedial action for the site. Table 5-1 provides a summary of how each alternative meets the RAOs. Table 5-2 provides the comparative analysis used to select the recommended alternative.

5.1 Development of Alternatives

The technologies retained in Section 4 are assembled into four remedial alternatives that are capable of meeting the RAOs for the media of concern: surface soil, subsurface soil, and groundwater. The four alternatives developed and retained for detailed analysis are:

Alternative 1 – No Action

- Required by DER-10 to serve as a baseline to compare other alternatives.

Alternative 2- Surface Soil Removal, Monitored Natural Attenuation (MNA), Institutional Controls/Engineering Controls (ICs/ECs)

- Excavation of impacted surface soil to a depth of 1 ft.
- Placement of a 1-ft thick layer of imported backfill in the surface soil excavation meeting the SCOs specified in 6 NYCRR Part 375-6.7(d) for Unrestricted Use.
- MNA for residual COC in groundwater on the substation parcel, northeast NYSEG parcel, and immediately downgradient area north of Hubert Street.
- ICs implemented through an SMP to include restrictions for subsurface soil disturbance, groundwater use, environmental easements, and maintenance of the Site cover.

The shallow surface soils located outside and on the west-northwest side the NYSEG substation fence would be excavated to remove COC (arsenic) above Unrestricted Use SCOs. The excavation would be restored to current condition by replacing excavated soil and planting grass and landscaping. The existing fence surrounding the substation would remain. The current gravel at the Site, estimated to be approximately 24 inches thick, would act as the site cover for commercial use (Commercial Use requires minimum one ft cover; if the existing stone cover is determined to be less than one ft thick, additional stone cover would be required to achieve minimum depth). A Monitoring Plan, included as part of the SMP, would be implemented and would include monitoring and maintenance of the site cover.

A Monitoring Plan, included as part of the SMP, would be implemented. Two additional monitoring wells, MW-9 and MW-10, would be constructed and sampled once a year with the existing eight monitoring wells to evaluate the performance of the remedy. Groundwater samples would be collected and analyzed for VOCs and SVOCs and MNA parameters. The Site area and monitoring well network would be inspected once a year in accordance with 6 NYCRR Part 375-1.8 (h) (3). A status report would be issued once a year.

Alternative 3 – Surface Soil Removal, Enhanced Aerobic Biodegradation, MNA, ICs/ECs

- Excavation of impacted surface soil to a depth of 1 ft.
- Placement of a 1-ft thick layer of imported backfill in the surface soil excavation meeting the SCOs specified in 6 NYCRR Part 375-6.7(d) for Unrestricted Use.
- Application of an ORC along the downgradient perimeter of the northeast NYSEG parcel to promote biodegradation of COC in the groundwater.
- MNA for residual COC in groundwater on the substation parcel, northeast NYSEG parcel, and immediately downgradient area north of Hubert Street.
- ICs implemented through an SMP to include restrictions for subsurface soil disturbance, groundwater use, and environmental easements and maintenance of the site cover.

The shallow surface soils located outside and on the west-northwest side the NYSEG substation fence would be excavated to remove COC (arsenic) above Unrestricted Use SCOs. The excavation would be restored to current condition by replacing excavated soil and planting grass and landscaping. The existing fence surrounding the substation would remain. The current gravel at the Site, estimated to be approximately 24 inches thick, would act as the site cover for commercial use (Commercial Use requires minimum one ft cover; if the existing stone cover is determined to be less than one ft thick, additional stone cover would be required to achieve minimum depth). A Monitoring Plan, included as part of the SMP, would be implemented and would include monitoring and maintenance of the site cover.

A Monitoring Plan, included as part of the SMP, would be implemented. Two additional monitoring wells, MW-9 and MW-10, would be constructed and sampled with the existing eight monitoring wells to evaluate the performance of the remedy. During the first year groundwater samples would be collected and analyzed quarterly, semi-annually during the second year, and annually thereafter. Groundwater samples would be analyzed for VOCs, SVOCs, and MNA parameters. The Site area and monitoring well network would be inspected once a year in accordance with 6 NYCRR Part 375-1.8 (h) (3) and a status report would be issued once a year.

Alternative 4 – Surface Soil Removal, Subsurface Soil and Gas Holder Excavation with Substation Relocation, MNA, ICs/ECs

- Excavation of impacted surface soil to a depth of 1 ft.
- Placement of a 1-ft thick layer of imported backfill in the surface soil excavation meeting the SCOs specified in 6 NYCRR Part 375-6.7(d) for Unrestricted Use.
- Identification, acquisition, and permitting of a parcel for substation relocation.
- Relocation of transmission lines, transformers, substation structures, and distribution lines.
- Removal of gas holder foundation.
- Installation of structural bracing/sheet piles.
- Excavation of impacted subsurface soil to bedrock surface.
- Excavation dewatering, treatment, and approved discharge.
- Off-site disposal of soil to landfill.
- Low-Temperature Thermal Desorption (LTTD) treatment of soil – if necessary.
- Placement of an ORC at bedrock interface to promote biodegradation of residual COC.

- Backfill excavation with imported backfill meeting the SCOs specified in 6 NYCRR Part 375-6.7(d) for Commercial Use.
- Restore surface of excavation to grass.
- MNA for residual COC that may exist in the groundwater outside of the remediated area.
- ICs implemented through an SMP to include restrictions for groundwater use and environmental easements until SCGs are achieved.

The shallow surface soils located outside and on the west-northwest side the NYSEG substation fence would be excavated to remove COC (arsenic) above Unrestricted Use SCOs. The excavation would be restored to current condition by replacing excavated soil and planting grass and landscaping.

Impacted fill/soil within and adjacent to the former gas holder would be excavated to bedrock, the excavation dewatered as needed, and an ORC solution applied to the base of the excavation to address residual groundwater impacts. The excavation would be backfilled with clean fill.

A Monitoring Plan, included as part of the SMP, would be implemented. Two additional monitoring wells, MW-9 and MW-10, would be constructed and sampled twice a year with the existing four monitoring wells (MW-1, MW-2, MW-5, and MW-6) to evaluate the performance of the remedy. Groundwater samples would be collected and analyzed for VOCs, SVOCs, and MNA parameters annually. The excavated/backfilled area would be inspected once a year in accordance with 6 NYCRR Part 375-1.8 (h)(3) and a status report would be issued once a year.

5.2 Detailed Analysis of Alternatives

The following eight criteria, provided in DER-10, will be used to evaluate each of the remedial alternatives:

- Overall protection of human health and the environment
- Compliance with SCGs
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, and/or volume
- Short-term effectiveness
- Implementability
- Cost effectiveness
- Land use

The ninth criterion, Community Acceptance will not be included as part of this document. This criterion will be evaluated following the public comment period on the proposed remedy. If warranted, the Proposed Remedial Plan will be modified in response to community comments prior to the NYSDEC's final approval.

Sustainability and green remediation concepts and techniques, per NYSDEC's guidance document DER-31 Green Remediation, are discussed in Short-Term Effectiveness.

Estimated costs are presented for the proposed remedies. These include capital and operations, maintenance, and monitoring (OM&M) costs. OM&M costs are presented as present worth costs calculated based on a discount rate of 5%. This value was selected based on guidance included in USEPA FS costing guidance (EPA, 2000) and recent decisions for similar sites by NYSDEC. Costs have been prepared to present a range of costs which may vary between -30% and +50% from actual costs.

A specific description of each remedial alternative is provided with a detailed evaluation using criteria established in DER-10.

5.2.1 Alternative 1 – No Action

The No Action alternative is retained as a baseline to compare subsequent alternatives. No ICs/ECs, monitoring or active remediation would be implemented to address impacted surface soil, subsurface soil, or groundwater.

5.2.1.1 Overall Protection of Human Health and the Environment

This alternative does not provide protection of human health and/or the environment. None of the identified RAOs for the Site would be achieved. None of the potential exposure pathways to surface soil, subsurface soil, and groundwater identified in the SC would be eliminated or controlled under this alternative.

5.2.1.2 Compliance with SCGs

This alternative will not meet chemical-specific SCGs for soil or groundwater.

5.2.1.3 Long-Term Effectiveness and Permanence

This alternative is not effective in the long term as it would not remove or treat any existing COC and would not provide any method to control those that remain.

5.2.1.4 Reduction of Toxicity, Mobility, or Volume

Natural processes, which are currently active in groundwater, would continue to reduce contaminant levels over time. However, the existing natural processes would likely take a long period of time.

5.2.1.5 Short-Term Effectiveness

Implementation of this alternative does not pose any short-term risks because no remedial activities would be performed on the Site. Under current use, exposures to Site media are limited and infrequent. No significant exposures to surface soil were identified in the SC. For that reason, this remedial alternative is protective in the short-term.

5.2.1.6 Implementability

This alternative would be difficult to implement due to administrative issues, especially State approvals. The RAOs would not be met and soil and groundwater contamination would remain above SCGs. .

5.2.1.7 Cost Effectiveness

There are no costs associated with this baseline alternative.

5.2.1.8 Land Use

This alternative would not be protective for continued Site use.

5.2.2 Alternative 2 – Surface Soil Removal, MNA, ICs/ECs

This alternative consists of the removal of impacted surface soil outside the substation parcel, placement of approved imported backfill material meeting Unrestricted Use SCOs, MNA for groundwater, and ICs/ECs for subsurface soil. Figure 5-1 shows the layout of Alternative 2.

A total of 27 CY of surface soil containing arsenic above Unrestricted Use SCOs would be removed just outside and adjacent to the western side of the fence surrounding western/northwestern portion of the substation. The depth of excavation would extend 1 ft bgs. Up to nine landscape trees would need to be removed to gain access to the impacted soil. When excavation is complete, documentation samples would be collected from the bottom of the excavation at the frequency required by DER-10. The excavated area would then be backfilled with imported fill meeting Unrestricted Use SCOs from an off-Site source, topsoil would be applied and the area seeded. Excavated soil would be disposed of at a permitted disposal facility. The existing fence surrounding the substation would remain.

The limited concentrations of COC in groundwater would be addressed by MNA and subsurface soil via ICs/ECs. The existing gravel cover would act as a site cover for commercial use (Commercial Use requires minimum one ft cover; if the existing stone cover is determined to be less than one ft thick, additional stone cover would be required to achieve minimum depth).

A Monitoring Plan would be implemented as part of an SMP to document the rate at which the COC concentrations are decreasing. As part of MNA implementation, it is assumed that two new monitoring wells would be required on the north side of Hulbert Street. MNA monitoring would be conducted as described below.

OM&M activities required following completion of this alternative would include the following:

- Annual inspections of the Site area.
- Groundwater monitoring would be performed once a year in ten monitoring wells. Groundwater samples would be analyzed for VOCs, SVOCs, and MNA parameters.
- Maintain the site cover.
- Status reports would be issued once a year.

The SMP will include additional action requirements should groundwater sampling of proposed wells MW-9 and MW-10 indicate that off-site migration is occurring. This may include notifying the owner of properties to the north of the Site (e.g., Water Street and New York State Department of Transportation), identifying and complying with applicable local ordinances, and identifying remedial actions to address off-site impacts.

Upon completion of the remedial activities, ICs/ECs would be established for areas which are not excavated until the groundwater meets cleanup criteria established in Section 3. An environmental easement would be put in place to restrict future development of impacted areas and ensure that potentially impacted groundwater is not utilized as a potable water source. An SMP would be implemented to require specific health and safety and waste management procedures to be followed if intrusive construction activities are implemented on-site.

Given the concentrations of organic COC, there is a potential for vapor intrusion. Therefore, the SMP will include a provision that vapor intrusion will be evaluated if any new structures are constructed at the Site.

5.2.2.1 Overall Protection of Human Health and the Environment

Alternative 2 would be protective of human health and the environment by addressing the RAOs for surface soil, subsurface soil, and groundwater as shown on Table 5-1. The potential for contact with COC in surface soil would no longer exist. Access to and use of subsurface soil and groundwater would be controlled by ICs/ECs. There is no current or any anticipated future use of groundwater from the Site.

5.2.2.2 Compliance with SCGs

This alternative will not meet chemical-specific SCGs for subsurface soil or groundwater. COC in groundwater would continue to decrease naturally by MNA, but the existing natural processes would not destroy the majority of the contaminants within the foreseeable future.

5.2.2.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence applies to the area where impacted surface soil was removed and backfilled with approved imported fill meeting Unrestricted Use SCOs. Under current use, exposures to impacted subsurface soil and groundwater media are limited and infrequent. Concentrations of COC in the groundwater are not likely to increase and organic COC are expected to decrease via natural attenuation over time. ICs/ECs would provide guidance for handling and managing impacted soil and groundwater encountered during future intrusive work.

5.2.2.4 Reduction of Toxicity, Mobility, or Volume

This alternative would reduce the volume, toxicity, and mobility of COC in surface soil on Site, however, since the surface soil will be transported to a landfill, mobility would be controlled but toxicity and volume would not be reduced. COC in the subsurface soil would not be affected. Natural attenuation would reduce the toxicity, mobility, and volume of COC in groundwater over a long period of time. There is low potential for off-site migration of dissolved phase COC due to their already low concentrations and likelihood of further degradation due to natural attenuation. . Mobility is generally restricted to the Site property.

5.2.2.5 Short-Term Effectiveness

Implementation of this alternative has minimal short-term risks associated with shallow surface soil excavation, loading and placement of backfill, and monitoring. Under current use, exposures to COC in Site media are limited and infrequent. Potential exposures to COC in soil and groundwater at the Site are generally associated with future activities conditions rather than those currently occurring. NYSEG has no plans to change current Site use.

Protection of the Community – A Community Air Monitoring Plan (CAMP) would be prepared in accordance with DER-10, Appendix 1A. Measures would be taken to monitor and reduce the potential impacts resulting from windblown particles, air emissions, dust, noise and traffic disturbance during soil excavation, placement of backfill, and transport of spoil materials off-site for disposal.

Protection of Workers – Contractor employees would wear the appropriate personal protective equipment (PPE) for various tasks as specified in the Site-specific Health and Safety Plan (HASP).

Environmental Impacts – Short-term adverse environmental impacts associated with this alternative are low due to soil excavation and MNA of the groundwater.

<u>Time Until Response Objectives are Achieved</u> – The groundwater monitoring program would be evaluated every five years. For costing purposes, assume that the groundwater monitoring program for MNA would be 30 years.

<u>Green Remediation Considerations</u> – Fossil fuels and disposal facilities would be used for the excavation, backfilling, grading, and transport of materials to and off the Site.

5.2.2.6 Implementability

Excavation and off-site disposal of soil, MNA, and ICs/ECs can easily be implemented as NYSEG currently owns the properties. As such, this alternative is both technically and administratively feasible. Services and materials required for this alternative are readily available.

5.2.2.7 Cost Effectiveness

The total estimated cost for Alternative 2 is $330,000. This cost includes approximately $120,000 in capital costs and $210,000 in present value for operation, maintenance and monitoring costs for the next 30 years. The costs include a 20 percent contingency, engineering expenses and administrative fees. Tables 5-3 and 5-4 detail capital and OM&M costs, respectively. Details of the capital cost estimate are provided in Appendix A.

Alternative 2 has a moderate cost effectiveness as RAOs would be addressed over a long time period. COC reduction in the groundwater would be evaluated every five years by the NYSDEC. It is assumed that the groundwater monitoring period for this alternative would be 30 years.

5.2.2.8 Land Use

One of the two adjoining Site parcels currently operates as NYSEG's Auburn Green Street Substation while the other parcel is currently grassed and undeveloped. NYSEG has no current plans to develop either parcel for different use. The properties are currently zoned for commercial use. Alternative 2 would allow the current commercial land use as an electrical substation to continue.

5.2.3 Alternative 3 – Surface Soil Removal, Enhanced Aerobic Biodegradation, MNA, ICs/ECs

This alternative consists of the removal of impacted surface soil outside the substation parcel, placement approved imported backfill material meeting Unrestricted Use SCOs, application of an ORC to promote biodegradation of COC as a biological barrier to off-site migration of groundwater COC, MNA for groundwater, and ICs/ECs for subsurface soil. Figure 5-2 shows the layout of Alternative 3.

Also, as discussed in Alternative 2, a total of 27 CY of surface soil containing arsenic above Unrestricted Use SCOs would be removed just outside and adjacent to the western side of the fence surrounding western/northwestern portion of the substation. The depth of excavation would extend 1 ft bgs. Up to nine landscape trees would need to be removed to gain access to the impacted soil. When excavation is complete, documentation samples would be collected from the bottom of the excavation at the frequency required by DER-10. The excavated area would then be backfilled with imported fill meeting Unrestricted Use SCOs from an off-site source, topsoil would be applied and the area seeded. Excavated soil would be disposed of at a permitted disposal facility.

The gravel cover would act as the site cover for commercial use (Commercial Use requires minimum one ft cover; if the existing stone cover is determined to be less than one ft thick, additional stone cover would be required to achieve minimum depth). The existing fence surrounding the substation would remain.

ORC would be applied through approximately ten ORC application wells to promote in-situ biodegradation of COC in saturated soil and groundwater. The application wells would be installed to a total depth of 15 to 20 ft bgs spaced approximately 12 ft apart along the northeastern NYSEG parcel northern property line. Four performance monitoring wells would be installed as paired upgradient/downgradient wells at two locations as depicted in Figure 5-3. Actual application well diameters, depths and screening would be determined during design. Soil cuttings and decontamination water resulting from well drilling operations would be properly disposed of at a permitted off-site landfill. ORC would be applied via filter socks placed directly in the application wells; the number of socks and frequency of replacement would be determined during design and performance monitoring.

The limited concentrations of COC in subsurface soil and the groundwater existing outside of the treatment areas would be addressed by MNA and ICs/ECs. A Monitoring Plan would be implemented as part of an SMP to document the rate at which the COC concentrations are decreasing. As part of MNA implementation, it is assumed that two new monitoring wells would be required on the north side of Hulbert Street. MNA monitoring would be conducted as described below.

OM&M activities required following completion of this alternative would include the following:

- Annual inspections of the Site area.
- Groundwater monitoring would be performed quarterly during the first year, semi-annually the second year, and annually thereafter. Groundwater samples collected from the ten monitoring wells and four performance monitoring wells would be analyzed for VOCs, SVOCs, and MNA parameters.
- After two years the system would be evaluated based on the results of monitoring. Additional application wells could be installed if required to optimize the effectiveness of the treatment.
- Maintain the site cover.
- Status reports would be issued once a year.

The SMP will include additional action requirements should groundwater sampling of proposed wells MW-9 and MW-10 indicate that off-site migration is occurring. This may include notifying the owner of properties to the north of the Site (e.g., Water Street and New York State Department of Transportation), identifying and complying with applicable local ordinances, and identifying remedial actions to address off-site impacts.

ICs/ECs would be established in areas which are not excavated until the groundwater meets cleanup levels established in Section 3. An environmental easement would be put in place to restrict future development of impacted areas and ensure that potentially impacted groundwater is not utilized as a potable water source. An SMP would be implemented to require specific health and safety and waste management procedures to be followed if intrusive construction activities are implemented on-site.

Given the concentrations of organic COC, there is a potential for vapor intrusion. Therefore, the SMP will include a provision that vapor intrusion will be evaluated if any new structures are constructed at the Site.

5.2.3.1 Overall Protection of Human Health and the Environment

Alternative 3 would be protective of human health and the environment by addressing the RAOs for surface soil, subsurface soil, and groundwater as shown on Table 5-1. The potential for contact with COC in surface soil would be eliminated through excavation. Access to and use of subsurface soil and groundwater would be controlled by ICs/ECs until monitoring indicates that SCG concentrations of COC are achieved. COC in groundwater would be prevented from migrating off-site. There is no current or any anticipated future use of groundwater from the Site.

5.2.3.2 Compliance with Standard Criteria and Guidance

Chemical-specific SCGs used to develop remedial criteria for soil and groundwater will be addressed. This alternative would meet the SCGs for surface soil. However, SCGs would be exceeded in some deep subsurface soil (i.e., in the vicinity of MW-4 and MW-7). Soil and groundwater quality would be expected to improve through MNA. SCGs would probably be achieved over time as attenuation of the COC are depleted.

5.2.3.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence applies to the area where impacted surface soil was removed and backfilled with approved imported fill meeting Unrestricted Use SCOs. COC remaining in impacted subsurface soil and groundwater pose minimal risk due to depth below grade and limited migration from the former gas holder. Groundwater with low level COC would be prevented from migrating off-site. Future OM&M would be performed to verify the effectiveness of the remedy. ICs/ECs would provide guidance for handling and managing impacted soil and groundwater encountered during future intrusive work until monitoring indicates that SCG concentrations of COC are achieved.

5.2.3.4 Reduction of Toxicity, Mobility, or Volume

This alternative would reduce the toxicity, mobility, and volume of COC in surface soil on Site, however, since the surface soil will be transported to a landfill, mobility would be controlled but toxicity and volume would not be reduced. Waste generated as a result of drilling operations would be managed and transported off-site to a disposal facility. Application of ORC at the barrier would result in the reduction in toxicity, mobility, and volume of COC in groundwater passing through the barrier. In time, toxicity, mobility, and volume of organic COC in the area of the former gas holder are expected to decrease via natural attenuation.

5.2.3.5 Short-Term Effectiveness

Implementation of this alternative has minimal short-term risks associated with shallow surface soil excavation, loading and placement of backfill, drilling injection wells, removal of spoil materials, injection of oxidizing solution, and monitoring. Under current use, exposures to COC in Site media are limited and infrequent. Potential exposures to COC in soil and groundwater at the Site are generally associated with future activities conditions rather than those currently occurring. NYSEG has no plans to change current Site use.

Protection of the Community – A CAMP would be prepared in accordance with DER-10, Appendix 1A Measures would be taken to monitor and reduce the potential impacts resulting from windblown particles, air emissions, dust, noise and traffic disturbance during soil excavation, placement of backfill, drilling operations, and transport of spoil materials off-site for disposal.

Protection of Workers – Contractor employees would wear the appropriate PPE for various tasks as specified in the site-specific HASP.

Environmental Impacts – Short-term adverse environmental impacts associated with alternative are low due to soil excavation, drilling operations, and MNA of groundwater.

Time Until Response Objectives are Achieved – The groundwater monitoring program would be evaluated every five years. For costing purposes, assume that the groundwater monitoring program for MNA would be 30 years.

Green Remediation Considerations – Fossil fuels and disposal facilities would be used for the excavation, backfilling, grading, drilling operations, and transport of materials to and off the Site.

5.2.3.6 Implementability

Technical Feasibility – It is technically feasible to implement Alternative 3. ORC applications are routinely used to promote aerobic biodegradation in groundwater and saturated soils for contaminants derived from MGP operations. Application wells can be installed in readily accessible areas using conventional drilling methods.

Administrative Feasibility - Excavation and off-site disposal of soil, injection of oxidizing solution, MNA, and ICs/ECs can easily be implemented and are administratively feasible as NYSEG owns the properties.

Availability of Services and Materials – Services and materials required for this alternative are readily available.

5.2.3.7 Cost Effectiveness

The total estimated cost for Alternative 3 is $545,000. This cost includes $315,000 in capital costs and $230,000 in present value for OM&M costs for the next 30 years. The costs include a 20 percent contingency, engineering expenses and administrative fees. Tables 5-3 and 5-4 detail capital and OM&M costs, respectively. Details of the capital cost estimate are provided in Appendix A.

Alternative 2 is a cost effective option as many of the RAOs would be addressed over a short period. COC reduction in the groundwater would be evaluated every five years by the NYSDEC. It is assumed that the groundwater monitoring period for this alternative would be 30 years.

5.2.3.8 Land Use

One of the two Site parcels currently operates as NYSEG's Auburn Green Street Substation, while the other parcel is currently grassed and undeveloped. NYSEG has no current plans to develop either parcel for different use. The properties are currently zoned for commercial use. Alternative 3 would allow the current commercial land use as an electrical substation to continue.

5.2.4 Alternative 4 –Surface Soil Removal, Subsurface Soil and Gas Holder Excavation with Substation Relocation, MNA, ICs/ECs

This alternative was developed to provide unrestricted use of the Site following remediation. Alternative 4 consists of the removal of the electrical substation and historical structures/foundations, excavation of impacted surface and subsurface soil, enhanced aerobic bioremediation, and MNA. Figure 5-3 shows the layout of Alternative 4.

The first step of implementing this alternative would be to remove the existing electrical substation. In order to minimize the disruption of electrical service to the community, a new substation would need to be constructed and brought online at a different location prior to removing the transmission lines, transformers, substation structures, and overhead and underground distribution lines at the existing facility. Once the new substation is online, structural sheet piling would be installed with toe-pins and wales around the perimeter of the excavation. The structural sheet piling would be advanced to the top of bedrock, approximately 20 ft bgs. The gas holder foundation and other former structures would be removed to facilitate remediation. Debris would be managed and transported off-site with excavated soil.

A dewatering and a groundwater treatment system consisting of pumps, tanks, filtration and carbon adsorption units would be required. Approval to discharge treated water to the local POTW or to surface water via a SPDES permit would be required. The sheet pile wall would serve as containment for groundwater to facilitate dewatering operations.

An estimated total of 5,300 CY of soil would be removed from this area. Approximately 4,800 CY would be transported to a licensed landfill for disposal and the remaining volume (estimated at 10 percent or approximately 530 CY) would be taken to a low-temperature thermal desorption facility for treatment. When excavation is complete, documentation samples would be collected from the bottom of the excavation at the frequency required by DER-10.

The steel sheeting surrounding the excavation would be removed and the area backfilled with approved imported fill meeting Unrestricted Use SCOs. Prior to backfilling, an ORC solution would be applied to the bedrock interface to treat residual COC. Selection and formulation of the solution would be determined following the pre-design investigation.

The limited concentrations of COC in subsurface soil and groundwater existing outside of the treatment areas would be addressed by MNA. A Monitoring Plan would be implemented as part of an SMP to verify that the elevated concentrations (above cleanup standards) of COC do not migrate outside the area where groundwater is currently impacted and to document the rate that COC concentrations are decreasing. As part of MNA implementation, it is assumed that two new monitoring wells would be required on the north side of Hulbert Street. MNA monitoring would be conducted as described below.

Also, as discussed in Alternatives 2 and 3, a total of 27 CY of surface soil containing arsenic above Unrestricted Use SCOs would be removed just outside and adjacent to the western side of the fence surrounding western/northwestern portion of the substation. The depth of excavation would extend 1 ft bgs. Up to nine landscape trees would need to be removed to gain access to the impacted soil. When excavation is complete, documentation samples would be collected from the bottom of the excavation at the frequency required by DER-10. The excavated area would then be backfilled with imported fill meeting Unrestricted Use SCOs from an off-site source, topsoil would be applied and the area seeded. Excavated soil would be disposed of at a permitted disposal facility. The existing fence surrounding the substation would remain.

OM&M activities required following completion of this alternative would include the following:

- Annual inspections of the Site area.
- Groundwater monitoring would be performed annually for a five year period. Groundwater samples collected from the six monitoring wells would be analyzed for VOCs, SVOCs, and MNA parameters.
- After five years, the system would be evaluated based on the results of the monitoring program.
- Status reports would be issued once a year.

Once all other remedial activities have been completed, ICs/ECs would be established until groundwater outside the excavation area meets cleanup levels established in Section 3. An environmental easement would be put in place to restrict future development and ensure that potentially impacted groundwater is not utilized as a potable water source. An SMP would be implemented to require specific health and safety and waste management procedures to be followed if intrusive construction activities are implemented in areas of the Site where groundwater may exceed guidance values.

5.2.4.1 Overall Protection of Human Health and the Environment

Alternative 4 would be protective of human health and the environment by addressing the RAOs for surface soils, subsurface soils, and the majority of impacted groundwater as shown on Table 5-1. Potential exposures to surface soil, subsurface soil, and groundwater would be addressed by excavating soil requiring remediation. Applying an ORC solution in the excavation before backfilling would promote biodegradation of residual COC in the groundwater.

5.2.4.2 Compliance with Standard Criteria and Guidance

Chemical-specific SCGs used to develop remedial criteria for soil and groundwater would be addressed. This alternative would meet the SCGs for surface soil and subsurface soil. Groundwater quality would be greatly improved. Limited residual concentrations of COC remaining in the groundwater would be reduced through the application of the oxidizing solution in the bottom of the excavation and addressed over time by natural attenuation.

5.2.4.3 Long-Term Effectiveness and Permanence

Alternative 4 provides for the removal and off-site management of all surface and subsurface soil which contains COC above unrestricted use standards, which meets the requirements of these criteria. Limited residual concentrations of COC remaining in the groundwater would be addressed through the use of the oxidizing solution and over time by natural attenuation.

5.2.4.4 Reduction of Toxicity, Mobility, or Volume

This alternative would reduce the toxicity, mobility, and volume of COC in surface soil on Site, however, since the surface soil will be transported to a landfill, mobility would be controlled but toxicity and volume would not be reduced. The removal of all subsurface soil which contains COC above Unrestricted Use SCOs would result in a significant reduction of toxicity, mobility, and volume of COC in subsurface soil on Site. An assumed 10% of the subsurface soil would be transported to a permitted thermal desorption facility for treatment, which would significantly reduce toxicity, mobility and volume for that portion; however, for soils transported to a landfill, mobility would be controlled but toxicity and volume would not be reduced. Application of the oxidizing solution would promote in-situ biodegradation effectively reducing the toxicity and volume of residual COC in subsurface soil and groundwater. In time, toxicity, mobility, and volume of COC in groundwater would also be reduced by natural attenuation.

5.2.4.5 Short-Term Impacts and Effectiveness of Controls

Implementation of this alternative has significant short-term impacts mainly associated with the removal of the existing electrical substation and construction of a new substation at a different location. Excavation of the impacted soil, dewatering operations, backfilling, and removal and disposal of spoil materials would contribute to the large negative impact associated with the relocation of the substation.

Protection of the Community – A CAMP would be prepared in accordance with DER-10, Appendix 1A Measures would be taken to monitor and reduce the potential impacts resulting from windblown particles, air emissions, dust, noise and traffic disturbance during soil excavation, placement of backfill, drilling operations, and transport of spoil materials off-site for disposal.

Protection of Workers – Contractor employees would wear the appropriate PPE for various tasks as specified in the site-specific HASP.

Environmental Impacts – Short term adverse environmental impacts associated with alternative are high due to the transport of impacted soil, thermal treatment, and generation of greenhouse gases.

Time Until Response Objectives are Achieved – The relocation of the substation including land acquisition is estimated to take three years. Removal of impacted soil, backfilling operations and application of the oxidizing solution is estimated to take approximately four months. The groundwater monitoring program would be evaluated in five years. For costing purposes, assume that the groundwater monitoring program for MNA would be completed in five years. Duration of time required to complete Alternative 4 would be approximately nine years.

Green Remediation Considerations – Use of fossil fuels and disposal facilities would be the highest for this alternative, considering the volume of soil to be removed, backfill place, demolition and construction of the substations.

5.2.4.6 Implementability

Technical Feasibility – It is technically feasible to implement Alternative 4. Excavation and off-site thermal treatment or landfill disposal of soil and administering oxidizing solution can be readily implemented as NYSEG currently owns the properties. Materials and remedial contractors qualified to perform the major portions of the work including shoring, installation, dewatering and water treatment, earthworks construction, and transportation of waste material are locally and regionally available.

The relocation of the electrical substation can be achieved using conventional equipment. It may be difficult to find a suitable location to construct the new substation. Scheduling and coordination would be complicated to ensure the new substation is brought online and can accommodate the needs of the community prior to demolishing the existing substation.

Administrative Feasibility – This alternative is administratively feasible, but can be hindered if NYSEG has difficulty purchasing suitable property that would be able to accommodate the new electrical substation.

Availability of Services and Materials – Services and materials required for this alternative are readily available. Many critical components would need to be identified, coordinated and scheduled due to the complexity associated with designing and developing a new electrical substation. Acquisition of electrical substation components may require extensive lead-time due to design, fabrication, and shipping requirements. Remedial procurement longer lead-time items include identifying soil disposal, thermal desorption and soil backfill facilities within a reasonable transportation distance

5.2.4.7 Cost Effectiveness

The total estimated cost for Alternative 4 is $20,480,000. This cost includes $20,405,000 in capital costs and $75,000 in present value for OM&M costs for the next five years. The costs include a 20 percent contingency, engineering expenses and administrative fees. Tables 5-3 and 5-4 detail capital and OM&M costs, respectively. Details of the capital cost estimate are provided in Appendix A.

This alternative ranks high in long-term effectiveness because it addresses all RAOs and does not leave soil COC remaining. It also ranks high in reductions of toxicity, mobility, and volume, but ranks low in short-term effectiveness because of its long schedule and impacts to the community associated with substation relocation. The cost for this alternative is very high.

5.2.4.8 Land Use

This alternative would remediate the Site to allow for any use.

6 Recommended Remedial Alternative

Based on the evaluation completed in Section 5, a recommended alternative has been identified which is protective, compliant with SCGs, addresses all identified exposures and RAOs, and provides the best all -around performance on eight of the nine evaluation criteria. An evaluation of community acceptance would be determined during the public hearing process.

6.1 Description of Recommended Remedial Alternative

Alternative 3 – Surface Soil Removal, Enhanced Aerobic Biodegradation, MNA, and ICs/ECs has been selected as NYSEG's recommended remedial alternative for the Site. As described in detail in Section 5.2.3 and shown in Figure 5-2, this alternative includes the following elements:

- Excavation of impacted surface soil to a depth of 1 ft.
- Placement of a 1-ft thick layer of imported backfill in the surface soil excavation meeting the SCOs specified in 6 NYCRR Part 375-6.7(d) for Unrestricted Use.
- Injection of an ORC along the downgradient perimeter of the northeast NYSEG parcel to promote biodegradation of COC in groundwater.
- MNA for residual COC in groundwater on the substation parcel, northeast NYSEG parcel, and immediately downgradient area north of Hulbert Street.
- ICs/ECs implemented through an SMP to include restrictions for groundwater use and environmental easements.

6.2 Basis for Recommendation

Table 5-1 shows the comparative ranking of the remedial alternatives for each of the eight evaluation criteria. Each of the alternatives except Alternative 1- No Action was rated as protective and compliant with SCGs. Because Alternative 1 is not rated as protective, it cannot be selected for implementation. Selection among remaining remedial alternatives that have been rated protective and compliant with SCGs is made by determining which has the best balance among the other seven evaluation criteria; long-term effectiveness, reduction in COC through treatment, short-term effectiveness, implementability, cost effectiveness, and land use.

Among the acceptable alternatives, Alternative 4 is rated highest in terms of its ability to reliably remove residual risks and impacts at the Site and to meet RAOs. For that reason, it is also ranked highest in the long-term effectiveness and reduction in toxicity, mobility, and volume criteria. The other two alternatives are rated acceptable in terms of these criteria. Alternative 4 is rated better than Alternative 3 for long-term effectiveness, because it addresses all RAOs and does not leave any COC. Alternative 4 is ranked better than Alternative 3 in terms of reduction in toxicity, mobility, and volume because it effectively addresses COC in subsurface soil and would decrease the COC in groundwater over a shorter time frame as the source would be removed. Alternative 2 is ranked lower than Alternative 3 in terms of long-term effectiveness because it leaves the most material behind. Alternative 2 is ranked significantly lower than the other alternatives in reduction in toxicity, mobility, and volume since it does not provide treatment of a large proportion of the COC in the groundwater and subsurface soil.

In terms of short-term effectiveness, Alternative 2 is ranked higher than Alternative 3 because it has the shortest schedule and would require the least amount of off-site shipping of waste material. Alternative 4 is ranked lowest since it has the longest schedule, would have the greatest adverse impact on the community, and would have the most off-site shipment of material. Alternative 3 is rated in the middle among the alternatives.

In terms of implementability, all of the active alternatives are evaluated as acceptable, since all can be constructed using available materials and contractors. There are some construction and administrative issues associated with Alternatives 2 and 3, and more significant construction and administrative issues associated with Alternative 4. However, these issues can be addressed during design and construction. Alternative 2 is rated highest because it does not require excavation of large quantities of overburden. Alternative 3 is rated slightly lower than Alternative 2. Alternative 4 is rated lowest because of the large amount of soil that would require removal and need to relocate the substation.

In terms of land use, all alternatives except Alternative 4 would require similar ongoing restrictions. For that reason, Alternative 4 is rated higher than the others. Alternatives 2 and 3 are rated similar on this criterion, although Alternative 2 is rated somewhat lower because remaining COC in the groundwater would take more time to address than Alternative 3 if future site work is planned.

In terms of cost-effectiveness, Alternative 3 is rated highest because it has been rated high in terms of cost effectiveness, including reduction in COC contact with groundwater.

Alternative 4 is the most effective alternative; it is also the most expensive by far. It is judged that the additional benefits are not justified by the additional cost. Based on this evaluation, Alternative 3 is rated higher on balance than Alternatives 2 and 4 and is selected as the recommended alternative.

7 References

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Tables

Table 1-1

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Historical Information Summary

Year(s)	Source of Information	Comments
1890	Atlantic Environmental Services, Inc. 1991 Report	Auburn Gas Light Co. constructs gas distribution holder at Site for gas produced at nearby McMaster MGP and possibly Clark Street MGP.
1898	1898 Sanborn Map	Shed to southeast of holder removed and a gas company office constructed between 1890 and 1898.
1904	1904 Sanborn Map	1904 Sanborn Map labels gas office building as the gas governor house.
1907-1909	Guidebook for the Auburn Green Street Former Coal Gas Holder Site	Auburn Gas Light Co. sells off northern and northwestern portions of Site to private citizens.
1911	Guidebook for the Auburn Green Street Former Coal Gas Holder Site	Auburn Gas Light Co. merges with Empire Gas and Electric Co.
1937	Guidebook for the Auburn Green Street Former Coal Gas Holder Site	NYSEG acquires Empire Gas and Electric Co. and therefore also Auburn Green Street Site.
1904-1941	Atlantic Environmental Services, Inc. 1991 Report	Former gas governor house converted to autobody repair and painting facility between 1904 and 1941.
1941	1941 Sanborn Map	Holder and dwellings were removed from the site sometime between 1931 and 1941, auto sales and service shop and warehouse now along Water Street north of holder location.
1946-1950	Atlantic Environmental Services, Inc. 1991 Report	Nearby lumber yard expanded into former gas holder area.
1950	Guidebook for the Auburn Green Street Former Coal Gas Holder Site	Substation constructed by NYSEG on Site.
1981	Guidebook for the Auburn Green Street Former Coal Gas Holder Site	NYSEG collects one soil sample from former holder area.
1987	EPA 1987 Report	EPA conducts Potential Hazardous Waste Site Preliminary Assessment. No contamination observed at Site.
1988	Guidebook for the Auburn Green Street Former Coal Gas Holder Site	NYSEG site inspection reveals few clinkers and small quantities of demolition debris, no coal tar odors or waste seen.
1991	Atlantic Environmental Services, Inc. 1991 Report	Atlantic Environmental Services, Inc. conducts site screening report to assess possible presence of the MGP-related impacts.

Sources:

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Table 2-1

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

SC Sample Summary and Rationale

Sample ID	Rationale or Location	Completion Depth (ft bgs)	Laboratory Sample Depth (ft bgs)	Number of Samples	Laboratory Analyses
Surface Soil					
SS4	To assess surface soil conditions along the northwestern property boundary.	-	0-0.17	At each location: 1	VOCs, SVOCs, PCBs, Metals, Total CN
SS5	To assess surface soil conditions along the eastern property boundary.	-	0-0.17		
SS6	To assess surface soil conditions along the western property boundary.	-	0-0.17		
SS7	To assess surface soil conditions north of the former Gas Holder.	-	0-0.17		
SS8	To assess surface soil conditions north of the former Gas Holder.	-	0-0.17		
SS9	To assess surface soil conditions north of the former Gas Holder.	-	0-0.17		
SS10	To assess surface soil conditions in the grassy area along the western property boundary.	-	0-0.17		
SS11	To assess surface soil conditions in the grassy area along the western property boundary.	-	0-0.17		
SS12	To assess surface soil conditions in the grassy area along the northwestern property boundary.	-	0-0.17		
Test Pits					
TP01	To evaluate the location and dimensions of the former Distribution Holder foundation. To assess subsurface soil conditions in the footprint of the former Distribution Holder.	10	10, 10, 3	3	VOCs, SVOCs, PCBs, Metals, Total CN
TP02	To evaluate the location and dimensions of the former Distribution Holder foundation. To assess subsurface soil conditions in the footprint of the former Distribution Holder.	7	7	1	
TP03	To assess subsurface soil conditions west of the former Distribution Holder.	7.5	7.5	1	
TP04	To evaluate the location and dimensions of the former Distribution Holder foundation. To assess subsurface soil conditions in the footprint of the former Distribution Holder.	7	7	1	
TP05	To assess subsurface soil conditions in the grassy area north of the former Distribution Holder foundation.	10.5	10.5	1	
Subsurface Soil					
SB1/MW-1	To assess deeper soil conditions in a location suspected to be downgradiant of the former Gas Holder.	19.6	5-7	1	VOCs, SVOCs, PCBs, Metals, Total CN
SB2	To assess deeper soil conditions in a location suspected to be downgradiant of the former Gas Holder.	21.9	13-16	1	
SB3/MW-3	To assess deeper soil conditions in a location suspected to be downgradiant of the former Gas Holder.	20	9-11, 18-20	2	
SB4/MW-4	To assess deeper soil conditions at a location suspected to be adjacent to the footprint of the former Gas Holder.	20	9-11, 18-20	2	
SB5/MW-5	To assess deeper soil conditions west of the former Gas Holder and along the western property boundary.	21	5-7, 19-21	2	
SB6/MW-6	To assess deeper soil conditions along the eastern property boundary and the two story brick building.	19.5	13-15	1	
SB7	To assess deeper soil conditions west of the former Gas Holder and in proximity of the western property boundary.	19.5	9-11	1	
SB8	To assess deeper soil conditions south of the former Gas Holder and along the southern property boundary.	20.3	5-7	1	
SB9	To assess deeper soil conditions south of the former Gas Holder and along the southern property boundary.	20	9-13	1	
SB10	To assess deeper soil conditions between the former Gas Holder and the two story brick building.	20	9-11	1	
SB11/MW-2	To assess deeper soil conditions in a location suspected to be downgradiant of the former Gas Holder.	18.5	9.1-13	1	
SB12	To assess the deeper soil conditions in the southwest corner of the grassy area to the north of the substation.	19	9-11	1	
SB13	To assess the deeper soil conditions in the southeast portion of the grassy area to the north of the substation.	17	8-10	1	
SB14	To assess deeper soil conditions along the southwestern boundary of the Site.	9.5	7.4-9.4	1	
MW-7	To assess soil conditions regarding the thickness and composition of fill beneath the site and depth to the water table.	18	9-11, 17-18	2	
MW-8	To assess soil conditions regarding the thickness and composition of fill beneath the site and depth to the water table.	18	7-9	1	
Groundwater Samples					
MW-1	To assess shallow groundwater conditions at a downgradient location.	NA	Center of screened interval	At each location: 1	VOCs, SVOCs, PCBs[1], Metals, Total CN
MW-2	To assess shallow groundwater conditions at a downgradient location.				
MW-3	To assess shallow groundwater conditions at a downgradient location.				
MW-4	To assess shallow groundwater conditions within the footprint of the former Gas Holder.				
MW-5	To assess shallow groundwater conditions at an upgradient location.				
MW-6	To assess shallow groundwater conditions at a location adjacent to the two story brick building.				
MW-7	To assess shallow groundwater conditions at a downgradient location.				
MW-8	To assess shallow groundwater conditions at an upgradient location.				

Notes:
[1]Groundwater samples collected in May 2014 not analyzed for PCBs
ft bgs - feet below ground surface
PCB - Polychlorinated Biphenyls
SVOCs - Semi-Volatile Organic Compounds
VOCs - Volatile Organic Compounds
CN - Cyanide
NA - Not Applicable

TABLE 2-2
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SURFACE SOIL SAMPLES
COMMERCIAL USE CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value
					Min	Max	Avg		
Volatile Organic Compounds									
1,2-Dichloroethane	MG/KG	30	12	3	0.004	0.005	0.004	0	SS-12
Chloromethane	MG/KG	-	12	1	1.30	1.30	1.30	0	SS-02
Semivolatile Organic Compounds									
2-Methylnaphthalene	MG/KG	-	12	6	0.004	0.017	0.011	0	SS-09
Acenaphthene	MG/KG	500	12	8	0.006	0.031	0.016	0	SS-11
Acenaphthylene	MG/KG	500	12	6	0.010	0.051	0.030	0	SS-10
Anthracene	MG/KG	500	12	9	0.013	0.100	0.049	0	SS-09
Benzo(a)anthracene	MG/KG	5.6	12	10	0.130	0.570	0.303	0	SS-01
Benzo(a)pyrene	MG/KG	1	12	11	0.130	0.520	0.293	0	SS-09
Benzo(b)fluoranthene	MG/KG	5.6	12	11	0.220	0.850	0.505	0	SS-09
Benzo(g,h,i)perylene	MG/KG	500	12	9	0.074	0.200	0.126	0	SS-09
Benzo(k)fluoranthene	MG/KG	56	12	11	0.021	0.410	0.185	0	SS-01
bis(2-Ethylhexyl)phthalate	MG/KG	-	12	9	0.097	4.20	0.593	0	SS-02
Carbazole	MG/KG	-	9	9	0.013	0.050	0.028	0	SS-11
Chrysene	MG/KG	56	12	11	0.170	0.910	0.357	0	SS-01
Dibenz(a,h)anthracene	MG/KG	0.56	12	7	0.030	0.180	0.136	0	SS-09
Dibenzofuran	MG/KG	350	12	3	0.013	0.016	0.015	0	SS-10
Fluoranthene	MG/KG	500	12	12	0.130	1.50	0.522	0	SS-01

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Protection of Public Health, Commercial, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-2
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SURFACE SOIL SAMPLES
COMMERCIAL USE CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value
					Min	Max	Avg		
Semivolatile Organic Compounds									
Fluorene	MG/KG	500	12	4	0.017	0.021	0.019	0	SS-04
Indeno(1,2,3-cd)pyrene	MG/KG	5.6	12	10	0.100	0.390	0.204	0	SS-01
Naphthalene	MG/KG	500	12	4	0.017	0.046	0.027	0	SS-11
Phenanthrene	MG/KG	500	12	12	0.100	1.10	0.309	0	SS-01
Pyrene	MG/KG	500	12	12	0.130	1.50	0.451	0	SS-01
Metals									
Aluminum	MG/KG	-	12	12	4,000	8,590	6,370	0	SS-06
Antimony	MG/KG	-	12	1	1.20	1.20	1.20	0	SS-04
Arsenic	MG/KG	16	12	12	4.00	24.90	11.92	4	SS-10
Barium	MG/KG	400	12	12	27.00	94.20	59.42	0	SS-04
Beryllium	MG/KG	590	12	9	0.260	0.520	0.368	0	SS-06
Cadmium	MG/KG	9.3	12	9	0.190	0.500	0.321	0	SS-10
Calcium	MG/KG	-	12	12	7,360	1.10E+05	4.64E+04	0	SS-02
Chromium	MG/KG	1500	12	12	4.00	14.40	9.38	0	SS-05
Cobalt	MG/KG	-	12	11	5.20	8.70	6.84	0	SS-09
Copper	MG/KG	270	12	12	17.10	42.10	30.73	0	SS-09
Iron	MG/KG	-	12	12	9,510	1.74E+04	1.23E+04	0	SS-09
Lead	MG/KG	1000	12	12	16.30	171.0	71.38	0	SS-10

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Protection of Public Health, Commercial, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-2
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SURFACE SOIL SAMPLES
COMMERCIAL USE CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value
					Min	Max	Avg		
Metals									
Magnesium	MG/KG	-	12	12	3,890	2.40E+04	1.34E+04	0	SS-02
Manganese	MG/KG	10000	12	12	348.0	619.0	454.5	0	SS-09
Mercury	MG/KG	2.8	12	10	0.031	0.410	0.144	0	SS-10
Nickel	MG/KG	310	12	12	10.80	18.00	13.98	0	SS-02
Potassium	MG/KG	-	12	12	680.0	1,610	1,086	0	SS-06
Selenium	MG/KG	1500	12	6	0.440	1.20	0.808	0	SS-11
Sodium	MG/KG	-	12	9	53.00	1,150	210.1	0	SS-05
Vanadium	MG/KG	-	12	12	7.20	19.50	13.44	0	SS-06
Zinc	MG/KG	10000	12	12	41.10	229.0	93.58	0	SS-04
Miscellaneous Parameters									
Cyanide (total)	MG/KG	27	12	2	1.10	1.60	1.35	0	SS-11

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Protection of Public Health, Commercial, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-2
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SURFACE SOIL SAMPLES
PROTECTION OF GROUNDWATER CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value
					Min	Max	Avg		
Volatile Organic Compounds									
1,2-Dichloroethane	MG/KG	0.02	12	3	0.004	0.005	0.004	0	SS-12
Chloromethane	MG/KG	-	12	1	1.30	1.30	1.30	0	SS-02
Semivolatile Organic Compounds									
2-Methylnaphthalene	MG/KG	36.4	12	6	0.004	0.017	0.011	0	SS-09
Acenaphthene	MG/KG	98	12	8	0.006	0.031	0.016	0	SS-11
Acenaphthylene	MG/KG	107	12	6	0.010	0.051	0.030	0	SS-10
Anthracene	MG/KG	1000	12	9	0.013	0.100	0.049	0	SS-09
Benzo(a)anthracene	MG/KG	1	12	10	0.130	0.570	0.303	0	SS-01
Benzo(a)pyrene	MG/KG	22	12	11	0.130	0.520	0.293	0	SS-09
Benzo(b)fluoranthene	MG/KG	1.7	12	11	0.220	0.850	0.505	0	SS-09
Benzo(g,h,i)perylene	MG/KG	1000	12	9	0.074	0.200	0.126	0	SS-09
Benzo(k)fluoranthene	MG/KG	1.7	12	11	0.021	0.410	0.185	0	SS-01
bis(2-Ethylhexyl)phthalate	MG/KG	435	12	9	0.097	4.20	0.593	0	SS-02
Carbazole	MG/KG	-	9	9	0.013	0.050	0.028	0	SS-11
Chrysene	MG/KG	1	12	11	0.170	0.910	0.357	0	SS-01
Dibenz(a,h)anthracene	MG/KG	1000	12	7	0.030	0.180	0.136	0	SS-09
Dibenzofuran	MG/KG	210	12	3	0.013	0.016	0.015	0	SS-10
Fluoranthene	MG/KG	1000	12	12	0.130	1.50	0.522	0	SS-01

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Restricted Use. Protection of Groundwater, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-2
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SURFACE SOIL SAMPLES
PROTECTION OF GROUNDWATER CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value
					Min	Max	Avg		
Semivolatile Organic Compounds									
Fluorene	MG/KG	386	12	4	0.017	0.021	0.019	0	SS-04
Indeno(1,2,3-cd)pyrene	MG/KG	8.2	12	10	0.100	0.390	0.204	0	SS-01
Naphthalene	MG/KG	12	12	4	0.017	0.046	0.027	0	SS-11
Phenanthrene	MG/KG	1000	12	12	0.100	1.10	0.309	0	SS-01
Pyrene	MG/KG	1000	12	12	0.130	1.50	0.451	0	SS-01
Metals									
Aluminum	MG/KG	-	12	12	4,000	8,590	6,370	0	SS-06
Antimony	MG/KG	-	12	1	1.20	1.20	1.20	0	SS-04
Arsenic	MG/KG	16	12	12	4.00	24.90	11.92	4	SS-10
Barium	MG/KG	820	12	12	27.00	94.20	59.42	0	SS-04
Beryllium	MG/KG	47	12	9	0.260	0.520	0.368	0	SS-06
Cadmium	MG/KG	7.5	12	9	0.190	0.500	0.321	0	SS-10
Calcium	MG/KG	-	12	12	7,360	1.10E+05	4.64E+04	0	SS-02
Chromium	MG/KG	NS	12	12	4.00	14.40	9.38	0	SS-05
Cobalt	MG/KG	-	12	11	5.20	8.70	6.84	0	SS-09
Copper	MG/KG	1720	12	12	17.10	42.10	30.73	0	SS-09
Iron	MG/KG	-	12	12	9,510	1.74E+04	1.23E+04	0	SS-09
Lead	MG/KG	450	12	12	16.30	171.0	71.38	0	SS-10

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Restricted Use. Protection of Groundwater, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-2
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SURFACE SOIL SAMPLES
PROTECTION OF GROUNDWATER CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value
					Min	Max	Avg		
Metals									
Magnesium	MG/KG	-	12	12	3,890	2.40E+04	1.34E+04	0	SS-02
Manganese	MG/KG	2000	12	12	348.0	619.0	454.5	0	SS-09
Mercury	MG/KG	0.73	12	10	0.031	0.410	0.144	0	SS-10
Nickel	MG/KG	130	12	12	10.80	18.00	13.98	0	SS-02
Potassium	MG/KG	-	12	12	680.0	1,610	1,086	0	SS-06
Selenium	MG/KG	4	12	6	0.440	1.20	0.808	0	SS-11
Sodium	MG/KG	-	12	9	53.00	1,150	210.1	0	SS-05
Vanadium	MG/KG	-	12	12	7.20	19.50	13.44	0	SS-06
Zinc	MG/KG	2480	12	12	41.10	229.0	93.58	0	SS-04
Miscellaneous Parameters									
Cyanide (total)	MG/KG	40	12	2	1.10	1.60	1.35	0	SS-11

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Restricted Use. Protection of Groundwater, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-2
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SURFACE SOIL SAMPLES
UNRESTRICTED USE CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value
					Min	Max	Avg		
Volatile Organic Compounds									
1,2-Dichloroethane	MG/KG	0.02	12	3	0.004	0.005	0.004	0	SS-12
Chloromethane	MG/KG	-	12	1	1.30	1.30	1.30	0	SS-02
Semivolatile Organic Compounds									
2-Methylnaphthalene	MG/KG	0.41	12	6	0.004	0.017	0.011	0	SS-09
Acenaphthene	MG/KG	20	12	8	0.006	0.031	0.016	0	SS-11
Acenaphthylene	MG/KG	100	12	6	0.010	0.051	0.030	0	SS-10
Anthracene	MG/KG	100	12	9	0.013	0.100	0.049	0	SS-09
Benzo(a)anthracene	MG/KG	1	12	10	0.130	0.570	0.303	0	SS-01
Benzo(a)pyrene	MG/KG	1	12	11	0.130	0.520	0.293	0	SS-09
Benzo(b)fluoranthene	MG/KG	1	12	11	0.220	0.850	0.505	0	SS-09
Benzo(g,h,i)perylene	MG/KG	100	12	9	0.074	0.200	0.126	0	SS-09
Benzo(k)fluoranthene	MG/KG	0.8	12	11	0.021	0.410	0.185	0	SS-01
bis(2-Ethylhexyl)phthalate	MG/KG	50	12	9	0.097	4.20	0.593	0	SS-02
Carbazole	MG/KG	-	9	9	0.013	0.050	0.028	0	SS-11
Chrysene	MG/KG	1	12	11	0.170	0.910	0.357	0	SS-01
Dibenz(a,h)anthracene	MG/KG	0.33	12	7	0.030	0.180	0.136	0	SS-09
Dibenzofuran	MG/KG	7	12	3	0.013	0.016	0.015	0	SS-10
Fluoranthene	MG/KG	100	12	12	0.130	1.50	0.522	0	SS-01

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Unrestricted Use, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-2
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SURFACE SOIL SAMPLES
UNRESTRICTED USE CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value
					Min	Max	Avg		
Semivolatile Organic Compounds									
Fluorene	MG/KG	30	12	4	0.017	0.021	0.019	0	SS-04
Indeno(1,2,3-cd)pyrene	MG/KG	0.5	12	10	0.100	0.390	0.204	0	SS-01
Naphthalene	MG/KG	12	12	4	0.017	0.046	0.027	0	SS-11
Phenanthrene	MG/KG	100	12	12	0.100	1.10	0.309	0	SS-01
Pyrene	MG/KG	100	12	12	0.130	1.50	0.451	0	SS-01
Metals									
Aluminum	MG/KG	10000	12	12	4,000	8,590	6,370	0	SS-06
Antimony	MG/KG	12	12	1	1.20	1.20	1.20	0	SS-04
Arsenic	MG/KG	13	12	12	4.00	24.90	11.92	5	SS-10
Barium	MG/KG	350	12	12	27.00	94.20	59.42	0	SS-04
Beryllium	MG/KG	7.2	12	9	0.260	0.520	0.368	0	SS-06
Cadmium	MG/KG	2.5	12	9	0.190	0.500	0.321	0	SS-10
Calcium	MG/KG	10000	12	12	7,360	1.10E+05	4.64E+04	11	SS-02
Chromium	MG/KG	30	12	12	4.00	14.40	9.38	0	SS-05
Cobalt	MG/KG	20	12	11	5.20	8.70	6.84	0	SS-09
Copper	MG/KG	50	12	12	17.10	42.10	30.73	0	SS-09
Iron	MG/KG	2000	12	12	9,510	1.74E+04	1.23E+04	12	SS-09
Lead	MG/KG	63	12	12	16.30	171.0	71.38	5	SS-10

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Unrestricted Use, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-2
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SURFACE SOIL SAMPLES
UNRESTRICTED USE CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value
					Min	Max	Avg		
Metals									
Magnesium	MG/KG	-	12	12	3,890	2.40E+04	1.34E+04	0	SS-02
Manganese	MG/KG	1600	12	12	348.0	619.0	454.5	0	SS-09
Mercury	MG/KG	0.18	12	10	0.031	0.410	0.144	1	SS-10
Nickel	MG/KG	30	12	12	10.80	18.00	13.98	0	SS-02
Potassium	MG/KG	-	12	12	680.0	1,610	1,086	0	SS-06
Selenium	MG/KG	3.9	12	6	0.440	1.20	0.808	0	SS-11
Sodium	MG/KG	-	12	9	53.00	1,150	210.1	0	SS-05
Vanadium	MG/KG	39	12	12	7.20	19.50	13.44	0	SS-06
Zinc	MG/KG	109	12	12	41.10	229.0	93.58	5	SS-04
Miscellaneous Parameters									
Cyanide (total)	MG/KG	27	12	2	1.10	1.60	1.35	0	SS-11

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Unrestricted Use, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

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TABLE 2-3
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SUBSURFACE SOIL SAMPLES
COMMERCIAL USE CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value	Depth Of Max
					Min	Max	Avg			
Volatile Organic Compounds										
Acetone	MG/KG	500	27	16	0.004	8.40	0.563	0	MW-07	9-11
Benzene	MG/KG	44	27	11	0.001	11.00	1.72	0	SB-04	18-20
Carbon disulfide	MG/KG	-	27	1	0.006	0.006	0.006	0	SB-02	13-16
Cyclohexane	MG/KG	-	27	1	0.001	0.001	0.001	0	SB-04	9-11
Ethylbenzene	MG/KG	390	27	6	0.0004	1.10	0.199	0	SB-04	18-20
Isopropylbenzene (Cumene)	MG/KG	-	27	2	0.0009	0.001	0.001	0	TP-01 BOT 2	10-10
Methyl ethyl ketone (2-Butanone)	MG/KG	500	27	10	0.002	0.029	0.012	0	TP-01 BOT 2	10-10
Methylcyclohexane	MG/KG	-	27	2	0.002	0.002	0.002	0	SB-02	13-16
Styrene	MG/KG	-	27	1	0.083	0.083	0.083	0	SB-04	9-11
Tetrachloroethene	MG/KG	150	27	2	0.001	0.002	0.002	0	SB-07	9-11
Toluene	MG/KG	500	27	9	0.0003	1.10	0.155	0	SB-04	9-11
Xylene (total)	MG/KG	500	27	6	0.0009	4.10	1.18	0	SB-04	18-20
Semivolatile Organic Compounds										
1,1-Biphenyl	MG/KG	-	27	1	0.660	0.660	0.660	0	SB-02	13-16
2-Methylnaphthalene	MG/KG	-	27	4	0.006	1.90	0.504	0	SB-02	13-16
4-Methylphenol (p-cresol)	MG/KG	500	27	1	0.013	0.013	0.013	0	SB-12	9-11
Acenaphthene	MG/KG	500	27	9	0.009	2.70	0.330	0	SB-02	13-16

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Protection of Public Health, Commercial, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-3
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SUBSURFACE SOIL SAMPLES
COMMERCIAL USE CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value	Depth Of Max
					Min	Max	Avg			
Semivolatile Organic Compounds										
Acenaphthylene	MG/KG	500	27	3	0.017	0.084	0.040	0	SB-12	9-11
Acetophenone	MG/KG	-	27	1	0.022	0.022	0.022	0	SB-04	9-11
Anthracene	MG/KG	500	27	14	0.009	8.50	0.747	0	SB-02	13-16
Benzaldehyde	MG/KG	-	27	1	0.028	0.028	0.028	0	SB-10	9-11
Benzo(a)anthracene	MG/KG	5.6	27	14	0.069	11.00	1.47	1	SB-02	13-16
Benzo(a)pyrene	MG/KG	1	27	18	0.013	8.10	0.976	4	SB-02	13-16
Benzo(b)fluoranthene	MG/KG	5.6	27	17	0.110	10.00	1.33	1	SB-02	13-16
Benzo(g,h,i)perylene	MG/KG	500	27	16	0.012	4.90	0.637	0	SB-02	13-16
Benzo(k)fluoranthene	MG/KG	56	27	15	0.006	3.90	0.625	0	SB-02	13-16
bis(2-Ethylhexyl)phthalate	MG/KG	-	27	1	0.190	0.190	0.190	0	MW-08	7-9
Carbazole	MG/KG	-	27	9	0.009	2.80	0.357	0	SB-02	13-16
Chrysene	MG/KG	56	27	20	0.009	9.00	0.891	0	SB-02	13-16
Dibenz(a,h)anthracene	MG/KG	0.56	27	10	0.039	4.10	0.875	2	SB-02	13-16
Dibenzofuran	MG/KG	350	27	3	0.012	4.30	1.45	0	SB-02	13-16
Fluoranthene	MG/KG	500	27	20	0.012	23.00	1.77	0	SB-02	13-16
Fluorene	MG/KG	500	27	7	0.008	4.30	0.632	0	SB-02	13-16
Indeno(1,2,3-cd)pyrene	MG/KG	5.6	27	16	0.060	6.30	0.910	1	SB-02	13-16

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Protection of Public Health, Commercial, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-3
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SUBSURFACE SOIL SAMPLES
COMMERCIAL USE CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value	Depth Of Max
					Min	Max	Avg			
Semivolatile Organic Compounds										
Naphthalene	MG/KG	500	27	9	0.021	5.90	1.14	0	SB-02	13-16
Phenanthrene	MG/KG	500	27	20	0.008	30.00	1.85	0	SB-02	13-16
Phenol	MG/KG	500	27	2	0.200	0.290	0.245	0	SB-04	18-20
Pyrene	MG/KG	500	27	19	0.011	21.00	1.75	0	SB-02	13-16
Metals										
Aluminum	MG/KG	-	27	27	3,660	1.08E+04	6,673	0	SB-08	5-7
Antimony	MG/KG	-	27	5	0.580	0.840	0.724	0	SB-01	5-7
Arsenic	MG/KG	16	27	27	3.00	43.40	12.99	7	MW-07	9-11
Barium	MG/KG	400	27	27	32.70	1,290	146.2	1	SB-12	9-11
Beryllium	MG/KG	590	27	27	0.170	0.630	0.399	0	SB-10	9-11
Cadmium	MG/KG	9.3	27	27	0.032	3.70	0.361	0	SB-10	9-11
Calcium	MG/KG	-	27	27	3,190	1.21E+05	5.76E+04	0	SB-14	7.4-9.4
Chromium	MG/KG	1500	27	27	5.60	16.30	10.85	0	SB-08	5-7
Cobalt	MG/KG	-	27	27	4.10	11.30	7.31	0	MW-07	9-11
Copper	MG/KG	270	27	27	10.40	48.90	23.98	0	TP-02	7-7
Iron	MG/KG	-	27	27	6,300	4.21E+04	1.56E+04	0	MW-07	9-11
Lead	MG/KG	1000	27	27	6.00	272.0	68.29	0	SB-03	9-11

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Protection of Public Health, Commercial, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-3
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SUBSURFACE SOIL SAMPLES
COMMERCIAL USE CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value	Depth Of Max
					Min	Max	Avg			
Metals										
Magnesium	MG/KG	-	27	27	4,620	3.81E+04	2.09E+04	0	SB-04	18-20
Manganese	MG/KG	10000	27	27	234.0	677.0	416.6	0	TP-05	10.5-10.5
Mercury	MG/KG	2.8	27	27	0.014	0.720	0.178	0	TP-02	7-7
Nickel	MG/KG	310	27	27	7.90	40.50	18.22	0	MW-07	9-11
Potassium	MG/KG	-	27	27	847.0	1,820	1,331	0	SB-10	9-11
Selenium	MG/KG	1500	27	19	0.470	2.30	0.985	0	SB-07	9-11
Silver	MG/KG	1500	27	1	0.470	0.470	0.470	0	MW-07	9-11
Sodium	MG/KG	-	27	27	31.40	352.0	152.1	0	MW-08	7-9
Vanadium	MG/KG	-	27	27	8.00	22.80	15.06	0	SB-13	8-10
Zinc	MG/KG	10000	27	27	17.80	589.0	103.7	0	SB-02	13-16
Miscellaneous Parameters										
Cyanide (total)	MG/KG	27	27	5	0.590	14.50	3.67	0	SB-02	13-16

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Protection of Public Health, Commercial, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-3
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SUBSURFACE SOIL SAMPLES
PROTECTION OF GROUNDWATER CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value	Depth Of Max
					Min	Max	Avg			
Volatile Organic Compounds										
Acetone	MG/KG	0.05	27	16	0.004	8.40	0.563	6	MW-07	9-11
Benzene	MG/KG	0.06	27	11	0.001	11.00	1.72	6	SB-04	18-20
Carbon disulfide	MG/KG	2.7	27	1	0.006	0.006	0.006	0	SB-02	13-16
Cyclohexane	MG/KG	-	27	1	0.001	0.001	0.001	0	SB-04	9-11
Ethylbenzene	MG/KG	1	27	6	0.0004	1.10	0.199	1	SB-04	18-20
Isopropylbenzene (Cumene)	MG/KG	2.3	27	2	0.0009	0.001	0.001	0	TP-01 BOT 2	10-10
Methyl ethyl ketone (2-Butanone)	MG/KG	0.12	27	10	0.002	0.029	0.012	0	TP-01 BOT 2	10-10
Methylcyclohexane	MG/KG	-	27	2	0.002	0.002	0.002	0	SB-02	13-16
Styrene	MG/KG	-	27	1	0.083	0.083	0.083	0	SB-04	9-11
Tetrachloroethene	MG/KG	1.3	27	2	0.001	0.002	0.002	0	SB-07	9-11
Toluene	MG/KG	0.7	27	9	0.0003	1.10	0.155	1	SB-04	9-11
Xylene (total)	MG/KG	1.6	27	6	0.0009	4.10	1.18	2	SB-04	18-20
Semivolatile Organic Compounds										
1,1-Biphenyl	MG/KG	-	27	1	0.660	0.660	0.660	0	SB-02	13-16
2-Methylnaphthalene	MG/KG	36.4	27	4	0.006	1.90	0.504	0	SB-02	13-16
4-Methylphenol (p-cresol)	MG/KG	0.33	27	1	0.013	0.013	0.013	0	SB-12	9-11
Acenaphthene	MG/KG	98	27	9	0.009	2.70	0.330	0	SB-02	13-16

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Restricted Use. Protection of Groundwater, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-3
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SUBSURFACE SOIL SAMPLES
PROTECTION OF GROUNDWATER CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value	Depth Of Max
					Min	Max	Avg			
Semivolatile Organic Compounds										
Acenaphthylene	MG/KG	107	27	3	0.017	0.084	0.040	0	SB-12	9-11
Acetophenone	MG/KG	-	27	1	0.022	0.022	0.022	0	SB-04	9-11
Anthracene	MG/KG	1000	27	14	0.009	8.50	0.747	0	SB-02	13-16
Benzaldehyde	MG/KG	-	27	1	0.028	0.028	0.028	0	SB-10	9-11
Benzo(a)anthracene	MG/KG	1	27	14	0.069	11.00	1.47	4	SB-02	13-16
Benzo(a)pyrene	MG/KG	22	27	18	0.013	8.10	0.976	0	SB-02	13-16
Benzo(b)fluoranthene	MG/KG	1.7	27	17	0.110	10.00	1.33	2	SB-02	13-16
Benzo(g,h,i)perylene	MG/KG	1000	27	16	0.012	4.90	0.637	0	SB-02	13-16
Benzo(k)fluoranthene	MG/KG	1.7	27	15	0.006	3.90	0.625	2	SB-02	13-16
bis(2-Ethylhexyl)phthalate	MG/KG	435	27	1	0.190	0.190	0.190	0	MW-08	7-9
Carbazole	MG/KG	-	27	9	0.009	2.80	0.357	0	SB-02	13-16
Chrysene	MG/KG	1	27	20	0.009	9.00	0.891	4	SB-02	13-16
Dibenz(a,h)anthracene	MG/KG	1000	27	10	0.039	4.10	0.875	0	SB-02	13-16
Dibenzofuran	MG/KG	210	27	3	0.012	4.30	1.45	0	SB-02	13-16
Fluoranthene	MG/KG	1000	27	20	0.012	23.00	1.77	0	SB-02	13-16
Fluorene	MG/KG	386	27	7	0.008	4.30	0.632	0	SB-02	13-16
Indeno(1,2,3-cd)pyrene	MG/KG	8.2	27	16	0.060	6.30	0.910	0	SB-02	13-16

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Restricted Use. Protection of Groundwater, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-3
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SUBSURFACE SOIL SAMPLES
PROTECTION OF GROUNDWATER CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value	Depth Of Max
					Min	Max	Avg			
Semivolatile Organic Compounds										
Naphthalene	MG/KG	12	27	9	0.021	5.90	1.14	0	SB-02	13-16
Phenanthrene	MG/KG	1000	27	20	0.008	30.00	1.85	0	SB-02	13-16
Phenol	MG/KG	0.33	27	2	0.200	0.290	0.245	0	SB-04	18-20
Pyrene	MG/KG	1000	27	19	0.011	21.00	1.75	0	SB-02	13-16
Metals										
Aluminum	MG/KG	-	27	27	3,660	1.08E+04	6,673	0	SB-08	5-7
Antimony	MG/KG	-	27	5	0.580	0.840	0.724	0	SB-01	5-7
Arsenic	MG/KG	16	27	27	3.00	43.40	12.99	7	MW-07	9-11
Barium	MG/KG	820	27	27	32.70	1,290	146.2	1	SB-12	9-11
Beryllium	MG/KG	47	27	27	0.170	0.630	0.399	0	SB-08	5-7
Cadmium	MG/KG	7.5	27	27	0.032	3.70	0.361	0	SB-10	9-11
Calcium	MG/KG	-	27	27	3,190	1.21E+05	5.76E+04	0	SB-14	7.4-9.4
Chromium	MG/KG	NS	27	27	5.60	16.30	10.85	0	SB-08	5-7
Cobalt	MG/KG	-	27	27	4.10	11.30	7.31	0	MW-07	9-11
Copper	MG/KG	1720	27	27	10.40	48.90	23.98	0	TP-02	7-7
Iron	MG/KG	-	27	27	6,300	4.21E+04	1.56E+04	0	MW-07	9-11
Lead	MG/KG	450	27	27	6.00	272.0	68.29	0	SB-03	9-11

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Restricted Use. Protection of Groundwater, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-3
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SUBSURFACE SOIL SAMPLES
PROTECTION OF GROUNDWATER CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value	Depth Of Max
					Min	Max	Avg			
Metals										
Magnesium	MG/KG	-	27	27	4,620	3.81E+04	2.09E+04	0	SB-04	18-20
Manganese	MG/KG	2000	27	27	234.0	677.0	416.6	0	TP-05	10.5-10.5
Mercury	MG/KG	0.73	27	27	0.014	0.720	0.178	0	TP-02	7-7
Nickel	MG/KG	130	27	27	7.90	40.50	18.22	0	MW-07	9-11
Potassium	MG/KG	-	27	27	847.0	1,820	1,331	0	SB-10	9-11
Selenium	MG/KG	4	27	19	0.470	2.30	0.985	0	SB-07	9-11
Silver	MG/KG	8.3	27	1	0.470	0.470	0.470	0	MW-07	9-11
Sodium	MG/KG	-	27	27	31.40	352.0	152.1	0	MW-08	7-9
Vanadium	MG/KG	-	27	27	8.00	22.80	15.06	0	SB-13	8-10
Zinc	MG/KG	2480	27	27	17.80	589.0	103.7	0	SB-02	13-16
Miscellaneous Parameters										
Cyanide (total)	MG/KG	40	27	5	0.590	14.50	3.67	0	SB-02	13-16

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Restricted Use. Protection of Groundwater, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-3
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SUBSURFACE SOIL SAMPLES
UNRESTRICTED USE CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value	Depth Of Max
					Min	Max	Avg			
Volatile Organic Compounds										
Acetone	MG/KG	0.05	27	16	0.004	8.40	0.563	6	MW-07	9-11
Benzene	MG/KG	0.06	27	11	0.001	11.00	1.72	6	SB-04	18-20
Carbon disulfide	MG/KG	2.7	27	1	0.006	0.006	0.006	0	SB-02	13-16
Cyclohexane	MG/KG	-	27	1	0.001	0.001	0.001	0	SB-04	9-11
Ethylbenzene	MG/KG	1	27	6	0.0004	1.10	0.199	1	SB-04	18-20
Isopropylbenzene (Cumene)	MG/KG	2.3	27	2	0.0009	0.001	0.001	0	TP-01 BOT 2	10-10
Methyl ethyl ketone (2-Butanone)	MG/KG	0.12	27	10	0.002	0.029	0.012	0	TP-01 BOT 2	10-10
Methylcyclohexane	MG/KG	-	27	2	0.002	0.002	0.002	0	SB-02	13-16
Styrene	MG/KG	300	27	1	0.083	0.083	0.083	0	SB-04	9-11
Tetrachloroethene	MG/KG	1.3	27	2	0.001	0.002	0.002	0	SB-07	9-11
Toluene	MG/KG	0.7	27	9	0.0003	1.10	0.155	1	SB-04	9-11
Xylene (total)	MG/KG	0.26	27	6	0.0009	4.10	1.18	2	SB-04	18-20
Semivolatile Organic Compounds										
1,1-Biphenyl	MG/KG	60	27	1	0.660	0.660	0.660	0	SB-02	13-16
2-Methylnaphthalene	MG/KG	0.41	27	4	0.006	1.90	0.504	1	SB-02	13-16
4-Methylphenol (p-cresol)	MG/KG	0.33	27	1	0.013	0.013	0.013	0	SB-12	9-11
Acenaphthene	MG/KG	20	27	9	0.009	2.70	0.330	0	SB-02	13-16

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Unrestricted Use, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-3
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SUBSURFACE SOIL SAMPLES
UNRESTRICTED USE CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value	Depth Of Max
					Min	Max	Avg			
Semivolatile Organic Compounds										
Acenaphthylene	MG/KG	100	27	3	0.017	0.084	0.040	0	SB-12	9-11
Acetophenone	MG/KG	-	27	1	0.022	0.022	0.022	0	SB-04	9-11
Anthracene	MG/KG	100	27	14	0.009	8.50	0.747	0	SB-02	13-16
Benzaldehyde	MG/KG	-	27	1	0.028	0.028	0.028	0	SB-10	9-11
Benzo(a)anthracene	MG/KG	1	27	14	0.069	11.00	1.47	4	SB-02	13-16
Benzo(a)pyrene	MG/KG	1	27	18	0.013	8.10	0.976	4	SB-02	13-16
Benzo(b)fluoranthene	MG/KG	1	27	17	0.110	10.00	1.33	5	SB-02	13-16
Benzo(g,h,i)perylene	MG/KG	100	27	16	0.012	4.90	0.637	0	SB-02	13-16
Benzo(k)fluoranthene	MG/KG	0.8	27	15	0.006	3.90	0.625	3	SB-02	13-16
bis(2-Ethylhexyl)phthalate	MG/KG	50	27	1	0.190	0.190	0.190	0	MW-08	7-9
Carbazole	MG/KG	-	27	9	0.009	2.80	0.357	0	SB-02	13-16
Chrysene	MG/KG	1	27	20	0.009	9.00	0.891	4	SB-02	13-16
Dibenz(a,h)anthracene	MG/KG	0.33	27	10	0.039	4.10	0.875	2	SB-02	13-16
Dibenzofuran	MG/KG	7	27	3	0.012	4.30	1.45	0	SB-02	13-16
Fluoranthene	MG/KG	100	27	20	0.012	23.00	1.77	0	SB-02	13-16
Fluorene	MG/KG	30	27	7	0.008	4.30	0.632	0	SB-02	13-16
Indeno(1,2,3-cd)pyrene	MG/KG	0.5	27	16	0.060	6.30	0.910	4	SB-02	13-16

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Unrestricted Use, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-3
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SUBSURFACE SOIL SAMPLES
UNRESTRICTED USE CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value	Depth Of Max
					Min	Max	Avg			
Semivolatile Organic Compounds										
Naphthalene	MG/KG	12	27	9	0.021	5.90	1.14	0	SB-02	13-16
Phenanthrene	MG/KG	100	27	20	0.008	30.00	1.85	0	SB-02	13-16
Phenol	MG/KG	0.33	27	2	0.200	0.290	0.245	0	SB-04	18-20
Pyrene	MG/KG	100	27	19	0.011	21.00	1.75	0	SB-02	13-16
Metals										
Aluminum	MG/KG	10000	27	27	3,660	1.08E+04	6,673	2	SB-08	5-7
Antimony	MG/KG	12	27	5	0.580	0.840	0.724	0	SB-01	5-7
Arsenic	MG/KG	13	27	27	3.00	43.40	12.99	9	MW-07	9-11
Barium	MG/KG	350	27	27	32.70	1,290	146.2	1	SB-12	9-11
Beryllium	MG/KG	7.2	27	27	0.170	0.630	0.399	0	SB-08	5-7
Cadmium	MG/KG	2.5	27	27	0.032	3.70	0.361	1	SB-10	9-11
Calcium	MG/KG	10000	27	27	3,190	1.21E+05	5.76E+04	25	SB-14	7.4-9.4
Chromium	MG/KG	30	27	27	5.60	16.30	10.85	0	SB-08	5-7
Cobalt	MG/KG	20	27	27	4.10	11.30	7.31	0	MW-07	9-11
Copper	MG/KG	50	27	27	10.40	48.90	23.98	0	TP-02	7-7
Iron	MG/KG	2000	27	27	6,300	4.21E+04	1.56E+04	27	MW-07	9-11
Lead	MG/KG	63	27	27	6.00	272.0	68.29	8	SB-03	9-11

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Unrestricted Use, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-3
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN SUBSURFACE SOIL SAMPLES
UNRESTRICTED USE CRITERIA
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value	Depth Of Max
					Min	Max	Avg			
Metals										
Magnesium	MG/KG	-	27	27	4,620	3.81E+04	2.09E+04	0	SB-04	18-20
Manganese	MG/KG	1600	27	27	234.0	677.0	416.6	0	TP-05	10.5-10.5
Mercury	MG/KG	0.18	27	27	0.014	0.720	0.178	7	TP-02	7-7
Nickel	MG/KG	30	27	27	7.90	40.50	18.22	3	MW-07	9-11
Potassium	MG/KG	-	27	27	847.0	1,820	1,331	0	SB-10	9-11
Selenium	MG/KG	3.9	27	19	0.470	2.30	0.985	0	SB-07	9-11
Silver	MG/KG	2	27	1	0.470	0.470	0.470	0	MW-07	9-11
Sodium	MG/KG	-	27	27	31.40	352.0	152.1	0	MW-08	7-9
Vanadium	MG/KG	39	27	27	8.00	22.80	15.06	0	SB-13	8-10
Zinc	MG/KG	109	27	27	17.80	589.0	103.7	5	SB-02	13-16
Miscellaneous Parameters										
Cyanide (total)	MG/KG	27	27	5	0.590	14.50	3.67	0	SB-02	13-16

*Criteria- 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Unrestricted Use, including CP-51 Table 1, Effective 12/2/10.

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-4A
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN MAY 2013 GROUNDWATER SAMPLES
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value
					Min	Max	Avg		
Volatile Organic Compounds									
2-Hexanone	UG/L	50	6	1	4.90	4.90	4.90	0	MW-05
Acetone	UG/L	50	6	4	5.60	82.00	26.45	1	MW-05
Benzene	UG/L	1	6	5	10.00	2,100	439.6	5	MW-04
Carbon disulfide	UG/L	60	6	1	0.320	0.320	0.320	0	MW-01
Chloroform	UG/L	7	6	1	1.40	1.40	1.40	0	MW-05
Ethylbenzene	UG/L	5	6	2	0.870	25.00	12.94	1	MW-04
Methyl ethyl ketone (2-Butanone)	UG/L	50	6	2	1.40	21.00	11.20	0	MW-05
Toluene	UG/L	5	6	3	1.50	750.0	251.5	1	MW-04
Xylene (total)	UG/L	5	6	3	0.930	260.0	87.61	1	MW-04
Semivolatile Organic Compounds									
2,4-Dimethylphenol	UG/L	50	6	1	1.60	1.60	1.60	0	MW-04
2-Methylnaphthalene	UG/L	-	6	1	1.30	1.30	1.30	0	MW-04
2-Methylphenol (o-cresol)	UG/L	1	6	1	2.90	2.90	2.90	1	MW-04
4-Methylphenol (p-cresol)	UG/L	1	6	1	2.80	2.80	2.80	1	MW-04
Acetophenone	UG/L	-	6	2	2.80	4.60	3.70	0	MW-04
Anthracene	UG/L	50	6	2	0.460	0.720	0.590	0	MW-03
Benzaldehyde	UG/L	-	6	1	1.40	1.40	1.40	0	MW-04

*Criteria- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, including January 1999 Errata Sheet, April 2000 and June 2004 Addenda. C

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-4A
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN MAY 2013 GROUNDWATER SAMPLES
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value
					Min	Max	Avg		
Semivolatile Organic Compounds									
Dimethylphthalate	UG/L	50	6	1	1.10	1.10	1.10	0	MW-05
Di-n-butylphthalate	UG/L	50	6	2	0.320	0.400	0.360	0	MW-05
Isophorone	UG/L	50	6	1	0.640	0.640	0.640	0	MW-05
Naphthalene	UG/L	10	6	1	140.0	140.0	140.0	1	MW-04
Phenanthrene	UG/L	50	6	2	0.500	0.740	0.620	0	MW-03
Phenol	UG/L	1	6	1	5.30	5.30	5.30	1	MW-04
Metals									
Aluminum	UG/L	-	6	6	64.00	6.88E+05	1.16E+05	0	MW-05
Arsenic	UG/L	25	6	3	6.00	330.0	118.0	1	MW-05
Barium	UG/L	1000	6	6	170.0	5,800	1,432	2	MW-05
Beryllium	UG/L	3	6	2	0.350	27.00	13.68	1	MW-05
Cadmium	UG/L	5	6	2	0.810	4.40	2.61	0	MW-05
Calcium	UG/L	-	6	6	1.67E+04	8.05E+06	1.44E+06	0	MW-05
Chromium	UG/L	50	6	6	1.30	1,200	202.2	1	MW-05
Cobalt	UG/L	-	6	6	1.00	690.0	117.0	0	MW-05
Copper	UG/L	200	6	6	3.10	1,300	220.8	1	MW-05
Iron	UG/L	300	6	6	240.0	9.75E+05	1.65E+05	5	MW-05

*Criteria- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, including January 1999 Errata Sheet, April 2000 and June 2004 Addenda. C

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-4A
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN MAY 2013 GROUNDWATER SAMPLES
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value
					Min	Max	Avg		
Metals									
Lead	UG/L	25	6	1	720.0	720.0	720.0	1	MW-05
Magnesium	UG/L	35000	6	6	2,400	3.73E+06	6.41E+05	2	MW-05
Manganese	UG/L	300	6	6	42.00	2.48E+04	4,390	4	MW-05
Mercury	UG/L	0.7	6	1	0.990	0.990	0.990	1	MW-05
Nickel	UG/L	100	6	6	2.00	1,600	270.5	1	MW-05
Potassium	UG/L	-	6	6	9,500	2.01E+05	5.20E+04	0	MW-05
Selenium	UG/L	10	6	2	9.10	17.00	13.05	1	MW-05
Sodium	UG/L	20000	6	6	1.73E+04	4.44E+05	1.77E+05	5	MW-03
Vanadium	UG/L	-	6	3	4.30	1,000	337.7	0	MW-05
Zinc	UG/L	2000	6	6	1.70	1,800	304.7	0	MW-05
Miscellaneous Parameters									
Cyanide (total)	UG/L	200	6	3	20.00	910.0	338.0	1	MW-04

*Criteria- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, including January 1999 Errata Sheet, April 2000 and June 2004 Addenda. C

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-4B
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN MAY 2014 GROUNDWATER SAMPLES
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value
					Min	Max	Avg		
Volatile Organic Compounds									
Acetone	UG/L	50	8	1	3.30	3.30	3.30	0	MW-03
Benzene	UG/L	1	8	2	22.00	1,400	711.0	2	MW-04
Carbon disulfide	UG/L	60	8	1	0.540	0.540	0.540	0	MW-01
Cyclohexane	UG/L	-	8	1	0.240	0.240	0.240	0	MW-01
Ethylbenzene	UG/L	5	8	1	20.00	20.00	20.00	1	MW-04
Styrene	UG/L	5	8	1	33.00	33.00	33.00	1	MW-04
Toluene	UG/L	5	8	1	410.0	410.0	410.0	1	MW-04
Xylene (total)	UG/L	5	8	1	220.0	220.0	220.0	1	MW-04
Semivolatile Organic Compounds									
2,4-Dimethylphenol	UG/L	50	8	1	2.30	2.30	2.30	0	MW-04
2-Methylnaphthalene	UG/L	-	8	1	1.70	1.70	1.70	0	MW-04
2-Methylphenol (o-cresol)	UG/L	1	8	1	2.50	2.50	2.50	1	MW-04
Acenaphthylene	UG/L	50	8	1	0.950	0.950	0.950	0	MW-04
Acetophenone	UG/L	-	8	1	4.90	4.90	4.90	0	MW-04
Carbazole	UG/L	50	8	1	0.620	0.620	0.620	0	MW-04
Di-n-butylphthalate	UG/L	50	8	4	0.280	0.640	0.418	0	MW-05
Naphthalene	UG/L	10	8	1	120.0	120.0	120.0	1	MW-04
Phenol	UG/L	1	8	2	0.970	4.90	2.94	1	MW-04

*Criteria- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, including January 1999 Errata Sheet, April 2000 and June 2004 Addenda. C

Concentration Exceeds Criteria

Only Detected Results Reported.

TABLE 2-4B
STATISTICAL SUMMARY OF DETECTED COMPOUNDS IN MAY 2014 GROUNDWATER SAMPLES
AUBURN GREEN STREET FORMER MGP GAS HOLDER SITE

Parameter	Units	Criteria*	No. of Samples	No. of Detections	Range of Detections			No. Exceed	Location of Max Value
					Min	Max	Avg		
Metals									
Aluminum	UG/L	-	8	7	62.00	3,300	681.1	0	MW-05
Arsenic	UG/L	25	8	5	5.90	22.00	12.00	0	MW-08
Barium	UG/L	1000	8	8	90.00	2,300	731.3	2	MW-07
Cadmium	UG/L	5	8	2	0.710	0.960	0.835	0	MW-03
Calcium	UG/L	-	8	8	2.24E+04	2.62E+05	1.25E+05	0	MW-08
Chromium	UG/L	50	8	5	1.20	4.50	2.02	0	MW-05
Cobalt	UG/L	-	8	5	0.660	2.50	1.32	0	MW-04
Copper	UG/L	200	8	4	1.70	4.30	2.78	0	MW-05
Iron	UG/L	300	8	8	670.0	3.38E+04	8,321	8	MW-08
Magnesium	UG/L	35000	8	8	1,100	4.56E+04	2.71E+04	3	MW-08
Manganese	UG/L	300	8	8	5.70	2,100	441.6	3	MW-08
Nickel	UG/L	100	8	7	1.50	6.30	3.07	0	MW-06
Potassium	UG/L	-	8	8	4,500	3.46E+04	1.59E+04	0	MW-04
Sodium	UG/L	20000	8	8	2.43E+04	4.56E+05	1.65E+05	8	MW-08
Vanadium	UG/L	-	8	3	1.60	5.00	2.83	0	MW-05
Zinc	UG/L	2000	8	8	0.00E+00	68.00	12.15	0	MW-03
Miscellaneous Parameters									
Cyanide (total)	UG/L	200	8	4	5.70	1,300	342.4	1	MW-04

*Criteria- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, including January 1999 Errata Sheet, April 2000 and June 2004 Addenda. C

Concentration Exceeds Criteria

Only Detected Results Reported.

Table 3-1

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Chemical-Specific Standards, Criteria, and Guidance

Media	Requirements	Citation	Description	SCG or TBC	Comment
Soil	NYSDEC Soil Cleanup Objectives (SCOs) for Inactive Hazardous Waste Sites	NYSDEC DER-10, May 2010	Establishes recommended soil cleanup objectives, soil cleanup objectives for protection of groundwater quality, and groundwater standards/criteria.	SCG	Specified screening-level goals may be applicable in determining site-specific soil objectives.
	NYSDEC Guidance for implementing SCOs	NYSDEC Policy Memorandum on Soil Cleanup Guidance CP-51, October 2010	Provides guidance on use of SCOs.	TBC	Guidance may be applicable to site-specific soil cleanup alternatives. Provides modification to SCOs for MGP sites.
	NYSDEC Remedial Program Soil Cleanup Objectives (SCOs)	6 NYCRR Part 375 Subpart 375-6	Establishes soil screening-level objectives based on residential, commercial, and industrial land use; protection of ecological resources; and protection of groundwater quality.	SCG	Specified screening-level goals may be applicable in determining site-specific soil objectives.
Groundwater	NYSDEC Groundwater Objectives	6 NYCRR Part 700-706 NYSDEC, Division of Water, TOGS (1.1.1) - 6 NYCRR 703.5	Establishes guidance or standard values for groundwater quality objectives.	SCG	May be applicable in determining site-specific groundwater objectives.
Soil Vapor	NYSDOH Soil Vapor Intrusion Decision Matrices	NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006, May 2017 Update	Provides guidance for evaluating indoor air and sub-slab concentrations of organic compounds.	TBC	Guidance may be applicable to existing or new buildings constructed on and downgradient of the site.

Notes:
SCG = Standards, Criteria, and Guidance
TBC = Other Criteria To Be Considered

Table 3-2

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Action-Specific Standards, Criteria, and Guidance

Action	Requirements	Citation	Description	SCG or TBC	Comment
Water Treatment Discharge	NYSDEC Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations	Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1, 1.1.2	Compilation of ambient water quality standards and guidance values for toxic and non-conventional pollutants for use in NYSDEC programs (i.e., SPDES).	TBC	These standards and guidance values are potentially applicable in establishing discharge limitations to surface waters.
	NYSDEC Industrial SPDES Permit Drafting Strategy for Surface Waters	TOGS 1.2.1	Guidance for developing effluent and monitoring limits for point source releases to surface water.	TBC	These standards and guidance values are potentially applicable in establishing discharge limitations to surface waters .
	Clean Water Act	Section 401	Water Quality Certification.	SCG	Potentially Applicable.
	SPDES	6 NYCRR Parts 750-01, 750-02	Requirements for obtaining a SPDES permit and requirements for operating in accordance with a SPDES permit.	SCG	Potentially Applicable to constructing and operating a water treatment system for discharge to surface water.
	Town Sewer Division	TOGS 1.3.8	Limits on new or changed discharges to Publicly Owned Treatment Works (POTWs), strict requirements regarding bioaccumulative and persistent substances, plus other considerations.	TBC	Potentially Applicable to constructing and operating a water treatment system for discharge to Publicly Owned Treatment Works.
Construction Stormwater	SPDES Permit	NYSDEC SPDES General Permit for Stormwater Discharge	Requirements to protect stormwater from construction impacts including preparation of a Stormwater Pollution Prevention Plan (SWPPP).	SCG	Not Applicable. Land disturbance area is less than one acre.
In-Situ Treatment of Soils and Groundwater	Underground Injection Control Program	40 CFR Part 144	Includes requirements for injection of chemicals.	SCG	Potentially Applicable for In-Situ Chemical Oxidation.
	NYSDEC Ambient Water Quality Standards and Guidance Values	Division of Water Technical and Operational Guidance Series (TOGS) 2.1.2	Applicability of SPDES permits and groundwater effluent standards to the use of underground injection/recirculation as a remediation measure.	SCG	Potentially Applicable.
Indoor Air	NYSDOH Background Air Levels	Draft Guidance for Evaluating Soil Vapor Intrusion in the State of New York	Includes a database of background indoor air concentrations and description of decision making process for remediation of indoor air impacts.	TBC	Not Applicable. No exposures have been identified.
Waste Management	Solid Waste Management Facility	6 NYCRR 360	Includes solid waste management facility requirements.	SCG	Applicable if soil is removed.
	Waste Transporter Permits	6 NYCRR 364	Regulates collection, transport and delivery of regulated waste. Requires that wastes be transported by permitted waste haulers.	SCG	Applicable if soil is removed.
		TAGM 4032	Disposal of Drill Cuttings.	SCG	Potentially Applicable during the installation of injection points or new monitoring wells.
MGP-Impacted Soil	Management of soil and sediment contaminated with coal tar from Manufactured Gas Plants	NYSDEC TAGM 4060 and NYSDEC TAGM 4061 (DER-4)	This guidance outlines the criteria for MGP coal tar waste. Soils and sediment only exhibiting the toxicity characteristic for benzene (D018) may be conditionally excluded from the requirements of 6 NYCRR Parts 370-374 and 376 when they are destined for permanent thermal treatment.	SCG	Applicable for off-site treatment and disposal of soil.
Hazardous Waste	**Federal:** *Resource Conservation and Recovery Act (RCRA) Subtitle C – Hazardous Waste Management*				
	Generation, Management, and Treatment of Hazardous Waste	40 CFR Parts 261-265	Outlines criteria for determining if a solid waste is a hazardous waste and establishes requirements for hazardous waste management.	SCG	Because of New York State policy for management of wastes from MGP sites, no hazardous wastes will be generated as part of implementation of the remedial actions. Not Applicable.
	State: NYSDEC Division of Hazardous Substances Regulation				
	New York State Hazardous Waste Management Regulations	6 NYCRR Parts 370-376	Outlines criteria for determining if a solid waste is a hazardous waste and establishes a hazardous waste management program.	SCG	Because of New York State policy for management of wastes from MGP sites, no hazardous wastes will be generated as part of implementation of the remedial actions. Not Applicable.
Off-site Management of Non-hazardous Waste	RCRA Subtitle D	42 U S C Section 6901 *et seq.*	State and local governments, in accordance with EPA's guidance, are the primary planning, regulating, and implementing entities for the management of non-hazardous solid waste, such as household garbage and non-hazardous industrial solid waste.	SCG	Applicable if soil is removed from Site.

Table 3-2

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Action-Specific Standards, Criteria, and Guidance

Action	Requirements	Citation	Description	SCG or TBC	Comment
	Clean Air Act (CAA)				
Air Emissions	New Source Review (NSR) and Prevention of Significant Deterioration (PSD) Requirements	40 CFR Part 52	New sources or modifications which emit greater than the defined threshold for listed pollutants must perform ambient impact analysis and install controls which meet best available control technology (BACT).	SCG	Not applicable. No new sources will be generated.
	National Emission Standards for Hazardous Air Pollutants (NESHAPs)	40 CFR Part 61; 40 CFR Part 63	Source-specific regulations which establish emissions standards for hazardous air pollutants (HAPs).	SCG	Not applicable.
	New York State Air Pollution Control Regulations	6 NYCRR Parts 120, 200-203, 207, 211, 212, 219, Air Guide-1	Establishes emissions standards and permitting requirements for new sources of air pollutants and specific contaminants.	SCG	Requirements would be applicable to remediation alternatives that result in emissions of air contaminants, including particulate matter and toxic air contaminants.
	New York State Ambient Air Quality Standards	6 NYCRR Part 257	Establishes state ambient air quality standards and guidelines for protection of public health.	SCG	May be applicable in evaluating air impacts during remediation activities. Establishes short-term exposure action limits for occupational exposure.
	Fugitive Dust Suppression and Particulate Monitoring	NYSDEC HWR-89-TAGM 4031	Fugitive dust suppression and particulate monitoring during source area remedial activities.	SCG	For implementation under a site health and safety plan and Community Air Monitoring Plan during remedial activities. Applicable to Site disturbance activities.
	Community Air Monitoring Plan (CAMP)	NYSDOH	Air Quality Requirements.	SCG	Applicable to Site construction activities.
Work Near Overhead Power Lines	Safety and Health Regulations for Construction	Occupational Safety and Health Administration (OSHA) 29 CFR Part 1926, Subpart K; Part 1926.550(a)(15)	Establishes minimum clearances and grounding requirements for work near electrical equipment and for the operation of cranes and derricks in the vicinity of electrical distribution and transmission lines.	SCG	The minimum required clearances will be maintained and equipment grounding will be established when work is performed in the vicinity of overhead power lines.
	Worker Protection - Safety and Health	New York State Department of Labor (NYSDOL) High-Voltage Proximity Act, Code Rule 57, Section 202-h	Establishes minimum clearances and grounding requirements for work near high-voltage power lines.	SCG	The minimum required clearances will be maintained and equipment grounding will be established when work is performed in the vicinity of overhead power lines.
Institutional Controls	Institution of an Environmental Easement	NYSDEC Policy on Environmental Easements: Environmental Conservation Law (ECL) Article 71, Title 36	NYSDEC has developed a draft standard form and procedure for establishing environmental easements.	TBC	Institutional controls will be established in accordance with NYSDEC policy
Monitored Natural Attenuation	Provides specific requirement for implementation of MNA	*Use of MNA at Superfund, RCRA Corrective Action and UST Sites* (USEPA, 1997)	This guidance document establishes the technical basis for implementing MNA.	TBC	Monitored Natural attenuation will be implemented in accordance with USEPA guidance
Site Management Plan (SMP)	Template document intended to expedite development and approval of a site-specific SMP by providing format and general content guidelines.	*Site Management Plan Template* (NYSDEC, April 2009)	NYSDEC has developed a Site Management Plan template for remedial projects performed under the management of the NYSDEC Division of Environmental Remediation.	TBC	An SMP will be utilized following remedial action, to address the means for implementing the Institutional Controls and Engineering Controls that will be required by an Environmental Easement for the Site.
Land Disturbing Activities	Excavation of impacted soil	DER-10; Technical Guidance for Site Investigation and Remediation	Requirements for collection and analysis of compliance and documentation samples.	TBC	Applicable.
			Requirements for CAMP implementation.	TBC	Applicable.
	Backfill	DER-10; Technical Guidance for Site Investigation and Remediation	Requriements for procedures to ensure that imported backfill is not impacted by COC.	TBC	Applicable.

Notes:
SCG = Standards, Criteria, and Guidance
TBC = Other Criteria To Be Considered

Table 3-3

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Location-Specific Standards, Criteria, and Guidance

Location	Requirements	Citation	Description	SCG or TBC	Comment
Entire Site	Cayuga County	General Regulations	County transportation and Site use regulations.	TBC	Requirements of County, Town, and City would be applicable to all remediation alternatives, especially those requiring transportation.
		Redevelopment Plans	None identified.	TBC	The master plan for redevelopment will have to be considered when considering future land use at the Site.
	City of Auburn	General Ordinances	City regulations regarding transportation, noise, zoning, building permits, etc.	TBC	Requirements of County, Town, and City would be applicable to all remediation alternatives, especially those requiring transportation.
Floodplains	Executive Order 11988 - Floodplain Management	40 CFR Part 6, Subpart A; 40 CFR Part 6.302	Activities taking place within floodplains must be done to avoid adverse impacts and preserve the beneficial values in floodplains.	SCG	Applicable.
	Floodplain Management Regulations	6 NYCRR Part 500	Establishes floodplain management requirements.	SCG	Applicable.
	100-year Floodplain Regulations	Federal Emergency Management Agency	Administers floodplain management requirements.	SCG	Applicable.
Wetlands/Waters of the U.S.	Executive Order 11990 - Protection of Wetlands	40 CFR Part 6, Subpart A	Activities taking place within wetlands must be done to avoid adverse impacts.	SCG	Not applicable. No wetlands are present at the Site.
	Dredging and Filling Regulations	Clean Water Act, Section 404; Rivers and Harbors Act	Regulates the discharge of dredged or fill material into waters of the United States. Requires a permit from the ACOE.	SCG	Applicable, work must be completed in accordance with permit conditions.
	Wetlands Regulations	NYSDEC Freshwater Wetlands Act	Regulates use and development of freshwater wetlands.	SCG	Not applicable. No wetlands are present at the Site.
	Protection of Water Regulations	6 NYCRR Part 608	Protection of Water Permit/ Water Quality Certification.	SCG	Applicable.
Critical Habitat	Endangered Species Act and Fish and Wildlife Coordination Act	16 USC 661; 16 USC 1531	Actions must be taken to conserve critical habitat in areas where there are endangered or threatened species.	SCG	No endangered or threatened species were identified at the Site. Not applicable.
Historic Preservation	National Historic Preservation Act	16 USC 470	Establishes requirements for the identification and preservation of historic and cultural resources.	SCG	Applicable to the management of historic or archeological artifacts identified on the Site. A "No Findings" determination is required prior to excavation.
	New York State Department of Parks, Recreation, and Historic Preservation	Historic Preservation Act	Establishes requirements for the identification and preservation of historic and cultural resources.	SCG	Applicable to the management of historic or archeological artifacts identified on the Site. A "No Findings" determination is required prior to excavation.

Notes:
SCG = Standards, Criteria, and Guidance
TBC = Other Criteria To Be Considered

Table 3-4

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Estimated Volume of Impacted Media

Media	Estimated Volume
Surface Soil (western property perimeter) - Unrestricted SCOs (0 - 1 ft bgs)	27 cy
Soil - Unrestricted SCOs	
- Former Gas Holder Area (80' x 90' x 20')	5,300 cy
Dissolved Groundwater Plume - Above NYSDEC Ambient Water Quality Standards	
- Area	17,400 sf
- Average Saturated Thickness in Overburden	13 ft
- Volume (Assume 30% Porosity)	1,800 cy / ~370,000 gallons

Table 4-1

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Initial Technology Screening for Surface Soil

General Response Action	Remedial Technology Type	Technology Process Option	Description	Screening Evaluation
No Action	No Action	No Action	No additional remedial action.	Consideration of a No Action alternative is included in accordance with DER-10 for comparison purposes. Retained for further evaluation.
Institutional Controls/ Engineering Controls (ICs/ECs)	Institutional Controls	Environmental Easement	An easement provides a legal agreement between the property owner and NYSDEC to restrict future site use. An easement can also be used to implement a Site Management Plan which describes work procedures required to manage any remaining site impacts.	Will be required unless all soil is cleaned up to unrestricted use levels. NYSEG owns the Site. Retained for further evaluation.
		Site Management Plan	Contingency plans for property owner actions, such as procedures for excavation and handling of surface soil. They are administered through environmental easements, deed restrictions, or third-party property agreements.	NYSEG owns the Site. Retained for further evaluation.
		Zoning Ordinance	Legal restriction on specific site use.	Ordinance does not provide reliable long-term prevention of exposure. Not retained for further evaluation.
	Engineering Controls	Barriers/Fencing	Construction of a fence to prevent site access.	Effective to prevent direct contact with surface soil on NYSEG property (permanent fencing already exists around NYSEG's primary substation parcel), but not effective in public right-of-way. Not consistent with NYSEG's long-term plans for the secondary (non-substation) parcel. Not retained for further evaluation.
		Signage	Signs, which deter potential receptors from exposures, such as trespassing on surface soil.	Potentially effective to prevent direct contact with surface soil on NYSEG property and in the public right-of-way, but not consistent with NYSEG's long-term plans for the secondary (non-substation) parcel. Not retained for further evaluation.
Removal	Excavation	Excavation	Removal of the top one-foot of soil (for Commercial site use) using a hydraulic excavator or other excavation equipment.	Eliminates exposure pathway for surface soil. Retained for further evaluation.
In-Situ Treatment	Biological Treatment	In-Situ Bioremediation	Natural biological processes are enhanced to promote treatment of organic COC.	Potentially effective for subsurface soil with moderate concentrations of COC, but due to presence of metals in the surface soil, the technology may not be effective. Not retained for further evaluation.
	Chemical Treatment	In-Situ Chemical Oxidation (ISCO)	Injection of chemical oxidants to treat organic COC.	Has been used to treat contaminated soil at MGP sites in New York, but due to the presence of metals in the surface soil, the technology may not be effective. Not retained for further evaluation.
	Physical Treatment	Solidification/ Stabilization	Physically binds or encloses contaminants within a stabilized mass and chemically reduces the hazard potential by converting the contaminants into a less soluble, mobile, or toxic form.	Can be cost prohibitive due to pre-treatment expenses. Not retained for further evaluation.
		In-Situ Soil Flushing	Injection and extraction of surfactant to remove metals in soil.	Impractical for surface soil. Not retained for further evaluation.
	Thermal Treatment	Vitrification	During the vitrification treatment process the metals are surrounded by a glass matrix and become chemically bonded inside the matrix.	Requires large amounts of energy, therefore can be expensive to implement. Off-gases may require further treatment to remove hazardous constituents. Not retained for further consideration.

Table 4-1

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Initial Technology Screening for Surface Soil

General Response Action	Remedial Technology Type	Technology Process Option	Description	Screening Evaluation
Containment	Surface Barriers	Soil Cover	Placement of a one-foot layer of clean soil to prevent contact with surface soil; graded and seeded.	Eliminates exposure pathway for surface soil. Since area of COC is very limited to western property boundary affecting a portion of both NYSEG property and City of Auburn right-of-way, not retained for further evaluation.
		Asphalt Pavement	Placement of asphalt pavement to prevent contact with surface soil.	Effective to address COC in surface soil. Considered equivalent to a soil cover. Not retained for further evaluation.
		Engineered Cap	Low-permeability cap constructed with clay or plastic hydraulic barrier layers.	No more effective than a soil cover to address COC in surface soil. More difficult to implement and maintain and more expensive. Not retained for further evaluation.
Waste Management	Off-Site Disposal or Treatment	Off-Site Landfill	Disposal at a permitted off-site landfill.	Common remedy for soil containing low levels of COC. Retained for further evaluation.
		Thermal Desorption	Treatment at a permitted off-site thermal desorption facility.	Common remedy for soil containing COC at MGP-impacted sites, but not effective for metals. Not retained for further evaluation.
	Off-Site Disposal or Treatment	Incineration	Treatment at a permitted off-site incinerator.	Not effective for metals contamination. Not retained for further evaluation.
		Chemical Treatment	Treatment at a permitted off-site chemical treatment facility.	Would be potentially feasible for high level COC and hazardous waste. Surface soil impacted with only metals. Not retained for further evaluation.
	On-Site Disposal or Treatment	On-Site Landfill	Disposal at an engineered on-site landfill.	Area of COC impact is limited and insufficient land area available. Unlikely to be acceptable to community. Not retained for further evaluation.
		Thermal Desorption	Treatment using permitted on-site thermal desorption equipment.	Not effective for metals. Area of COC impact is limited. Not retained for further evaluation.
		Incineration	Treatment using permitted on-site incineration equipment.	Not effective for metals. Area of COC impact is limited. Not retained for further evaluation.

Table 4-2

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Initial Technology Screening for Subsurface Soil

General Response Action	Remedial Technology Type	Technology Process Option	Description	Screening Evaluation
No Action	No Action	No Action	No additional remedial action.	Consideration of a No Action alternative is included in accordance with DER-10 for comparison purposes. Retained for further evaluation.
Institutional Controls/ Engineering Controls (ICs/ECs)	Institutional Controls	Environmental Easement	An easement provides a legal agreement between the property owner and NYSDEC to restrict future site use. An easement can also be used to implement a Site Management Plan which describes work procedures required to manage any remaining site impacts.	NYSEG owns the Site. Will be required unless all soil is cleaned up to unrestricted use levels. Retained for further evaluation.
		Site Management Plan	Contingency plans for property owner actions, such as procedures for excavation for underground utilities or drilling and handling of subsurface soil. They are administered through environmental easements, deed restrictions, or third-party property agreements.	NYSEG owns the Site. Retained for further evaluation.
		Zoning Ordinance	Legal restriction on specific site use.	Ordinance does not provide reliable long-term prevention of exposure. Not retained for further evaluation.
	Engineering Controls	Temporary Barriers/Fencing	Temporary fencing during excavation or drilling in which subsurface soil is encountered.	Applicable for on-site construction, excavation, or drilling activities. Permanent fencing exists around the primary NYSEG substation parcel. Not consistent with NYSEG's long-term plans for the secondary (non-substation) parcel. Retained for further evaluation.
		Temporary Signage	Temporary signs which deter potential receptors from exposures during excavation or drilling in which subsurface soil is encountered.	Applicable for on-site construction, excavation, or drilling activities. Not consistent with NYSEG's long-term plans for the secondary (non-substation) parcel. Retained for further evaluation.
Removal	Excavation	Excavation	Removal of soil using a hydraulic excavator or other excavation equipment. For excavations extending below the water table steel sheet piling and dewatering operations will be required as part of excavation.	Common remedy for soil containing COC, but would require decommissioning/dismantling/relocation of the substation. Retained for further evaluation.
In-Situ Treatment	Biological Treatment	In-Situ Bioremediation	Natural biological processes are enhanced to promote treatment of organic COC.	Potentially effective with moderate concentrations of COC. Retained for further evaluation.
	Chemical Treatment	In-Situ Chemical Oxidation (ISCO)	Injection of chemical oxidants to treat organic COC.	Has been used to treat contaminated subsurface soil at MGP sites in New York. Feasible in close proximity to and/or underneath an active substation. Retained for further evaluation.
	Physical Treatment	Soil Vapor Extraction	Use of a blower to extract and treat VOCs in soil.	Not effective against PAHs or other SVOCs. Not retained for further evaluation.
		Air Sparging/Soil Vapor Extraction	Injection of pressurized air into the subsurface below the water table to induce volatilization of dissolved-phase COC.	Effective for VOCs in groundwater and soil vapor. Ineffective for PAHs and other SVOCs and for meeting soil-related RAOs. Limited effectiveness in shallow groundwater environments. Not retained for further evaluation.
		In-Situ Soil Flushing	Injection and extraction of surfactant to remove COC in soil.	The technology can remove COC. Retained for further evaluation.
	Thermal Treatment	Thermal	Subsurface soil is heated in conjunction with vapor extraction to reduce the mobility of remaining contamination through stripping of the volatile portion of the contamination.	Currently being implemented for subsurface soil at an MGP site in New York, but heat source in close proximity to and/or underneath an active substation is unfeasible. Not retained for further evaluation.
	Immobilization	In-Situ Solidification (ISS) using Auger Mixing	Overlapping columns are augered as a grout/soil mixture to form a solid monolith of low permeability. Physically binds or encloses a COC mass and/or induces a chemical reaction between the stabilizing agent and the COC to reduce their mobility within the subsurface and to decrease permeability of the mass so that groundwater does not contact the COC.	Not feasible in close proximity to and/or underneath an active substation. Would require decommissioning/dismantling/relocation of the substation. Not retained for further evaluation unless substation decommissioning/dismantling is considered.
		In-Situ Solidification (ISS) using Pressure Grouting	High-pressure jet grouting displaces soil to form a grout column. Overlapping grout columns form a solid monolith of low permeability.	Not feasible in close proximity to and/or underneath an active substation. Would require decommissioning/dismantling/relocation of the substation. Not retained for further evaluation unless substation decommissioning/dismantling is considered.
		In-Situ Solidification (ISS) using Excavator Bucket Mixing	Bulk soil is mixed into a grout/soil mixture to form a solid monolith of low permeability.	Not feasible in close proximity to and/or underneath an active substation. Would require decommissioning/dismantling/relocation of the substation. Not retained for further evaluation unless substation decommissioning/dismantling is considered.

Table 4-2

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Initial Technology Screening for Subsurface Soil

General Response Action	Remedial Technology Type	Technology Process Option	Description	Screening Evaluation
In-Situ Treatment	Enhanced Recovery	Steam	Uses injected steam to heat subsurface soil and groundwater and enhance mobility to allow for more effective treatment or extraction. This technology is in the experimental phase. Substantial risk of uncontrolled migration of contaminants.	Experimental technology with a substantial risk for uncontrolled migration. Not retained for further evaluation.
		Electro-Thermal	Uses electrical current to heat subsurface soil and groundwater and enhance mobility to allow for more effective treatment or extraction. This technology is in the experimental phase. Substantial risk of uncontrolled migration of COC.	Experimental technology with a substantial risk for uncontrolled migration. Not retained for further evaluation.
		Surfactants	Uses surfactant chemicals (soap formulations) injected in the subsurface to enhance mobility to allow for more effective treatment or extraction. This technology is in the experimental phase. Substantial risk of uncontrolled migration of COC.	Experimental technology with a substantial risk for uncontrolled migration. Not retained for further evaluation.
		Acoustic Vibrations	Uses sound to vibrate subsurface soil and groundwater and enhance mobility to allow for more effective treatment or extraction. This technology is in the experimental phase. Substantial risk of uncontrolled migration of COC.	Experimental technology with a substantial risk for uncontrolled migration. Not retained for further evaluation.
Containment	Subsurface Vertical Barriers	Sheet Pile Wall	Driven steel piles used to create a barrier.	Containment remedies are not effective for reducing exposures to COC in soil. Not retained for further evaluation.
		Slurry Wall	Low-permeability bentonite/soil wall installed in an excavated trench.	Containment remedies are not effective for reducing exposures to COC in soil. Not retained for further evaluation.
		Jet Grouting	Low-permeability soil/grout wall installed using an injection system.	Containment remedies are not effective for reducing exposures to COC in soil. Not retained for further evaluation.
		Solidified Earth Wall	Low-permeability soil/grout wall installed using an auger or excavation equipment.	Containment remedies are not effective for reducing exposures to COC in soil. Not retained for further evaluation.
Waste Management	Off-Site Disposal or Treatment	Off-Site Landfill	Disposal at a permitted off-site landfill.	Common remedy for soil containing COC at MGP site. Retained for further evaluation.
		Thermal Desorption	Treatment at a permitted off-site thermal desorption facility.	Common remedy for soil containing COC at MGP site. Retained for further evaluation.
		Incineration	Treatment at a permitted off-site incinerator.	Would be potentially feasible for high level COC or hazardous waste. Evaluation indicates COC are generally low and no hazardous waste will be generated during remediation. Not retained for further evaluation.
		Biological Treatment	Landfarming or soil windrow tilling to enhance biological treatment of COCs in soil.	No active facilities are available for MGP-impacted soils. Not retained for further evaluation.
		Chemical Treatment	Treatment at a permitted off-site chemical treatment facility.	Would be potentially feasible for high level COC or hazardous waste. Evaluation indicates COC are generally low and no hazardous waste will be generated during remediation. Not retained for further evaluation.
	On-Site Disposal or Treatment	On-Site Landfill	Disposal at an engineered on-site landfill.	Insufficient land area available. Unlikely to be acceptable to community. Not retained for further evaluation.
		Thermal Desorption	Treatment using permitted on-site thermal desorption equipment.	Insufficient land area available. Unlikely to be acceptable to community. Not retained for further evaluation.
		Incineration	Treatment using permitted on-site incineration equipment.	Insufficient land area available. Unlikely to be acceptable to community. Not retained for further evaluation.
		Biological Treatment	Landfarming or soil windrow tilling to enhance biological treatment of COCs in soil.	Insufficient land area available. Unlikely to be acceptable to community. Not retained for further evaluation.

Table 4-3

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Initial Technology Screening for Groundwater

General Response Action	Remedial Technology	Technology Process Option	Description	Screening Evaluation
No Action	No Action	No Action	No additional remedial action.	Consideration of a No Action alternative is included in accordance with DER-10 for comparison purposes. Retained for further evaluation.
Institutional Controls/ Engineering Controls (ICs/ECs)	Institutional Controls	Environmental Easement	An easement provides a legal agreement between the property owner and NYSDEC to restrict future site use. An easement can also be used to implement a Site Management Plan which describes work procedures required to manage any remaining site impacts.	NYSEG owns the Site. Will be required unless all groundwater is returned to required cleanup levels. Retained for further evaluation.
		Site Management Plan	Contingency plans for property owner actions, such as use of site groundwater and handling of groundwater during excavations for underground utilities or for future construction or for drilling. They are administered through environmental easements, deed restrictions, or third-party property agreements.	Can prevent potential contact with COC in on-site groundwater. Retained for further evaluation.
		Local Ordinance	Legal restriction preventing installation of new wells or use of new wells.	Commonly used in municipalities which have a public water system. Can prevent potential contact with COC in on-site groundwater. Retained for further evaluation.
	Engineering Controls	Temporary Barriers/Fencing	Temporary fencing during excavation or drilling in which groundwater is encountered.	Applicable for on-site construction, excavation, or drilling activities. Permanent fencing exists around the primary NYSEG substation parcel. Not consistent with NYSEG's long-term plans for the secondary (non-substation) parcel. Retained for further evaluation.
		Temporary Signage	Temporary signs which deter potential receptors from exposures during excavation or drilling in which groundwater is encountered.	Applicable for on-site construction, excavation, or drilling activities. Not consistent with NYSEG's long-term plans for the secondary (non-substation) parcel. Retained for further evaluation.
Source Material Removal	Excavation	Excavation and Removal of Soil Containing Source Material (See Table 4-2)	Removal of soil using a hydraulic excavator or other excavation equipment. For excavations extending below the water table steel sheet piling and dewatering operations will be required as part of excavation.	Effective for meeting soil-related RAOs and for meeting groundwater-related RAOs over time, but would require decommissioning/dismantling/relocation of the substation. Retained for further evaluation.
Groundwater Removal	Groundwater Recovery	Extraction Wells with On-Site Treatment	Extraction of groundwater from wells with pumps installed in the impacted area.	Limited effectiveness if soil containing source material is present around wells. On-Site groundwater plume containing COC is centered on soil containing source material. Since groundwater extraction is a widely used groundwater remediation technology, it has been retained for further evaluation.
		Extraction Trench with On-Site Treatment	Extraction of groundwater using a gravel-filled trench.	Considered equivalent to extraction wells. Will not be evaluated further, but may be considered during design if a groundwater extraction alternative is selected. Not retained for further evaluation.
	Enhanced Recovery	Steam/Hot Water	Uses injected steam and/or hot water to heat subsurface soil and groundwater and enhance mobility to allow for more effective treatment or extraction. This technology is in the experimental phase. Substantial risk of uncontrolled migration of COC.	Experimental technology with a substantial risk for uncontrolled migration of COC to off-site areas. High cost. Not retained for further evaluation.
		Electro-Thermal	Uses electrical current to heat subsurface soil and groundwater and enhance mobility to allow for more effective treatment or extraction. This technology is in the experimental phase. Substantial risk of uncontrolled migration of steam and COC.	Experimental technology with a substantial risk for uncontrolled migration of COC to off-site areas. High cost. Not retained for further evaluation.
		Surfactants	Uses surfactant chemicals (soap formulations) injected in the subsurface to enhance mobility to allow for more effective treatment or extraction. This technology is in the experimental phase. Substantial risk of uncontrolled migration of COC.	Experimental technology with a substantial risk for uncontrolled migration of COC to off-site areas. Not retained for further evaluation.
		Acoustic Vibrations	Uses sound to vibrate subsurface soil and groundwater and enhance mobility to allow for more effective treatment or extraction. This technology is in the experimental phase. Substantial risk of uncontrolled migration of COC.	Experimental technology with a substantial risk for uncontrolled migration of COC to off-site areas. Not retained for further evaluation.

Table 4-3

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Initial Technology Screening for Groundwater

General Response Action	Remedial Technology	Technology Process Option	Description	Screening Evaluation
In-Situ Treatment	Natural Attenuation	Monitored Natural Attenuation (MNA)	Groundwater remediation achieved by naturally occurring physical, chemical, and biological processes.	Commonly used for groundwater remedies which do not immediately meet groundwater cleanup criteria for organic COC. Retained for further evaluation.
	Biological Treatment	In-Situ Bioremediation/ Aerobic Biodegradation	Natural biological processes are enhanced through injection of oxygen or oxygen releasing compounds (ORC) to promote treatment of organic COC.	Effective in areas of low COC concentrations. Retained for further evaluation.
		Phytoremediation	Trees or other plants are placed to remove groundwater and immobilize or treat COC.	COC in groundwater found at depths greater than suitable for phytoremediation. Not retained for additional evaluation.
	Physical Treatment	Air Sparging/Soil Vapor Extraction	Air is injected into the aquifer to promote biodegradation and volatilized VOCs.	Not a suitable technology for treatment of PAHs. Limited effectiveness in shallow groundwater environments. Not retained for further evaluation.
	Chemical Treatment	In-Situ Chemical Oxidation (ISCO)	Chemical oxidant is injected to treat organic COC.	Has been used to treat COC at MGP sites in New York. Retained for further evaluation.
	Immobilization	In-Situ Solidification (ISS) using Auger Mixing	Overlapping columns are augered as a grout/soil mixture to form a solid monolith of low permeability.	Not feasible in close proximity to and/or underneath an active substation. Would require decommissioning/dismantling/relocation of the substation. Not retained for further evaluation unless substation decommissioning/dismantling is considered.
		In-Situ Solidification (ISS) using Pressure Grouting	Overlapping columns are high-pressure jet grouted to form a solid monolith of low permeability.	Not feasible in close proximity to and/or underneath an active substation. Would require decommissioning/dismantling/relocation of the substation. Not retained for further evaluation unless substation decommissioning/dismantling is considered.
		In-Situ Solidification (ISS) using Excavator Bucket Mixing	Bulk soil is mixed into a grout/soil mixture to form a solid monolith of low permeability.	Not feasible in close proximity to and/or underneath an active substation. Would require decommissioning/dismantling/relocation of the substation. Not retained for further evaluation unless substation decommissioning/dismantling is considered.
Treatment	Organic Treatment	Air Stripping	Air is used to volatilize VOCs in groundwater so that they can be removed, collected, and treated.	Potentially feasible for use in water treatment at the Site. Specific unit processes for treatment of organic COC in groundwater will be evaluated during design. Generic organic water treatment is retained for further evaluation.
		Granular Activated Carbon	Treatment by adsorption of COC on carbon.	Potentially feasible for use in water treatment at the Site. Specific unit processes for treatment of organic COC in groundwater will be evaluated during design. Generic organic water treatment is retained for further evaluation.
		Chemical/UV Oxidation	Treatment of organic contaminants by adding oxidants such as peroxide or ozone and exposing to ultra violet light.	Potentially feasible for use in water treatment at the Site. Specific unit processes for treatment of organic COC in groundwater will be evaluated during design. Generic organic water treatment is retained for further evaluation.
		Oil/Water Separation	Removal of NAPL from extracted water using gravity separation.	No NAPL has been detected or observed at the Site. Not retained for further evaluation.
	Inorganic Treatment	Chemical Precipitation	Addition of coagulants to water to promote precipitation of inorganic COC.	Potentially feasible for use in water treatment at the Site. Specific unit processes for treatment of inorganic COC in groundwater will be evaluated during design. Generic inorganic water treatment is retained for further evaluation.
		Ion Exchange/Adsorption	Groundwater treatment using ion exchange resins that remove ionized inorganic COC from water.	Potentially feasible for use in water treatment at the Site. Specific unit processes for treatment of inorganic COC in groundwater will be evaluated during design. Generic inorganic water treatment is retained for further evaluation.
		Filtration	Use of a filter to remove COC absorbed to particulates.	Potentially feasible for use in water treatment at the Site. Specific unit processes for treatment of inorganic COC in groundwater will be evaluated during design. Generic inorganic water treatment is retained for further evaluation.
	Inorganic Treatment	Peroxide Oxidation	Addition of hydrogen peroxide to water to treat inorganic constituents, particularly cyanide.	Potentially feasible for use in water treatment at the Site. Specific unit processes for treatment of inorganic COC in groundwater will be evaluated during design. Generic inorganic water treatment is retained for further evaluation.

Table 4-3

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Initial Technology Screening for Groundwater

General Response Action	Remedial Technology	Technology Process Option	Description	Screening Evaluation
Containment	Process Barriers	Biological Containment	Natural biological processes are enhanced. Containment is provided by installing application wells around areas identified as sources of contamination to groundwater. Contaminants in groundwater are treated by in-situ bioremediation via aerobic or anaerobic amendments. This technology treats contaminated water before it migrates off-site.	Potentially effective for containment of COC in groundwater. This technology is retained for further evaluation.
		Chemical Containment	Containment by a line of wells downgradient of the impacted area, which are used to chemically degrade the COC, usually by addition of an oxidant such as ozone, hydrogen peroxide, or potassium permanganate. The groundwater is treated in-situ before it migrates off-site.	Potentially effective for containment of COC in groundwater. Not retained for further evaluation.
		Permeable Reactive Barrier	Treatment chemical is mixed with soil in order to prevent migration of COC in groundwater.	Potentially effective for containment of COC in groundwater. Not retained for further evaluation.
		Hydraulic Containment	Containment is provided by installing groundwater extraction wells or trenches around areas identified as sources of contamination to groundwater. Water is pumped to a treatment system for discharge to surface water or POTW. This technology captures contaminated water before it migrates off-site.	Potentially effective for containment of COC in groundwater. Not retained for further evaluation.
		Funnel and Gate	This technology uses impermeable funnel walls to force polluted groundwater through a highly permeable zone of reactive porous media (i.e., "the gates"), where contaminants are treated using in-situ bioremediation or other treatment process.	Although the technology has been successfully used at sites to contain and treat groundwater it is not retained for further evaluation due to subsurface conditions.
	Subsurface Vertical Physical Barriers	Sheet Pile Wall	Driven steel piles used to create a downgradient barrier.	Has been selected for use to contain COC at MGP sites in New York. Not retained for further evaluation.
		Slurry Wall	Low-permeability bentonite/soil wall installed in an excavated trench.	Considered equivalent to a sheet pile wall. Will not be evaluated further, but may be considered during design if a barrier wall alternative is selected. Not retained for further evaluation.
		Jet Grouting	Low-permeability soil/grout wall installed using an injection system.	Considered equivalent to a sheet pile wall. Will not be evaluated further, but may be considered during design if a barrier wall alternative is selected. Not retained for further evaluation.
Discharge	Groundwater Discharge	Discharge to a Local Publicly-Owned Treatment Works (POTW)	Water is discharged to a sanitary sewer for conveyance to a POTW.	Common method for removal of treated or untreated groundwater. Retained for further evaluation.
		Discharge to Surface Water via Storm Sewer	Treated water is discharged to surface water.	Common method for removal of treated groundwater. Retained for further evaluation.

Table 4-4

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Remedial Technology Evaluation for Surface Soil

General Response Action	Remedial Technology Type	Technology Process Option	Description	Effectiveness	Implementability	Relative Cost	Retained?
No Action	No Action	No Action	Consideration of a No Action alternative is included in accordance with DER-10 for comparison of the overall effectiveness of the other alternatives.	No Action will not meet the surface soil RAOs in an acceptable timeframe.	Does not require implementation.	No Cost	Yes
Institutional Controls/ Engineering Controls (ICs/ECs)	Institutional Controls	Environmental Easement	An easement provides a legal agreement between the property owner and NYSDEC to restrict future site use. An easement can also be used to implement a Site Management Plan (SMP) which describes work procedures required to manage any remaining site impacts.	Effective in preventing exposures to construction/utility/maintenance workers and public pedestrians.	Readily implementable.	Low	Yes
		Site Management Plan	Contingency plans for property owner actions, such as procedures for excavation and handling of surface soil. They are administered through environmental easements, deed restrictions, or third-party property agreements.	Effective in preventing exposures to construction/utility/maintenance workers and public pedestrians.	Readily implementable.	Low	Yes
Removal	Excavation	Excavation	Removal of the top one-foot of soil (for Commercial site use) using a hydraulic excavator or other excavation equipment.	Removal of surface soil will meet the RAOs for prevention of ingestion/direct contact with COC in surface soil.	Readily implementable.	Moderate	Yes
Containment	Surface Barriers	Soil Cover	Placement of a one-foot layer of clean soil to prevent contact with surface soil; graded and seeded.	Effective in preventing exposures to construction/utility/maintenance workers and public pedestrians.	Readily implementable, but will not maintain current surface elevations, making it necessary to excavate existing surface soil.	Moderate Capital and Low O&M	No
Waste Management	Off-site Disposal or Treatment	Off-site Landfill	Soil removed from the site is transported to a permitted off-site landfill for disposal.	Once surface soil has been removed from its original location, landfill disposal is effective in preventing human contact with contaminants and will meet the surface soil RAO.	This technology is implementable. Non-hazardous waste landfills can accept MGP waste materials which have low concentrations of COC. Facilities with sufficient capacity are available.	Moderate-High	Yes

Table 4-5

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Remedial Technology Evaluation for Subsurface Soil

General Response Action	Remedial Technology Type	Technology Process Option	Description	Effectiveness	Implementability	Relative Cost	Retained?
No Action	No Action	No Action	Consideration of a No Action alternative is included in accordance with DER-10 for comparison of the overall effectiveness of the other alternatives.	No Action will not meet the subsurface soil RAOs in an acceptable timeframe.	Does not require implementation.	No Cost	Yes
Institutional Controls/ Engineering Controls (ICs/ECs)	Institutional Controls	Environmental Easement	An easement provides a legal agreement between the property owner and NYSDEC to restrict future site use. An easement can also be used to implement a Site Management Plan (SMP) which describes work procedures required to manage any remaining site impacts.	Effective in preventing exposures to construction/utility/maintenance workers. Not effective in limiting subsurface migration of COC, volume reduction, or treatment.	Readily implementable.	Low	Yes
Institutional Controls/ Engineering Controls (ICs/ECs)	Institutional Controls	Site Management Plan	Contingency plans for property owner actions, such as procedures for excavation for underground utilities or drilling and handling of subsurface soil. They are administered through environmental easements, deed restrictions, or third-party property agreements.	Effective in preventing exposures to construction/utility/maintenance workers. Not effective in limiting subsurface migration of COC, volume reduction, or treatment.	Readily implementable.	Low	Yes
Institutional Controls/ Engineering Controls (ICs/ECs)	Engineering Controls	Temporary Barriers/ Fencing and Signage	Temporary barriers/fencing and/or signs which deter potential receptors from exposures during excavation or drilling in which subsurface soil is encountered.	Effective in preventing exposures to construction/utility/maintenance workers. Not effective in limiting subsurface migration of COC, volume reduction, or treatment.	Readily implementable.	Low	No
Removal	Excavation	Excavation	Removal of soil using a hydraulic excavator or other excavation equipment. For excavations extending below the water table steel sheet piling and dewatering operations will be required as part of excavation.	Effective at meeting soil RAOs and addressing groundwater RAOs. Removal of subsurface soil will meet the RAOs for prevention of ingestion/direct contact with or inhalation of COC in subsurface soils and removal of the source of groundwater contamination, and prevention of migration of contaminants in soil.	Readily implementable for accessible soil. For excavations extending below the water table steel sheet piling and dewatering operations will be required. Excavation under the substation will require decommissioning/dismantling/relocation of the substation.	Very High	Yes
In-Situ Treatment	Biological Treatment	In-Situ Bioremediation	Natural biological processes are enhanced to promote treatment of organic COC.	Potentially effective at meeting soil RAOs with moderate concentrations of COC. May require multiple applications.	Readily implementable for accessible soil outside the former gas holder. Treatment within the former gas holder / under the substation would be unreliable.	Moderate-High	Yes (outside holder) No (inside holder)
In-Situ Treatment	Chemical Treatment	In-Situ Chemical Oxidation (ISCO)	In-Situ chemical oxidation involves the injection of chemicals such as ozone, hydrogen peroxide, magnesium peroxide, sodium persulfate, or potassium permanganate into the subsurface using injection wells or well points. The chemical oxidants react with contaminants to reduce mass.	Potentially effective at meeting soil (and groundwater) RAOs with moderate concentrations of COC. May require multiple applications.	Readily implementable for accessible soil outside the former gas holder. Treatment within the former gas holder / under the substation would be unreliable.	Moderate-High	Yes (outside holder) No (inside holder)
In-Situ Treatment	Physical Treatment	In-Situ Soil Flushing	This technology uses injection of surfactant solution and extraction simultaneously to flush out the contaminants and capture them. A treatment system will also be needed to treat the extracted solution.	Potentially effective in meeting soil RAOs, especially at sites where subsurface geology is fairly homogeneous.	Implementable after thorough analysis of geology and pilot testing.	High	No

Table 4-5

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Remedial Technology Evaluation for Subsurface Soil

General Response Action	Remedial Technology Type	Technology Process Option	Description	Effectiveness	Implementability	Relative Cost	Retained?
Waste Management	Off-site Disposal or Treatment	Off-site Landfill	Soil removed from the site is transported to a permitted off-site landfill for disposal.	Once soil has been removed from its original location, landfill disposal is effective in preventing human contact with contaminants and will meet the subsurface soil RAOs.	This technology is implementable. Non-hazardous waste landfills can accept MGP waste materials which have low concentrations of COC. Facilities with sufficient capacity are available.	Moderate-High	Yes
		Thermal Desorption	Soil removed from the site is transported to a permitted off-site thermal desorption facility for treatment.	Once soil has been removed from its original location, thermal treatment is effective in preventing human contact with contaminants and will meet the subsurface soil RAOs.	This technology is implementable. Permitted facilities are available in New York.	Moderate-High	Yes

Table 4-6

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Remedial Technology Evaluation for Groundwater

General Response Action	Remedial Technology Type	Technology Process Option	Description	Effectiveness	Implementability	Relative Cost	Retained?
No Action	No Action	No Action	Consideration of a No Action alternative is included in accordance with DER-10 for comparison of the overall effectiveness of the other alternatives.	No Action will not meet the groundwater RAOs in an acceptable timeframe.	Does not require implementation.	No Cost	Yes
Institutional Controls/ Engineering Controls (ICs/ECs)	Institutional Controls	Environmental Easement	An easement provides a legal agreement between the property owner and NYSDEC to restrict future site use. An easement can also be used to implement a Site Management Plan (SMP) which describes work procedures required to manage any remaining site impacts.	Effective in preventing exposures to construction/utility/maintenance workers. Not effective in limiting subsurface migration of COC, volume reduction, or treatment.	Readily implementable.	Low	Yes
		Site Management Plan	Contingency plans for property owner actions, such as procedures for excavation for underground utilities or drilling and handling of groundwater. They are administered through environmental easements, deed restrictions, or third-party property agreements. Provide requirements for groundwater monitoring.	Effective in preventing exposures to construction/utility/maintenance workers. Not effective in limiting subsurface migration of COC, volume reduction, or treatment.	Readily implementable.	Low	Yes
		Local Ordinance	Legal restriction preventing installation of new wells or use of new wells.	Preventing future use of groundwater for potable or other uses will meet the RAOs for prevention of ingestion, direct contact with, or inhalation of volatiles of COC in site groundwater.	Potentially implementable depending on whether local ordinances are already in effect.	Low	Yes
	Engineering Controls	Temporary Barriers/ Fencing and Signage	Temporary barriers/fencing and/or signs which deter potential receptors from exposures during excavation or drilling in which groundwater is encountered.	Effective in preventing exposures to construction/utility/maintenance workers. Not effective in limiting subsurface migration of COC, volume reduction, or treatment.	Readily implementable.	Low	No
Source Material Removal	Excavation	Excavation and Removal of Soil Containing Source Material	Removal of soil using a hydraulic excavator or other excavation equipment. For excavations extending below the water table steel sheet piling and dewatering operations will be required as part of excavation.	Effective for meeting soil-related RAOs and for meeting groundwater-related RAOs over time, but would require decommissioning/dismantling/relocation of the substation.	Readily implemented for accessible soil.	Very High	Yes
Groundwater Removal	Groundwater Recovery	Extraction Wells	Removal of groundwater containing COC using pumps at the extraction wells and treatment of the removed groundwater prior to discharging it into nearby water body or POTW. Dewatering would be required as part of the excavation activities below the groundwater table.	Removal of contaminated groundwater may remove groundwater containing COC. Dewatering may be required to maintain the water level during excavation or as a required component of the containment strategy, if selected.	Implementable in accessible areas.	Moderate	Yes
In-Situ Treatment	Natural Attenuation	Monitored Natural Attenuation (MNA)	Uses naturally occurring physical, chemical, and biological processes to reduce the concentrations of contaminants in groundwater. A groundwater monitoring program is required to verify that the technology is effective.	Effective over time for meeting groundwater RAOs once sources of groundwater impacts have been addressed. If sources cannot be fully addressed, MNA is effective in providing a decreasing trend of groundwater COC.	Implementable. Requires monitoring to demonstrate reduction of contaminants.	Low Capital Cost. Moderate O&M Cost.	Yes

Table 4-6

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Remedial Technology Evaluation for Groundwater

General Response Action	Remedial Technology Type	Technology Process Option	Description	Effectiveness	Implementability	Relative Cost	Retained?
In-Situ Treatment	Biological Treatment	In-Situ Bioremediation/ Aerobic Biodegradation	Implemented by adding an oxygen source and nutrients in order to stimulate naturally occurring microbial action.	Effective in treating organic constituents, including PAHs, when concentrations of COC are low or moderate. Effectiveness dependent upon contact through the groundwater column and therefore is less effective in less porous soils such as clays and silts. Long-term management and monitoring may be required to achieve groundwater RAOs. Less effective if ongoing sources of groundwater impacts cannot be fully addressed.	Readily implementable outside the former gas holder. Technology is proven and is being implemented at MGP sites in New York State. Implementation is accomplished using drill rigs, injection wells, and other common equipment. Restricted access / unreliable inside former gas holder.	Low to Moderate	Yes (outside holder) No (inside holder)
	Chemical Treatment	In-Situ Chemical Oxidation (ISCO)	Involves the injection of chemicals such as ozone, hydrogen peroxide, magnesium peroxide, sodium persulfate, or potassium permanganate into the subsurface using injection wells or well points. The chemical oxidants react with contaminants to reduce mass.	ISCO is potentially effective for use with moderate concentrations of COC in soil or groundwater. It may be necessary to perform multiple injections. It may be more effective in areas with lower concentrations of contaminants and may be useful in areas where access is difficult because of existing structures.	Readily implementable outside the former gas holder; however, the relatively rapid consumption of ISCO would require multiple applications. Restricted access/ unreliable inside former gas holder.	Moderate	No
Treatment	Water Treatment	Organic Treatment	Treatment of organic compounds in groundwater extracted during remedial activities may be required for a number of potential technologies. Specific treatment processes to be considered during design may include air stripping, granular activated carbon adsorption, or chemical/UV oxidation.	This technology process would be effective at meeting the RAOs for prevention of exposure to contaminants in groundwater. Process would potentially be used as part of a treatment train to treat groundwater removed from excavation areas. Has potential to be used as part of a treatment system to meet the RAOs.	This technology is implementable, and will be used in conjunction with the dewatering activities during excavation or containment.	Moderate Capital. Moderate-High O&M.	Yes
		Inorganic Treatment	Treatment of inorganic chemicals in groundwater extracted during remedial activities may be required for a number of potential technologies. Specific treatment processes which may be incorporated into the treatment system include chemical precipitation, ion exchange/adsorption, filtration, or peroxide oxidation.	This technology process would be effective at meeting the RAO for prevention of exposure to contaminants in groundwater. Process would potentially be used as part of a treatment train to treat groundwater removed from excavation areas. Has potential to be used as part of a treatment system to meet the RAOs.	This technology is implementable, and will be used in conjunction with the dewatering activities during excavation or containment.	Moderate Capital. Moderate-High O&M.	Yes
Containment	Process Barriers	Chemical Containment	Containment by a line of wells downgradient of the impacted area, which are used to chemically degrade the COC, usually by addition of an oxidant such as ozone, hydrogen peroxide, or potassium permanganate. The groundwater is treated in-situ before it migrates off-site.	Potentially effective to meet the RAOs for prevention of off-site migration of COC in groundwater. Not effective to meet the RAOs for restoring the groundwater aquifer, removing the source of groundwater impact, or prevention of direct contact.	Implementable. This Site has a low groundwater gradient and slow groundwater movement, enhancing implementability.	Moderate Capital. Moderate-High O&M.	No
		Permeable Reactive Barrier	Treatment chemical or carbon is mixed with soil in order to prevent migration of COC in groundwater.	Potentially effective to meet the RAOs for prevention of off-site migration of COC in groundwater. Not effective to meet the RAOs for restoring the groundwater aquifer, removing the source of groundwater impact, or prevention of direct contact.	Implementable. This Site has a low groundwater gradient and slow groundwater movement, enhancing implementability.	Moderate Capital. Moderate-High O&M.	No

Table 4-6

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Remedial Technology Evaluation for Groundwater

General Response Action	Remedial Technology Type	Technology Process Option	Description	Effectiveness	Implementability	Relative Cost	Retained?
Containment	Process Barriers	Hydraulic Containment	Containment is provided by installing groundwater extraction wells or trenches around areas identified as sources of contamination to groundwater. Water is pumped to a treatment system for discharge to surface water or POTW. This technology captures contaminated water before it migrates off-site.	Potentially effective to meet the RAOs for prevention of off-site migration of COC in groundwater. Not effective to meet the RAOs for restoring the groundwater aquifer, removing the source of groundwater impact, or prevention of direct contact.	Implementable. This Site has a low groundwater gradient and slow groundwater movement, enhancing implementability.	Moderate Capital. Moderate-High O&M.	No
		Funnel and Gate	This technology uses impermeable funnel walls to force polluted groundwater through a highly permeable zone of reactive porous media (i.e., "the gates"), where contaminants are treated using in-situ bioremediation or other treatment process.	Potentially effective to meet the RAOs for prevention of off-site migration of COC in groundwater. Not effective to meet the RAOs for restoring the groundwater aquifer, removing the source of groundwater impact, or prevention of direct contact.	Implementable. This Site has a low groundwater gradient and slow groundwater movement, enhancing implementability.	High	No
	Subsurface Vertical Physical Barriers	Sheet Pile Wall	For this technology, a sheet pile wall will be driven to the depth of the low permeability silt layer as a physical barrier to groundwater migration. Special piles with sealable joints can be used to reduce permeability if needed.	Potentially effective to meet the RAOs for prevention of off-site migration of COC in groundwater. Not effective to meet the RAOs for restoring the groundwater aquifer, removing the source of groundwater impact, or prevention of direct contact.	Iimplementable, but may require use of a low-flow groundwater pump and treat system to remove water that infiltrates into the area within the wall. Long-term O&M of the pump and treat system will be required.	High	No
Discharge	Groundwater Discharge	Discharge to a Local Publicly-Owned Treatment Works (POTW)	Treated or untreated water is discharged to a sanitary sewer and treated at a local POTW facility.	Proven process for effectively disposing of groundwater. Typically requires the least amount of pre-treatment because the discharged water will be subjected to additional treatment at the POTW. Could be used as a component of an overall remedy to meet the RAOs for groundwater.	Implementable. The pipe carrying the treated water will have to be tied into the sewer service in the area around the Site. It will be necessary to obtain approval from the City of Auburn.	Low Capital. Moderate O&M.	Yes
		Discharge to Surface Water via Storm Sewer	Treated water is discharged to surface water, provided that the water quality and quantity meet the allowable discharge requirements for surface water (NYSDEC SPDES compliance).	This technology process would effectively dispose of groundwater. Impacted groundwater would require treatment to achieve water quality discharge limits. Helps in the management of treated water, but does not directly lead to achieving the RAOs for groundwater.	Discharges to surface water must meet substantive requirements of a SPDES permit. Cleanup objectives and sampling requirements may be restrictive.	Low Capital. Moderate O&M.	Yes

Table 5-1

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Remedial Action Objective Summary

Applicable Medium	RAO	Remedial Alternative			
		Alternative 1 No Action	**Alternative 2 Surface Soil Removal, MNA, and ICs/ECs**	**Alternative 3 Surface Soil Removal, Enhanced Aerobic Biodegradation, MNA, and ICs/ECs**	**Alternative 4 Soil Removal with Substation Relocation and MNA**
Surface Soil	Prevent ingestion/direct contact with contaminated surface soil. Prevent inhalation exposure to contaminants volatilizing from surface soil. Prevent migration of contaminants that would result in groundwater contamination.	Not addressed.	Addressed by excavation.	Addressed by excavation.	Addressed by excavation.
Subsurface Soil	Prevent ingestion/direct contact with contaminated subsurface soil. Prevent inhalation exposure to contaminants volatilizing from subsurface soil. Prevent migration of contaminants that would result in groundwater contamination.	Not addressed.	Addressed by MNA and SMP.	Addressed by enhanced aerobic biodegradation, MNA and SMP.	Addressed by excavation.
Groundwater	Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards. Prevent contact with or inhalation of volatiles from contaminated groundwater. Remove the source of groundwater or surface water contamination. Prevent discharge of contaminants to surface water. Restore the groundwater aquifer to pre-disposal/pre-release conditions to the extent practicable.	Not addressed.	Addressed by MNA and SMP.	Addressed by enhanced aerobic biodegradation, MNA and SMP.	Addressed by excavation, enhanced aerobic biodegradation, MNA, and SMP.
Soil Vapor	Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.	Not addressed	Addressed by MNA and SMP.	Addressed by MNA and SMP.	Addressed by MNA and SMP.

RAO - Remedial Action Objective
SMP - Site Management Plan
MNA - Monitored Natural Attenuation
ICs/ECs - Institutional Controls/ Engineering Controls

Table 5-2

Former Auburn Green Street MGP Site
Auburn, Cayuga County, New York

Comparative Ranking for Remedial Alternatives

Alternative	Description	Threshold Criteria		Balancing Criteria						
		Overall Protection of Human Health and the Environment	Compliance with SCGs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, & Volume Through Treatment	Short-Term Effectiveness	Implementability	Land Use	Total Cost Range (-30 to +50%)	Cost Effectiveness
1	No Action	Not protective	Not compliant	4	4	1	1	4	No Cost	No Cost
2	Surface Soil Removal, MNA, ICs/ECs	Protective	Compliant	3	3	2	2	3	$330,000	2
3	Surface Soil Removal, Enhanced Aerobic Biodegradation, MNA, ICs/ECs	Protective	Compliant	2	2	3	3	2	$545,000	1
4	Soil Removal with Substation Relocation, MNA, ICs/ECs	Protective	Compliant	1	1	4	4	1	$20,480,000	3

Comparative Ranking:

1 - Ranked First - - Best
2 - Ranked Second
3 - Ranked Third
4 - Ranked Fourth - - Last

TABLE 5-3

FORMER AUBURN GREEN STREET MGP SITE
AUBURN, CAYUGA COUNTY, NEW YORK

CAPITAL COSTS SUMMARY

ALTERNATIVE 2						
DESCRIPTION	**QTY**	**UOM**	**UNIT COST**	**PROFIT ON SUB**	**TOTAL UNIT COST**	**TOTAL COST**
MOBILIZATION AND DEMOBILIZATION						**$ 13,817.91**
* Equipment and Personnel Mob/Demob (PRIME)	$ 1	LS	$ 1,000		$ 1,000	$ 1,000
* Equipment and Personnel Mob/Demob (SUB), assume 25% of Prime Mob cost	$ 1	LS	$ 250	$ 25	$ 275	$ 275
* Plans and Submittals	$ 1	LS	$ 10,000		$ 10,000	$ 10,000
* Permitting and Compliance	$ 1	LS	$ 1,000		$ 1,000	$ 1,000
Project Signage	$ 1	EA	$ 543		$ 543	$ 543
* Utility Location	$ 1	LS	$ 500		$ 500	$ 500
* Traffic Controls	$ 1	LS	$ 500		$ 500	$ 500
SITE FACILITIES						**$ 4,318**
Storage Trailer	$ 1	MO	$ 81		$ 81	$ 81
Sanitary Facilities (Port-o-John and Handwash Station)	$ 1	MO	$ 380		$ 380	$ 380
Temporary Fencing	$ 120	LF	$ 10		$ 10	$ 1,146
Project Manager	$ 2	HR	$ 144		$ 144	$ 288
Site Superintendent	$ 16	HR	$ 135		$ 135	$ 2,160
Home Office Administration	$ 4	HR	$ 66		$ 66	$ 263
SURVEY						**$ 1,911**
Surveying, per day	$ 2	DAY	$ 868	$ 87	$ 955	$ 1,911
EROSION AND SEDIMENT CONTROL						**$ 263**
Catch Basin/DI Inlet Protection	$ 5	EA	$ 53		$ 53	$ 263
HEALTH AND SAFETY						**$ 3,882**
On-Site Safety Officer	$ 16	HR	$ 89		$ 89	$ 1,416
* PPE	$ 1	LS	$ 200		$ 200	$ 200
* CAMP	$ 1	WEEK	$ 2,060	$ 206	$ 2,266	$ 2,266
CLEARING AND GRUBBING						**$ 2,200**
* Tree & Brush Clearing, Grubbing, Chipping, Transport and Disposal	$ 1	LS	$ 2,000	$ 200	$ 2,200	$ 2,200
EXCAVATION AND SOIL MANAGEMENT						**$ 716**
Shallow Excavation	$ 30	CY	$ 24		$ 24	$ 716
TRANSPORT AND DISPOSAL						**$ 5,611**
Soil, Non-Hazardous (1.5 x Shallow Excavation)	$ 45	TON	$ 113	$ 11	$ 124	$ 5,571
C&D/Contractor-generated Waste	$ 2	TON	$ 18	$ 2	$ 20	$ 40
SAMPLING						**$ 1,654**
Excavation Compliance Sample Analysis	$ 5	EA	$ 217		$ 217	$ 1,087
Waste Characterization Sample Analysis (may be included in disposal cost)	$ 1	EA	$ 567		$ 567	$ 567
BACKFILL, GRADING AND COMPACTION						**$ 1,936**
Demarcation Barrier	$ 81	SY	$ 2		$ 2	$ 199
Topsoil Placement (Same as Shallow Excavation, Assume 1 ft of topsoil)	$ 30	CY	$ 5		$ 5	$ 162
Topsoil Purchase, including delivery	$ 30	CY	$ 53		$ 53	$ 1,575
RESTORATION						**$ 5,132**
Seeding	$ 0	AC	$ 4,371	$ 437	$ 4,808	$ 240
Sidewalk Replacement	$ 48	SF	$ 4		$ 4	$ 180
Planting (Trees and Shrubs)	$ 15	EA	$ 300		$ 300	$ 4,500
Fencing	$ 20	LF	$ 11		$ 11	$ 211
MONITORING WELLS						**$ 3,678**
Monitoring Well Installation and Development	$ 40	LF	$ 84	$ 8	$ 92	$ 3,678
FINAL REPORTING						**$ 23,000**
* Construction Completion Report	$ 1	LS	$ 7,500		$ 7,500	$ 7,500
Environmental Easement - Alta Survey	$ 1	LS	$ 7,500		$ 7,500	$ 7,500
* Site Management Plan (ICs/ECs)	$ 1	LS	$ 8,000		$ 8,000	$ 8,000
CAPITAL COSTS SUBTOTAL						**$ 68,119**

TABLE 5-3

FORMER AUBURN GREEN STREET MGP SITE
AUBURN, CAYUGA COUNTY, NEW YORK

CAPITAL COSTS SUMMARY

ALTERNATIVE 3								
DESCRIPTION	**$**	**-**	**QTY**	**UOM**	**UNIT COST**	**PROFIT ON SUB**	**TOTAL UNIT COST**	**TOTAL COST**
MOBILIZATION AND DEMOBILIZATION	$	-	$ -	$ -	$ -	$ -	$ -	**$ 15,390**
* Equipment and Personnel Mob/Demob (PRIME)			$ 1	LS	$ 1,000	$ -	$ 1,000	$ 1,000
* Equipment and Personnel Mob/Demob (SUB), assume $1000			$ 1	LS	$ 1,000	$ 100	$ 1,100	$ 1,100
* Plans and Submittals			$ 1	LS	$ 5,000	$ -	$ 5,000	$ 5,000
* Permitting and Compliance			$ 1	LS	$ 2,000	$ -	$ 2,000	$ 2,000
Staging Area Construction			$ 250	SY	$ 11	$ -	$ 11	$ 2,748
Project Signage			$ 1	EA	$ 543	$ -	$ 543	$ 543
Utility Location			$ 1	LS	$ 2,000	$ -	$ 2,000	$ 2,000
* Traffic Controls			$ 1	LS	$ 1,000	$ -	$ 1,000	$ 1,000
SITE FACILITIES	$	-						**$ 19,648**
Storage Trailer			$ 1	MO	$ 81	$ -	$ 81	$ 81
Sanitary Facilities (Port-o-John and Handwash Station)			$ 1	MO	$ 380	$ -	$ 380	$ 380
Project Manager			$ 40	HR	$ 144	$ -	$ 144	$ 5,760
Site Superintendent			$ 80	HR	$ 135	$ -	$ 135	$ 10,800
Home Office Administration			$ 40	HR	$ 66	$ -	$ 66	$ 2,627
SURVEY	$	-						**$ 1,911**
Surveying, per day	$	-	$ 2	DAY	$ 868	$ 87	$ 955	$ 1,911
EROSION AND SEDIMENT CONTROL	$	-						**$ 263**
Catch Basin/DI Inlet Protection	$	-	$ 5	EA	$ 53	$ -	$ 53	$ 263
HEALTH AND SAFETY								**$ 12,612**
On-Site Safety Officer	**$**	**-**	$ 80	HR	$ 89	$ -	$ 89	$ 7,080
PPE	$	-	$ 1	LS	$ 1,000	$ -	$ 1,000	$ 1,000
* CAMP	$	-	$ 2	WEEK	$ 2,060	$ 206	$ 2,266	$ 4,532
CLEARING AND GRUBBING (N/A)	$	-						**$ -**
Tree & Brush Clearing, Grubbing, Chipping, Transport and Disposal			$ -	LS	$ 11,941	$ 1,194	$ 13,135	$ -
EXCAVATION AND SOIL MANAGEMENT								**$ 716**
Shallow Excavation	$	-	$ 30	CY	$ 24	$ -	$ 24	$ 716
TRANSPORT AND DISPOSAL	$	-						**$ 6,576**
Soil, Non-Hazardous (1.5 x Shallow Excavation)			$ 45	TON	$ 113	$ 11	$ 124	$ 5,571
C&D/Contractor-generated Waste	$	-	$ 50	TON	$ 18	$ 2	$ 20	$ 1,004
IN-SITU GROUNDWATER TREATMENT	$	-						**$ 63,883**
WELL INSTALLATION	$	-						
4-Inch Vertical Injection Well Installation and Development			$ 280	LF	$ 84	$ 8	$ 92	$ 25,744
Vertical Well Drilling Mobilization	$	-	$ 1	LS	$ 10,000	$ 1,000	$ 11,000	$ 11,000
ORC Sock Installation	$	-						
ORC Socks	$	-	$ 160	EA	$ 138	$ 14	$ 152	$ 24,273
Labor (2 laborers, 10-hr days; weighted average rate to account for overtime work)			$ 20	HR	$ 107	$ 11	$ 117	$ 2,343
Pickup Truck with Storage Container	$	-	$ 20	HR	$ 24	$ 2	$ 26	$ 523
SAMPLING	$	-						**$ 1,654**
Excavation Compliance Sample Analysis	$	-	$ 5	EA	$ 217	$ -	$ 217	$ 1,087
Waste Characterization Sample Analysis (may be included in disposal cost)			$ 1	EA	$ 567	$ -	$ 567	$ 567
BACKFILL, GRADING AND COMPACTION	$	-						**$ 1,936**
Demarcation Barrier	$	-	$ 81	SY	$ 2	$ -	$ 2	$ 199
Topsoil Purchase, including delivery	$	-	$ 30	CY	$ 53	$ -	$ 53	$ 1,575
Topsoil Placement (Same as Shallow Excavation, Assume 1 ft of topsoil)			$ 30	CY	$ 5	$ -	$ 5	$ 162
RESTORATION	$	-						**$ 11,188**
Seeding	$	-	$ 0	AC	$ 4,371	$ 437	$ 4,808	$ 240
Asphalt Paving	$	-	$ 400	SF	$ 15	$ -	$ 15	$ 6,056
Sidewalk Replacement	$	-	$ 48	SF	$ 4	$ -	$ 4	$ 180
Planting (Trees and Shrubs)	$	-	$ 15	EA	$ 300	$ -	$ 300	$ 4,500
Fencing	$	-	$ 20	LF	$ 11	$ -	$ 11	$ 211
MONITORING WELLS	$	-						**$ 3,678**
Monitoring Well Installation and Development			$ 40	LF	$ 84	$ 8	$ 92	$ 3,678
FINAL REPORTING	$	-						**$ 37,500**
Construction Completion Report	$	-	$ 1	LS	$ 20,000	$ -	$ 20,000	$ 20,000
Environmental Easement - Alta Survey	$	-	$ 1	LS	$ 7,500	$ -	$ 7,500	$ 7,500
Site Management Plan (ICs/ECs)	$	-	$ 1	LS	$ 10,000	$ -	$ 10,000	$ 10,000
CAPITAL COSTS SUBTOTAL	$	-	$ -					**$ 176,955**

TABLE 5-3

FORMER AUBURN GREEN STREET MGP SITE
AUBURN, CAYUGA COUNTY, NEW YORK

CAPITAL COSTS SUMMARY

ALTERNATIVE 4								
DESCRIPTION	**$**	**-**	**QTY**	**UOM**	**UNIT COST**	**PROFIT ON SUB**	**TOTAL UNIT COST**	**TOTAL COST**
MOBILIZATION AND DEMOBILIZATION	$	-						**$ 207,537**
Equipment and Personnel Mob/Demob (PRIME)			$ 1	LS	$ 17,911	$ -	$ 17,911	$ 17,911
Equipment and Personnel Mob/Demob (SUB), assume 25% of Prime Mob cost			$ 1	LS	$ 4,478	$ 448	$ 4,925	$ 4,925
Water Treatment System Mob and Construction			$ 1	LS	$ 119,405	$ -	$ 119,405	$ 119,405
Plans and Submittals	$	-	$ 1	LS	$ 36,016	$ -	$ 36,016	$ 36,016
Permitting and Compliance	$	-	$ 1	LS	$ 5,628	$ -	$ 5,628	$ 5,628
Project Signage	$	-	$ 1	EA	$ 543	$ -	$ 543	$ 543
Staging Area Construction	$	-	$ 250	SY	$ 11	$ -	$ 11	$ 2,748
Temporary Access Roads/Construction Entrance			$ 250	SY	$ 11	$ -	$ 11	$ 2,748
Utility Location	$	-	$ 1	LS	$ 2,000	$ -	$ 2,000	$ 2,000
Traffic Controls	$	-	$ 1	LS	$ 2,000	$ -	$ 2,000	$ 2,000
Material Storage (stockpile) setup	$	-	$ 1	LS	$ 13,614	$ -	$ 13,614	$ 13,614
SITE FACILITIES	$	-						**$ 293,384**
Contractor's Trailer	$	-	$ 8	MO	$ 252	$ -	$ 252	$ 2,012
Engineer's/Client's Trailer	$	-	$ 8	MO	$ 252	$ -	$ 252	$ 2,012
Storage Trailer	$	-	$ 8	MO	$ 81	$ -	$ 81	$ 652
Sanitary Facilities (Port-o-John and Handwash Station)			$ 8	MO	$ 380	$ -	$ 380	$ 3,040
Electricity	$	-	$ 8	MO	$ 162	$ -	$ 162	$ 1,296
Internet	$	-	$ 8	MO	$ 100	$ -	$ 100	$ 800
Temporary Fencing	$	-	$ 50	LF	$ 10	$ -	$ 10	$ 478
Project Manager	$	-	$ 320	HR	$ 144	$ -	$ 144	$ 46,080
Site Superintendent	$	-	$ 1,600	HR	$ 135	$ -	$ 135	$ 216,000
Home Office Administration	$	-	$ 320	HR	$ 66	$ -	$ 66	$ 21,015
SURVEY	$	-						**$ 19,106**
Surveying, per day	$	-	$ 20	DAY	$ 868	$ 87	$ 955	$ 19,106
EROSION AND SEDIMENT CONTROL	$	-						**$ 716**
Silt Fence	$	-	$ 250	LF	$ 2	$ -	$ 2	$ 453
Catch Basin/DI Inlet Protection	$	-	$ 5	EA	$ 53	$ -	$ 53	$ 263
HEALTH AND SAFETY	**$**	**-**						**$ 325,759**
On-Site Safety Officer	**$**	**-**	$ 1,600	HR	$ 89	$ -	$ 89	$ 141,600
Odor Control	$	-	$ 8	MO	$ 10,985	$ -	$ 10,985	$ 87,882
Dust Control	$	-	$ 8	MO	$ 2,846	$ -	$ 2,846	$ 22,765
CAMP	$	-	$ 8	MO	$ 8,240	$ 824	$ 9,064	$ 72,512
PPE	$	-	$ 1	LS	$ 1,000	$ -	$ 1,000	$ 1,000
CLEARING AND GRUBBING	$	-						**$ 13,135**
Tree & Brush Clearing, Grubbing, Chipping, Transport and Disposal			$ 1	LS	$ 11,941	$ 1,194	$ 13,135	$ 13,135
EXCAVATION AND SOIL MANAGEMENT	**$**	**-**						**$ 174,551**
Shallow Excavation	$	-	$ 30	CY	$ 24	$ -	$ 24	$ 716
Deep Excavation, placement in rolloff and mixing with moisture amendment			$ 5,400	CY	$ 14	$ -	$ 14	$ 72,933
Moisture Control (LKD/CKD) (Assume 5% of Soil T&D Quantity)			$ 407	TON	$ 248	$ -	$ 248	$ 100,903
EXCAVATION PROTECTION	$	-						**$ 585,265**
Temporary Sheet Piling	$	-	$ 10,000	SF	$ 59	$ -	$ 59	$ 585,265
TRANSPORT AND DISPOSAL	$	-						**$ 1,010,408**
Soil, Non-Hazardous (shallow plus deep excavation)			$ 8,145	TON	$ 113	$ 11	$ 124	$ 1,008,400
C&D/Contractor-generated Waste	$	-	$ 100	TON	$ 18	$ 2	$ 20	$ 2,009
DEWATERING	$	-						**$ 173,571**
Treatment System Operation and Maintenance			$ 32	WK	$ 4,299	$ -	$ 4,299	$ 137,555
Sampling/Analysis	$	-	$ 32	EA	$ 1,126	$ -	$ 1,126	$ 36,016
SAMPLING	$	-						**$ 4,704**
Excavation Compliance Sample Analysis	$	-	$ 6	EA	$ 217	$ -	$ 217	$ 1,305
Waste Characterization Sample Analysis (may be included in disposal cost)			$ 6	EA	$ 567	$ -	$ 567	$ 3,399
BACKFILL, GRADING AND COMPACTION	$	-						**$ 274,583**
Fill Purchase (1.2 x Deep Excavation)	$	-	$ 6,480	CY	$ 30	$ -	$ 30	$ 192,002
ORC Material Purchase	$	-	$ 1	TON	$ 16,000	$ -	$ 16,000	$ 16,000
Demarcation Barrier (Deep Excavation Surface Area + Shallow Excavation Area)			$ 1,700	SY	$ 2	$ -	$ 2	$ 4,182
Topsoil Placement (Shallow Excavation and Deep Excavation)			$ 163	CY	$ 5	$ -	$ 5	$ 882
Topsoil Purchase, including delivery			$ 163	CY	$ 53	$ -	$ 53	$ 8,575
Grading Deep Excavation Area			$ 800	SY	$ 5	$ -	$ 5	$ 4,320
Backfill and Compaction (Deep Excavation Only)			$ 5,400	ECY	$ 9	$ -	$ 9	$ 48,622
RESTORATION	$	-						**$ 11,909**
Seeding	$	-	$ 0	AC	$ 4,371	$ 437	$ 4,808	$ 962
Asphalt Paving	$	-	$ 400	SF	$ 15	$ -	$ 15	$ 6,056
Sidewalk Replacement	$	-	$ 48	SF	$ 4	$ -	$ 4	$ 180
Planting (Trees and Shrubs)	$	-	$ 15	EA	$ 300	$ -	$ 300	$ 4,500
Fencing	$	-	$ 20	LF	$ 11	$ -	$ 11	$ 211
REAL ESTATE, RELOCATIONS, LANDS AND DAMAGES								**$ 8,250,000**
Relocate Substation	$	-	$ 1	LS	$ 7,500,000	$ -	$ 7,500,000	$ 7,500,000
Commercial Right-of-Way Purchase	$	-	$ 1	LS	$ 750,000	$ -	$ 750,000	$ 750,000
MONITORING WELLS	$	-						**$ 3,678**
Monitoring Well Installation and Development			$ 40	LF	$ 84	$ 8	$ 92	$ 3,678
FINAL REPORTING	$	-						**$ 77,500**
Construction Completion Report	$	-	$ 1	LS	$ 50,000	$ -	$ 50,000	$ 50,000
Environmental Easement - Alta Survey	$	-	$ 1	LS	$ 7,500	$ -	$ 7,500	$ 7,500
Site Management Plan (ICs/ECs)	$	-	$ 1	LS	$ 20,000	$ -	$ 20,000	$ 20,000
#								
CAPITAL COSTS SUBTOTAL	$	-						**$ 11,425,807**

TABLE 5-4

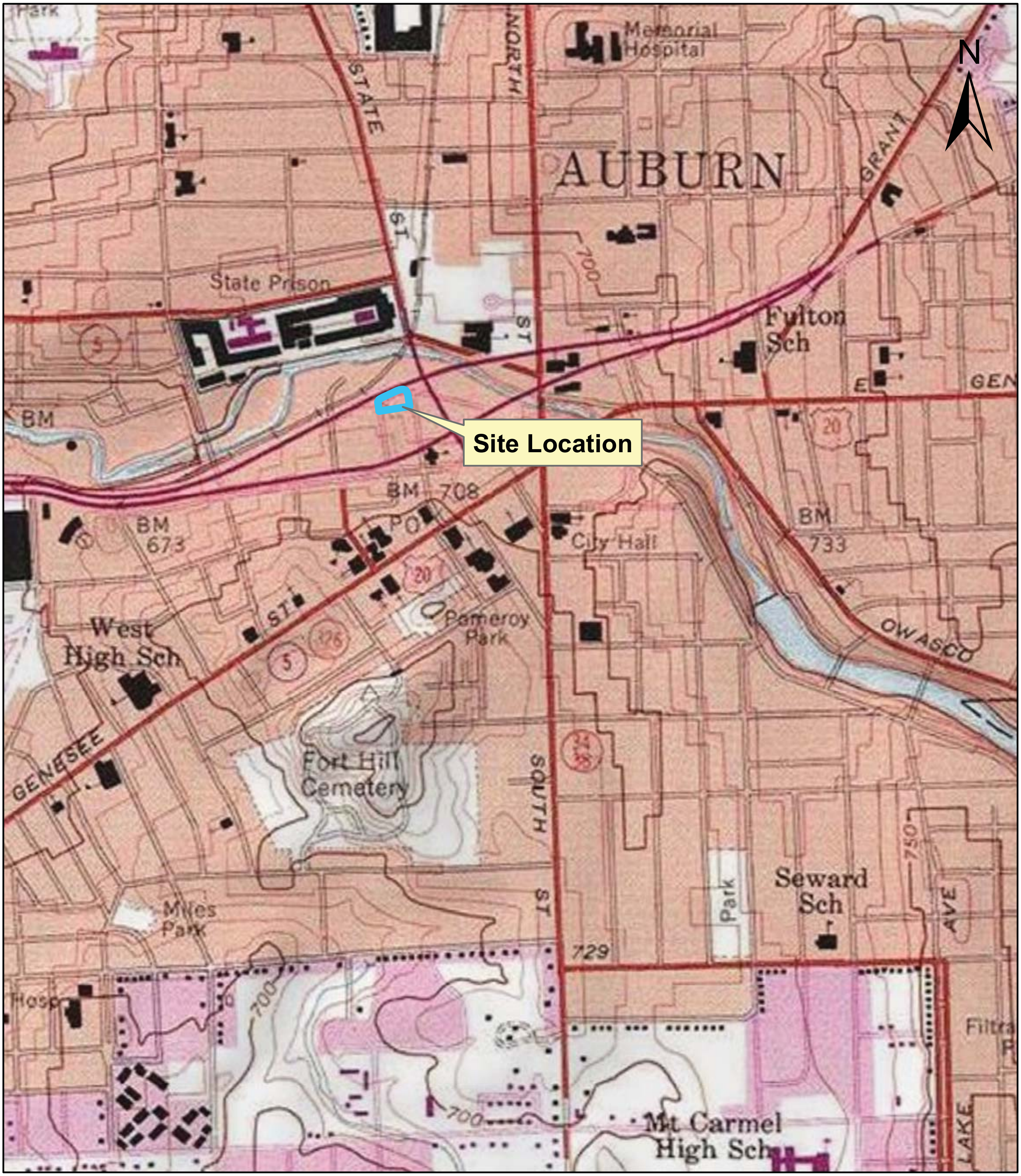
FORMER AUBURN GREEN STREET MGP SITE
AUBURN, CAYUGA COUNTY, NEW YORK

O&M COSTS SUMMARY

ALTERNATIVE 2	Duration	Frequency	Annual Cost	PW (5%)
Annual Inspections	30	yr	$ 1,500	**$ 23,059**
Annual Monitoring				**$ 187,934**
2-Day Site Visit (1 Laborer and 1 pickup for 20 total hours)	30	yr	$ 1,540	$ 23,680
Lab Cost	30	yr	$ 6,385	$ 98,153
Data Validation	30	yr	$ 1,800	$ 27,670
Reporting	30	yr	$ 2,500	$ 38,431
Annual subtotal (no discount):			*$ 13,725*	
O&M SUBTOTAL (PW)				**$ 210,993**
ALTERNATIVE 3	Duration	Frequency	Annual Cost	PW (5%)
Annual Inspections	30	yr	$ 1,500	**$ 23,059**
Quarterly Monitoring (First Year)				**$ 11,643**
2-Day Site Visit (1 Laborer and 1 pickup for 20 total hours)	1	yr	$ 1,540	$ 1,467
Lab Cost	1	yr	$ 6,385	$ 6,081
Data Validation	1	yr	$ 1,800	$ 1,714
Reporting	1	yr	$ 2,500	$ 2,381
Semi-Annual Monitoring (Second Year)				**$ 11,643**
2-Day Site Visit (1 Laborer and 1 pickup for 20 total hours)	1	yr	$ 1,540	$ 1,467
Lab Cost	1	yr	$ 6,385	$ 6,081
Data Validation	1	yr	$ 1,800	$ 1,714
Reporting	1	yr	$ 2,500	$ 2,381
Annual Monitoring (Years 3 through 30)				**$ 182,136**
2-Day Site Visit (1 Laborer and 1 pickup for 20 total hours)	28	yr	$ 1,540	$ 22,949
Lab Cost	28	yr	$ 6,385	$ 95,125
Data Validation	28	yr	$ 1,800	$ 26,817
Reporting	28	yr	$ 2,500	$ 37,245
O&M SUBTOTAL (PW)				**$ 228,481**
ALTERNATIVE 4	Duration	Frequency	Annual Cost	PW (5%)
Annual Inspections	30	yr	$ 1,500	**$ 23,059**
Annual Monitoring (Years 1 through 5)				**$ 52,930**
2-Day Site Visit (1 Laborer and 1 pickup for 20 total hours)	5	yr	$ 1,540	$ 6,669
Lab Cost	5	yr	$ 6,385	$ 27,644
Data Validation	5	yr	$ 1,800	$ 7,793
Reporting	5	yr	$ 2,500	$ 10,824
O&M SUBTOTAL (PW)				**$ 75,988**

Note: Discount rate of 5% used for present worth (PW) calculation.

Figures



Legend

Approximate Site Boundary

Former Auburn Green Street MGP Site
Green Street
Auburn, Cayuga County, New York

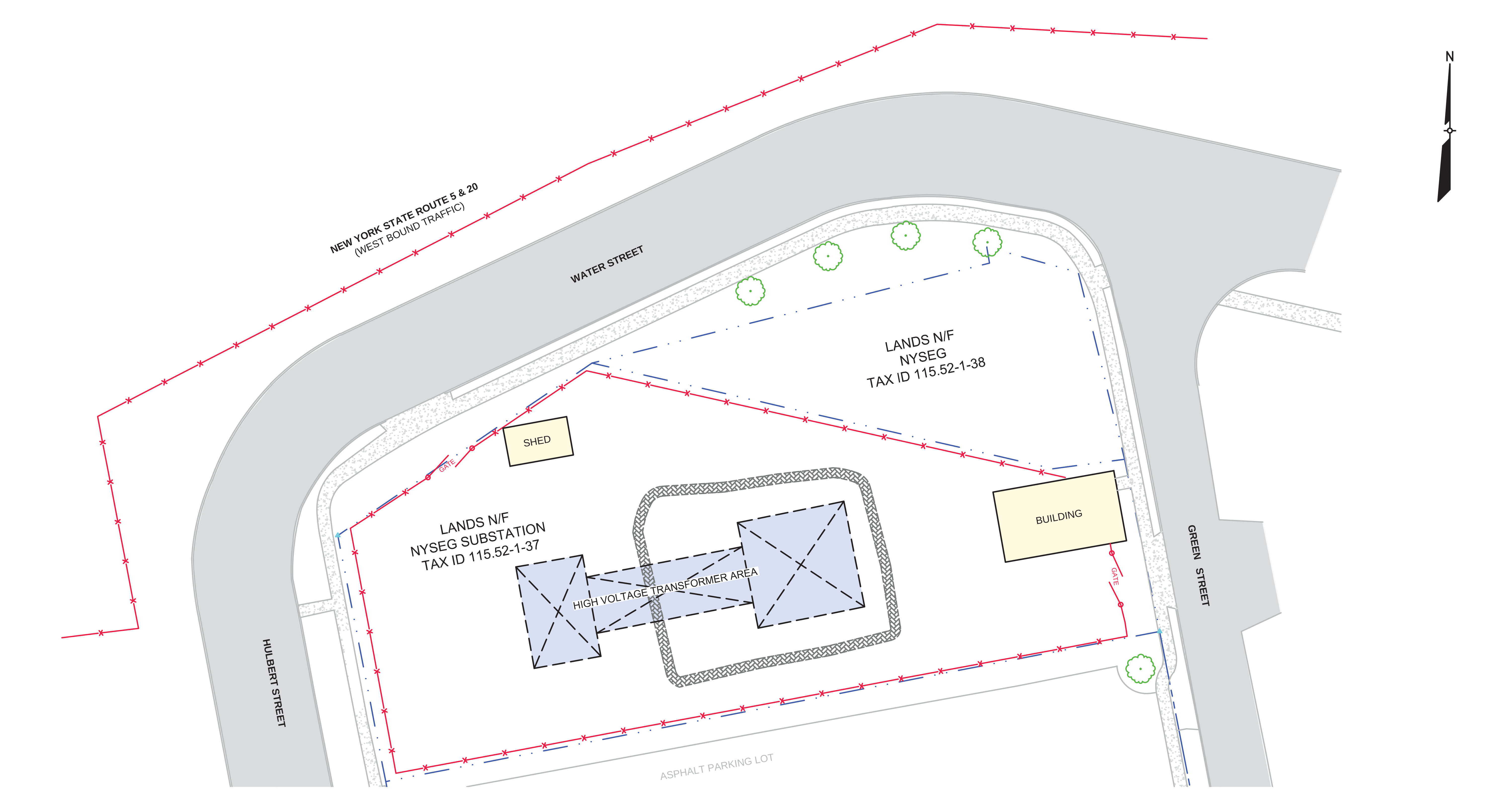
0 700 1,400 2,800 Feet

Figure 1-1

Site Location Map

AECOM

July 2017



LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- FENCE
- BUILDING
- PAVEMENT
- BERM

SOURCE: BASEMAP CREATED USING *T.G. MILLER P.C. ENGINEERS AND SURVEYORS* TOPOGRAPHIC MAP; JUNE 20, 2013.

0 15 30 60

SCALE IN FEET

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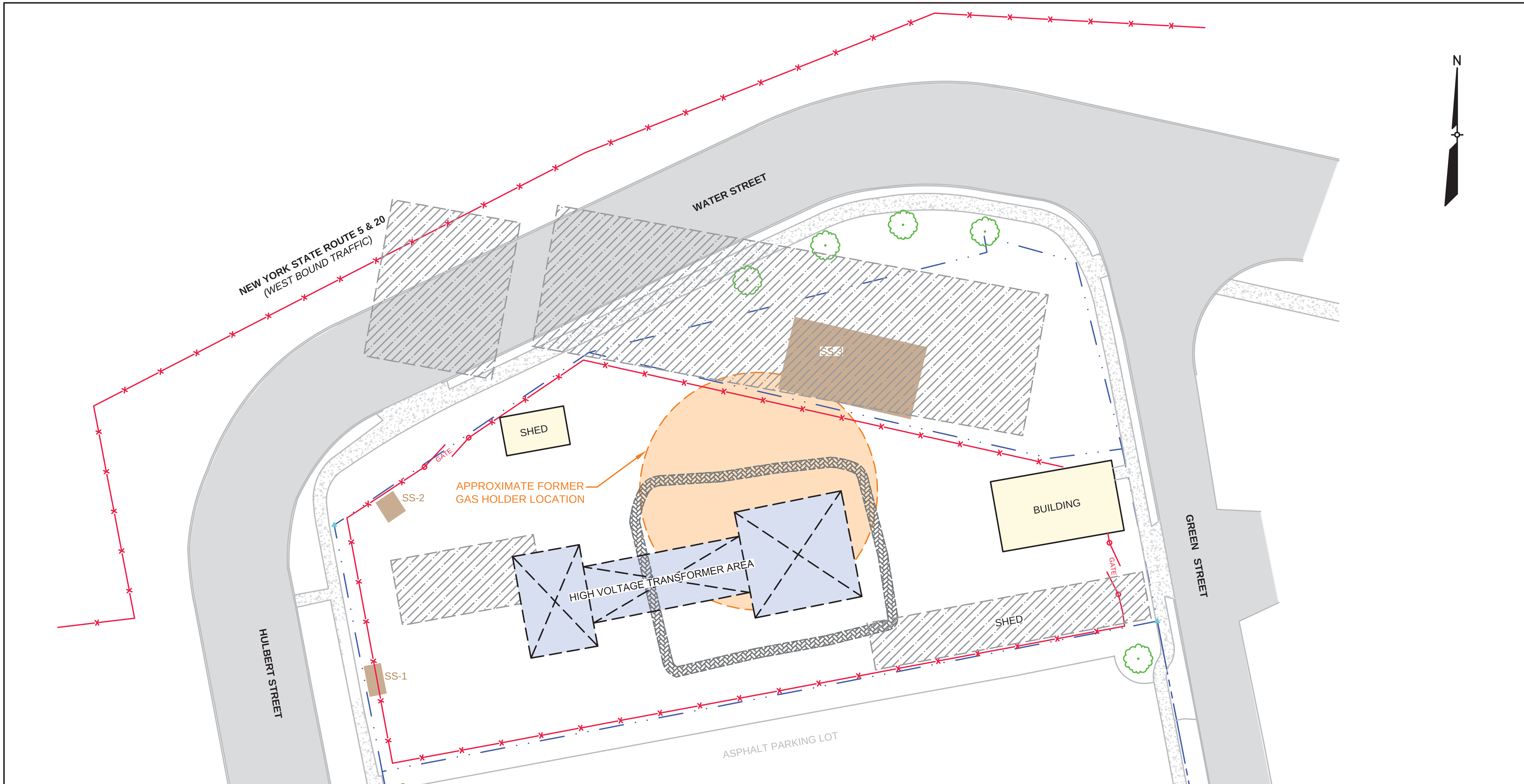
Figure 1-2
Site Location and Area Features

Former Auburn Green Street MGP Site
Green Street
Auburn, Cayuga County, New York

June 2017

60543583



LEGEND

- HISTORICAL SURFACE SOIL SAMPLE
- APPROXIMATE HISTORICAL FEATURES
- BUILDING
- PAVEMENT
- BERM
- APPROXIMATE PROPERTY BOUNDARY
- FENCE
- APPROXIMATE FORMER GAS HOLDER LOCATION

0 15 30 60
SCALE IN FEET

SOURCE: BASEMAP CREATED USING *T.G. MILLER P.C. ENGINEERS AND SURVEYORS* TOPOGRAPHIC MAP; JUNE 20, 2013.

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Figure 1-3
Historical Features

Former Auburn Green Street MGP Site
Green Street
Auburn, Cayuga County, New York

June 2017

60543583

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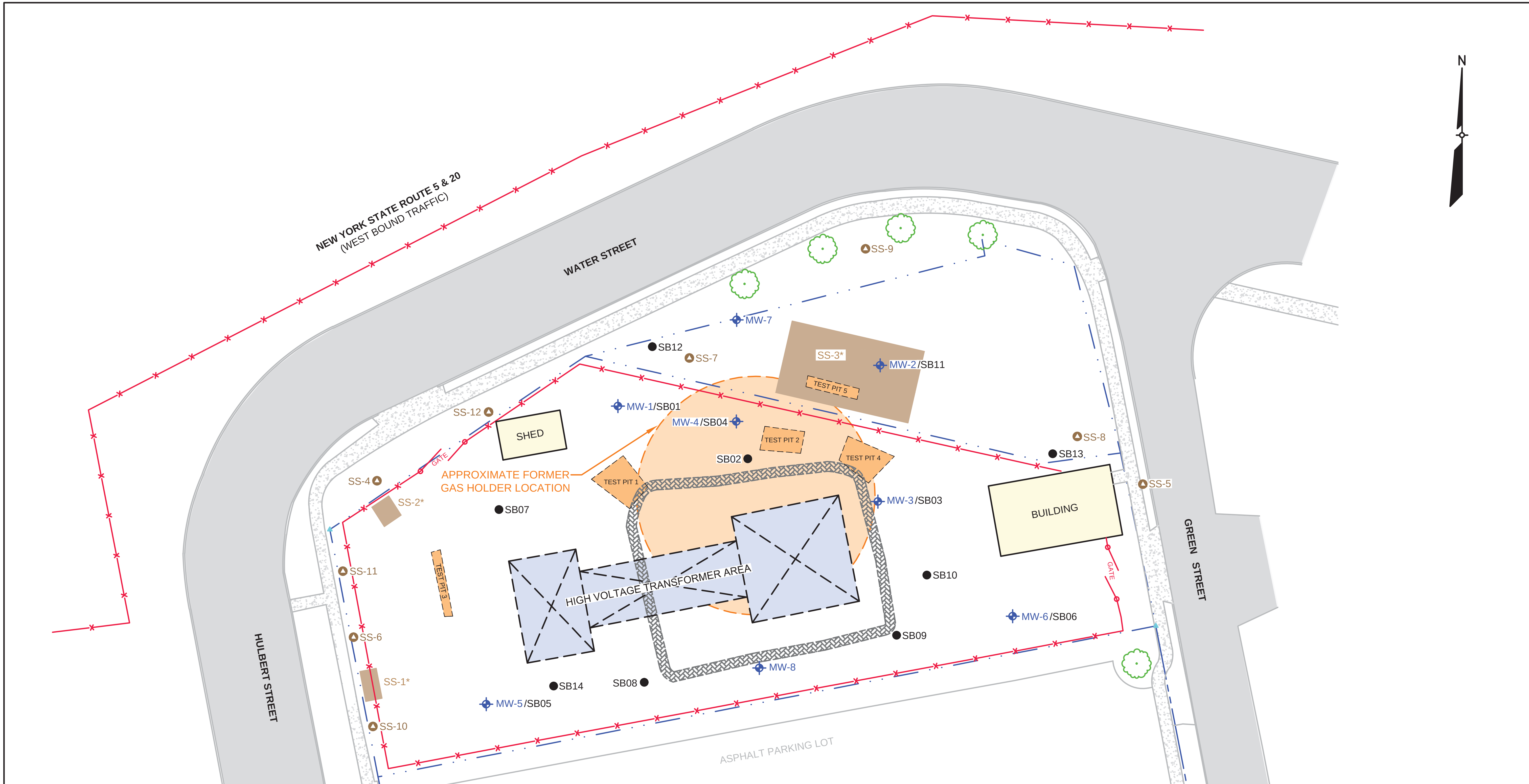

LEGEND

- MONITORING WELL LOCATION
- SURFACE SOIL LOCATION
- SOIL BORING
- HISTORICAL SURFACE SOIL SAMPLE*
- BUILDING
- PAVEMENT
- BERM
- APPROXIMATE PROPERTY BOUNDARY
- FENCE
- APPROXIMATE FORMER GAS HOLDER LOCATION

0 15 30 60
SCALE IN FEET

SOURCE: BASEMAP CREATED USING *T.G. MILLER P.C. ENGINEERS AND SURVEYORS* TOPOGRAPHIC MAP; JUNE 20, 2013.
* ATLANTIC ENVIRONMENTAL SERVICES, INC, SEPTEMBER 1991. "MANUFACTURED GAS PLANT SITE SCREENING REPORT, GREEN STREET SITE, AUBURN, NY"

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Figure 2-1
Sample Location Map

Former Auburn Green Street MGP Site
Green Street
Auburn, Cayuga County, New York

June 2017

60543583

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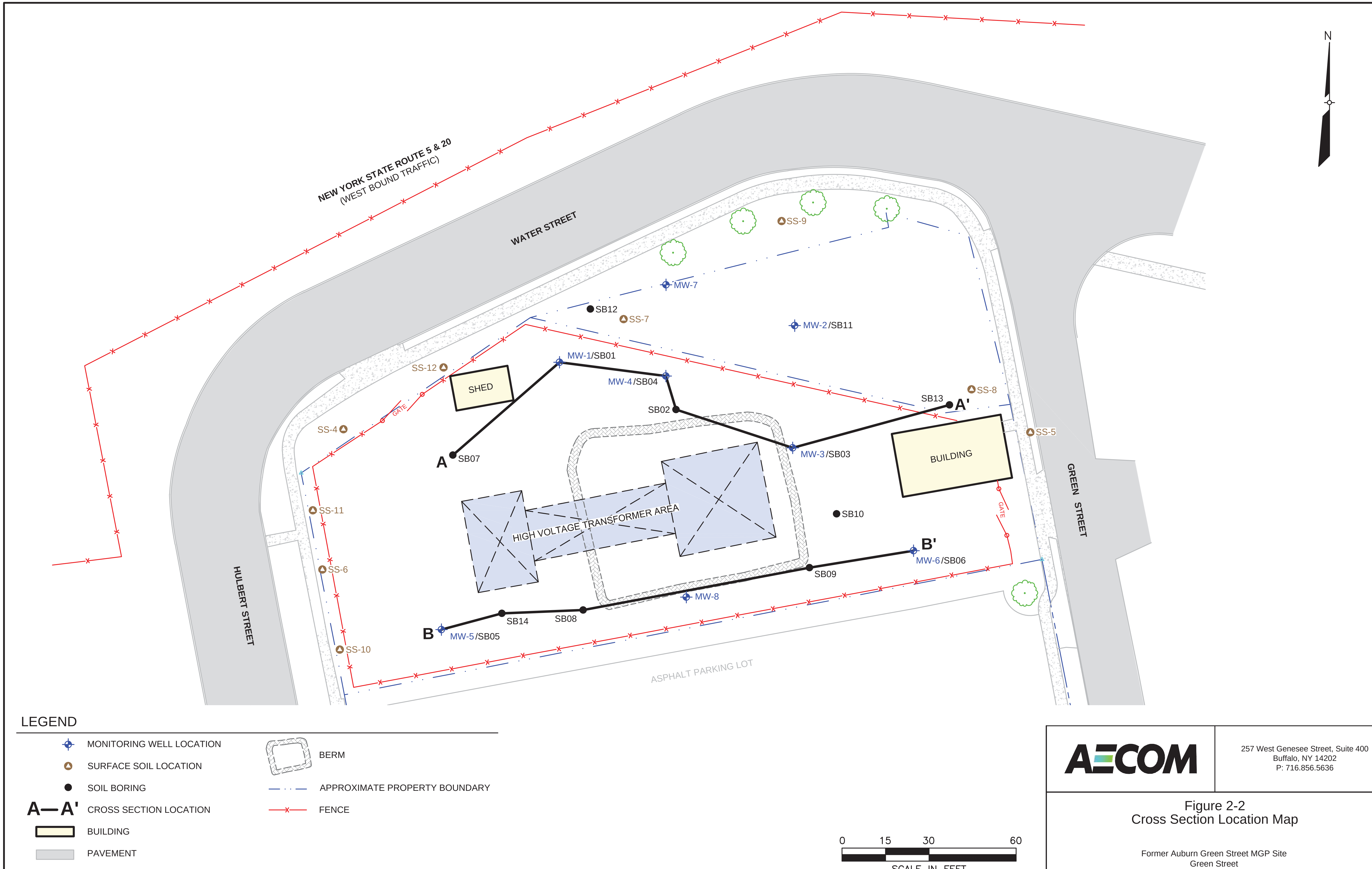

SOURCE: BASEMAP CREATED USING *T.G. MILLER P.C. ENGINEERS AND SURVEYORS* TOPOGRAPHIC MAP; JUNE 20, 2013.

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Figure 2-2
Cross Section Location Map

Former Auburn Green Street MGP Site
Green Street
Auburn, Cayuga County, New York

June 2017

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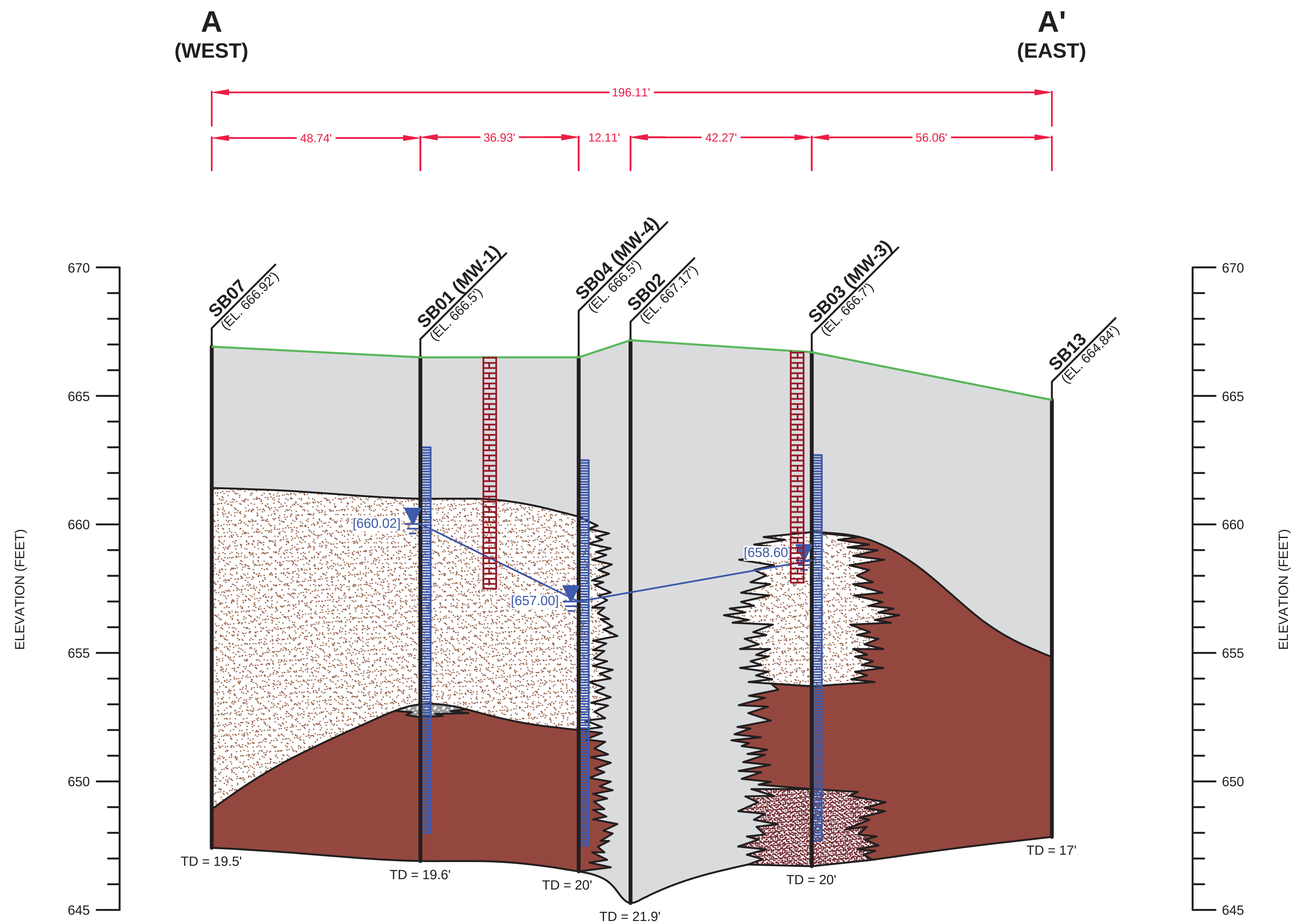

LEGEND

FILL	TD = TOTAL DEPTH
SANDY SILT	BORING
FINE TO COARSE GRAVEL	SCREEN
RED-BROWN SILTY CLAY / CLAYEY SILT	GAS HOLDER WALL
RED-BROWN SILTY FINE SAND	
[660.02] DEPTH TO GROUNDWATER (ft bgs) (MAY 2013)	

VERTICAL SCALE EXAGGERATION 6x

0 2.5 5 10

SCALE IN FEET

HORIZONTAL SCALE

0 15 30 60

SCALE IN FEET

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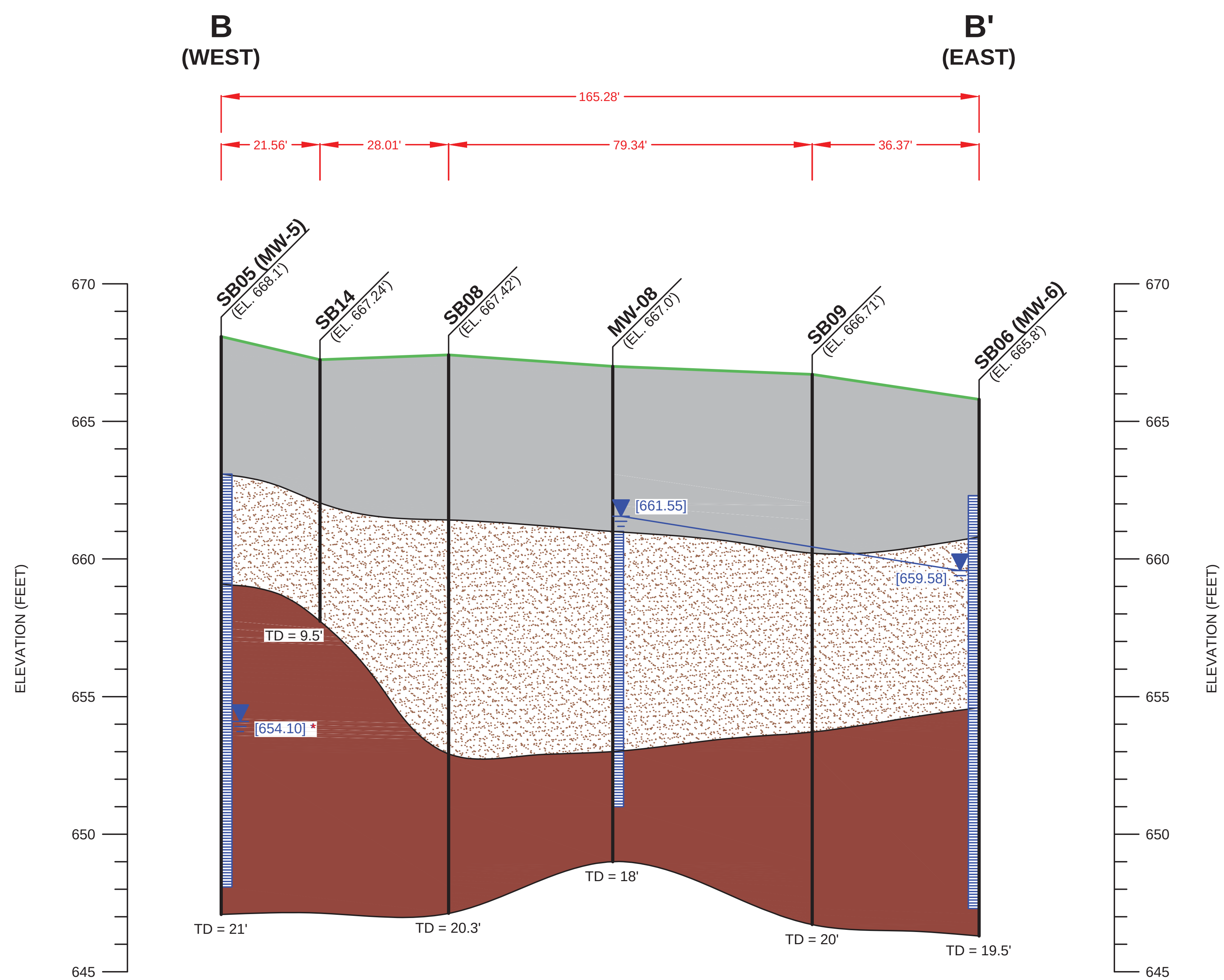
Figure 2-3
Cross Section A - A'

Former Auburn Green Street MGP Site
Green Street
Auburn, Cayuga County, New York

June 2017

60543583



LEGEND

FILL

SANDY SILT

FINE TO COARSE GRAVEL

RED-BROWN SILTY CLAY / CLAYEY SILT

RED-BROWN SILTY FINE SAND

[654.10] DEPTH TO GROUNDWATER (ft bgs) (MAY 2014)

TD = TOTAL DEPTH

BORING

SCREEN

NOTE

1. MW-5* GROUNDWATER ELEVATION IS BELIEVED TO REPRESENT A DIFFERENT WATER LAYER WITH A LOWER HYDRAULIC HEAD COMPARED TO OTHER SITE WELLS.

VERTICAL SCALE EXAGGERATION 6x

0 2.5 5 10

SCALE IN FEET

HORIZONTAL SCALE

0 15 30 60

SCALE IN FEET

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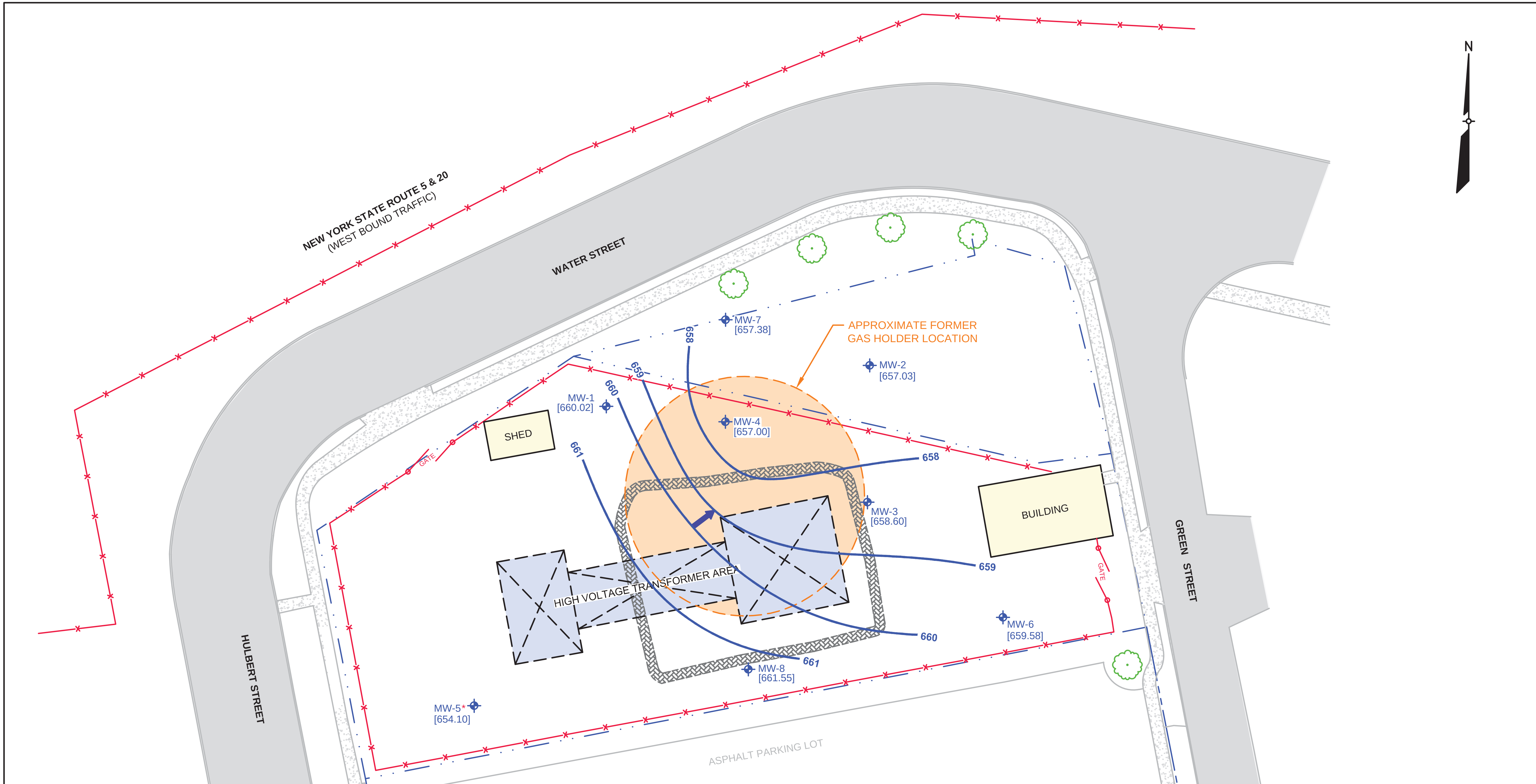
Figure 2-4
Cross Section B - B'

Former Auburn Green Street MGP Site
Green Street
Auburn, Cayuga County, New York

June 2017 60543583



LEGEND

MONITORING WELL LOCATION

[657.00] GROUNDWATER RESULT (feet NAVD 88)

GROUNDWATER CONTOUR

BUILDING

PAVEMENT

BERM

GROUNDWATER FLOW DIRECTION

APPROXIMATE PROPERTY BOUNDARY

FENCE

APPROXIMATE FORMER GAS HOLDER LOCATION

NOTES

1. GROUNDWATER ELEVATION MEASURED ON MAY 12, 2014.
2. MW-5* GROUNDWATER ELEVATION WAS NOT INCLUDED IN CONTOURING. THIS WELL ELEVATION IS BELIEVED TO REPRESENT A DIFFERENT WATER LAYER WITH A LOWER HYDRAULIC HEAD COMPARED TO OTHER SITE WELLS.

0 15 30 60

SCALE IN FEET

SOURCE: BASEMAP CREATED USING *T.G. MILLER P.C. ENGINEERS AND SURVEYORS* TOPOGRAPHIC MAP; JUNE 20, 2013.

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Figure 2-5
Groundwater Flow Map
(May 12, 2014)
Former Auburn Green Street MGP Site

Green Street
Auburn, Cayuga County, New York

June 2017

60543583

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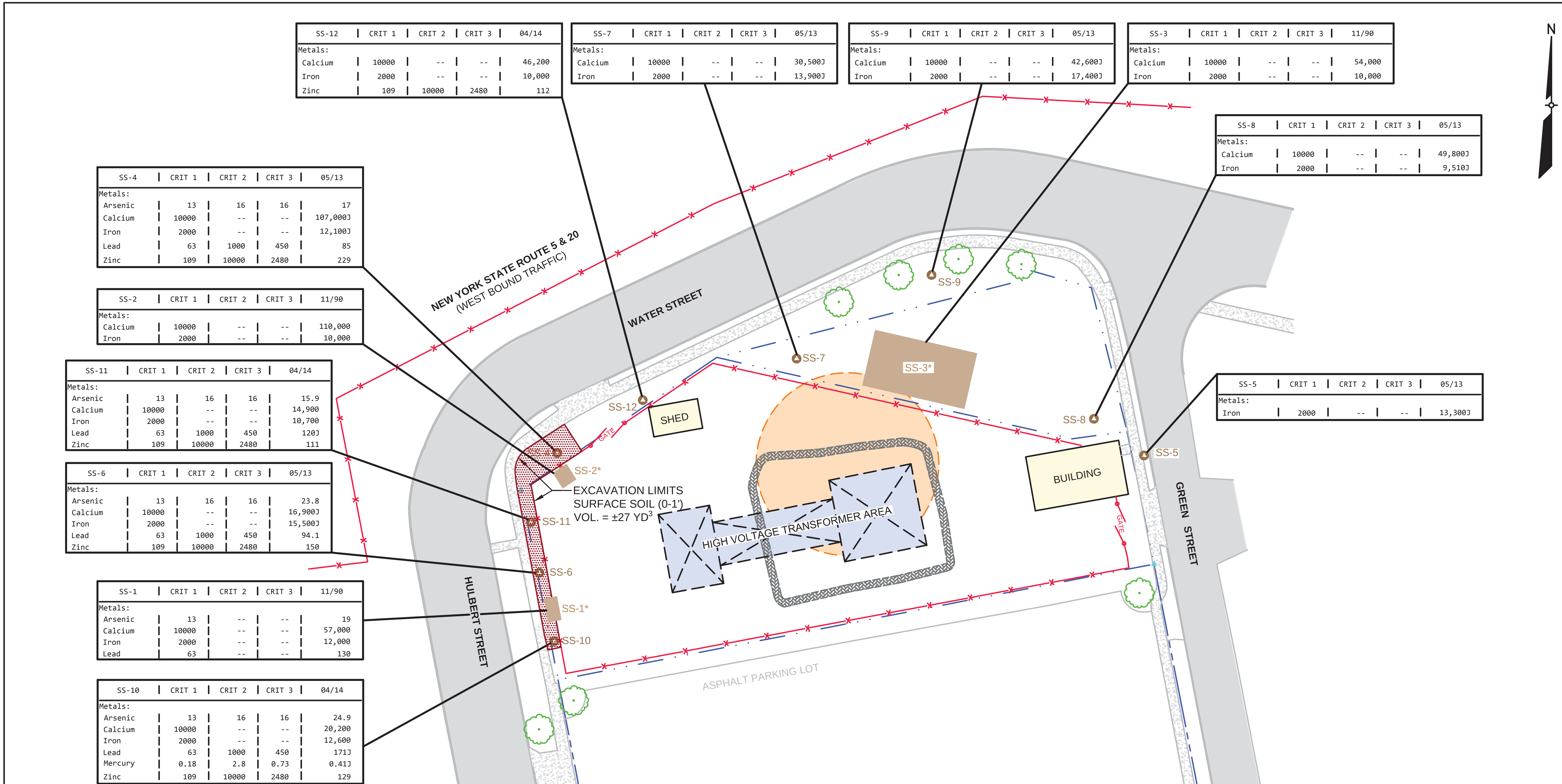

SS-12	CRIT 1	CRIT 2	CRIT 3	04/14
Metals:				
Calcium	10000	--	--	46,200
Iron	2000	--	--	10,000
Zinc	109	10000	2480	112

SS-7	CRIT 1	CRIT 2	CRIT 3	05/13
Metals:				
Calcium	10000	--	--	30,500J
Iron	2000	--	--	13,900J

SS-9	CRIT 1	CRIT 2	CRIT 3	05/13
Metals:				
Calcium	10000	--	--	42,600J
Iron	2000	--	--	17,400J

SS-3	CRIT 1	CRIT 2	CRIT 3	11/90
Metals:				
Calcium	10000	--	--	54,000
Iron	2000	--	--	10,000

SS-8	CRIT 1	CRIT 2	CRIT 3	05/13
Metals:				
Calcium	10000	--	--	49,800J
Iron	2000	--	--	9,510J

SS-5	CRIT 1	CRIT 2	CRIT 3	05/13
Metals:				
Iron	2000	--	--	13,300J

SS-4	CRIT 1	CRIT 2	CRIT 3	05/13
Metals:				
Arsenic	13	16	16	17
Calcium	10000	--	--	107,000J
Iron	2000	--	--	12,100J
Lead	63	1000	450	85
Zinc	109	10000	2480	229

SS-2	CRIT 1	CRIT 2	CRIT 3	11/90
Metals:				
Calcium	10000	--	--	110,000
Iron	2000	--	--	10,000

SS-11	CRIT 1	CRIT 2	CRIT 3	04/14
Metals:				
Arsenic	13	16	16	15.9
Calcium	10000	--	--	14,900
Iron	2000	--	--	10,700
Lead	63	1000	450	120J
Zinc	109	10000	2480	111

SS-6	CRIT 1	CRIT 2	CRIT 3	05/13
Metals:				
Arsenic	13	16	16	23.8
Calcium	10000	--	--	16,900J
Iron	2000	--	--	15,500J
Lead	63	1000	450	94.1
Zinc	109	10000	2480	150

SS-1	CRIT 1	CRIT 2	CRIT 3	11/90
Metals:				
Arsenic	13	--	--	19
Calcium	10000	--	--	57,000
Iron	2000	--	--	12,000
Lead	63	--	--	130

SS-10	CRIT 1	CRIT 2	CRIT 3	04/14
Metals:				
Arsenic	13	16	16	24.9
Calcium	10000	--	--	20,200
Iron	2000	--	--	12,600
Lead	63	1000	450	171J
Mercury	0.18	2.8	0.73	0.41J
Zinc	109	10000	2480	129

LEGEND

- SURFACE SOIL LOCATION
- HISTORICAL SURFACE SOIL SAMPLE*
- BUILDING
- PAVEMENT
- AREAL EXTENT OF SURFACE SOIL REQUIRING REMEDIATION, (0-1')
- BERM
- APPROXIMATE PROPERTY BOUNDARY
- FENCE
- APPROXIMATE FORMER GAS HOLDER LOCATION

		CRITERIA	CRITERIA	CRITERIA	DATE	
LOC. ID	SS-4	CRIT 1	CRIT 2	CRIT 3	05/13	
	Metals:					
PARAMETER	Arsenic	16	16	16	17	CONCENTRATION (mg/kg)

CRITERIA: 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Protection of Public Health, Unrestricted, Commercial, and Protection of Groundwater including CP-51 Table 1, Effective 12/2/10.
CRITERIA 1 = Unrestricted, CRITERIA 2 = Commercial, CRITERIA 3 = Protection of Groundwater
SOURCE: BASEMAP CREATED USING *T.G. MILLER P.C. ENGINEERS AND SURVEYORS* TOPOGRAPHIC MAP; JUNE 20, 2013.
* ATLANTIC ENVIRONMENTAL SERVICES, INC, SEPTEMBER 1991. "MANUFACTURED GAS PLANT SITE SCREENING REPORT, GREEN STREET SITE, AUBURN, NY"

0 20 40 80
SCALE IN FEET

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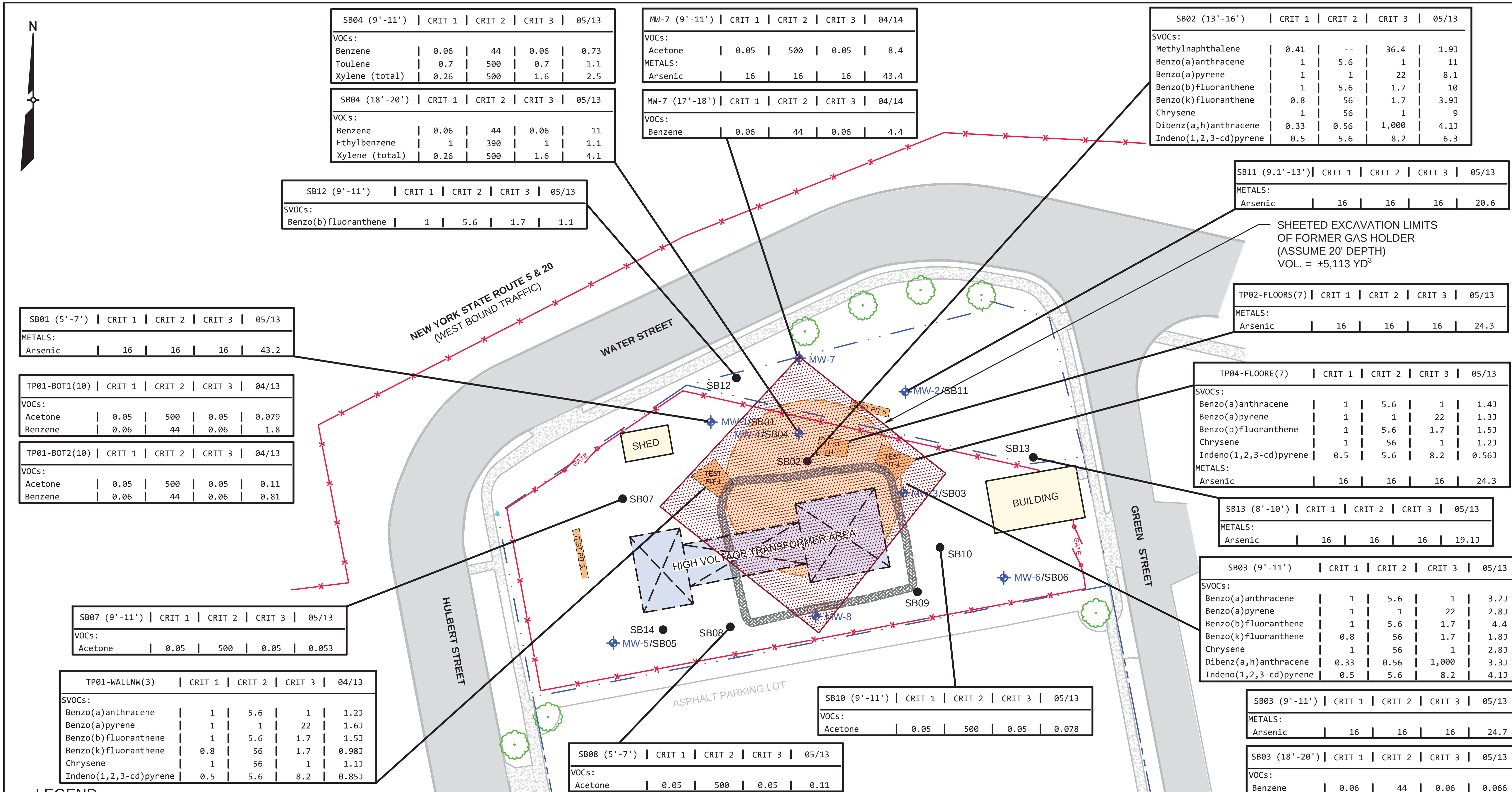
Figure 2-6
Surface Soil Exceedances

Former Auburn Green Street MGP Site
Green Street
Auburn, Cayuga County, New York

June 2017 60543583



SB04 (9'-11')	CRIT 1	CRIT 2	CRIT 3	05/13
VOCs:				
Benzene	0.06	44	0.06	0.73
Toulene	0.7	500	0.7	1.1
Xylene (total)	0.26	500	1.6	2.5

SB04 (18'-20')	CRIT 1	CRIT 2	CRIT 3	05/13
VOCs:				
Benzene	0.06	44	0.06	11
Ethylbenzene	1	390	1	1.1
Xylene (total)	0.26	500	1.6	4.1

MW-7 (9'-11')	CRIT 1	CRIT 2	CRIT 3	04/14
VOCs:				
Acetone	0.05	500	0.05	8.4
METALS:				
Arsenic	16	16	16	43.4

MW-7 (17'-18')	CRIT 1	CRIT 2	CRIT 3	04/14
VOCs:				
Benzene	0.06	44	0.06	4.4

SB02 (13'-16')	CRIT 1	CRIT 2	CRIT 3	05/13
SVOCs:				
Methylnaphthalene	0.41	--	36.4	1.9J
Benzo(a)anthracene	1	5.6	1	11
Benzo(a)pyrene	1	1	22	8.1
Benzo(b)fluoranthene	1	5.6	1.7	10
Benzo(k)fluoranthene	0.8	56	1.7	3.9J
Chrysene	1	56	1	9
Dibenz(a,h)anthracene	0.33	0.56	1,000	4.1J
Indeno(1,2,3-cd)pyrene	0.5	5.6	8.2	6.3

SB12 (9'-11')	CRIT 1	CRIT 2	CRIT 3	05/13
SVOCs:				
Benzo(b)fluoranthene	1	5.6	1.7	1.1

SB11 (9.1'-13')	CRIT 1	CRIT 2	CRIT 3	05/13
METALS:				
Arsenic	16	16	16	20.6

SB01 (5'-7')	CRIT 1	CRIT 2	CRIT 3	05/13
METALS:				
Arsenic	16	16	16	43.2

TP02-FLOORS(7)	CRIT 1	CRIT 2	CRIT 3	05/13
METALS:				
Arsenic	16	16	16	24.3

TP01-BOT1(10)	CRIT 1	CRIT 2	CRIT 3	04/13
VOCs:				
Acetone	0.05	500	0.05	0.079
Benzene	0.06	44	0.06	1.8

TP04-FLOORE(7)	CRIT 1	CRIT 2	CRIT 3	05/13
SVOCs:				
Benzo(a)anthracene	1	5.6	1	1.4J
Benzo(a)pyrene	1	1	22	1.3J
Benzo(b)fluoranthene	1	5.6	1.7	1.5J
Chrysene	1	56	1	1.2J
Indeno(1,2,3-cd)pyrene	0.5	5.6	8.2	0.56J
METALS:				
Arsenic	16	16	16	24.3

TP01-BOT2(10)	CRIT 1	CRIT 2	CRIT 3	04/13
VOCs:				
Acetone	0.05	500	0.05	0.11
Benzene	0.06	44	0.06	0.81

SB13 (8'-10')	CRIT 1	CRIT 2	CRIT 3	05/13
METALS:				
Arsenic	16	16	16	19.1J

SB03 (9'-11')	CRIT 1	CRIT 2	CRIT 3	05/13
SVOCs:				
Benzo(a)anthracene	1	5.6	1	3.2J
Benzo(a)pyrene	1	1	22	2.8J
Benzo(b)fluoranthene	1	5.6	1.7	4.4
Benzo(k)fluoranthene	0.8	56	1.7	1.8J
Chrysene	1	56	1	2.8J
Dibenz(a,h)anthracene	0.33	0.56	1,000	3.3J
Indeno(1,2,3-cd)pyrene	0.5	5.6	8.2	4.1J

SB07 (9'-11')	CRIT 1	CRIT 2	CRIT 3	05/13
VOCs:				
Acetone	0.05	500	0.05	0.053

TP01-WALLNW(3)	CRIT 1	CRIT 2	CRIT 3	04/13
SVOCs:				
Benzo(a)anthracene	1	5.6	1	1.2J
Benzo(a)pyrene	1	1	22	1.6J
Benzo(b)fluoranthene	1	5.6	1.7	1.5J
Benzo(k)fluoranthene	0.8	56	1.7	0.98J
Chrysene	1	56	1	1.1J
Indeno(1,2,3-cd)pyrene	0.5	5.6	8.2	0.85J

SB10 (9'-11')	CRIT 1	CRIT 2	CRIT 3	05/13
VOCs:				
Acetone	0.05	500	0.05	0.078

SB03 (9'-11')	CRIT 1	CRIT 2	CRIT 3	05/13
METALS:				
Arsenic	16	16	16	24.7

SB08 (5'-7')	CRIT 1	CRIT 2	CRIT 3	05/13
VOCs:				
Acetone	0.05	500	0.05	0.11

SB03 (18'-20')	CRIT 1	CRIT 2	CRIT 3	05/13
VOCs:				
Benzene	0.06	44	0.06	0.066

LEGEND

- MONITORING WELL LOCATION
- SOIL BORING
- BUILDING
- PAVEMENT
- AREAL EXTENT OF SUBSURFACE SOIL REQUIRING REMEDIATION
- BERM
- APPROXIMATE PROPERTY BOUNDARY
- FENCE
- APPROXIMATE FORMER GAS HOLDER LOCATION

LOC. ID — CRITERIA CRITERIA CRITERIA DATE

SB03 (18'-20')	CRIT 1	CRIT 2	CRIT 3	05/13
VOCs:				
Benzene	4.8	44	0.06	0.066

PARAMETER — CONCENTRATION (mg/kg)

0 20 40 80
SCALE IN FEET

CRITERIA: 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Protection of Public Health, Unrestricted, Commercial, and Protection of Groundwater including CP-51 Table 1, Effective 12/2/10.
CRITERIA 1 = Unrestricted, CRITERIA 2 = Commercial, CRITERIA 3 = Protection of Groundwater
SOURCE: BASEMAP CREATED USING *T.G. MILLER P.C. ENGINEERS AND SURVEYORS* TOPOGRAPHIC MAP; JUNE 20, 2013.

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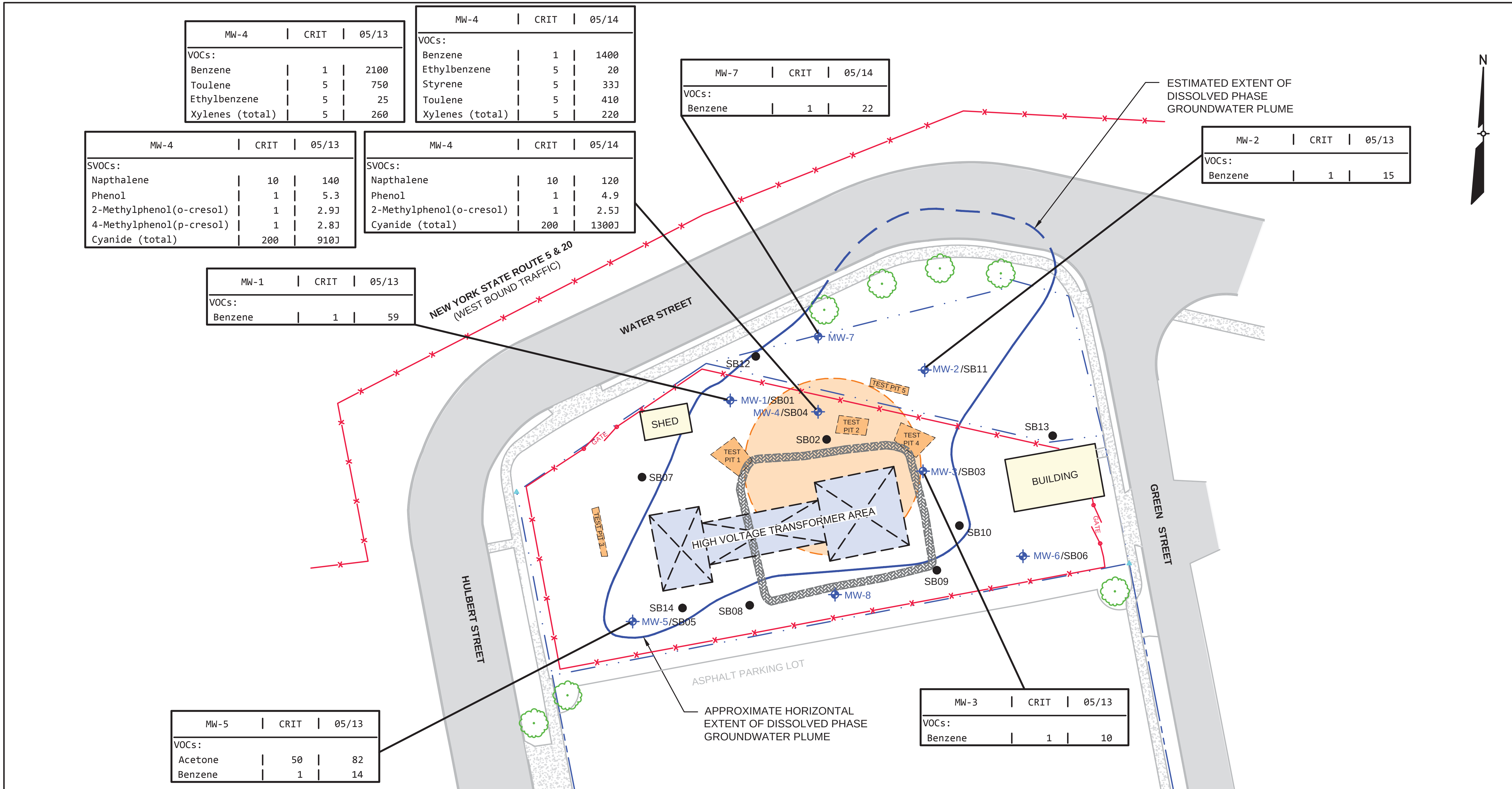
Figure 2-7
Subsurface Soil Exceedances

Former Auburn Green Street MGP Site
Green Street
Auburn, Cayuga County, New York

June 2017 60543583



MW-4	CRIT	05/13
VOCs:		
Benzene	1	2100
Toulene	5	750
Ethylbenzene	5	25
Xylenes (total)	5	260

MW-4	CRIT	05/14
VOCs:		
Benzene	1	1400
Ethylbenzene	5	20
Styrene	5	33J
Toulene	5	410
Xylenes (total)	5	220

MW-7	CRIT	05/14
VOCs:		
Benzene	1	22

MW-4	CRIT	05/13
SVOCs:		
Napthalene	10	140
Phenol	1	5.3
2-Methylphenol(o-cresol)	1	2.9J
4-Methylphenol(p-cresol)	1	2.8J
Cyanide (total)	200	910J

MW-4	CRIT	05/14
SVOCs:		
Napthalene	10	120
Phenol	1	4.9
2-Methylphenol(o-cresol)	1	2.5J
Cyanide (total)	200	1300J

MW-2	CRIT	05/13
VOCs:		
Benzene	1	15

MW-1	CRIT	05/13
VOCs:		
Benzene	1	59

MW-5	CRIT	05/13
VOCs:		
Acetone	50	82
Benzene	1	14

MW-3	CRIT	05/13
VOCs:		
Benzene	1	10

LEGEND

- MONITORING WELL LOCATION
- SOIL BORING
- BUILDING
- PAVEMENT
- BERM
- APPROXIMATE PROPERTY BOUNDARY
- FENCE
- APPROXIMATE FORMER GAS HOLDER LOCATION

LOC. ID — CRITERIA — DATE

MW-1	CRIT	05/13
VOCs:		
Benzene	1	59

PARAMETER — CONCENTRATION (µg/L)

0 20 40 80
SCALE IN FEET

CRITERIA: NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.

SOURCE: BASEMAP CREATED USING *T.G. MILLER P.C. ENGINEERS AND SURVEYORS* TOPOGRAPHIC MAP; JUNE 20, 2013.

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Figure 2-8
Groundwater Exceedances

Former Auburn Green Street MGP Site
Green Street
Auburn, Cayuga County, New York

June 2017 60543583

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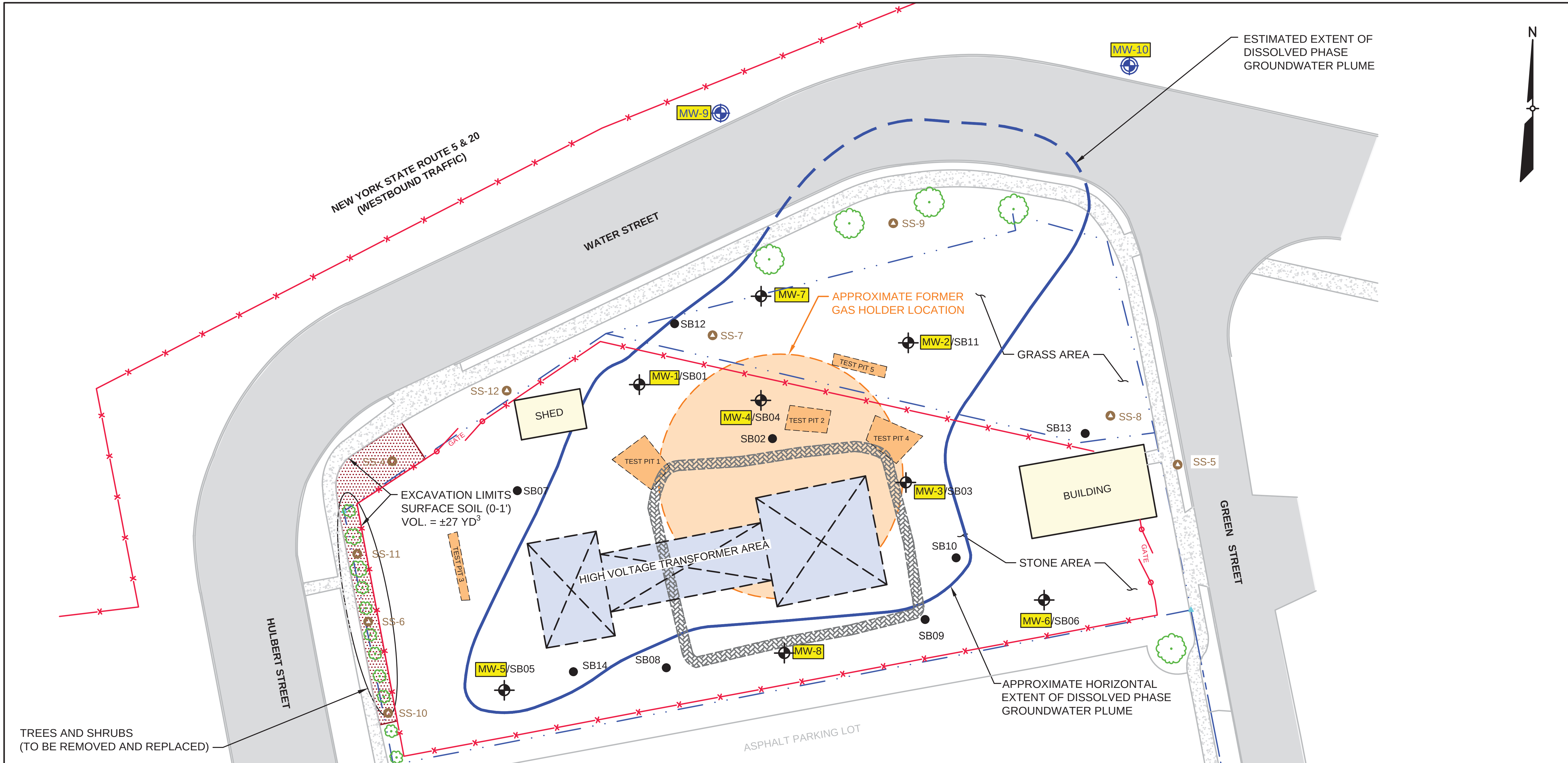

LEGEND

EXISTING MONITORING WELL LOCATION	APPROXIMATE PROPERTY BOUNDARY
SURFACE SOIL SAMPLE LOCATION	CHAIN LINK FENCE
SOIL BORING	APPROXIMATE FORMER GAS HOLDER LOCATION
BUILDING	PROPOSED MONITORING WELL
ASPHALT PAVEMENT	EXCAVATION LIMITS SURFACE SOIL (0-1')
SIDEWALK	MW-4 MONITORING WELLS SAMPLED ANNUALLY
BERM	

0 15 30 60
SCALE IN FEET

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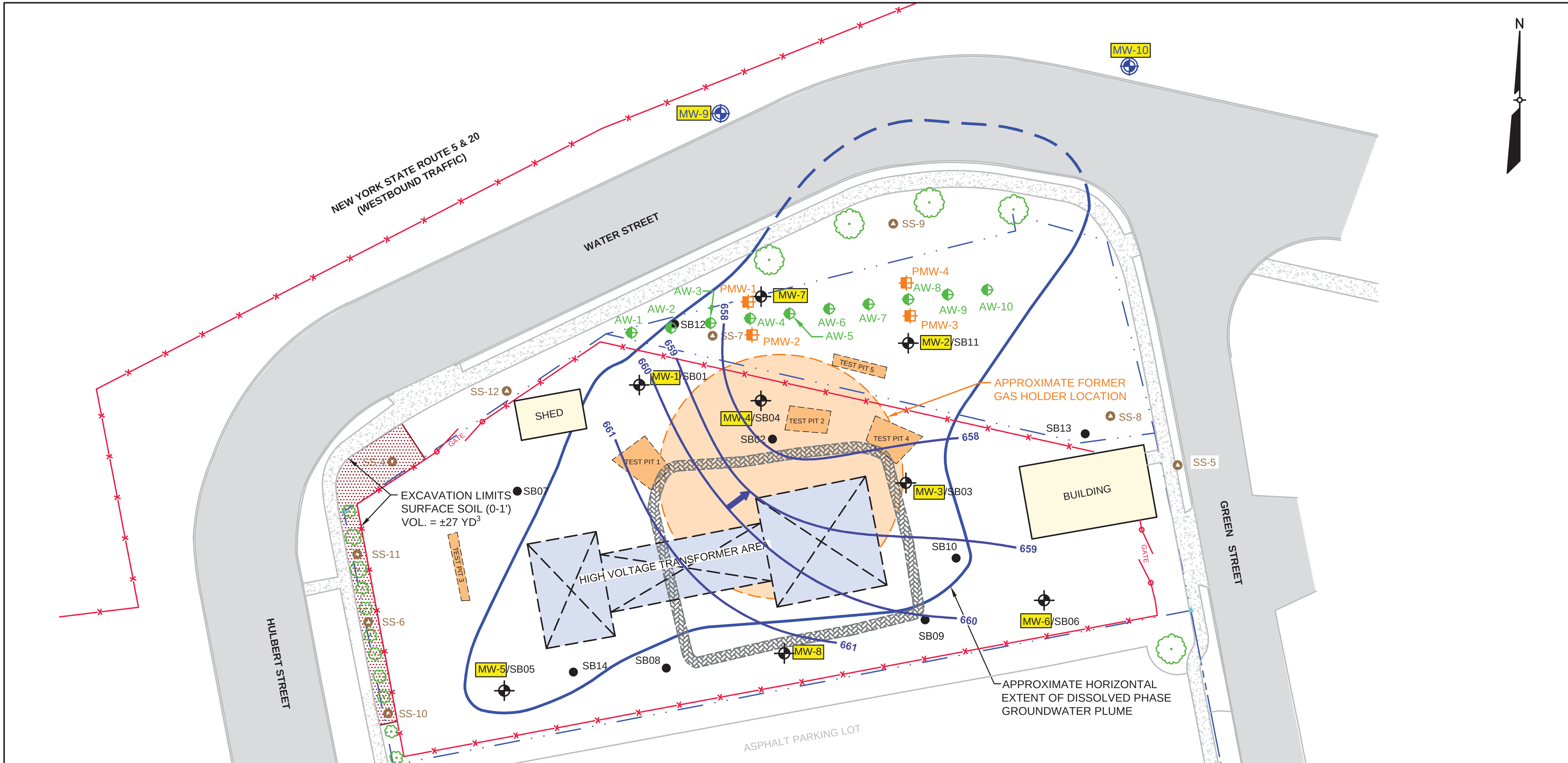
Figure 5-1 - Remedial Alternative 2
Surface Soil Removal, MNA, IC/ECs

Former Auburn Green Street MGP Site
Green Street
Auburn, Cayuga County, New York

JUNE 2017 60543583

SOURCE: BASEMAP CREATED USING *T.G. MILLER P.C. ENGINEERS AND SURVEYORS* TOPOGRAPHIC MAP; JUNE 20, 2013.



LEGEND

- EXISTING MONITORING WELL LOCATION
- SURFACE SOIL SAMPLE LOCATION
- SOIL BORING
- BUILDING
- ASPHALT PAVEMENT
- SIDEWALK
- BERM
- APPROXIMATE PROPERTY BOUNDARY
- CHAIN LINK FENCE
- APPROXIMATE FORMER GAS HOLDER LOCATION
- MW-4 MONITORING WELLS SAMPLED QUARTERLY YEAR 1; SEMI-ANNUALLY YEAR 2; ANNUALLY THEREAFTER
- PROPOSED MONITORING WELL
- EXCAVATION LIMITS SURFACE SOIL (0-1')
- O_2 PERFORMANCE MONITORING WELLS
- O_2 APPLICATION WELL

0 15 30 60
SCALE IN FEET

SOURCE: BASEMAP CREATED USING *T.G. MILLER P.C. ENGINEERS AND SURVEYORS* TOPOGRAPHIC MAP; JUNE 20, 2013.

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Figure 5-2 - Remedial Alternative 3
Surface Soil Removal, Enhanced
Aerobic Biodegradation, MNA, IC/ECs

Former Auburn Green Street MGP Site
Green Street
Auburn, Cayuga County, New York

JUNE 2017
60543583

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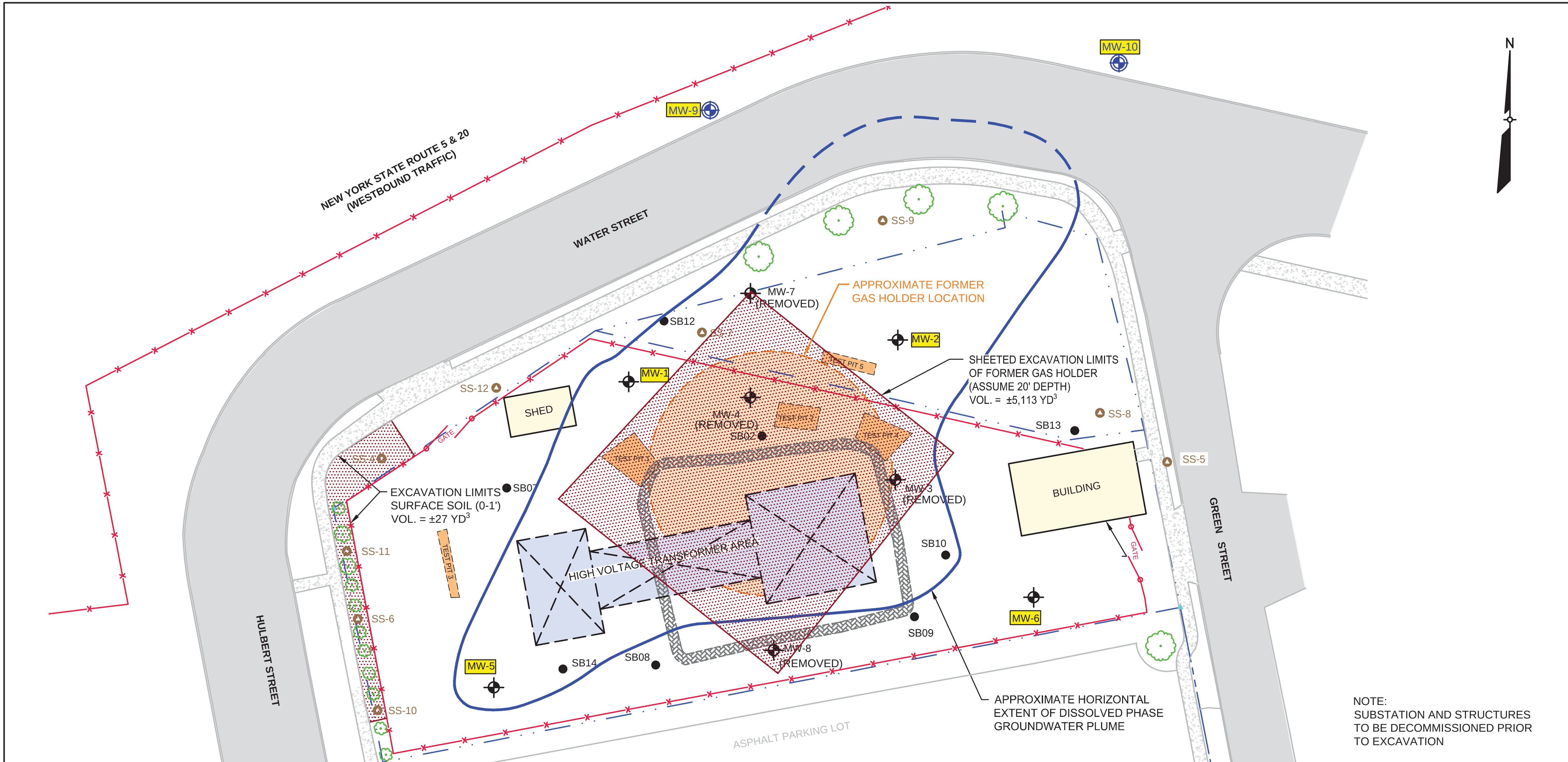

NOTE:
SUBSTATION AND STRUCTURES
TO BE DECOMMISSIONED PRIOR
TO EXCAVATION

LEGEND

- EXISTING MONITORING WELL LOCATION
- SURFACE SOIL SAMPLE LOCATION
- SOIL BORING
- BUILDING
- ASPHALT PAVEMENT
- SIDEWALK
- BERM
- APPROXIMATE PROPERTY BOUNDARY
- CHAIN LINK FENCE
- APPROXIMATE FORMER GAS HOLDER LOCATION
- PROPOSED MONITORING WELL
- EXCAVATION LIMITS
- MW-5 MONITORING WELLS SAMPLED ANNUALLY

SOURCE: BASEMAP CREATED USING *T.G. MILLER P.C. ENGINEERS AND SURVEYORS* TOPOGRAPHIC MAP; JUNE 20, 2013.

0 15 30 60
SCALE IN FEET

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P: 716.856.5636

Figure 5-3 - Remedial Alternative 4
Surface Soil Removal, Subsurface Soil and
Gas Holder Excavation with Substation
Relocation, MNA, IC/ECs

Former Auburn Green Street MGP Site
Green Street
Auburn, Cayuga County, New York

JUNE 2017
60543583

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Appendix A

Cost Estimates

FORMER AUBURN GREEN STREET MGP SITE
AUBURN, CAYUGA COUNTY, NEW YORK

SUMMARY OF ALTERNATIVES

Alternative	DESCRIPTION	CAPITAL COST	PRIME O&P (21%)	ENGINEERING AND DESIGN (20%)	BONDS AND INSURANCE (3%)	CONTINGENCY (20%)	TOTAL CAPITAL COST	O&M COST (PW 5%)	TOTAL COST	TOTAL COST (ROUNDED)
1	**No Action (30 years of Annual Monitoring and Inspections)**	NA	NA	NA	NA	NA	$ -	**$ -**	**$ -**	**$ -**
2	Surface Soil Excavation, Monitored Natural Attenuation, ICs/ECs	$ 68,119	$ 14,305	$ 16,485	$ 2,473	$ 20,276	**$ 121,659**	**$ 210,993**	**$ 332,652**	**$ 330,000**
3	Surface Soil Excavation, Enhanced Aerobic Biodegradation, IC/ECs	$ 176,955	$ 37,161	$ 42,823	$ 6,423	$ 52,673	**$ 316,035**	**$ 228,481**	**$ 544,516**	**$ 545,000**
4	Surface Soil Excavation, Gas Holder Excavation with Substation Relocation, ICs/ECs	$ 11,425,807	$ 2,399,419	$ 2,765,045	$ 414,757	$ 3,401,006	**$ 20,406,034**	**$ 75,988**	**$ 20,482,022**	**$ 20,480,000**

* Engineering and Design and Bonds and Insurance Markups are each applied to the sum of Capital Cost plus Prime Overhead & Profit (O&P).
* Contingency is applied to the sum of the Capital Cost and all other markups
* Escalation is applied to individual cost items as necessary, and is not included as a "bottom line" markup
* Engineering and Design includes preparation of Contract Documents; construction oversight; and project management. Construction Completion reporting and Site Management Plan preparation are included as capital costs.
* Discount rate of 5% used for present worth (PW) calculation.

FORMER AUBURN GREEN STREET MGP SITE
AUBURN, CAYUGA COUNTY, NEW YORK

ALTERNATIVE 2
Surface Soil Excavation, Monitored Natural Attenuation, ICs/ECs

DESCRIPTION	QTY	UOM	UNIT COST	PROFIT ON SUB	TOTAL UNIT COST	TOTAL COST
MOBILIZATION AND DEMOBILIZATION						**$ 13,817.91**
* Equipment and Personnel Mob/Demob (PRIME)	1	LS	$ 1,000		$ 1,000	$ 1,000
* Equipment and Personnel Mob/Demob (SUB), assume 25% of Prime Mob cost	1	LS	$ 250	$ 25	$ 275	$ 275
* Plans and Submittals	1	LS	$ 10,000		$ 10,000	$ 10,000
* Permitting and Compliance	1	LS	$ 1,000		$ 1,000	$ 1,000
Project Signage	1	EA	$ 543		$ 543	$ 543
* Utility Location	1	LS	$ 500		$ 500	$ 500
* Traffic Controls	1	LS	$ 500		$ 500	$ 500
SITE FACILITIES						**$ 4,318**
Storage Trailer	1	MO	$ 81		$ 81	$ 81
Sanitary Facilities (Port-o-John and Handwash Station)	1	MO	$ 380		$ 380	$ 380
Temporary Fencing	120	LF	$ 10		$ 10	$ 1,146
Project Manager	2	HR	$ 144		$ 144	$ 288
Site Superintendent	16	HR	$ 135		$ 135	$ 2,160
Home Office Administration	4	HR	$ 66		$ 66	$ 263
SURVEY						**$ 1,911**
Surveying, per day	2	DAY	$ 868	$ 87	$ 955	$ 1,911
EROSION AND SEDIMENT CONTROL						**$ 263**
Catch Basin/DI Inlet Protection	5	EA	$ 53		$ 53	$ 263
HEALTH AND SAFETY						**$ 3,882**
On-Site Safety Officer	16	HR	$ 89		$ 89	$ 1,416
* PPE	1	LS	$ 200		$ 200	$ 200
* CAMP	1	WEEK	$ 2,060	$ 206	$ 2,266	$ 2,266
CLEARING AND GRUBBING						**$ 2,200**
* Tree & Brush Clearing, Grubbing, Chipping, Transport and Disposal	1	LS	$ 2,000	$ 200	$ 2,200	$ 2,200
EXCAVATION AND SOIL MANAGEMENT						**$ 716**
Shallow Excavation	30	CY	$ 24		$ 24	$ 716
TRANSPORT AND DISPOSAL						**$ 5,611**
Soil, Non-Hazardous (1.5 x Shallow Excavation)	45	TON	$ 113	$ 11	$ 124	$ 5,571
C&D/Contractor-generated Waste	2	TON	$ 18	$ 2	$ 20	$ 40
SAMPLING						**$ 1,654**
Excavation Compliance Sample Analysis	5	EA	$ 217		$ 217	$ 1,087
Waste Characterization Sample Analysis (may be included in disposal cost)	1	EA	$ 567		$ 567	$ 567
BACKFILL, GRADING AND COMPACTION						**$ 1,936**
Demarcation Barrier	81	SY	$ 2		$ 2	$ 199
Topsoil Placement (Same as Shallow Excavation, Assume 1 ft of topsoil)	30	CY	$ 5		$ 5	$ 162
Topsoil Purchase, including delivery	30	CY	$ 53		$ 53	$ 1,575
RESTORATION						**$ 5,132**
Seeding	0.05	AC	$ 4,371	$ 437	$ 4,808	$ 240
Asphalt Paving		SF	$ 15		$ 15	$ -
Sidewalk Replacement	48	SF	$ 4		$ 4	$ 180
Planting (Trees and Shrubs)	15	EA	$ 300		$ 300	$ 4,500
Fencing	20	LF	$ 11		$ 11	$ 211
MONITORING WELLS						**$ 3,678**
Monitoring Well Installation and Development	40	LF	$ 84	$ 8	$ 92	$ 3,678
FINAL REPORTING						**$ 23,000**
* Construction Completion Report	1	LS	$ 7,500		$ 7,500	$ 7,500
Environmental Easement - Alta Survey	1	LS	$ 7,500		$ 7,500	$ 7,500
* Site Management Plan (ICs/ECs)	1	LS	$ 8,000		$ 8,000	$ 8,000
CAPITAL COSTS SUBTOTAL						**$ 68,119**

* Unit cost reduced due to limited project scope

OPERATION AND MAINTENANCE	QTY	UOM	ANNUAL COST	PRESENT WORTH COST
Annual Inspections	**30**	**yr**	**$ 1,500**	**$ 23,059**
Annual Monitoring				**$ 187,934**
2-Day Site Visit (1 Laborer and 1 pickup for 20 total hours)	30	yr	$ 1,540	$ 23,680
Lab Cost	30	yr	$ 6,385	$ 98,153
Data Validation	30	yr	$ 1,800	$ 27,670
Reporting	30	yr	$ 2,500	$ 38,431
O&M SUBTOTAL				**$ 210,993**

TOTAL CAPITAL AND O&M (PW) COST	**$ 279,113**

FORMER AUBURN GREEN STREET MGP SITE
AUBURN, CAYUGA COUNTY, NEW YORK

ALTERNATIVE 3
Surface Soil Excavation, Enhanced Aerobic Biodegradation, ICs/ECs

DESCRIPTION	QTY	UOM	UNIT COST	PROFIT ON SUB	TOTAL UNIT COST	TOTAL COST
MOBILIZATION AND DEMOBILIZATION						**$ 15,390.41**
* Equipment and Personnel Mob/Demob (PRIME)	1	LS	$ 1,000		$ 1,000	$ 1,000
* Equipment and Personnel Mob/Demob (SUB), assume $1000	1	LS	$ 1,000	$ 100	$ 1,100	$ 1,100
* Plans and Submittals	1	LS	$ 5,000		$ 5,000	$ 5,000
* Permitting and Compliance	1	LS	$ 2,000		$ 2,000	$ 2,000
Staging Area Construction	250	SY	$ 11		$ 11	$ 2,748
Project Signage	1	EA	$ 543		$ 543	$ 543
Utility Location	1	LS	$ 2,000		$ 2,000	$ 2,000
* Traffic Controls	1	LS	$ 1,000		$ 1,000	$ 1,000
SITE FACILITIES						**$ 19,648**
Storage Trailer	1	MO	$ 81		$ 81	$ 81
Sanitary Facilities (Port-o-John and Handwash Station)	1	MO	$ 380		$ 380	$ 380
Project Manager	40	HR	$ 144		$ 144	$ 5,760
Site Superintendent	80	HR	$ 135		$ 135	$ 10,800
Home Office Administration	40	HR	$ 66		$ 66	$ 2,627
SURVEY						**$ 1,911**
Surveying, per day	2	DAY	$ 868	$ 87	$ 955	$ 1,911
EROSION AND SEDIMENT CONTROL						**$ 263**
Catch Basin/DI Inlet Protection	5	EA	$ 53		$ 53	$ 263
HEALTH AND SAFETY						**$ 12,612**
On-Site Safety Officer	80	HR	$ 89		$ 89	$ 7,080
PPE	1	LS	$ 1,000		$ 1,000	$ 1,000
* CAMP	2	WEEK	$ 2,060	$ 206	$ 2,266	$ 4,532
CLEARING AND GRUBBING (N/A)						**$ -**
Tree & Brush Clearing, Grubbing, Chipping, Transport and Disposal		LS	$ 11,941	$ 1,194	$ 13,135	$ -
EXCAVATION AND SOIL MANAGEMENT						**$ 716**
Shallow Excavation	30	CY	$ 24		$ 24	$ 716
TRANSPORT AND DISPOSAL						**$ 6,576**
Soil, Non-Hazardous (1.5 x Shallow Excavation)	45	TON	$ 113	$ 11	$ 124	$ 5,571
C&D/Contractor-generated Waste	50	TON	$ 18	$ 2	$ 20	$ 1,004
IN-SITU GROUNDWATER TREATMENT						**$ 63,883**
WELL INSTALLATION						
4-Inch Vertical Injection Well Installation and Development	280	LF	$ 84	$ 8	$ 92	$ 25,744
Vertical Well Drilling Mobilization	1	LS	$ 10,000	$ 1,000	$ 11,000	$ 11,000
ORC Sock Installation						
ORC Socks	160	EA	$ 138	$ 14	$ 152	$ 24,273
Labor (2 laborers, 10-hr days; weighted average rate to account for overtime work)	20	HR	$ 107	$ 11	$ 117	$ 2,343
Pickup Truck with Storage Container	20	HR	$ 24	$ 2	$ 26	$ 523
SAMPLING						**$ 1,654**
Excavation Compliance Sample Analysis	5	EA	$ 217		$ 217	$ 1,087
Waste Characterization Sample Analysis (may be included in disposal cost)	1	EA	$ 567		$ 567	$ 567
BACKFILL, GRADING AND COMPACTION						**$ 1,936**
Demarcation Barrier	81	SY	$ 2		$ 2	$ 199
Topsoil Purchase, including delivery	30	CY	$ 53		$ 53	$ 1,575
Topsoil Placement (Same as Shallow Excavation, Assume 1 ft of topsoil)	30	CY	$ 5		$ 5	$ 162
RESTORATION						**$ 11,188**
Seeding	0.05	AC	$ 4,371	$ 437	$ 4,808	$ 240
Asphalt Paving	400	SF	$ 15		$ 15	$ 6,056
Sidewalk Replacement	48	SF	$ 4		$ 4	$ 180
Planting (Trees and Shrubs)	15	EA	$ 300		$ 300	$ 4,500
Fencing	20	LF	$ 11		$ 11	$ 211
MONITORING WELLS						**$ 3,678**
Monitoring Well Installation and Development	40	LF	$ 84	$ 8	$ 92	$ 3,678
FINAL REPORTING						**$ 37,500**
Construction Completion Report	1	LS	$ 20,000		$ 20,000	$ 20,000
Environmental Easement - Alta Survey	1	LS	$ 7,500		$ 7,500	$ 7,500
Site Management Plan (ICs/ECs)	1	LS	$ 10,000		$ 10,000	$ 10,000
CAPITAL COSTS SUBTOTAL						**$ 176,955**

* Unit cost reduced due to limited project scope
1 The cost for subcontractor mobilization does not include the cost for mobilization by the horizontal drilling subcontractor, which was provided separately

OPERATION AND MAINTENANCE				
Annual Inspections	30	yr	$ 1,500	**$ 23,059**
Quarterly Monitoring (First Year)				**$ 11,643**
2-Day Site Visit (1 Laborer and 1 pickup for 20 total hours)	1	yr	$ 1,540	$ 1,467
Lab Cost	1	yr	$ 6,385	$ 6,081
Data Validation	1	yr	$ 1,800	$ 1,714
Reporting	1	yr	$ 2,500	$ 2,381
Semi-Annual Monitoring (Second Year)			$ -	**$ 11,643**
2-Day Site Visit (1 Laborer and 1 pickup for 20 total hours)	1	yr	$ 1,540	$ 1,467
Lab Cost	1	yr	$ 6,385	$ 6,081
Data Validation	1	yr	$ 1,800	$ 1,714
Reporting	1	yr	$ 2,500	$ 2,381
Annual Monitoring (Years 3 through 30)			$ -	**$ 182,136**
2-Day Site Visit (1 Laborer and 1 pickup for 20 total hours)	28	yr	$ 1,540	$ 22,949
Lab Cost	28	yr	$ 6,385	$ 95,125
Data Validation	28	yr	$ 1,800	$ 26,817
Reporting	28	yr	$ 2,500	$ 37,245
O&M SUBTOTAL				**$ 228,481**

TOTAL CAPITAL AND O&M (PW) COST	**$ 405,436**

FORMER AUBURN GREEN STREET MGP SITE
AUBURN, CAYUGA COUNTY, NEW YORK

ALTERNATIVE 4

Surface Soil Excavation, Gas Holder Excavation with Substation Relocation, ICs/ECs

DESCRIPTION	QTY	UOM	UNIT COST	PROFIT ON SUB	TOTAL UNIT COST	TOTAL COST
MOBILIZATION AND DEMOBILIZATION						**$ 207,537**
Equipment and Personnel Mob/Demob (PRIME)	1	LS	$ 17,911		$ 17,911	$ 17,911
Equipment and Personnel Mob/Demob (SUB), assume 25% of Prime Mob cost	1	LS	$ 4,478	$ 448	$ 4,925	$ 4,925
Water Treatment System Mob and Construction	1	LS	$ 119,405		$ 119,405	$ 119,405
Plans and Submittals	1	LS	$ 36,016		$ 36,016	$ 36,016
Permitting and Compliance	1	LS	$ 5,628		$ 5,628	$ 5,628
Project Signage	1	EA	$ 543		$ 543	$ 543
Staging Area Construction	250	SY	$ 11		$ 11	$ 2,748
Temporary Access Roads/Construction Entrance	250	SY	$ 11		$ 11	$ 2,748
Utility Locatior	1	LS	$ 2,000		$ 2,000	$ 2,000
Traffic Controls	1	LS	$ 2,000		$ 2,000	$ 2,000
Material Storage (stockpile) setup	1	LS	$ 13,614		$ 13,614	$ 13,614
SITE FACILITIES						**$ 293,384**
Contractor's Trailer	8	MO	$ 252		$ 252	$ 2,012
Engineer's/Client's Trailer	8	MO	$ 252		$ 252	$ 2,012
Storage Trailer	8	MO	$ 81		$ 81	$ 652
Sanitary Facilities (Port-o-John and Handwash Station)	8	MO	$ 380		$ 380	$ 3,040
Electricity	8	MO	$ 162		$ 162	$ 1,296
Internet	8	MO	$ 100		$ 100	$ 800
Temporary Fencing	50	LF	$ 10		$ 10	$ 478
Project Manager	320	HR	$ 144		$ 144	$ 46,080
Site Superintendent	1,600	HR	$ 135		$ 135	$ 216,000
Home Office Administration	320	HR	$ 66		$ 66	$ 21,015
SURVEY						**$ 19,106**
Surveying, per day	20	DAY	$ 868	$ 87	$ 955	$ 19,106
EROSION AND SEDIMENT CONTROL						**$ 716**
Silt Fence	250	LF	$ 2		$ 2	$ 453
Catch Basin/DI Inlet Protection	5	EA	$ 53		$ 53	$ 263
HEALTH AND SAFETY						**$ 325,759**
On-Site Safety Officer	1,600	HR	$ 89		$ 89	$ 141,600
Odor Control	8	MO	$ 10,985		$ 10,985	$ 87,882
Dust Control	8	MO	$ 2,846		$ 2,846	$ 22,765
CAMP	8	MO	$ 8,240	$ 824	$ 9,064	$ 72,512
PPE	1	LS	$ 1,000		$ 1,000	$ 1,000
CLEARING AND GRUBBING						**$ 13,135**
Tree & Brush Clearing, Grubbing, Chipping, Transport and Disposal	1	LS	$ 11,941	$ 1,194	$ 13,135	$ 13,135
EXCAVATION AND SOIL MANAGEMENT						**$ 174,551**
Shallow Excavation	30	CY	$ 24		$ 24	$ 716
Deep Excavation, placement in rolloff and mixing with moisture amendment	5,400	CY	$ 14		$ 14	$ 72,933
Moisture Control (LKD/CKD) (Assume 5% of Soil T&D Quantity)	407	TON	$ 248		$ 248	$ 100,903
EXCAVATION PROTECTION						**$ 585,265**
Temporary Sheet Piling	10,000	SF	$ 59		$ 59	$ 585,265
TRANSPORT AND DISPOSAL						**$ 1,010,408**
Soil, Non-Hazardous (shallow plus deep excavation)	8,145	TON	$ 113	$ 11	$ 124	$ 1,008,400
C&D/Contractor-generated Waste	100	TON	$ 18	$ 2	$ 20	$ 2,009
DEWATERING						**$ 173,571**
Treatment System Operation and Maintenance	32	WK	$ 4,299		$ 4,299	$ 137,555
Sampling/Analysis	32	EA	$ 1,126		$ 1,126	$ 36,016
SAMPLING						**$ 4,704**
Excavation Compliance Sample Analysis	6	EA	$ 217		$ 217	$ 1,305
Waste Characterization Sample Analysis (may be included in disposal cost)	6	EA	$ 567		$ 567	$ 3,399
BACKFILL, GRADING AND COMPACTION						**$ 274,583**
Fill Purchase (1.2 x Deep Excavation)	6,480	CY	$ 30		$ 30	$ 192,002
ORC Material Purchase	1	TON	$ 16,000		$ 16,000	$ 16,000
Demarcation Barrier (Deep Excavation Surface Area + Shallow Excavation Area)	1,700	SY	$ 2		$ 2	$ 4,182
Topsoil Placement (Shallow Excavation and Deep Excavation)	163	CY	$ 5		$ 5	$ 882
Topsoil Purchase, including delivery	163	CY	$ 53		$ 53	$ 8,575
Grading Deep Excavation Area	800	SY	$ 5		$ 5	$ 4,320
Backfill and Compaction (Deep Excavation Only)	5,400	ECY	$ 9		$ 9	$ 48,622
RESTORATION						**$ 11,909**
Seeding	0.2	AC	$ 4,371	$ 437	$ 4,808	$ 962
Asphalt Paving	400	SF	$ 15		$ 15	$ 6,056
Sidewalk Replacement	48	SF	$ 4		$ 4	$ 180
Planting (Trees and Shrubs)	15	EA	$ 300		$ 300	$ 4,500
Fencing	20	LF	$ 11		$ 11	$ 211
REAL ESTATE, RELOCATIONS, LANDS AND DAMAGES						**$ 8,250,000**
Relocate Substation	1	LS	$ 7,500,000		$ 7,500,000	$ 7,500,000
Commercial Right-of-Way Purchase	1	LS	$ 750,000		$ 750,000	$ 750,000
MONITORING WELLS						**$ 3,678**
Monitoring Well Installation and Development	40	LF	$ 84	$ 8	$ 92	$ 3,678
FINAL REPORTING						**$ 77,500**
Construction Completion Report	1	LS	$ 50,000		$ 50,000	$ 50,000
Environmental Easement - Alta Survey	1	LS	$ 7,500		$ 7,500	$ 7,500
Site Management Plan (ICs/ECs)	1	LS	$ 20,000		$ 20,000	$ 20,000
CAPITAL COSTS SUBTOTAL						**$ 11,425,807**

OPERATION AND MAINTENANCE				
Annual Inspections	30	yr	$ 1,500	**$ 23,059**
Annual Monitoring (Years 1 through 5)			$ -	**$ 52,930**
2-Day Site Visit (1 Laborer and 1 pickup for 20 total hours)	5	yr	$ 1,540	$ 6,669
Lab Cost	5	yr	$ 6,385	$ 27,644
Data Validation	5	yr	$ 1,800	$ 7,793
Reporting	5	yr	$ 2,500	$ 10,824
O&M SUBTOTAL				**$ 75,988**

TOTAL CAPITAL AND O&M (PW) COST	**$ 11,501,795**

Appendix B

Auburn Zoning Map

New York State Electric & Gas Corporation
Auburn Green Street Former MGP Site -
City of Auburn Zoning Map

City of Auburn Zoning Map