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Geotechnical
Environmental and
Water Resources
Engineering

Feasibility Study Report

Lyons Manufactured Gas Plant Site
Village of Lyons, New York

NYSDEC Site # 8-59-020
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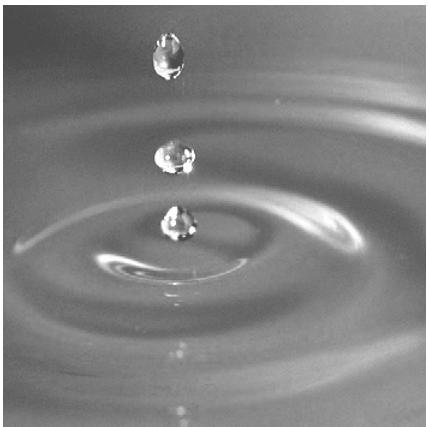

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Abbreviations and Acronyms

AOC	Area of Concern
AWQS	Ambient Water Quality Standards, Guidance Values, and Groundwater Effluent Limitations
bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
COC	Constituents of Concern
CY	cubic yard
DEC Soil Cleanup Guidance	Soil Cleanup Guidance DEC Policy, November 4, 2009
DER	Department of Environmental Remediation
DER-10	NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, May, 2010
DPW	Department of Public Works
EPA	United States Environmental Protection Agency
FS	Feasibility Study
GAC	Granular Activated Carbon
GEI	GEI Consultants, Inc., P.C.
GRA	General Response Action
IC/ECs	Institutional Controls/Engineering Controls
ISCO	In-Situ Chemical Oxidation
ISS	In-Situ Solidification
LTTD	Low-Temperature Thermal Desorption
MGP	Manufactured Gas Plant
mg/kg	Milligrams per kilogram (equivalent to ppm)
MNA	Monitored Natural Attenuation
NAPL	Non-Aqueous Phase Liquid
NAVD88	North American Vertical Datum 1988
NCP	National Contingency Plan. 40CFR1J Part 300 – National Oil and Hazardous Substances Pollution Contingency Plan
NYSCC	New York State Canal Corporation
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
NYSEG	New York State Electric and Gas Corporation
OM&M	Operations, Maintenance and Monitoring
PAH	Polycyclic Aromatic Hydrocarbon
POTW	Publically Owned Treatment Works
ppb	parts per billion

Abbreviations and Acronyms (cont.)

PPE	Personal protective equipment
ppm	parts per million (equivalent to mg/kg in soil)
PRAP	Proposed Remedial Action Plan
RAO	Remedial Action Objective
RI	Remedial Investigation
RIR	Remedial Investigation Report
ROD	Record of Decision
ROW	Right-of-way
SCG	Standards, Criteria, and Guidance
SCO	Soil Cleanup Objective
SMP	Site Management Plan
SVOC	Semi-Volatile Organic Compound
TOGS	Technical and Operational Guidance Series
UST	Underground Storage Tank
VOC	Volatile Organic Compound

Engineer's Certification

In accordance with NYSDEC DER-10 Section 1.5 (b) 2,

I, Daniel R. Kopcow, certify that I am currently a NYS registered professional engineer, and that this Report was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the NYSDEC Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10).

Engineer's Seal
GEI Consultants, Inc., P.C.

Date 10-8-13

It is a violation of New York State Education Law for any person, unless acting under the direction of a licensed professional engineer, to alter in any way plans, specifications, plates, and reports to which the seal of a professional engineer has been applied. If an item bearing the seal of an engineer or land surveyor is altered, the altering engineer shall seal the item and add the notation "altered by", sign and date such alteration, and provide a specific description of the alteration.

Executive Summary

Introduction and Purpose

This report describes the Feasibility Study (FS) undertaken for a site located on Geneva and Water Streets in the Village of Lyons, New York. The site is the location of a former manufactured gas plant (MGP) which was constructed and operated by the Lyons Gas Light Company, a predecessor company to NYSEG. The location is shown in Figure 1.

The FS was conducted pursuant to a Multi-site Order on Consent between NYSEG and the New York State Department of Environmental Conservation (NYSDEC), and the guidance provided in the document entitled "*NYSDEC Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation*" (DER-10). The FS is based on an environmental investigation performed at the site which is described in the Remedial Investigation Report (RIR) of December 2012.

The purpose of this FS is to: 1) identify and comparatively evaluate appropriate remedial alternatives for soil and groundwater, 2) recommend media-specific alternatives that adequately mitigate potential threats to human health and the environment due to the constituents of concern (COC) from former MGP operations, and 3) identify alternatives which are consistent with the remedial objectives for the future contemplated site use.

Site Description and History

The site is a ½ acre area located in the central business district of the Village of Lyons. The site consists of two parcels of land. The majority of the site consists of a parcel owned by NYSEG. This parcel is currently leased by Wayne County and is used by the Village of Lyons as a municipal parking lot. A NYSEG natural gas regulator station building is located in the north/central area of the lot. The Village of Lyons owns a small portion of the site located at the intersection of Geneva and Water Streets. A raised-bed, landscaped area with signs constructed by the Village Department of Public Works (DPW) is present in this area. This parcel is within a New York State Department of Transportation (NYSDOT) Right-of-Way (ROW) for Water Street and Geneva Street / NYS RT 14, which was established for the re-construction of the intersection of Geneva and Water Streets and a bridge across the adjacent New York State (NYS) Barge Canal to the south in the 1980's. For the purposes of this report, the site consists of these two parcels of land. The former MGP operations were conducted within the boundaries of this area. The NYSDOT ROW area is shown on Figure 4.

The MGP operated for 58 years from 1859 to 1917. The features of the MGP included: a gas production building with gas purifiers and retorts; two gas holders; a dwelling on the MGP parcel; a

coal, lime and brick shed; a tramway connecting the shed to the former Erie Canal located along the western boundary of the site; and a repair shed located adjacent to the former Erie Canal towpath. When natural gas became available in the area, the plant was shut down and most of the MGP above-grade features were demolished. One of the gas holders was used for natural gas storage until 1950. The gas production building was used as a natural gas governor building until it was demolished in the 1970's. The Erie Canal to the west of the site was filled-in by the Village of Lyons following decommissioning of the MGP.

Geology and Hydrology

Anthropogenic fill materials are present in most areas of the site. The fill is thickest in the central area of the site, in the area of the original gas holder foundation. Underlying the fill is alluvium comprised of inter-bedded layers of silt, sand, and gravel and thin, laterally discontinuous lenses of glacial till. Bedrock is present at depths varying from 31 to 62 feet in the area investigated during the Remedial Investigation (RI). The surface of the bedrock slopes from all directions towards a trough in the central area of the NYSEG parcel.

There are no surface water features at the site. Storm water drains into catch basins in the site parking lot, and then to a storm sewer system in Water and Geneva Streets. The groundwater table is found at depths which range from approximately 17 to 28 feet across the site. The groundwater table in the summer and winter months rises and falls approximately 5 feet in response to the raising and lowering of the NYS Barge Canal. The direction of flow in both the shallow (at the groundwater table) and deep (at the top of the bedrock) groundwater zones in the alluvium is from north to south.

Soil Impacts and Subsurface Structures

Surface soil sampling was performed at twelve locations in the grass-covered areas around the perimeter site's parking lot and natural gas regulator station building. Surface soil was not impacted at ten of the locations. At two of the locations, soil samples contained polycyclic aromatic hydrocarbons (PAHs) in low-level concentrations, which slightly exceeded Commercial Use Soil Cleanup Objectives (SCOs). The concentrations of COC detected in the surface soil samples were consistent with concentrations anticipated for urban areas.

Two subsurface structures and three areas of concern for soil impacts (AOCs as defined in DER-10, 1.3 (b) 1) were identified.

Based on the historical information reviewed, and on the sampling performed during the RI, the above-grade MGP structures, and many of the below-grade foundations for the former MGP structures have been removed. The foundations for the MGP Building and two gas holders are still present in the subsurface of the site. The western gas holder foundation has been designated Gas Holder B, and the eastern gas holder foundation has been designated Gas Holder A (Figure 3).

Below and adjacent to the northwestern portion of the foundation for Gas Holder B, coal tar mixed in the soil matrix was observed to a depth of approximately 19 feet. Borings advanced in the four lateral directions have identified the horizontal limits of the impacted area. For the purposes of this report, this impacted area of the site is designated Area of Concern 1 (AOC 1).

The foundation for Gas Holder A is comprised of brick and is approximately 12 feet deep. Sampling was performed to assess the conditions at this holder foundation during the RI including: test pits inside and outside of the foundation, borings inside and around the foundation, and angle borings advanced to bedrock beneath the holder. Visible evidence of MGP-related residuals was not identified in any of the exploration locations adjacent to, or inside of the foundation. For the purposes of this report, the holder foundation and adjacent area are no longer designated an AOC and, for discussion purposes, is designated the Gas Holder A Foundation.

The MGP Building foundation itself was not found to contain coal tar. However, coal tar mixed in the fill and soil matrix was observed around or below the foundation to a depth of approximately 28 feet. Borings advanced in the four lateral directions have determined the horizontal extent of the impacts in this area. For the purposes of this report, this impacted area of the site is designated Area of Concern 2 (AOC 2).

Soil borings advanced at locations adjacent to and to the west of Geneva Street in the Geneva Street / NYS RT 14 ROW, identified intervals with coal tar mixed in the soil matrix in the interval between 20 to 28 feet. It is not known whether coal tar mixed in the soil matrix is also present beneath Geneva Street; however, coal tar-impacted soil was not observed at the eastern side of Geneva Street at the off-site parcel at 67 Geneva Street. For the purposes of this report, the eastern portion of the ROW is designated Area of Concern 3 (AOC 3).

Groundwater Impacts

Groundwater monitoring was performed in both the shallow and deep zones in the alluvium beneath the site. The monitoring has demonstrated that groundwater at the site is only minimally impacted by MGP-related COC. Total cyanide was elevated above the groundwater standard at one well location in the western area of the site. Low-level PAH concentrations (estimated below the laboratory reporting limits) were identified at a second well in the MGP Building area. Groundwater is not extracted and/or used at the site. The Village of Lyons obtains its drinking water from a lake which is approximately 30 miles to the south of the site.

Human Health Exposure Assessment

A qualitative human health exposure assessment was performed during the RI for the site and the adjacent off-site areas for current and potential future receptors. The assessment evaluated the potential for an exposure to MGP site-related COC for site users, outdoor utility and maintenance workers, and subsurface utility workers.

For all but one potential receptor group, the potential for an exposure to an MGP site-related COC is considered to be low, or a potentially complete pathway was not identified. Subsurface utility or construction workers who may perform subsurface excavation work on the site at AOC 1 (in and around the northwestern portion of Gas Holder B), and AOC 2 (the MGP Building Area) may potentially contact coal tar mixed in the fill or soil matrix. It is unlikely that coal tar-impacted soil would be encountered in excavations less than 5 feet deep in these areas. However, should deeper excavation work be needed, a worker may potentially be exposed to impacted soil.

Based on a boring advanced in the Geneva Street / NYS RT 14 ROW to the east of Geneva Street (MW5S), coal tar mixed in the soil matrix is present at a depth interval of 20 to 28 feet. If deep excavation work is performed in the ROW, a worker may be exposed to impacted subsurface soil. However, the potential for an exposure in this area is considered to be low based on the depth of the impacted soil and on the depths of the utilities (all above 12 feet deep) in this area.

General Response Actions (GRAs)

For this FS, GRAs are categories or approaches to the remedy which may be combined and further defined to create remedial alternatives. To meet the remedial action objectives (RAOs) developed for the site, the following GRAs were identified:

1. **No Action.** This response action is listed for compliance with DER-10 FS guidance, but would not result in meeting the RAOs and is not contemplated for this site.
2. **Institutional Controls and Engineering Controls (IC/ECs) Pertaining to Soil or Groundwater.** These actions, also known as IC/ECs, involve restrictions of legal access to soil or groundwater, and engineering controls to limit physical access.
3. **Containment of Soil and Groundwater.** Containment actions involve little or no treatment, but provide physical barriers to exposure, or otherwise remove pathways of exposure. These actions include vertical barriers and surface soil covers or impervious caps.
4. **In-Situ Treatment of Soil and Groundwater.** These actions include on-site reduction in the volume, toxicity, and/or mobility of the COC. Technologies include in-situ solidification/stabilization (ISS) of impacted soil, in-situ groundwater treatment, active enhancement of natural attenuation, and monitored natural attenuation (MNA) of groundwater.
5. **Removal and Off-Site Treatment/Disposal of Soil and NAPL/Groundwater**. These actions include excavation of impacted soil and extraction of non-aqueous phase liquid (NAPL), and off-site treatment/disposal of these wastes in properly permitted facilities.

Identification and Screening of Technologies

Remediation technologies are the practical means used to address a specific environmental condition. The goal of the identification and screening of technologies in this FS was to enable the most effective and applicable technologies to be applied to meet the site-specific conditions and remedial objectives. The individual technologies and approaches were then grouped to form alternatives, with each alternative addressing the site as a whole.

The identification and screening of technologies was conducted in three stages, in accordance with DER-10 guidance. An initial screening process was first used to determine the most applicable technologies for the site. For each of the General Response Actions – No Action, Institutional Controls/Engineering Controls, Containment, In-Situ Treatment, and Removal, one or more technologies and process options were identified, described, and screened with respect to site-specific applicability.

Next, the technologies that were not eliminated from consideration due to site-specific applicability were further refined and evaluated. The evaluation at this stage used the criteria of effectiveness, implementability, and relative cost, in accordance with the DER-10 guidance.

The retained technologies for this FS included IC/ECs, ISS, subsurface soil excavation and off-site soil treatment and disposal, surface soil removal and cover, and groundwater MNA.

Development and Analysis of Alternatives

A range of alternatives for additional remedial actions were developed based on the results of the RI, land use approaches, RAOs, and GRAs and the identified applicable remedial technologies. A total of five alternatives were developed and retained for detailed analysis. The five alternatives developed for the site include:

1. **Alternative 1** – No Action (required for comparison purposes by DER-10).
2. **Alternative 2**
   - Soil removal and re-grading to accommodate a 1-foot thickness of clean cover soil meeting the SCOs specified in 6 NYCRR Part 375-6.7(d) for Commercial Use
   - MNA for groundwater
   - IC/ECs site-wide implemented by an SMP (site and groundwater use restrictions, and an environmental easement)
   - Periodic Certification of IC/ECs in accordance with Part 375-1.8(h)(3)

3. **Alternative 3**

AOC 1 (Gas Holder B Area) and AOC 2 (MGP Building Area)

- Relocation of utilities
- Removal of foundations
- Removal of known MGP process piping
- Removal of soil in the area identified for ISS
- ISS of fill and soil exceeding 500 parts per million (ppm) for Total PAHs (0-15 feet)
- ISS of soil with source material below 15 feet
- Jet or pressure grouting may be utilized to address impacted soil around or beneath major obstructions
- Site re-grading to accommodate a 1-foot thickness of clean cover soil meeting the SCOs specified in 6 NYCRR Part 375-6.7(d) for Commercial Use
- MNA for groundwater
- Groundwater monitoring (applied site-wide)
- IC/ECs implemented site-wide by an SMP (including site and groundwater use restrictions, and an environmental easement)
- Periodic Certification of IC/ECs in accordance with Part 375-1.8(h)(3)

AOC 3 (Geneva Street / NYS RT 14 ROW)

- Groundwater monitoring (applied site-wide)
- IC/ECs implemented site-wide by an SMP (including site and groundwater use restrictions and an environmental easement)

4. **Alternative 4**

AOC 1 (Gas Holder B Area) and AOC 2 (MGP Building Area)

- Relocation of utilities
- Removal of foundations
- Removal of known MGP process piping
- Removal of soil exceeding 500 ppm for Total PAHs (0-15 feet)
- Removal of soil with source material below 15 feet
- Jet or pressure grouting may be utilized to address impacted soil around or beneath major obstructions
- Backfilling of excavated areas with clean soil which meets the SCOs specified in 6 NYCRR Part 375-6.7(d)
- Site re-grading to accommodate a 1-foot thickness of clean cover soils meeting the SCOs specified in 6 NYCRR Part 375-6.7(d) for Commercial Use
- MNA for groundwater
- Groundwater monitoring (applied site-wide)

- IC/ECs implemented site-wide by an SMP (including site and groundwater use restrictions, and an environmental easement)
- Periodic Certification of IC/ECs in accordance with Part 375-1.8(h)(3)

AOC 3 (Geneva Street / NYS RT 14 ROW)

- Groundwater monitoring (applied site-wide)
- IC/ECs implemented site-wide by an SMP (including site and groundwater use restrictions and an environmental easement)

5. **Alternative 5** – Soil Removal to Applicable NYSDEC Part 375 Unrestricted Use Criteria.

FS Evaluation

Detailed comparative evaluation of the five alternatives was then performed using the following eight criteria as defined by DER-10:

1. Overall protection of human health and the environment
2. Conformance with standards, criteria, and guidance (SCGs)
3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume of COC through treatment
5. Short-term impacts and effectiveness of controls
6. Implementability
7. Cost effectiveness
8. Land Use

Community Acceptance, which is the ninth criterion, will be evaluated after the public comment period for the proposed remedy, in accordance with DER-10.

Alternative 2 would not meet the RAOs for environmental protection and was dropped from further consideration. The remaining three alternatives all attain the project RAOs. Alternative 3 achieves the RAOs at a lower cost than Alternative 4, and is more readily implementable adjacent to the high-use roadway to the east (Geneva Street / NYS RT 14). Both Alternatives 3 and 4 would be more implementable with less community disruption and short-term risks than Alternative 5. Compared to the cost for Alternatives 3 and 4, the higher cost of Alternative 5 does not offer a commensurately higher value in additional environmental protection, nor does it increase the actual land use options. Alternative 5 involves a high-level of community disruption with action identified in the Geneva Street / NYS RT 14 ROW, and involves the removal and reconstruction of the natural gas distribution system for the Village of Lyons and surrounding areas, and has a higher resource utilization during implementation.

Estimated Costs for Each Alternative

The costs of each alternative evaluated are summarized as follows:

Alternative	Estimated Cost
Alternative 1	No Cost
Alternative 2	$0.4 million
Alternative 3	$2.8 million
Alternative 4	$3.9 million
Alternative 5	$10.9 million

Recommended Remedy

The elements identified in Alternative 3 are recommended for the areas of the site with surface soil impacts and for the site AOCs. Alternative 3 was selected based on the criteria evaluated in the FS with additional consideration given to the RAOs.

Surface Soil Areas

A soil cover is recommended for two areas of the site where exceedances of Commercial Use SCOs for surface soil were identified. These areas include an area adjacent to the NYSEG natural gas regulator station building, and a second area adjacent to Water Street. The horizontal extent of these areas will be confirmed during a Pre-Design Investigation. A cover to accommodate a 1-foot thickness of soil meeting the SCOs specified in 6 NYCRR Part 375-6.7(d) for Commercial Use is recommended for these areas. A demarcation material will be placed under areas where the 1-foot thick cover meeting Commercial Use SCOs is placed. If site grading requires the removal of soils before the placement of the 1-foot soil cover, the removed soils will be properly disposed of off site. If areas outside of the areas designated for the 1-foot soil cover require the addition of soils for site grading purposes, then the imported soils will also meet the Commercial Use SCOs.

AOC 1 (Gas Holder B Area) and AOC 2 (MGP Building Area)

- Pre-Design Investigation to assess the horizontal limits of mercury-impacted soil outside of the excavation/ISS area at AOC 2.
- Temporary relocation of utilities (underground electric, overhead electric distribution and transmission lines, and subsurface natural gas, water lines, and storm sewer lines).
- Excavation and removal of the former MGP Building foundation, and the northwestern portion of the foundation for the Gas Holder B.
- Removal and off-site disposal of known underground process piping associated with the former MGP in the excavation areas.

- Excavation of fill and soil in the areas identified for ISS to allow for a utility corridor. Also, removal of any ISS swell to ensure that the ISS solidified mass is below the frost line.
- ISS of fill and soil exceeding 500 ppm for Total PAHs from a depth of 0 to 15 feet.
- ISS of fill and soil with source material below 15 feet.
- Jet or pressure grouting may be utilized to address impacted soil around or beneath major obstructions.
- Backfill of the area above the ISS mass with clean soil which meets the SCOs specified in 6 NYCRR Part 375-6.7(d).
- Re-grading to accommodate a 1-foot thickness of clean cover soil meeting the SCOs specified in 6 NYCRR Part 375-6.7(d) for Commercial Use. Demarcation material will be placed under areas where a 1-foot cover meeting Commercial Use SCOs is placed.
- MNA to address the minimal groundwater impacts at the site.
- IC/ECs implemented site-wide by an SMP (including site and groundwater use restrictions, and an environmental easement agreement).
- Implementation of a program for periodic IC/EC inspections, and certifications in Periodic Review Reports, in accordance with Part 375-1.8(h)(3).

Gas Holder A Foundation

Extensive sampling was performed during the RI to assess conditions in and around the Gas Holder A Foundation. Visible evidence of coal tar-impacted soil or soil with Total PAHs greater than 500 ppm was not identified in the Gas Holder A Foundation and this area is no longer designated an area of concern. Additional groundwater monitoring, at a location down gradient from this foundation, is recommended to continue to assess conditions in this area. The monitoring would be performed according to the site-wide Monitoring Plan which will be developed for the site remedy and included in the SMP.

AOC 3

Groundwater monitoring is recommended in the eastern area of the ROW along Geneva Street / NYS RT 14 to continue to assess the potential for migration of COC from the site to the cross gradient area to the east. With the recommended actions for AOC 2 implemented, concentrations of COC in groundwater in AOC 3 would be anticipated to remain at non-detect levels.

The estimated cost for implementation of Alternative 3 is $2.8 million.

This remedy was selected because:

1. The remedy meets the RAOs developed for the site.
2. This alternative is readily implementable with moderate short-term impacts.
3. This alternative will allow for the continued property use as a NYSEG natural gas regulator station and, as determined by NYSEG through a lease agreement, a municipal parking lot for the Village of Lyons.
4. This alternative is implementable with the least adverse impacts adjacent to the high-use roadway to the east (Geneva Street / NYS RT 14).
5. This alternative is the most cost effective when compared with the other alternatives while offering a high-level of protection for both human and ecological receptors based on the stabilization of the MGP-related source material at the site.
6. Although less impacted material will be physically removed from the site under Alternative 3, the ISS-treated material will not pose a threat for migration because the impacted soil will be solidified. Groundwater concentrations of COC are already near non-detect levels and would be anticipated to further decrease with the solidification of the source material and MNA.
7. ISS is considered to be more readily implementable and cost-effective technology at this site, rather than excavation, given the technical challenges of working adjacent to the high-use roadway of Geneva Street / NYS RT 14.

In accordance with DER-31 Green Remediation, this alternative would have a moderate environmental footprint, primarily associated with the initial removal and disposal of impacted soil and debris, the ISS process, and the placement of the backfill material. During the course of the remedial activities, steps would be taken to mitigate the environmental footprint and provide for sustainable practices, energy usage, and materials. The details of these provisions will be developed in the design phase of the remedy.

The next step will be for the NYSDEC to issue a Proposed Remedial Action Plan (PRAP) for public comment and then a Record of Decision (ROD) for the site. A design for the remedy, including detailed drawings and specifications for remedial construction, will follow the issuance of the PRAP and ROD.

1. Introduction and Scope

This report describes the Feasibility Study (FS) undertaken for a site located at the corner of Geneva and Water Streets in the Village of Lyons, New York. The site is the location of a former manufactured gas plant (MGP) that was constructed in 1859 and operated at the site until 1917 by a predecessor company to NYSEG. The location of the site is shown on Figure 1.

The FS was conducted pursuant to a Multi-site Order on Consent between NYSEG and the New York State Department of Environmental Conservation (NYSDEC), and the specifications provided in the document entitled "*NYSDEC Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation*" *(DER-10)*, issued May 2010 [NYSDEC, 2010a].

1.1 Purpose of Report

As requested by the NYSDEC, this FS Report has been prepared following the completion of the Remedial Investigation Report (RIR) for the site [GEI, 2012]. DER-10 specifies that the FS Report should be prepared by the party responsible for performing remediation, and the report should be submitted to the NYSDEC DER for approval prior to the implementation of the remedy. The FS develops and evaluates options for remedial action in accordance with CERCLA [40 CFR 300.430(e)] to address the impacted media at the site or area of concern (AOC) that is being addressed by cleanup actions. The purpose of this FS is summarized as follows:

- To identify the goal of the remedial program;
- To define the nature and extent of the MGP-related residuals to be addressed by the developed alternatives;
- To develop remedial action objectives (RAOs) for the site;
- To develop a set of remedial action alternatives;
- To complete an initial screening and detailed analysis of the identified alternatives;
- To implement the specified decision process identified in DER-10, to identify and evaluate appropriate remedial options;
- To develop and provide a detailed description of the recommended site remedy; and
- To demonstrate that the recommended remedy can achieve the cleanup objectives for the site.

1.2 Report Organization

The balance of this document is divided into the following sections, in accordance with NYSDEC's guidance document DER-10 [Section 4.4 (b) 4]:

- **Section 2.0 - Site Description and History**. This section provides a description of the current layout of the site, and the history of the MGP.
- **Section 3.0 - Summary of the Remedial Investigation (RI) and Exposure Assessment**. This section describes the results of the environmental investigation, and evaluates the resulting potential for current or potential future site users to be exposed to MGP-related constituents of concern (COC).
- **Section 4.0 - Remedial Goals and Remedial Action Objectives**. This section introduces the documents that govern the FS evaluation, and presents the requirements which are applied to the MGP site.
- **Section 5.0 - General Response Actions (GRAs) and Volume Estimates**. This section describes the broad categories of remedies under consideration for this site and provides estimates of the volumes of the impacted media present at the site.
- **Section 6.0 - Identification and Screening of Technologies**. This section names and describes the principal technologies which might be brought to bear for the remedy of the site, and screens these technologies for applicability to the Lyons MGP site.
- **Section 7.0 - Development and Analysis of Alternatives**. In this section, a range of alternatives consisting of several technologies are described, evaluated in accordance with a standard set of criteria, and compared with one another.
- **Section 8.0 - Recommended Remedy**. This section presents the principal elements and sequence of implementation of the remedy.
- **Section 9.0 - References**. This section lists the references cited in this report.

Cost estimates for the remedial alternatives are provided in Appendix A. Volume estimates for impacted media are summarized in Appendix B.

2. Site Description and History

This section provides a summary of the site history and description based on information presented in the RIR for the Lyons MGP site.

2.1 Site Description

The site is a ½ acre area located within a mixed commercial and residential area in the central business district in the Village of Lyons. The site consists of two parcels of land (Figure 2). These parcels encompass the area of the former MGP operations.

The majority of the site is owned by NYSEG. NYSEG leases this parcel to Wayne County. A municipal parking lot covers most of the ground surface of the parcel. The lot is maintained by the Village of Lyons. The lot is surrounded on all sides by grass-covered areas. Access to the lot is from the Village of Lyons parking lot parcels to the west and north of the site. Because the site is predominantly a municipal parking lot surrounded by landscaped or grass-covered areas, public access to the site is unrestricted.

Also present at the parcel is the NYSEG Natural Gas House Regulator Station R#80/81 (Figure 2). The station is a small, one story masonry building which contains natural gas regulating and metering equipment. Access to the building is limited to NYSEG employees.

The Village of Lyons owns the southeast corner of the site. This parcel is an irregular shaped area at the corner of Water and Geneva Streets. The Village Department of Public Works (DPW) has constructed a raised-bed, landscaped area at this parcel, and a lighted sign welcoming visitors to the Village (Figure 2). This parcel is within the footprint of a New York State Department of Transportation (NYSDOT) Right-of-Way (ROW) which was established in the 1980's for the reconstruction of the intersection of Geneva Street / NYS RT 14 and Water Street, and the adjacent NYS RT 14 bridge over the New York State (NYS) Barge Canal to the south.

2.1.2 Adjacent Off-Site Parcels and Zoning

The adjacent off-site roadways and parcels are described below.

North

To the north of the site is a parcel of land owned by the Village of Lyons. This parcel is also a paved municipal parking lot. Around the perimeter of the parking lot are grass-covered areas (Figure 2). The zoning designation for the parcel is C1 Commercial.

South

Directly to the south and southeast of the site are Water Street, and the intersection of Water, Geneva, and Elm Streets (Figure 2). Across Water Street to the southwest is the Village of Lyons Fire Department building.

To the south of Water Street, at the corner of Water Street and Geneva Streets, are two parcels of land owned by the same owner with addresses of 15 Water and 72 Geneva Streets (Figure 3). A tavern was formerly present at the parcel at 72 Geneva Street which is now being renovated. The former tavern building is located at the top of the bank of the NYS Barge Canal. The second building at 15 Water Street is located in the central area of the tavern parking lot (Figure 2). This building is the former location of a gasoline sales station.

At the southeast corner of Elm and Geneva Streets is a parcel owned by the Village of Lyons. A grocery store was formerly present at this location. The parcel was recently redeveloped by the NYSDOT when the new bridge across the NYS Barge Canal was constructed in 1989. New landscaping and a sidewalk have recently been constructed in this area to provide access to a new recreational path (Lyons Waterfront Park) to the south, which is situated along the north shore of the canal.

Further to the south of these parcels is the NYS Barge Canal. The canal is located approximately 160 feet to the south of the site. The direction of surface water flow in the canal is from the west to the east. A lock, which is located 1,000 feet to the west of the site, controls the elevation of the water in the canal in the area to the south of the site.

East

To the east of the site is Geneva Street (Figure 4). To the east of Geneva Street are three parcels of land. Two of these parcels are the residential properties located at 63 and 65 Geneva Street. A zoning map for the Village of Lyons (included in the RIR in Appendix A) indicates that these two parcels are zoned R1 – Low Density Residential District. These properties are the nearest residential properties to the site, and are located approximately 50 feet to the east of the site's eastern boundary.

The third parcel to the east of the site is located at the corner of Geneva and Elm Streets. The address for the parcel is 67 Geneva Street. A gasoline sales and service station (Lyons Gas Station) was formerly present at this parcel. The parcel is currently vacant land, and is owned by the NYSDOT. The NYSDOT purchased this parcel to demolish the gasoline sales station, and then to widen Geneva Street / NYS RT 14 as part of the construction of the new bridge across the canal in 1989. This parcel is zoned Commercial C1. The property is a NYSDEC-listed petroleum spill site. Underground storage tanks (USTs) and impacted soil have been removed previously from this parcel. Based on drawings obtained from the NYSDOT, it appears that one UST is still present in the subsurface which was decommissioned in place (filled with sand).

West

To the west of the site is a parcel of land owned by the Village of Lyons. The footprint of this parcel roughly corresponds to the footprint of the former Erie Canal and Tow Path. The Erie Canal channel was filled-in in the early 1930's by the Village of Lyons. A rail track and corridor was later present at the parcel which was operated by the R.S. & E.R.R. (Rochester Syracuse and Eastern Rapid Railway Company). This area is currently a municipal parking lot which is maintained by the Village of Lyons. This parcel is zoned Commercial C1.

2.2 Site History and Former Structures

The RIR contains a chronology of the site from the 1876 to 1989, which has been compiled from a number of sources, including records obtained from NYSEG, the Village of Lyons, and the NYSDOT. The historical features of the MGP are shown in blue on Figure 3. Other historical features are shown in green on Figure 3. The Lyons MGP was constructed in 1859 by the Lyons Gas Light Company, a predecessor company to NYSEG. Based on the date of construction, the configuration of the plant, and the information provided in the Brown's Directory, the MGP was constructed and operated as a coal carbonization plant using coal as a feedstock. According to the Brown's Directory records, the MGP was shut down in 1917.

2.2.1 Historical Site Features

The historical research identified former site features which may have been potential source areas or AOCs for MGP-related residuals, and as such, those areas were targeted for investigation during the RI. The key features of the MGP, shown on Figure 3, are summarized below:

- **MGP Building** – The MGP Building was located in the east/central area of the site. The building was subdivided into three areas. These areas were labeled "Gas Retorts", "Purifiers", and "Shop" on the historical maps. The MGP Building was later used as a natural gas governor house.
- **Gas Holder A** – The original gas holder (Gas Holder A) was located to the west of the MGP Building.
- **Gas Holder B** – A second gas holder (Gas Holder B) was constructed to the west of Gas Holder A.
- **Coal/Lime/Brick Shed** – A building was located to the north of the MGP Building which was labeled "Coal/Lime/Brick Shed". The structure was also labeled "Store House" on several of the historic maps.
- **Shed** – An additional building labeled "Shed" was located at the western edge of the MGP property, adjacent to the Tow Path for the Erie Canal. The purpose of the building is unknown.

- **Tramway** – A Tramway/Trestle was present between the Coal/Lime/Brick Shed and the Tow Path of the former Erie Canal.
- **MGP Structure A** – A dwelling is shown to the west of Gas Holder A on the historical maps. The dwelling was located within the footprint of Gas Holder B. Because the dwelling is shown on the MGP parcel at the time of operations, it is possible that the dwelling may have been the residence of the plant operator.
- **MGP Structure B** – An unknown structure was present at the eastern end of the Tramway. The structure is shown; however, is not labeled on any of the Sanborn or facility maps.
- **Former Erie Canal** – During the time of MGP operations, the Erie Canal was located adjacent to, and to the west of the MGP. This was the nearest water body to the MGP during the period of manufactured gas production. The canal was filled-in sometime between 1917 and 1931 by the Village of Lyons.
- **Former Clyde River/NYS Barge Canal** – The NYS Barge Canal is currently the closest water body to the site. The Clyde River was present to the south of the site from the time of plant construction until sometime between 1911 to 1917, when the river channel was deepened and realigned to form the current NYS Barge Canal.

2.2.2 Other Site Uses

NYSEG acquired the Empire Gas and Electric Company and the Lyons MGP parcel in 1936. NYSEG used the larger gas holder (Gas Holder B) for the storage and distribution of natural gas. The former MGP Building was used as a governor building. The building was demolished in 1976. The site was then redeveloped to its current configuration as a NYSEG natural gas regulator station and a municipal parking lot.

2.3 Physical Setting and Local Land and Water Use

2.3.1 Topography

The ground surface of the site is highest in the southwest corner of the site. The ground surface elevation in this area is approximately 410 feet North American Vertical Datum 1988 (NAVD88). From this area the ground surface slopes to the northeast. The overall change in elevation across the site is 7 feet. Additional information regarding the topography of the site is included in the RIR.

2.3.2 Land Use

As described above, the site is used for several purposes. The majority of the site is a parking lot which, under a lease agreement with NYSEG, is maintained by the Village of Lyons. A NYSEG natural gas regulator station is also present in the central area of the site. A landscaped strip is present at the corner of Geneva and Water Streets. The surrounding area is used for a combination of commercial, recreational, and residential purposes.

2.3.3 Zoning

According to information provided by the Village of Lyons Code Enforcement Department, the site is zoned for Commercial land use (Village of Lyons - C1 Commercial Designation). The Village of Lyons zoning map is included in Appendix A of the RIR.

2.3.4 Utilities and Infrastructure

Utilities at the site include water lines, high- and low-pressure natural gas lines, underground electric lines, overhead electrical transmission and distribution lines, overhead communication lines, and storm sewer catch basins and piping. Additional site infrastructure is present as part of the NYSEG natural gas regulator station including significant high-pressure natural gas distribution pipes. Figure 3 shows the layout and surface features, and the locations of underground utility lines.

2.3.5 Water Supply in the Area

According to the Village of Lyons DPW, the Village obtains its potable water supply from Canandaigua Lake. The distribution of potable water in the Village is managed by the Wayne County Water & Sewer Authority (WCW&SA).

2.4 Site Geology

At the majority of the soil boring locations in and around the MGP process area, a layer of anthropogenic fill material was observed. The fill was thickest (approximately 12 feet thick) in the area of the Gas Holder A Foundation. The fill material was observed to consist mostly of sand and gravel mixed with varying amounts of brick fragments, clinkers, ash, and coal.

The fill is underlain by alluvium which is comprised of a heterogeneous mixture of clayey silt, sandy silt, sand and gravel. Laterally continuous units within the alluvium that may potentially be acting as confining units were not observed during the soil sampling. At several of the boring locations, a thin layer of glacial till was observed beneath the alluvium. The glacial till was not observed to be laterally continuous across the site. The bedrock (Camillus Shale) was encountered beneath the alluvium or till at depths which ranged from 31 to 62 feet. The surface of the bedrock is deepest in a trough in the south/central area of the NYSEG parcel. The surface of the bedrock slopes towards this area from all directions.

2.5 Site Hydrogeology

2.5.1 Site Surface Water and Drainage

There are no surface water features at the site. Storm water at the parking lot of the site drains into a catch basin in the eastern area of the lot (Figure 3). From this catch basin, water flows to the south to a deep (approximately 10 feet deep) storm water drain system in Water and Geneva Streets (Figure 3), which was constructed by the NYSDOT in the 1980's.

NYS Barge Canal

The NYS Barge Canal flows from the west to the east to the south of the property located at 15 Water Street. The distance from the former MGP production area to the canal is approximately 230 feet. The elevation of water in the canal is seasonally controlled by a lock system, located to the west of the site in the Village of Lyons. The lock and the canal system are maintained by the New York State Canal Corporation (NYSCC).

The water level in the canal is typically regulated by the NYSCC at elevations between 385 and 390 feet NAVD88 during the warmer months (generally May through October). This is the time of the year when the canal is open to navigation. The elevation of the water in the canal at the time of the gauging event performed during the RI in May 2012 was 384.66 feet NAVD88.

The water level in the canal is typically regulated at a lower elevation (approximately 380 feet NAVD88) during the winter months. This period is generally from November through April, when the canal is closed to navigation. The elevation of the surface water for an event performed during the RI in December 2011 was 379.52 feet NAVD88.

2.5.2 Groundwater

Groundwater elevation data was obtained from two zones in the alluvium during the RI. These zones included the zone at, or near the water table (shallow zone), and the zone at, or near the top of the bedrock (deep zone).

Shallow Zone Groundwater Flow Direction

Complete rounds of depth-to-water measurements were taken in December 2011 and May 2012 for all the site wells. Based on the measurements from the shallow zone wells, and the measurement obtained for the surface water elevation reference point, the surface of the water table slopes from the site southwards towards the canal for both the high and low canal water level conditions. The horizontal gradient from the site to the canal for the December 2012 event was 0.004 feet/foot. For the event performed in May 2012 (high canal water level conditions), the horizontal gradient from the site to the canal was 0.0037 feet/foot.

Deep Zone Groundwater Flow Direction

Information regarding deep groundwater flow direction was obtained for both the December 2011 and May 2012 gauging events. For the December 2011 event, the highest elevations of the piezometric surface were observed for wells in the northern area of the site. The slope for the piezometric surface for the deep wells is generally from the north to the south/southwest. A similar pattern for the slope of the piezometric surface was observed for the May 2012 sampling event. For the December 2011 event, the horizontal hydraulic gradient for the piezometric surface for the deeper wells was 0.005 feet/foot. For the May 2012 sampling event, the horizontal hydraulic gradient for the piezometric surface for the deeper wells was 0.0036 feet/foot.

Vertical Hydraulic Gradient

Vertical hydraulic gradients were evaluated by reviewing groundwater elevation data for those shallow zone and deeper zone wells that are in close proximity to each other. The elevation data, and the potential direction of groundwater flow for each pair, is summarized in the RIR. Based on the data collected during the RI (December 27, 2011 and May 2, 2012 gauging events), there does not appear to be a discernible trend for vertical hydraulic gradient across the site.

Estimate of Hydraulic Conductivity

Permeability testing was performed at one well during the RI. The hydraulic conductivity of the alluvium was calculated to be 45 feet per day. Additional information regarding the hydraulic conductivity testing performed is provided in the RIR.

3. Summary of the RI and Exposure Assessment

This section summarizes the results of the RI including the human health exposure assessment.

3.1 Site AOC Summary

The areas of concern for the site were identified and investigated in the RI. For the purposes of this FS, the AOCs have been further defined based on specific areas of impacts, or by former MGP features. Information regarding conditions observed at the former MGP features, and the nature and extent of MGP-related residuals associated with the features, is summarized below. The locations of the test pits, soil borings, and monitoring wells are shown on Figure 5.

Two subsurface structures and three areas of concern (AOCs as defined in DER-10, 1.3 (b) 1), are identified and discussed in this FS.

Gas Holder B

The foundation for the gas holder is still present in the subsurface at the location shown on Figure 5. The foundation is now covered by approximately 3 feet of fill, which is comprised predominantly of sand. The diameter of the foundation is 70 feet. The floor of the foundation is constructed of concrete, and is 4 inches thick. The outer (perimeter) edge of the floor is supported by a concrete ring foundation, which is 2 feet thick and 3.5 feet deep. Beneath the concrete ring foundation is a footer which is approximately 2 feet thick. Visible evidence of coal tar-impacted soil was not observed in the eastern portion of the gas holder foundation.

Visible evidence of coal tar-impacted soil was observed in the western area of the gas holder foundation. Hardened coal tar mixed with fill was observed from 4 to 8 feet deep, and hardened coal tar and coal tar blebs were observed from 14 to 18 feet. To assess the horizontal extent of the impacts observed at western portion of the holder, soil borings were advanced in all directions from this area. The approximate limit lines for the coal tar-impacted soil in this area were identified by these step-out borings. For the purposes of this FS, the impacted area in and around the Gas Holder B foundation is designated Area of Concern 1 (AOC 1).

Gas Holder A

Based on the test pit and soil borings advanced in the footprint of Gas Holder A, the foundation for the holder is still present in the subsurface of the site. The foundation is constructed of bricks, and is 3 feet thick. The diameter of the foundation is 30 feet. Based on information obtained from a boring inside the holder, and a test pit outside the holder, the bottom floor of the foundation is 12 feet deep. The foundation contains fill material including metal debris, glass, concrete, bricks, and soil. Water was observed at 5 feet deep inside the holder. Because the water level in the holder is approximately

15 feet above the ground water table, it appears that the foundation is still competent enough to hold, or partially hold water. Visible evidence of coal tar-impacted fill or soil was not observed inside the holder foundation. Borings were advanced in all directions around the holder foundation, and two angle borings were advanced below the holder foundation down to the bedrock unit. Coal tar-impacted soil was not observed in the soil samples collected from either of the two angle borings.

Although MGP-related residuals have not been observed in or around the holder foundation and this area is no longer considered an area of concern, some level of monitoring is warranted due to the presence of vessel water in the foundation. For the purposes of this FS, this area has been designated the Gas Holder A Foundation. Actions are recommended for this area in the recommended alternative (groundwater monitoring applied site-wide).

MGP Building

Based on test pits excavated in the footprint of the building, and on the soil borings advanced in this area, the remains of building floors, interior wall foundations, and exterior wall foundations are present in the subsurface in this area. The foundations are constructed from several types of materials including bricks, concrete, and field stone. Two soil borings were advanced in the footprint of the MGP Building foundation. Coal tar mixed in the soil matrix was observed from 6 to 19 feet deep. Coal tar blebs were observed from depths of approximately 23 feet. Soil borings advanced in all directions have identified the horizontal extent of the impacts in this area. For the purposes of this FS, this area of impact is designated Area of Concern 2 (AOC 2) (Figure 7).

MGP Structure A

A foundation for the structure was not encountered during the excavation of test pits in this area. Visible evidence of MGP-related residuals was not observed in borings surrounding the structure.

Coal/Lime/Brick Shed

A foundation for the shed was not encountered during the advancement of the soil boring in this area. Hardened coal tar was observed from 3 to 4 feet at this boring location. Soil borings were advanced in all directions from this area to assess the horizontal extent of the shallow tar-impacted soil. Visible evidence of coal tar-impacted soil was not observed at any of the step-out boring locations. The area of impact has been included in AOC 2 in this report.

Shed

A foundation for the Shed was not encountered in the soil boring advanced in this area. Visible evidence of MGP-related residuals was not observed in the soil borings in this area.

MGP Structure B

A foundation for the structure was not observed in the soil borings advanced at this location. Coal tar stringers and black hydrocarbon staining was observed from 8 to 19 feet in this area. This area of impact is included in AOC 1.

Former Erie Canal Area

Five soil borings were advanced in the footprint of the former Erie Canal to assess the presence of MGP-related residuals. Visible evidence of MGP-related residuals was not observed at any of the boring or well locations. Additional actions in the former Erie Canal area are not recommended in this report.

Village of Lyons Property – Geneva and Water Streets / NYS RT 14 NYSDOT ROW

RI sampling was performed in the Village of Lyons property to the south along Water Street, and to the east along Geneva Street / NYS RT 14 (Figure 5). This area is also a NYSDOT easement area which was created in the 1980's to re-construct the corner of Geneva and Water Streets, and a new bridge across the NYS Barge Canal. Soil or groundwater impacts were not identified in the ROW area along Water Street.

For the sampling performed in the Geneva Street / NYS RT 14 ROW, coal tar mixed in the soil matrix was identified at one of four borings (MW5S). The coal tar observed at this location was described by the geologist as being very weathered, and did not appear to be flowable. Photographs of the coal tar-impacted soil observed in this area are included in Figure 16. Wells were screened across the most impacted interval at MW5S, and also a sheen-impacted interval at MW5D, to obtain groundwater samples in this area. MGP-related COC were not detected in the groundwater samples collected from wells MW5S and MW5D. It is unknown whether coal tar-impacted soil is also present beneath Geneva Street; however, coal tar-impacted soil was not observed to the east, at the eastern side of Geneva Street (MW10S/D). For the purposes of this FS, the eastern portion of the Geneva Street ROW has been designated Area of Concern 3 (AOC 3) (Figure 7).

3.2 Off-Site Areas

RI sampling was performed at four off-site parcels to assess the presence of MGP-related residuals in these areas. These parcels include the Village of Lyons parking lots to the north and west of the site, the parcel at 67 Geneva Street, and the parcel at 15 Water / 72 Geneva Street.

67 Geneva Street

Petroleum-related impacts were observed during the installation of wells at the parcel which is the former site of a gasoline sales and automotive service station. Hydrocarbon-like staining was observed from 6.5 to 10 feet, and from 15 to 26 feet at two well locations. "Gasoline-like" odors were observed by the field geologist performing the soil and groundwater sampling. This property is

a NYSDEC-listed petroleum spill site. Two USTs have been removed from the property. One UST appears to be decommissioned (filled with sand) and left in the subsurface of the property. Petroleum-impacted soil has also been excavated from the property in the 1990's. Because the impacts at this parcel appear to be a result of the petroleum spill, and visible evidence of coal tar mixed in the soil matrix was not observed at the property, additional action for this parcel is not recommended in this FS.

15 Water / 72 Geneva Street

This parcel is the former site of a gasoline sales and automotive repair facility (Figure 3). During the installation of two wells at the parcel in 1992, the field geologist observed "kerosene-like" odors from 26 to 35 feet at this parcel. A slight odor was observed during the groundwater sampling performed at the two wells. Although these impacts were observed, soil sampling did not identify COC in concentrations exceeding Soil Cleanup Objectives (SCOs). Groundwater sampling performed in 1994 identified low-level concentrations of COC; however, for the most recent sampling performed during the RI, COC was not identified in concentrations greater than the groundwater standards. Based on the absence of a migration pathway for COC to migrate from the site to this parcel, and on the most recent groundwater analyses performed at the parcel, it appears that this area is outside of the area of MGP-related impacts. Additional action for this parcel is not recommended in this FS.

Village of Lyons Parking Lots

RI sampling was performed in the Village of Lyons parking lots to the north and west of the site. Visible evidence of coal tar mixed in the soil matrix was not observed in these areas (Figure 5). Because these areas appear to be outside of the area with identified MGP-related impacts, additional action for this parcel is not recommended in this FS.

3.3 Nature and Extent of MGP-Related COC

Media which were investigated during the RI included surface soil, subsurface soil, and groundwater. Conclusions for each are summarized below.

3.3.1 Surface Soil

Surface soil is not significantly impacted at the site. The concentrations of PAHs identified in the surface soil samples were low-level concentrations, which were only slightly elevated above the Commercial Use SCOs at two of the 12 locations sampled. The concentrations of COC detected in the samples are consistent with the concentrations anticipated for soil in urban areas. Actions to address the two areas where the exceedances of Commercial Use SCOs were identified are included in Section 7.

3.3.2 Subsurface Soil

Subsurface soil with visible coal tar or coal tar mixed in the soil matrix, and/or COC with concentrations greater than Commercial Use SCOs, is present in three areas of the site:

- Coal tar mixed in the soil matrix was observed between 4 and 19 feet deep in the footprint of, and adjacent to the northwestern portion of the Gas Holder B foundation (AOC 1).
- Coal tar mixed in the soil matrix was observed between 5 and 28 feet deep in the eastern area of the MGP Building foundation (AOC 2).
- Hardened coal tar mixed in the soil matrix was observed between 20 and 25 feet bgs at MW5S (AOC 3).

3.3.3 Groundwater

- With one exception, groundwater with concentrations of volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) exceeding NYSDEC groundwater standards or guidance values was not identified at the site. A groundwater sample collected from MWPZ5 contained very low (estimated "J" values below the method reporting limits) concentrations of PAHs for one of the two sampling events performed for this well.
- Total cyanide was detected in one shallow zone well (MW1S) in a concentration slightly greater than the NYSDEC groundwater standard for one of the two sampling rounds performed during the RI.

3.4 Fate and Transport Mechanisms

Conclusions for each media investigated during the RI are summarized below.

3.4.1 Surface Soil

The concentrations of PAHs identified in the surface soil samples were very low-level concentrations, which were only slightly elevated above the Commercial Use SCOs. The concentrations detected are consistent with background concentrations commonly measured for urban areas. Based on the short duration of any work that would be performed in the grass-covered areas of the site, the potential for an exposure to COC in surface soil is considered to be low. It is unlikely that the migration of COC in surface soil by wind or water erosion would result in impacts to surface water or sediment in the areas adjacent to the site.

3.4.2 Subsurface Soil

Subsurface soil with hardened coal tar or coal tar mixed in the soil matrix, and/or COC with concentrations greater than Commercial Use SCOs, is present in three areas of the site. Coal tar mixed in the soil matrix was observed between 4 and 19 feet deep in the footprint of, and adjacent to the northwestern portion of the Gas Holder B foundation (AOC 1). Coal tar and coal tar mixed in the soil matrix was observed between 5 and 28 feet deep in the eastern area of the MGP Building

foundation (AOC 2). The impacted interval in the eastern area of the site (AOC 3) extends to just below the groundwater table at MW5S (20-25 feet bgs). Borings advanced in all directions from these AOCs, have demonstrated that coal tar is not migrating away from these areas of the site.

3.4.3 Groundwater

Groundwater is only minimally impacted at the site. Groundwater with concentrations of VOCs and SVOCs exceeding NYSDEC groundwater standards was not identified in the on-site area, with the exception of MWPZ5 discussed above. Total cyanide was detected in one of the shallow zone wells in a concentration greater than the NYSDEC groundwater standard for one of the two sampling rounds performed. Based on the wells installed during the RI, impacted groundwater is not migrating from the site towards adjacent off-site areas. Groundwater is not extracted and/or used at the site. The Village of Lyons obtains its drinking water from Canandaigua Lake.

3.5 Exposure Pathways and Potential Receptors

The RIR contains an evaluation of exposure pathways and receptors for the area investigated during the RI. The evaluation examined the following media and potential release mechanisms, and examined how each potential human receptor group might come into contact with impacted media.

- **Fugitive Dust.** COCs in surface and subsurface soil could be a potential source for fugitive dust via physical disturbance.
- **Volatilization.** Volatile COCs may potentially be transported from subsurface soil by volatilizing into soil-pore space and eventually emanate into ambient or indoor air.
- **Leaching.** COCs in surface or subsurface soil could potentially leach to groundwater.

There are three mechanisms by which COCs in groundwater can be transported to other media. These migration pathways include the following:

- **Adsorption.** COCs in groundwater may be sorbed onto subsurface soils.
- **Volatilization to Ambient Air.** Volatile COCs in groundwater may potentially desorb into soil vapor and be transported through the vadose zone into ambient or indoor air.
- **Extraction or Migration.** COCs in groundwater may migrate to other media by extraction or migration and use of impacted groundwater.

Each of these potential release mechanisms was evaluated for each potential receptor group, both on site and off site. The receptor groups included:

- On-Site Workers
- On-Site Outdoor Maintenance Workers
- On-Site Subsurface Utility or Construction Workers

- Site Visitors
- Recreational Users

A qualitative human health exposure assessment was performed for the site. With one exception, the potential for an exposure to MGP-related residuals is considered to be low, or no potentially complete exposure pathway was identified. For a subsurface utility worker or construction worker who may perform excavation work in two areas of the site, the worker may potentially be exposed to hardened coal tar or coal tar mixed in the soil matrix. These areas include the northwestern portion of the foundation for Gas Holder B (AOC 1), and in the eastern portion of the MGP Building foundation (AOC 2). With the exception of the area of MW4D, where a shallow lens of hardened coal tar was observed, it is unlikely that these residuals would be encountered at depths of less than 5 feet deep in these areas. It is unlikely that a subsurface utility worker would be exposed to coal tar mixed in the soil matrix in AOC 3, because of the depth of the impact (15-25 feet) and the absence of utilities deeper than 10-12 feet in this area.

Ecological Receptors

A significant high-value habitat is not present at the site because the site is a paved parking lot located in an urban area. The potential for an exposure for an ecological receptor at the site is therefore considered to be very low.

4. Remedial Goals and Remedial Action Objectives

4.1 Standards, Criteria, and Guidance (SCGs)

As defined in the DER-10, standards and criteria are the New York State regulations or statutes that dictate the cleanup standards, standards of control and other substantive environmental protection requirements, criteria, or limitations which are generally applicable, consistently applied, officially promulgated and are directly applicable to a remedial action.

The principal SCGs applicable to this site are:

- **6 NYCRR § 375-1**: General Remedial Program Requirements;
- **6 NYCRR § 375-2**: Inactive Hazardous Waste Disposal Site Remedial Program;
- **6 NYCRR § 375-6**: Remedial Program Soil Cleanup Objectives;
- **NYSDEC Policy Memorandum CP-51** on Soil Cleanup Guidance (Soil Cleanup Memo), October 21, 2010 [NYSDEC, 2010b];
- **NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1** Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations;
- **Guidance for Evaluating Soil Vapor Intrusion in New York**;
- **DER-10** Technical Guidance for Site Investigation and Remediation;
- **DER-31** Green Remediation;
- **TAGM 4030** Selection of Remedial Actions at Inactive Hazardous Waste Sites; and
- **NYSDEC Technical Guidance for Screening Contaminated Sediments**.

Detailed lists of the chemical-specific, action-specific, and location-specific SCGs are provided in Tables 4-1, 4-2 and 4-3, respectively.

The site-specific cleanup levels for the MGP-related COC in soil and groundwater are the SCGs that will be used to define the RAOs and to develop the remedial alternatives.

4.2 Soil Cleanup Levels

As stated in the NYSDEC Soil Cleanup Memo CP-51, Section 5, Paragraph A: *a soil cleanup level is the concentration of a given COC for a specific site that must be achieved under a remedial program for soil. The determination of soil cleanup levels is dependent on the following criteria* (the criteria are provided in *italics*, below):

1. ***The applicable regulatory program***, which for this site is the Inactive Hazardous Waste Program.
2. ***Whether the groundwater beneath or down gradient of the site is or may become impacted with site related COCs***, which for this site is confirmed by the RIR; however, for this site, the concentrations of COC are already near non-detect levels.
3. ***Whether ecological resources constitute an important component of the environment at or adjacent to the site, and which are, or may be, impacted by site-related COC.*** Ecological resource considerations do not apply for this FS, as established in the RIR, because the site is a natural gas regulator station and municipal parking lot in an urban area.
4. ***Other impacted environmental media such as surface water, sediment, and soil vapor***. These considerations for surface water and sediment are not applicable, as these media are not present at the site. Because no occupied buildings exist at the site, or in close proximity to the site, soil vapor is not currently applicable at this site. The prevention of potential inhalation of soil vapor COC due to soil vapor intrusion into any potential future building at the NYSEG property will be addressed by the management of source material.

After evaluating the nature and extent of the soil impacts on the site, this FS presents alternatives based on Approach 2: Restricted Use SCOs, as described in the NYSDEC Soil Cleanup Memo CP-51, Soil Cleanup Guidelines. Within the Restricted Use approach, the Commercial Use SCOs are applicable for the site soils based on the current and likely land use and continued ownership by NYSEG, and the zoning designation for the property (Village of Lyons – Commercial C-1 designation). The development of these SCOs is described in more detail below.

Protection of Groundwater. Protection of Groundwater SCOs (which are the Unrestricted Use SCOs for the PAHs and benzene, toluene, ethyl benzene, and xylene (BTEX) compounds at this site) may be deemed not applicable by the NYSDEC, allowing a Restricted Use approach, if the following conditions are met, as described in the NYSDEC Soil Cleanup Memo CP-51, Section V, Paragraph D2 (the Memo text is provided in *italics,* below):

- ***The groundwater standard contravention is the result of an on-site source which is addressed by the remedial program***. In order for this condition to be met, the remedial alternatives in this FS that are based on the Restricted Use approach include technologies that address the on-site source areas.
- ***An environmental easement or other institutional control will be put in place which provides for a groundwater use restriction.*** This provision has been included in the alternatives in this FS that are based on the Restricted Use approach.
- ***DEC determines that contaminated groundwater at the site****:*

a) ***Is not migrating, nor likely to migrate, off-site***. As demonstrated by the RI, substantial off-site migration of groundwater with MGP-related COC was not found to be occurring and on-site groundwater impacts are minimal. *Or*

b) *Is migrating, or likely to migrate, off-site; however, the remedy includes active groundwater management to address off-site migration.* Not applicable.

- ***DEC determines that groundwater quality will improve over time***. Groundwater is only minimally impacted at the site. The only COC over groundwater standards was total cyanide at one well, and PAHs (estimated concentrations below the method reporting limits) at a second well.

4.3 Land Use and Cleanup Objectives

4.3.1 Soil Cleanup Levels

The SCOs as defined in 6 NYCRR Part 375-6 which apply to the site are determined based on the site use. The majority of the site is a natural gas regulator station and municipal parking lot, with landscaped strips of land between the parking lot and the adjacent roadways. The future site ownership and use is projected to remain as it is today. The following SCOs have been selected for the site:

- **Commercial Use Soil Standards – Applicable to Soil Less than 15 feet bgs:** This FS proposes to use a soil cleanup level for Total PAHs of 500 parts per million (ppm), applicable to a depth of 15 feet, as stated in CP-51 Paragraph H. The 500 ppm level will be used in lieu of achieving individual COC specific cleanup levels. For the purposes of this provision, subsurface soil will be defined as soil beneath at least 1 foot of soil cover or soil that meets the applicable SCOs.
- **Source Removal Below 15 feet bgs:** Source removal refers to the removal of a discrete source area, which is defined in DER-10 1.3 (b) 70 as containing "*COC in soil in sufficient concentrations to migrate in soil, or to release significant levels of COC to another environmental medium, which could result in a threat to public health and the environment. A source area typically includes, but is not limited to, a portion of a site where a substantial quantity of any of the following is present:*

  i. concentrated solid or semi-solid hazardous substances;

  ii. non-aqueous phase liquids; or

  iii. grossly impacted media. [see 6 NYCRR 375-1.2(au)]

4.3.2 Groundwater Cleanup Levels

The SCGs for groundwater quality are the Ambient Water Quality Standards, Guidance Values, and Groundwater Effluent Limitations (AWQS) identified in "*NYSDEC Technical and Operational*

Guidance Series 1.1.1" (TOGS) [NYSDEC, 1998]. Based on this document, there is a single standard for groundwater in New York, based on the use of groundwater as drinking water.

4.4 Remedial Action Objectives (RAOs)

The RAOs are established as the overall goals for the site remediation to provide protection of human health and the environment. The RAOs for this site were developed based on the applicable SCGs and the current and intended future land use. The RAOs are site-specific goals that address the media of concern, specific COC, and the exposure pathways for the site. Specific COC to be addressed in this FS are PAHs, BTEX, and total cyanide.

Upon consideration of the SCGs, and the nature and extent of MGP impacts, as described in the RI, the following RAOs were developed for the site. These RAOs are goals to be achieved to the extent practicable.

4.4.1 Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with soil with COC levels exceeding the applicable SCOs.
- Prevent inhalation of or exposure to COC volatilizing from soil.

RAOs for Environmental Protection

- Prevent migration of COC that would result in groundwater, surface water, or sediment impacts.
- Prevent impacts to biota from ingestion/direct contact with soil causing toxicity.

4.4.2 Groundwater

RAOs for Public Health Protection

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

RAOs for Environmental Protection

- Prevent the discharge of COC to surface water or sediment.
- Remove the source of groundwater or surface water impacts, to the extent practicable.
- Restore groundwater aquifer to ambient groundwater quality criteria, to the extent practicable.

4.4.3 Surface Water

- **Not Applicable**. There are no surface water features at the site.

4.4.4 Sediment

- **Not Applicable**. There are no sediments at the site.

4.4.5 Soil Vapor

RAOs for Public Health Protection

- **Not Applicable**. With the exception of the natural gas regulator station building, there are no buildings at the site. The natural gas regulator station building is only accessed intermittently for maintenance purposes. The prevention of inhalation of soil vapor COC due to soil vapor intrusion into any potential future building at the NYSEG property will be addressed by the management of source material and by Institutional Controls/Engineering Controls (IC/ECs).

5. General Response Actions and Estimated Volumes

In accordance with the guidance provided in DER-10 regarding the development and evaluation of remedial alternatives, this section describes the development of General Response Actions (GRAs) to address the RAOs identified in Section 4, and the estimated volumes of impacted media.

5.1 Potentially Site-Derived MGP Constituents of Concern

The potentially site-derived MGP COC, as identified in the RI, are BTEX, PAHs, and total cyanide. The 17 PAH compounds included in the Total PAH concentrations (Total PAH17) discussed in this FS include the following:

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

5.2 Range of General Response Actions (GRAs)

GRAs are not specific to any single technology, but represent categories or approaches which may be combined and further defined to create remedial alternatives. To meet the RAOs developed for the site, the following GRAs were identified:

1. **No Action.** This response action is listed for compliance with DER-10 FS guidance, but would not result in meeting the RAOs and is not contemplated for this site.
2. **Institutional Controls and Engineering Controls (IC/ECs) Pertaining to Soil or Groundwater.** These actions, also known as IC/ECs, involve restrictions of legal access to soil or groundwater and engineering controls to limit physical access.
3. **Containment of Soil and Groundwater.** Containment actions involve little or no treatment, but provide physical barriers to exposure, or otherwise remove pathways of exposure. These actions include vertical barriers and surface soil covers or impervious caps.
4. **In-Situ Treatment of Soil and Groundwater.** These actions include on-site reduction in the volume, toxicity, and/or mobility of the COC. Technologies include in-situ solidification

(ISS) of impacted soil, in-situ groundwater treatment, active enhancement of natural attenuation, and monitored natural attenuation (MNA) of groundwater.

5. **Removal and Off-Site Treatment/Disposal of Soil and NAPL/Groundwater**. These actions include excavation of impacted soil and extraction of non-aqueous phase liquid (NAPL), and off-site treatment/disposal of these in properly permitted facilities.

5.3 General Extent of Impacts

The nature and extent of impacts in surface soil, subsurface soil, and groundwater were described in Section 3. In accordance with the guidance provided in DER-10, this section presents the estimated extent of impacts in soil at the NYSEG property, and the off-site ROW Area AOC 3. The extent of impacts was determined with reference to the data presented in the RIR. Laboratory data from the RI were tabulated and compared to chemical-specific SCGs for surface soil, subsurface soil, and groundwater. The estimated areal extent of soil impacts, defined as exceedances of Part 375 Unrestricted Use SCOs, is shown in Figure 5. The estimated extent of groundwater impacts, defined as exceedances of NYSDEC Ambient Water Quality Standards, is shown in Figure 6.

RIR Table 25 presents a summary of the frequency of exceedances of the SCOs for subsurface soil. The table includes the number of subsurface soil samples collected, the range of each of the COC concentrations detected, and the number of exceedances of the Subpart 375 Unrestricted and Commercial Use SCOs [GEI, 2012].

5.4 Volume Estimates

The volumes of impacted soil and groundwater present at each AOC were estimated for the purpose of providing a basis for the development and evaluation of remedial alternatives. Table 5-1 provides a summary of the volumes for each impacted medium. Volume calculation tables are provided in Appendix B.

Table 5-1 Estimated Volumes of Impacted Media

Medium	Estimated Volume
Surface Soil – Commercial Use SCOs (0-1 foot bgs)	118 CY
Surface and Subsurface Soil – Unrestricted Use SCOs	30,560 CY
Identified Area of Concern AOC 1	
1. Subsurface Soil Exceeding 500 ppm Total PAH Commercial Use SCO (0 to 15 ft bgs)	1,560 CY
2. Deeper Source Material[1] (below 15 feet)[2]	1,040 CY
Identified Area of Concern AOC 2	
1. Subsurface Soil Exceeding 500 ppm Total PAH Commercial Use SCO (0 to 15 ft bgs)	1,860 CY
2. Deeper Source Material[1] (below 15 feet)[2]	610 CY
Identified Area of Concern AOC 3	
1. Subsurface Soil Exceeding 500 ppm Total PAH Commercial Use SCO (0 to 15 ft bgs)	0 CY
2. Deeper Source Material[1] (below 15 feet)[2]	290 CY

Table Notes:

[1]Source Material is defined as coal tar lenses or deposits, or coal tar mixed in the fill or soil matrix as observed in RI borings or test pits.

[2]Source Material was not observed at depths deeper than 30 ft bgs during the RI.

5.4.1 Surface Soils

The surface soil sampling performed during the RI identified two areas with surface soil with concentrations of COC exceeding the individual Commercial Use SCOs. The approximate footprint of these areas with the exceedances is shown on Figure 8. This FS contains a provision for a 1-foot soil cover over the soil areas shown on Figure 8.

5.4.2 Subsurface Soils

The extent of impacted soil in the identified AOCs 1, 2, and 3 are shown on Figure 7. The footprint of these areas was estimated based on the observations and analytical laboratory results reported in the RIR and the exceedance criteria. The soil volumes were estimated as the product of the applicable areal extent and the applicable impacted depths. Although non-impacted soil may be present above deeper coal tar-impacted zones, this soil was included in the volume estimates because it would need to be excavated or pre-excavated (for ISS) to address the deeper impacted soil in most remedial scenarios.

The total volume of soil exceeding the Unrestricted Use SCOs was estimated to provide a maximum impacted soil volume, for comparison purposes. The horizontal extent of soil exceeding the

Unrestricted Use SCOs is shown in Figure 5. The vertical extent of the impacted soil was assumed to be approximately 30 feet deep.

As discussed in Sections 3 and 4, the site use is currently classified as Commercial Use based on the Village of Lyons designation, and on the current and planned future use for the foreseeable future. Therefore, Commercial Use SCOs provided the basis for soil volume estimates in accordance with NYS Part 375 and the NYSDEC CP-51. The soil volumes were estimated for total extent, without regard to accessibility. Table 5-1 provides these soil volumes for soils less than 15 feet in depth and exceeding 500 ppm Total PAHs. Included in this volume are observed source areas that may not have been sampled for laboratory analysis (source areas were assumed to exceed 500 ppm Total PAHs). Table 5-1 also provides estimates of source areas deeper than 15 feet with observed source areas from the RIR used to develop the areal extent and depth.

5.4.3 Groundwater

The areas of impacted groundwater are shown in Figure 6. As shown on the figure, for the NYSEG property the horizontal extent of the groundwater impacted areas have been demonstrated to be minimal. The areas of impact include the area of MW1S, where slightly elevated concentrations of total cyanide were detected for one of two sampling events, and the area of MWPZ5 where very low concentrations of PAHs (estimated concentrations below the method reporting limits) were identified.

6. Identification and Screening of Technologies

Remediation technologies are the practical means used to address a specific environmental condition. The goal of the identification and screening of technologies is to enable the most effective and applicable technologies to be applied to meet the site-specific conditions and remedial objectives. The individual technologies and approaches are then grouped to form alternatives, with each alternative addressing the site as a whole.

The identification and screening of technologies was conducted in three stages, in accordance with DER-10 guidance. An initial screening process was first used to determine the most applicable technologies for the site, using literature sources and GEI's experience at similar sites [FRTR, 2002; GRI, 1997; ITRC, 2002; NYSDEC, 1992]. For each of the GRAs identified in Section 5.2 – No action, Institutional Controls/Engineering Controls, Containment, In-Situ Treatment, and Removal – one or more technologies and process options were identified, described, and screened with respect to site-specific applicability. The outcome of this initial screening is presented on Table 6-1 for groundwater technologies, Table 6-2 for surface soil, and Table 6-3 for subsurface soil.

Next, the technologies that were not eliminated from consideration due to site-specific applicability were further refined and evaluated. The evaluation at this stage used the criteria of effectiveness, implementability, and relative cost, in accordance with the DER-10 guidance. The outcome of this screening evaluation is presented on Table 6-4 for surface soil, Table 6-5 for subsurface soil, and Table 6-6 for groundwater technologies.

Finally, a more in-depth evaluation was conducted and technologies were then combined to form alternatives for analysis, as presented in Section 7.

The remainder of this section provides additional brief descriptions of the technologies and a discussion of the evaluation issues for groundwater, surface soil, and subsurface soil.

6.1 Surface Soil Technologies

6.1.1 IC/ECs

Institutional controls can provide an effective measure to limit or prevent direct contact exposure to soil. Applicable actions may include access control protocols, deed restrictions with an environmental easement, and the establishment for managing ground-intrusive activities through the implementation of a Site Management Plan (SMP). Because an SMP would be applicable as an institutional control that would establish protocols for soil-disturbing activities at the site, IC/ECs were retained for alternative development.

6.1.2 Surface Soil Barriers

Physical barriers may be used to limit the transport of COC and to prevent potential exposures. Site covers or caps can be constructed of any combination of soil, gravel, asphalt, concrete, clay, or synthetic materials. The design and materials utilized to construct the cap or cover system depends upon the intended post-remedial use of the site, the resistance to potential erosion required, and the desired permeability. Areas to be re-used for roadways and parking are typically gravel, asphalt, or concrete covered. Permeability will depend on the degree to which the cover/cap reduces infiltration of precipitation and the required resistance to erosion. Low permeability covers (e.g., asphalt, concrete, clay, or a synthetic material) are used to restrict infiltration and reduce the leaching of soil COC in the vadose zone. Soil covers are more permeable and are used where infiltration and erosion are not major concerns.

A permeable or impermeable cover or cap could be used at the designated areas of the site to prevent direct contact with soil and potential transport via water and wind erosion. In combination with the retained institutional controls (SMP), a cover or cap would attain the soil RAOs for the protection of public health. By preventing potential off-site migration of impacted soil, a properly maintained cover would also meet the soil RAOs for environmental protection. Permeable and low permeability cover options are therefore retained for further consideration in the development of remedial alternatives.

6.1.3 Surface Soil Removal

Surface soil removal by conventional excavators and graders was retained as a possible technology for alternative development. Removal alone has limited effectiveness if the soil beneath the surface soil is also impacted. Therefore, this technology was retained for possible use as grading in combination with placement of soil cover materials.

6.2 Subsurface Soil Technologies

6.2.1 IC/ECs

IC/ECs for soils can be an important component during site remediation when combined with other response actions. An example would include the combination of an appropriate access restriction and soil management procedures with measures to control fugitive dust generation and provisions for long-term maintenance to achieve the soil RAOs for the protection of human health and the environment. Site access protocols, soil management protocols, and site maintenance planning (in an environmental easement as an SMP) are therefore retained for alternative development.

6.2.2 In-Situ Treatment of Subsurface Soil

Subsurface soil treatment technologies include ISS, in-situ chemical oxidation (ISCO), and enhanced in-situ bioremediation.

ISCO

ISCO would have limitations regarding its effectiveness at this site, as highly impacted soils would have limited treatability. Delivery of the oxidizing agents would be difficult due to the presence of subsurface structures. Therefore, ISCO was not retained for alternative development.

Enhanced In-Situ Bioremediation

Enhanced in-situ bioremediation involves the use of microorganisms to assimilate and degrade the COC present in soil and groundwater. It relies on changing the nutrient and oxygenation characteristics in the subsurface by distribution of active agents throughout the affected saturated zone. However, the presence of fine-grained soils, and highly impacted soil, can limit this distribution and limit the enhancement of bioremediation beyond natural attenuation. With the additional effectiveness of this technology substantially limited by the presence of highly impacted soils, this technology was not retained for alternative development.

ISS

ISS is increasingly becoming an accepted means of remediation at MGP sites [EPA, 2000], including MGP sites in New York State [New York Construction, 2007]. ISS of impacted soil involves the in-place mixing of cementitious reagents (such as Portland cement) with impacted soil with a vertical or horizontal-mounted auger or excavator bucket to create a solidified mass that substantially decreases the ability of groundwater to come into contact with the impacted soil, and also effectively immobilizes COC in the ISS-treated soil. The resulting material is typically a homogeneous mixture of soil and grout that hardens into a low permeability soil/cement material.

ISS results in the formation of a solid monolith of relatively impermeable material in the saturated zone. Groundwater is forced around and under the ISS monolith, thus preventing contact of groundwater with the COC contained in the monolith. ISS results in an expansion of about 30% in the volume of treated soil, thus requiring either pre-excavation or post-excavation of soil to a depth such that the final ISS monolith does not exist in the frost zone. At this site, it is assumed that all of the source material can be reached by an ISS system. This technology was retained for alternative analysis development.

Jet Grouting

The jet grouting process involves the use of high pressure to inject and mix a liquid cement bentonite grout into a column or area of soil. The high pressure mixing accomplished with this method allows for a smaller diameter drill or auger hole to be used, which allows use of this method around obstructions such as utilities or foundations. An advantage of this method includes the ability to target specific depth intervals for treatment, including thin lenses of impacted media at depth or

obstructions. However, the homogenization of the soil is difficult to accomplish for this method for larger applications. Jet or pressure grouting may be applicable to address some of the impacted areas of the site beneath and around major obstructions. For this reason, it is retained for alternative development.

6.2.3 Subsurface Soil Removal

Excavation of soil is implementable and highly effective when coupled with an appropriate treatment or disposal option. Removal of impacted soils would achieve (in part or completely) the RAO for this media. Removal of soils containing coal tar in the matrix would remove a potential source of on-going groundwater impacts. Technologies for excavation include use of conventional trackhoe equipment for excavation to depths of 20 feet, extended arm trackhoe equipment for excavation to depths of 40 feet, and crane-mounted Kellybar/clam shell equipment for excavation to depths of 100 feet or more [Hayward Baker, 2005]. At this site, excavation for removal of impacted soils would most likely extend to a depth of 28 feet, to below the depth of the deepest observed soil impacts. A combination of conventional trackhoe and extended arm trackhoe technologies, and staged, shored excavations, would be used to accomplish the excavation work and are therefore carried forward for the development of the alternatives. The excavation of soils below the saturated zone is feasible but additional cost will be incurred due to measures needed to maintain a stable excavation area and to de-water both the excavation area as needed, and the excavated soils prior to off-site transport. Significant technical challenges would be present to implement soil removal in the area adjacent to the high-use roadway to the east of the site (Geneva Street / NYS RT 14).

Control of odors and VOC emissions will be a critical aspect of all excavation scenarios. Excavation and loading activities could be conducted using a temporary fabric structure (if determined during the design phase of the project), odor-controlling foam, temporary plastic covering, fabric-covered perimeter fencing, and direct load-out, as was effectively done for odor control during recent remedial actions at other MGP sites.

6.2.4 Subsurface Soil Off-Site Treatment and Disposal

On-site soil treatment processes conducted on excavated soil include biological, chemical, or thermal treatment. The effectiveness of these processes is variable and each requires a site-specific demonstration to determine the degree of treatment, time, and land area required. These processes require a location with an appropriate distance from residential areas. These considerations resulted in on-site treatment processes not being retained for alternative development.

Subsurface soil off-site treatment and disposal technologies include conventional landfilling (Subtitle D landfill), low-temperature thermal desorption (LTTD), and disposal in waste-to-energy facilities. Each of these technologies has its place as a potentially applicable approach for certain soils or solid debris, and may be advantageous under particular conditions. Therefore, all were retained for alternative development.

6.3 Groundwater Technologies

6.3.1 Institutional Controls and Engineering Controls (IC/ECs)

The institutional controls for groundwater that may be applicable to alternatives for this site include an environmental easement for site and groundwater use, and a restriction for the construction and use of new groundwater wells.

6.3.2 Groundwater Containment Technologies

Groundwater containment technologies include soil cover, low permeability caps such as asphalt parking lots, subsurface vertical barriers such as steel sheet pile walls, and active process barriers such as biologically active zones which form treatment walls preventing off-site migration of residuals. These technologies are most applicable to sites characterized by off-site migration of impacted groundwater. The groundwater impacts at the site are minimal and are confined to the on-site area. It is assumed at this site that minimal impacts would be addressed by the management of source material, and that the remaining COC (already at near non-detect levels) would rapidly degrade with monitored natural attenuation (MNA) following remediation. Soil cover and low permeability surface cover have been retained for alternative development as the maintenance of the existing site soil cover and asphalt parking lot may prevent future migration of COC into groundwater by decreasing infiltration of precipitation through coal tar mixed in the soil matrix.

6.3.3 In-Situ Treatment

Air sparging/soil vapor extraction is the injection of pressurized air into the subsurface below the water table to induce volatilization of dissolved phase COC. The volatilized compounds are then removed by active vapor extraction wells. This technology is applicable to sites such as gasoline spills where VOCs are predominant. Because MGP-impacted groundwater contains PAHs which are not readily-volatilized by air sparging, this technology is not being retained for alternative development.

Groundwater MNA relies upon the natural degradation and mitigation processes which occur in the subsurface to remedy groundwater impacts over time. The natural attenuation processes include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of COC in soil or groundwater. These processes include biodegradation, dispersion, dilution, sorption, volatilization, and chemical or biological stabilization, transformation, or destruction of COC.

A recent study of MNA at an MGP site has shown its effectiveness following source removal and with favorable subsurface conditions [Neuhauser, et al, 2009]. Implementation is determined as a function of an evaluation of physical and chemical soil and groundwater characteristics including soil and groundwater chemistry, groundwater hydraulics, and biodegradation processes associated

with microbial activity related to such compounds as oxygen, carbon dioxide, nitrate, sulfate and iron. Groundwater MNA was retained for alternative development because it is readily implementable, with low cost.

Enhanced biological treatment of groundwater may use aerobic or anaerobic microbial degradation of COC. These are active management processes in which natural groundwater conditions are modified in order to facilitate bioremediation of the COC to innocuous end-products. Engineered saturated zone bioremediation processes are designed to treat the dissolved constituents of the groundwater plume by ensuring the existence of a bioactive zone which is sufficient to degrade the constituents before they reach an environmental receptor. Aerobic biological treatment is the most applicable to MGP sites. In this process, oxygen releasing compounds or direct air/oxygen injection is used in wells to deliver oxygen to the affected groundwater over the required time period to achieve the desired amount of oxygen. Enhancements such as increasing the dissolved oxygen content in the subsurface have been shown to be effective at MGP sites [Levinson, 2009]. These technologies are used to treat dissolved COC in groundwater. These technologies were not retained for alternative development for groundwater because groundwater is minimally impacted and already appears to be naturally attenuating to non-detect levels. The management of source material at the site would be anticipated to further reduce the potential for groundwater impacts.

6.3.4 Removal Technologies for Addressing Groundwater

It would be feasible to extract impacted groundwater for above-ground treatment at this site. On-site treatment technology options for extracted groundwater may include air stripping and/or granular activated carbon (GAC). Although the MGP COC is amenable to biological treatment, the concentrations in groundwater are typically too low for biological treatment to be effective without addition of large amounts of co-substrate to maintain a viable biomass. Pumped groundwater would be appropriate for off-site treatment at a publically owned treatment works (POTW), though some pretreatment may be required by the Village. Groundwater extraction with air stripping, GAC and/or discharge to the POTW is retained for further consideration in development of alternatives.

As discussed above, groundwater extraction would result in a very high volume with low concentrations of COC. Mass removal rates relative to the recovery effort would be very low. A more efficient means to extract the source material mass, and reduce the on-going source of groundwater impacts would be to remove coal tar from the subsurface. At the site, flowable NAPL has not been observed and therefore is not accumulating in the monitoring wells. Groundwater is only minimally impacted at two discrete areas. Coal tar residual will not flow as a separate phase and would be anticipated to be extremely difficult to mobilize. Therefore, the most efficient and direct means to remove the coal tar is to physically excavate soils containing the coal tar material. Removal of soil with source material is therefore retained for further consideration.

NAPL recovery can reduce the mass of NAPL in the subsurface and also can, by recovering the flowable fraction, reduce the mobility of residual NAPL. Typical recovery systems include specially constructed wells and/or recovery trenches. Collection may be passive or may require an active pumping system. Several NAPL pumping systems are available, including low-flow NAPL pumps which, for many systems, allow for the greatest NAPL recovery [EPRI, 2000]. Recovery of viscous and weathered NAPL may be difficult, and low rates of recovery may indicate that there is not a substantial flowable NAPL fraction. Because flowable NAPL has not been observed in the RI soil borings, wells, or test pits, this technology was not retained for alternative development.

6.4 Secondary Technology Screening

The secondary technology screening retained technologies that are an appropriate and effective means to prevent exposure to site-related COC. These technologies are retained for incorporation into the remedial alternatives. The use of a permeable cover (with appropriate soil management provisions and drainage controls) would provide a reliable means to prevent direct contact exposures and transport via wind and water erosion on the site, and is retained for incorporation into remedial alternatives. ISS was retained for potential consideration to manage source material in the identified areas of concern for the site. Jet or pressure grouting was retained for potential consideration to address impacted soil around or beneath major obstructions. Excavation was also retained for these areas given the anticipated depth of excavation (up to 30 feet). With proper stabilization and contingency measures, this deeper excavation in localized areas could be performed. Off-site LTTD and disposal would be feasible for treatment of excavated soils. Following ISS or excavation, MNA for the overburden groundwater was retained for further consideration to address the already minimal impacts to groundwater. The retained technology options and media are summarized as follows:

Technology Option	***Media***
No Action	All
Institutional Controls (Deed Restrictions, Environmental Easements):	
▪ SMP	Soil and Groundwater
▪ Groundwater Use Prohibitions	Groundwater
Barriers:	
▪ Soil Cover	Soil, Groundwater
▪ Low Permeability Surface Cover (pavement)	Soil, Groundwater
In-Situ Treatment:	
▪ Jet or Pressure Grouting	Soil
▪ ISS	Soil
Removal and Ex-Situ Treatment:	
▪ Excavation	Soil
▪ Landfilling	Soil
▪ LTTD	Soil

7. Development and Analysis of Alternatives

In this section, the remedial alternatives for the site are developed and evaluated. A comparison of alternatives is presented at the conclusion of this section. A summary of how the alternatives address the RAOs is provided in Table 7-1. A summary and comparison of the remedial alternatives is provided in Table 7-2. The recommended alternative is further described in Section 8.

7.1 Development of Alternatives for Additional Remedial Actions

A range of alternatives for additional remedial actions were developed for this site, based on the land use approaches, RAOs, and GRAs identified in Sections 3, 4 and 5, and the applicable technologies identified in Section 6. A total of five alternatives were developed and retained for detailed analysis. The five alternatives are summarized as follows:

Alternative 1: No Action

- No Action (required for comparison purposes by DER-10)

Alternative 2: Surface Soil Removal, Soil Cover, MNA, and IC/ECs

- Surface soil removal and the addition of a 1-foot clean soil cover meeting the SCOs specified in 6 NYCRR Part 375-6.7(d) for Commercial Use in two identified areas of the site
- MNA for groundwater
- IC/ECs implemented site-wide by an SMP (including site and groundwater use restrictions and an environmental easement agreement)

A Monitoring Plan (included in the SMP and applied site-wide) would be developed to monitor the performance of the MNA. Soil cover areas would be inspected annually and a Periodic Review Report prepared in accordance with Part 375-1.8(h)(3).

Alternative 3: ISS of Soil

AOC 1 and AOC 2

- Relocation of overhead electrical transmission and distribution lines and communication lines, and underground electric, natural gas, water, and storm sewer lines
- Removal of the MGP Building foundation, and the western portion of Gas Holder B foundation, and known MGP piping

- Pre-excavation of soil above the ISS area to allow for a utility corridor and to ensure that the ISS mass is below the frost line
- Off-site disposal of debris and soil or off-site treatment of soil at an LTTD facility
- ISS for soil exceeding 500 ppm Total PAHs (0-15 feet)
- ISS for soil with source material below 15 feet
- Jet or pressure grouting may be utilized to address impacted soil around or beneath major obstructions
- Site re-grading to accommodate a 1-foot thick clean soil cover meeting the SCOs specified in 6 NYCRR Part 375-6.7(d) for Commercial Use
- A demarcation material will be placed under areas where a 1-foot thick clean soil cover meeting the SCOs specified for Commercial Use is placed
- Restoration of the site parking lot and landscaped areas
- MNA for groundwater
- IC/ECs implemented site-wide by an SMP (including site and groundwater use restrictions and an environmental easement agreement)

AOC 3

- Groundwater monitoring (applied site-wide)
- IC/ECs implemented site-wide by an SMP (including groundwater use restrictions and an environmental easement agreement)

A Pre-Design Investigation would be performed to assess the horizontal limits of the surface soil removal and cover, and the mercury-impacted soil identified at TP3, in the area outside of the proposed excavation/ISS for AOC 2.

A Monitoring Plan (included in the SMP) would be developed for the site to assess the performance of the remedy. Soil cover areas would be inspected annually and a Periodic Review Report prepared in accordance with Part 375-1.8(h)(3).

Alternative 4: Excavation of Soil

AOC 1 and AOC 2

- Relocation of overhead electrical transmission and distribution lines and communication lines, and underground electric, natural gas, water, and storm sewer lines

- Removal of MGP Building foundation and the western portion of Gas Holder B foundation and known MGP piping
- Removal of soil exceeding 500 ppm Total PAHs (0-15 feet)
- Removal of soil with source material below 15 feet
- Jet or pressure grouting may be used to address impacted soil around or below major obstructions
- Off-site disposal or treatment of soil and debris at an LTTD or landfill
- Backfill of the excavation with soils meeting the SCOs specified in 6 NYCRR Part 375-6.7(d)
- Site re-grading to accommodate a 1-foot thick clean soil cover meeting the SCOs specified in 6 NYCRR Part 375-6.7(d) for Commercial Use
- A demarcation material will be placed under areas when a 1-foot thick soil cover meeting the SCOs for Commercial Use is placed
- Restoration of the site parking lot and landscaped areas
- MNA for groundwater
- IC/ECs implemented site-wide by an SMP (including site and groundwater use restrictions and an environmental easement agreement)

AOC 3

- Groundwater monitoring (applied site-wide)
- IC/ECs implemented site-wide by an SMP (including site and groundwater use restrictions and an environmental easement agreement)

A Pre-Design Investigation would be performed to assess the horizontal limits of the surface soil removal and cover, and the mercury-impacted soil identified at TP3, in the area outside of the proposed excavation for AOC 2.

A Monitoring Plan (included in the SMP) would be developed for the site to assess the performance of the remedy. Soil cover areas would be inspected annually and a Periodic Review Report prepared in accordance with Part 375-1.8(h)(3).

Alternative 5 (required for comparison purposes by DER-10)

- Removal and reconstruction of site utilities, the natural gas regulator station, and a portion of the Geneva Street / NYS RT 14 ROW
- Removal of foundations and MGP piping

- Soil Removal to Unrestricted Use SCO levels

7.2 Detailed Analysis of Alternatives

The following sections present descriptions of each of the remedial alternatives and the results of the evaluation of the alternatives with regard to the following eight criteria defined by DER-10:

1. Overall protection of human health and the environment
2. Conformance with SCGs
3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume of COC through treatment
5. Short-term impacts and effectiveness of controls
6. Implementability
7. Cost effectiveness
8. Land Use

When performing this evaluation, the first two evaluation criteria are threshold criteria and must be met for an alternative to be considered for selection. The next six evaluation criteria are balancing criteria which are used to compare the positive and negative aspects of each of the remedial alternatives, contingent on whether the alternative satisfies the threshold criteria.

A ninth criterion, Community Acceptance, is considered after a decision document has been subject to public comment. This modifying criterion is evaluated after any public comments on the remedy have been received, prior to NYSDEC's final approval of the remedy.

In accordance with the NYSDEC guidance document DER-31 – Green Remediation, aspects of environmental sustainability were evaluated as part of the detailed analysis of alternatives. These aspects were included in the considerations of the short-term impacts for each alternative.

Estimated costs are presented for the proposed remedies. These include capital and operations, maintenance, and monitoring (OM&M) costs. OM&M costs are associated with groundwater monitoring for this site and are presented as present worth costs calculated based on a maximum period of 30 years with a discount rate of 5 percent. This value was selected based on recommendations by the NYSDEC. Costs have been prepared to present a range that may vary between +50 % and -30 % from actual costs.

7.2.1 Alternative 1: No Action

The No Action Alternative is used as a baseline condition for comparison to other alternatives. It involves no monitoring, active remediation, or IC/ECs. There is no cost associated with this baseline alternative. Because it would not address the surface or subsurface impacts present at the site, the No Action Alternative would not achieve the threshold criterion of conformance with SCGs required by DER-10. It would have low long-term effectiveness and permanence, and would not reduce mobility, toxicity, or volume. However, because the potential for an exposure at the site is currently very low and groundwater is only minimally impacted, overall protection of human health and the environment is close to being achieved under the No Action Alternative. While No Action would have no negative short-term impacts, and would be implementable and cost effective, it would not meet the RAOs for subsurface soil to the extent practicable and is therefore not a viable alternative.

7.2.2 Alternative 2: Isolation and Implementation of IC/ECs

Description

This alternative consists of the establishment and maintenance of a soil cover, MNA to address the impacts to groundwater (already at near non-detect levels), and IC/ECs. This alternative provides for protection of human health and the environment while having very low short-term impacts and remedial action cost by installation of a soil cover, the reduction of COC in groundwater utilizing MNA, and IC/ECs implemented by an SMP, including site and groundwater use restrictions and an environmental easement. The remedy would allow the current commercial land use as a natural gas regulator station and parking lot to continue (as determined by NYSEG under a lease agreement), provided an SMP is in place to address control of any future excavation within the impacted areas. This remedial alternative is depicted in Figure 8.

An environmental easement would be established with NYSEG and the Village of Lyons as the property owners, with consideration of the NYSDOT easement in the RT 14 corridor, in accordance with Draft DER-33. An SMP would be established such that any future excavation in the impacted areas would be conducted under a NYSDEC-approved work plan. There are currently no wells for groundwater use on the site, and future installation of wells and groundwater use on the properties would be restricted by the environmental easement established under this alternative.

The soil cover would be inspected annually and a Periodic Review Report would be prepared in accordance with Part 375-1.8(h)(3). Groundwater monitoring would be performed for 5 years and the results re-evaluated with the NYSDEC. For the estimate of costs for this FS, it is assumed that the monitoring would be performed for 30 years.

Overall Protection of Human Health and the Environment

The potential for contact with COC in surface soils will be mitigated by the establishment of a soil cover, the pavement cover of the parking lot, and by the IC/ECs. The presence of coal tar mixed in

the soil matrix in the subsurface poses a continued concern for any utility work that may be needed at the site, as well as for any future construction. Groundwater is deep (17-25 feet) at this site, and impacted groundwater is not migrating off site. There is no current or anticipated future use of groundwater at the site or in the vicinity of the site. Table 7-1 provides a summary of how this alternative addresses the RAOs.

Conformance with SCGs

This alternative does not conform to the applicable SCGs for subsurface soil. Sources of COC in soil which may potentially contribute to exceedances of the NYSDEC Ambient Groundwater Water Quality Standards will be present at the identified areas of concern. However, it appears that the potential for ongoing groundwater impacts is already very low. Table 7-1 provides a summary of how this alternative addresses the RAOs.

Long-Term Effectiveness and Permanence

Other than the soil cover, Alternative 2 does not include active remediation. Site controls include an SMP to provide appropriate procedures for handling and managing impacted soil encountered during future invasive activities, and methods to address potential future soil vapor intrusion, should construction be undertaken at the site. The COC which remain in groundwater poses minimal risk to human health under current site use conditions and are not likely to increase in concentration over time. Remaining impacted soils which may act as a source of COC impacts to groundwater will remain; however, it does not appear that the impacts would be significant.

Reduction of Mobility, Toxicity, or Volume Through Treatment

Other than the surface soil cover, this remedial alternative will not reduce the toxicity, mobility, or volume of COC in subsurface soil. MNA will be anticipated to further reduce the volume of COC in groundwater over time in the two areas where groundwater impacts were identified.

Short-Term Impacts and Effectiveness of Controls

Implementation of this alternative poses only minimal short-term risks because no remedial activities other than the establishment of the soil cover and groundwater monitoring would be performed on the site. This alternative is highly effective in the short-term; however, groundwater monitoring may be required for a very long period of time because source material in the subsurface would remain on site.

Implementability

- **Technical Feasibility.** This action is readily implementable from a technical standpoint.
- **Administrative Feasibility.** This alternative is administratively feasible. NYSEG and the Village of Lyons own the properties.
- **Availability of Services and Materials.** The services and materials required for this alternative are readily available.

Cost Effectiveness

This alternative has a moderate cost effectiveness because some of the remedial objectives are addressed over a long time period.

The projected costs for this alternative are as follows:

Capital and Engineering Cost	$0.11 million	
OM&M Cost	$0.27 million	
Contingency	$0.08 million	(20% for undefined costs and conditions)
Rounded Total	$0.46 million	

Details of the cost estimate are provided in Appendix A.

Land Use

The current and planned future land uses for the site as a parking lot and a natural gas regulator station would be allowed to continue under this alternative.

7.2.3 Alternative 3

Description

This alternative consists of the relocation of overhead and subsurface utilities, the removal of the MGP Building foundation, a portion of Gas Holder B foundation, known MGP piping, and fill and soil associated with these features, excavation of soil to accommodate ISS, the ISS of soil exceeding 500 ppm for Total PAHs (0-15 feet), ISS for soil with source material below 15 feet, the potential use of jet or pressure grouting to address impacted soil beneath or around major obstructions, the backfill of the areas above the ISS mass, the installation of a soil cover, MNA to address groundwater, and IC/ECs. A small batch plant would be set-up on the NYSEG property for the ISS.

This alternative provides for protection of human health and the environment by addressing surface soil COC, and source material in the identified areas of concern AOC 1 and 2, while having moderate short-term impacts and remedial action cost. This remedial alternative is depicted in Figure 9, and in the cross-sectional views in Figures 12-14.

Groundwater monitoring wells would be recommended for sampling following ISS. Existing well locations are highlighted in blue on the figure; however, the number and location of groundwater monitoring wells would be established during the Remedial Design. Groundwater monitoring over the course of several years on the site (5 year initial period) would indicate any trends in concentrations of COC and track the progress of MNA. The details of the monitoring program, including the number and location of the wells and frequency of sampling, will be described in a

Monitoring Plan in a NYSDEC-approved SMP prepared during the Remedial Design. For the purposes of the cost estimate in this FS, it was assumed that groundwater sampling of 12 wells would occur twice per year for a period of 30 years.

The soil removal and cover address PAH exceedances in surface soil in an area adjacent to Water Street, and around the western end of the NYSEG natural gas regulator station building. These areas are shown on Figure 8. The actual areas to be covered would be determined during the design of the remedy, which may include additional sampling for delineation of these areas.

Estimated excavation of debris and soil, and soil addressed by ISS volumes, are summarized as follows:

Alternative 3				
Excavation Area[1]	***Total Excavated (CY)***	***Total Transported to Facility (CY)***	***Facility Option (CY)***	
			Landfill	***LTTD***
Surface Soil (two areas)	120	120	120	0
Subsurface Soil and Debris	1,520	1,520	920	600
ISS	***ISS Soil (CY)***	***Total Transported to Facility (CY)***	***Facility Option (CY)***	
			Landfill	***LTTD***
ISS	3,550	0	NA	NA
ISS Swell (estimate)	1,820	1,820	1,820	0
TOTAL	**7,010**	**3,460**	**2,860**	**600**

CY – Cubic Yards

(1) Excavation necessary to clear debris from ISS area.

Overall Protection of Human Health and the Environment

Alternative 3 will be effective at meeting RAOs and will be protective of human health and the environment. The potential for direct contact with COC in surface soils would be mitigated by the establishment and maintenance of a soil cover. The ISS and IC/ECs would prevent potential direct contact with COC in subsurface soil. However, some level of concern would remain for the continued presence of coal tar in the ISS solidified mass. Potential on-going groundwater impacts would be addressed by the solidification of the COC in the ISS mass. Impacts to groundwater (already at near non-detect levels) would be addressed by MNA.

Conformance with SCGs

This alternative conforms to the applicable soil SCGs through the implementation of ISS. The SCGs for groundwater would be addressed through the ISS of the source material. Groundwater concentrations of COC (already at near non-detect levels) would be anticipated to be reduced by MNA over time to concentrations below the groundwater standards or guidance values. Table 7-1 provides a summary of how this alternative addresses the RAOs.

Long-Term Effectiveness and Permanence

This alternative would be effective because the coal tar-impacted soil and COC would be solidified by the ISS. Some level of concern would remain for permanence for this alternative due to the continued presence of coal tar and COC in the ISS solidified mass; however, the concern would be low since the potential for the leaching of COC in the ISS mass to groundwater would be greatly reduced. The COC that would remain in the subsurface in the ISS mass would be addressed by institutional controls. These institutional controls can be maintained indefinitely. The COC, which would remain in groundwater (already at very low levels) poses minimal risk to human health, would be anticipated to decrease in concentration over time with the management of the source material removed and MNA. Significant off-site migration of COC is not presently occurring and would not be anticipated in the future.

Reduction of Mobility, Toxicity, or Volume Through Treatment

Direct reduction of mobility, and toxicity of the coal tar and COC would occur by the physical stabilization of the soil by ISS. The volume of COC would be reduced partially by excavation for the ISS expansion; however, the COC would also remain in the ISS solidified mass. Natural attenuation is anticipated to further reduce concentrations of COC in groundwater to non-detect levels. Post-remedial reduction through natural attenuation of groundwater would be monitored.

Short-Term Impacts and Effectiveness of Controls

Implementation of this alternative poses minimal short-term risks from the loading and grading of the additional soil cover, the removal of the building and holder foundations and associated debris and soil, and the implementation of the ISS.

- **Protection of Community.** During the implementation of this alternative, measures would be taken to monitor and reduce the potential for air emissions during the soil placement actions, excavation of foundations, and the ISS.
- **Protection of Workers.** Workers involved in the remedial and OM&M activities would wear the appropriate personal protective equipment (PPE).
- **Environmental Impacts.** The potential for negative environmental impacts from this alternative would be low.
- **Time Until Response Objectives are Achieved.** The timeframe for this alternative following ISS would be an assumed 5-year monitoring period for groundwater with the

results reviewed with the NYSDEC. For the purposes of this FS cost estimate, it is assumed that a 30-year monitoring period for MNA, and an assumed 30-year OM&M period would be applicable.

- **Green Remediation Considerations**: This alternative would require use of fossil fuels and disposal facilities for the excavation and cover placement actions, and the ISS. Other resource utilization would include the clean soils brought onto the site for cover, and the solidification additives for the ISS.

Implementability

- **Technical Feasibility.** It is technically feasible to re-route the existing overhead and subsurface utilities to the site. ISS is a newer technology but has been proven to be implementable and is gaining wider acceptance for application at MGP sites by the NYSDEC. Subsurface foundations will impede this remedy. Foundations would need to be removed by excavation prior to initiation of ISS. This would include removing the MGP Building foundation and a portion of the Gas Holder B foundation. MNA has been demonstrated as a technically feasible approach at similar MGP sites, and groundwater is currently only minimally impacted. ISS would allow work to be conducted more safely and efficiently adjacent to the high-use roadway to the east (Geneva Street / NYS RT 14). Institutional controls such as an environmental easement are commonly adopted and are considered readily implementable.
- **Administrative Feasibility.** This alternative is administratively feasible because NYSEG owns the property where ISS is recommended (AOC 1 and AOC 2).
- **Availability of Services and Materials.** The services and materials required for this alternative are available. The ISS unit is the only piece of equipment that may not be readily available, thus scheduling its time at the site will be an important logistical consideration.

Cost Effectiveness

This alternative has a moderate cost effectiveness because some of the remedial objectives are addressed over a long time period. The projected costs for this alternative are as follows:

Capital and Engineering Cost	$2.0 million	
OM&M Cost	$0.3 million	
Contingency	$0.5 million	(20% for undefined costs and conditions)
Rounded Total	$2.8 million	

Land Use

The current and planned future land uses for the site as a parking lot (as determined by NYSEG through a lease agreement) and as a natural gas regulator station would be allowed to continue under this alternative. The future land use would be restricted in accordance with the institutional controls.

7.2.4 Alternative 4

Description

This alternative consists of the relocation of overhead and underground utilities, the removal of the MGP Building foundation and the western portion of the Gas Holder B foundation, and known MGP piping in these areas, the removal of soil exceeding 500 ppm for Total PAHs (0-15 feet), removal of soil with source material below 15 feet, the installation of a soil cover, MNA for overburden groundwater, and IC/ECs. Jet or pressure grouting may be utilized to address impacted soil beneath or around major obstructions. Excavated soils would be transported to an off-site facility for low LTTD and disposal or another acceptable method. Debris would be transported to a local land fill, or if impacted, potentially to a waste-to-energy facility for disposal. Soil (meeting Part 375 requirements) would be used to backfill the excavated areas. This alternative is similar to Alternative 3, except for the method used to address the source material.

This alternative provides for protection of human health and the environment by addressing surface soil COC, and source material in the identified areas of concern (AOC 1 and AOC 2), while having low short-term impacts and moderate remedial action cost. This remedial alternative is depicted in Figure 9.

Estimated excavation and disposal volumes are as follows:

Alternative 4				
Excavation Area	***Total Excavated (CY)***	***Total Transported to Facility (CY)***	***Facility Option (CY)***	
			Landfill	***LTTD***
Surface Soil	120	120	120	0
AOC 1	2,610	2,610	420	2,190
AOC 2	2,480	2,480	500	1,980
TOTAL	**5,210**	**5,210**	**1,040**	**4,170**

Overall Protection of Human Health and the Environment

This remedial alternative is protective of human health and the environment. The potential for contact with COC in surface soils and subsurface soils would be mitigated by the removal and covering of surface soil and the removal of impacted subsurface soil.

Conformance with SCGs

This alternative conforms to the applicable soil SCGs through the removal of the soil. Groundwater concentrations of COC (already at near non-detect levels) following the removal of the source material would be further reduced by MNA over time to concentrations below the groundwater standards or guidance values. Table 7-1 provides a summary of how this alternative addresses the RAOs.

Long-Term Effectiveness and Permanence

This alternative would be effective and permanent because the source material would be removed and disposed of off site, and additional impacts to groundwater would be anticipated to be minimal. The COC which would remain in groundwater poses minimal risk to human health, and would be anticipated to decrease in concentration over time. The potential for off-site migration of COC would be very low as significant migration is not presently occurring, and the concentrations of COC are already close to non-detect levels.

Reduction of Mobility, Toxicity, or Volume Through Treatment

This remedial alternative will result in a reduction of the volume of COCs present at the site by the removal of impacted soil and source material. The excavated soil would be treated and disposed of at off-site facilities. This alternative would greatly reduce the potential for contact between groundwater and impacted soil.

Short-Term Impacts and Effectiveness of Controls

The primary short-term impacts of this alternative are associated with the relocation of the utilities, the grading and cover installation for surface soil, the excavation of the soil in AOCs 1 and 2, and the backfilling and site restoration activities. There is potential for exposure to dust and odor by the construction workers and the community members during excavation activities; however, measures would be taken to manage these potential exposures. As determined in the Remedial Design stage, excavation activities may be performed inside of a temporary fabric structure.

- **Protection of Community.** Truck traffic from the operations would be a moderate short-term impact. Truck traffic would include mobilization and demobilization of heavy construction equipment, trucking of impacted material from the site, and trucking of backfill material onto the site. During the implementation of this alternative, measures would be taken to monitor and reduce the potential for air emissions during the excavation and well

installation actions. Excavation activities may be performed inside of a temporary fabric structure.

- **Protection of Workers.** Workers would be protected during implementation of this alternative as direct contact with impacted material will be minimized by use of heavy equipment to perform the excavation and loading activities. Workers involved in the remedial activities would wear the appropriate PPE. Workers involved in the remedial and OM&M activities would wear the appropriate PPE.
- **Environmental Impacts.** The potential for negative environmental impacts from this alternative would be low. Impacts during the soil and debris removal operations will be addressed by use of spill prevention and control measures.
- **Time Until Response Objectives are Achieved.** The objectives for this remedy would be met upon completion of the soil excavation, and the period for MNA to address the remaining COC in groundwater. The trends would be reviewed after the first 5-year period and the sampling program would be re-evaluated at that time. It is anticipated that groundwater monitoring will continue for a period of 30 years for the purposes of cost estimating and comparison to other alternatives, and an assumed 30-year OM&M period.
- **Green Remediation Considerations**: This alternative would require use of fossil fuels and disposal facilities for the excavation and cover placement actions, and the installation of groundwater treatment and monitoring wells.

Implementability

- **Technical Feasibility.** It is technically feasible to re-route the existing overhead utilities to the site. Soil excavation is technically feasible using conventional equipment and construction methods. However, significant technical challenges would be encountered with the excavation of deeper soil in close proximity to the Geneva Street / NYS RT 14 ROW. MNA for groundwater has been demonstrated as a technically feasible approach at similar MGP sites.
- **Administrative Feasibility.** This alternative is administratively feasible because NYSEG and the Village of Lyons owns the properties.
- **Availability of Services and Materials.** The services and materials required for this alternative are readily available.

Cost Effectiveness

This alternative has a moderate cost effectiveness because some of the remedial objectives are addressed over a long time period. The projected costs for this alternative are as follows:

Capital and Engineering Cost	$3.0 million
OM&M Cost	$0.3 million

Contingency $0.6 million (20% for undefined costs and conditions)

Rounded Total $3.9 million

Land Use

The current and planned future land use for the NYSEG parcel as a natural gas regulator station, and as determined by a lease agreement as a municipal parking lot, would be allowed to continue under this alternative. This alternative would be consistent with this land use as restricted in accordance with the institutional controls.

7.2.5 Alternative 5

Description

This alternative consists of the removal of the MGP foundations, the natural gas regulator station, a portion of the Geneva Street / NYS RT 14 ROW, followed by the removal of soil to Unrestricted Use SCOs. This alternative provides for protection of human health and the environment, but because of the regulator station and roadway removal and reconstruction, has extremely high short-term impacts and remedial action costs.

This remedial alternative is depicted in Figure 15. The highlighted remedial actions consist of removal and replacement of approximately 30,560 CY of soil. Removal of the natural gas regulator station would have significant technical and logistical problems. This alternative includes construction of a new gas regulator station facility, and portions of a new roadway in the ROW.

Because of the completeness of the removal, MNA for overburden groundwater would not be applicable.

After excavation is completed, confirmatory groundwater monitoring would be recommended for a period of 5 years, with the results reviewed with the NYSDEC.

The estimated excavation and disposal volumes are as follows:

Alternative 5				
Excavation Area	***Total Excavated (CY)***	***Total Transported to Facility (CY)***	***Facility Option (CY)***	
			Landfill	***LTTD***
TOTAL	**30,560**	**30,560**	**24,300**	**6,260**

Overall Protection of Human Health and the Environment

Alternative 5 meets all RAOs. This remedial alternative is protective of human health and the environment. A high level of overall protection would be achieved by the complete removal action defined by this alternative. Over an anticipated short time, the RAOs for groundwater would be met by the MNA as groundwater is currently only minimally impacted.

Conformance with SCGs

SCGs for soils will be achieved by the removal of soils exceeding Part 375 Unrestricted levels. It is anticipated that this complete removal action would also result in achieving groundwater RAOs within a short time period. Table 7-1 provides a summary of how this alternative addresses the RAOs.

Long-Term Effectiveness and Permanence

This remedy relies primarily on removal actions which will be effective and permanent, and will eliminate direct exposure potential upon removal.

Reduction of Mobility, Toxicity, or Volume Through Treatment

This remedial alternative will result in rapid substantial reduction of mobility, toxicity, and volume of COC through the removal action.

Short-Term Impacts and Effectiveness

The primary short-term impacts of this alternative are associated with the removal and re-construction of the natural gas regulator station and a portion of the Geneva Street / NYS RT 14 ROW. The extensive excavation and backfilling in the soil removal area would also have a very large negative short-term impact. Greenhouse gas emissions and other green remediation considerations would be higher for this alternative.

- **Protection of Community.** During the implementation of this alternative, measures would be taken to monitor and reduce the potential for air emissions during source removal actions and transportation off site. Truck traffic from the operations would be a significant impact. Truck traffic would include mobilization and demobilization of heavy construction equipment, trucking of impacted material from the site, and trucking of backfill material onto the site. As determined in the Remedial Design stage, excavation activities may be performed inside of a temporary fabric structure. Natural gas distribution may temporarily be disrupted during implementation of the remedy. The public roadway would need to be closed while remediation is performed.
- **Protection of Workers.** Workers would be protected during implementation of this alternative as direct contact with impacted material will be minimized by use of heavy equipment to perform the excavation and loading activities. Workers involved in the remedial activities would wear the appropriate PPE.

- **Environmental Impacts.** The potential for negative environmental impacts for this alternative would be high due to impacts from trucking and LTTD treatment of soil will include the generation of greenhouse gasses.
- **Time Until Response Objectives are Achieved.** The SCOs would be met upon completion of the removal, which is estimated to take a year to complete, including the re-location of the natural gas regulator station and the re-routing of the critical transmission and distribution utilities and reconstruction of the ROW. Groundwater objectives would be met after a final attenuation period, estimated to have a duration of 1-5 years.
- **Green Remediation Considerations**: This alternative would have the highest required use of fossil fuels and disposal facilities for the excavation and cover placement actions. Other resource utilization would include the clean soils brought onto the site for cover, and the resources expended with the demolition and reconstruction of the natural gas regulator station and roadway.

Implementability

- **Technical Feasibility.** Although very costly and technically challenging, the removal and reconstruction of the natural gas regulator station is technically feasible using conventional equipment. Soil removal by excavation is technically feasible using conventional excavation equipment. Excavation, transportation, and disposal of impacted soils are conventional remedial methods. The feasibility may be hindered by lack of an alternative for distribution natural gas from the regulator station facility.
- **Administrative Feasibility.** This alternative is administratively feasible because the property is owned by NYSEG and the Village of Lyons.
- **Availability of Services and Materials.** The services and materials required for this alternative are readily available. Multiple facilities may need to be identified for both treatment of excavated soil and provision of clean backfill material, acceptable to the NYSDEC, due to the significant quantities of material involved. Excavation uses conventional construction equipment that is readily available.

Cost Effectiveness

This remedy would not be cost effective, as the extremely high costs would not have a commensurately high value in additional environmental protection or increase in actual land use since the land uses, as the natural gas regulator station, are the only current and planned future uses.

The projected costs for this alternative are as follows:

Capital and Engineering Cost	$9.0 million
OM&M Cost	$0.1 million

Contingency $1.8 million (20% for undefined costs and conditions)

Rounded Total $10.9 million

Details of the cost estimate are provided in Appendix A.

Land Use

This alternative would remediate the site to allow for any use. However, the implementation of this alternative would substantially disrupt natural gas distribution to the Village of Lyons and surrounding areas, parking in the Village, and the use of the NYS RT 14 ROW. These are the only current known or planned future uses.

7.3 Comparison of Alternatives

A comparative analysis was conducted in which the alternatives were compared to one another with regard to each of the eight analysis criteria. A summary of the comparative analysis is presented in Table 7-2. The following discussion provides a comparison of the four substantive alternatives, without the No Action Alternative, which is not considered a viable alternative.

Overall Protection of Human Health and the Environment

All four of the substantive alternatives include common elements that would result in overall protection of human health and the environment. All four alternatives would be protective of human health and the environment by eliminating potential exposure pathways or maintaining barriers to potential exposure pathways, either by removal or IC/ECs. For all but Alternative 2, SCGs for groundwater would be anticipated to be met in an acceptable period of time.

With respect to this criterion, the alternatives are ranked as follows:

1. **Alternative 5** would be the most protective, because it would involve the most complete removal of COC.
2. **Alternative 4** would be the next most protective, as removal of impacted soil in the identified areas of concern, and placement of the soil cover would provide a similar level of protection, and would address the groundwater impacts. It would also decrease potential for accidental exposure from uncontrolled future excavation activities.
3. **Alternative 3** would be the next most protective, as solidification of impacted soil in the identified areas of concern and soil cover would provide a similar level of protection to Alternative 4, this alternative would also address the groundwater impacts by MNA. It would also decrease potential for accidental exposure from uncontrolled future excavation activities by use of IC/ECs.

4. **Alternative 2** would be less protective because, while the IC/ECs would be in place (including the existing soil cover), it would only minimally address the subsurface soil and groundwater impacts, and would not meet the RAOs for these media.

Conformance with SCGs

Alternatives 3 and 4 would provide substantial conformance with the SCGs appropriate for the current and future land uses for each alternative, to the extent practicable, in accordance with the RAOs. Alternative 5 would provide additional conformance to SCGs. Additional comparisons of the alternatives with regard to the RAOs are provided in Table 7-1.

Long-Term Effectiveness and Permanence

Alternatives 4 and 5 would provide substantial long-term effectiveness and permanence. Alternative 3 would provide a similar level of permanence with the solidification of the COC by ISS. SCGs for groundwater would likely immediately be achieved for the limited area of groundwater impacts on site based on the current concentrations of COC detected (near non-detect levels). With MNA the concentrations of COC would be anticipated to further decrease to concentrations below the groundwater standards over a short period of time.

With respect to this criterion, the alternatives are ranked as follows:

1. **Alternative 5** would be the most effective and permanent, because it would involve the most complete removal of impacted materials.
2. **Alternative 4** would rank as the next most effective and permanent option due to the extensive removal of source material using excavation.
3. **Alternative 3** would rank as the next most effective and permanent option. COC would remain in the subsurface soil; however, the COC would be solidified in the ISS mass. Additional impacts to groundwater would be anticipated to be minimal following soil solidification.
4. **Alternative 2** would be ranked as the least effective and permanent. The IC/ECs, soil cover, and MNA would not be as effective or permanent as the other alternatives.

Reduction of Toxicity, Mobility, or Volume

Alternative 5 would remove the COC in all areas of the NYSEG and Village of Lyons parcels. Alternative 3 and 4 would provide substantial reductions of toxicity, mobility, or volume. With respect to this criterion, the alternatives are ranked as follows:

1. **Alternative 5** would result in the most reduction, because it would involve the most complete removal of impacted materials.

2. **Alternative 4** would result in the next most reduction due to the combination of soil removal, followed by MNA.
3. **Alternative 3** would result in the next most reduction because of the combination of soil solidification and MNA. COC would remain in the soil; however, the COC would be solidified in the ISS mass, and would not likely pose a threat for ongoing groundwater impacts.
4. **Alternative 2** would not involve substantial reduction of toxicity, mobility, or volume.

Short-Term Impacts and Effectiveness of Controls

With respect to this criterion, the alternatives are ranked as follows:

1. **Alternative 2** would have the least short-term impact because, other than the installation of the soil cover, it would not involve any invasive actions.
2. **Alternatives 3 and 4** rank next because the greater short-term impacts resulting from either the ISS or soil removal and site restoration. The methods available to control these impacts would be reliable and effective.
3. **Alternative 5** would involve the greatest excavation quantities and depths, resulting in the greatest negative short-term impacts, with a high-level of disruption due to the removal and replacement of the existing natural gas regulator station and roadway. A larger truck traffic volume would be required.

Implementability

With respect to this criterion, the alternatives are ranked as follows:

1. **Alternative 2** would be most implementable, because it involves the least intrusive site work, with little uncertainty with regard to means and methods.
2. **Alternative 3** would rank as next most implementable, because ISS poses a lower level of difficulty for implementation in the area adjacent to the high-use roadway to the east of the site (Geneva Street / NYS RT 14).
3. **Alternative 4** would be less implementable, because deep excavation would require greater structural controls due to the concerns of performing work near the roadway, and for the management of water which will be encountered in the deeper portions of the excavated areas.
4. **Alternative 5** would not be readily implementable, primarily due to the removal of the natural gas regulator station and portions of Geneva Street / NYS RT 14 ROW. Decommissioning and construction of a new regulator station would require a high level staging and coordination with a very high cost.

Cost Effectiveness

The alternatives are ranked as follows with respect to cost effectiveness:

1. **Alternative 3** is the most cost-effective option as it provides for the current and future land use, addresses potential exposure issues for surface soil, addresses source areas and possible future groundwater impacts (already at near non-detect levels) with source material solidification, and has a relatively moderate total cost of approximately $2.8 million.
2. **Alternative 4** is the next most cost-effective option as it provides for the current and future land use, addresses potential exposure issues for surface soil, addresses source areas and possible future groundwater impacts, and has a relatively moderate total cost of approximately $3.9 million.
3. **Alternative 2** is the next most cost-effective option. Although it has a relatively moderate total cost of approximately $0.5 million, it does not address the source material at the site which will result in a very long groundwater monitoring period and implementation of IC/ECs.
4. **Alternative 5** is the least cost effective as its extremely high costs of $10.9 million would not have a commensurately high value in additional environmental protection or increase in actual land use additional to the current and future planned land use.

Land Use

The alternatives are ranked as follows with respect to land use:

1. **Alternative 4** would allow for the removal of COC and allow for current land use.
2. **Alternative 3** would be supportive of current and future planned land uses with some level of concern remaining following implementation of the remedy due to the COC remaining in the solidified mass.
3. **Alternative 2** would be supportive of current and future planned land uses with a higher level of additional concern due to the COC remaining at the site.
4. **Alternative 5** would allow for unrestricted future land use; however, this alternative would disrupt the current land uses and therefore would rank last for this criterion among the active alternatives.

8. Recommended Remedy

Upon consideration of the results of the RI, and on the evaluated alternatives and their respective attributes and limitations, the elements detailed in Alternative 3 emerged as the recommended remedy for the site. Alternative 3 is comprised of the following elements:

AOC 1 (Gas Holder B Area) and AOC 2 (MGP Building Area)

- Pre-Design Investigation to assess the horizontal limits of mercury-impacted soil outside of the excavation/ISS area at AOC 2.
- Relocation of utilities in the identified areas of concern including subsurface and overhead electric lines, natural gas lines, water and sewer lines, and overhead communication lines.
- Excavation and removal of the former MGP Building foundation, and the northwestern portion of the foundation for Gas Holder B.
- Removal and off-site disposal of all known underground process piping associated with the former MGP in AOC 1 and AOC 2.
- Removal and disposal of soil above the ISS to accommodate a utility corridor and to ensure that the ISS solidified mass is below the frost line.
- ISS of fill and soil with 500 ppm for Total PAHs from a depth of 0 to 15 feet.
- ISS of fill and soil with source material below 15 feet.
- Jet or pressure grouting may be utilized to address impacted soil beneath or around major obstructions.
- Backfill of the ISS area above the solidified mass with clean soil which meets the SCOs specified in 6 NYCRR Part 375-6.7(d).
- Site re-grading to accommodate a 1-foot thickness of clean imported cover soil meeting the SCOs specified in 6 NYCRR Part 375-6.7(d) for Commercial Use.
- Groundwater monitoring (applied site-wide)
- IC/ECs implemented site-wide by an SMP (including site and groundwater use restrictions and an environmental easement)

AOC 3 (Geneva Street / NYS RT 14 ROW Area)

- Groundwater monitoring (applied site-wide)

- IC/ECs implemented site-wide by an SMP (including site and groundwater use restrictions and an environmental easement)

Surface Soil Areas

- Pre-Design Investigation to assess the horizontal limits of impacted surface soil.
- Remove and re-grade surface soils to accommodate a 1-foot thickness of clean soil cover in areas adjacent to Water Street and around the western portion of the NYSEG natural gas regulator station building. The soil will meet the SCOs specified in 6 NYCRR Part 375-6.7(d) for Commercial Use. A demarcation material will be used over areas where the 1-foot cover meeting Commercial Use SCOs is placed. If site grading requires the removal of soil before the placement of the 1-foot soil cover, then removed soils will be properly disposed of at a permitted facility. If areas outside the 1-foot soil cover require the addition of soils for site re-grading purposes, then the imported soil will also meet the Commercial Use SCOs.

The remedy for the site will include the implementation of an institutional control in the form of an environmental easement for the site which will require: the submittal of a periodic certification of institutional and engineering controls to the NYSDEC in accordance with Part 375-1.8 (h)(3); will allow the use and development of the site for Commercial Use as defined by Part 375-1.8(h)(3); and will restrict the use of groundwater as a source of potable or process water.

A NYSDEC-approved Site Management Plan will be developed which will include an Institutional and Engineering Control Plan that will identify all use restrictions and engineering controls for the site, and will detail the steps and media-specific requirements necessary to ensure the engineering controls remain in place and are effective. The SMP will include an Excavation Plan which will detail the provisions for management of any potential future excavations at the site, a provision for the evaluation of the potential for soil vapor for any buildings developed on the site, and provisions for the management and inspection of the identified engineering controls. The plan will also have provisions for maintaining site access controls and procedures for NYSDEC notification.

A Monitoring Plan, also included in the SMP, will be developed to assess the performance and effectiveness for the MNA. The plan will include a schedule of monitoring and frequency of submittals to the NYSDEC. The duration of the groundwater monitoring program is anticipated to be for 5 years. Following this period, the results of the monitoring and any trends identified will be reviewed with the NYSDEC, and revisions to the program will be made as needed.

The estimated cost for implementation of Alternative 3 is $2.8 million.

The recommended remedy represents a balanced and appropriate approach to address the MGP-related COC present on the site, given the current and future planned uses of the property. The remedy may be designed and implemented in coordination with the operations of the NYSEG

natural gas regulator station and activities in the Village of Lyons parking lot so that scheduling of the on-site activities, traffic flows, parking areas, equipment staging, and other aspects of the work may be coordinated with the maximum efficiency and least short-term impacts, to the ultimate benefit of the Village of Lyons and the surrounding community. Green remediation principles and techniques will be implemented to the extent feasible in the Remedial Design, site remediation, and site management of the remedy in accordance with the specifications provided in DER-31.

The next step is a NYSDEC issuance of a Proposed Remedial Action Plan (PRAP) for public comment followed by a Record of Decision (ROD). A design for the remedy including detailed drawings and specifications for remedial construction will follow the issuance of the PRAP and ROD. A Pre-Design Investigation may be implemented to define the basis for design.

9. References

EPA, 2000. Solidification/Stabilization Use at Superfund Sites. September 2000.

EPRI, 2000. Technical and Economic Evaluation of Coal Tar Dense Non-Aqueous Phase Liquid (NAPL) Pumping Techniques. TR-113101. Final Report, March 2000 Cosponsor Baltimore Gas & Electric Co. (BGE), Suite 101, 609 Energy Parkway, Baltimore, Maryland 21226.

FRTR, 2002. Federal Remediation Technology Roundtable - Remediation Technologies Screening Matrix and Reference Guide, 4th Edition, January, 2002. http://www.frtr.gov/matrix2/section4/4_9.html#app and http://www. frtr.gov/matrix2/section4/4_34.html#des.

GEI, 2012. Remedial Investigation Report. Lyons Manufactured Gas Plant Site, Village of Lyons, New York, NYSDEC Site # 8-59-020, Index #: D0-0002-9309, December 19, 2012.

GRI, 1997. Environmentally Acceptable Endpoints in Soil. David G Linz and David V. Nakles, RETEC eds. Gas Research Institute. Academy of Environmental Engineers, USA.

Hayward Baker, 2005. Website information: http://www.haywardbaker.com/services/slurry_trench.htm

ITRC, 2002. Remediation Technology Review resource of the Inter-State Technology Research Council. USA. Itrcweb.org, June, 2002.

Levinson, M. 2009. Multiple Oxygen Injection "Curtain Walls" Treat Groundwater Impacted with MGP Contaminants. Matthew Levinson, GEI Consultants, Inc. Presented at Tenth Bioremediation Symposium, Battelle, May 5-8, 2009, Baltimore, Maryland.

Neuhauser, E.F., et al, 2009. Monitored Natural Attenuation of Manufactured Gas Plant Tar Mono- and Polycyclic Aromatic Hydrocarbons in Ground Water: A 14-Year Field Study. E. F. Neuhauser, J.A. Ripp, N.A. Azzolina, E.L. Madsen, D.M. Mauro, T. Taylor. Ground Water Monitoring & Remediation, Vol 29 No 3 p 66-76, 2009.

New York Construction, 2007. "Nyack Manufactured Gas Plant Remediation" McGraw Hill 2007 Award Winning Design. December 2007.

NYSDEC, 1992. NYSDEC HWR TAGM#4042 Interim Remedial Measures, p. 2.

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

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

NYSDEC, 2010b. CP-51 / Soil Cleanup Guidance Policy Memorandum.

Tables

Table 4-1
Chemical-Specific Standards, Criteria, and Guidance
Lyons MGP Site

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 (SCOs), SCOs 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 SCOs	6 NYCRR Part 375 Subpart 375-6	Establishes SCOs 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.
Surface water	NYSDEC Surface Water Objectives	6 NYCRR Part 700-706 NYSDEC, Division of Water, TOGS (1.1.1) - 6 NYCRR 703.5	Establishes guidance or standard values for surface water quality objectives.	SCG	Not applicable to this site. There are no surface water features at the site.
Sediment	NYSDEC Sediment Quality Criteria Development Process	Technical Guidance for Screening Contaminated Sediments (NYSDEC, 1999). Evaluating Ecological Risk to Invertebrate Receptors From PAHs in Sediments at Hazardous Waste Sites (USEPA, 2009)	Describes process for developing sediment quality criteria in the State of New York.	TBC	Not applicable to this site. There are no sediments at the site.
	Bioavailability Methods	ASTM D-7363-07 Standard Test Method for Solid-Phase Micro Extraction and PAH Analysis	Describes an updated process for developing sediment quality criteria.	TBC	Not applicable to this site. There are no sediments at the site.
Soil Vapor	Indoor Air Quality Objectives	NYSDOH Soil Vapor Intrusion Guidance October 2006	Establishes methods and guidance regarding data acquisition, interpretation, and mitigation.	TBC	Currently not applicable to this site. There are no buildings at the site.

Notes:

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

Table 4-2
Action-Specific Standards, Criteria, and Guidance
Lyons MGP Site

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	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 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 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.
	Wastewater Treatment Plant	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 temporary water treatment system for discharge to POTWs.
Construction Stormwater	SPDES Permit Requirements	NYSDEC SPDES General Permit for Stormwater Discharge	Requirements to protect stormwater from construction impacts including preparation of a Stormwater Pollution Prevention Plan (SWPPP).	SCG	Potentially applicable. A permit itself is not needed, only that the substantive requirements are fulfilled.
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	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 buildings are present at the site.
Waste Management	Solid Waste Management Facility	6 NYCRR 360	Includes solid waste management facility requirements.	SCG	Applicable if soil or NAPL are 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 or NAPL are removed.
		DER-10 3.3(e)	Disposal of drill cuttings.	SCG	Potentially applicable during the installation of new monitoring wells.
MGP-Impacted Soil and Sediment	Management of Soil and Sediment Impacted with Coal Tar from Manufactured Gas Plant Sites	NYSDEC TAGM 4060 and NYSDEC 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.

Table 4-2
Action-Specific Standards, Criteria, and Guidance
Lyons MGP Site

Action	Requirements	Citation	Description	SCG or TBC	Comment
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, hazardous waste will not be generated as part of implementation of the remedial actions, except possibly NAPL. Potentially 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, hazardous waste will not be generated as part of implementation of the remedial actions, except possibly NAPL. Potentially 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 USEPA'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 or NAPL are removed from site.
Air Emissions	*Clean Air Act (CAA)*				
	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 volatile or semi-volatile COCs.
	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 - DER-10, Appendix 1B	Fugitive dust suppression and particulate monitoring during source area remedial activities.	SCG	For implementation under a site health and safety plan and CAMP during remedial activities. Applicable to site disturbance activities.
Construction-Related Air Emissions	Community Air Monitoring Plan (CAMP)	NYSDEC - DER-10, Appendix 1A	Air Quality Requirements	SCG	Applicable to remedial site construction activities, well installation activities, or future construction.
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.

Table 4-2
Action-Specific Standards, Criteria, and Guidance
Lyons MGP Site

Action	Requirements	Citation	Description	SCG or TBC	Comment
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 (MNA)	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	MNA 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 an SMP 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	Requirements for procedures to document that imported backfill is not impacted by COC.	TBC	Applicable.

Table 4-3
Location-Specific Standards, Criteria, and Guidance
Lyons MGP Site

Location	Requirements	Citation	Description	SCG or TBC	Comment
Entire Site	Wayne County	General Regulations	County transportation and site use regulations.	TBC	Requirements of County, Town, and Village would be applicable to all remediation alternatives, especially those requiring transportation.
	Village of Lyons	Redevelopment Plans	None identified.	TBC	Any master plan for redevelopment would be considered when planning future land use at the site.
	Village of Lyons	General Ordinances	Village regulations regarding transportation, noise, zoning, building permits, etc.	TBC	Requirements of County, Town, and Village would be applicable to all remediation alternatives, especially those requiring transportation.
	New York State Department of Transportation	General Regulations	NYSDOT regulations regarding work conducted in the NYS Route 14 R.O.W.	TBC	Requirements of NYSDOT would be applicable to most remediation alternatives.
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	Not applicable. The site is in Zone C of the FEMA Flood Insurance Map which indicates it is located in an area of minimal flooding.
	Floodplain Management Regulations	6 NYCRR Part 500	Establishes floodplain management requirements.	SCG	Not applicable. The site is in Zone C of the FEMA Flood Insurance Map which indicates it is located in an area of minimal flooding.
	100-year floodplain regulations	Federal Emergency Management Agency	Administers floodplain management requirements.	SCG	Not applicable. The site is in Zone C of the FEMA Flood Insurance Map which indicates it is located in an area of minimal flooding.
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. Wetlands are not 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	Not applicable. Sediments are not present at the site.
	Wetlands Regulations	NYSDEC Freshwater Wetlands Act	Regulates use and development of freshwater wetlands.	SCG	Not applicable. Wetlands are not present at the site.
	Protection of Water Regulations	6 NYCRR Part 608	Protection of Water Permit/ Water Quality Certification.	SCG	Not 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	Not applicable. A high-value habitat for wildlife is not present at the site.
Historic Preservation	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 6-1
Initial Technology Screening for Surface Soil
Lyons MGP Site

General Response Action	Remedial Technology Type	Technology Process Option	Description	Site-Specific Screening Evaluation
No Action	No Action	No Action	No additional remedial action.	No Action is included for comparison purposes in accordance with NYSDEC DER-10.
Institutional Controls/ Engineering Controls (IC/ECs)	Institutional Controls	Environmental Easement / Deed Restriction	Legal agreement or notice restricting site use in accordance with NYSDEC DER-10.	The Site is owned by NYSEG and the Village of Lyons. 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.	The Site is owned by NYSEG and the Village of Lyons. Retained for further evaluation.
	Engineering Controls	Fencing	Fencing or other physical barriers prevent potential receptors from exposures. For surface soil, this would include site perimeter fencing.	Not consistent with the current function of the site as a municipal parking lot. Not retained.
		Signage	Signs, which deter potential receptors from exposures, such as trespassing on surface soil.	Not consistent with the current function of the site as a municipal parking lot. Not retained.
Containment	Surface Barriers	Soil Covers	One foot clean soil cover, for Commercial Site use, with site grading for drainage.	Eliminates exposure pathway to surface soils. Retained for further evaluation.
		Low Permeability Surface Caps	Includes low permeability covers including pavement and concrete building pads.	Eliminates exposure pathway to surface soils. Retained for further evaluation.
Removal	Excavation	Conventional excavators and graders	Excavation of the top one-foot of soil (for Commercial site use). Addition of a soil cover is necessary if soil below surface soil is impacted.	Eliminates exposure pathway to surface soils. Retained for further evaluation.
Treatment and Disposal	Off-Site Disposal or Treatment	Landfill	Disposal at a permitted off-site landfill.	A widely used conventional technology. Retained for further evaluation.
		Low-Temperature Thermal Desorption	Treatment at a permitted thermal desorption facility. The soil is heated in order to volatilize COCs, which are then destroyed in an afterburner.	A widely used conventional technology for MGP-impacted soils. Retained for further evaluation.
		Waste-to-Energy/ Management of NAPL-impacted large debris	Co-fired boiler or other waste-to-energy facilities, resulting in destruction of COCs and energy production.	Potentially applicable for impacted site debris that is too large for LTTD. Capacity of facilities is limited and may not be applicable for bulk soil. Retained for further evaluation.
		Soil Washing/ Chemical Treatment	Soil washing and chemical treatment by addition of oxidants.	Not applicable for MGP-impacted soils. Not retained.
		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.
	On-Site Disposal or Treatment	Landfill	Disposal at an on-site location constructed as a permitted landfill.	Insufficient land area available. Not retained.
		Low-Temperature Thermal Desorption	Treatment on site with a mobile permitted thermal desorption facility. The soil is heated in order to volatilize COCs which are then destroyed in an afterburner.	Insufficient land area available. Not likely to be acceptable to surrounding community. Not retained.
		Incineration	High temperature burning on site with a mobile permitted incinerator.	Insufficient land area available. Not likely to be acceptable to surrounding community. Not retained.
		Soil Washing/ Chemical Treatment	Soil washing and chemical treatment by addition of oxidants.	Not applicable to MGP-impacted soils. Not retained.
		Biological Treatment	Landfarming or soil windrow tilling to enhance biological treatment of contaminants in soil.	Insufficient land area available. Not retained.

Table 6-2
Initial Technology Screening for Subsurface Soil
Lyons MGP Site

General Response Action	Remedial Technology Type	Technology Process Option	Description	Site-Specific Screening Evaluation
No Action	No Action	No Action	No additional remedial action.	No Action is included for comparison purposes in accordance with NYSDEC DER-10.
Institutional Controls/ Engineering Controls (IC/ECs)	Institutional Controls	Environmental Easement / Deed Restriction	Legal agreement or notice restricting site use in accordance with NYSDEC DER-10.	The Site is owned by NYSEG and the Village of Lyons. Retained for further evaluation.
		Site Management Plan	Contingency plans for property owner actions, such as procedures for handling subsurface soil during excavations for underground utilities or basements. They are administered through environmental easements, deed restrictions or third-party property agreements.	The Site is owned by NYSEG and the Village of Lyons. Retained for further evaluation.
	Engineering Controls	Temporary Fencing	Temporary fencing during excavation in which subsurface soil is encountered.	Applicable for on-site construction activities. Retained for further evaluation.
		Temporary Signage	Temporary signs which deter potential receptors from exposures during excavation in which subsurface soil is encountered.	Applicable for on-site construction activities. Retained for further evaluation.
Containment	Subsurface Vertical Barriers	Steel Sheet Piling Bentonite/Cement Slurry Walls HDPE Sheeting Walls, Drilled Grout and Solidified Earth Column Walls Jet Grout Column Walls	Subsurface vertical barrier walls have been used at MGP sites to prevent the migration of NAPL in subsurface soil. (See Table 6-3, Initial Technology Screening for Groundwater, for descriptions.)	Based on the sampling performed during the RI, it does not appear that there is a significant amount of free-phase NAPL at the site. Not retained.
In-Situ Treatment	Immobilization	In-Situ Solidification (ISS) using Auger Mixing method	Overlapping columns are augered as a grout/soil mixture to form a solid monolith of low permeability. Most effective to a depth of approximately 40 feet but constructable to a depth of approximately 50 feet. Physically binds or encloses a COC mass and/or induces a chemical reaction between the stabilizing agent and the COCs to reduce their mobility within the subsurface and to decrease permeability of the mass so that groundwater does not contact the COCs.	Effective for meeting soil-related RAOs. Retained for further evaluation.
		In-Situ Solidification (ISS) using Jet Grouting method	High pressure jet grouting displaces soil to form a grout column. Overlapping grout columns form a solid monolith of low permeability. Most effective to a depth of approximately 40 feet.	Potentially effective for meeting soil-related RAOs. Retained for further evaluation.
		In-Situ Solidification (ISS) using Excavator Bucket Mixing method	Bulk soil is mixed into a grout/soil mixture to form a solid monolith of low permeability. Constructable to a depth of approximately 20 feet (deeper if larger excavator with extended long reach boom is utilized).	Effective for meeting soil-related RAOs. Retained for further evaluation.
	Chemical Treatment	In-Situ Chemical Oxidation (ISCO)	Treatment by a field of wells in the impacted area, which are used to chemically degrade the COCs, usually by addition of an oxidant such as ozone, hydrogen peroxide, or potassium	Limited applicability due to technology uncertainty. Not retained.

Table 6-2 (Cont'd.)
Initial Technology Screening for Subsurface Soil
Lyons MGP Site

General Response Action	Remedial Technology Type	Technology Process Option	Description	Site-Specific Screening Evaluation
In-Situ Treatment (cont.)			permanganate.	
	Biological Treatment	Enhanced In-Situ Bioremediation: Aerobic Biodegradation	Air sparging, oxygen injection and addition of oxygen releasing compounds (ORC).	Potentially effective for subsurface soil with moderate concentrations of COCs. Soils containing COCs on-site are concentrated around soil containing coal tar or coal tar NAPL with high concentrations of COCs. Not retained.
		Enhanced In-Situ Bioremediation: Anaerobic Biodegradation	Addition of a carbon substrate or electron acceptor as a reducing agent to maintain anaerobic conditions.	Potentially effective for subsurface soil with moderate concentrations of COCs. Soils containing COCs on-site are concentrated around soil containing coal tar or coal tar NAPL with high concentrations of COCs. Not retained.
	Air Sparging/Soil Vapor Extraction	Air Sparging/Soil Vapor Extraction	This technology is the injection of pressurized air into the subsurface below the water table to induce volatilization of dissolved phase COCs.	Effective for VOCs in groundwater and soil vapor. Not effective for meeting soil-related RAOs. Not retained.
	Enhanced Recovery technologies	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 technologies with a substantial risk for uncontrolled migration. Not retained.
		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 COCs.	Experimental technologies with a substantial risk for uncontrolled migration. Not retained.
		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 COCs.	Experimental technologies with a substantial risk for uncontrolled migration. Not retained.
		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 COCs.	Experimental technologies with a substantial risk for uncontrolled migration. Not retained.
Removal	Excavation	Conventional and Long-Stick Excavators/ Shoring	For excavations to approximately 20 feet (slightly deeper for long-stick excavators). Shoring and benching required for deeper excavations.	A widely used conventional technology. Retained for further evaluation.
		Slurry Trench Excavation	Excavations deeper than the typical reach of an excavator, with flowing sand and artesian conditions. A slurry is used to maintain sidewall support. Requires additional equipment and more extensive dewatering and earth support structures.	During the RI, MGP impacts were not observed to be deeper than 28 feet. Subsurface soils containing COCs are within the typical reach of conventional and long-stick excavators. Not retained.

Table 6-2 (Cont'd.)
Initial Technology Screening for Subsurface Soil
Lyons MGP Site

General Response Action	Remedial Technology Type	Technology Process Option	Description	Site-Specific Screening Evaluation
Treatment and Disposal	Off-Site Treatment and Disposal	Landfill	Disposal at a permitted off-site landfill.	A widely used conventional technology for the management of MGP-impacted soils. Retained for further evaluation.
		Low-Temperature Thermal Desorption	Treatment at a permitted thermal desorption facility. The soil is heated in order to volatilize COCs, which are then destroyed in an afterburner.	A widely used conventional technology for the management of MGP-impacted soils. Retained for further evaluation.
		Waste-to-Energy	Co-fired boiler or other waste-to-energy facilities, resulting in destruction of COCs and energy production.	Potentially applicable for impacted site debris that is too large for LTTD. Capacity of facilities is limited and may not be applicable for bulk soil. Retained for further evaluation.
		Soil Washing/ Chemical Treatment	Soil washing and chemical treatment by addition of oxidants.	Not applicable for MGP-impacted soils. Not Retained.
		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.
	On-Site Treatment and Disposal	Landfill	Disposal at an on-site location constructed as a permitted landfill.	Insufficient land area available. Not retained.
		Low-Temperature Thermal Desorption	Treatment on site with a mobile permitted thermal desorption facility. The soil is heated in order to volatilize COCs, which are then destroyed in an afterburner.	Insufficient land area available. Not likely to be acceptable to surrounding community. Not retained.
		Incineration	High temperature burning on site with a mobile permitted incinerator.	Insufficient land area available. Not likely to be acceptable to surrounding community. Not retained.
		Soil Washing/ Chemical Treatment	Soil washing and chemical treatment by addition of oxidants.	Not applicable to MGP-impacted soils. Not retained.
		Biological Treatment	Landfarming or soil windrow tilling to enhance biological treatment of COCs in soil.	Insufficient land area available. Not likely to be acceptable to surrounding community. Not retained.

Table 6-3
Initial Technology Screening for Groundwater
Lyons MGP Site

General Response Action	Remedial Technology Type	Technology Process Option	Description	Site-Specific Screening Evaluation
No Action	No Action	No Action	No remedial action.	No Action is included for comparison purposes in accordance with NYSDEC DER-10.
Institutional Controls/ Engineering Controls (IC/ECs)	Institutional Controls	Environmental Easement/ Deed Restriction	Legal agreement or notice restricting site use in accordance with NYSDEC DER-10.	The Site is owned by NYSEG and the Village of Lyons. Retained for further evaluation.
		Local Groundwater Use Ordinance	Legal restriction placed by the local municipality preventing installation of new wells or use of existing wells.	Can prevent potential contact with COCs in on-site groundwater. 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. They are administered through environmental easements, deed restrictions, or third-party property agreements.	Can prevent potential contact with COCs in on-site groundwater. Retained for further evaluation.
	Engineering Controls	Fencing	Fencing or other physical barriers prevent potential receptors from exposures.	Not consistent with current site use as a municipal parking lot. Not retained.
		Signage	Signs, which deter potential receptors from exposures.	Not consistent with current site use as a municipal parking lot. Not retained.
Containment	Surface Barriers: Cover Soil and Caps	Soil Covers	One foot clean soil cover (for Commercial Site use), with site grading for drainage.	Can prevent potential exposure and can decrease infiltration of precipitation and therefore have a positive effect on groundwater quality. Retained for further evaluation.
		Low Permeability Surface Caps	Includes low permeability covers including pavement and concrete building pads.	Surface barriers minimize infiltration of precipitation to source areas, reducing migration of dissolved COCs. Retained for further evaluation.
	Subsurface Vertical Barriers	Steel Sheet Piling	Interlocking steel sheets are driven by vibration or hammer to pre-determined depths.	The RI sampling has demonstrated that groundwater is minimally impacted by MGP-related COCs. Not retained.
		Bentonite/Cement Slurry Walls	Slurry walls involve excavation of a 1.5 to 5 foot wide trench followed by immediate placement of slurry which hardens to form the barrier.	The RI sampling has demonstrated that groundwater is minimally impacted by MGP-related COCs. Not retained.
		HDPE Sheeting Walls	HDPE interlocking sheeting is installed through a slurry-supported trench.	The RI sampling has demonstrated that groundwater is minimally impacted by MGP-related COCs. Not retained.
		Drilled Grout and Solidified Earth Column Walls	Overlapping columns are drilled and filled with grout or grout/soil mixture to form a barrier wall with low permeability.	The RI sampling has demonstrated that groundwater is minimally impacted by MGP-related COCs. Not retained.
		Jet Grout Column Walls	High pressure jet grouting displaces soil to form a grout column. Overlapping grout columns form a barrier wall.	The RI sampling has demonstrated that groundwater is minimally impacted by MGP-related COCs. Not retained.
	Process Barriers	Biological Containment	Containment by a line of wells downgradient of the impacted area, which are used to stimulate microbial activity, usually by air sparging. The groundwater is treated in-situ before it migrates off site.	The RI sampling has demonstrated that groundwater is minimally impacted by MGP-related COCs. Not retained.
		Chemical Containment	Containment by a line of wells downgradient of the impacted area, which are used to chemically degrade the COCs, 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.	The RI sampling has demonstrated that groundwater is minimally impacted by MGP-related COCs. Not retained.

Table 6-3 (Cont'd.)
Initial Technology Screening for Groundwater
Lyons MGP Site

General Response Action	Remedial Technology Type	Technology Process Option	Description	Site-Specific Screening Evaluation
Containment (Cont'd.)	Process Barriers (Cont'd.)	Permeable Reactive Barrier	Containment by construction of a vertical treatment zone downgradient of the impacted area, which is used to chemically and biologically degrade the COCs, usually by the placement of a reactive material such as iron filings or activated carbon. This can also be combined with NAPL capture, biological and chemical in-situ treatment. The groundwater is treated in-situ before it migrates off site.	The RI sampling has demonstrated that groundwater is minimally impacted by MGP-related COCs. Not retained.
		Hydraulic Containment	Containment by extracting groundwater by wells or trenches around the impacted area. Just enough groundwater is captured so that an inward hydraulic gradient is maintained and off-site migration does not occur. The captured groundwater is treated prior to discharge to surface water or the local sewage treatment system.	The RI sampling has demonstrated that groundwater is minimally impacted by MGP-related COCs. Not retained.
In-Situ Treatment	Natural Attenuation	Monitored Natural Attenuation (MNA)	MNA refers to the reliance on natural treatment processes to achieve site-specific remedial objectives. The natural attenuation processes include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of COCs in soil or groundwater. These processes include biodegradation, dispersion, dilution, sorption, volatilization, and chemical or biological stabilization, transformation, or destruction of COCs.	The RI sampling has demonstrated that groundwater is minimally impacted by MGP-related COCs. Retained for further evaluation.
	Immobilization	In-Situ Solidification (ISS) using Auger Mixing method	Overlapping columns are augered as a grout/soil mixture to form a solid monolith of low permeability. Most effective to a depth of approximately 40 feet but constructable to a depth of approximately 50 feet.	Effective for meeting groundwater and soil-related RAOs. Retained for further evaluation.
		In-Situ Solidification (ISS) using Pressure Grouting method	High pressure jet grouting displaces soil to form a grout column. Overlapping grout columns form a solid monolith of low permeability. Constructable to a depth of approximately 40 feet.	Potentially effective for meeting groundwater and soil-related RAOs. Retained for further evaluation.
		In-Situ Solidification (ISS) using Excavator Bucket Mixing method	Bulk soil is mixed into a grout/soil mixture to form a solid monolith of low permeability. Constructable to a depth of approximately 20 feet (deeper if larger excavator with extended long reach boom is utilized).	Effective for meeting groundwater and soil-related RAOs. Retained for further evaluation.
	Chemical Treatment	In-Situ Chemical Oxidation (ISCO)	Treatment by a field of wells in the impacted area, which are used to chemically degrade the COCs, usually by addition of an oxidant such as ozone, hydrogen peroxide, or potassium permanganate.	Limited applicability due to technology uncertainty. Not retained.
	Biological Treatment	Enhanced In-Situ Bioremediation: Aerobic Biodegradation	Air sparging, oxygen injection and addition of oxygen releasing compounds (ORC).	The RI sampling has demonstrated that groundwater is minimally impacted by MGP-related COCs. Not retained.
		Enhanced In-Situ Bioremediation: Anaerobic Biodegradation	Addition of a carbon substrate or electron acceptor as a reducing agent to maintain anaerobic conditions.	The RI sampling has demonstrated that groundwater is minimally impacted by MGP-related COCs. Not retained.
		Phytoremediation	Trees or other plants are placed to remove groundwater and immobilize or treat COCs.	The RI sampling has demonstrated that groundwater is minimally impacted by MGP-related COCs. Not retained.
	Air Sparging/Soil Vapor Extraction	Air Sparging/Soil Vapor Extraction	This technology is the injection of pressurized air into the subsurface below the water table to induce volatilization of dissolved phase COCs.	The RI sampling has demonstrated that groundwater is minimally impacted by MGP-related COCs. Not retained.

Table 6-3 (Cont'd.)
Initial Technology Screening for Groundwater
Lyons MGP Site

General Response Action	Remedial Technology Type	Technology Process Option	Description	Site-Specific Screening Evaluation
Source Material Removal	Excavation (Refer to Table 6-2 for Treatment Technology Screening)	Excavation and Removal of Soil Containing Source Material	Removal of soil using a hydraulic excavator or other excavation equipment. For deeper excavations, it is likely that shoring and dewatering operations will be required as part of excavation.	Effective for meeting soil-related RAOs and for meeting groundwater-related RAOs over time. Retained for further evaluation.
Groundwater Removal	Groundwater Extraction and Treatment	Groundwater Pumping via Centralized Extraction Wells, with On-Site Treatment	Removal of groundwater by extracting groundwater from wells in the impacted area. The captured groundwater is treated prior to discharge to surface water or the POTW.	The RI sampling has demonstrated that groundwater is minimally impacted by MGP-related COCs. Not retained.
	NAPL Recovery	Recovery Wells and Trenches	This technology involves the extraction of free-phase NAPL from wells or trenches. The NAPL accumulates in the well, and is then pumped into a holding tank prior to off-site disposal or recycling at an appropriate facility. Partially addresses source material and aids in meeting groundwater and soil-related RAOs. Effective at removing free-phase NAPL from the subsurface; and therefore reducing the COC flux into the groundwater. Pilot tests are typically required to determine recovery rates, NAPL recoverability, well or trench design, pumping and control equipment.	Based on the sampling performed during the RI, it does not appear that there is a significant amount of free-phase NAPL at the site. NAPL was not observed in the soil samples collected from soil borings and has not accumulated in any wells installed on site. Not retained.
	Enhance Recovery Technologies	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 COCs.	Experimental technologies with a substantial risk for uncontrolled migration of COCs to off-site areas. High cost. Not retained.
		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 COCs.	Experimental technologies with a substantial risk for uncontrolled migration of COCs to off-site areas. High cost. Not retained.
		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 COCs.	Experimental technologies with a substantial risk for uncontrolled migration of COCs to off-site areas. Not retained.
		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 COCs.	Experimental technologies with a substantial risk for uncontrolled migration of COCs to off-site areas. Not retained.
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 excavation water treatment at the site. Specific unit processes for treatment of organic COCs in groundwater will be evaluated during design. Generic organic water treatment is retained for further evaluation.
		Granular Activated Carbon	Treatment by adsorption of COCs on carbon.	Potentially feasible for use in excavation water treatment at the site. Specific unit processes for treatment of organic COCs in groundwater will be evaluated during design. Generic organic water treatment is retained for further evaluation.

Table 6-3 (Cont'd.)
Initial Technology Screening for Groundwater
Lyons MGP Site

General Response Action	Remedial Technology Type	Technology Process Option	Description	Site-Specific Screening Evaluation
Treatment (Cont'd.)	Organic Treatment (Cont'd.)	Oil/Water Separation	Removal of NAPL from extracted water using gravity separation.	Potentially feasible for use in excavation water treatment at the site. Specific unit processes for treatment of organic COCs in groundwater will be evaluated during design. Generic organic water treatment is retained for further evaluation.
	Inorganic Treatment	Chemical/UV Oxidation	Groundwater treatment using ion exchange resins that remove ionized inorganic COCs from water.	Potentially feasible for use in excavation water treatment at the site. Specific unit processes for treatment of inorganic COCs in groundwater will be evaluated during design. Generic inorganic water treatment is retained for further evaluation.
		Chemical Precipitation	Addition of coagulants to water to promote precipitation of inorganic COCs.	Potentially feasible for use in excavation water treatment at the site. Specific unit processes for treatment of inorganic COCs in groundwater will be evaluated during design. Generic inorganic water treatment is retained for further evaluation.
		Ion Exchange/Adsorption	Use of equipment to remove and treat COC in groundwater.	Potentially feasible for use in excavation water treatment at the site. Specific unit processes for treatment of inorganic COCs 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 excavation water treatment at the site. Specific unit processes for treatment of inorganic COCs in groundwater will be evaluated during design. Generic inorganic water treatment is retained for further evaluation.
		Peroxide Oxidation	Addition of hydrogen peroxide to water to treat inorganic COCs, particularly cyanide.	Potentially feasible for use in excavation water treatment at the site. Specific unit processes for treatment of inorganic COCs in groundwater will be evaluated during design. Generic inorganic water treatment is retained for further evaluation.

Table 6-4
Remedial Technology Evaluation for Surface Soil
Lyons MGP Site

General Response Action	Remedial Technology Type	Technology Process Option	Effectiveness	Implementability	Relative Cost	Site-Specific Applicability and Screening Evaluation
No Action	No Action	No Action	Not effective for achieving RAOs for surface soil in an acceptable timeframe.	Readily implemented.	No Cost	No Action is included for comparison purposes in accordance with NYSDEC DER-10. Retained for alternative development.
Institutional Controls/ Engineering Controls (IC/ECs)	Institutional Controls	Environmental Easement / Deed Restriction	Effective in preventing exposures to construction/utility workers and residents.	Readily implemented.	Low	The Site is owned by NYSEG and the Village of Lyons. Retained for alternative development.
		Site Management Plan	Effective in preventing exposures to construction/utility workers and residents.	Readily implemented.	Low	The Site is owned by NYSEG and the Village of Lyons. Retained for alternative development.
Containment	Surface Barriers	Soil Cover	Effective in preventing exposures for construction/utility workers and residents.	Technology proven and readily implemented.	Moderate	Retained for alternative development.
		Low Permeability Surface Cap	Effective in preventing exposures for construction/utility workers and residents.	Technology proven and readily implemented.	Moderate	Retained for alternative development.
Removal	Excavation	Conventional Excavators and Graders	Effective at meeting surface soil RAOs.	Technology proven and readily implemented.	Moderate	Retained for alternative development.
Treatment and Disposal	Off-Site Disposal or Treatment	Landfill	Effective and widely used technologies.	Readily implemented.	Moderate	Retained for alternative development.
		Low-Temperature Thermal Desorption	Effective and widely used technologies.	Readily implemented.	High	Retained for alternative development.
		Waste-to-Energy	Effective and widely used technologies.	Readily implemented.	High	Retained for alternative development.

Table 6-5
Remedial Technology Evaluation for Subsurface Soil
Lyons MGP Site

General Response Action	Remedial Technology Type	Technology Process Option	Effectiveness	Implementability	Relative Cost	Site-Specific Applicability and Screening Evaluation
No Action	No Action	No Action	Not effective for achieving RAOs for subsurface soil in an acceptable timeframe.	Readily implemented.	No Cost	No Action is included for comparison purposes in accordance with NYSDEC DER-10. Retained for alternative development.
Institutional Controls/ Engineering Controls (IC/ECs)	Institutional Controls	Environmental Easement Site Management Plan (SMP)	Effective in preventing exposures to construction/utility workers. Not effective in limiting subsurface migration of COCs, volume reduction, or treatment.	Readily implemented.	Low	Retained for alternative development.
	Engineering Controls	Temporary Fencing and Signage	Effective in preventing exposures for construction/utility workers. Not effective in limiting subsurface migration of COCs, volume reduction, or treatment.	Readily implemented.	Low	Retained for alternative development.
In-Situ Treatment	Immobilization	In-Situ Solidification (ISS): Auger Mixing, Excavator Bucket Mixing, and Pressure/Jet Grouting	The ISS monolith physically prevents exposures to impacted subsurface soils. Physically binds or encloses a COC mass and/or induces a chemical reaction between the stabilizing agent and the COCs to reduce their mobility within the subsurface and to decrease permeability of the mass so that groundwater does not contact the COCs. Pressure/Jet Grouting method may be less effective due to unpredictability in extent of ISS monolith.	Technology proven and implementable under some conditions.	High mobilization costs. Costs of ISS for saturated soils can be less than excavation/off-site disposal.	Auger mixing and excavator bucket mixing method retained for alternative development. Pressure/Jet grouting method not retained due to unpredictability in effective implementation.
Removal	Excavation	Conventional and Long-Stick Excavators/ Shored Excavation	Effective at meeting soil RAOs and addressing groundwater RAOs.	Technology is proven and readily implemented for accessible soils. Excavations deeper than the typical reach of an excavator, approximately 20 feet, would require additional equipment and more extensive dewatering and earth support structures.	High	Retained for alternative development.
Treatment and Disposal	Off-Site Treatment and Disposal	Landfill LTTD Waste-to-Energy	Effective and widely used technologies.	Readily implemented.	Moderate	All Retained for alternative development.

Table 6-6
Remedial Technology Evaluation for Groundwater
Lyons MGP Site

General Response Action	Remedial Technology Type	Technology Process Option	Effectiveness	Implementability	Relative Cost	Site-Specific Applicability and Screening Evaluation
No Action	No Action	No Action	Not effective for achieving RAOs for groundwater in an acceptable timeframe.	Readily implemented.	No Cost	No Action is included for comparison purposes in accordance with NYSDEC DER-10. Retained for alternative development.
Institutional Controls/ Engineering Controls (IC/ECs)	Institutional Controls	Environmental Easement/ Deed Restriction Local Groundwater Use Ordinance Site Management Plan	Effective in preventing exposures to construction/utility workers. Not effective in limiting subsurface migration of COCs, volume reduction, or treatment.	Readily implemented. The Site is owned by NYSEG and the Village of Lyons.	Low	Retained for alternative development.
Containment	Surface Barriers	Soil Cover Low permeability surface cover	Effective for decreasing infiltration of precipitation with site grading and draining.	Readily implemented.	Low	Retained for alternative development.
In-Situ Treatment	Natural Attenuation	Monitored Natural Attenuation (MNA)	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 COCs.	Implementable.	Low capital costs, Moderate OM&M costs.	Retained for alternative development.
	Immobilization	In-Situ Solidification (ISS): Auger Mixing Excavator Bucket Mixing Pressure/Jet Grouting	Effective for meeting groundwater RAOs. Physically binds or encloses a COC mass and/or induces a chemical reaction between the stabilizing agent and the COCs to reduce their mobility within the subsurface and to decrease permeability of the mass so that groundwater does not contact the COCs. Pressure/Jet Grouting method may be less effective due to unpredictability in extent of ISS monolith.	Technology proven and implementable.	High mobilization costs. Costs of ISS for saturated soils can be less than excavation/off-site disposal.	Auger mixing and excavator bucket mixing method retained for alternative development. Pressure/Jet grouting method not retained due to unpredictability in effective implementation.
Source Material Removal	Excavation (Refer to Table 6-5 for Treatment Technology Evaluation)	Excavation and removal of soil containing source material or COCs.	Effective at meeting soil RAOs and addressing groundwater RAOs through the removal of source material.	Technology is proven and readily implemented for accessible soils. Excavations deeper than the typical reach of an excavator, approximately 20 feet, would require additional equipment and more extensive dewatering and earth support structures.	Moderate	Retained for alternative development.
Treatment	Organic Treatment	Air Stripping Granular Activated Carbon Oil/Water Separation	The technology would be effective at meeting the RAOs for prevention of exposure to COCs in groundwater. Processes 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.	The technology is implementable.	Moderate capital costs, Moderate to High OM&M costs	Retained for treatment of groundwater removed during on-site excavation.
	Inorganic Treatment	Chemical/UV Oxidation Chemical Precipitation Ion Exchange/Adsorption Filtration Peroxide Oxidation	The technology would be effective at meeting the RAOs for prevention of exposure to COCs in groundwater. Processes 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.	The technology is implementable.	Moderate capital costs, Moderate to High OM&M costs	Retained for treatment of groundwater removed during on-site excavation.

Table 7-1
Alternatives Summary and RAOs
Lyons MGP Site

SMP = Site Management Plan MNA = Monitored Natural Attenuation COC = Constituent of Concern IC/ECs = Institutional Controls / Engineering Controls		**Alternative 1 No Action**	**Alternative 2 Isolation**	**Alternative 3 ISS**	**Alternative 4 Soil Removal**	**Alternative 5 Soil Removal to Unrestricted Use SCOs**
IDENTIFIED AREAS WITH RECOMMENDED ACTIONS	**Two Areas with Surface Soil Impacts (NYSEG Parcel and Water Street ROW)**	No Action	Remove impacted surface soil, install and maintain soil cover	Remove impacted surface soil, install and maintain soil cover	Remove impacted surface soil, install and maintain soil cover	
	AOC 1 – Gas Holder B	No Action	MNA IC/ECs (applied site-wide)	Relocate utilities Remove foundations Pre-excavation of soil above ISS ISS of subsurface soil exceeding 500 ppm for Total PAHs 0-15 feet ISS of soil with source material below 15 feet Jet or pressure grouting may be utilized to address impacted soil below or around major obstructions Backfill and re-grading MNA Monitoring (applied site-wide) IC/ECs (applied site-wide)	Relocate utilities Remove foundations Excavate soil to 500 ppm for Total PAHs 0-15 feet Excavate soil with source material below 15 feet Jet or pressure grouting may be utilized to address impacted soil below or around major obstructions Backfill and re-grading MNA Monitoring (applied site-wide) IC/ECs (applied site-wide)	Relocate utilities Remove subsurface foundations Remove soil to Unrestricted Use SCOs
	AOC 2 – MGP Building	No Action	MNA IC/ECs (applied site-wide)	Relocate utilities Remove foundations Pre-excavation of soil above ISS ISS of subsurface soil exceeding 500 ppm for Total PAHs 0-15 feet ISS of soil with source material below 15 feet Jet or pressure grouting may be utilized to address impacted soil below or around major obstructions Backfill and re-grading MNA Monitoring (applied site-wide) IC/ECs (applied site-wide)	Relocate utilities Remove foundations Excavate soil to 500 ppm for Total PAHs (0-15 feet) Excavate soil with source material below 15 feet Jet or pressure grouting may be utilized to address impacted soil below or around major obstructions Backfill and re-grading MNA Monitoring (applied site-wide) IC/ECs (applied site-wide)	
	AOC 3 – Geneva Street / NYS RT 14 ROW	No Action	Monitoring (applied site-wide) IC/ECs (applied site-wide)	Monitoring (applied site-wide) IC/ECs (applied site-wide)	Monitoring (applied site-wide) IC/ECs (applied site-wide)	
Applicable Medium	**RAOs**					
Surface Soil	Prevent ingestion/ direct contact with soil containing COC levels exceeding the applicable SCOs. Prevent inhalation of or exposure to COCs in surface soil. Prevent migration of COCs that would result in groundwater or surface water impacts. Prevent impacts to biota from ingestion/ direct contact with soil causing toxicity.	Not addressed	Addressed by surface soil removal and installation and maintenance of soil cover IC/ECs (applied site-wide)	Addressed by surface soil removal and installation and maintenance of soil cover IC/ECs (applied site-wide)	Addressed by surface soil removal and installation and maintenance of soil cover IC/ECs (applied site-wide)	Addressed by soil removal and soil cover

Table 7-1 (Cont'd.)
Alternatives Summary and RAOs
Lyons MGP Site

SMP = Site Management Plan MNA = Monitored Natural Attenuation COC = Constituent of Concern IC/ECs = Institutional Controls / Engineering Controls		**Alternative 1 No Action**	**Alternative 2 Isolation**	**Alternative 3 ISS**	**Alternative 4 Soil Removal**	**Alternative 5 Soil Removal to Unrestricted Use SCOs**
Applicable Medium	**RAOs**					
Subsurface Soil	Prevent ingestion/ direct contact with soil containing COC levels exceeding the applicable SCOs. Prevent inhalation of, or exposure to, COCs in subsurface soil. Prevent migration of COCs that would result in groundwater or surface water impacts. Prevent impacts to biota from ingestion/ direct contact with soil causing toxicity.	Not addressed	Addressed by IC/ECs (applied site-wide)	Addressed by soil removal and ISS IC/ECs (applied site-wide)	Addressed by soil removal IC/ECs (applied site-wide)	Addressed by soil removal
Groundwater	Prevent ingestion of groundwater with COC levels exceeding drinking water standards. Prevent contact with, or inhalation of, volatiles from impacted groundwater. Prevent discharge of COCs to surface water. Remove the source of groundwater impacts to the extent practicable. Restore groundwater aquifer to ambient groundwater quality criteria, to the extent practicable.	Not addressed	Addressed by MNA IC/ECs (applied site-wide)	Addressed by ISS of source material MNA IC/ECs (applied site-wide)	Addressed by removal of source material MNA IC/ECs (applied site-wide)	Addressed by soil removal

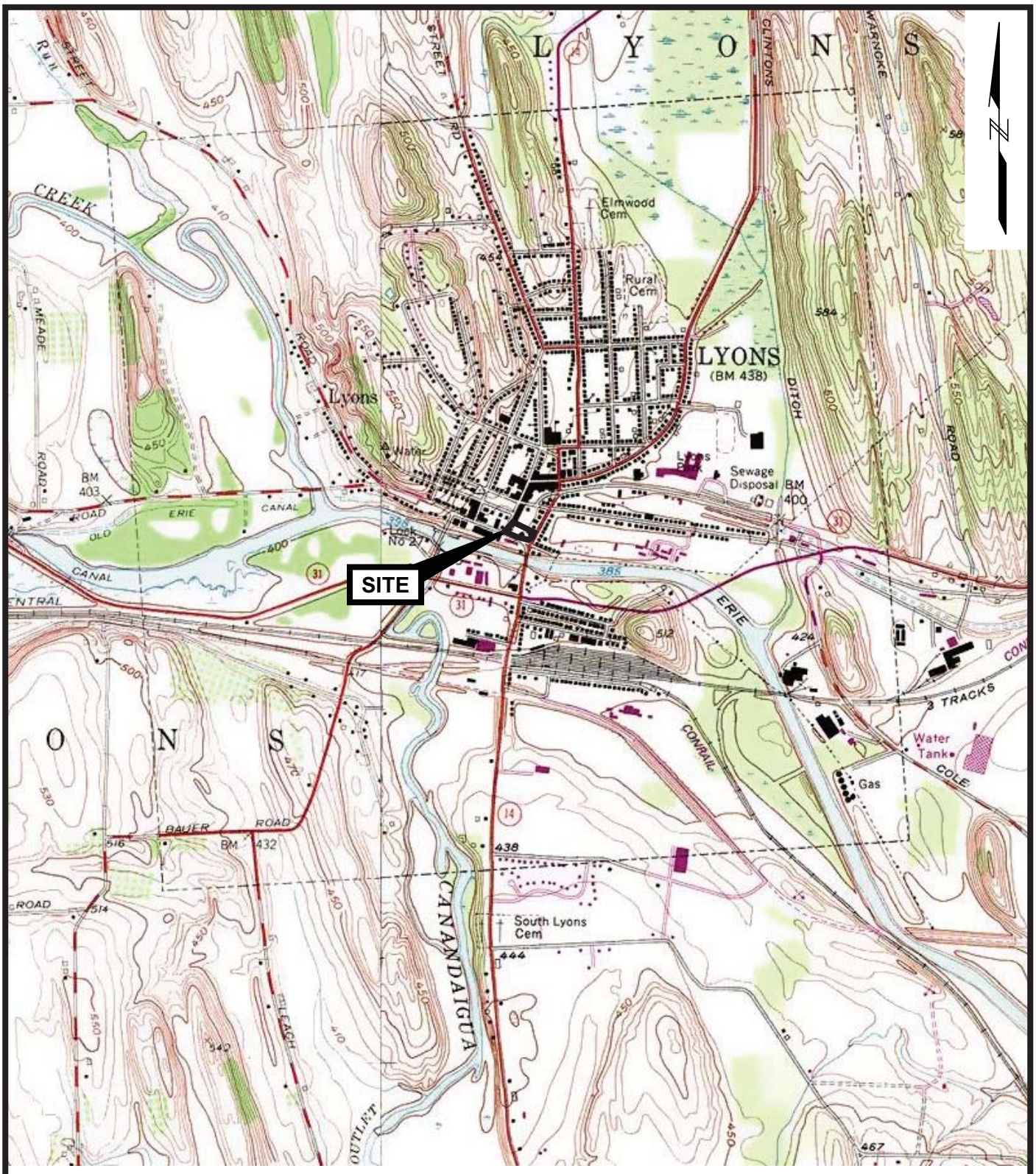
Table 7-2
Comparative Ranking of Alternatives
Lyons MGP Site

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	Total Cost (FS accuracy +50%/ - 30%)	Cost Effectiveness	Land Use
1	No Action	Not Protective	Not Compliant	5th	5th	1st	1st	No Cost	No Cost	Not Supportive
2	Remove impacted surface soil, soil cover, MNA for groundwater, IC/ECs	4th	4th	4th	4th	2nd	2nd	$460,000	3rd	3rd
3	Remove impacted surface soil, soil cover, remove foundations, excavate soil above ISS, ISS of subsurface soil exceeding 500 mg/kg for Total PAHs (0-15 ft), ISS of source material below 15 feet bgs, backfill and re-grade, MNA, IC/ECs	3rd	3rd	3rd	3rd	3rd	3rd	$2,810,000	1st	2nd
4	Remove impacted surface soil, soil cover, remove foundations, excavation of subsurface soil exceeding 500 mg/kg for Total PAHs (0-15 feet bgs), excavation of source material below 15 feet bgs, excavation backfill, MNA, IC/ECs	2nd	2nd	2nd	2nd	4th	4th	$3,920,000	2nd	1st
5	Remove subsurface foundations, remove soil to Unrestricted Use SCOs	1st	1st	1st	1st	5th	5th	$10,890,000	4th	5th

Comparative Ranking:

1st - Ranked First, Best
2nd - Ranked Second
3rd - Ranked Third
4th - Ranked Fourth
5th - Ranked Fifth, Last
Duplicate ranks indicate equivalent ranking.

Figures



SOURCE: Map created with TOPO! ® ©2001 National Geographic (www.nationalgeographic.com/topo)"

0 2000 4000

SCALE, FEET

FEASIBILITY STUDY REPORT
LYONS MGP SITE
VILLAGE OF LYONS, NEW YORK

NYSEG
BINGHAMTON, NEW YORK

GEI Consultants

SITE LOCATION MAP

Project 112830-2002 | October 2013 | Figure 1

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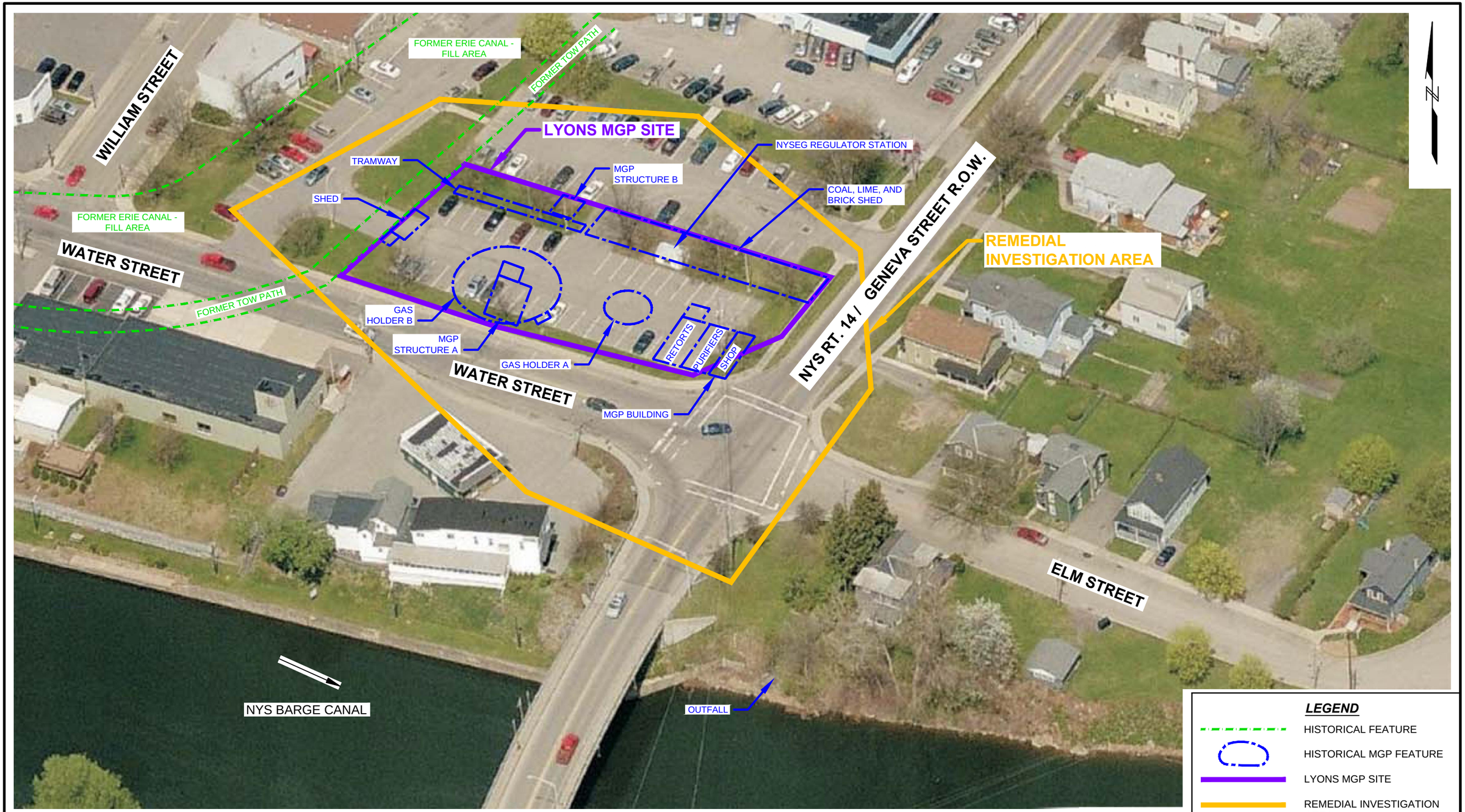

LEGEND

- HISTORICAL FEATURE
- HISTORICAL MGP FEATURE
- LYONS MGP SITE
- REMEDIAL INVESTIGATION AREA

SOURCES:

1. DRAWING TITLED "LYONS FORMER MGP SITE" PREPARED BY NYSEG ENGINEERING SERVICES, BINGHAMTON, N.Y. DATED 5/17/99 AND 9/13/00.
2. PROPERTY LINES DIGITIZED FROM DRAWING TITLED "BOUNDARY AND TOPOGRAPHY SURVEY OF LYONS, NY MGP SITE" PREPARED BY S.Y. KIM LAND SURVEYOR P.C. DATED 1/24/91.
3. DRAWING TITLED "LYONS MGP SITE SURVEY" PERFORMED BY THEW ASSOCIATES, 9478 RIVER ROAD MERCY, NEW YORK, DATED 11/2011.

0 50 100

SCALE, FEET

FEASIBILITY STUDY REPORT
LYONS MGP SITE
VILLAGE OF LYONS, NEW YORK

NYSEG
BINGHAMTON, NEW YORK

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LYONS MGP SITE AND REMEDIAL INVESTIGATION AREA

Project 112830-2002 | October 2013 | Figure 2

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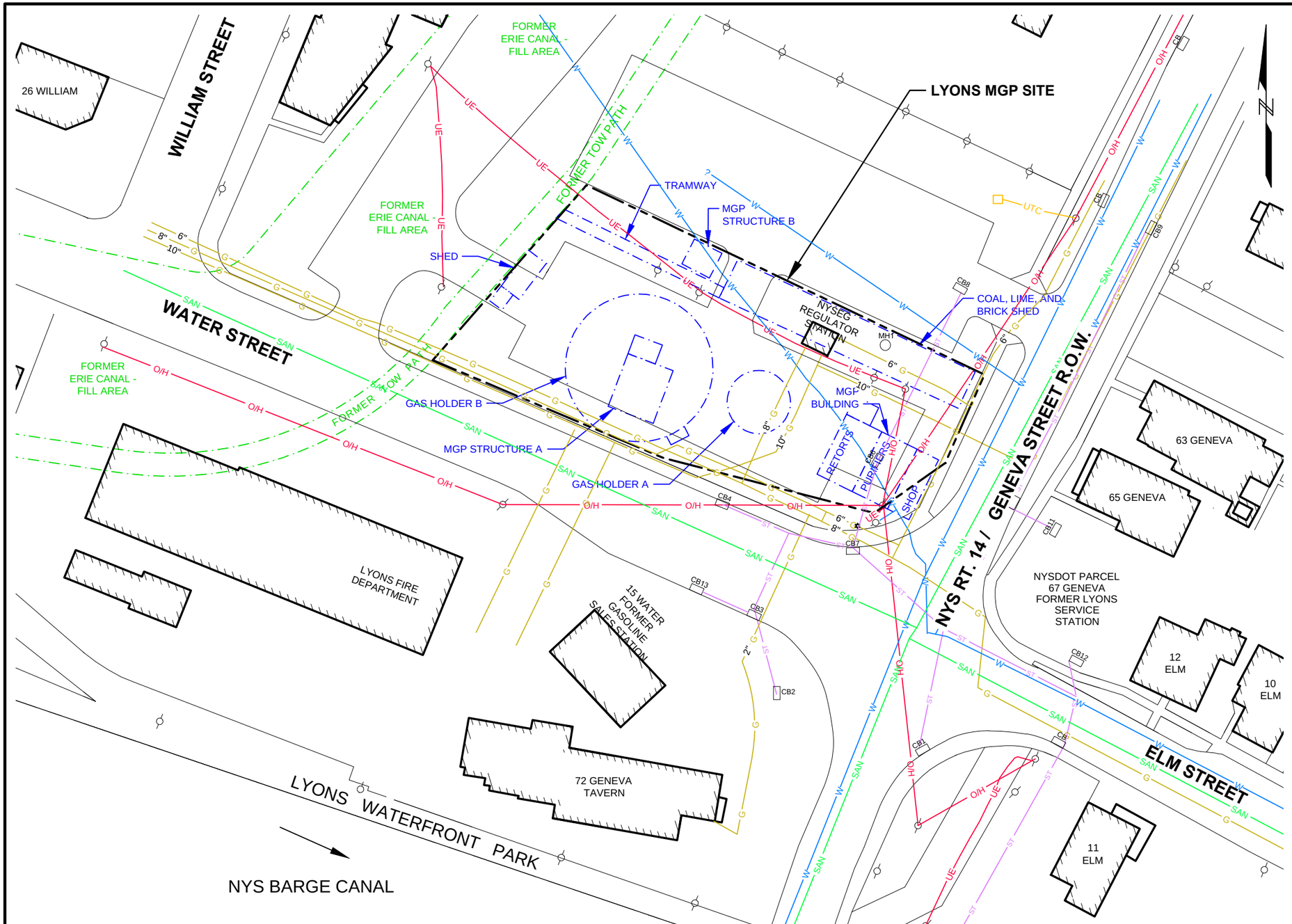

LEGEND:

- PROPERTY LINE
- EXISTING BUILDING
- CURRENT FEATURE
- HISTORICAL FEATURE
- HISTORICAL MGP FEATURE
- O/H — OVERHEAD ELECTRIC
- UE — UNDERGROUND ELECTRIC
- G — GAS
- W — WATER
- SAN — SANITARY SEWER
- ST — STORM SEWER
- CB1 — CATCH BASIN
- MH-1 — MANHOLE
- HYDRANT
- POLE

NOTE:

1. UTILITY LINES SHOWN ON FIGURE ARE APPROXIMATE, VERIFY IN FIELD PRIOR TO DRILLING OR EXCAVATION.

SOURCES:

1. DRAWING TITLED "LYONS FORMER MGP SITE" PREPARED BY NYSEG ENGINEERING SERVICES, BINGHAMTON, N.Y. DATED 5/17/99 AND 9/13/00.
2. PROPERTY LINES DIGITIZED FROM DRAWING TITLED "BOUNDARY AND TOPOGRAPHY SURVEY OF LYONS, NY MGP SITE" PREPARED BY S.Y. KIM LAND SURVEYOR P.C. DATED 1/24/91.
3. DRAWING TITLED "LYONS MGP SITE SURVEY" PERFORMED BY THEW ASSOCIATES, 9478 RIVER ROAD MERCY, NEW YORK, DATED 11/2011.

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SCALE, FEET

FEASIBILITY STUDY REPORT
LYONS MGP SITE
VILLAGE OF LYONS, NEW YORK

NYSEG
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CURRENT AND HISTORICAL FEATURES AND UTILITIES

October 2013 Figure 3

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LEGEND:

NYSDOT R.O.W. AREA

LYONS MGP SITE

1. FOR UNDERGROUND TANK INFORMATION AT THE NORTHEAST CORNER INTERSECTION ROUTE 14 AND WATER ST. SEE DWG. IGL-1.

BEGIN RECONST. WATER ST. ℄ STA. 'WW' 8+60 ℄ STA. 'W' 8+46.21, 24.58' L

℄ STA. WW 8+50

END RECONSTRUCTION CONTRACT & PROJECT STOPS ℄ STA. 'G' 10+93.37, 27.27' Lt. ℄ STA. 19+30.00 = ℄ STA. 'WE' 10+00.00

℄ 17+05.29 = ℄ 'WE' 10+00.00

℄ 17+11.38 = ℄ 'WW' 10+00

Exist. Highway Boundary

Conc. Walk

Exist. Highway Boundary

AS-BUILT REVISIONS

DATE

SIGNATURE

PLAN

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION

DRAWING No.	SCALE	DATE	REGION	SHEET No.
P-1	1" = 40'	NOV. 1989	3	28

modi associates
CONSULTING ENGINEERS & LAND SURVEYORS
6260 SOUTH BAY ROAD
CLAY, NY 13041, 315-699-4606

THE VILLAGE OF LYONS (REPUTED OWNER) Bk. 684 Pg. 566

PAUL E. FERA & ANGELA FERA (REPUTED OWNERS) Bk. 725 Pg. 715

PROPELL LIMITS

PROP. R.O.W.

1 Sty. Brick Bldg.

2 Sty. Wood Fr. Bldg.

WATER STREET

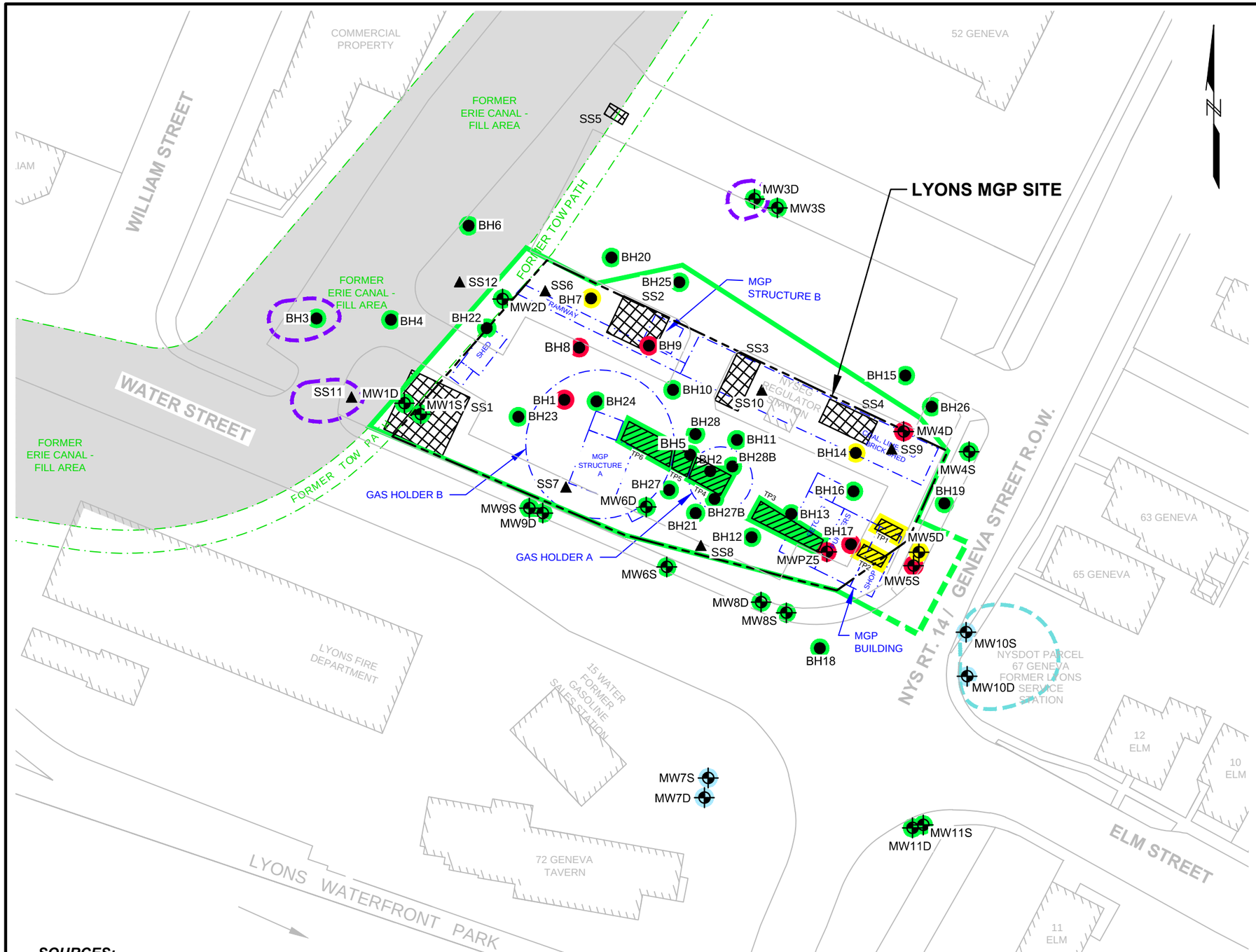
Exist. Street Boundary

Survey Baseline

Exist. Canal Bndy

47' Lt.

A-21
1989 NYSDOT Plan



LEGEND:

- PROPERTY LINE
- EXISTING BUILDING
- CURRENT FEATURE
- HISTORICAL FEATURE
- HISTORICAL MGP FEATURE
- BH3 — SUBSURFACE SOIL BORING
- MW1S — MONITORING WELL
- TP5 — TEST PIT
- SS4 — 0-6" COMPOSITE SURFACE SAMPLE
- SS8 — 0-2" SURFACE SOIL SAMPLE
- APPROXIMATE EXTENT OF EXCEEDANCES OF UNRESTRICTED SCOs APPARENTLY NOT RELATED TO THE MGP SITE
- APPROXIMATE EXTENT OF EXCEEDANCES OF UNRESTRICTED USE SCOs APPARENTLY RELATED TO THE MGP SITE (DASHED WHERE INFERRED)
- APPROXIMATE EXTENT OF EXCEEDANCES OF UNRESTRICTED SCOs ATTRIBUTED TO THE OFF-SITE NYSDEC PETROLEUM SPILL SITE
- COAL TAR OR COAL TAR NAPL COATED OR SATURATED SOIL
- HYDROCARBON STAIN, SHEEN OR NAPL BLEBS
- PETROLEUM IMPACTS STAINING & ODOR
- NO VISIBLE HYDROCARBON IMPACTS OBSERVED

SOURCES:

1. DRAWING TITLED "LYONS FORMER MGP SITE" PREPARED BY NYSEG ENGINEERING SERVICES, BINGHAMTON, N.Y. DATED 5/17/99 AND 9/13/00.
2. PROPERTY LINES DIGITIZED FROM DRAWING TITLED "BOUNDARY AND TOPOGRAPHY SURVEY OF LYONS, NY MGP SITE" PREPARED BY S.Y. KIM LAND SURVEYOR P.C. DATED 1/24/91.
3. DRAWING TITLED "LYONS MGP SITE SURVEY" PERFORMED BY THEW ASSOCIATES, 9478 RIVER ROAD MERCY, NEW YORK, DATED 11/2011.

0 50 100

SCALE, FEET

FEASIBILITY STUDY REPORT
LYONS MGP SITE
VILLAGE OF LYONS, NEW YORK

NYSEG
BINGHAMTON, NEW YORK

GEI Consultants

Project 112830-2002

APPROXIMATE EXTENT OF SOIL EXCEEDANCES FOR UNRESTRICTED USE SCOs

October 2013 Figure 5

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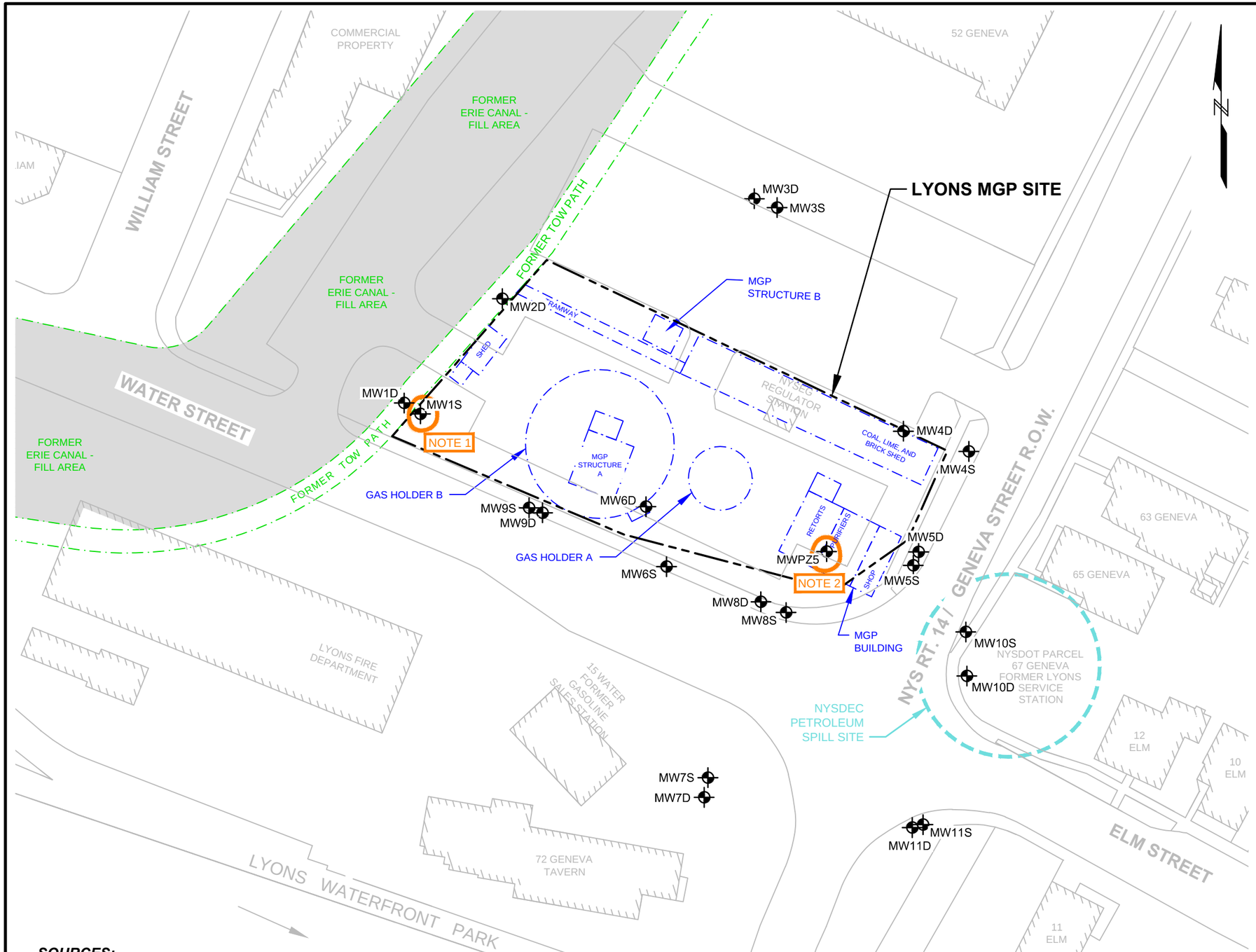

LEGEND:

- PROPERTY LINE
- EXISTING BUILDING
- CURRENT FEATURE
- HISTORICAL FEATURE
- HISTORICAL MGP FEATURE
- MW1S — MONITORING WELL S = SHALLOW OVERBURDEN D = DEEP OVERBURDEN
- APPROXIMATE EXTENT OF EXCEEDANCES OF NYSDEC AMBIENT WATER QUALITY STANDARDS FOR TOTAL CN, VOCs AND SVOCs
- APPROXIMATE EXTENT OF EXCEEDANCES OF NYSDEC AMBIENT WATER QUALITY STANDARDS - NYSDEC PETROLEUM SPILL SITE

NOTES:

1. MW1S TOTAL CN EXCEEDANCE ONLY. NO VOC OR SVOC EXCEEDANCES.
2. MWPZ5 - NO TOTAL CN OR VOC EXCEEDANCES. PAH COMPOUNDS IDENTIFIED IN ESTIMATED CONCENTRATIONS BELOW THE LABORATORY REPORTING LIMITS.

SOURCES:

1. DRAWING TITLED "LYONS FORMER MGP SITE" PREPARED BY NYSEG ENGINEERING SERVICES, BINGHAMTON, N.Y. DATED 5/17/99 AND 9/13/00.
2. PROPERTY LINES DIGITIZED FROM DRAWING TITLED "BOUNDARY AND TOPOGRAPHY SURVEY OF LYONS, NY MGP SITE" PREPARED BY S.Y. KIM LAND SURVEYOR P.C. DATED 1/24/91.
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FEASIBILITY STUDY REPORT
LYONS MGP SITE
VILLAGE OF LYONS, NEW YORK

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APPROXIMATE EXTENT OF NYSDEC AMBIENT WATER QUALITY STANDARDS EXCEEDANCES

October 2013 Figure 6

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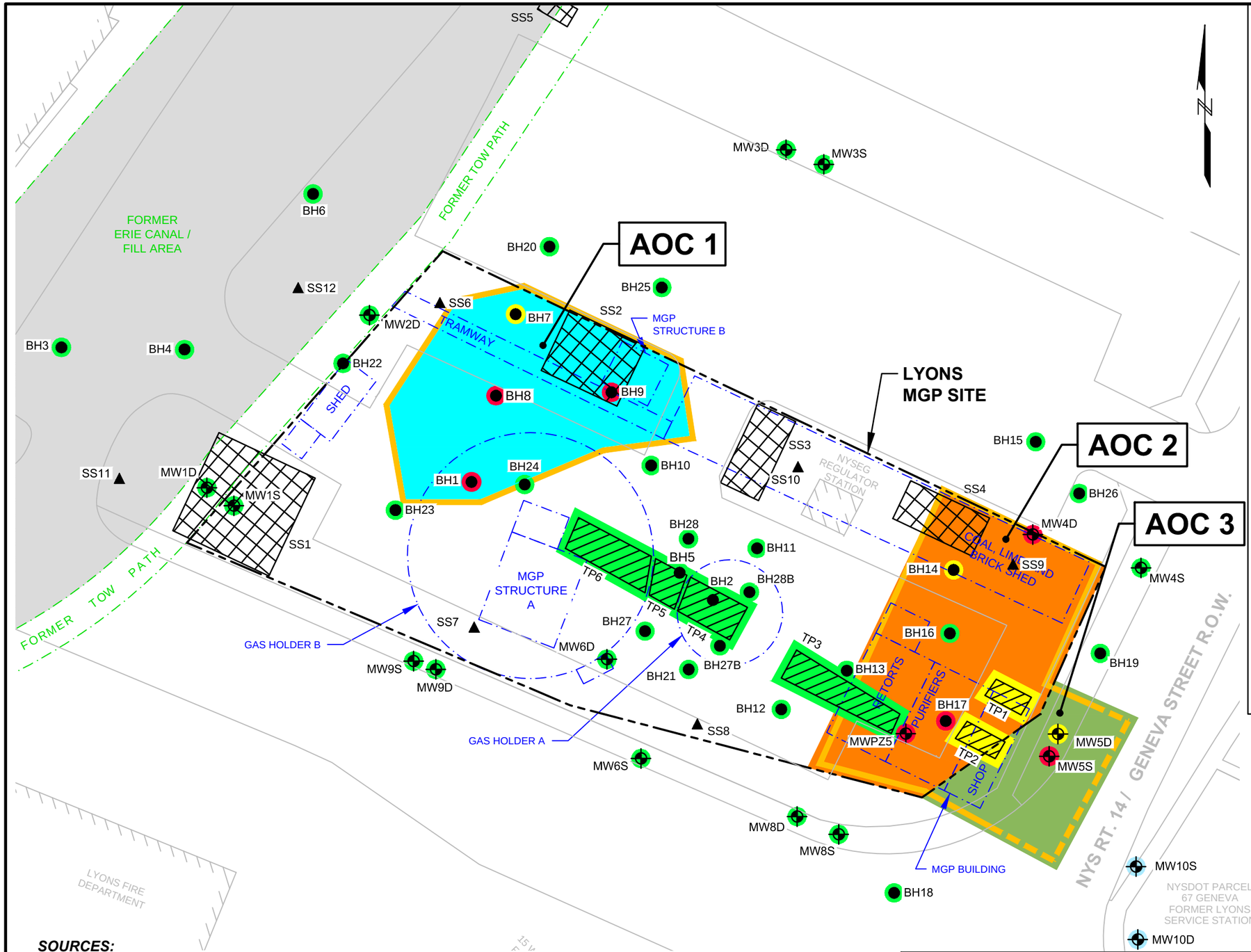

LEGEND:

- PROPERTY LINE
- EXISTING BUILDING
- CURRENT FEATURE
- HISTORICAL FEATURE
- HISTORICAL MGP FEATURE
- BH3 — SUBSURFACE SOIL BORING
- MW1S — MONITORING WELL
- TP5 — TEST PIT
- SS4 — 0-6" COMPOSITE SURFACE SAMPLE
- SS8 — 0-2" SURFACE SOIL SAMPLE
- APPROXIMATE EXTENT OF EXCEEDANCES OF SOIL CLEANUP LEVEL FOR COMMERCIAL USE (500 mg/kg TOTAL PAHs)
- (DASHED WHERE INFERRED)
- COAL TAR OR COAL TAR NAPL COATED OR SATURATED SOIL
- HYDROCARBON STAIN, SHEEN OR NAPL BLEBS
- PETROLEUM IMPACTS STAINING & ODOR
- NO VISIBLE HYDROCARBON IMPACTS OBSERVED
- AREA OF CONCERN 1 - GAS HOLDER B
- AREA OF CONCERN 2 - MGP BUILDING
- AREA OF CONCERN 3 - GENEVA STREET/RTE 14/NYSDOT R.O.W. AREA

SOURCES:

1. DRAWING TITLED "LYONS FORMER MGP SITE" PREPARED BY NYSEG ENGINEERING SERVICES, BINGHAMTON, N.Y. DATED 5/17/99 AND 9/13/00.
2. PROPERTY LINES DIGITIZED FROM DRAWING TITLED "BOUNDARY AND TOPOGRAPHY SURVEY OF LYONS, NY MGP SITE" PREPARED BY S.Y. KIM LAND SURVEYOR P.C. DATED 1/24/91.
3. DRAWING TITLED "LYONS MGP SITE SURVEY" PERFORMED BY THEW ASSOCIATES, 9478 RIVER ROAD MERCY, NEW YORK, DATED 11/2011.

0 30 60

SCALE, FEET

FEASIBILITY STUDY REPORT
LYONS MGP SITE
VILLAGE OF LYONS, NEW YORK

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BINGHAMTON, NEW YORK

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SITE AOCs AND APPROXIMATE EXTENT OF SOIL EXCEEDANCES FOR COMMERCIAL USE SCOs

October 2013 Figure 7

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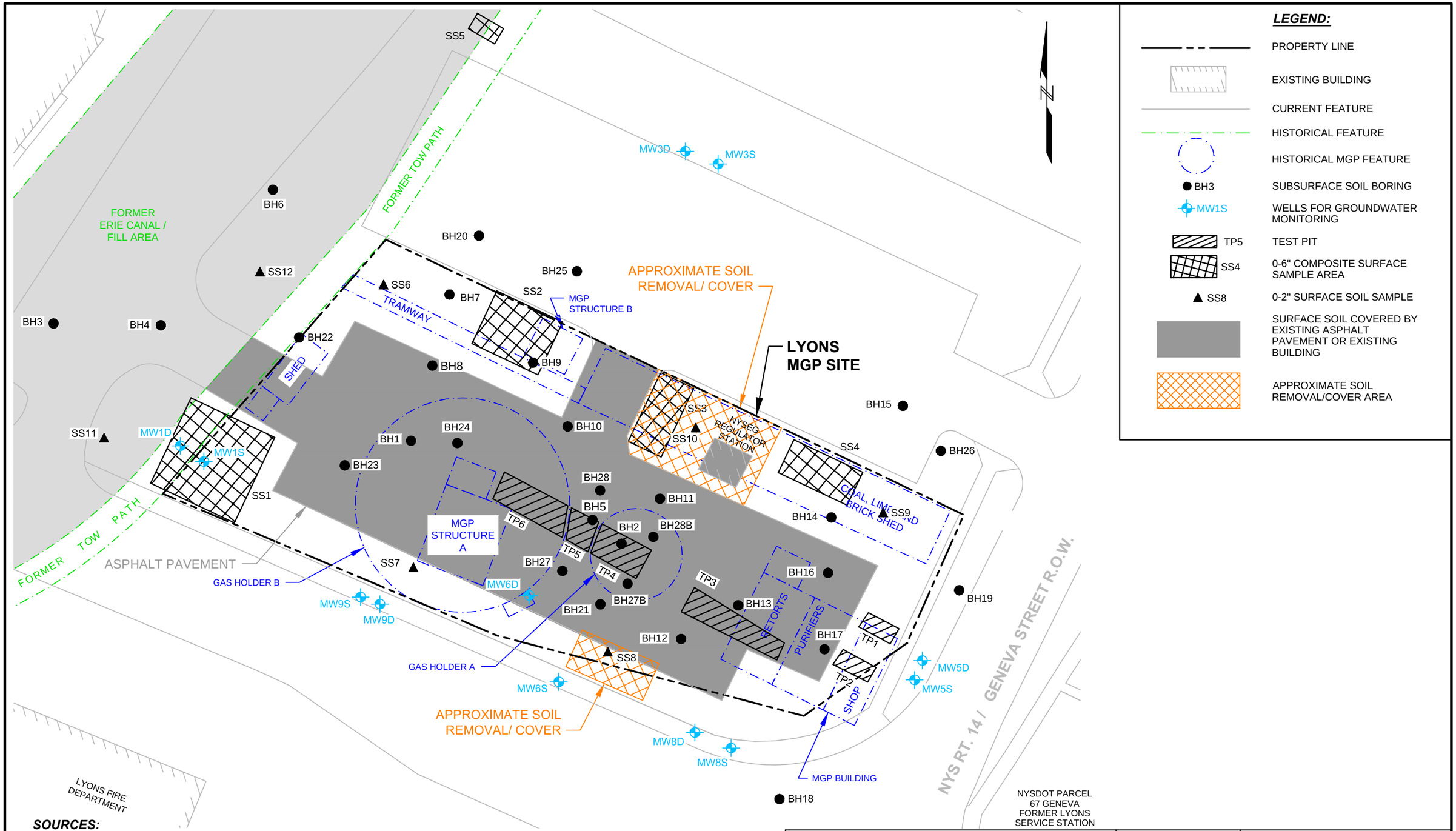

SOURCES:

1. DRAWING TITLED "LYONS FORMER MGP SITE" PREPARED BY NYSEG ENGINEERING SERVICES, BINGHAMTON, N.Y. DATED 5/17/99 AND 9/13/00.
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3. DRAWING TITLED "LYONS MGP SITE SURVEY" PERFORMED BY THEW ASSOCIATES, 9478 RIVER ROAD MERCY, NEW YORK, DATED 11/2011.

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SCALE, FEET

FEASIBILITY STUDY REPORT
LYONS MGP SITE
VILLAGE OF LYONS, NEW YORK

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BINGHAMTON, NEW YORK

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**ALTERNATIVE 2:
SOIL REMOVAL/COVER;
MNA; ICs/ ECs**

October 2013 Figure 8

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AOC 1 - ISS

AOC 2 - ISS

AOC 3 - MONITORING

LYONS MGP SITE

FORMER ERIE CANAL / FILL AREA

FORMER TOW PATH

APPROXIMATE SOIL REMOVAL/ COVER

TRAMWAY

SHED

MGP STRUCTURE B

MGP STRUCTURE A

GAS HOLDER B

GAS HOLDER A

COAL, LIME, AND BRICK SHED

RETORTS

CONDENSERS

SHOP

MGP BUILDING

MW6D

MW6S

MW8D

MW8S

MW9S

MW9D

MW1D

MW1S

MW3D

MW3S

MW5D

MW5S

BH1 BH2 BH3 BH4 BH5 BH6 BH7 BH8 BH9 BH10 BH11 BH12 BH13 BH14 BH15 BH16 BH17 BH18 BH19 BH20 BH21 BH22 BH23 BH24 BH25 BH27 BH27B BH28 BH28B

TP1 TP2 TP3 TP4 TP5 TP6

CB1 CB3 CB4 CB5 CB6 CB7 CB8 CB11 CB13

NYS RT. 14 / GENEVA STREET R.O.W.

LYONS FIRE DEPARTMENT

15 WATER FORMER GASOLINE SALES STATION

NYSDOT PARCEL
67 GENEVA
FORMER LYONS
SERVICE STATION

N

LEGEND:

- PROPERTY LINE
- EXISTING BUILDING
- CURRENT FEATURE
- HISTORICAL FEATURE
- HISTORICAL MGP FEATURE
- BH3 — SUBSURFACE SOIL BORING
- MW1S — WELLS FOR GROUNDWATER MONITORING AFTER REMEDIATION
- TP5 — TEST PIT
- AREA OF CONCERN 1 - GAS HOLDER B
- AREA OF CONCERN 2 - MGP BUILDING
- AREA OF CONCERN 3 - GENEVA STREET/RTE 14/NYSDOT R.O.W. AREA
- APPROXIMATE SOIL REMOVAL/COVER AREA
- O/H — OVERHEAD ELECTRIC
- UE — UNDERGROUND ELECTRIC
- G — GAS
- W — WATER
- SAN — SANITARY SEWER
- ST — STORM SEWER
- CB1 — CATCH BASIN
- MH-1 — MANHOLE
- HYDRANT
- POLE

SOURCES:

1. DRAWING TITLED "LYONS FORMER MGP SITE" PREPARED BY NYSEG ENGINEERING SERVICES, BINGHAMTON, N.Y. DATED 5/17/99 AND 9/13/00.
2. PROPERTY LINES DIGITIZED FROM DRAWING TITLED "BOUNDARY AND TOPOGRAPHY SURVEY OF LYONS, NY MGP SITE" PREPARED BY S.Y. KIM LAND SURVEYOR P.C. DATED 1/24/91.
3. DRAWING TITLED "LYONS MGP SITE SURVEY" PERFORMED BY THEW ASSOCIATES, 9478 RIVER ROAD MERCY, NEW YORK, DATED 11/2011.

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SCALE, FEET

FEASIBILITY STUDY REPORT
LYONS MGP SITE
VILLAGE OF LYONS, NEW YORK

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ALTERNATIVE 3: ISS; SOIL REMOVAL/COVER; MNA; ICs/ECs

October 2013 Figure 9

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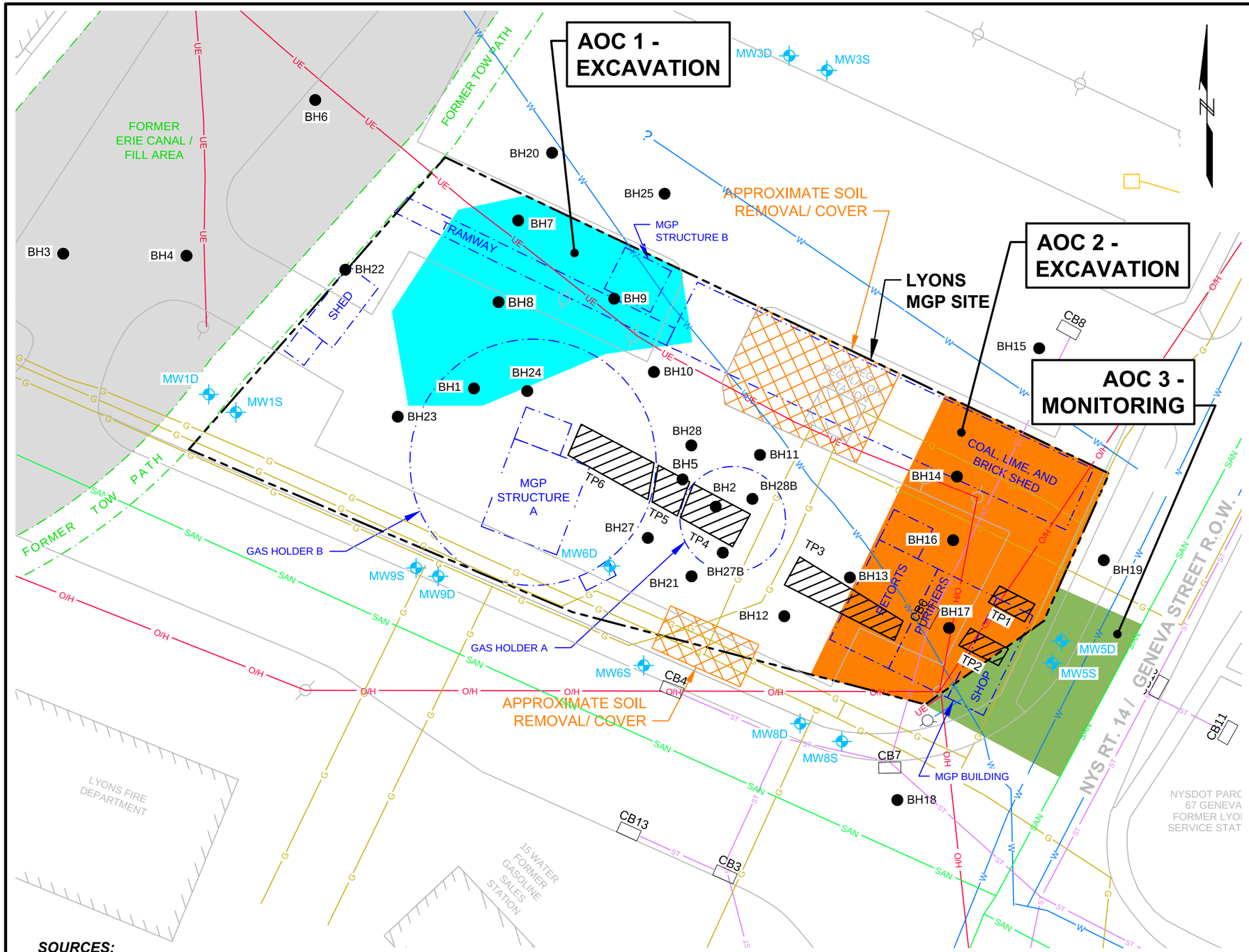

LEGEND:

- PROPERTY LINE
- EXISTING BUILDING
- CURRENT FEATURE
- HISTORICAL FEATURE
- HISTORICAL MGP FEATURE
- BH3 — SUBSURFACE SOIL BORING
- MW1S — WELLS FOR GROUNDWATER MONITORING
- TP5 — TEST PIT
- AREA OF CONCERN 1 - GAS HOLDER B
- AREA OF CONCERN 2 - MGP BUILDING
- AREA OF CONCERN 3 - GENEVA STREET/RTE 14/NYSDOT R.O.W. AREA
- APPROXIMATE SOIL REMOVAL/COVER AREA
- O/H — OVERHEAD ELECTRIC
- UE — UNDERGROUND ELECTRIC
- G — GAS
- W — WATER
- SAN — SANITARY SEWER
- ST — STORM SEWER
- CB1 — CATCH BASIN
- MH-1 — MANHOLE
- HYDRANT
- POLE

SOURCES:

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3. DRAWING TITLED "LYONS MGP SITE SURVEY" PERFORMED BY THEW ASSOCIATES, 9478 RIVER ROAD MERCY, NEW YORK, DATED 11/2011.

0 30 60

SCALE, FEET

FEASIBILITY STUDY REPORT
LYONS MGP SITE
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ALTERNATIVE 4: EXCAVATION; SOIL REMOVAL/COVER; MNA; ICs/ECs

October 2013 Figure 10

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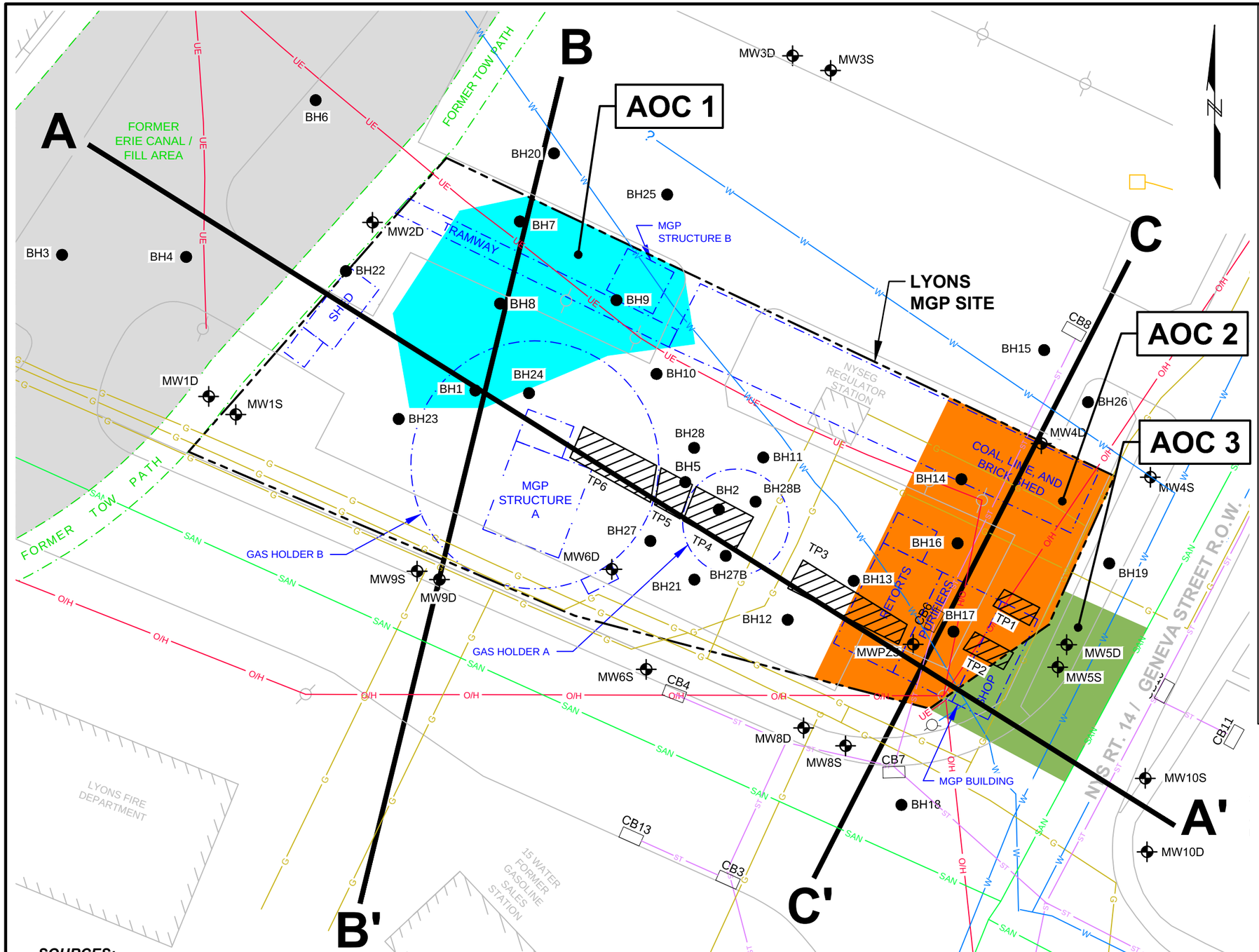

LEGEND:

- PROPERTY LINE
- EXISTING BUILDING
- CURRENT FEATURE
- HISTORICAL FEATURE
- HISTORICAL MGP FEATURE
- A — A' CROSS SECTION LOCATION
- BH3 SUBSURFACE SOIL BORING
- MW1S MONITORING WELL
- TP5 TEST PIT
- AREA OF CONCERN 1 - GAS HOLDER B
- AREA OF CONCERN 2 - MGP BUILDING
- AREA OF CONCERN 3 - GENEVA STREET/RTE 14/NYSDOT R.O.W. AREA
- O/H OVERHEAD ELECTRIC
- UE UNDERGROUND ELECTRIC
- G GAS
- W WATER
- SAN SANITARY SEWER
- ST STORM SEWER
- CB1 CATCH BASIN
- MH-1 MANHOLE
- HYDRANT
- POLE

SOURCES:

1. DRAWING TITLED "LYONS FORMER MGP SITE" PREPARED BY NYSEG ENGINEERING SERVICES, BINGHAMTON, N.Y. DATED 5/17/99 AND 9/13/00.
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3. DRAWING TITLED "LYONS MGP SITE SURVEY" PERFORMED BY THEW ASSOCIATES, 9478 RIVER ROAD MERCY, NEW YORK, DATED 11/2011.

FEASIBILITY STUDY REPORT
LYONS MGP SITE
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BINGHAMTON, NEW YORK

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CROSS-SECTION LOCATIONS

October 2013 Figure 11

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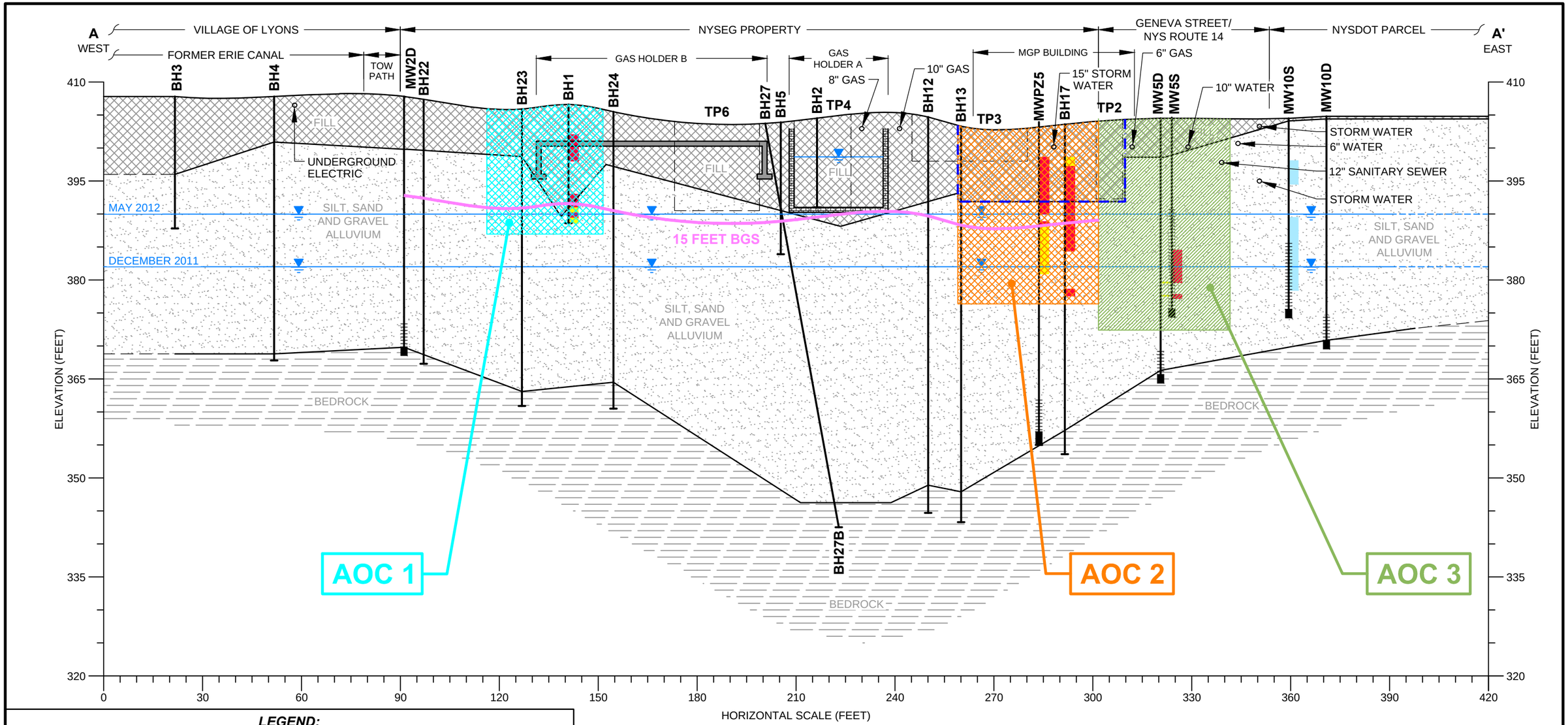

LEGEND:

- APPROXIMATE EXTENT OF MGP BUILDING FOUNDATION
- GROUNDWATER TABLE
- CONTACT
- INREFFED CONTACT
- 15 FEET BGS
- MW1D — SOIL BORING/WELL IDENTIFICATION
- SCREEN INTERVAL
- DNAPL SUMP
- BOTTOM OF BORING
- FILL
- SILT, SAND AND GRAVEL ALLUVIUM
- BEDROCK
- HYDROCARBON STAIN, SHEEN OR NAPL BLEBS
- COAL TAR OR COAL TAR COATED OR SATURATED SOIL
- PETROLEUM IMPACTS STAINING AND ODOR
- APPROXIMATE LOCATION OF UNDERGROUND UTILITIES
- TP6 — TEST PIT

30
15
0
SCALE, FEET
0
30
60

NOTE: 2x VERTICAL EXAGGERATION

LEGEND:

- AREA OF CONCERN 1 - ISS OR EXCAVATION (APPROXIMATE LIMITS)
- AREA OF CONCERN 2 - ISS OR EXCAVATION (APPROXIMATE LIMITS)
- AREA OF CONCERN 3 - MONITORING

FEASIBILITY STUDY REPORT
LYONS MGP SITE
VILLAGE OF LYONS, NEW YORK

NYSEG
BINGHAMTON, NEW YORK

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**ALTERNATIVES 3 AND 4:
CROSS SECTION A-A'**

October 2013 Figure 12

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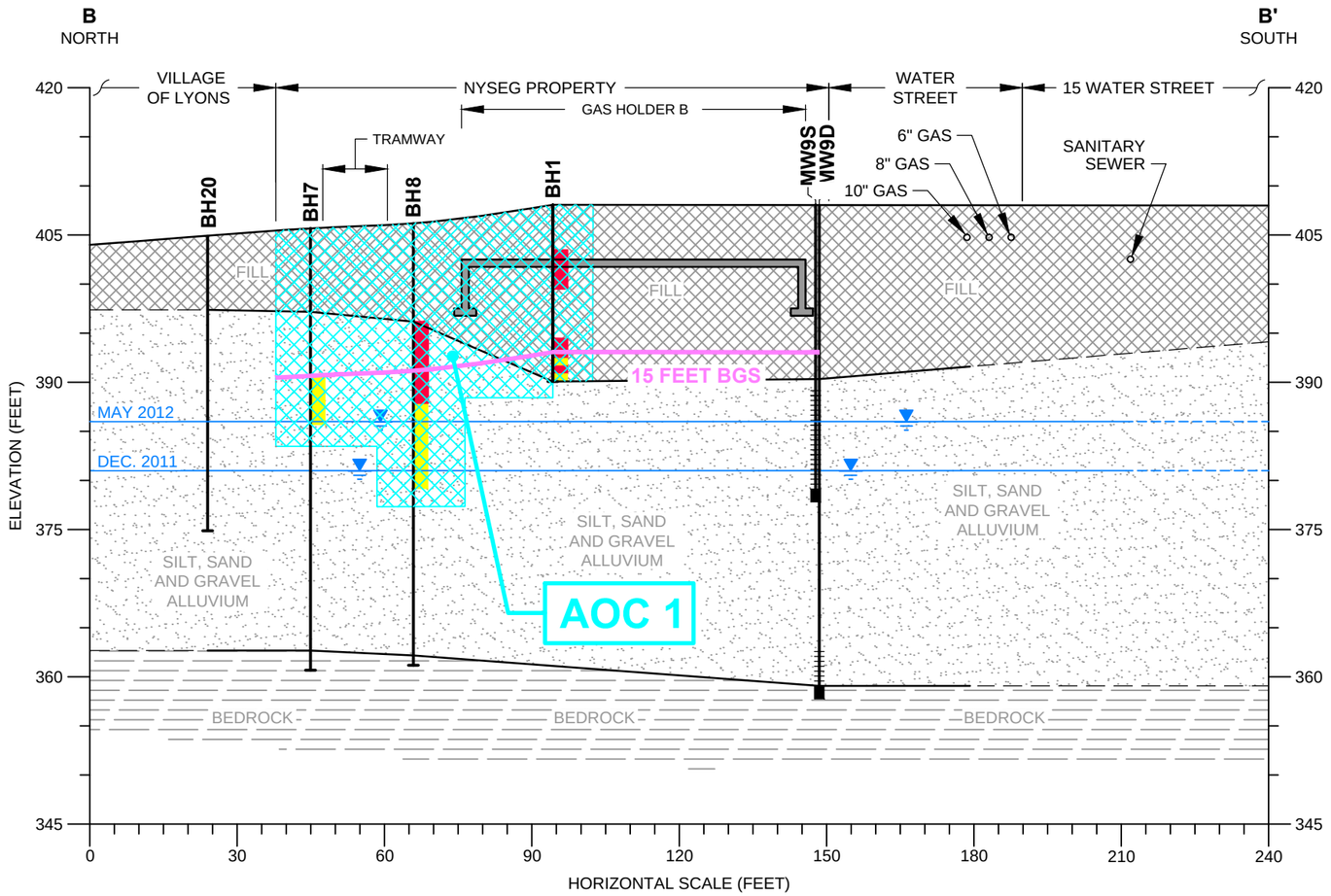

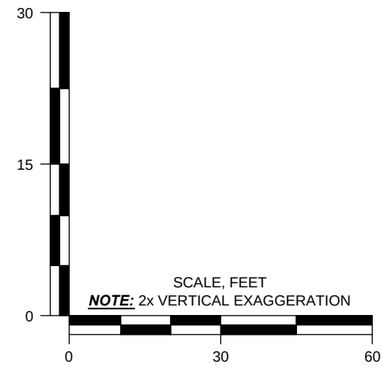

LEGEND:

- GROUNDWATER TABLE
- CONTACT
- INFERRED CONTACT
- 15 FEET BGS
- MW1D — SOIL BORING/WELL IDENTIFICATION
- SCREEN INTERVAL
- DNAPL SUMP
- BOTTOM OF BORING
- APPROXIMATE LOCATION OF UNDERGROUND UTILITIES
- FILL
- SILT, SAND AND GRAVEL ALLUVIUM
- BEDROCK
- HYDROCARBON STAIN, SHEEN OR NAPL BLEBS
- COAL TAR OR COAL TAR COATED OR SATURATED SOIL
- PETROLEUM IMPACTS STAINING AND ODOR
- AREA OF CONCERN 1 - ISS OR EXCAVATION (APPROXIMATE LIMITS)

FEASIBILITY STUDY REPORT
LYONS MGP SITE
VILLAGE OF LYONS, NEW YORK

NYSEG
BINGHAMTON, NEW YORK

GEI Consultants

Project 112830-2002

**ALTERNATIVES 3 AND 4:
CROSS SECTION B-B'**

October 2013 Figure 13

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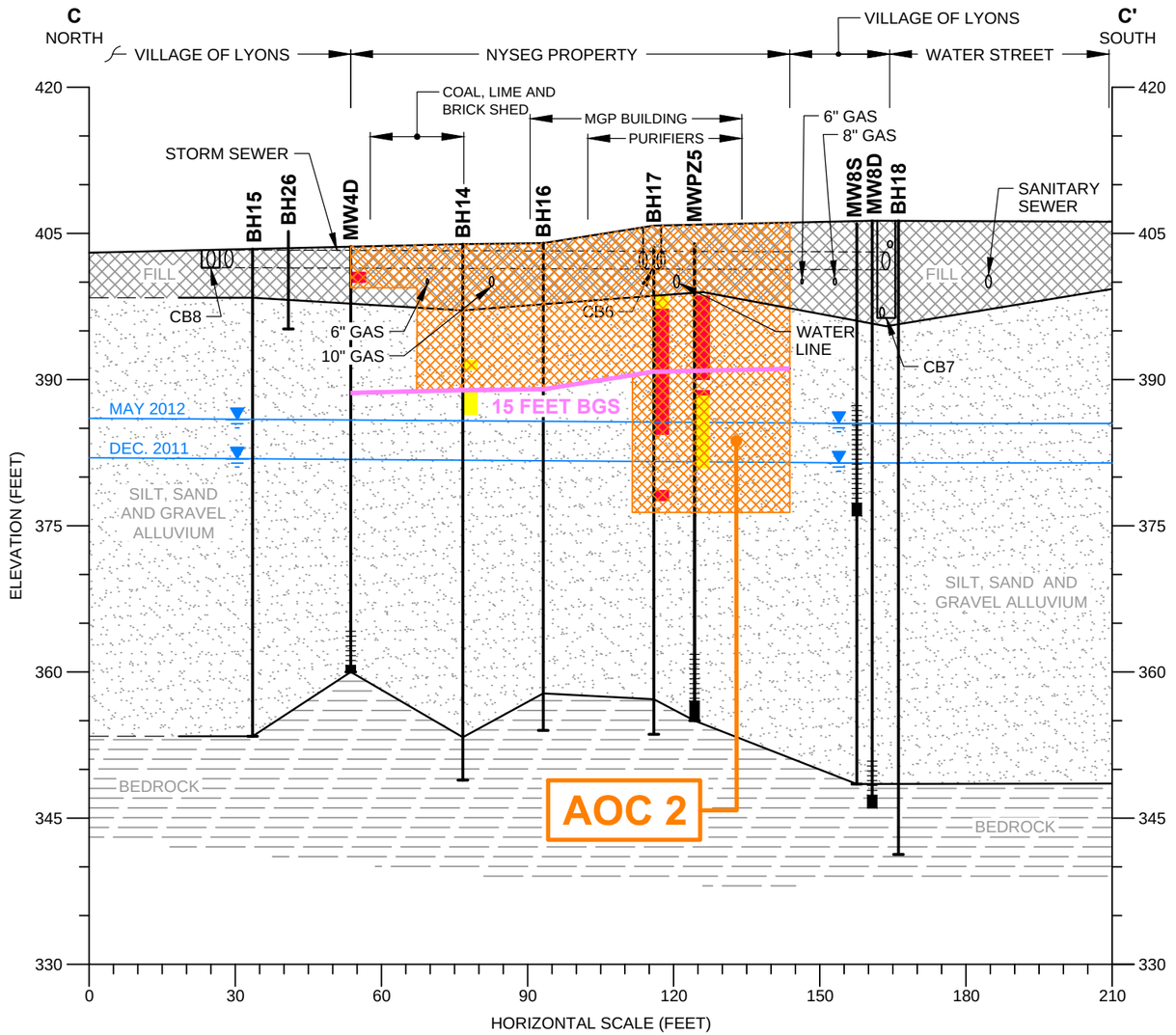

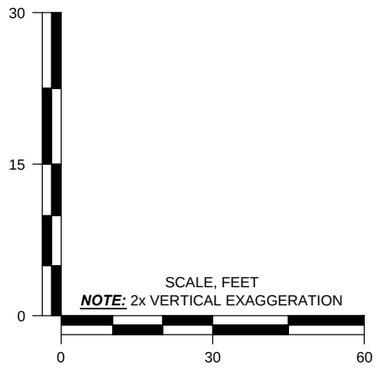

LEGEND:

- GROUNDWATER TABLE
- CONTACT
- INFERRED CONTACT
- 15 FEET BGS
- MW1D — SOIL BORING/WELL IDENTIFICATION
- SCREEN INTERVAL
- DNAPL SUMP
- BOTTOM OF BORING
- CATCH BASIN
- APPROXIMATE LOCATION OF UNDERGROUND UTILITY
- FILL
- SILT, SAND AND GRAVEL ALLUVIUM
- BEDROCK
- HYDROCARBON STAIN, SHEEN OR NAPL BLEBS
- COAL TAR OR COAL TAR COATED OR SATURATED SOIL
- PETROLEUM IMPACTS STAINING AND ODOR
- AREA OF CONCERN 2 - ISS OR EXCAVATION (APPROXIMATE LIMITS)

FEASIBILITY STUDY REPORT
LYONS MGP SITE
VILLAGE OF LYONS, NEW YORK

NYSEG
BINGHAMTON, NEW YORK

GEI Consultants

**ALTERNATIVES 3 AND 4:
CROSS SECTION C-C'**

Project 112830-2002 | October 2013 | Figure 14

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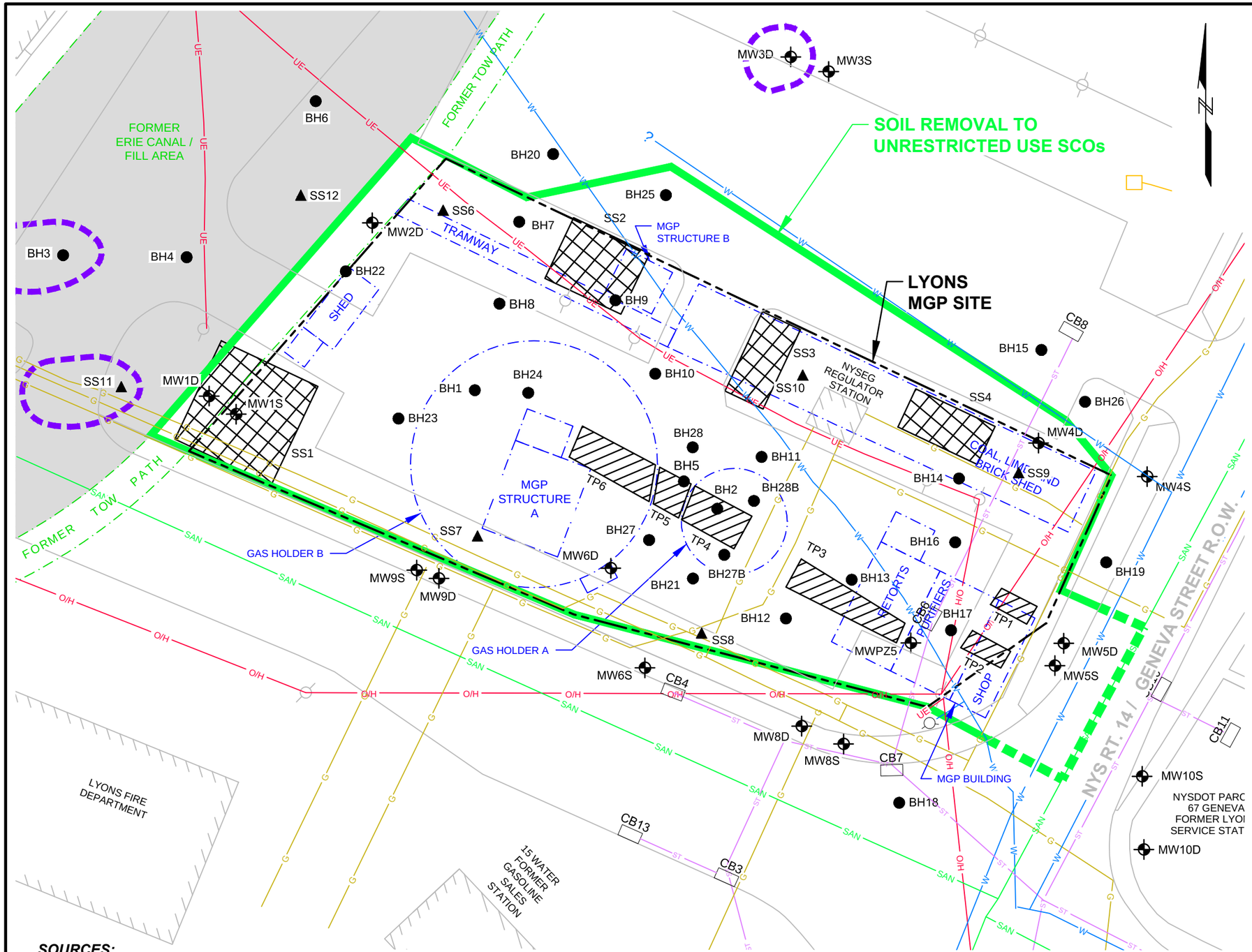

LEGEND:

- PROPERTY LINE
- EXISTING BUILDING
- CURRENT FEATURE
- HISTORICAL FEATURE
- HISTORICAL MGP FEATURE
- BH3 — SUBSURFACE SOIL BORING
- MW1S — MONITORING WELL
- TP5 — TEST PIT
- SS4 — 0-6" COMPOSITE SURFACE SAMPLE
- SS8 — 0-2" SURFACE SOIL SAMPLE
- APPROXIMATE EXTENT OF EXCEEDANCES OF UNRESTRICTED USE SCOs APPARENTLY RELATED TO THE MGP SITE
- DASHED WHERE INFERRED
- O/H — OVERHEAD ELECTRIC
- UE — UNDERGROUND ELECTRIC
- G — GAS
- W — WATER
- SAN — SANITARY SEWER
- ST — STORM SEWER
- CB1 — CATCH BASIN
- MH-1 — MANHOLE
- HYDRANT
- POLE

SOURCES:

1. DRAWING TITLED "LYONS FORMER MGP SITE" PREPARED BY NYSEG ENGINEERING SERVICES, BINGHAMTON, N.Y. DATED 5/17/99 AND 9/13/00.
2. PROPERTY LINES DIGITIZED FROM DRAWING TITLED "BOUNDARY AND TOPOGRAPHY SURVEY OF LYONS, NY MGP SITE" PREPARED BY S.Y. KIM LAND SURVEYOR P.C. DATED 1/24/91.
3. DRAWING TITLED "LYONS MGP SITE SURVEY" PERFORMED BY THEW ASSOCIATES, 9478 RIVER ROAD MERCY, NEW YORK, DATED 11/2011.

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SCALE, FEET

FEASIBILITY STUDY REPORT
LYONS MGP SITE
VILLAGE OF LYONS, NEW YORK

NYSEG
BINGHAMTON, NEW YORK

GEI Consultants

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ALTERNATIVE 5: EXCAVATION OF SOIL TO UNRESTRICTED USE SCOs

October 2013 Figure 15

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Photograph #1: Soil from soil boring MW5S from 24 to 25' bgs. Black hydrocarbon staining and soil coated with brownish-black tar-like material.

Photograph #2: Soil from soil boring MW5S from 26.8' bgs to 27.4' bgs. Soil coated with tar-like material.

FEASIBILITY STUDY REPORT LYONS MGP SITE VILLAGE OF LYONS, NEW YORK	GEI Consultants	GENEVA STREET / NYS RT 14 NYSDOT ROW—OBSERVATIONS AT MW5S
NYSEG BINGHAMTON, NEW YORK	Project 112830-2002	October 2013 Figure 16

Appendix A

Remedial Alternative Cost Estimates

Table A-1
Detailed Cost Estimate - Alternatives Summary
Lyons MGP Site

Alternative	Description	Total Cost (2013 $)
Alternative 1	No Action	No Cost
Alternative 2	Remove surface soil exceeding Commercial Use SCOs, soil cover, MNA for groundwater, IC/ECs	$460,000
Alternative 3	Remove surface soil exceeding Commercial Use SCOs, remove foundations as needed, pre-excavation for ISS, ISS of subsurface soil exceeding 500 ppm for Total PAHs (to 15 feet deep), ISS of soil containing source material below 15 feet, soil cover, MNA for groundwater, IC/ECs	$2,810,000
Alternative 4	Remove surface soil exceeding Commercial Use SCOs, remove foundations as needed, excavation of subsurface soil exceeding 500 ppm for Total PAHs (to 15 feet deep), excavation of soil containing source material below 15 feet, soil cover, MNA for groundwater, IC/ECs	$3,920,000
Alternative 5	Remove foundations, soil removal to Unrestricted Use SCOs	$10,890,000

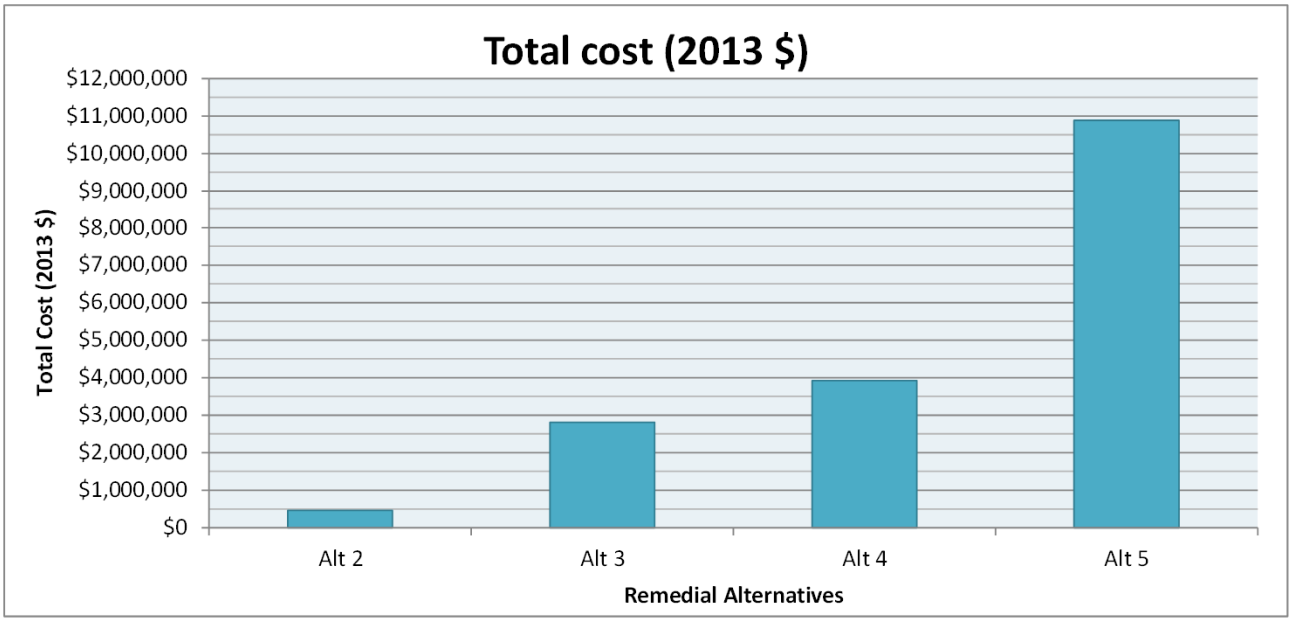

Table A-2
Detailed Cost Estimate - Alternative 2 - Soil Cover to meet Commercial Use SCOs for Surface Soil
Lyons MGP Site

Remedial Component	Unit	Unit Price	Quantity	Total Cost
COMMON COST COMPONENTS				
100 ENGINEERING				
101 Engineering Design, Contract Drawings	Lump Sum	$15,000	1	$15,000
102 Draft Work Plan for NYSDEC Review	Lump Sum	$17,000	1	$17,000
103 Draft of Completion Report	Lump Sum	$17,000	1	$17,000
			Subtotal	$49,000
			% Total Costs	11%
			TOTAL ENGINEERING COSTS	**$49,000**
200 CONSTRUCTION MANAGEMENT				
201 Construction Oversight (including CAMP oversight)	Week	$5,075	2	$10,150
203 CAMP Equipment Rental	Week	$1,050	2	$2,100
			Subtotal	$12,250
			% Total Costs	3%
300 REMEDIAL COMPONENTS				
302 Mobilization / Demobilization	Lump Sum	$5,000	1	$5,000
303 Survey and Layout Work	Acre	$3,882	1	$3,882
Excavation				
307 Excavation	Cubic Yard	$25	118	$2,950
312 Disposal - Soil - Landfill	Tons	$60	189	$11,328
Soil Cover				
324 Borrow, compaction, grading, and seeding for 1-ft cover	Cubic Yard	$20	118	$2,360
Institutional Controls / Engineering Controls				
326 Environmental Easement, Groundwater Deed Restrictions	Lump Sum	$10,000	1	$10,000
327 Site Management Plan	Lump Sum	$15,000	1	$15,000
			Subtotal	$50,520
			% Total Costs	11%
			TOTAL CAPITAL COSTS	**$62,770**
400 OPERATION AND MAINTENANCE				
First 5 Years Post Remediation				
401 Sample Collection	Semi-Annual	$4,832	2	$9,664
402 Lab Costs	Semi-Annual	$2,280	2	$4,560
403 Validation	Semi-Annual	$792	2	$1,584
404 Reports	Semi-Annual	$5,000	2	$10,000
405 IC Inspection	Annual	$1,100	1	$1,100
			Annual Subtotal	$26,908
Subsequent 25 Years				
401 Sample Collection	Annual	$4,832	1	$4,832
402 Lab Costs	Annual	$2,280	1	$2,280
403 Validation	Annual	$792	1	$792
404 Reports	Annual	$5,000	1	$5,000
405 IC Inspection	Annual	$1,100	1	$1,100
			Annual Subtotal	$14,004
			Present Worth Given a 30 Year Period with 5% Effective Rate	$ 271,143.37
			% Total Costs	59%
			TOTAL O&M COSTS	**$271,143**
REMEDIAL COST SUMMARY				
Total Engineering Costs				$49,000
Total Capital Costs				$62,770
Total Operation and Maintenance Costs				$271,143
			Total Capital, O&M, and Engineering Costs	**$382,913**
500 CONTINGENCY				
501 Allowance for Undefined Costs Associated with Utilities, Subsurface Structures, and Extent of Impacts.			20%	$76,582.60
			% TOTAL COSTS	17%
			TOTAL COST	**$ 459,496**
			ROUNDED COST	**$460,000**

Table A-3
Detailed Cost Estimate - Alternative 3 - ISS of soil exceeding 500 ppm for Total PAHs
Lyons MGP Site

Remedial Component	Unit	Unit Price	Quantity	Total Cost
COMMON COST COMPONENTS				
100 ENGINEERING				
101 Engineering Design, Contract Drawings	Lump Sum	$225,000	1	$225,000
102 Draft Work Plan for NYSDEC Review	Lump Sum	$45,000	1	$45,000
103 Draft of Completion Report	Lump Sum	$65,000	1	$65,000
			Subtotal	$335,000
			% Total Costs	12%
		TOTAL ENGINEERING COSTS		**$335,000**
200 CONSTRUCTION MANAGEMENT				
201 Construction Oversight	Month	$22,330	4	$89,320
202 CAMP Technician	Month	$14,300	4	$57,200
203 CAMP Equipment Rental	Month	$6,875	4	$27,500
204 Pre-design investigation/pre-characterization/confirmation sampling	Each	$425	105	$44,625
205 ISS Bench Scale Study	Each	$20,000	1	$20,000
			Subtotal	$238,645
			% Total Costs	8%
300 REMEDIAL COMPONENTS				
301 Utility Relocation (Gas lines)	Lump Sum	$245,000	1	$245,000
Utility Relocation (Overhead Electric)	Pole	$30,000	2	$60,000
Utility Relocation (Water line and Storm sewer)	Lump Sum	$10,000	1	$10,000
302 Excavation Equipment Mobilization / Demobilization	Lump Sum	$50,000	1	$50,000
303 Survey and Layout Work	Acre	$3,882	3	$11,645
304 Parking lot demolition/removal of asphalt	Lump Sum	$2,446	1	$2,446
305 Temporary Facilities	Month	$1,539.94	4	$6,160
306 Temporary Fence	Linear Foot	$27.65	740	$20,461
Excavation				
307 Excavation of surface soil, overburden fill, and MGP structure foundation	Cubic Yard	$20	1638	$32,760
308 Excavation of ISS ground swell within frost zone	Cubic Yard	$15	1823	$27,344
309 Excavation Support for deep MGP building foundation removal	Square Foot	$45	1650	$74,250
310 Odor Control - Odor suppressant foam	Month	$20,000	4	$80,000
315 Disposal - Soil - Thermal Desorption	Ton	$100.00	960	$96,000
316 Disposal - Soil - Landfill	Ton	$60.00	4578	$274,651
317 Backfill	Cubic Yard	$20.00	3343	$66,859
In-Situ Solidification (ISS)				
320 ISS equipment and Batch Plant Mobilization	Lump Sum	$150,000.00	1	$150,000
321 Water for ISS mix	Gal	$0.05	238998	$11,950
322 Auger ISS	Cubic Yard	$50.00	3550	$177,500
Soil Cover and Restoration				
323 Asphalt and pavement repair	Lump Sum	$71,373	1	$71,373
324 Borrow, compaction, grading, and seeding for 1-ft cover	Cubic Yard	$20	118	$2,360
Institutional Controls / Engineering Controls				
326 Environmental Easement, Groundwater Deed Restrictions	Lump Sum	$10,000	1	$10,000
327 Site Management Plan	Lump Sum	$15,000	1	$15,000
			Subtotal	$1,495,758
			% Total Costs	53%
			TOTAL CAPITAL COSTS	**$1,734,403**
400 OPERATION AND MAINTENANCE				
First 5 Years Post Remediation				
401 Sample Collection	Semi-Annual	$4,832	2	$9,664
402 Lab Costs	Semi-Annual	$2,280	2	$4,560
403 Validation	Semi-Annual	$792	2	$1,584
404 Reports	Semi-Annual	$5,000	2	$10,000
405 IC Inspection	Annual	$1,100	1	$1,100
			Annual Subtotal	$26,908
Subsequent 25 Years				
401 Sample Collection	Annual	$4,832	1	$4,832
402 Lab Costs	Annual	$2,280	1	$2,280
403 Validation	Annual	$792	1	$792
404 Reports	Annual	$5,000	1	$5,000
405 IC Inspection	Annual	$1,100	1	$1,100
			Annual Subtotal	$14,004
			Present Worth Given a 30 Year Period with 5% Effective Rate	$ 271,143.37
			% Total Costs	10%
			TOTAL O&M COSTS	**$271,143**
REMEDIAL COST SUMMARY				
Total Engineering Costs				$335,000
Total Capital Costs				$1,734,403
Total Operation and Maintenance Costs				$271,143
			Total Capital, O&M, and Engineering Costs	**$2,340,547**
500 CONTINGENCY				
501 Allowance for Undefined Costs Associated with Utilities, Subsurface Structures, and Extent of Impacts.			20%	$468,109.33
			% TOTAL COSTS	17%
			TOTAL COST	**$ 2,808,656**
			ROUNDED COST	**$2,810,000**

Table A-4
Detailed Cost Estimate - Alternative 4 - Excavation of soil exceeding 500 ppm for Total PAHs
Lyons MGP Site

Remedial Component	Unit	Unit Price	Quantity	Total Cost
COMMON COST COMPONENTS				
100 ENGINEERING				
101 Engineering Design, Contract Drawings	Lump Sum	$225,000	1	$225,000
102 Draft Work Plan for NYSDEC Review	Lump Sum	$45,000	1	$45,000
103 Draft of Completion Report	Lump Sum	$65,000	1	$65,000
			Subtotal	$335,000
			% Total Costs	9%
		TOTAL ENGINEERING COSTS		**$335,000**
200 CONSTRUCTION MANAGEMENT				
201 Construction Oversight	Month	$22,330	4	$89,320
202 CAMP Technician	Month	$14,300	4	$57,200
203 CAMP Equipment Rental	Month	$6,875	4	$27,500
204 Pre-design investigation/pre-characterization/confirmation sampling	Each	$425	225	$95,625
			Subtotal	$269,645
			% Total Costs	7%
300 REMEDIAL COMPONENTS				
301 Utility Relocation (Gas lines)	Lump Sum	$245,000	1	$245,000
Utility Relocation (Overhead Electric)	Pole	$30,000	2	$60,000
Utility Relocation (Water line and Storm sewer)	Lump Sum	$10,000	1	$10,000
302 Mobilization / Demobilization	Lump Sum	$100,000	1	$100,000
303 Survey and Layout Work	Acre	$3,882	6	$23,290
304 Parking lot demolition/removal of asphalt	Lump Sum	$2,446	1	$2,446
305 Temporary Facilities	Month	$1,539.94	4	$6,160
306 Temporary Fence	Linear Foot	$27.65	740	$20,461
Excavation				
307 Excavation	Cubic Yard	$20	5208	$104,160
309 Excavation Support for deep foundation and soil removal - Sheet Pile	Square Foot	$45	7050	$317,250
311 Odor Control - Temporary Structure Mobilization/Demobilization	Lump Sum	$300,000	1	$300,000
312 Odor Control - Maintain/Operate Temporary Structure	Week	$7,000	16	$112,000
313 Dewatering equipment - Local	Month	$20,000	4	$80,000
314 Disposal - Water pre-treatment and disposal at POTW facility	gal	$0.1	500000	$50,000
315 Disposal - Soil - Thermal Desorption	Ton	$100.00	6672	$667,200
316 Disposal - Soil - Landfill	Ton	$60.00	1472	$88,320
317 Backfill	Cubic Yard	$20.00	5090	$101,800
Soil Cover and Restoration				
323 Asphalt and pavement repair	Lump Sum	$71,373	1	$71,373
324 Borrow, compaction, grading, and seeding for 1-ft cover	Cubic Yard	$20	118	$2,360
Institutional Controls / Engineering Controls				
326 Environmental Easement, Groundwater Deed Restrictions	Lump Sum	$10,000	1	$10,000
327 Site Management Plan	Lump Sum	$15,000	1	$15,000
			Subtotal	$2,386,820
			% Total Costs	61%
		TOTAL CAPITAL COSTS		**$2,656,465**
400 OPERATION AND MAINTENANCE				
First 5 Years Post Remediation				
401 Sample Collection	Semi-Annual	$4,832	2	$9,664
402 Lab Costs	Semi-Annual	$2,280	2	$4,560
403 Validation	Semi-Annual	$792	2	$1,584
404 Reports	Semi-Annual	$5,000	2	$10,000
405 IC Inspection	Annual	$1,100	1	$1,100
			Annual Subtotal	$26,908
Subsequent 25 Years				
401 Sample Collection	Annual	$4,832	1	$4,832
402 Lab Costs	Annual	$2,280	1	$2,280
403 Validation	Annual	$792	1	$792
404 Reports	Annual	$5,000	1	$5,000
405 IC Inspection	Annual	$1,100	1	$1,100
			Annual Subtotal	$14,004
		Present Worth Given a 30 Year Period with 5% Effective Rate		$ 271,143.37
			% Total Costs	7%
		TOTAL O&M COSTS		**$271,143**
REMEDIAL COST SUMMARY				
Total Engineering Costs				$335,000
Total Capital Costs				$2,656,465
Total Operation and Maintenance Costs				$271,143
		Total Capital, O&M, and Engineering Costs		**$3,262,608**
500 CONTINGENCY				
501 Allowance for Undefined Costs Associated with Utilities, Subsurface Structures, and Extent of Impacts.			20%	$652,521.59
			% TOTAL COSTS	17%
			TOTAL COST	**$ 3,915,130**
		ROUNDED COST		**$3,920,000**

Table A-5
Detailed Cost Estimate - Alternative 5 - Excavation of soil to Unrestricted Use SCOs
Lyons MGP Site

Remedial Component	Unit	Unit Price	Quantity	Total Cost
COMMON COST COMPONENTS				
100 ENGINEERING				
101 Engineering Design, Contract Drawings	Lump Sum	$300,000	1	$300,000
102 Draft Work Plan for NYSDEC Review	Lump Sum	$65,000	1	$65,000
103 Draft of Completion Report	Lump Sum	$85,000	1	$85,000
			Subtotal	$450,000
			% Total Costs	4%
		TOTAL ENGINEERING COSTS		**$450,000**
200 CONSTRUCTION MANAGEMENT				
201 Construction Oversight	Month	$1,015	176	$178,640
202 CAMP Technician	Month	$650	176	$114,400
203 CAMP Equipment Rental	Month	$6,875	8	$55,000
204 Pre-design investigation/pre-characterization/confirmation sampling	Each	$425	400	$170,000
			Subtotal	$518,040
			% Total Costs	5%
300 REMEDIAL COMPONENTS				
301 Utility Relocation (Gas regulator station and gas lines)	Lump Sum	$1,075,000	1	$1,075,000
Utility Relocation (Overhead Electric)	Pole	$30,000	2	$60,000
Utility Relocation (Storm sewer, Water line, Rte. 14 water and san sewer)	Lump Sum	$50,000	1	$50,000
302 Mobilization / Demobilization	Lump Sum	$100,000	1	$100,000
303 Survey and Layout Work	Acre	$3,882	12	$46,580
304 Parking lot demolition/removal of asphalt	Lump Sum	$2,446	1	$2,446
305 Temporary Facilities	Month	$1,539.94	8	$12,320
306 Temporary Fence	Linear Foot	$27.65	900	$24,885
Excavation				
307 Excavation	Cubic Yard	$15	30560	$458,400
309 Excavation Support for deep foundation and soil removal - Sheet Pile	Square Foot	$45	21600	$972,000
311 Odor Control - Temporary Structure Mobilization/Demobilization	Lump Sum	$300,000	1	$300,000
312 Odor Control - Maintain/Operate Temporary Structure	Week	$7,000	32	$224,000
313 Dewatering equipment - Local	Month	$20,000	8	$160,000
314 Disposal - Water pre-treatment and disposal at POTW facility	gal	$0.1	3000000	$300,000
315 Disposal - Soil - Thermal Desorption	Ton	$100.00	10008	$1,000,800
316 Disposal - Soil - Landfill	Ton	$60.00	38888	$2,333,280
317 Backfill	Cubic Yard	$20.00	30560	$611,200
Soil Cover and Restoration				
323 Asphalt and pavement repair	Lump Sum	$71,373	1	$71,373
324 Borrow, compaction, grading, and seeding for 1-ft cover	Cubic Yard	$20	830	$16,593
325 NYS RT 14 Reconstruction	Lump Sum	$150,000	1	$150,000
Institutional Controls / Engineering Controls				
326 Environmental Easement, Groundwater Deed Restrictions	Lump Sum	$10,000	1	$10,000
327 Site Management Plan	Lump Sum	$15,000	1	$15,000
			Subtotal	$7,993,876
			% Total Costs	73%
		TOTAL CAPITAL COSTS		**$8,511,916**
400 OPERATION AND MAINTENANCE				
First 5 Years Post Remediation				
401 Sample Collection	Semi-Annual	$4,832	2	$9,664
402 Lab Costs	Semi-Annual	$2,280	2	$4,560
403 Validation	Semi-Annual	$792	2	$1,584
404 Reports	Semi-Annual	$5,000	2	$10,000
			Annual Subtotal	$25,808
		Present Worth Given a 30 Year Period with 5% Effective Rate		$ 111,735.13
			% Total Costs	1%
		TOTAL O&M COSTS		**$111,735**
REMEDIAL COST SUMMARY				
Total Engineering Costs				$450,000
Total Capital Costs				$8,511,916
Total Operation and Maintenance Costs				$111,735
		Total Capital, O&M, and Engineering Costs		**$9,073,651**
500 CONTINGENCY				
501 Allowance for Undefined Costs Associated with Utilities, Subsurface Structures, and Extent of Impacts.			20%	$1,814,730.19
			% TOTAL COSTS	17%
			TOTAL COST	**$ 10,888,381**
		ROUNDED COST		**$10,890,000**

Table A-6
Detailed Cost Estimate Notes - Alternatives 2, 3, 4, 5
Lyons MGP Site

100 ENGINEERING	
101 Engineering Design, Contract Drawings	GEI Project Experience
102 Draft Work Plan for NYSDEC Review	GEI Project Experience
103 Draft of Completion Report	GEI Project Experience
200 CONSTRUCTION MANAGEMENT	
201 Construction Oversight	Assume 1 Grade 3 Project Engineer, vehicle and supplies, no per diem
202 CAMP Technician	Assume 1 Grade 1 Staff Engineer, no per diem
203 CAMP equipment Rental	Cost basis obtained from recent rental pricing. Cost assumes 4 CAMP stations (2 upwind, 2 downwind) with remote monitoring, 1 weather station, 1 work zone PID
204 Confirmation Sampling	Cost basis obtained from recent lab pricing. Assuming sampling for metals, semi-volatile and volatile organic compounds.
205 ISS Bench Scale Study	Recent contractor pricing
300 REMEDIAL COMPONENTS	
301 Utility Relocation (Gas)	NYSEG Gas Group
Utility Relocation (Overhead and Electric)	Recent contractor pricing
Utility Relocation (Water and Storm Sewer)	Recent contractor pricing
302 Mobilization/Demobilization	GEI Project Experience
303 Survey and Layout Work	RS Means estimate, quantity increased to account for multiple rounds of surveying to document work
304 Parking lot demolition/removal of asphalt	Recent contractor pricing
305 Trailers and Chemical Toilets	RS Means estimate, assuming 2 trailers with supplies and utilities, and 2 chemical toilets per month
306 Temporary Fence	RS Means, assuming an 8 ft fence height
Excavate and Backfill Materials	
307 Excavations to remove Soils	Recent contractor pricing, Alt 2 unit rate increased to account for smaller volume
308 Excavation of ISS ground swell within frost zone	Recent contractor pricing, assume final ISS mass cannot exist in 4-foot frost zone
309 Excavation Support for deep foundation removal and ISS/deep soil removal	Recent contractor pricing, cost in price per area of exposed sheeting
310 Odor Control - Odor suppressant foam	Recent contractor pricing
311 Odor Control - Temporary Structure Mobilization/Demobilization	Recent contractor pricing
312 Odor Control - Maintain/Operate Temporary Structure	Recent contractor pricing
313 Dewatering equipment - local	Recent contractor pricing, assuming the use of sumps and trash pumps for localized dewatering.
314 Disposal - Water pre-treatment and disposal at POTW facility	Recent contractor pricing
315 Disposal - Soil - Thermal Desorption	Recent contractor pricing, incl. transportation, assume soil excavated below 4ft will be undergo off-site treatment through LTTD
316 Disposal - Soil - Landfill	Recent contractor pricing, incl. transportation, assume soil excavated above 4ft will be transported off-site to a landfill
In-Situ Solidification	
320 ISS equipment and Batch Plant Mobilization	Recent contractor pricing
321 Water for ISS mix	assuming 1:1:1 ratio (soil to ISS mix to water)
322 Auger ISS	assuming water and electricity are readily available
Soil Cover and Restoration	
323 Asphalt and pavement repair	Recent contractor pricing
324 Borrow, compaction, grading, and seeding for 1-ft cover	Recent contractor pricing
325 NYS RT 14 Reconstruction	GEI Project Experience
Institutional Controls / Engineering Controls	
326 Groundwater Deed Restrictions	GEI Project Experience
327 Site Management Plan	GEI Project Experience
400 OPERATION AND MAINTENANCE	For Alts 2,3,4 assume a 30-year OMM period. For Alt 5 assume 5-year OMM period. 12 wells in the monitoring program. 2 sampling events per year for 5 years, 1 sampling event per year for subsequent 25 years. 3QA/QC samples.
Groundwater Monitoring	
401 Sample Collection	GEI Project Experience
402 Lab Costs	Recent lab pricing
403 Validation	GEI Project Experience
404 Reports	GEI Project Experience
405 IC Inspection	GEI Project Experience
REMEDIAL COST SUMMARY	
Total Engineering Costs	Includes Sections 100
Total Capital Costs	Includes Section 200,300
Total Operation and Maintenance Costs	Includes Section 400. Present Cost given a 30 year period and 5% effective rate. 5 year period for Alt 5.
500 CONTINGENCY	
501 Allowance for Undefined Costs Associated with Utilities, Subsurface Structures, and Extent of Impacts. Applied to Total Cost.	

Appendix B

Remedial Alternative Volume Estimates

Table B-1
Volume Estimates
Lyons MGP Site
Feasibility Study

Volume of Impacted Soil Exceeding the Unrestricted Use SCOs					
Area ID	Area (sf)	SCO	Avg Depth (ft)	Volume CY	
NYSEG Parcel and Village of Lyons Parcel	27,500	Unrestricted	30	30,556	
Rounded Total Volume				**30,560**	**CY**
Volume of MGP Impacted Soil Exceeding Soil Cleanup Levels (0-15 feet)					
Area ID	Area (sf)	SCO	Avg Thickness (ft)	Volume CY	
AOC 1	2,810	Commercial	15	1,561	
AOC 2	3,350	Commercial	15	1,861	
AOC 3	1,565	Commercial	0	-	
Rounded Total Volume				**3,420**	**CY**
Volume of Soil Containing Coal Tar Mixed in the Soil Matrix					
Area ID	Area (sf)	SCO	Avg Thickness (ft)	Volume CY	
AOC 1	2,810	Commercial	10	1,041	
AOC 2	1,275	Commercial	13	614	
AOC 3	1,565	Commercial	5	290	
Rounded Total Volume				**1,940**	**CY**