REPORT

Feasibility Study
South First Street Site
Fulton, New York

National Grid

February 2009

Job No. 1118.35165

REPORT

Feasibility Study
South First Street Site
Fulton, New York

National Grid

Douglas M. Crawford, P.E., Vice President
O'Brien & Gere Engineers, Inc.

February 2009

O'BRIEN & GERE

TABLE OF CONTENTS

1. Introduction 1
1.1. Purpose 1
1.2. Project Background 1
1.3. Report Organization 1
1.4. Site Description and History 2
1.5. Summary of Previous Investigations 3
1.6. Summary of Environmental Data 4
1.6.1. Hydrogeologic Conditions 4
1.6.2. Nature and Extent of Contamination 4
1.7. Qualitative Exposure Assessment 7
2. Development of Remedial Alternatives 8
2.1. Identification of Potential Standards, Criteria, and Guidance (SCGs) 8
2.2. Development of Remedial Action Objectives 8
2.2.1 Remedial Action Objectives 8
2.3. Identification of Areas and Volumes of Impacted Media 9
2.4. Physical Limitations to Remediation 10
2.5. Identification of General Response Actions 11
2.6. Identification, Screening of Remedial Technologies and Process Options 11
2.7. Evaluation of Remedial Technologies 12
2.7.1. Soil 12
2.7.2. Ground Water 13
2.8. Assembly of Remedial Alternatives 14
2.8.1. Common Components of Alternatives 14
2.8.2. Alternative 1 – No Further Action 15
2.8.3. Alternative 2 – Limited Excavation, Capping and Sewer Rehabilitation 15
2.8.4. Alternative 3 – Excavation, Capping and Cutoff Wall 16
2.8.5. Alternative 4 – Excavation of Soil Exhibiting MGP COCs above SCOs 17
3. Detailed Analysis of Alternatives 18
3.1. Individual Analysis of Alternatives 18
3.1.1. Overall Protection of Human Health and the Environment 18
3.1.2. Compliance with SCGs 18
3.1.3. Long-Term Effectiveness and Permanence 19
3.1.4. Reduction of Toxicity, Mobility, or Volume though Treatment 19
3.1.5. Short-Term Effectiveness 19
3.1.6. Implementability 19
3.1.7. Cost 19
3.1.8. Support Agency Acceptance 19
3.1.9. Community Acceptance 19
3.2. Comparative Analysis of Alternatives 19
3.2.1. Overall Protection of Human Health and the Environment 20
3.2.2. Compliance with SCGs 20
3.2.3. Long-Term Effectiveness and Permanence 20
3.2.4. Reduction of Toxicity, Mobility, or Volume though Treatment 20
3.2.5. Short-Term Effectiveness 21
3.2.6. Implementability 21
3.2.7. Cost 21

3.2.8. Support Agency Acceptance 22
3.2.9. Community Acceptance 22
4. Recommended Alternative 23
References 24

List of Tables

Located in the text

3-1 Summary of Alternative Costs

Located following the text

1 Evaluation of Potential SCGs
2 Evaluation of Process Options – Soil
3 Evaluation of Process Options – Ground Water
4 Components of Remedial Alternatives
5 Detailed Analysis of Alternatives
6 Alternative 1 Cost Estimate
7 Alternative 2 Cost Estimate
8 Alternative 3 Cost Estimate
9 Alternative 4 Cost Estimate

List of Figures

1 Site Location Map
2 Site Map
3 Historical Features
4 Sample Locations
5 Cross Section A-A'
6 Cross Section B-B'
7 Cross Section C-C'
8 Extent of MGP-impacted Material in Subsurface Soil and Surface Soil
9 Extent of Subsurface Soil Greater than SCOs
10 Alternative 2 – Limited Excavation, Cover, and Sewer Rehabilitation
11 Alternative 3 – Excavation, Capping, and Cutoff Wall
12 Alternative 4 – Excavation and Cover

List of Appendices

A SCG Analysis

1. Introduction

1.1. Purpose

This report presents the Feasibility Study (FS) for the South First Street former manufactured gas plant (MGP) Site in Fulton, New York. This FS Report documents the assembly and evaluation of remedial alternatives to address environmental media affected by MGP operations and associated residuals at the Site. Based on this evaluation, a recommended alternative for the Site is provided in the last section of this report.

1.2. Project Background

This FS Report was completed by O'Brien & Gere on behalf of National Grid pursuant to an Order on Consent with the New York State Department of Environmental Conservation (NYSDEC), dated November 2003 (Index # A-0473-0000). The investigation activities at the Site were initiated in 1996 under an earlier Order on Consent dated December 7, 1992 between the NYSDEC and the Niagara Mohawk Power Corporation. The 2003 Order on Consent supersedes the 1992 Order. Niagara Mohawk is now operating as National Grid.

Pursuant to the agreements with NYSDEC noted above, Niagara Mohawk implemented a Preliminary Site Assessment and Interim Remedial Measures (PSA/IRM) Study at the Site between July 1996 and September 1996. The results of the PSA did not indicate conditions that would warrant the completion of an IRM. However, based on the results of the PSA a Remedial Investigation (RI) was recommended to further evaluate the horizontal and vertical extent of chemical constituents. RI activities were completed between 1998 and 2005, and were documented in the RI Report, dated May 2006 (O'Brien & Gere, 2006). In its letter dated March 11, 2008, NYSDEC stated that, with the exception of the additional required soil vapor evaluation, the RI adequately defined the nature and extent of MGP-related contamination at the Site and requested that National Grid proceed with development of a FS Report (Omorogbe 2008).

This FS Report has been prepared in accordance with the following documents:

- *National Oil and Hazardous Substances Pollution Contingency Plan*. 40 CFR 300. March 8, 1990.
- *Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA (Interim Final)*. United States Environmental Protection Agency (USEPA). October 1988.
- *Technical and Administrative Guidance Memorandum (TAGM) for the Selection of Remedial Actions at Inactive Hazardous Waste Sites TAGM 4030.* NYSDEC. May 1990.
- *Draft DER-10, Technical Guidance for Site Investigation and Remediation. Division of Environmental Remediation.* NYSDEC. December 25, 2002.

1.3. Report Organization

The FS Report is organized into the following sections:

- *Introduction.* Provides the purpose and regulatory framework for the FS Report. Also provides a summary of the relevant site background information and findings of past investigations.

- *Development of Remedial Alternatives*. Provides the rationale for development of remedial action objectives (RAOs) to address media at the Site. Also provides the screening and evaluation of remedial technologies that are ultimately combined into the proposed remedial alternatives to address the Site.

- *Detailed Analysis of Alternatives.* Provides an evaluation of the remedial alternatives using the NCP criteria, such that a recommended alternative can be selected.

- *Recommended Alternative.* Presents the recommended alternative that addresses the threshold criteria (overall protectiveness of human health and the environment and the Remedial Action Objectives (RAOs)) and represents the most cost-effective balance among the evaluation criteria.

1.4. Site Description and History

The Site encompasses approximately 1.04 acres; and as illustrated on Figure 1, is located in Fulton, New York. The Site is made up of two areas, Area 1 (approximately 0.51 acres) and Area 2 (approximately 0.53 acres, which are separated by South First Street, as illustrated on Figure 2. Both Area 1 and Area 2 are owned by National Grid. Area 1 is located on the northeast side and Area 2 is located on the southwest side of South First Street. Presently, Area 1 is an undeveloped grass covered lot bounded by Conrail railroad tracks to the northeast and residential properties to the northwest and southeast. The topography in this area slopes to the southwest. The railroad tracks are elevated approximately 10 ft above the surface of Area 1.

Area 2 is a vacant, asphalt-paved lot. Within the lot is a concrete slab where the former Crossroads Gospel Tabernacle Ministries Church (CGTMC) building was located. Area 2 is bounded by the Oswego River to the southwest and residential properties to the northwest and southeast. The topography of the Site is generally flat, sloping gently to the southwest toward the Oswego River. The surface water level in the Oswego River is approximately 10 feet below the ground surface of Area 2. The surface of Area 2 is approximately four feet above the surrounding properties.

There are a number of properties surrounding the Site as shown on Figure 2. Land between Area 2 and the Oswego River is owned by the New York State Canal Corporation. Land to the southwest of Area 2 is owned by the City of Fulton and is used as a park. Land northwest and southeast of Area 2 is owned by private property owners. As with the Area 2 parcel, land between the residential properties and the river is owned by the New York State Canal Corporation.

The following historical information was developed by National Grid based on a review of historical records and maps. This information has been excerpted from the Final Work Plan for the PSA/IRM dated June 1996 as prepared by Niagara Mohawk. Figure 3 depicts Site historical features.

In 1902, the Fulton Fuel and Light Company built the gas plant on South First Street, which began operation on February 20, 1903. Prior to construction of the MGP in 1902, the Site was vacant. The gas plant itself was located on Area 2, southwest of South First Street. A gas holder and oil tank were located on Area 1, northeast of South First Street. By 1906, a gas tank was constructed on Area 1 east of the oil tank (Sanborn 1906) (Niagara Mohawk 1996).

By 1911, two additional gas tanks, a coke shed and a small oil house were constructed on Area 2 west of the gas plant (Sanborn 1911). A survey map also indicates that by 1911, and possibly earlier, a tar well,

approximately 4 ft in diameter, was located between the southern corner of the coal shed and the northern corner of the coke shed.

A 1924 Sanborn Fire Insurance Map indicates the coke shed was removed in Area 2 and a concentrator house was added east of the coke shed location. In Area 1, a 30,000 cubic foot holder and second gas tank were added between the first holder and the railroad tracks.

In the late 1920's, natural gas was discovered locally and the gas plant was only used to supplement the peak demand periods. By 1932, a pipeline from Syracuse brought natural gas to Fulton and the gas plant ceased operation. A natural gas regulator station was located on Area l until 1984.

In 1947, the southern half of Area 2 was used as a used car lot. From 1958 to 1978 the southern half of Area 2 was used as Foster's Garden Center and Outdoor Power Equipment. In 1980, Area 2 was occupied by Modern Floor Covering (Fulton City Directories 1947-1980). The former Garden Center building was converted and used as the CGTMC. The CGTMC building and property was purchased by Niagara Mohawk and subsequently demolished in January 1992.

In late July/early August 1993, Niagara Mohawk cleared debris, and graded and seeded the northeastern half of Area 1 in response to complaints from adjacent landowners regarding the aesthetics of the Site. Prior to initiating the work, the western half of Area 1 was well-maintained lawn. The eastern half of Area 1 was undulating, overgrown, and contained large concrete saddles. The work consisted of the removal of the concrete saddles and general debris; grubbing of vegetation; placement of 102 cubic yards of bank-run gravel to fill low areas; placement of 36 cubic yards of topsoil; and hydro-seeding. Area 1 has subsequently been maintained by periodic mowing of the grass.

Review of historical maps from the Site area at the Friends of Fulton Historical Society indicates that the Oswego Canal was constructed prior to 1827. Excavation and subsequent maintenance of the canal created an island of dredge spoils west of the Site named Yelverton Island. Review of aerial photographs indicates that the canal was no longer present in 1938. Presumably, the canal was backfilled to grade prior to 1938. Based on an interview with City of Fulton Water Department representative Roger Parsons, the canal was partially backfilled and the edge of the former canal served as an open drainage ditch. Sections of piping were subsequently added as the ditch was filled in to provide useable land.

1.5. Summary of Previous Investigations

Work completed in connection with this Site is summarized in the following documents:

- *Preliminary Site Assessment Interim Remedial Measures (PSA/IRM) Study Repor*t, prepared by O'Brien & Gere Engineers, Inc., dated May 1996.
- *Remedial Investigation Report*, prepared by O'Brien & Gere Engineers, Inc., dated February 1999.
- *Remedial Investigation Report*, prepared by O'Brien & Gere Engineers, Inc., dated May 2006.
- *Soil Vapor Sampling Report* (letter), prepared by O'Brien & Gere Engineers, Inc., dated October 19, 2007.
- *2008 Soil Vapor Sampling Results* (letter), prepared by O'Brien & Gere Engineers, Inc., dated September 15, 2008.

1.6. Summary of Environmental Data

1.6.1. Hydrogeologic Conditions

The overburden deposits encountered at the Site consist of three units: fill, alluvial deposits consisting of discontinuous lenses of sand, silt, clay and gravel, and sandy glacial till. The till generally becomes more dense with depth. Bedrock was encountered at approximately 36.5 ft below grade at one location. The location of geologic cross-sections included as Figures 5, 6, and 7 are shown on Figure 4.

The water table is present within the overburden materials overlying the till at depths ranging from 1.5 to 8 feet deep across the Site.

The geometric mean hydraulic conductivity of the till unit (0.15 ft/d) is an order of magnitude lower than that of the overlying deposits (1.0 ft/d). Thus, lateral ground water flow in the overburden occurs primarily within the deposits above the till.

The top of the till unit serves as the bottom of the upper water-bearing zone. The surface of till unit undulates, but generally slopes downward toward the Oswego River. Although variable, where completely penetrated, the till is approximately 17.5 ft thick.

Shallow ground water flows to the south and west across the Site. In Area 2, the flow contours converge in the vicinity of the storm sewer line that crosses the area. This indicates that the sewer and/or associated bedding intercepts shallow ground water flowing across the Site. This convergence is likely a localized effect due to leakage into the sewer line that is located west of Area 2. Based on conversations with the City of Fulton, the storm sewer discharges to the Oswego River approximately 0.4 miles north of the site. The storm sewer is located 18 to 25 ft below ground surface. Based on the video inspection, ground water appears to contribute water to the storm sewer. Based on the relatively low hydraulic conductivity of the till unit, the rate of ground water flow through this unit is substantially lower than in the overlying water bearing zone. A slight downward vertical hydraulic gradient exists in Area 2 from the upper water-bearing zone to the till unit.

The City of Fulton ground water supply wells are presently adjacent to the Oswego River approximately one mile upstream to the southeast of the Site (Figure 1). Thus, Site ground water is outside the capture zone of these wells. Respondents to the ground water user survey completed as part of the RI indicated that no domestic ground water wells exist at the residences adjacent to the Site.

1.6.2. Nature and Extent of Contamination

Evidence of past MGP practices was observed during field investigations at the site. Specifically, MGP-impacted material, characterized by observations of odor, sheen, or blebs, is noted in boring logs across the Site. Heavily MGP-impacted material, characterized by observations of NAPL/NAPL saturated soil or a combination of heavy sheens and staining was also noted in some borings at the Site. MGP-related constituents of concern (COCs) (benzene, toluene, ethylbenzene and xylene (BTEX), semivolatile organic compounds (SVOCs) summarized as total carcinogenic polycyclic aromatic hydrocarbons (cPAHs) and total PAHs, and the inorganic compound cyanide), were detected in samples from various media at the Site. The nature and extent of MGP-related material observed at the site is summarized below. Sample locations discussed in this section are presented on Figure 4. A comparison of SCGs to site surface soil, subsurface soil and ground water is presented in Table 1-1 of Appendix A. Detailed description of the nature and extent of contamination is presented in the RI Report (O'Brien & Gere, 2006).

Soil vapor. BTEX and PAH constituents were not detected in soil vapor samples SV-1, SV-2, and SV-3 collected during the RI in 1998. Subsequent to the issuance of the NYSDOH document entitled *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* dated October 2006, NYSDEC requested

that the vapor migration pathway be addressed using the methods identified in this document. This evaluation was conducted in two phases. Phase I occurred in July 2007 and included the collection of six soil vapor samples at locations along the property boundaries of the four adjacent residences. The results revealed elevated concentrations of BTEX compounds (O'Brien & Gere 2007). Since the BTEX could have originated from other non-MGP sources on the properties (automobiles, lawn and garden equipment) a second set of soil vapor samples were collected in June 2008 to further assess the distribution and sources of the identified BTEX. The samples were oriented along four transects representing potential on-site sources of MGP-material, the site boundary, and a point in between. The analysis was a modification of USEPA Method TO-15 and included a PIANO-list of constituents (paraffins, isoparaffins, aromatics, napthenes, and olefins) as well as a number of MGP-indicator compounds identified in the NYSDOH guidance document. The analytical results indicated that BTEX compounds in the 2008 samples were significantly lower than the 2007 samples and MGP-indicator compounds were generally not present. Although MGP-indicators were present at one location along the property boundary (SV-06R), the data from other nearby locations suggested that it was local in nature and does not appear to migrate. Furthermore, there was no consistent trend of concentrations from the on-site locations to the property boundary. The analytical results for 2008 were submitted to NYSDEC in September 2008 (O'Brien & Gere 2008). Based on the 2008 results, further evaluation may be performed at one location (SV-06R), but not at the other locations. In order to expedite the FS, soil vapor concerns are being addressed separately from this FS. Soil vapor evaluations are being performed and analytical results will be evaluated consistent with the NYSDOH Soil Vapor Intrusion protocols. Existing sample locations are provided on Figure 4.

Surface soil. BTEX compounds detected in surface soils are consistent with background concentrations. Total PAH and total cPAH (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo[a,h]anthracene, ideno(1,2,3-cd)pyrene) concentrations were elevated in comparison to background concentrations at four areas characterized by surface sample locations SS-1, SS-2, SS-4, and SS-24. Samples SS-1 and SS-2 are located within Area 1. SS-4 is located adjacent to the pavement in Area 2. These three locations are on the property owned by National Grid. PAH and cPAH concentrations were compared to background concentrations due to the historic use of coal-fired equipment by industries in the vicinity of the site.

Sample SS-24 is located on property to the west of Area 2. This property is behind a residence and owned by the City of Fulton. Additional sampling defined the northern and western extent of cPAHs above background levels in the vicinity of sample SS-24. The southern extent was not defined. Household debris including roofing shingles and ashes are present in the tree line south of sample SS-24. As documented in the RI Report, the material in this area was the result of filling of the Oswego Canal sometime in between 1911 (1911 Sanborn Fire Insurance map) and 1938 (aerial photograph dated June 6, 1938). The source of the fill has not been determined, but likely comprises predominantly dredge spoils that had been placed on the former Yelverton Island. A review of historical records indicated that in 1912 there were discussions among local officials regarding use of dredge spoils from Yelverton Island, formerly located near the Site between the Oswego River and the former Oswego Canal, to backfill the canal bed (*Fulton Times*, March 6, 1912). Given that constituents in this area are attributed to sources other than past MGP operations, this area is not being considered an area of concern in this FS. Sample locations are provided on Figure 4.

Cyanide was detected in the 0 to 2 inch and 0 to 24 inch intervals of surface soil sample SS-2 at concentrations ranging from 11 to 810 mg/kg. Further sampling in the vicinity of SS-2 indicated that the extent of cyanide was limited to the immediate vicinity of SS-2. There was no cleanup guideline for cyanide at the time the RI was completed, therefore, concentrations were compared to the USEPA Preliminary Remediation Goals (PRGs) for Region 3 (1,564 mg/kg) and Region 9 (1,200 mg/kg) and it was concluded that there was no concern. However, NYSDEC Part 375 was promulgated subsequent to

the RI Report submittal. Using the Part 375 (unrestricted and restricted residential) clean up objective of 27 mg/kg the concentrations of cyanide at SS-2 and SS-09 from the surface to 24 inches should be addressed.

Subsurface soil. In Area 1, both analytical and visual evidence of MGP-impacted material was reported in subsurface soil. In general, these observations are noted in the vicinity of the northeastern concrete gas holder pad. Impacts are limited to the upper 12 ft below ground surface. Subsurface soil from the adjacent properties bordering Area 1 did not exhibit MGP-impacted material.

In Area 2, analytical and visual evidence of MGP-impacted material was reported in subsurface soil. These observations begin 4 ft below grade and, in the southern corner of the area, extend to depths up to at least 28 ft below grade. The widest zone of observed MGP-impacted material was between 4 to 12 ft below grade. The MGP-impacted material extends off the National Grid property and on to the Canal Corporation property to the south but was not observed adjacent to the Oswego River.

Impacted material was reported in subsurface soil in two additional off-site areas to the west of Area 2. One area is located west of the former Oswego Canal (vicinity of SB-43 and SB-44) from 0-4 ft. The material in this area is mostly cinders, ash and slag and not considered to be residuals from the MGP operation. The second area is located in the vicinity of the sewer line that runs along the southwestern side of Area 2 (vicinity of SB-14 and PZ-06). The location of boring SB-14 is near the sewer line that runs along the southern property boundary in what was formerly the old canal. Conversations with representatives of the Fulton Public Works Department reveal that the sewer line was constructed in this area as the canal was being filled in. The MGP ceased operation in 1932 and review of a 1938 aerial photograph indicates that the regrading of the former Yelverton Island and filling in of the canal was nearing completion at that time. Although observations and analytical data indicate that MGP-related materials are present, the impacted materials identified begin above the depth of the sewer line (18 ft at PZ-06 and 14 ft at SB-14). The materials are described as stained or containing blebs of NAPL. At PZ-06 the impacted soil is clay and silt and contains shells. Therefore, the impacted materials may be associated with dredge spoils or canal sediments placed or relocated to this area rather than migration of NAPL from Area 2. As described above, observations and concentrations in soil borings from these areas are likely attributed to sources other than past MGP operations, therefore, these areas are not considered areas of concern to be addressed in this FS report. Sample locations are provided on Figure 4.

Ground water. Concentrations of BTEX compounds, PAHs and cyanide above the ground water screening criteria (NYSDEC TOGS) are limited to the shallow ground water beneath Area 2. Constituent concentrations in offsite wells, including those between Area 2 and the Oswego River, are below the screening criteria. Ground water with constituent concentrations above the criteria is likely captured via seepage to the storm sewer located directly southwest of Area 2. Video inspection directly upstream and downstream of the Site did not indicate any visible site-related impacts. Samples from storm sewer manholes located 400 feet upstream and 600 ft downstream of the Site indicated the presence of low concentrations of benzene, ethylbenzene, and total xylenes in the downstream storm water sample. It is unclear whether this is the result of contribution from the property or influent from storm water discharges from nearby roadways or other potential sources. Sample locations are provided on Figure 4.

Ground water downgradient of Area 1 (MW-02) is not impacted. Although a slight sheen was noted on the sample in the area of SB-15, the lack of constituents of concern in MW-02 suggests that soil impacts are localized and not mobile.

Sediment. There is no evidence of contribution of site-related constituents to the sediment of the river. PAH compounds were detected below screening criteria at all locations and were consistent with

concentrations in background (upstream) samples. BTEX compounds were not detected. As such, sediment is not considered to be a medium of concern and is not addressed by the FS.

1.7. Qualitative Exposure Assessment

The Qualitative Exposure Assessment for onsite and offsite areas is as follows:

Surface Soil. Dermal contact, inhalation, or accidental ingestion of surface soil.

Area 1 – Potentially complete exposure pathway for trespassers, utility workers, and construction workers.

Area 2 – Potentially complete exposure pathway for utility workers and construction workers.

Off-site (west of Area 2) – Potentially complete exposure pathway for trespassers, utility workers, and construction workers. As described in Section 1.6.2, constituents in soil west of Area 2 are not site-related.

Subsurface Soil. Dermal contact, inhalation, or accidental ingestion of subsurface soil.

Area 1 – Potentially complete exposure pathway for trespassers, utility workers, and construction workers.

Area 2 – Potentially complete exposure pathway for trespassers, utility workers, and construction workers.
Off-site (west and south of Area 2) - Potentially complete exposure pathway for trespassers, utility workers, and construction workers. As described in Section 1.6.2, constituents in soil west of Area 2 are not site-related.

Ground Water. Dermal contact, inhalation, or accidental ingestion of ground water.

Area 1 – No potentially complete exposure pathways. Ground water at Area 1 was not found to contain site-related constituents above the screening criteria.

Area 2 – Potentially complete exposure pathway for utility workers, and construction workers.

Off Site – No potentially complete exposure pathways. Off-site ground water was not found to contain site-related constituents above the screening criteria.

2. Development of Remedial Alternatives

The process for the development of remedial alternatives to address MGP-impacted site media consisted of six steps as presented below:

- identification of potential standards, criteria and guidance (SCGs)
- development of remedial action objectives (RAOs)
- identification of areas and volumes of impacted media
- identification of general response actions (GRAs)
- identification, screening, and evaluation of remedial technologies and process options
- assembly of remedial alternatives.

2.1. Identification of Potential Standards, Criteria, and Guidance (SCGs)

NYSDEC evaluates compliance with Standards, Criteria, and Guidance, as such, SCGs were evaluated for this Site. As defined in NYSDEC's DER-10, SCGs are promulgated requirements ("standards" and "criteria") and non-promulgated guidance ("guidance") which govern activities that may affect the environment and are used at various stages of investigation and remediation of a site. SCGs incorporate both the CERCLA concept of "applicable or relevant and appropriate requirements" (ARARs) and EPA's "to be considered" (TBCs) category of non-enforceable criteria or guidance (NYSDEC 2002). Consistent with USEPA's definition of TBC's presented in the *CERCLA Compliance with Other Laws Manual,* guidance does not have the same status as promulgated requirements, however, remedial programs should be designed with consideration of guidance (USEPA, 1988).

There are three types of SCGs: chemical-, location-, and action-specific SCGs. Chemical-specific SCGs are health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to the ambient environment. Location-specific SCGs set restrictions on activities based on the characteristics of the site or immediate environs. Action-specific SCGs set controls or restrictions on particular types of remedial actions once the remedial actions have been identified as part of a remedial alternative. The identification of potential SCGs is documented in Table 1.

2.2. Development of Remedial Action Objectives

Remedial action objectives (RAOs) are goals set for impacted environmental media identified for this site that provide protection for human health and the environment. RAOs form the basis for the FS by providing overall goals for site remediation. The RAOs are considered during the identification of appropriate remedial technologies and formulation of alternatives for the Site, and later during the evaluation of remedial alternatives.

RAOs are based on engineering judgment, risk-based information established in the risk assessment, and potential SCGs. Documentation of the rationale employed in the development of the RAOs for the Site is presented in the following sections.

2.2.1 Remedial Action Objectives

The following RAOs were developed for the Site:

Eliminate or reduce, to the extent practicable:

- exposure to (*i.e.*, direct contact with, inhalation of, ingestion of) MGP-related COCs in surface and subsurface soil and ground water
- the source of MGP-related ground water impacts
- potential future migration of MGP-related COCs that could result in off-site ground water impacts.

In addition, improve ground water quality where impacted by MGP operations to achieve ground water standards, to the extent practicable.

2.3. Identification of Areas and Volumes of Impacted Media

Site conditions, the nature and extent of contamination, and the RAOs were taken into consideration to estimate the volumes and areas of media to be addressed by the general response actions. As described in the summary of environmental data, evidence of past MGP practices was observed at the site. Specifically, MGP-impacted material, characterized by observations of staining and odor, sheen, or NAPL, is noted in boring logs at the Site. MGP-related COCs (BTEX, SVOCs summarized as total cPAHs and total PAHs, and the inorganic compound cyanide), were detected in samples from various media at the Site. A discussion of the criteria used in estimating areas and volumes of media is provided below:

Surface soil (0-2 inches). The areas and volumes of surface soil (0-2 inches) to be addressed were evaluated based on cPAH and PAHs above background concentrations and cyanide concentrations above its Part 375 SCO of 27 mg/kg. Surface soil to be addressed based on these criteria is limited to two locations in Area 1 adjacent to the former gas holders and one location (in the vicinity of SS-04) in Area 2. Approximately 10 cubic yards of surface soil were estimated to exhibit cPAH and/or cyanide concentrations above background levels. The approximate areas of these surface soils are depicted on Figure 8.

Subsurface soil (deeper than 2 inches). For subsurface soil (deeper than 2 inches), areas to be addressed were evaluated based on the presence of MGP-impacted material. MGP-impacted material refers to the presence of staining and odor, sheen, or NAPL, as noted in the soil boring logs. Based on these criteria:

- Cyanide to 24 inches in one location (near SS-02 and SS-09) in Area 1.
- MGP-impacted material to be addressed in Area 1 is present in the area around the eastern concrete gas holder pad, and is limited to the upper 16 ft.
- MGP-impacted material to be addressed is generally present between 4 and 16 ft bgs in Area 2. Evidence of MGP-impacted material at depths greater than 16 ft bgs is primarily limited to the southeastern and southwestern corners of the property.

Approximately 3,450 cubic yards of MGP-impacted subsurface soil are estimated to be present above the ground water level to ground surface at the Site. Approximately 6,700 cubic yards of MGP-impacted subsurface soil are estimated to be above the dense till layer to ground surface at the Site. In addition to the volume of MGP-impacted material provided above, the volume of subsurface soil containing MGP-related COCs with concentrations greater than the corresponding 6 NYCRR Part 375 Unrestricted Use SCOs was estimated to be 12,000 cubic yards. The approximate areas of these subsurface soils are depicted on Figures 8 and 9.

Ground water. Concentrations of BTEX compounds, PAHs, and cyanide above the ground water NYS Class GA standards and guidance values are limited to the shallow ground water beneath Area 2. Residual NAPL identified at the Site is not recoverable and is considered immobile soil-bound NAPL. Constituent concentrations in off-site wells, including those between Area 2 and the Oswego River, are below the corresponding standards and guidance values.

Soil vapor. The soil vapor pathway is being addressed separately from this FS.

2.4. Physical Limitations to Remediation

Site conditions present challenges to remediation at the Site. Specifically, the small size of the site, the residential surroundings and the shallow ground water are physical characteristics that complicate remediation and need to be considered during development and evaluation of alternatives for the Site.

The small size of the site and presence of overhead utilities makes it difficult to implement staging of construction equipment or materials and on-site treatment of remediation wastes as well as excavation and shoring activities. The lack of room makes extensive excavation very difficult, because there is limited room for staging of excavation materials or trucks awaiting loading. The lack of space between impacted soil and the neighboring properties does not allow for excavation benching to access material to be excavated at depth, requiring shoring to be used for excavations beneath the water table. The size of the site also limits the ability to stage shoring equipment and materials (including backfill material), thus limiting productivity and extending mobilization phases. The presence of overhead utilities presents limitations on excavation, loading and installation of sheeting for Areas 1 and 2. Underground utilities associated with natural gas distribution are also known to exist on the southern end of Area 1.

The logistical constraints presented by the small size of the site are compounded by the presence of residences around the site. Odors and vapor emissions related to open excavations are a significant consideration for residents. Given the low anticipated excavation rates due to the limitations described above odors and vapors could be emitted for extended durations. In addition to potentially subjecting residents to odors and vapor emissions for the duration of excavation, the noise and vibration due to shoring installation and truck traffic could be considerable for extensive excavations. Installation of sheeting along the perimeter of Area 2 could also affect the integrity of nearby residential foundations In

addition, installation of sheeting could result in potential basement flooding due to potential ground water mounding caused by the presence of sheet piles.

The residential nature of the area make the anticipated truck traffic related to excavation and disposal yet another significant consideration for this project. It is likely that the roadways may not withstand the traffic and associated heavy loads anticipated with extensive excavation at the site. In addition, the heavy traffic and associated inconvenience to residents would be considerable for extensive excavations.

In addition to the considerable nuisance and inconvenience posed to residents and the logistical constraints presented by the location and small size of the site, the presence of shallow ground water and deep contamination present constructability limitations as well. The presence of ground water at 1.5 to 8 ft below ground surface will result in significant dewatering needs and excavation shoring needs for deep excavations. To remove certain areas of contamination, excavations would need to extend to depths of 28 ft below ground surface. Collected ground water resulting from construction dewatering would require transportation off-site due to the space constraints discussed above that limit on-site treatment, further contributing to the traffic problems associated with remedies including extensive excavation. In addition to dewatering needs, it is anticipated that excavation shoring systems will require the use of bracing and anchoring systems, due to the nature of the till present in the subsurface which would not allow the use of conventionally driven sheet piles, adding considerable complication and cost to shoring designs for deep excavation at the site.

In addition to the physical constraints of the site, it should be noted that excavation of MGP-impacted material results in generation of greenhouse gases associated with excavation activities and off-site transportation of material, and related importation of fill. The relative quantity of greenhouse gases generated is proportional to the quantity of material excavated. Thus, full-scale removal of MGP-impacted material down to a depth of 28 ft could result in significant greenhouse gas generation when compared to equally protective options.

2.5. Identification of General Response Actions

General Response Actions (GRAs) are remedial actions for impacted environmental media that may be combined into alternatives to satisfy the RAOs. Based on the RAOs in Section 2.2, soil and ground water are the media of concern. The GRAs that address the RAOs for soil are institutional controls, containment, *in situ* treatment, *ex situ* treatment, removal, and off-site treatment and disposal. The GRAs that address the RAOs for ground water are institutional controls, containment, collection, *in situ* treatment, *ex situ* treatment, and discharge actions.

2.6. Identification, Screening of Remedial Technologies and Process Options

Potentially applicable remedial technology types and process options for each GRA were identified during this step. Process options were screened on the basis of technical implementability. The technical implementability of each identified process option was evaluated with respect to site contaminant information, areas and volumes of affected media, and the physical and constructability limitations to remediation.

Tables 2 and 3 present descriptions of the technologies and process options that were identified for the Site soil and ground water, respectively.

2.7. Evaluation of Remedial Technologies

Technologies and process options that were identified as potentially implementable for the Site were evaluated based on the criteria of effectiveness, implementability, and cost.

The effectiveness criterion evaluates:
(1) the effectiveness of the process options in meeting the RAOs and handling the estimated volumes or areas of media;
(2) the potential impacts to human health and the environment during construction and implementation; and
(3) how proven and reliable the process option is with respect to site contaminants and conditions.

The implementability criterion evaluates the technical and administrative/institutional feasibility of implementing a process option.

The cost criterion evaluates the capital and operation and maintenance (O&M) costs of each process option on the basis of whether they are high, medium, or low relative to other process options in the same remedial technology group.

Based on this evaluation, a representative process option is selected for each remedial technology. Selection of representative process options simplifies the assembly and evaluation of alternatives, but does not eliminate process options from consideration in the remedial design phase. The process options marked with an asterisk in Tables 2 and 3 were selected as representative process options. The following sections describe the technologies that are implementable and technically feasible at this site.

2.7.1. Soil

No action. The no action GRA must be considered in the FS, as specified in NYSDEC Draft DER-10, *Technical Guidance for Site Investigation and Remediation* (2002).

Institutional controls. An environmental easement and a site management plan were identified as the potentially implementable remedial technologies associated with the institutional GRA for soil.

- **Environmental Easement.** An environmental easement would provide restrictions on land use and site activities that could result in unacceptable exposures to surface and subsurface soil.

- **Site Management Plan.** A site management plan would document site use restrictions and required operation and monitoring of the remedy.

Containment. Capping and subsurface wall barrier were identified as the potentially implementable remedial technologies associated with the containment GRA for soil.

- **Cover.** A cover would consist of installation of a vegetated soil cover over surface and subsurface material.

- **Capping.** Capping would consist of installation of a layer such as asphalt or concrete and a low permeability membrane to cover surface and subsurface soil.

- **Subsurface wall barrier.** Sheet piles would be installed around the area of contamination to contain subsurface materials. Sheet pile materials include HDPE, fiberglass, vinyl, and steel.

Removal. Excavation was identified as the potentially implementable remedial technology associated with the removal GRA for soil.

- **Excavation.** Excavation would consist of physical removal of surface soil, MGP-related material and MGP-related structures using such equipment as backhoes, loaders, and/or dozers. Temporary support structures (*e.g.*, sheetpiling) and dewatering activities would likely be required to implement excavation at the Site.

Off-site Treatment and Disposal. Treatment and disposal were identified as the potentially implementable remedial technologies associated with off-site treatment and disposal. The process options considered potentially implementable low temperature thermal desorption and commercial landfill.

- **Low Temperature Thermal Desorption.** Excavated TAGM 4061 exempt soil would be transported off-site to a permitted treatment facility where it would be heated to between 90 and 320 °C (200 to 600 °F) to desorb organic compounds from the soil into an induced airflow. An air emissions control system is then used to treat the off gas.

- **Commercial Landfill.** Excavated soil would be transported for disposal at an off-site permitted landfill.

2.7.2. Ground Water

No action. The no action GRA must be considered in the FS, as specified in NYSDEC Draft DER-10, *Technical Guidance for Site Investigation and Remediation* (2002).

Institutional controls. Monitoring, an environmental easement, and a Site Management Plan were identified as the potentially implementable remedial technologies associated with the institutional GRA for ground water.

- **Monitoring.** Ground water monitoring would involve periodic sampling and analysis of ground water. Ground water monitoring would provide a means of detecting changes in constituent concentrations in the ground water.

- **Environmental Easement.** Currently, ground water is not used as a potable water source at or in the vicinity of the Site. Ground water use restrictions would be placed on the Site property that would require compliance with the approved Site Management Plan.

- **Site Management Plan.** The Site Management Plan would prohibit the use of ground water. In addition, a Site Management Plan would preclude excavation and construction activities that would expose workers without proper protective equipment to affected ground water.

Containment. A subsurface barrier wall and sewer rehabilitation were identified as a potentially implementable remedial technologies related to the containment GRA for ground water. These technologies are described below.

- **Sheet Pile Cutoff Wall.** Sheet piles would be installed around the area of contamination to contain ground water. Sheet pile materials include HDPE, fiberglass, vinyl, and steel. The sheet piling would extend into the underlying confining unit (till layer) located approximately 10 to 28 ft bgs.

- **Sewer rehabilitation.** Sewer would be repaired to minimize ground water infiltration and potential off-site migration of impacted ground water.

In situ treatment. Biological treatment and monitored natural attenuation were identified as the potentially implementable remedial technologies associated with the *in situ* treatment GRA for ground water. The potentially implementable process options are described below.

- **Monitored Natural Attenuation**. Natural attenuation relies on the naturally occurring *in situ* biotic and abiotic processes to degrade organic constituents in the saturated zone. Baseline and ongoing monitoring is required to evaluate the effectiveness of this process option.

- **Enhanced *In Situ* Biodegradation**. Natural *in situ* microbial degradation of organic contaminants can be enhanced through injection of microbial populations, nutrient sources, and electron donors into ground water through injection wells. A treatability study would be necessary to field verify effectiveness of biological treatment.

Ex situ treatment. Physical treatment was identified as the potentially implementable remedial technology associated with the short-term *ex situ* treatment of ground water (such as during construction activities). The potentially implementable process options are described below.

- **Carbon Adsorption**. Activated carbon can readily adsorb organic contaminants from ground water onto its surfaces during contact. The carbon must be periodically replaced, regenerated, treated, and/or disposed. Spent carbon would be regenerated or disposed of off site at a permitted commercial facility.

- **Filtration**. Consists of the separation of solids from water phase using semi-permeable filter medium, such as a bag filter. Sludge management may be required.

Discharge. Discharge of treated ground water was identified as the potentially implementable remedial technology associated with the short-term discharge GRA for ground water (such as during construction activities). The potentially implementable process options are described below.

- **Discharge to POTW.** Collected and treated ground water would be released to municipal sanitary sewers and discharged to a municipal treatment plant.

- **Transport to Commercially Operated Treatment/Disposal Facility.** Collected ground water would be transported to a commercial treatment/disposal facility.

2.8. Assembly of Remedial Alternatives

Remedial alternatives were developed by assembling general response actions and representative process options into combinations that address the MGP-impacted media at the Site. Four alternatives were developed for the Site. A summary of the alternatives and their components is presented in Table 4. A description of each alternative is included in the following subsections.

2.8.1. Common Components of Alternatives

An environmental easement, a Site Management Plan, and ground water monitoring are common elements to the alternatives being evaluated for the Site. A description of these elements is included below.

Environmental Easement. Property use restrictions and ground water use restrictions would be placed on the property that would require compliance with the Site Management Plan.

Site Management Plan. A Site Management Plan would guide future activities at the property and provide ground water use restrictions, and require periodic site management reviews and reports to NYSDEC. The periodic site management reviews would focus on evaluating the site with regard to the continuing protection of human health and the environment as provided by information such as ground water monitoring results and documentation of field inspections.

Ground Water Monitoring. With the exception of Alternative 4, ground water monitoring would be conducted to document the absence of impacts to off-site ground water and the southern end of Area 1. For cost purposes, ground water monitoring was assumed to be conducted annually at five monitoring wells for 30 years. Samples would be analyzed for MGP-related COCs (BTEX and SVOCs).

2.8.2. Alternative 1 – No Further Action

Alternative 1 is the no further action alternative. The no further action alternative is required by NYSDEC Draft DER-10, *Technical Guidance for Site Investigation and Remediation* (2002) and serves as a benchmark for the evaluation of action alternatives. This alternative provides for an assessment of the environmental conditions if no further active remedial actions are implemented. The no further action alternative consists of ground water monitoring, an environmental easement and a Site Management Plan, as described in Section 2.8.1. Area 2 is currently covered with an asphalt parking lot and a concrete building foundation floor, thus containment is currently implemented and affords a level of protectiveness for human health and the environment.

2.8.3. Alternative 2 – Limited Excavation, Cover and Sewer Rehabilitation

Alternative 2 consists of limited excavation of surface soil and MGP-impacted material, to the extent practicable, in Area 1, removal of MGP-related structures and foundations, including impacted soils immediately surrounding the structures in Areas 1 and 2, installation of a cover at Area 2, and rehabilitation of the storm sewer west of Area 2, in addition to ground water monitoring, environmental easement, and the Site Management Plan described in Section 2.8.1. In addition to a cover and sewer rehabilitation, enhanced natural attenuation of ground water in Area 1 and in the vicinity of the storm sewer west of Area 2 will be considered. A pre-design investigation would be conducted to evaluate the effectiveness of addition of an oxygen releasing compound (ORC) or other amendment to enhance natural biological degradation of MGP COCs in ground water in the vicinity of the storm sewer west of Area 2, and potential ground water impacts that may result from residual material in Area 1.

Cover. A cover would be constructed for Area 2 following excavation activities. The currently present asphalt parking lot and a concrete building foundation floor would be removed to facilitate removal of the MGP-related structures. The final components of the cover will be selected during design. Proper maintenance of this cover would be provided for in the Site Management Plan. This cover would continue to provide a means of preventing direct contact with MGP-related material present in Area 2.

Limited Excavation. Limited excavation would consist of excavation of MGP-related structures and foundations, including MGP-impacted material immediately surrounding the foundations, to the extent practicable in Area 1and Area 2, and limited excavation in Area 1. The MGP structures and foundations are anticipated to extend to approximately 4 to 5 feet below grade. Excavations will extend to depths up to 7 feet below grade. Removal of this material will address the potential for direct contact with the MGP-related material. In Area 2, the limited excavation to be implemented associated with removal of MGP-structures is anticipated to address minor surface soil impacts. The approximate area to be excavated is depicted on Figure10. Approximately 2,822 cubic yards of soil and debris from MGP-related structures is anticipated to be excavated under this alternative. Excavated material and excavated MGP-related structures would be transported to an off-site treatment, storage and disposal facility. Due to the limited depth of excavation, minimal construction water is anticipated as a result of ground water infiltration into excavations. Construction water, if any, would be collected. Due to the limited space

available at the site, it is assumed collected construction water would be temporarily stored on site with subsequent off-site treatment and disposal.

Following excavation, the excavated area would be backfilled and compacted. Restoration of excavations in Area 1 would include placement of topsoil and seeding.

Storm Sewer Rehabilitation. The storm sewer located west of Area 2 would be rehabilitated to limit ground water infiltration that could migrate offsite. As part of the rehabilitation a portion of the sewer would be repaired using slip-lining or a similar technology, while a portion would be replaced. For the portion that is replaced, a means of stopping ground water migration within the sewer bedding would be provided. The approximate location of the storm sewer rehabilitation is shown on Figure 10.

2.8.4. Alternative 3 – Excavation, Capping and Cutoff Wall

Alternative 3 consists of limited excavation of surface soil and MGP-impacted material, installation of a cap, and installation of a sheet pile cutoff wall, in addition to ground water monitoring, an environmental easement, and the Site Management Plan described in Section 2.8.1. In addition to containment of ground water, enhanced natural attenuation of ground water in Area 1 will be considered. A pre-design investigation will be conducted to evaluate the effectiveness of addition of ORC or other amendment to enhance natural biological degradation of potential MGP COCs impacts to ground water that may result from residual material in Area 1.

Excavation. Excavation would consist of MGP-related structures and MGP-impacted material present above the ground water table, to the extent practicable. MGP-related structures are present in Area 1 and Area 2, as depicted on Figure 3. The ground water table is estimated to be present at approximately 1.5 to 6 ft below grade in Area 1 and approximately 6 to 7.5 ft below grade in Area 2, thus excavation in Area 1 will be to an average depth of approximately 3 ft, while in Area 2 it will be to an average depth of approximately 7 ft. The approximate area to be excavated is depicted on Figures 8 and 9. Approximately 3,450 cubic yards of soil and debris from MGP-related structures is anticipated to be excavated under this alternative. The basis for the volume of excavated material is presented in Section 2.3. Because of the limited size of the site and the proximity of residences to the edges of the site, sheet piling would be necessary to provide structural support for the excavation of subsurface materials in Area 2. Excavated material and excavated MGP-related structures would be transported to an off-site treatment, storage and disposal facility. Due to the limits of the depth of excavation, minimal construction water is anticipated as a result of ground water infiltration into excavations. Construction water, if any, would be collected. Due to the limited space available at the site, it is assumed collected construction water would be temporarily stored on site with subsequent off-site treatment and disposal.

Following excavation, the excavated area would be backfilled and compacted. Restoration of excavations in Area 1 would include installation of topsoil and seeding. Restoration of excavations in Area 2 would include the installation of a new cap, as described below.

Cap. A low permeability cap consisting of a low permeability membrane and new asphalt parking lot would be constructed for Area 2. The currently present asphalt parking lot and a concrete building foundation floor would be removed, along with sufficient subsurface material to allow the construction of the new cap to result in finished elevations similar to present elevations. The new cap would allow for final use as a parking lot and boat ramp access area. Proper maintenance of this cover would be provided for in the Site Management Plan. This cap would continue to provide a means of preventing direct contact with MGP-related material present in Area 2.

Sheet pile Cutoff Wall. A subsurface barrier wall (consisting of a sheet pile cutoff wall) would be installed around Area 2. The sheet pile cutoff wall would consist of sheet piling installed with sealed joints. This

barrier wall would be installed to minimize the potential for future migration of MGP-related COCs to off-site ground water, thus sheet piles would extend to the till unit, approximately 10 to 24 ft below grade. The sheet pile cutoff wall is estimated to extend approximately 1,300 linear feet around Area 2. A pre-design investigation would be required to obtain information related to the actual depth required for the sheet pile cutoff wall.

2.8.5. Alternative 4 – Excavation of Soil Exhibiting MGP COCs above SCOs

As required pursuant to 6 NYCRR 375-2.8(c)(2)(i), where the remedial investigation identifies soil contamination above the unrestricted use soil cleanup objectives, the feasibility study shall develop and evaluate one or more alternatives that achieve that soil cleanup objective. As such, Alternative 4 consists of excavation of surface soil containing MGP-related COCs above background concentrations and MGP-related material exhibiting concentrations greater than NYS Unrestricted Use SCOs, to the extent practicable, in addition to an environmental easement, and the Site Management Plan described in Section 2.8.1. It is important to note that this alternative is considered to be considerably difficult to implement given the site constraints and more importantly, presents more short term impacts (to the community and site workers) with no additional protection of human health and the environment as compared to Alternatives 2 and 3.

Excavation. Excavation would consist of excavation of MGP-related structures and soil containing MGP-related COCs at concentrations greater than NYS Unrestricted Use SCOs, to the extent practicable. MGP-related structures are present in Area 1 and Area 2, as depicted on Figure 3. The estimated depth of excavation in Area 1 is 16 ft below ground surface and the estimated depth of excavation in Area 2 is 33 ft below ground surface. The approximate area to be excavated is depicted on Figure 10. Approximately 12,000 cubic yards of soil and debris from MGP-related structures is anticipated to be excavated under this alternative. The basis for the volume of excavated material is presented in Section 2.3. Because of the limited size of the site, the proximity of residences to the edges of the site, and the anticipated depth of excavation, temporary sheet piling will be necessary to complete the excavation. Excavated material and excavated MGP-related structures would be transported to an off-site treatment, storage and disposal facility. In addition, due to the depths of anticipated excavation, continuous construction dewatering is likely to be necessary to manage ground water infiltration into the excavation areas. Due to the limited space available at the site, it is assumed collected construction water would be temporarily stored on site with subsequent off-site treatment and disposal.

Following excavation, the excavated area would be backfilled and compacted. Restoration of excavations in Area 1 would include installation of topsoil and seeding. Restoration of excavations in Area 2 would include the installation of a new asphalt cover, as described below.

Asphalt Cover. An asphalt cover would be installed over the backfilled portions of Area 2. The objective would be to replace the current paved parking and access drive to the boat launch area currently present on the Oswego shore. The asphalt cover would consist of compacted stone overlain by asphalt.

3. Detailed Analysis of Alternatives

The following section documents the detailed analysis of the alternatives developed for the site. The objective of the detailed analysis of alternatives was to analyze and present sufficient information to allow the alternatives to be compared and a remedy selected. The analysis consisted of an individual assessment of each alternative with respect to nine evaluation criteria that encompass statutory requirements and overall feasibility and acceptability. The detailed analysis of alternatives also included a comparative evaluation designed to consider the relative performance of the alternatives and identify major trade-offs among them. The nine evaluation criteria are:

- Overall protectiveness of human health and the environment
- Compliance with SCGs
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost
- Support agency acceptance
- Community acceptance.

The preamble to the NCP (Federal Register 1990) indicates that, during remedy selection, these nine criteria should be categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria. The two threshold criteria, overall protection of human health and the environment, and compliance with SCGs, must be satisfied for an alternative to be eligible for selection. Long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost are primary balancing criteria that are used to balance the trade-offs between alternatives. The modifying criteria are state and community acceptance, which are formally considered after public comment is received on the Proposed Remedial Action Plan (PRAP). The New York State TAGM entitled *Selection of Remedial Actions at Inactive Hazardous Waste Sites*, (NYSDEC 1990) and NYSDEC's Department of Environmental Restoration (DER)-10 draft guidance entitled *Technical Guidance or Site Investigation and Remediation* were also considered during this evaluation (NYSDEC 2002).

3.1. Individual Analysis of Alternatives

In the individual analysis of alternatives, each of the remedial alternatives was evaluated with respect to the above-listed evaluation criteria. A summary of this analysis is presented in Table 5.

3.1.1. Overall Protection of Human Health and the Environment

The analysis of each alternative with respect to this criterion provides an evaluation of whether the alternative would achieve and maintain adequate protection and a description of how site risks would be eliminated, reduced, or controlled through treatment, engineering, or institutional controls.

3.1.2. Compliance with SCGs

Potential SCGs for the Site are presented in Table 1.

3.1.3. Long-Term Effectiveness and Permanence

This criterion assesses the magnitude of residual risk remaining from untreated material or treatment residuals at the site. The adequacy and reliability of controls used to manage untreated material or treatment residuals are also evaluated.

3.1.4. Reduction of Toxicity, Mobility, or Volume though Treatment

The evaluation of this criterion addresses the expected performance of treatment technologies in each alternative.

3.1.5. Short-Term Effectiveness

The evaluation of short-term effectiveness addresses the protection of workers and the community during construction and implementation of each alternative and potential environmental effects that would result from implementation of each alternative. The time required to achieve remedial objectives was also evaluated under this criterion.

3.1.6. Implementability

The analysis of implementability involves an assessment of the ability to construct and operate the technologies, the reliability of the technologies, the ease of undertaking additional remedial action, the ability to monitor the effectiveness of each remedy, and the ability to obtain necessary approvals from other agencies. Additionally, the availability of services, capacities, equipment, materials, and specialists necessary for implementation of the alternative is also assessed.

3.1.7. Cost

For the cost analysis, cost estimates were prepared for each alternative based on vendor information and quotations, cost estimating guides, and experience. Cost estimates were prepared for the purpose of alternative comparison and were based on information currently known about the study area. The cost estimates include capital costs, annual operation and maintenance costs, and present worth cost. The present worth cost for these alternatives was calculated for the expected duration of the remedy at a 7% discount rate.

The individual cost estimates for the remedial alternatives are included in Tables 6 through 10.

3.1.8. Support Agency Acceptance

Support agency acceptance will be addressed during development of the PRAP.

3.1.9. Community Acceptance

Community acceptance will be addressed during the public comment period prior to the Record of Decision (ROD).

3.2. Comparative Analysis of Alternatives

In the comparative analysis of alternatives, the performance of each alternative relative to the others was evaluated for each criterion. As discussed in the following subsections, with the exception of Alternative 1, each alternative would satisfy the threshold criteria by providing protection to human health and the environment and by addressing the identified SCGs. Please note, as discussed in Section 2.8.6, Alternative 4 is presented pursuant to 6 NYCRR 375 and is considered to be considerably difficult to implement given the site constraints. As shown below, Alternatives 2 and 3 achieve the same level of protection to human health and the environment as Alternative 4 with significantly less impact to the community and site workers. The primary balancing criteria (long-term effectiveness and permanence;

reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost) were used in the comparative analysis of alternatives.

3.2.1. Overall Protection of Human Health and the Environment

With respect to protection of human health, each alternative would provide equal protectiveness from exposure to ground water and soil through institutional controls and capping. With respect to protection of the environment, off-site impacts to the environment (off-site ground water) have not been observed. The combination of limited excavation, cover, sewer rehabilitation, and enhanced natural attenuation (Alternative 2) or excavation, capping, a cutoff wall and enhanced natural attenuation (Alternative 3) would mitigate contaminant migration and/or would provide ground water treatment and provide the same level of protection as Alternative 4.

3.2.2. Compliance with SCGs

As summarized in Table 1, chemical-specific SCGs were identified for ground water and soil. Each alternative would address ground water and soil SCGs, through institutional controls. The combination of limited excavation, cover, sewer rehabilitation, and enhanced natural attenuation (Alternative 2) or excavation, capping, a cutoff wall and enhanced natural attenuation (Alternative 3) would address ground water SCGs through containment and treatment. Alternative 4 would also address the SCGs through removal of soil exhibiting concentrations above NYS Unrestricted Use SCOs.

No location-specific SCGs were identified for the site. Action-specific SCGs related to OSHA requirements during construction activities were identified for Alternatives 2, 3, and 4, and would be met during construction. Action-specific SCGs related to air emissions and waste management were identified for Alternatives 2, 3, and 4 and would be met during remedy implementation.

3.2.3. Long-Term Effectiveness and Permanence

Each alternative would provide long-term effectiveness and permanence through adequate and reliable mitigation of exposures to soil and ground water. Although Alternative 4 would provide added long-term effectiveness and permanence through the removal of soil exceeding NYS Unrestricted Use, the combination of limited excavation, cover, sewer rehabilitation, and enhanced natural attenuation (Alternative 2) or excavation, capping, a cutoff wall and enhanced natural attenuation (Alternative 3) would provide similar long-term effectiveness and permanence through reduction in the potential for migration of MGP-related COCs off-site.

When comparing Alternatives 2 and 3, the lack of sheeting in Alternative 2 has the added benefit of no potential localized ground water mounding that could present long-term effects to nearby residents with respect to potential basement flooding.

3.2.4. Reduction of Toxicity, Mobility, or Volume though Treatment

Each alternative, through installation of a cap or an existing asphalt cover would provide reduction in potential mobility of MGP-related COCs through minimization of surface water infiltration. Limited excavation of soil included in Alternative 3 would provide only a minor reduction in volume of MGP-related material present at the Site (compared to Alternative 2), however, the majority of MGP-related material would remain under this alternative (due to the extensive depth to the material). Removal of soil exceeding NYS Unrestricted Use SCOs included in Alternative 4 would provide a larger reduction in volume of MGP-related material when compared to the other alternatives. However, since current site conditions indicate that impacted ground water is not migrating off-site (except potentially though the sewer) and NAPL was not observed to be mobile, Alternatives 2 and 3 achieve similar reduction in potential mobility through either sewer rehabilitation and enhanced natural attenuation. Alternative 3 achieves a similar reduction in potential mobility with the subsurface barrier wall and cap installation.

3.2.5. Short-Term Effectiveness

Engineering controls would be implemented during construction of the alternatives that would be adequately protective of the community and the environment.

Excavation activities related to Alternatives 2, 3 and 4 would present odor, dust and vapor exposures to nearby residents. The extensive excavation included in Alternative 4 would result in significant impacts to the community and site workers related to these exposures. The high level of traffic associated with off-site disposal and excavation backfill in Alternative 4 would also present significant impacts to the local community. Alternative 2, includes the least amount of subsurface disturbance and would result in the least odor, dust and vapor exposures in comparison to Alternatives 3 and 4.

Environmental impacts such as air emissions, including greenhouse gases would be the low for Alternative 2, significant for Alternative 3, and even more significant for Alternative 4. These emissions are most influenced by the anticipated duration of activities involving excavation and the anticipated quantity of excavated materials requiring transportation off-site. No emissions related to greenhouse gases are anticipated for Alternative 1.

Alternative 2, which meets the RAOs and provides equal protectiveness as Alternatives 3 and 4, can be constructed with significantly less short-term impacts to the local community and the environment. This is primarily due to the absence of significant excavation elements in this alternative.

3.2.6. Implementability

The technologies being used in each alternative are reliable technologies. Each alternative would allow for additional remedial actions to be implemented, if necessary, and would be readily monitored for effectiveness of the remedy.

Alternative 2 is implementable, meets the RAOs, and provides equal protectiveness as Alternatives 3 and 4. Alternative 2 is also significantly easier to implement as it incorporates limited excavation, installation of a cover, rehabilitation of the sewer, and avoids substantial construction challenges associated with extensive unconventional excavation shoring, loading and staging of excavation and fill materials, and construction dewatering. Construction activities associated with the limited excavation and the cap present significantly lower noise and traffic congestion to local residents and do not result in as much potential for odor and vapor emissions to the community and workers associated with Alternatives 3 and 4.

Alternative 3 is implementable, however, it presents significant challenges given the site constraints (especially given the lack of space to manage excavated soil). Furthermore, Alternative 3 presents significant construction challenges associated with traffic management and odor/vapor/emission control.

Alternative 4 is considerably difficult to construct given the constraints at this site (space is not available to address material staging, excavated material staging, excavation dewatering) and is only considered in this comparative analysis pursuant to the requirements established in 6 NYCRR 375.

3.2.7. Cost

Detailed cost estimates for Alternatives 1 through 5 are included as Tables 6 through 10. A summary table is provided below:

Table 3-1 *Summary of Alternative Costs.*

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Total Capital Cost	$102,000	$3,583,000	$5,319,000	$12,036,000
Total O&M Cost	$42,500	$39,000	$44,100	$36,300
Total Present Worth (30 yrs, 7%) Cost	$502,000	$3,943,000	$5,739,000	$12,356,000

Source: O'Brien & Gere

3.2.8. Support Agency Acceptance

Support agency acceptance will be addressed during development of the preferred alternative.

3.2.9. Community Acceptance

Community acceptance will be addressed during the preferred alternative public comment period prior to the ROD.

4. Recommended Alternative

Based on the evaluation of each individual remedial alternative, the comparative evaluation of alternatives, and given the constraints present at this site, Alternative 2 is the recommended alternative. Alternative 2 was selected as the recommended alternative because it achieves the RAOs and satisfies the threshold criteria by providing protection to human health and the environment. Furthermore, Alternative 2 cost-effectively provides the best balance of the evaluation criteria.

Alternative 2 consists of:

- Excavation to the ground water table in Area 1 – to remove impacted soil and mitigate potential surface soil exposure
- Removal of MGP-related structures and foundations, including impacted soil immediately surrounding foundations, to the extent practicable in Areas 1 and 2 – to reduce the volume of impacted material. Excavations will extend to depths up to 7 feet below grade, to the extent practicable.
- Installation and maintenance of a cover over Area 2 – to mitigate exposure to impacted soil
- Rehabilitation of the storm sewer west of Area 2 – to mitigate ground water infiltration into the storm sewer and migration offsite.
- Instituting an environmental easement – to restrict the use of the site.
- Ground water monitoring – to monitor the effectiveness of the remedy and continue to document that MGP impacts are not migrating offsite.
- Application of ORC (or other amendment) in Areas 1 and 2 – to treat impacted ground water in the vicinity of the storm sewer west of Area 2 and potential ground water impacts from residual material in Area 1.

Alternative 2, which meets the RAOs and provides equal protectiveness as Alternatives 3 and 4, can be constructed with significantly less short-term impacts to the local community, such as noise, dust, odors, vapor emissions, potential basement flooding and traffic congestion associated with sheet pile installation and extensive excavation. Alternative 2, would also be significantly easier to implement as it would achieve protectiveness through removal of MGP-impacted material, to the extent practicable, in Area 1 and installation of a cover at Area 2. This is because the components in Alternative 2 can be completed avoiding construction challenges associated with extensive unconventional excavation shoring, loading and staging of excavation and fill materials, and construction dewatering. An added benefit of Alternative 2 is that it can be implemented with lower impacts to the environment relative to air emissions including greenhouse gases in comparison to Alternatives 3 and 4, while achieving a similar level of protectiveness as the other alternatives at a lower cost and significantly lower use of natural resources.

References

Federal Register. 1990. *National Oil and Hazardous Substances Pollution Contingency Plan*. 40 CFR 300. March 8, 1990.

New York State Department of Environmental Conservation (NYSDEC). 1990. *Technical and Administrative Guidance Memorandum (TAGM) 4030 for the Selection of Remedial Actions at Inactive Hazardous Waste Sites*. May 1990.

Niagara Mohawk, June 1996. Final Work Plan for the *Preliminary Site Assessment Interim Remedial Measures (PSA/IRM) Study at the South First Street Site,* City of Fulton, NY.

NYSDEC. 1989. TAGM 4025 – *Guidelines for Conducting Remedial Investigations/Feasibility Studies*. March 31, 1989.

NYSDEC. 1998. *Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1, Ambient Water Quality Standards and Guidance Values and Ground Water Effluent Limitations*. June 1998.

NYSDEC. 2002. Draft DER-10, Technical Guidance for Site Investigation and Remediation. Division of Environmental Remediation. December 25, 2002.

O'Brien & Gere Engineers, Inc. 1997. *Preliminary Site Assessment Interim Remedial Measures (PSA/IRM) Study Report, South First Street, City of Fulton, NY – Niagara Mohawk Power Corporation*.

O'Brien & Gere Engineers, Inc. 1998. *Revised Remedial Investigation/Feasibility Study Work Plan, South First Street, Fulton, New York.*

O'Brien & Gere Engineers, Inc., 1999. *Remedial Investigation Report, South First Street Site, Fulton, New York* February 1999.

O'Brien & Gere Engineers, Inc. 2006. *Remedial Investigation, South First Street, Fulton, New York.*

O'Brien & Gere Engineers, Inc. 2007. Soil Vapor Sampling Report letter to Amen Omorogbe, P.E. (NYSDEC). October 19, 2007.

O'Brien & Gere Engineers, Inc. 2008. 2008 Soil Vapor Sampling Results letter to Amen Omorogbe, P.E. (NYSDEC). September 1 5, 2008.

Omorogbe, Amen M. (NYSDEC). Letter to Brian Stearns (National Grid). March 11, 2008.

United States Environmental Protection Agency (USEPA). 1988. *Guidance of Conducting Remedial Investigation and Feasibility Studies under CERCLA (Interim Final)*. October 1988.

USEPA. 1988. *CERCLA Compliance with Other Laws Manual: Interim Final*. August 1988.

National Grid
Fulton, NY Site
Feasibility Study

Table 1. Evaluation of Potential SCGs.

Medium/Location/ Action	Citation	Requirements	Comments	Potential SCG
Potential chemical-specific SCGs				
	6 NYCRR 700.1 - Definitions	Promulgated state regulation that provides ground water definitions.	Fresh ground water is defined as ground water with a chloride concentration equal to or less than 250 mg/L or a total dissolved solids concentration (TDS) equal to or less than 1,000 mg/L.	Yes
	6 NYCRR 701 - Classifications - Surface Waters and Ground Waters	Promulgated state regulation that provides ground water classifications.	6 NYCRR Part 701.15 states that Class GA ground water is fresh ground water, and the best use of Class GA ground water is potable use.	Yes
	6 NYCRR 702 - Derivation and Use Of Standards and Guidance Values	Promulgated state regulation that provides NYSDEC with procedures for deriving standards and guidance values.	Not applicable, relevant or appropriate because this regulation is administrative in nature. Standards are defined in specific promulgated state regulations for ground water, surface water and soil. Guidance values are provided in regulatory guidance documents.	No
	6 NYCRR 703 - Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations	Promulgated state regulation that provides water quality standards for surface water and ground water. Also provides Maximum Allowable Concentrations for discharge to Class GA ground waters of the state.	Potentially applicable to site ground water and surface water. Potentially applicable to discharges to ground or unsaturated zone.	Yes
	6 NYCRR 705 - References	Promulgated state regulation that lists Federal statutes or regulations referenced in 6 NYCRR Parts 700 through 704.	Not applicable, relevant or appropriate because this regulation is administrative in nature.	No
	6 NYCRR 706 - Appendices to Parts 700 - 705	Promulgated state regulation that provides NYSDEC with procedures for deriving standards and guidance values to protect aquatic life from acute and chronic effects.	Not applicable, relevant or appropriate because this regulation is administrative in nature. Standards are defined in specific state promulgated regulations for ground water, surface water and soil. Guidance values are provided in regulatory guidance documents.	No
	NYS TOGS 1.1.1 – Ambient Water Quality Standards and Guidance Values and Ground Water Effluent Limitations	Unpromulgated state guidance that summarizes ground water standards and guidance values. Guidance values are provided where standards are not available.	Potentially applicable for site ground water, where more stringent than promulgated SCGs.	Yes
	40 CFR 131 - Water Quality Standards	Promulgated federal regulation that describes the requirements and procedures for developing, reviewing, revising, and approving water quality standards by the states. Provides federally promulgated water quality standards for certain states. Federally promulgated water quality standards do not exist for New York.	Not applicable, relevant or appropriate because this regulation is administrative in nature. Water quality standards are defined in state promulgated regulations.	No
	40 CFR Part 141 - Drinking Water Standards	Promulgated federal regulation that establishes primary drinking water regulations applicable to public water systems.	Not applicable, relevant or appropriate because site ground water is not used as drinking water source.	No

Table 1. Evaluation of Potential SCGs.

Medium/Location/ Action	Citation	Requirements	Comments	Potential SCG
Potential chemical-specific SCGs (continued)				
Soil	6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives	Promulgated state regulation that provides guidance for soil cleanup objectives for various property uses.	Potentially applicable to site soil. Soil cleanup objectives for the protection of ground water are potentially applicable. Unrestricted use soil cleanup objectives for the protection of public health are potentially applicable.	Yes
	NYSDEC TAGM HWR-94-4046 - Recommended soil cleanup objectives	Unpromulgated state guidance that provides recommended soil cleanup objectives.	Potentially applicable for site soil constituents that are not addressed in 6 NYCRR Part 375.	Yes
	NYSDEC TAGM HWR-02-4061 - Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment from Former Manufactured Gas Plants (MGPs)	Provides criteria for excluding coal tar waste and impacted soils from former MGPs which exhibit the hazardous characteristic for benzene (D018) from the hazardous requirements of 6 NYCRR parts 370 - 374 and 376 when destined for thermal treatment.	Potentially applicable for site soil intended to be treated via thermal treatment.	Yes
	USEPA Soil Screening Guidance (1996)	Guidance that provides methodology for developing site-specific soil screening levels. Also provides generic soil screening levels based on default assumptions.	Potentially relevant and appropriate to site soil.	Yes

Table 1. Evaluation of Potential SCGs.

Medium/Location/ Action	Citation	Requirements	Comments	Potential SCG
Potential location-specific SCGs (continued)				
100-year flood plain	6 NYCRR 373-2.2 - Location standards for hazardous waste treatment, storage, and disposal facilities -100-yr floodplain	Promulgated state regulation requiring that hazardous waste treatment, storage, or disposal facilities located in a 100-yr floodplain must be designed, constructed, operated and maintained to prevent washout of hazardous waste during a 100-yr flood.	Not applicable or relevant and appropriate because the site is not located in the 100-year floodplain.	No
	Executive Order 11988 - Floodplain Management	Executive order requiting EPA to conduct activities to avoid, to the extent possible, the long- and short- term adverse impacts associated with the occupation or modification of floodplains. The procedures also require EPA to avoid direct or indirect support of floodplain development wherever there are practicable alternatives and minimize potential harm to floodplains when there are no practicable alternatives.	Not applicable or relevant and appropriate because the site is not located in the 100-year floodplain.	No
	40 CFR Part 264.18(b) - Standards For Owners And Operators Of Hazardous Waste Treatment, Storage, And Disposal Facilities - General Facility Standards - Location Standards - Floodplains	Promulgated federal regulation requiring that hazardous waste treatment, storage, or disposal facilities located in a 100-yr floodplain must be designed, constructed, operated and maintained to prevent washout of hazardous waste during a 100-yr flood.	Not applicable or relevant and appropriate because the site is not located in the 100-year floodplain.	No
	6 NYCRR 500 - Floodplain Management Regulations Development Permits	Promulgated state regulations providing permit requirements for development in areas of special flood hazard (floodplain within a community subject to a one percent or greater chance of flooding in any given year, i.e., 100-yr floodplain).	Not applicable or relevant and appropriate because the site is not located in the 100-year floodplain.	No
Within 61 meters (200 ft) of a fault displaced in Holocene time	40 CFR Part 264.18(a) - Standards For Owners And Operators Of Hazardous Waste Treatment, Storage, And Disposal Facilities - General Facility Standards - Location Standards - Seismic considerations	Promulgated federal regulation precluding new treatment, storage, or disposal of hazardous waste within 200 ft of a fault displaced in the Holocine time.	Not applicable or relevant and appropriate. Site is not located within 200 ft of a fault displaced in Holocene time, as listed in 40 CFR 264 Appendix VI. None listed in New York State.	No
Habitat of an endangered or threatened species	6 NYCRR 182	Promulgated state regulation that provides requirements to minimize damage to habitat of an endangered species.	Not applicable or relevant and appropriate, unless endangered or threatened wildlife species, rare plants or significant habitats have been identified at the site. **Note:** not anticipated to be present.	No

Table 1. Evaluation of Potential SCGs.

Medium/Location/ Action	Citation	Requirements	Comments	Potential SCG
Potential location-specific SCGs (continued)				
Habitat of an endangered or threatened species (cont.)	Endangered Species Act	Provides a means for conserving various species of fish, wildlife, and plants that are threatened with extinction.	Not applicable or relevant and appropriate, unless endangered or threatened wildlife species, rare plants or significant habitats have been identified at the site. **Note:** not anticipated to be present.	No
	50 CFR Part 17 - Endangered and Threatened Wildlife and Plants	Promulgated federal regulation that requires that federal agencies ensure authorized, funded, or executed actions will not destroy or have adverse modification of critical habitat.	Not applicable or relevant and appropriate, unless endangered or threatened wildlife species, rare plants or significant habitats have been identified at the site. **Note:** not anticipated to be present.	No
Historical property or district	National Historic Preservation Act	Remedial actions are required to account for the effects of remedial activities on any historic properties included on or eligible for inclusion on the National Register of Historic Places.	Not applicable or relevant and appropriate, unless site is identified as a historic property. **Note:** not anticipated to be a historic property.	No
	36 CFR Part 65 - National Historic Landmarks Program	Promulgated federal regulation requiring that actions must be taken to preserve and recover historical/archeological artifacts found.	Not applicable or relevant and appropriate, unless site is identified as a historic historic landmark. **Note:** not anticipated to be a historic landmark.	No
	36 CFR Part 800 - Protection Of Historic Properties	Promulgated federal regulation requiring that remedial actions must take into account effects on properties in or eligible for inclusion in the National Registry of Historic Places.	Not applicable or relevant and appropriate, unless site is identified as a historic place. **Note:** not anticipated to be eligible for inclusion on the National Registry of Historic Places.	No
Wilderness area	Wilderness Act 50 CFR Part 35 - Wilderness Preservation and Management	Provides for protection of federally-owned designated wilderness areas.	Not applicable or relevant and appropriate. Site not located in wilderness area.	No
Wildlife refuge	National Wildlife Refuge System Administration Act 50 CFR Part 27 - Prohibited Acts	Provides for protection of areas designated as part of National Wildlife Refuge System.	Not applicable or relevant and appropriate. Site not located in wildlife refuge.	No
Wild, scenic, or recreational river	Wild and Scenic Rivers Act	Provides for protection of areas specified as wild, scenic, or recreational.	Not applicable or relevant and appropriate. Site not located near wild, scenic or recreational river.	No
Coastal zone	Coastal Zone Management Act	Requires activities be conducted consistent with approved State management programs.	Not applicable or relevant and appropriate. Site not located in coastal zone.	No

Table 1. Evaluation of Potential SCGs.

Medium/Location/ Action	Citation	Requirements	Comments	Potential SCG
Potential location-specific SCGs (continued)				
Coastal barrier	Coastal Barrier Resources Act	Prohibits any new Federal expenditure within the Coastal Barrier Resource System.	Not applicable or relevant and appropriate. Site not located in coastal barrier.	No
Protection of waters	33 U.S.C. 1341 - Clean Water Act Section 401, State Water Quality Certification Program	States have the authority to veto or place conditions on federally permitted activities that may result in water pollution.	Potentially applicable to site.	Yes
Potential action-specific SCGs				
Water discharge	6 NYCRR 700 - Definitions, Samples and Tests	Promulgated state regulation that provides NYSDEC with procedures for sampling and analysis of ground water, surface water or effluent samples for the purpose of making a determination of compliance or noncompliance of sewage, industrial waste or other waste discharges.	Not applicable, relevant or appropriate because this regulation is administrative in nature. Effluent sampling requirements would be defined under State Discharge Elimination System (SPDES) requirements.	No
	6 NYCRR 701 - Classifications-Surface Waters and Groundwaters	Promulgated state regulation that establishes classifications of surface water and ground water in New York State. Provides general condition that discharges shall not cause impairment of the best usages of the receiving water as specified by the water classifications at the location of discharge and at other locations that may be affected by such discharge. Also establishes that ground water classifications apply to all ground waters of the state.	Potentially applicable to alternatives where treated ground water is discharged to the river.	Yes
	6 NYCRR 703 - Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations	Promulgated state regulation that provides water quality standards for surface water and ground water. Also provides Maximum Allowable Concentrations for discharge to Class GA ground waters of the state.	Potentially applicable to alternatives where treated ground water is discharged to the river.	Yes
	6 NYCRR 704 - Criteria Governing Thermal Discharges	Promulgated state regulation that provides criteria for thermal discharges to surface waters.	No thermal discharges are anticipated as part of alternatives.	No
	6 NYCRR Parts 750 - 758 - State Pollution Discharge Elimination System (SPDES)	Promulgated state regulation requiring that discharges to surface waters must be in accordance with substantive SPDES requirements.	Potentially applicable to alternatives where treated ground water is discharged to the river.	Yes

Table 1. Evaluation of Potential SCGs.

Medium/Location/ Action	Citation	Requirements	Comments	Potential SCG
Potential action-specific SCGs (continued)				
Water discharge (cont.)	40 CFR 122 - EPA Administered Permit Programs: The National Pollutant Discharge Elimination System (NPDES)	Promulgated federal regulation that implements the National Pollutant Discharge Elimination System (NPDES) Program. The NPDES program requires permits for the discharge of "pollutants" from any "point source" into "waters of the United States. **Note:** New York State has a state program (State Pollutant Discharge Elimination System- SPDES) that has been approved by the USEPA for the control of wastewater and stormwater discharges in accordance with the Federal Clean Water Act.	Potentially relevant and appropriate for alternatives that include discharges to the river. Federal CWA requirements are complied with through the permit requirements under the SPDES regulations (6 NYCRR 750), however, some requirements of 40 CFR 122 apply to state promulgated programs.	Yes
	40 CFR 123 - State Program Requirements	Promulgated federal regulation that provides the procedures EPA will follow in approving, revising, and withdrawing State programs and the requirements State programs must meet to be approved under the National Pollutant Discharge Elimination System (NPDES) of the CWA. **Note:** New York State has a state program (State Pollutant Discharge Elimination System- SPDES) that has been approved by the USEPA for the control of wastewater and stormwater discharges in accordance with the Federal Clean Water Act.	Not applicable or relevant and appropriate because this regulation is administrative in nature. Federal CWA requirements are complied with through the state permit requirements under the SPDES regulations (6 NYCRR 750).	No
	40 CFR 129 - Toxic Pollutant Effluent Standards	Promulgated federal regulation that provides effluent standards for Aldrin/Dieldrin, DDT, Endrin, Toxaphene, Benzidine, and PCBs into navigable waters.	Not applicable, relevant or appropriate since Aldrin/Dieldrin, DDT, Endrin, Toxaphene, Benzidine, or PCBs have not been identified as chemical parameters of interest (CPOIs) for this site.	No
	40 CFR 136 - Guidelines Establishing Test Procedures for The Analysis Of Pollutants	Federal guidance providing test procedures for NPDES programs.	Potentially relevant or appropriate for water discharges.	Yes
	40 CFR 403 - General Pretreatment Regulations Fof Existing And New Sources of Pollution	Federal pretreatment requirements for water discharges to POTWs or	Potentially applicable for alternatives where water is discharged to the sewer or directly to a POTW.	Yes
Modifications in streams	6 NYCRR 608 - Use and Protection Of Waters	Promulgated state regulation that provides requirements for the disturbance of protected (classified) streams. Provides restrictions on excavation and placement of fill in navigable waters.	No excavation or filling of river anticipated as part of alternatives.	No
Modifications in streams	16 USC 661 - Fish and Wildlife Coordination Act	Requires protection of fish and wildlife in a stream when performing activities that modify a stream or river.	No modifications to river anticipated as part of alternatives.	No

Table 1. Evaluation of Potential SCGs.

Medium/Location/ Action	Citation	Requirements	Comments	Potential SCG
Potential action-specific SCGs (continued)				
Landfilling of solid wastes	6 NYCRR 360. - Solid Waste Management Facilities Landfill Closure	Promulgated state regulation that provides requirements for construction of the final cover of a solid waste landfill.	Landfill closure is not anticipated to be a component of alternatives.	No
	40 CFR Part 257 - Criteria for Classification of Solid Waste Disposal Facilities and Practices	Promulgated federal regulation that provides criteria for solid waste disposal facilities to protect health and the environment.	Potentially applicable to alternatives where excavated material are consolidated onsite.	Yes
Generation and management of solid waste	6 NYCRR 360 - Solid Waste Management Facilities	Promulgated state regulation that provides requirements for management of solid wastes, including disposal and closure of disposal facilities.	Potentially applicable to alternatives including disposal of wastes or residuals generated by treatment processes.	Yes
Land disposal	6 NYCRR 376 - Land Disposal Restrictions	Promulgated federal and state regulations that provide treatment standards to be met prior to land disposal of hazardous wastes.	No hazardous waste anticipated at the site.	No
	40 CFR Part 268 - Land Disposal Restrictions			
	62 FR 25997 - Phase IV Supplemental Proposal on Land Disposal of Mineral Processing Wastes			
Generation of waste	40 CFR 261 - Identification and Listing of Hazardous Waste	Promulgated federal regulation that defines constituent levels that require management of waste as hazardous waste.	Potentially applicable when idenfiying nature of generated wastes.	Yes
General excavation	6 NYCRR 257 - Air Quality Standards	Promulgated state regulation that provides specific limits on generation of SO2, particulates, CO2, photochemical oxidants, hydrocarbons (non-methane), NO2, fluorides, beryllium and H2S from point sources.	No point source air emissions anticipated as part of alternatives.	No
	40 CFR Part 50.1 - 50.12 - National Ambient Air Quality Standards	Promulgated federal regulation that provides air quality standards for pollutants considered harmful to public health and the environment. The six principle pollutants are carbon monoxide, lead, nitrogen dioxide, particulates, ozone, and sulfur oxides.	Potentially applicable to alternatives during which dust generation may result, such as during earth moving, grading, and excavation.	Yes
	NYS TAGM 4031 - Dust Suppressing and Particle Monitoring at Inactive Hazardous Waste Disposal Sites	Unpromulgated state guidance document that provides limitations on dust emissions.	Potentially applicable where more stringent than air-related promulgated standards.	Yes
Construction	29 CFR Part 1910.120 - Occupational Safety and Health Standards - Hazardous Waste Operations and Emergency Response	Promulgated federal regulation requiring that remedial activities must be in accordance with applicable OSHA requirements.	Potentially applicable for construction activities.	Yes
	29 CFR Part 1926 - Safety and Health Regulations for Construction	Promulgated federal regulation requiring that remedial construction activities must be in accordance with applicable OSHA requirements.	Potentially applicable for construction activities.	Yes

Table 1. Evaluation of Potential SCGs.

Medium/Location/ Action	Citation	Requirements	Comments	Potential SCG
Potential action-specific SCGs (continued)				
Transportation	6 NYCRR 364 - Waste Transporter Permits	Promulgated state regulation requiring that hazardous waste transport must be conducted by a hauler permitted under 6 NYCRR 364.	No hazardous waste anticipated at the site. Potentially applicable for alternatives including waste transportation.	Yes
	49 CFR 107, 171-174 and 177-179 - Department of Transportation Regulations	Hazardous waste transport to offsite disposal facilities must be conducted in accordance with applicable DOT requirements.	No hazardous waste anticipated at the site. No hazardous wastes are anticipated to be transported for the alternatives.	No
Thermal treatment	NYSDEC TAGM 4061 (DER-4) - Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment from Former Manufactured Gas Plants (MGPs)	Provides criteria for excluding coal tar waste and impacted soils from former MGPs which exhibit the hazardous characteristic for benzene (D018) from the hazardous requirements of 6 NYCRR parts 370 - 374 and 376 when destined for destined for thermal treatment.	Potentially applicable for site soil intended to be treated via thermal treatment.	Yes

Table 2. Evaluation of Remedial Technologies and Process Options for Soil.

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	DESCRIPTION	IMPLEMENTABILITY	EFFECTIVENESS	RELATIVE COST	RETAINED OR NOT RETAINED FOR FURTHER EVALUATION
No Action	None	No action	No action.	Implementable.	Relies solely on natural attenuation.	No capital cost. Low O&M cost.	Required for consideration by NYSDEC Draft DER-10, Technical Guidance for Site Investigation and Remediation.
Institutional Controls	Use restrictions	Property barriers	Restricting access to a site via property barriers such as fences and the posting of "No Trespassing" signs.	Implementable. Fencing is not consistent with current and intended future use, which includes public access to the Site.	Effective for reducing Site access to trespassers.	Low to medium capital cost. Low O&M cost.	Not retained.
		Environmental easement*	Restrictions on land uses and site activities that could result in unacceptable exposures to contaminated soil. Requires compliance with Site Management Plan.	Implementable.	Effective means of legally documenting Site use restrictions.	Low capital cost. No O&M cost.	Retained.
		Site Management Plan*	Documentation of Site use restrictions and provisions for continued operation and monitoring of the remedy.	Implementable.	Effective means of documenting institutional and engineering controls and operations, monitoring, and maintenance activities.	Low capital cost. Low O&M cost.	Retained.
Containment	Capping	Asphalt/Concrete cover	Application of a layer of asphalt or concrete over impacted soils.	Implementable.	Effective means of preventing contact with Site soil. May reduce the mobility of contaminants by reducing infiltration. Asphalt cover is consistent with current and future Site uses. Long-term effectiveness requires ongoing maintenance.	Medium capital cost. Medium O&M cost.	Retained.
		Low permeability cover*	Application of asphalt and low permeability layer over impacted soils.	Implementable.	Effective means of preventing contact with Site soil. May reduce the mobility of contaminants by reducing infiltration. Asphalt cover is consistent with current and future Site uses. Long-term effectiveness requires ongoing maintenance.	Medium capital cost. Medium O&M cost.	Retained.
		Cover	Restoration of surface using topsoil and seeding.	Implementable	Effective means of preventing contact with Site soil. Long-term effectiveness requires ongoing maintenance.	Low capital cost. Low O&M cost.	Retained.
	Subsurface barrier wall	Ground water cut-off wall constructed using slurry wall techniques	Soil- or cement-bentonite slurry wall placed around the area of contamination to contain impacted soil. Should extend into a confining layer.	Not easily implementable due to Site logistics. Access for installation to depth of confining layer is limited. Surface and subsurface structures may impede installation. Excavated soil likely not reusable in wall construction.	Effective means of containing impacted material.	High capital cost. No O&M cost.	Not retained.
		Sheet pile cut-off wall*	Sheet piles installed around the area of contamination to contain impacted materials. Sheet pile materials include HDPE, fiberglass, vinyl, and steel. Should extend into a confining layer.	Potentially implementable. Surface and subsurface structures may complicate installation.	Effective means of containing impacted material.	High capital cost. No O&M cost.	Retained.

Table 2. Evaluation of Remedial Technologies and Process Options for Soil.

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	DESCRIPTION	IMPLEMENTABILITY	EFFECTIVENESS	RELATIVE COST	RETAINED OR NOT RETAINED FOR FURTHER EVALUATION
In Situ Treatment	Thermal	Dynamic underground stripping and hydrous pyrolysis/oxidation (DUS/HPO)	Injection of steam into the subsurface to mobilize contaminants and NAPL. Mobilized contaminants are then collected, condensed, and treated.	Presence of underground MGP structures may impede technology use.	A pilot study may be required to determine effectiveness. Process may result in migration of contaminants.	High capital costs. No O&M costs.	Not retained.
		Conductive heating (thermal desorption)	Electrical heaters are placed within thermal wells. Heat is transferred via conduction. Vaporized contaminants are collected within vacuum wells and treated *ex situ.*	Potentially implementable. Potential impacts to Oswego River due to potential material mobilization would need to be evaluated.	Effective for treating Site contaminants. Process may result in migration of contaminants.	High capital costs. No O&M costs.	Not retained.
	Immobilization	Solidification/Stabilization	Contaminants are physically bound or enclosed within a solidified mass (solidification), or chemical reactions are induced between the stabilizing agent and contaminants to reduce their mobility (stabilization).	Implementation would be difficult due to lack of space for staging and proximity of residences. Subsurface structures would have to be removed prior to implementation.	A pilot study would be required to determine effectiveness.	High capital costs. No O&M costs.	Not retained.
	Chemical	Chemical Oxidation	Injection of oxidation agents such as hydrogen peroxide, ozone, or permanganate to oxidize/destroy organic contaminants	Implementable.	Effective for oxidizing VOCs in saturated zone. Treatability study may be required. Multiple applications may be necessary. Could potentially disrupt natural attenuation processes.	Low capital cost. No longterm O&M cost.	Not retained.
	Biological	Enhanced *in situ* biodegradation	Injection of microbial populations, nutrient sources, and electron donors to enhance biological degradation of organic constituents.	Implementable.	Not effective for treatment of source material or NAPL. Not effective for SVOCs. Treatability study may be required. Multiple applications may be necessary.	Low capital cost. Low O&M cost.	Not retained.
Removal	Excavation	Excavation*	Physical removal of impacted soil and structures/debris. Typical excavation equipment includes backhoes, loaders, and/or dozers. Temporary support structures (*e.g.,* sheetpiling) and dewatering activities would likely be required.	Implementable. Would likely require live-loading of dump trucks for transport from the Site due to space limitations.	Effective means of removing contaminated soil.	High capital cost. No O&M cost.	Retained.
Ex Situ On-Site Treatment	Immobilization	Solidification/Stabilization	Contaminants are physically bound or enclosed within a solidified mass (solidification), or chemical reactions are induced between the stabilizing agent and contaminants to reduce their mobility (stabilization).	Not implementable due to space limitations and residential surroundings. Odors and emissions may be difficult to control.	A pilot study would be required to determine effectiveness.	Medium capital cost. No O&M cost.	Not retained.

Table 2. Evaluation of Remedial Technologies and Process Options for Soil.

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	DESCRIPTION	IMPLEMENTABILITY	EFFECTIVENESS	RELATIVE COST	RETAINED OR NOT RETAINED FOR FURTHER EVALUATION
Ex Situ On-Site Treatment (continued)	Thermal Destruction	Low temperature thermal desorption	Excavated soils are heated to between 90 and 320 °C (200 to 600 °F) to desorb organic compounds from the soil into an induced airflow. An air emissions control system is then used to treat the off gas. Treated soils are returned to the subsurface at the Site.	Not implementable due to space limitations and residential surroundings.	Effective means of volatilizing organic constituents.	Medium capital cost. No O&M cost.	Not retained.
		Incineration	A mobile incineration unit is used to heat excavated soils to high temperatures (1600-2200 °F) to volatilize and combust organic constituents. Treated soils are returned to the subsurface at the Site.	Not implementable due to space limitations and residential surroundings.	Effective means of volatilizing organic constituents. Off gas control and ash disposal is required.	High capital cost. No O&M cost.	Not retained.
Off-Site Treatment/Disposal	Recycle/Reuse	Asphalt Concrete Batch Plant	Excavated soil is transported to an off-site location where it is used as a raw material in asphalt concrete paving mixtures.	Implementable, although permitted facilities and demand are limited. Would likely require live-loading of dump trucks for transport from the Site due to space limitations.	Effective means of volatilizing or encapsulating organic constituents.	Medium capital cost. No O&M cost.	Not retained.
		Brick/Concrete Manufacture	Excavated soil is transported to an off-site location where it is used as a raw material in the manufacture of bricks or concrete.	Implementable, although demand is limited. Would likely require live-loading of dump trucks for transport from the Site due to space limitations.	Effective means of volatilizing or vitrifying organic constituents.	Medium capital cost. No O&M cost.	Not retained.
		Co-Burn in utility boiler	Excavated soil is transported to an off-site location where it is blended with feed coal and burned in a utility boiler.	Implementable, although the energy content of the excavated soil may not be sufficient for this use. Would likely require live-loading of dump trucks for transport from the Site due to space limitations.	Effective means of destroying organic constituents.	Medium capital cost. No O&M cost.	Not retained.
	Treatment	Low Temperature Thermal Desorption	Excavated soil is transported off-site to a permitted treatment facility where it is heated to between 90 and 320 °C (200 to 600 °F) to desorb organic compounds from the soil into an induced airflow. An air emissions control system is then used to treat the off gas.	Implementable. Would likely require live-loading of dump trucks for transport from the Site due to space limitations.	Effectively treats organic constituents.	Medium capital cost. No O&M cost.	Retained.
	Disposal	Commercial landfill*	Transport and disposal of excavated soil at an off-site permitted landfill.	Implementable. Would likely require live-loading of dump trucks for transport from the Site due to space limitations. May require stabilization prior to acceptance at a landfill.	Effective method of disposal. Minimizes on-site and off-site constituent migration.	Medium capital cost. No O&M cost.	Retained.

Notes: * Denotes representative technology.
Shading denotes not retained for further evaluation.

Table 3. Evaluation of Remedial Technologies and Process Options for Ground Water.

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	DESCRIPTION	IMPLEMENTABILITY	EFFECTIVENESS	RELATIVE COST	RETAINED OR NOT RETAINED FOR FURTHER EVALUATION
No Action	None	No action	No action.	Implementable.	Relies on natural biotic and abiotic degradation to attenuate the plume.	No capital cost. Low O&M cost.	Required for consideration by NYSDEC Draft DER-10 (Technical Guidance for Site Investigation and Remediation) for baseline comparison.
Institutional Controls	Monitoring	Ground water monitoring	Periodic sampling and analysis of ground water to document changes in chemical characteristics of ground water over time.	Implementable.	Effective for monitoring changes in ground water concentrations. Useful for evaluating remedy effectiveness.	Low capital cost. Low O&M cost.	Retained.
	Use restrictions	Environmental easement	Restriction of ground water use at the Site. Ground water is not currently used	Implementable.	Effective means of legally documenting Site use restrictions.	Low capital cost. No O&M cost.	Retained.
		Site management plan	Documentation of Site use restrictions and provisions for continued operation and monitoring of the remedy.	Implementable.	Effective means of documenting institutional and engineering controls and operations, monitoring, and maintenance activities.	Low capital cost. Low O&M cost.	Retained.
Containment	Subsurface barrier wall	Ground water cut-off wall constructed using slurry wall techniques	Soil- or cement-bentonite slurry wall placed around the area of contamination to contain ground water. Should extend into a confining layer.	Not easily implementable due to Site logistics. Access for installation to depth of confining layer is limited. Surface and subsurface structures may impede installation. Excavated soil likely not reusable in wall construction.	Effective at hydraulically containing ground water if used in conjunction with ground water extraction system.	High capital cost. No O&M cost.	Not retained.
		Sheet pile cut-off wall	Sheet piles installed around the area of contamination to contain ground water. Sheet pile materials include HDPE, fiberglass, vinyl, and steel. Should extend into a confining layer.	Potentially implementable. Surface and subsurface structures may complicate installation.	Effective means of containing impacted ground water.	High capital cost. No O&M cost.	Retained.
	Sewer Rehabilitation	Slip Lining	Sewer is rehabiliated using liner or section replacement to reduce ground water infiltration.	Potentially implementable.	Effective means of preventing infiltration of impacted ground water.	Medium capital cost. No O&M cost.	Retained.

Table 3. Evaluation of Remedial Technologies and Process Options for Ground Water.

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	DESCRIPTION	IMPLEMENTABILITY	EFFECTIVENESS	RELATIVE COST	RETAINED OR NOT RETAINED FOR FURTHER EVALUATION
Collection	Ground water extraction	Extraction wells (vertical or horizontal)	Removal of ground water by pumping from recovery wells for hydraulic containment or mass removal.	Implementable. Space to perform water treatment is limited.	Effective at collecting ground water. Potentially effective at hydraulically controlling ground water migration, depending on well spacing. Would likely require pumping and treating large quantities of water over long periods of time. Site soil not conducive to NAPL movement.	Medium capital cost. Medium to high O&M cost.	Not retained.
		Recovery trench	Removal of ground water by pumping from recovery trench for hydraulic containment or mass removal.	Not easily implementable due to Site logistics. Access for installation and space to perform water treatment is limited.	Effective at collecting ground water and hydraulically controlling ground water flow off-site. Would likely require pumping and treating large quantities of water over long periods of time. Site soil not conducive to NAPL movement.	High capital cost. Medium to high O&M cost.	Not retained.
	NAPL extraction	Passive NAPL removal	NAPL is passively collected in vertical wells and removed.	Implementable.	Not effective. To date, no recoverable NAPL has been observed on-site. NAPL appears to be bound to soil and immobile and unrecoverable.	Medium capital cost. Low O&M cost.	Not retained.
In Situ Treatment	Natural degradation	Monitored natural attenuation	Baseline and long-term monitoring of the natural biotic and abiotic degradation of organic constituents.	Implementable.	Effective at documenting natural changes in chemical characteristics over time.	Low capital Low O&M	Retained.
	Biological	Enhanced *in situ* biodegradation	Injection of microbial populations, nutrient sources, and electron donors into ground water to enhance biological degradation of organic constituents.	Implementable.	Effective for destruction of dissolved organic constituents in saturated zone. Not effective at treating source material. Treatability study would be required. Multiple applications may be necessary.	Low capital cost. Medium O&M cost.	Retained.

Table 3. Evaluation of Remedial Technologies and Process Options for Ground Water.

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	DESCRIPTION	IMPLEMENTABILITY	EFFECTIVENESS	RELATIVE COST	RETAINED OR NOT RETAINED FOR FURTHER EVALUATION
In Situ Treatment (continued)	Physical	In-well air stripping	Injection of oxygen/air into the water column within the well to volatilize constituents. Ground water circulation is performed *in situ* , with ground water entering the well at one screen and being discharged through a second screen. Air is collected and treated if necessary.	Presence of underground MGP structures would likely impede technology use.	Effective for reducing the toxicity and volume of volatile organic constituents. Not effective for heavier SVOCs.	Medium capital cost. Medium O&M cost.	Not retained.
		Air sparging	Injection of oxygen/air into the saturated zone to volatilize constituents. Emissions are then collected in the unsaturated zone using a soil vapor extraction system.	Presence of underground MGP structures would likely impede technology use.	Effective for reducing the toxicity and volume of volatile organic constituents. Not effective for heavier SVOCs.	Medium capital cost. No O&M cost.	Not retained.
	Chemical	Chemical oxidation	Injection of oxidation agents such as hydrogen peroxide, ozone, or permanganate into ground water to oxidize/destroy organic compounds.	Implementable.	Effective for oxidizing organic constituents in saturated zone. Treatability study would be required. Multiple applications may be necessary. Could potentially disrupt natural attenuation processes.	Low capital cost. Medium O&M cost.	Not retained.
	Thermal	Dynamic underground stripping and hydrous pyrolysis/oxidation (DUS/HPO)	Injection of steam into the subsurface to mobilize contaminants and NAPL. Mobilized contaminants are then collected, condensed, and treated.	Presence of underground MGP structures may impede technology use.	A pilot study may be required to determine effectiveness. Process may result in migration of contaminants.	High capital costs. No O&M costs.	Not retained.
		Conductive heating	Electrical heaters are placed within thermal wells. Heat is transferred via conduction. Vaporized contaminants are collected within vacuum wells and treated *ex situ.*	Potentially implementable. Potential impacts to Oswego River would need to be evaluated.	Effective for treating Site contaminants. Process may result in migration of contaminants.	High capital costs. No O&M costs.	Not retained.
	Permeable reactive barrier	Treatment wall	Construction of a reactive material wall, air sparging zone, or biobarrier to treat ground water as it flows through the treatment zone.	Not easily implementable due to Site logistics. Access for installation is limited.	Only effective for treating contaminants as they flow through the treatment zone. Effectiveness may be limited because contamination does not appear to be migrating off-site via ground water.	High capital cost. Medium O&M cost.	Not retained.

Table 3. Evaluation of Remedial Technologies and Process Options for Ground Water.

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	DESCRIPTION	IMPLEMENTABILITY	EFFECTIVENESS	RELATIVE COST	RETAINED OR NOT RETAINED FOR FURTHER EVALUATION
Ex Situ Treatment	Chemical	UV/Oxidation	Absorbency of UV light causes a transition of electrons and an eventual breakdown of compounds. During breakdown, chemical is more susceptible to oxidation by ozone or hydrogen peroxide. Oxidation state of undesirable chemical is changed to a less harmful species.	Implementable, although space for ground water treatment is limited. May require special provisions for the storage of process chemicals.	Effective at oxidizing MGP constituents.	High capital cost. High O&M cost.	Not retained.
		Chemical Oxidation	Addition of oxidation agents such as hydrogen peroxide and ultraviolet light to water to oxidize/destroy organic contaminants.	Implementable, although space for ground water treatment is limited. May require special provisions for the storage of process chemicals.	Effective at oxidizing MGP constituents. Disposal or regeneration of spent carbon is required.	High capital cost. Medium O&M cost.	Not retained.
	Physical	Carbon Absorption	Adsorption of organic constituents from water to activated carbon.	Implementable, although space for ground water treatment is limited.	Effective at removing MGP constituents. Disposal or regeneration of spent carbon is required.	High capital cost. High O&M cost.	Retained for short-term activities only.
		Filtration	Separation of solids from water phase using semi-permeable filter medium, such as a bag filter.	Implementable, although space for ground water treatment is limited. Disposal of solids would be required.	Effective pre-treatment process to remove suspended solids.	Low capital cost. Low O&M cost.	Retained for short-term activities only.
Disposal	Ground water discharge	Discharge to surface water	Treated ground water is discharged to a surface water body. Can be used to support long-term technologies (*e.g.,* pump and treat) or short-term activities (*e.g.,* dewatering of excavation areas).	Technically implementable. Requires NYSDEC approval and SPDES permit. Difficult to obtain permit. Would require extensive ongoing monitoring and laboratory analysis of ground water at discharge point.	Effective means of discharging treated ground water. Ground water must comply with permits limits.	Low capital cost. Medium O&M cost.	Not retained.
		Discharge to Publicly Owned Treatment Works (POTW)	Treated or untreated water is discharged to a sanitary sewer and treated at a local POTW facility. Can be used to support long-term technologies (*e.g.,* pump and treat) or short-term activities (*e.g.,* dewatering of excavation areas).	Technically implementable. Requires POTW permit for acceptance of Site water.	Effective means of discharging and treating treated or untreated ground water. May require pretreatment.	Medium capital cost. Medium O&M cost.	Retained for short-term activities only.
		Transport to commercially operated treatment/disposal facility	Treated or untreated water is collected and transported to a commercially operated treatment/disposal facility. Can be used to support long-term technologies (*e.g.,* pump and treat) or short-term activities (*e.g.,* dewatering of excavation areas).	Implementable.	Effective means of discharging ground water for treatment at a commercial treatment/disposal facility.	Medium capital cost. High O&M cost.	Retained for short-term activities only.

Notes: Shading denotes not retained for further evaluation.

National Grid
Fulton, NY Site
Feasibility Study

Table 4. Components of Remedial Alternatives.

General Response Actions	Remedial Technology - Process Option	No Further Action	Limited Excavation, Cover, and Sewer Rehabiliation	Excavation, Capping and Cutoff Wall	Excavation of soil in excess of SCOs
		1	2	3	4
Institutional Controls	Monitoring - Ground Water Monitoring	x	x	x	
	Use Restrictions - Environmental Easement	x	x	x	x
	Use Restrictions - Site Management Plan	x	x	x	x
Containment	Capping - Low permeability cover	x*	x***	x	x**
	Subsurface Barrier Wall - Sheet Pile Cut-off Wall			x	
	Sewer rehabilitation		x		
Ground Water Treatment	Enhanced natural attenuation in Area 1 (considered)		x	x	x
	Enhanced natural attenuation near sewer west of Area 2 (considered)		x		
Removal	Excavation - Removal of MGP-related structures and heavily impacted MGP-related material surrounding structures in Area 1 to the extent practicable		x	x	
	Excavation - Removal of MGP-related structures and heavily impacted MGP-related material above the ground water table in Area 2			x	
	Excavation - Removal of MGP-related structures and soil containing MGP-related COCs above 6 NYCRR Part 375 Unrestricted Use SCOs in Areas 1 and 2				x

Notes:

* Refers to existing asphalt cover for Alternative 1.

** Refers to conventional asphalt pavement cover for Alternative 4.

Table 5. Detailed Analysis of Alternatives

Criterion	Alternative 1: No further action	Alternative 2: Limited Excavation, Capping and Sewer Rehabilitation	Alternative 3: Excavation, Capping and Cutoff Wall	Alternative 4: Excavation of soil above SCOs
	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Asphalt/concrete cap -Area 2**	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Cover - Areas 1 and 2** • **Sewer rehabilitation** • **Enhanced natural attenuation (ORC) considered for Areas 1 and 2** • **Excavation -of MGP-related structures and heavily impacted MGP-related material to the extent practicable in Area 1**	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Cap - Area 2** • **Subsurface barrier wall - Area 2** • **Enhanced natural attenuation (ORC) considered for Area 1** • **Excavation -of MGP-related structures and heavily impacted MGP-related material above the ground water table in Areas 1 and 2**	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Cover - Area 2** • **Excavation -of MGP-related structures and heavily impacted MGP-related material above the 6 NYCRR Unrestricted Use SCOs in Areas 1 and 2**
Overall protection of human health and the environment				
Overall protection of human health	Protection of human health is provided through capping, institutional controls precluding ground water use and restricting activities involving exposure to soil and ground water.	Protection of human health is provided through cover, institutional controls precluding ground water use and restricting activities involving exposure to soil and ground water.	Protection of human health is provided through capping, institutional controls precluding ground water use and restricting activities involving exposure to soil and ground water. Additional protection to human health is afforded through removal of MGP-related material to depths of approximately 1.5 to 8 ft below grade.	Protection of human health is provided through capping, institutional controls precluding ground water use and restricting activities involving exposure to soil and ground water. Additional protection to human health is afforded through removal of MGP-related material exhibiting concentrations greater than Unrestricted SCOs, to the extent practicable, at the Site.
Overall protection of the environment	Off-site migration of COCs has not been observed. Existing asphalt cover would reduce infiltration that could potentially mobilize on-site ground water contamination.	Off-site migration of COCs has not been observed. Enhanced natural attenuation being considered in this Alternative provides an added measure of protection of the environment through treatment of ground water in Areas 1 and 2. Sewer rehabilitation provides an added measure of protection of the environment by minimizing the potential for off-site migration of COCs.	Off-site migration of COCs has not been observed. Cap would reduce infiltration that could potentially mobilize on-site ground water contamination. Subsurface barrier would minimize future potential migration of MGP-related COCs to off-site ground water. Enhanced natural attenuation being considered in this Alternative provides an added measure of protection of the environment through treatment of ground water in Area 1.	Off-site migration of COCs has not been observed. Removal of contaminated soil would reduce the potential for contaminant migration.
Compliance with standards, criteria, and guidance (SCGs)				
Compliance with chemical-specific SCGs	Relies on natural attenuation to achieve ground water SCGs. Relies on institutional controls and asphalt cap to address soil SCGs.	Enhanced natural attenuation being considered to achieve ground water SCGs. Relies on institutional controls and cover to address soil SCGs. Excavation of soil is an additional measure to address soil SCGs.	Enhanced natural attenuation being considered to achieve ground water SCGs in Area 1. Addresses soil SCGs through removal of soil above the ground water table. Institutional controls and asphalt cap provide additional measures to address soil SCGs. Subsurface barrier provides additional measure to address potential future excursions of ground water SCGs.	Addresses chemical-specific soil SCGs through removal of soil.
Compliance with location-specific SCGs	No potential location specific SCGs were identified.	No potential location specific SCGs were identified.	No potential location specific SCGs were identified.	No potential location specific SCGs were identified.

Table 5. Detailed Analysis of Alternatives

Criterion	Alternative 1: No further action	Alternative 2: Limited Excavation, Capping and Sewer Rehabilitation	Alternative 3: Excavation, Capping and Cutoff Wall	Alternative 4: Excavation of soil above SCOs
	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Asphalt/concrete cap -Area 2**	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Cover - Areas 1 and 2** • **Sewer rehabilitation** • **Enhanced natural attenuation (ORC) considered for Areas 1 and 2** • **Excavation -of MGP-related structures and heavily impacted MGP-related material to the extent practicable in Area 1**	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Cap - Area 2** • **Subsurface barrier wall - Area 2** • **Enhanced natural attenuation (ORC) considered for Area 1** • **Excavation -of MGP-related structures and heavily impacted MGP-related material above the ground water table in Areas 1 and 2**	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Cover - Area 2** • **Excavation -of MGP-related structures and heavily impacted MGP-related material above the 6 NYCRR Unrestricted Use SCOs in Areas 1 and 2**
Compliance with standards, criteria, and guidance (SCGs) (cont.)				
Compliance with action-specific SCGs	No actions are part of this alternative.	Construction activities would be conducted consistent with air quality standards and in accordance with OSHA safety requirements. Wastes generated would be managed, transported and disposed of in accordance with applicable state and federal requirements.	Construction activities would be conducted consistent with air quality standards and in accordance with OSHA safety requirements. Wastes generated would be managed, transported and disposed of in accordance with applicable state and federal requirements.	Construction activities would be conducted consistent with air quality standards and in accordance with OSHA safety requirements. Wastes generated would be managed, transported and disposed of in accordance with applicable state and federal requirements.
Long-term effectiveness and permanence				
Magnitude of residual risk	Minimal residual risk of exposure to ground water due to natural attenuation and use controls. Minimal risk of exposure to soil through existing capping and use controls.	Minimal residual risk of exposure to ground water due to natural attenuation and use controls. Minimal risk of exposure to soil through cover and use controls. Provides added measure to address direct contact with soil through removal of soil above ground water in Area 1.	Minimal residual risk of exposure to ground water due to natural attenuation, use controls, and subsurface barrier wall. Minimal risk of exposure to soil through capping and use controls. Provides added measure to address direct contact with soil through removal of soil above ground water in Areas 1 and 2.	Minimal residual risk of exposure to ground water due to natural attenuation and use controls. Minimal risk of exposure to soil through capping and use controls. Provides most protection from potential soil exposure through removal of soil above SCGs.
Adequacy and reliability of controls	Institutional controls are reliable means of managing risks due to ground water and soil. Monitoring of ground water provides an effective means of evaluating changes in ground water quality. Capping is a reliable means of controlling exposures to contaminated soil.	Institutional controls are reliable means of managing risks due to ground water and soil. Monitoring of ground water provides an effective means of evaluating changes in ground water quality. Cover is a reliable means of controlling exposures to contaminated soil. Excavation of soil surrounding MGP structures, to extent practicable, in Area 1 provides added measure of protection against potential exposure to contaminated soil. Sewer rehabilitation is a reliable means of minimizing the potential for off-site migration of COCs.	Institutional controls are reliable means of managing risks due to ground water and soil. Monitoring of ground water provides an effective means of evaluating changes in ground water quality. Capping is a reliable means of controlling exposures to contaminated soil. Excavation of soil above ground water in Areas 1 and 2 provides added measure of protection against potential exposure to contaminated soil. Subsurface barrier wall provides added measure of protection against potential future migration of MGP-related COCs in ground water.	Institutional controls are reliable means of managing risks due to ground water and soil. Monitoring of ground water provides an effective means of evaluating changes in ground water quality. Capping is a reliable means of controlling exposures to contaminated soil. Excavation of soil above SCGs provides added measure of protection against potential exposure to contaminated soil.

Table 5. Detailed Analysis of Alternatives

Criterion	Alternative 1: No further action	Alternative 2: Limited Excavation, Capping and Sewer Rehabilitation	Alternative 3: Excavation, Capping and Cutoff Wall	Alternative 4: Excavation of soil above SCOs
	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Asphalt/concrete cap -Area 2**	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Cover - Areas 1 and 2** • **Sewer rehabilitation** • **Enhanced natural attenuation (ORC) considered for Areas 1 and 2** • **Excavation -of MGP-related structures and heavily impacted MGP-related material to the extent practicable in Area 1**	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Cap - Area 2** • **Subsurface barrier wall - Area 2** • **Enhanced natural attenuation (ORC) considered for Area 1** • **Excavation -of MGP-related structures and heavily impacted MGP-related material above the ground water table in Areas 1 and 2**	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Cover - Area 2** • **Excavation -of MGP-related structures and heavily impacted MGP-related material above the 6 NYCRR Unrestricted Use SCOs in Areas 1 and 2**
Reduction of toxicity, mobility, or volume through treatment				
Treatment process used and materials treated	No treatment processes other than natural attenuation are used in this alternative.	Enhanced natural attenuation being considered in this alternative.	Enhanced natural attenuation for Area 1 being considered in this alternative.	No treatment processes other than natural attenuation are used in this alternative.
Amount of hazardous material destroyed or treated	Unknown amount of material destroyed through natural attenuation.	Unknown amount of material destroyed through natural attenuation. Approximately 250 cy of MGP-related material would be removed.	Unknown amount of material destroyed through natural attenuation. Approximately 3450 cy of MGP-related material would be removed.	Unknown amount of material destroyed through natural attenuation. Approximately 12,000 cy of MGP-related material would be removed.
Degree of expected reduction in toxicity, mobility, or volume	Unknown degree of reduction in toxicity, mobility, and volume due to natural attenuation. Off-site migration of COCs has not been observed. Existing cap reduces the potential mobility of contaminated ground water.	Unknown degree of reduction in toxicity, mobility, and volume due to enhanced natural attenuation. Sewer rehabilitation reduces the potential mobility of contaminated ground water. Off-site migration of COCs has not been observed. Reduction in volume by excavation of 230 CY of MGP-impacted material.	Unknown degree of reduction in toxicity, mobility, and volume due to enhanced natural attenuation. Installation of cap and subsurface barrier wall reduce the potential mobility of contaminated ground water. Off-site migration of COCs has not been observed. Reduction in volume by excavation of 3450 CY of MGP-impacted material.	Removal of 12,000 CY MGP-related material above SCOs would minimize the amount of source material at the Site. Off-site migration of COCs has not been observed.
Degree to which treatment is irreversible	Degradation of COCs is irreversible.	Degradation of COCs is irreversible.	Degradation of COCs is irreversible.	No treatment processes are used in this alternative.
Type and quantity of residuals remaining after treatment	No treatment processes are used in this alternative.	Approximately 2822 cy of MGP-related material removed in this alternative. MGP-related material remains in this alternative.	Approximately 3450 cy of MGP-related material removed in this alternative. MGP-related material remains below ground water table in this alternative.	No treatment processes are used in this alternative. Approximately 12,000 cy of MGP-related material removed in this alternative. This is anticipated to be the full extent of soil contamination at the Site.
Short-term effectiveness				
Protection of community during remedial actions	No remedial actions are considered under this alternative.	Proper health and safety measures will be established and implemented during remedial activities.	Proper health and safety measures will be established and implemented during remedial activities.	Proper health and safety measures will be established and implemented during remedial activities.
Protection of workers during remedial actions	No remedial actions are considered under this alternative.	Proper health and safety measures will be established and implemented during remedial activities.	Proper health and safety measures will be established and implemented during remedial activities.	Proper health and safety measures will be established and implemented during remedial activities.

Table 5. Detailed Analysis of Alternatives

Criterion	Alternative 1: No further action	Alternative 2: Limited Excavation, Capping and Sewer Rehabilitation	Alternative 3: Excavation, Capping and Cutoff Wall	Alternative 4: Excavation of soil above SCOs
	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Asphalt/concrete cap -Area 2**	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Cover - Areas 1 and 2** • **Sewer rehabilitation** • **Enhanced natural attenuation (ORC) considered for Areas 1 and 2** • **Excavation -of MGP-related structures and heavily impacted MGP-related material to the extent practicable in Area 1**	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Cap - Area 2** • **Subsurface barrier wall - Area 2** • **Enhanced natural attenuation (ORC) considered for Area 1** • **Excavation -of MGP-related structures and heavily impacted MGP-related material above the ground water table in Areas 1 and 2**	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Cover - Area 2** • **Excavation -of MGP-related structures and heavily impacted MGP-related material above the 6 NYCRR Unrestricted Use SCOs in Areas 1 and 2**
Short-term effectiveness (cont.)				
Environmental impacts	There are no environmental impacts expected as a result of implementation of this alternative. No environmental impacts related to greenhouse gas emissions would be anticipated with this alternative.	Dust, volatile emissions, and surface runoff controls will be instituted to minimize impacts to the environment during implementation of this alternative. Results in least environmental impacts for active remedies relative to greenhouse gas emissions originating from equipment operating at the site.	Dust, volatile emissions, and surface runoff controls will be instituted to minimize impacts to the environment during implementation of this alternative. Moderate environmental impacts related to greenhouse gas emissions would be anticipated due to excavation and transportation of soil and MGP related material from the site.	Dust, volatile emissions, and surface runoff controls will be instituted to minimize impacts to the environment during implementation of this alternative. Greatest environmental impacts related to greenhouse gas emissions would be anticipated due to excavation and transportation of soil and MGP related material from the site.
Time until remedial action objectives are achieved	The remedial action objective related to elimination or reduction in exposure to MGP-related COCs in surface and subsurface soil and ground water would be met upon implementation of institutional controls and with the existing cap. Remedial actions objectives related to elimination or reduction of the source of MGP-related ground water impacts and prevention or reduction of the potential migration of MGP-related COCs to off-site ground water would not be achieved by this alternative. Off-site migration of COCs has not been observed.	The remedial action objective related to elimination or reduction in exposure to MGP-related COCs in surface and subsurface soil and ground water would be met upon implementation of institutional controls, and with the existing cap. Soil removal would add to protection against potential direct contact. Removal of some MGP-related material from Area 1 and sewer rehabilitation provide some level of reduction of the potential migration of MGP-related COCs to off-site ground water. The remedial action objective related to elimination or reduction of the source of MGP-related ground water impacts would be addressed by the cover and removal of MGP structures and associated soil. Off-site migration of COCs has not been observed.	The remedial action objective related to elimination or reduction in exposure to MGP-related COCs in surface and subsurface soil and ground water would be met upon implementation of institutional controls, and with the existing cap. Soil removal would add to protection against potential direct contact. The remedial action objective related to reduction of the potential migration of MGP-related COCs to off-site ground water would be met upon implementation of the subsurface barrier wall. The remedial action objective related to elimination or reduction of the source of MGP-related ground water impacts would be minimally achieved by this alternative, through removal of some source material. Off-site migration of COCs has not been observed.	The remedial action objectives related to elimination or reduction in exposure to MGP-related COCs in surface and subsurface soil and ground water, reduction of the potential migration of MGP-related COCs to off-site ground water, and elimination or reduction of the source of MGP-related ground water impacts would be met upon implementation of institutional controls, soil excavation, and installation of the cap.

Table 5. Detailed Analysis of Alternatives

Criterion	Alternative 1: No further action	Alternative 2: Limited Excavation, Capping and Sewer Rehabilitation	Alternative 3: Excavation, Capping and Cutoff Wall	Alternative 4: Excavation of soil above SCOs
	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Asphalt/concrete cap -Area 2**	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Cover - Areas 1 and 2** • **Sewer rehabilitation** • **Enhanced natural attenuation (ORC) considered for Areas 1 and 2** • **Excavation -of MGP-related structures and heavily impacted MGP-related material to the extent practicable in Area 1**	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Cap - Area 2** • **Subsurface barrier wall - Area 2** • **Enhanced natural attenuation (ORC) considered for Area 1** • **Excavation -of MGP-related structures and heavily impacted MGP-related material above the ground water table in Areas 1 and 2**	• **Environmental easement** • **Site management plan** • **Ground water monitoring** • **Cover - Area 2** • **Excavation -of MGP-related structures and heavily impacted MGP-related material above the 6 NYCRR Unrestricted Use SCOs in Areas 1 and 2**
Implementability				
Ability to construct and operate the technology	There are no technologies to be constructed in this alternative.	Minimal amount of space required for decontamination and staging of equipment. Shallow excavation envisioned is readily implementable. Excavation of material subjects local residents to noise, odors, air emissions, for duration of activities. Excavation and transportation of soil would result in some local traffic congestion.	Subsurface barrier walls are readily constructable. Excavation of material complicated by potential need for sheeting, moderate construction dewatering, significant amount of space needed to stage and load excavated materials. Installation of subsurface barrier wall subjects local residents to noise and moderately impacts local traffic. Excavation of material subjects local residents to noise, odors, air emissions, for duration of activities. Excavation and transportation of soil would result in significant local traffic congestion.	Excavation of deep material complicated by need for sheeting, significant construction dewatering, significant amount of space needed to stage and load excavated materials. Excavation of material subjects local residents to noise, odors, air emissions, for duration of activities. Excavation and transportation of soil would result in significant local traffic congestion.
Reliability of technology	Institutional controls are reliable means of managing risks due to ground water and soil. Monitoring of ground water provides an effective means of evaluating changes in ground water quality. Capping is a reliable means of controlling exposures to contaminated soil.	Institutional controls are reliable means of managing risks due to ground water and soil. Monitoring of ground water provides an effective means of evaluating changes in ground water quality. A cover is a reliable means of controlling exposures to contaminated soil. Excavation is a reliable technology to remove material. PDI necessary to evaluate reliability of enhanced natural attenuation.	Institutional controls are reliable means of managing risks due to ground water and soil. Monitoring of ground water provides an effective means of evaluating changes in ground water quality. Capping is a reliable means of controlling exposures to contaminated soil. A subsurface barrier wall is a reliable means of containing ground water. Excavation is a reliable technology to remove material. PDI necessary to evaluate reliability of enhanced natural attenuation.	Institutional controls are reliable means of managing risks due to ground water and soil. Monitoring of ground water provides an effective means of evaluating changes in ground water quality. Capping is a reliable means of controlling exposures to contaminated soil. Excavation is a reliable technology to remove material.
Ease of undertaking additional remedial actions, if necessary	Additional remedial actions, if necessary, would be readily implementable.	Additional remedial actions, if necessary, would be readily implementable.	Additional remedial actions, if necessary, would be readily implementable.	Additional remedial actions, if necessary, would be readily implementable.
Ability to monitor effectiveness of remedy	Effectiveness of remedy could be monitored through sampling of ground water.	Effectiveness of remedy could be monitored through sampling of ground water.	Effectiveness of remedy could be monitored through sampling of ground water.	Effectiveness of remedy could be monitored through sampling of ground water.

Table 5. Detailed Analysis of Alternatives

Criterion	Alternative 1: No further action	Alternative 2: Limited Excavation, Capping and Sewer Rehabilitation	Alternative 3: Excavation, Capping and Cutoff Wall	Alternative 4: Excavation of soil above SCOs
	• Environmental easement • Site management plan • Ground water monitoring • Asphalt/concrete cap -Area 2	• Environmental easement • Site management plan • Ground water monitoring • Cover - Areas 1 and 2 • Sewer rehabilitation • Enhanced natural attenuation (ORC) considered for Areas 1 and 2 • Excavation -of MGP-related structures and heavily impacted MGP-related material to the extent practicable in Area 1	• Environmental easement • Site management plan • Ground water monitoring • Cap - Area 2 • Subsurface barrier wall - Area 2 • Enhanced natural attenuation (ORC) considered for Area 1 • Excavation -of MGP-related structures and heavily impacted MGP-related material above the ground water table in Areas 1 and 2	• Environmental easement • Site management plan • Ground water monitoring • Cover - Area 2 • Excavation -of MGP-related structures and heavily impacted MGP-related material above the 6 NYCRR Unrestricted Use SCOs in Areas 1 and 2
Implementability (cont.)				
Availability of off-site treatment storage and disposal services and capacities	None required.	Disposal services would be readily available for management of excavated soil.	Disposal services would be readily available for management of excavated soil.	Disposal services would be readily available for management of excavated soil.
Availability of necessary equipment, specialists, and materials	None required.	Readily available.	Readily available.	Readily available.
Costs				
Capital cost	$102,000	$3,583,000	$5,319,000	$12,036,000
Present worth of operation and maintenance cost	$400,000	$360,000	$420,000	$320,000
Approximate total net present worth cost	$502,000	$3,943,000	$5,739,000	$12,356,000

Table 6
REMEDIAL ALTERNATIVE COST SUMMARY

Alternative #1 - No Further Action

COST ESTIMATE SUMMARY

Site: National Grid
Location: Fulton, NY
Phase: Feasibility Study (-30% to +50%)
Base Year: 2008

Description: Ground water monitoring, environmental easement and a Site Management Plan

ITEM		UNIT	ESTIMATED QUANTITY	ESTIMATED UNIT COST	ESTIMATED COST		NOTES
Direct Capital Costs							
1)	Environmental Easement						
	Ground water use restrictions	LS	1	$15,000	$15,000		
	Property use restrictions	LS	1	$10,000	$10,000		
	Site information database	LS	1	$25,000	$25,000		
					SUBTOTAL:	**$50,000**	
2)	Site Management Plan	LS	1	$20,000	$20,000		
					SUBTOTAL:	**$20,000**	
					TOTAL DIRECT CAPITAL COST:	**$70,000**	
Indirect Capital Costs							
1)	Contingency (25% of Direct Capital Costs)		1	$17,500	$17,500		
					SUBTOTAL :	$17,500	
2)	Engineering (15% of Direct Capital Costs)		1	$10,500	$10,500		
					SUBTOTAL:	$10,500	
3)	Legal Fees (5% of Direct Capital Costs)		1	$3,500	$3,500		
					SUBTOTAL:	$3,500	
					TOTAL INDIRECT CAPITAL COST:	**$31,500**	
					TOTAL CAPITAL COSTS (rounded):	**$102,000**	$101,500
Operation & Maintenance Costs							
1)	Periodic Review	LS	1	$10,000	$10,000		Assumes reviews are conducted every 5 years.
2)	Site Mowing	LS	1	$3,000	$3,000		Assumes mowing 6 months of the year.
3)	Cover Maintenance	LS	1	$6,000	$6,000		Assumes annual sealing.
4)	Ground Water Monitoring (Years 1 - 30)	LS	1	$5,000	$5,000		Assumes annual sampling of 4 existing wells and analysis for MGP-related COCs.
5)	Annual Report (Years 1 - 30)	LS	1	$10,000	$10,000		
6)	Contingency (Years 5, 10, 15, 20, 25, 30)	LS	1	$2,500	$2,500		Assumes 25% of annual O&M costs.
	Contingency (Years 1-30)			$6,000	$6,000		Assumes 25% of annual O&M costs.
					PRESENT WORTH OF O&M COSTS:	**$400,000**	Assumes 30 years of O&M at a discount rate of 7%.
					APPROXIMATE TOTAL PRESENT WORTH COST (rounded):	**$502,000**	

Table 7
REMEDIAL ALTERNATIVE COST SUMMARY

Alternative 2 - Limited Excavation, Cover and Sewer Rehabilitation

O'BRIEN & GERE

COST ESTIMATE SUMMARY

Site: National Grid
Location: Fulton, NY
Phase: Feasibility Study (-30% to +50%)
Base Year: 2008

Description: Installation of a vegetated topsoil cover, sewer rehabilitation, Limited excavation varying depths (3-ft to 7-ft), enhanced natural attenuation, ground water monitoring, environmental easement, and Site Management Plan.

	ITEM	UNIT	ESTIMATED QUANTITY	ESTIMATED UNIT COST	ESTIMATED COST		NOTES
Direct Capital Costs							
1)	Environmental Easement						
	Ground water use restrictions	LS	1	$15,000	$15,000		
	Property use restrictions	LS	1	$10,000	$10,000		
	Site information database	LS	1	$25,000	$25,000		
					SUBTOTAL:	**$50,000**	
2)	Site Management Plan	LS	1	$20,000	$20,000		
					SUBTOTAL:	**$20,000**	
3)	General Conditions/Mob/Demob	MO	4	$45,000	$180,000		Includes: H&S, Trailer, Storage, Power, and Temporary Toliets.
					SUBTOTAL:	**$180,000**	
4)	Sewer Line Rehabilitation						
	Installation of Solider Pile & Lagging (100'x30')	SF	3000	$55	$165,000		To access section to repair and install sliplining.
	Construction Water Collection	MO	2	$50,000	$100,000		Allowance for Stormwater Management.
	Jetvak Truck to Clean Existing 36" Line	WK	1	$15,000	$15,000		
	Soil Excavation, Replace Line, and Backfill with new soils	LF	50	$950	$47,500		
	Slipline Existing 36" Concrete Pipe	LF	260	$420	$109,200		
					SUBTOTAL:	**$436,700**	
5)	Site Preparation						
	Pre-design Soil Boring Program	LS	1	$50,000	$50,000		
	Silt Fence	LF	1700	$2	$3,400		
	Construct and Remove Equipment Decontamination Pad	LS	1	$15,000	$15,000		
	Install Temporary Fencing	LF	1550	$25	$38,750		
	Utility Location Markout	LS	1	$10,000	$10,000		
					SUBTOTAL:	**$117,150**	
6)	Limited Excavation - Area 1 and Area 2						
	Construction and Maintenance of Soil Staging Areas	LS	1	$35,000	$35,000		Area 1 MGP related structures.
	Removal of MGP-related structures - Area 1	SF	4195	$15	$62,925		Structure removal assumed to be remaining holder foundation in Area 1.
	Removal of Concrete Pads - Area 2	SF	6070	$15	$91,050		Pad removal assumed to be existing within Area 2
	Soil Excavation and Handling	CY	2822	$40	$112,880		Soil excavation ranges 3-ft to 7-ft; No shoring assumed.
	Vapor/Odor Control	WK	6	$5,500	$33,000		
	Construction Water Management	MO	1.5	$50,000	$75,000		Allowance for Stormwater Management.
	Demarcation Layer	SF	12,000	$0.25	$3,000		
	Fill Placement, Compaction, and Grading	CY	2822	$35	$98,770		
					SUBTOTAL:	**$511,625**	
7)	Surface Restoration						
	Topsoil & Seeding Area 1 and Area 2	SF	44000	$2	$88,000		
	Removal of Existing Asphalt Area 2	SF	20500	$1	$20,500		
					SUBTOTAL:	**$108,500**	
8)	Off-Site Disposal						
	Waste Characterization	Each	8	$1,200	$9,600		Characterization samples collected at a frequency of 1 per 500 tons. 1.5 tons/CY.
	Truck Loadout Area	SF	11250	$2	$22,500		
	Soil Transportation & Disposal	Ton	4233	$100	$423,300		Disposal at a chemical waste landfill.
	Soil Transportation & Disposal (Sewer Line)	Ton	1388	$100	$138,800		
	Water Transportation & Disposal	Gal	22000	$0.96	$21,120		
	Concrete Transportation & Disposal	Ton	1850	$80	$148,000		Area 1 MGP related structures. Disposal at a solid waste landfill.
	Concrete Transportation & Disposal (Sewer Line)	Ton	5	$80	$400		
	Asphalt Transportation & Disposal	Ton	560	$80	$44,800		Dispoal at a solid waste landfill.
					SUBTOTAL:	**$808,520**	

Table 7
REMEDIAL ALTERNATIVE COST SUMMARY

Alternative 2 - Limited Excavation, Cover and Sewer Rehabilitation

O'BRIEN & GERE

COST ESTIMATE SUMMARY

Site: National Grid
Location: Fulton, NY
Phase: Feasibility Study (-30% to +50%)
Base Year: 2008

Description: Installation of a vegetated topsoil cover, sewer rehabilitation, Limited excavation varying depths (3-ft to 7-ft), enhanced natural attenuation, ground water monitoring, environmental easement, and Site Management Plan.

ITEM		UNIT	ESTIMATED QUANTITY	ESTIMATED UNIT COST	ESTIMATED COST		NOTES
9)	Enhanced natural attenuation						
	Pre-design biological investigation	LS	1	$50,000	$50,000		
	Installation of wells - Area 1	Each	2	$3,500	$7,000		
	Installation of wells - Area 2 along western property line near sewer line	Each	6	$3,500	$21,000		
					SUBTOTAL:	**$78,000**	
					TOTAL DIRECT CAPITAL COST:	**$2,310,495**	
Indirect Capital Costs							
1)	Contingency (25% of Direct Capital Costs)	LS	1	$577,624	$577,624		
					SUBTOTAL:	**$577,624**	
2)	Engineering (15% of Direct Capital Costs)	LS	1	$346,574	$346,574		
					SUBTOTAL:	**$346,574**	
3)	Construction Management (10% of Direct Capital Costs)	LS	1	$231,050	$231,050		
					SUBTOTAL:	**$231,050**	
3)	Legal Fees (5% of Direct Capital Costs)	LS	1	$115,525	$115,525		
					SUBTOTAL:	**$115,525**	
4)	Construction Performance Bond (1.25% Direct Capital Construction Costs)	LS	1	$1,464	$1,464		
					SUBTOTAL:	**$1,464**	
					TOTAL INDIRECT CAPITAL COST:	**$1,272,237**	
					TOTAL CAPITAL COST (rounded):	**$3,583,000**	
Operation & Maintenance Costs							
1)	Periodic Review	LS	1	$10,000	$10,000		Assumes reviews are conducted every 5 years.
2)	Site Mowing	LS	1	$3,000	$3,000		Assumes mowing 6 months of the year.
3)	Cover Maintenance	LS	1	$1,000	$1,000		Assumes annual sealing.
4)	Oxygen application	Each	2	$1,400	$2,800		Assumes up to 9 application points, twice a year.
5)	Ground Water Monitoring (Years 1 - 30)	LS	1	$5,000	$5,000		Assumes annual sampling of 4 existing wells and analysis for MGP-related COCs.
6)	Annual Report (Years 1 - 30)	LS	1	$10,000	$10,000		
7)	Contingency (Years 5, 10, 15, 20, 25, 30)	LS	1	$2,500	$2,500		Assumes 25% of periodic reviews O&M costs.
	Contingency (Years 1-30)			$4,750	$4,750		Assumes 25% of annual O&M costs exclusive of periodic reviews.
					PRESENT WORTH OF O&M COSTS:	**$360,000**	Assumes 30 years of O&M at a discount rate of 7%.
					APPROXIMATE TOTAL PRESENT WORTH COST (rounded):	**$3,943,000**	

Table 8
REMEDIAL ALTERNATIVE COST SUMMARY

Alternative 3 - Excavation, Capping and Cutoff Wall

O'BRIEN & GERE

COST ESTIMATE SUMMARY

Site: National Grid
Location: Fulton, NY
Phase: Feasibility Study (-30% to +50%)
Base Year: 2008

Description: Excavation of surface soil and heavily impacted MGP-related material to ground water in Areas 1 and 2, installation of low permeability membrane/asphalt cap and sheet pile cutoff wall in Area 2, enhance natural attenuation, ground water monitoirng, environmental easements, and Site Management Plan.

ITEM		UNIT	ESTIMATED QUANTITY	ESTIMATED UNIT COST	ESTIMATED COST		NOTES
Direct Capital Costs							
1)	Environmental Easement						
	Ground water use restrictions	LS	1	$15,000	$15,000		
	Property use restrictions	LS	1	$10,000	$10,000		
	Site information database	LS	1	$25,000	$25,000		
					SUBTOTAL:	**$50,000**	
2)	Site Management Plan	LS	1	$20,000	$20,000		
					SUBTOTAL:	**$20,000**	
3)	General Conditions/Mob/Demob	MO	4	$45,000	$180,000		Includes: H&S, Trailer, Storage, Power, and Temporary Toliets.
					SUBTOTAL:	**$180,000**	
4)	Subsurface Barrier Wall						Also used as shoring for excavation in Area 2.
	Pre-design Soil Boring Program	LS	1	$50,000	$50,000		
	Silt Fence	LF	1700	$2	$3,400		
	Installation of Sheet Piling (1300'x20')	SF	26000	$50	$1,300,000		Assumes interlocked construction to minimize ground water infiltration.
	Construct and Remove Equipment Decontamination Pad	LS	1	$15,000	$15,000		
	Install Temporary Fencing	LF	1550	$25	$38,750		
	Utility Location Markout	LS	1	$10,000	$10,000		
					SUBTOTAL:	**$1,417,150**	
5)	Limited Excavation						
	Construction and Maintenance of Soil Staging Areas	LS	1	$35,000	$35,000		
	Removal of MGP-related structures	SF	10265	$15	$153,975		Area 1 &2 MGP related structures.
	Soil Excavation and Handling	CY	3760	$40	$150,400		Excavation in Area 2 to ground water, depth of 4-8 ft below ground surface.
	Vapor/Odor Control	WK	8	$5,500	$44,000		Excavation in Area 1 will be benched, No Shoring necessary.
	Fill Placement, Compaction, and Grading	CY	3760	$35	$131,600		
	Construction Water Collection	MO	2	$50,000	$100,000		Allowance for Stormwater Management.
					SUBTOTAL:	**$614,975**	
6)	Surface Restoration						
	Topsoil & Seeding Area 1	SF	19500	$2	$39,000		
	Removal of Existing Asphalt Area 2	SF	20500	$1	$20,500		
	Low Permeability Asphalt Cap - Area 2	SF	24500	$4	$98,000		The asphalt cap consists of low permeability liner compacted stone and asphalt.
	Bedding Layer for Liner	SF	24500	$1	$24,500		
					SUBTOTAL:	**$182,000**	
7)	Off-Site Disposal						
	Waste Characterization	Each	11	$1,200	$13,200		Characterization samples collected at a frequency of 1 per 500 tons. 1.5 tons/CY.
	Truck Loadout Area	SF	11250	$2	$22,500		
	Soil Transportation & Disposal	Ton	5640	$100	$564,000		Disposal at a chemical waste landfill.
	Water Transportation & Disposal	Gal	30000	$0.96	$28,800		
	Concrete Transportation & Disposal	Ton	2620	$80	$209,600		Area 1 &2 MGP related structures. Disposal at a solid waste landfill.
	Asphalt Transportation & Disposal	Ton	560	$80	$44,800		Disposal at a solid waste landfill.
					SUBTOTAL:	**$882,900**	
8)	Enhanced natural attenuation						
	Pre-design biological investigation	LS	1	$50,000	$50,000		
	Installation of wells - Area 1	Each	2	$3,500	$7,000		
					SUBTOTAL:	**$57,000**	
					TOTAL DIRECT CAPITAL COST:	**$3,404,025**	

Table 8
REMEDIAL ALTERNATIVE COST SUMMARY

Alternative 3 - Excavation, Capping and Cutoff Wall

O'BRIEN & GERE

COST ESTIMATE SUMMARY

Site: National Grid
Location: Fulton, NY
Phase: Feasibility Study (-30% to +50%)
Base Year: 2008

Description: Excavation of surface soil and heavily impacted MGP-related material to ground water in Areas 1 and 2, installation of low permeability membrane/asphalt cap and sheet pile cutoff wall in Area 2, enhance natural attenuation, ground water monitoirng, environmental easements, and Site Management Plan.

ITEM		UNIT	ESTIMATED QUANTITY	ESTIMATED UNIT COST	ESTIMATED COST		NOTES
Indirect Capital Costs							
1)	Contingency (25% of Direct Capital Costs)	LS	1	$851,006	$851,006		
					SUBTOTAL:	**$851,006**	
2)	Engineering (15% of Direct Capital Costs)	LS	1	$510,604	$510,604		
					SUBTOTAL:	**$510,604**	
3)	Construction Management (10% of Direct Capital Costs)	LS	1	$340,403	$340,403		
					SUBTOTAL:	**$340,403**	
3)	Legal Fees (5% of Direct Capital Costs)	LS	1	$170,201	$170,201		
					SUBTOTAL:	**$170,201**	
4)	Contstruction Performance Bond (1.25% Direct Capital Construction Costs)	LS	1	$42,550.31	$42,550		
					SUBTOTAL:	**$42,550**	
					TOTAL DIRECT CAPITAL COST:	**$1,914,764**	
					TOTAL CAPITAL COST (rounded):	**$5,319,000**	
Operation & Maintenance Costs							
1)	Periodic Review	LS	1	$10,000	$10,000		Assumes reviews are conducted every 5 years.
2)	Site Mowing	LS	1	$3,000	$3,000		Assumes mowing 6 months of the year.
3)	Cap Maintenance	LS	1	$6,000	$6,000		Assumes annual sealing.
4)	Oxygen application	Each	2	$800	$1,600		Assumes up to 3 application points, twice a year.
6)	Ground Water Monitoring (Years 1 - 30)	LS	1	$5,000	$5,000		Assumes annual sampling of 4 existing wells and analysis for MGP-related COCs.
7)	Annual Report (Years 1 - 30)	LS	1	$10,000	$10,000		
8)	Contingency (Years 5, 10, 15, 20, 25, 30)	LS	1	$2,500	$2,500		Assumes 25% of periodic reviews O&M costs.
	Contingency (Years 1-30)	LS	1	$6,000	$6,000		Assumes 25% of annual O&M costs exclusive of periodic reviews.
					PRESENT WORTH OF O&M COSTS:	**$420,000**	Assumes 30 years of O&M at a discount rate of 7%.
					APPROXIMATE TOTAL PRESENT WORTH COST (rounded):	**$5,739,000**	

Table 9
REMEDIAL ALTERNATIVE COST SUMMARY

Alternative 4 - Excavation of Soil Exhibiting MGP COCs Above SCOs

O'BRIEN & GERE

COST ESTIMATE SUMMARY

Site: National Grid
Location: Fulton, NY
Phase: Feasibility Study (-30% to +50%)
Base Year: 2008

Description: Excavation of surface soil containing MGP-related COC above background concentrations and MGP-related material exhibiting concentrations greater than NYS Unrestricted Use SCOs in Areas 1 and 2, installation of asphalt cover, ground water monitoring, environmental easement, and Site Management Plan.

	ITEM	UNIT	ESTIMATED QUANTITY	ESTIMATED UNIT COST	ESTIMATED COST		NOTES
Direct Capital Costs							
1)	Environmental Easement						
	Ground water use restrictions	LS	1	$15,000	$15,000		
	Property use restrictions	LS	1	$10,000	$10,000		
	Site information database	LS	1	$25,000	$25,000		
					SUBTOTAL:	**$50,000**	
2)	Site Management Plan	LS	1	$20,000	$20,000		
					SUBTOTAL:	**$20,000**	
3)	General Conditions/Mob/Demob	MO	12	$45,000	$540,000		Includes: H&S, Trailer, Storage, Power, and Temporary Toliets.
					SUBTOTAL:	**$540,000**	
4)	Construct and Remove Decontamination Pad	LS	1	$15,000	$15,000		
					SUBTOTAL:	**$15,000**	
5)	Install Temporary Fencing	LF	1550	$25	$38,750		
					SUBTOTAL:	**$38,750**	
6)	Soil Removal						
	Pre-Design Investigation	LS	1	$75,000	$75,000		
	Construction and Maintenance of Soil Staging Areas	LS	1	$80,000	$80,000		
	Utility Location Markout	LS	1	$10,000	$10,000		
	Silt Fence	LF	1700	$2	$3,400		
	Removal of MGP-related structures	SF	14460	$15	$216,900		Area 1 &2 MGP related structures.
	Installation of Solider Pile & Lagging (630'x30')	SF	18900	$55	$1,039,500		
	Soil Excavation and Handling	CY	13130	$40	$525,200		Excavation to maximum depth of 28 ft below ground surface.
	Vapor/Odor Control	WK	48	$5,500	$264,000		
	Fill Placement, Compaction, and Grading	CY	13130	$35	$459,550		
	Construction Water Collection	MO	12	$50,000	$600,000		
					SUBTOTAL:	**$3,273,550**	
7)	Surface Restoration						
	Removal of Existing Asphalt	SF	20500	$1	$20,500		
	Asphalt Cover - Area 2	SF	24500	$3	$73,500		The asphalt cover consists of compacted stone and asphalt.
	Area 1 Restoration - Topsoil & Seeding	SF	19500	$2	$39,000		
					SUBTOTAL:	**$133,000**	
8)	Off-Site Disposal						
	Waste Characterization	Each	39	$1,200	$46,800		Characterization samples collected at a frequency of 1 per 500 tons. 1.5 tons/CY.
	Truck Loadout Area	SF	11250	$2	$22,500		
	Soil Transportation & Disposal	Ton	19695	$100	$1,969,500		Disposal at a chemical waste landfill.
	Water Transportation & Disposal	Gal	8928000	$0.15	$1,339,200		Ground water infiltration volume estimates based on Site hydrogeology.
	Concrete Transportation & Disposal	Ton	2620	$80	$209,600		Area 1 &2 MGP related structures. Disposal at a solid waste landfill.
	Asphalt Transportation & Disposal	Ton	560	$80	$44,800		Disposal at a solid waste landfill.
					SUBTOTAL:	**$3,632,400**	
					TOTAL DIRECT CAPITAL COST:	**$7,702,700**	

Table 9
REMEDIAL ALTERNATIVE COST SUMMARY

Alternative 4 - Excavation of Soil Exhibiting MGP COCs Above SCOs

O'BRIEN & GERE

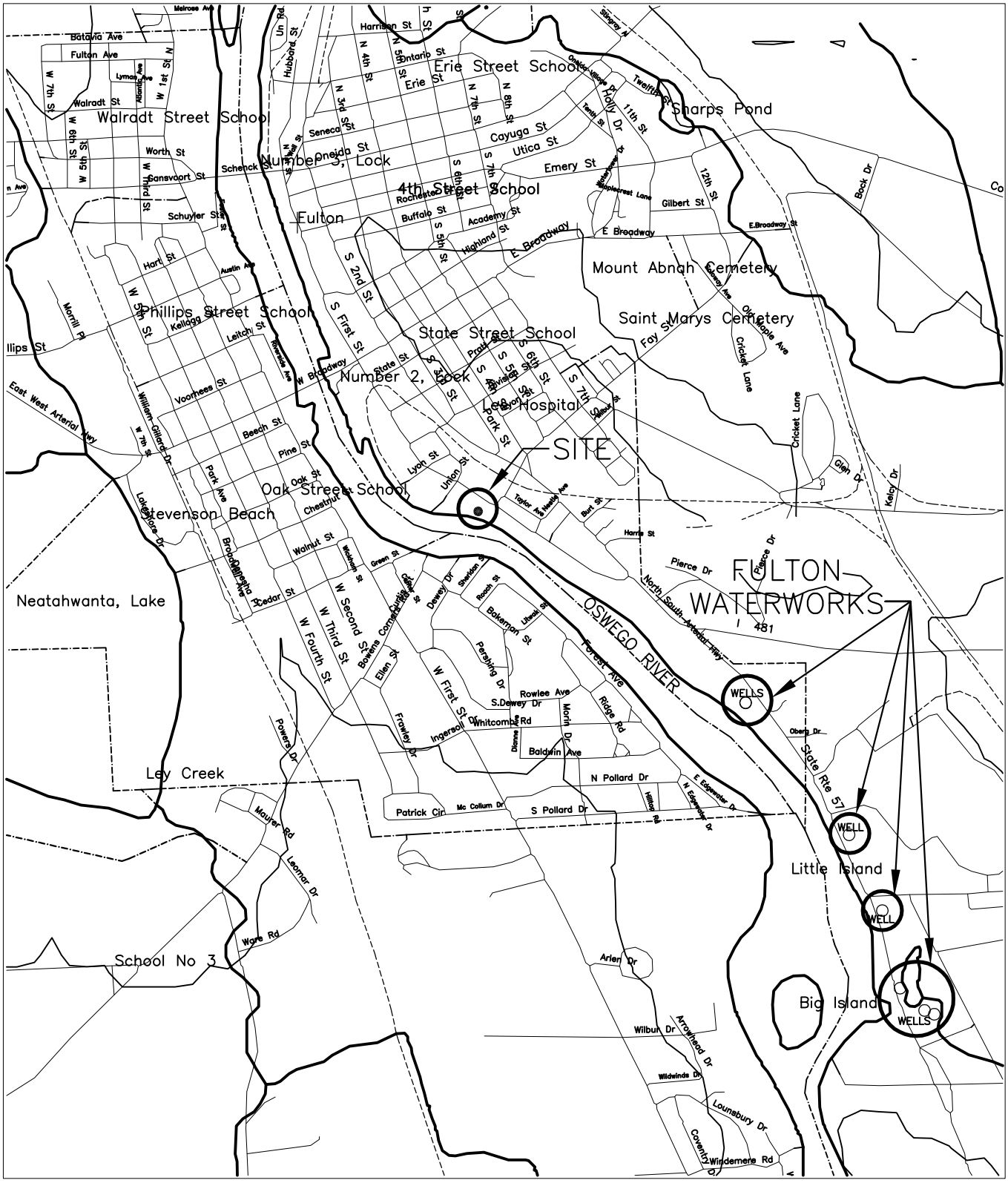
COST ESTIMATE SUMMARY

Site: National Grid
Location: Fulton, NY
Phase: Feasibility Study (-30% to +50%)
Base Year: 2008

Description: Excavation of surface soil containing MGP-related COC above background concentrations and MGP-related material exhibiting concentrations greater than NYS Unrestricted Use SCOs in Areas 1 and 2, installation of asphalt cover, ground water monitoring, environmental easement, and Site Management Plan.

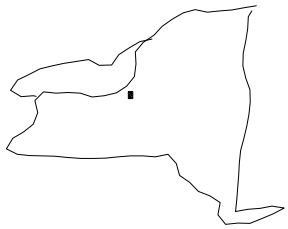
ITEM		UNIT	ESTIMATED QUANTITY	ESTIMATED UNIT COST	ESTIMATED COST		NOTES
Indirect Capital Costs							
1)	Contingency (25% of Direct Capital Costs)	LS	1	$1,925,675	$1,925,675		
					SUBTOTAL:	**$1,925,675**	
2)	Engineering (15% of Direct Capital Costs)	LS	1	$1,155,405	$1,155,405		
					SUBTOTAL:	**$1,155,405**	
3)	Construction Management (10% of Direct Capital Costs)	LS	1	$770,270	$770,270		
					SUBTOTAL:	**$770,270**	
3)	Legal Fees (5% of Direct Capital Costs)	LS	1	$385,135	$385,135		
					SUBTOTAL:	**$385,135**	
4)	Contstruction Performance Bond (1.25% Direct Capital Construction Costs)	LS	1	$96,283.75	$96,284		
					SUBTOTAL:	**$96,284**	
					TOTAL DIRECT CAPITAL COST:	**$4,332,769**	
					TOTAL CAPITAL COST (rounded):	**$12,036,000**	
Operation & Maintenance Costs							
1)	Periodic Review	LS	1	$10,000	$10,000		Assumes reviews are conducted every 5 years.
2)	Site Mowing	LS	1	$3,000	$3,000		Assumes mowing 6 months of the year.
3)	Cover Maintenance	LS	1	$6,000	$6,000		Assumes annual sealing.
4)	Annual Report (Years 1 - 30)	LS	1	$10,000	$10,000		
5)	Contingency (Years 5, 10, 15, 20, 25, 30)	LS	1	$2,500	$2,500		Assumes 25% of periodic reviews O&M costs.
	Contingency (Years 1-30)			$4,750	$4,750		Assumes 25% of annual O&M costs exclusive of periodic reviews.
					PRESENT WORTH OF O&M COSTS:	**$320,000**	Assumes 30 years of O&M at a discount rate of 7%.
					APPROXIMATE TOTAL PRESENT WORTH COST (rounded):	**$12,356,000**	

FIGURE 1



NATIONAL GRID
SOUTH FIRST STREET SITE
FULTON, NEW YORK

SITE LOCATION MAP



QUADRANGLE LOCATION

2000 0 2000

SCALE IN FEET

O'BRIEN & GERE
ENGINEERS, INC.

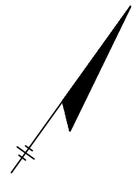
FILE NO. 1118-35165.002

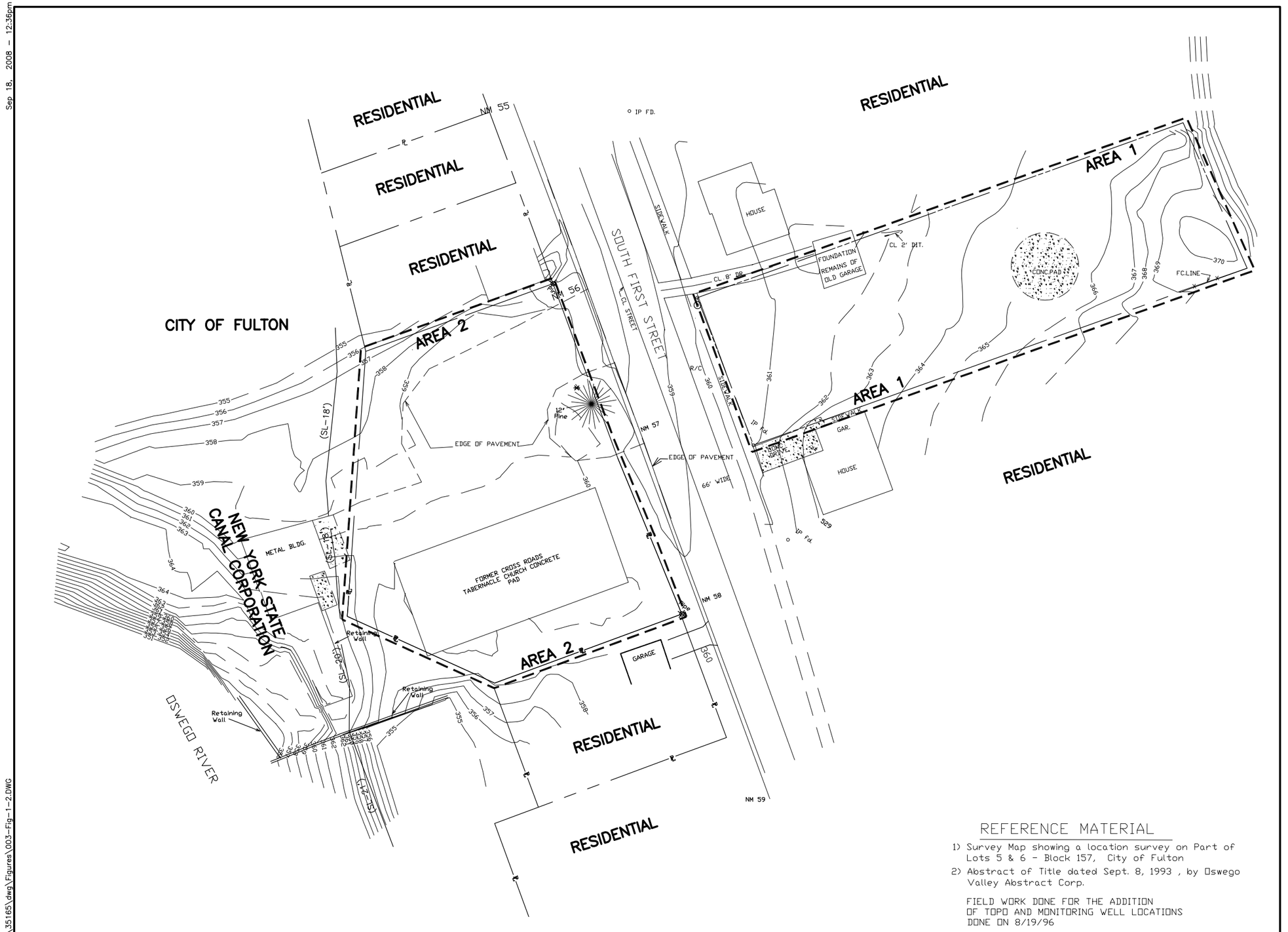
Sep 11, 2008 - 3:36pm

i:\DIV71\Projects\1118\35165\dwg\Figures\002-Fig 1-1.dwg

Sep 18, 2008 - 12:36pm

FIGURE 2





LEGEND

- PROPERTY LINES
- AREA BOUNDARIES
- RESIDENTIAL — PROPERTY OWNERSHIP
- HISTORICAL STRUCTURES

REFERENCE MATERIAL

1) Survey Map showing a location survey on Part of Lots 5 & 6 - Block 157, City of Fulton
2) Abstract of Title dated Sept. 8, 1993 , by Oswego Valley Abstract Corp.

FIELD WORK DONE FOR THE ADDITION OF TOPO AND MONITORING WELL LOCATIONS DONE ON 8/19/96

SURVEY REF. FILE NO. 3199

NATIONAL GRID
SOUTH FIRST STREET SITE
FULTON, NEW YORK

SITE MAP

1"=50' 50 0 50

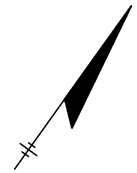
FILE NO. 1118.35165.003
SEPTEMBER 2008

O'BRIEN & GERE ENGINEERS, INC.

I:\DIV71\Projects\1118\35165\dwg\Figures\003-Fig-1-2.DWG

Sep 11, 2008 - 3:39pm

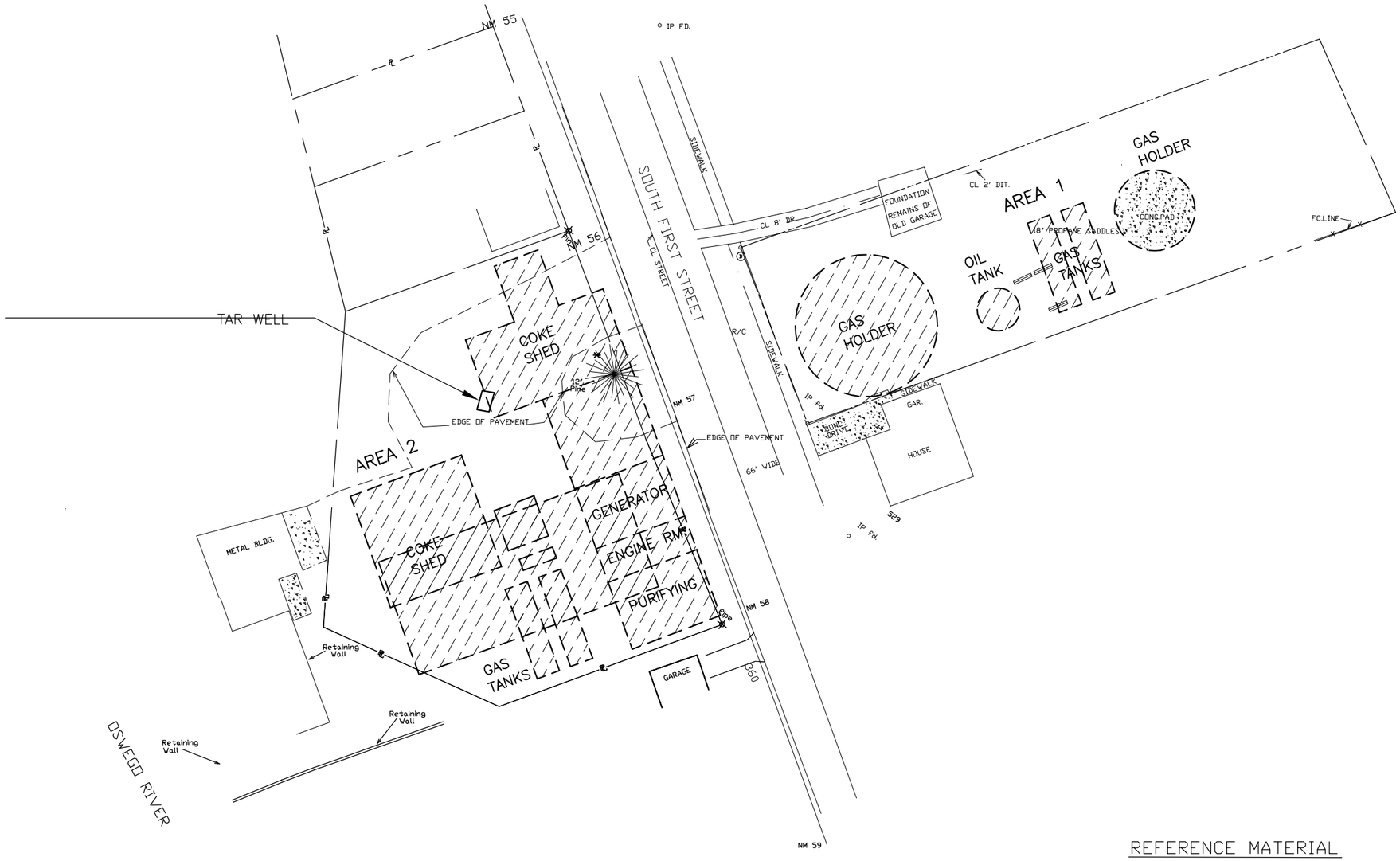
FIGURE 3



LEGEND

PL ---- PROPERTY LINES

HISTORICAL STRUCTURES



REFERENCE MATERIAL

1) Survey Map showing a location survey on Part of Lots 5 & 6 - Block 157, City of Fulton
2) Abstract of Title dated Sept. 8, 1993 , by Oswego Valley Abstract Corp.
3) Information obtained from outside sources by Niagara Mohawk (Niagara Mohawk 1996a)

FIELD WORK DONE FOR THE ADDITION OF TOPO AND MONITORING WELL LOCATIONS DONE ON 8/19/96

SURVEY REF. FILE NO. 3199

NATIONAL GRID
SOUTH FIRST STREET SITE
FULTON, NEW YORK

HISTORICAL FEATURES

1"=50' 50 0 50

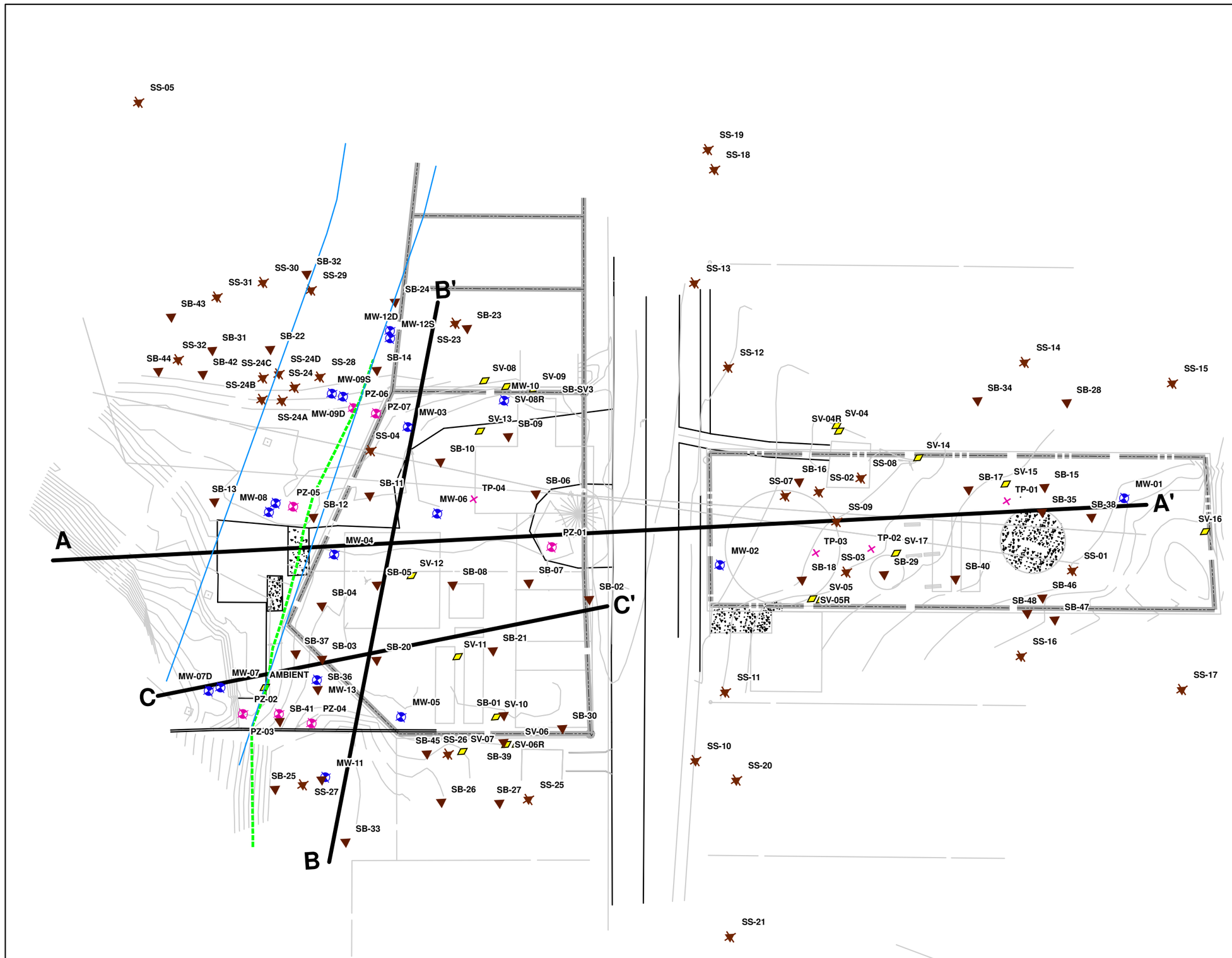
FILE NO. 1118.35165.004
SEPTEMBER 2008

O'BRIEN & GERE
ENGINEERS, INC.

I:\DIV71\Projects\1118\35165\dwg\Figures\004-Fig-1-3.dwg

T:\1118_NIMO\Fulton\MXD\35165\FS\Sample Locations - Figure 4.mxd

FIGURE 4



This document was developed in color. Reproduction in B/W may not represent the data as intended.
Soil vapor sample locations are approximate.

PLOT DATE: 09/30/08 SMT

LEGEND

- APPROXIMATE BOUNDARY OF FORMER CANAL
- APPROXIMATE SEWERLINE
- CROSS SECTION LINES

SAMPLE LOCATIONS

- MONITORING WELL
- PIEZOMETER
- SOIL BORING
- SURFACE SOIL
- TEST PIT
- SOIL VAPOR

NATIONAL GRID
SOUTH FIRST STREET
FULTON, NEW YORK

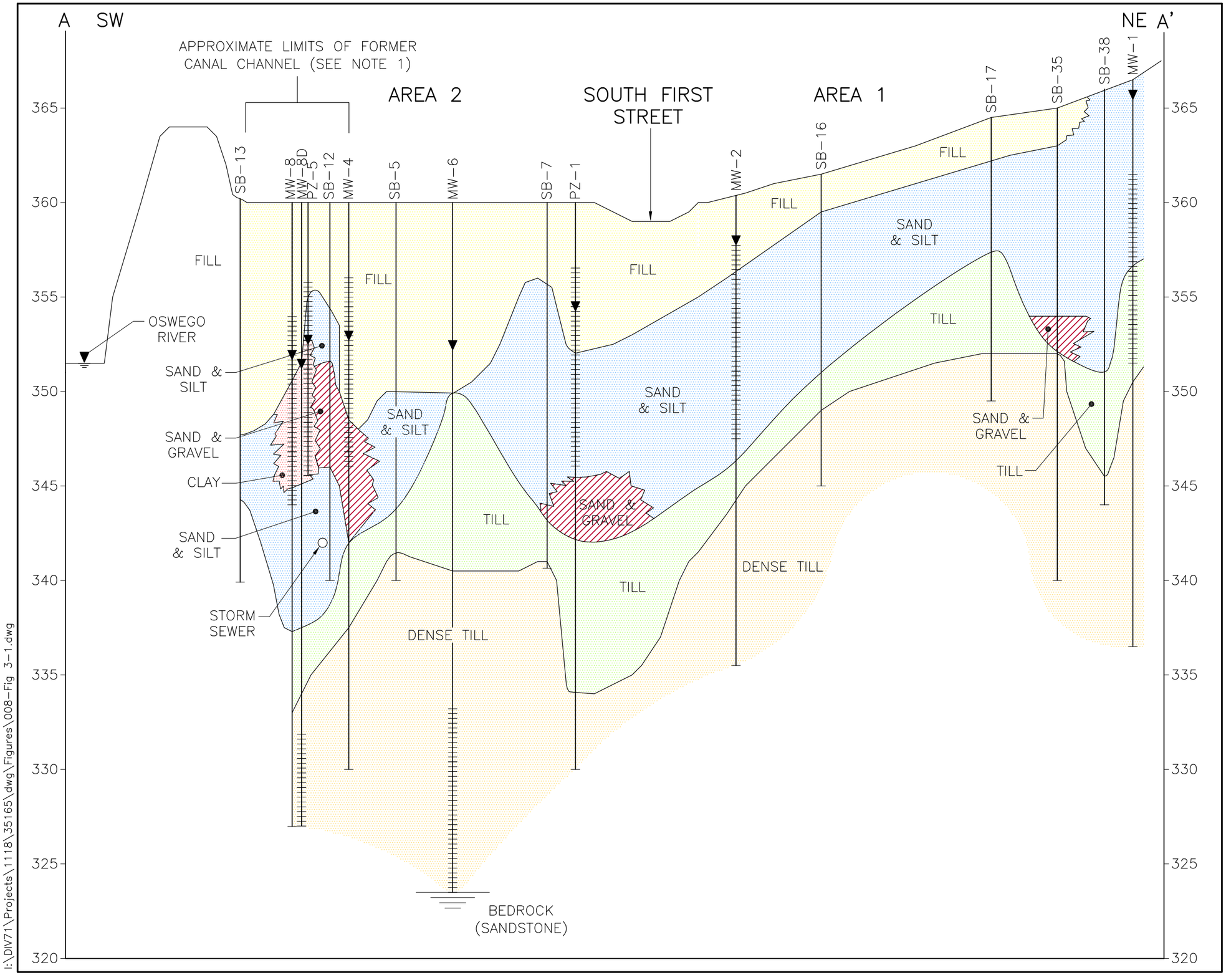
SAMPLE LOCATIONS

0 25 50 100
Feet

SEPTEMBER 2008
1118.35165

O'BRIEN & GERE ENGINEERS, INC.

FIGURE 5



I:\DIV71\Projects\1118\35165\dwg\Figures\008-Fig 3-1.dwg

DRAWING NOTE:

1. THE SUBSURFACE PROFILE IS AN INTERPRETATION OF THE DATA DERIVED FROM SOIL BORINGS CONDUCTED IN THE AREA. THE ACTUAL CONDITIONS ENCOUNTERED MAY DIFFER MARKEDLY FROM THOSE SHOWN.

LEGEND

WELL SCREEN

▼ GROUND WATER ELEVATION (MARCH 31, 2006)

NOTE:

1. CANAL LIKELY DID NOT HAVE CONSTRUCTED WALLS ADJACENT TO THE SITE.
2. OSWEGO RIVER WATER ELEVATION IS APPROXIMATE.
3. POSITION AND DEPTH OF STORM SEWER IS APPROXIMATE.

NATIONAL GRID
SOUTH FIRST STREET SITE
FULTON, NEW YORK

CROSS SECTION A–A'

1"=50' 50 0 50
HORIZONTAL SCALE IN FEET

1"=5' 5 0 5
VERTICAL SCALE IN FEET

FILE NO. 1118.35165.008
SEPTEMBER 2008

O'BRIEN & GERE ENGINEERS INC.

Sep 11, 2008 - 3:44pm

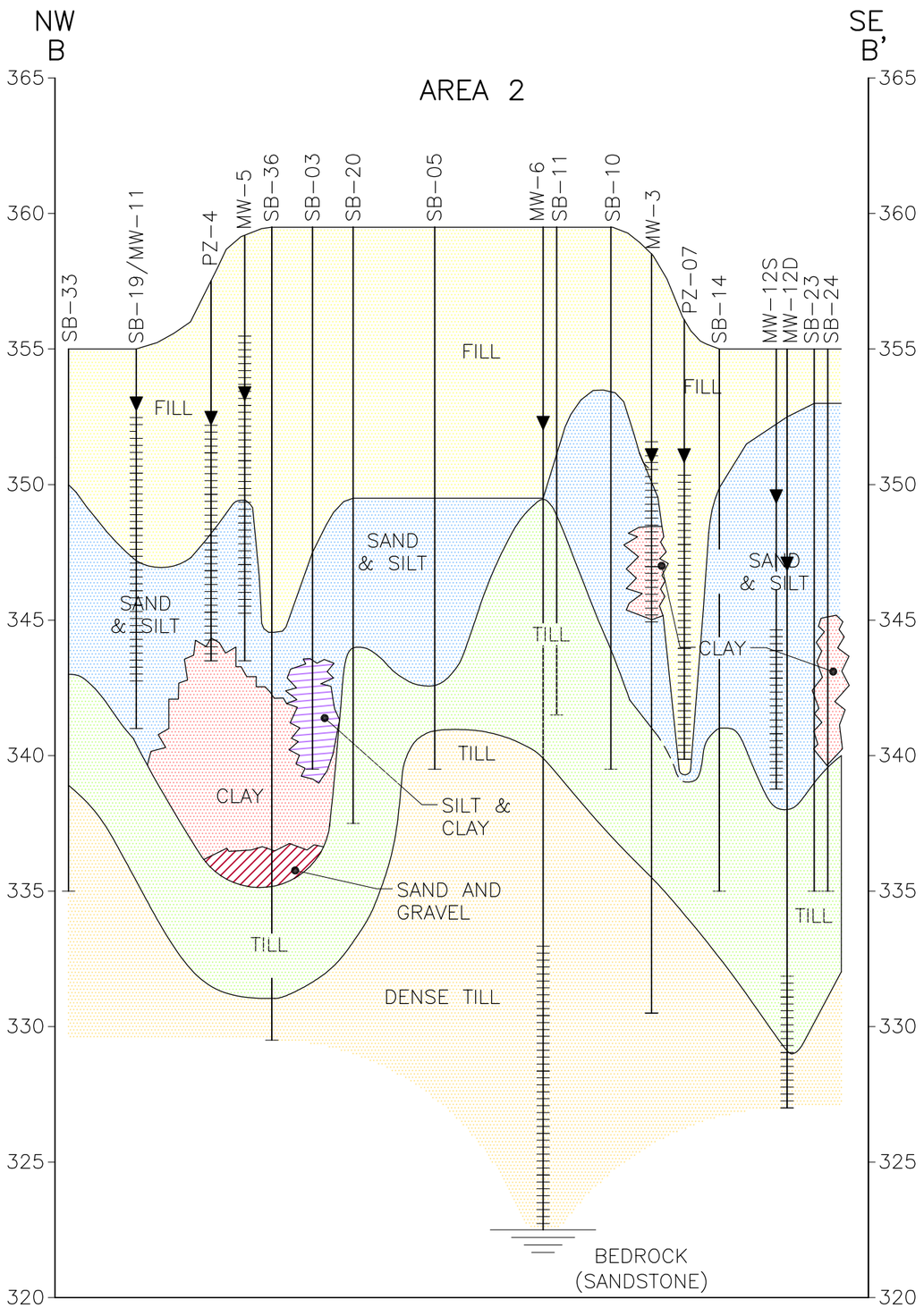


FIGURE 6

DRAWING NOTE:

1. THE SUBSURFACE PROFILE IS AN INTERPRETATION OF THE DATA DERIVED FROM SOIL BORINGS CONDUCTED IN THE AREA. THE ACTUAL CONDITIONS ENCOUNTERED MAY DIFFER MARKEDLY FROM THOSE SHOWN.

LEGEND

WELL SCREEN

▼ GROUND WATER ELEVATION (MARCH 31, 2006)

NATIONAL GRID
SOUTH FIRST STREET SITE
FULTON, NEW YORK

CROSS SECTION
B-B'

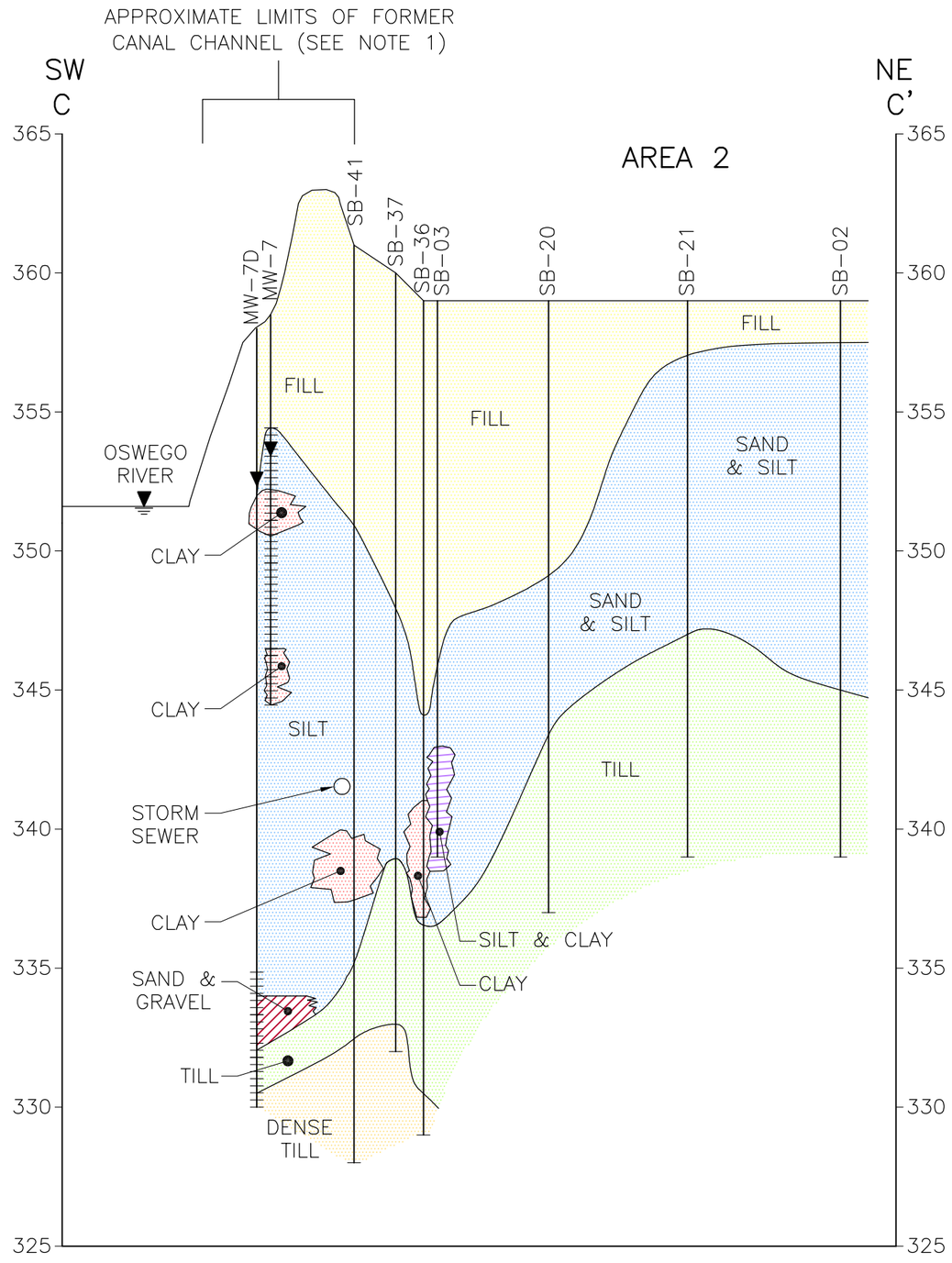
1"=50' 50 0 50
HORIZONTAL SCALE IN FEET

1"=5' 5 0 5
VERTICAL SCALE IN FEET

FILE NO. 1118.35165.009
SEPTEMBER 2008

O'BRIEN & GERE
ENGINEERS INC.

I:\DIV71\Projects\1118\35165\dwg\Figures\009-Fig 3-2.dwg



I:\DIV71\Projects\1118\35165\dwg\Figures\010-Fig 3-3.dwg

FIGURE 7

DRAWING NOTE:

1. THE SUBSURFACE PROFILE IS AN INTERPRETATION OF THE DATA DERIVED FROM SOIL BORINGS CONDUCTED IN THE AREA. THE ACTUAL CONDITIONS ENCOUNTERED MAY DIFFER MARKEDLY FROM THOSE SHOWN.

LEGEND

WELL SCREEN

▼ GROUND WATER ELEVATION (MARCH 31, 2006)

NOTE:

1. CANAL LIKELY DID NOT HAVE CONSTRUCTED WALLS ADJACENT TO THE SITE.
2. OSWEGO RIVER WATER ELEVATION IS APPROXIMATE.
3. POSITION AND DEPTH OF STORM SEWER IS APPROXIMATE.

NATIONAL GRID
SOUTH FIRST STREET SITE
FULTON, NEW YORK

CROSS SECTION C-C'

1"=50' 50 0 50
HORIZONTAL SCALE IN FEET

1"=5' 5 0 5
VERTICAL SCALE IN FEET

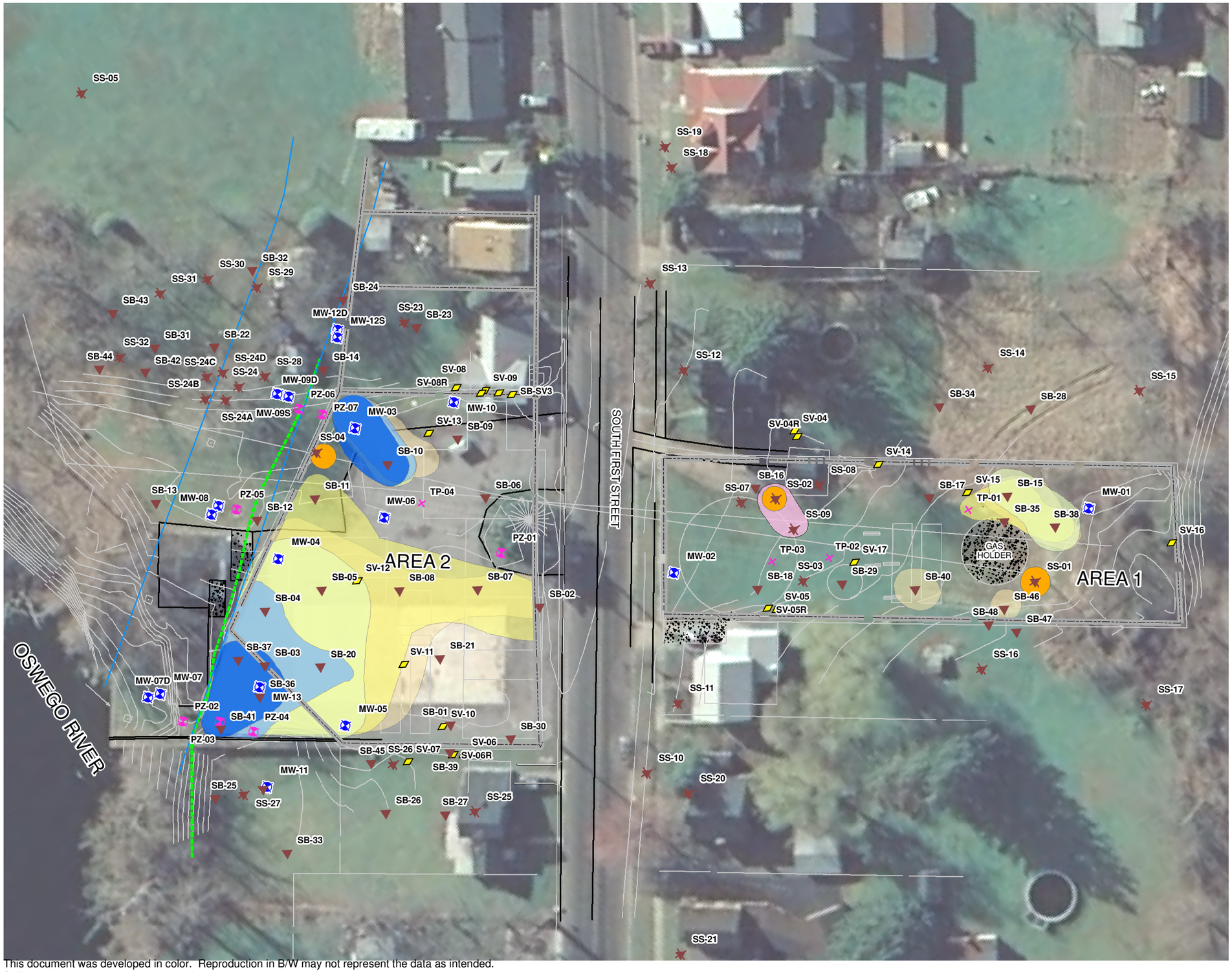
FILE NO. 1118.35165.010
SEPTEMBER 2008

O'BRIEN & GERE ENGINEERS INC.

PATH: T:\1118_NIMO\Fulton\MXD\35165\FS\MGP Impacts_Figure 8.mxd

DATE: 9/30/2008 1:51:32 PM NAME: tuckersm

FIGURE 8



This document was developed in color. Reproduction in B/W may not represent the data as intended.
Soil vapor sample locations are approximate.

LEGEND

- APPROXIMATE BOUNDARY OF FORMER CANAL
- APPROXIMATE SEWERLINE
- HISTORICAL FEATURES
- PAVED AREA
- PROPERTY LINE

SAMPLE LOCATIONS

- MONITORING WELL
- PIEZOMETER
- SOIL BORING
- SOIL VAPOR
- SURFACE SOIL
- TEST PIT

MGP Impact Depth Intervals

- >16 FT
- 12-16 FT
- 8-12 FT
- 4-8 FT
- 0-4 FT
- SURFACE SOIL (TOTAL CPAH & PAH)
- 0-2 FT Cyanide

NATIONAL GRID
SOUTH FIRST STREET
FULTON, NEW YORK

EXTENT OF MGP-IMPACTED MATERIAL IN SUBSURFACE SOIL AND SURFACE SOIL

0 25 50 100
Feet

SEPTEMBER 2008
1118.35165

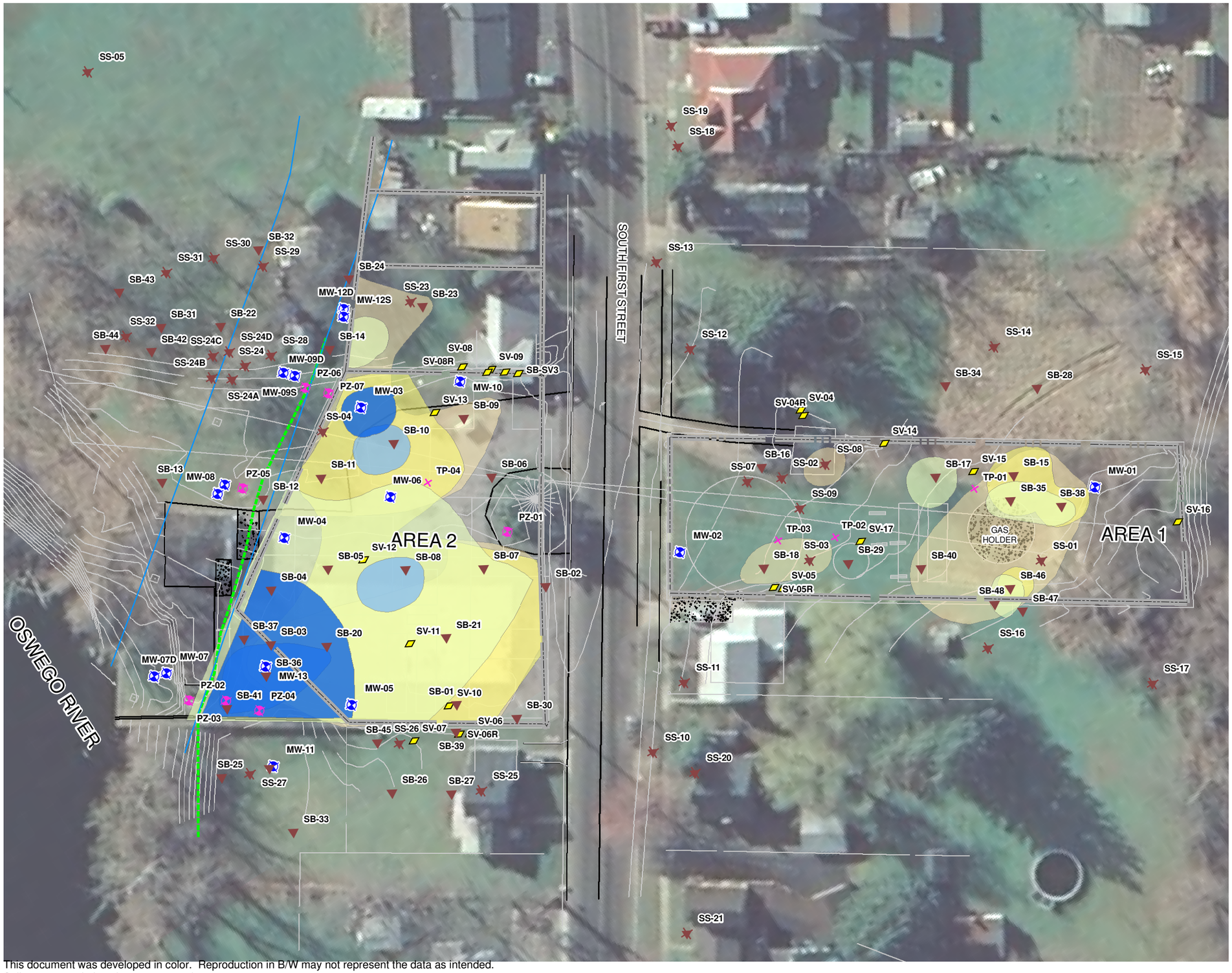
O'BRIEN & GERE ENGINEERS, INC.

PATH: T:\1118_NIMO\Fulton\MXD\35165\FS\Part 375 Unrestricted_SCOs_Figure 9.mxd

NAME: tuckersm

DATE: 9/30/2008 1:58:42 PM

FIGURE 9



LEGEND

- APPROXIMATE BOUNDARY OF FORMER CANAL
- APPROXIMATE SEWERLINE
- HISTORICAL FEATURES
- PAVED AREA
- PROPERTY LINE

SAMPLE LOCATIONS

- MONITORING WELL
- PIEZOMETER
- SOIL BORING
- SOIL VAPOR
- SURFACE SOIL
- TEST PIT

EXCEEDS PART 375 UNRESTRICTED SCOs

- >16 FT
- 12-16 FT
- 8-12 FT
- 4-8 FT
- 0-4 FT

NATIONAL GRID
SOUTH FIRST STREET
FULTON, NEW YORK

EXTENT OF SURFACE SOIL AND SUBSURFACE SOIL GREATER THAN 6NYCRR PART 375 UNRESTRICTED SCO'S

0 25 50 100
Feet

September 2008
1118.35165

O'BRIEN & GERE ENGINEERS, INC.

This document was developed in color. Reproduction in B/W may not represent the data as intended.
Soil vapor sample locations are approximate.

PATH: T:\1118_NIMO\Fulton\MXD\35165\FS\Alternative 2_Figure 10.mxd

FIGURE 10

LEGEND

- EXISTING BUILDINGS
- SURFACE RESTORATION
- HISTORICAL BUILDINGS
- APPROXIMATE BOUNDARY OF FORMER CANAL
- APPROXIMATE SEWERLINE LENGTH TO BE REHABILITATED
- APPROXIMATE SEWERLINE LENGTH TO BE REPLACED
- MGP RELATED STRUCTURE (AND ADJACENT SOIL) TO BE REMOVED

MGP IMPACTED MATERIAL TO BE REMOVED

- 0-4 FT
- 0-7 FT
- SURFACE SOIL (TOTAL CPAH & PAH)
- 0-2 FT CYANIDE
- CONCRETE PAD
- ELEVATION CONTOURS
- PAVED AREA
- PROPERTY LINE

Notes:
Alternative 2 consists of :
- Environmental easement and site management plan.
- Ground water monitoring.
- Excavation of MGP-material to the ground water table surface, to the extent practicable, at Area 1.
- Removal of MGP structures and foundations at Area 1 and Area 2 determined to contain MGP source materials to their full depth.
- Excavation and removal of soil containing visible coal tar or separate phase materials surrounding the structures and foundations in Areas 1 and 2 to depths up to 7 feet bgs, or to the extent practicable due to dewatering limitations.
- Rehabilitation of sewerline west of Area 2.
- Surface restoration at Area 2.
- Enhanced biological treatment considered at Area 1 and in vicinity of sewerline at Area 2.

This document was developed in color. Reproduction in B/W may not represent the data as intended.
Soil vapor sample locations are approximate.

NATIONAL GRID
SOUTH FIRST STREET
FULTON, NEW YORK

ALTERNATIVE 2 LIMITED EXCAVATION COVER AND SEWER REHABILITATION

0 25 50 100
Feet

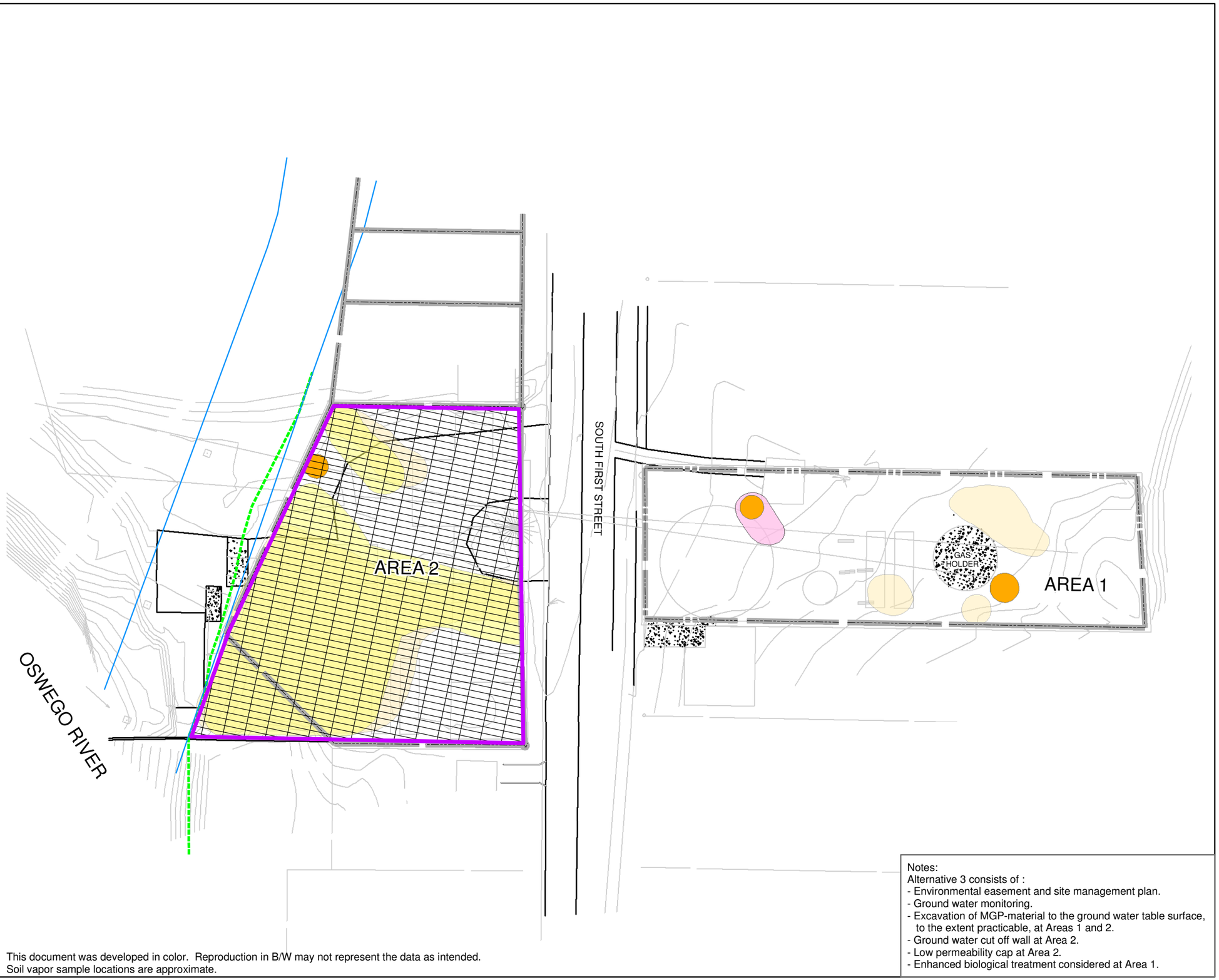
FEBRUARY 2009
1118.35165

O'BRIEN & GERE ENGINEERS, INC.

DATE: 2/25/2009 2:15:36 PM NAME: tuckersm

PATH: T:\1118_NIMO\Fulton\MXD\35165\FS\Alternative 3_Figure 11.mxd

FIGURE 11



LEGEND

- APPROXIMATE LIMITS OF GROUND WATER CUT OFF WALL
- LOW PERMEABILITY CAP
- APPROXIMATE BOUNDARY OF FORMER CANAL
- APPROXIMATE SEWERLINE
- HISTORICAL FEATURES
- PAVED AREA
- PROPERTY LINE

MGP IMPACTED MATERIAL TO BE REMOVED

- 4-8 FT
- 0-4 FT
- SURFACE SOIL (TOTAL CPAH & PAH)
- 0-2 FT CYANIDE

Notes:
Alternative 3 consists of :
- Environmental easement and site management plan.
- Ground water monitoring.
- Excavation of MGP-material to the ground water table surface, to the extent practicable, at Areas 1 and 2.
- Ground water cut off wall at Area 2.
- Low permeability cap at Area 2.
- Enhanced biological treatment considered at Area 1.

This document was developed in color. Reproduction in B/W may not represent the data as intended.
Soil vapor sample locations are approximate.

NATIONAL GRID
SOUTH FIRST STREET
FULTON, NEW YORK

ALTERNATIVE 3
EXCAVATION, CAPPING, AND CUT OF WALL

0 25 50 100
Feet

DECEMBER 2008
1118.35165

DATE: 12/10/2008 1:04:33 PM NAME: tuckersm

FIGURE 12

LEGEND

- ASPHALT COVER
- APPROXIMATE BOUNDARY OF FORMER CANAL
- APPROXIMATE SEWERLINE
- HISTORICAL FEATURES
- PAVED AREA
- PROPERTY LINE

MGP IMPACTED MATERIAL EXCEEDING PART 375 SCOs TO BE REMOVED

- >16 ft
- 12-16 ft
- 8-12 ft
- 4-8 ft
- 0-4 ft

NATIONAL GRID
SOUTH FIRST STREET
FULTON, NEW YORK

ALTERNATIVE 4
EXCAVATION AND COVER

0 25 50 100
Feet

DECEMBER 2008
1118.35165

Notes:
Alternative 4 consists of :
- Environmental easement and site management plan.
- Excavation of MGP-material exceeding 6NYCRR Part 375 SCOs for Unrestricted Land Use, to the extent practicable, at Areas 1 and 2.
- Asphalt cover at Area 2.

This document was developed in color. Reproduction in B/W may not represent the data as intended.
Soil vapor sample locations are approximate.

PATH: T:\1118_NIMO\Fulton\MXD\35165\FS\Alternative 4_Figure 12.mxd
NAME: tuckersm
DATE: 12/10/2008 1:06:09 PM

Appendix A

SCG Analysis

Table 1-1
National Grid
Fulton, New York
SCG Analysis

GROUNDWATER	Contaminants of Concern	Concentration Range Detected (ppb)	SCG[a] (ppb)	Exceedances	Number of Samples	Frequency of Exceeding SCG
VOCs	Benzene	ND - 980	1	15	51	15 of 51
	Ethylbenzene	ND - 590	5	15	51	15 of 51
	Toluene	ND - 93	5	13	51	13 of 51
	Xylene (total)	ND - 800	5	15	51	15 of 51
SVOCs	Acenaphthene	2 J - 460	20	12	51	12 of 51
	Acenaphthylene	1 J - 270 J	NC	0	51	0 of 51
	Anthracene	1 J - 220 J	50	3	51	3 of 51
	Benzo[a]anthracene	2.5 J - 200 J	0.002	0	51	0 of 51
	Benzo[a]pyrene	11 - 190 J	ND	6	51	6 of 51
	Benzo[b]fluoranthene	1.6 J - 190 J	0.002	7	51	7 of 51
	Benzo[g,h,i]perylene	5.8 J - 100 J	NC	0	51	0 of 51
	Benzo[k]fluoranthene	3.7 J - 72	0.002	5	51	5 of 51
	Chrysene	2.8 J - 180 J	0.002	8	51	8 of 51
	2-Chloronaphthalene	ND - ND	10	0	51	0 of 51
	Dibenz[a,h]anthracene	2 J - 2 J	NC	0	51	0 of 51
	Fluoranthene	1 J - 430	50	6	51	6 of 51
	Fluorene	1 J - 290 J	50	6	51	6 of 51
	Indeno[1,2,3-cd]pyrene	5.4 J - 110 J	0.002	5	51	5 of 51
	2-Methylnaphthalene	3 J - 530	NC	0	51	0 of 51
	Naphthalene	1 J - 4800	10	16	51	16 of 51
	Phenanthrene	1 J - 680	50	7	51	7 of 51
	Pyrene	1 J - 440 J	50	6	51	6 of 51
	Total CPAH	ND - 942 J	NA	0	51	0 of 51
	Total PAH	ND - 8972 J	NA	0	51	0 of 51
Metals	Cyanide	ND - 5300 J	200	11	31	11 of 31

SUBSURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)	SCG[b] (ppm)	Exceedances	Number of Samples	Frequency of Exceeding SCG
VOCs	Benzene	ND - 11 J	4.8	2	115	2 of 115
	Ethylbenzene	ND - 63	41	2	115	2 of 115
	Toluene	ND - 20	100	0	115	0 of 115
	Xylene (total)	ND - 120	100	2	115	2 of 115
	Total BTEX	ND - 193.5 J	10	10	115	10 of 115
SVOCs	Acenaphthene	0.016 J - 450	100	2	201	2 of 201
	Acenaphthylene	0.004 J - 540	100	5	201	5 of 201
	Anthracene	0.006 J - 670	100	11	201	11 of 201
	Benzo[a]anthracene**	0.015 J - 950	1	64	201	64 of 201
	Benzo[a]pyrene**	0.006 J - 770	1	64	201	64 of 201
	Benzo[b]fluoranthene**	0.004 J - 910	1	64	201	64 of 201
	Benzo[g,h,i]perylene	0.005 J - 440	100	3	201	3 of 201
	Benzo[k]fluoranthene**	0.005 J - 410	3.9	37	201	37 of 201
	Chrysene**	0.005 J - 900	3.9	47	201	47 of 201
	2-Chloronaphthalene	ND - ND	NC	0	201	0 of 201
	Dibenz[a,h]anthracene**	0.042 J - 55 J	0.33	39	201	39 of 201
	Fluoranthene	0.004 J - 1800	100	18	201	18 of 201
	Fluorene	0.004 J - 490	100	8	201	8 of 201
	Indeno[1,2,3-cd]pyrene**	0.005 J - 430	0.5	60	201	60 of 201
	2-Methylnaphthalene	0.004 J - 640	NC	17	201	17 of 201
	Naphthalene	0.024 J - 2100	100	16	201	16 of 201
	Phenanthrene	0.004 J - 1900	100	15	201	15 of 201
	Pyrene	0.005 J - 1600	100	16	201	16 of 201
	Total CPAH	ND - 4370 J	10[c]	56	201	56 of 201
	Total PAH	ND - 11341 J	500[c]	22	201	22 of 201
Metals	Cyanide	ND - 2000 J	27	0	26	0 of 26

SURFACE SOIL (0-2")	Contaminants of Concern	Concentration Range Detected (ppm)	SCG[b] (ppm)	Exceedances	Number of Samples	Frequency of Exceeding SCG
VOCs	Benzene	ND - 0.0037 J	4.8	0	18	0 of 18
	Ethylbenzene	ND - ND	41	0	18	0 of 18
	Toluene	ND - 0.0026 J	100	0	18	0 of 18
	Xylene (total)	ND - 0.00077 J	100	0	18	0 of 18
	Total BTEX	ND - 0.00077 J	10	0	18	0 of 18
SVOCs	Acenaphthene	0.005 J - 0.48 J	100	0	32	0 of 32
	Acenaphthylene	0.004 J - 5.4	100	0	32	0 of 32
	Anthracene	0.013 J - 3.4 J	100	0	32	0 of 32
	Benzo[a]anthracene	0.009 J - 22	2[d]	6	32	6 of 32
	Benzo[a]pyrene	0.009 J - 23	2[d]	9	32	9 of 32
	Benzo[b]fluoranthene	0.017 J - 50	3.1[d]	10	32	10 of 32
	Benzo[g,h,i]perylene	0.006 J - 16	100	0	32	0 of 32
	Benzo[k]fluoranthene	0.005 J - 33	3.9	3	32	3 of 32
	Chrysene	0.011 J - 25	3.9	6	32	6 of 32
	Dibenz[a,h]anthracene	0.079 J - 4.1 J	0.33	3	32	3 of 32
	Fluoranthene	0.02 J - 36	100	0	32	0 of 32
	Fluorene	0.007 J - 0.5 J	100	0	32	0 of 32
	Indeno[1,2,3-cd]pyrene	0.005 J - 16	0.8[d]	13	32	13 of 32
	2-Methylnaphthalene	0.005 J - 0.97 J	NC	0	32	0 of 32
	Naphthalene	0.007 J - 2.4 J	100	0	32	0 of 32
	Phenanthrene	0.01 J - 12	100	0	32	0 of 32
	Pyrene	0.015 J - 40	100	0	32	0 of 32
	Total CPAH	0.056 J - 156.1 J	11.24[d]	10	32	10 of 32
	Total PAH	0.119 J - 271.24 J	24.25[d]	8	32	8 of 32
Metals	Cyanide	ND - 810 J	27	1	13	1 of 13

Notes:
ppm - part per million (mg/kg)
ppb - parts per billion (ug/kg)
J - Estimate value
ND - Not detected
VOCs - Volatile Organic Compounds
SVOCs - Semi-Volatile Organic Compounds
PAHs - Poly Aromatic Hydrocarbons; Acenaphthene, Acenaphthylene, Anthracene, Benz(a)anthracene, Benz(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, 2-Chloronaphthalene, (Dibenz[a,h]anthracene, Fluoranthene, Fluorene, Ideno(1,2,3-cd)pyrene, 2-Methylnaphthalene, Naphthalene, Phenanthrene, Pyrene.
CPAHs - Carcinogenic Poly Aromatic Hydrocarbons; Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Chrysene, Dibenz[a,h]anthracene, Indeno[1,2,3-cd]pyrene.
SCGs - Standards, Criteria, and Guidance values.

[a] New York State Department of Environmental Conservation, Technical and Operational Guidance Series (1.1.1), Class GA Standards and Guidance Values, Revised June 1998.

[b] 6 NYCRR Part 375, Table 375-6.8(b): Restricted Use Soil Cleanup Objectives, Protection of Public Health, Residential, December 14, 2006.

[c] New York State Department of Environmental Conservation, Technical and Administrative Guidance Memorandum (TAGM) 4046: Recommended Soil Cleanup Objectives, January 11, 2001.

[d] Based on background conentration evaluation results presented in Remedial Investigation Report