New York State Department of Environmental Conservation

FACT SHEET

Manufactured Gas Plant Program

Syracuse - Hiawatha Boulevard
Former Manufactured Gas Plant Site
Site #734059
Hiawatha Blvd.
City of Syracuse, NY

February 2010

Remedy Proposed for Former Manufactured Gas Plant Site
Public Comment Period and Public Meeting Dates Announced

Public Meeting
March 18, 2010
7:00 pm

NYSDEC Region 7 Office Building
615 Erie Blvd. West
Syracuse, NY

NYSDEC invites you to a public meeting to discuss the remedy proposed for this site. You are encouraged to provide comments at the meeting and during the 30-day comment period described in this fact sheet.

The public is invited to comment on the remedy proposed by the New York State Department of Environmental Conservation (NYSDEC) to address environmental impacts related to the Syracuse - Hiawatha Boulevard Former Manufactured Gas Plant (MGP) Site. The site is located adjacent to the Metropolitan Sewage Treatment Plant (STP) on Hiawatha Boulevard in the City of Syracuse, Onondaga County. See the attached map for the site location. National Grid, the site owner, has entered into a consent order with NYSDEC requiring National Grid to investigate and remediate the site to a level that is protective of public health and the environment. The investigation and remediation are being performed with the oversight of the NYSDEC and the New York State Department of Health (NYSDOH).

The Proposed Remedy

The remedy proposed for the site includes the solidification of contaminated soils, enhanced bioremediation of impacted groundwater and land use restrictions on the site. The proposed remedy is described in a draft cleanup plan called a "Proposed Remedial Action Plan", developed under New York State's Manufactured Gas Plant Program. The document is available for public review at the locations identified below under "Where to Find Information".

How to Comment

NYSDEC is accepting written comments about the proposed remedy for 30 days, from **February 25, 2010** through **March 27, 2010**.

About the Manufactured Gas Plant Program:

NYSDEC has one of the most aggressive Manufactured Gas Plant (MGP) site investigation and remediation programs in the country. Since the problems associated with former MGP sites were identified, NYSDEC has been working with all the utilities on a state-wide basis to identify and address the issue of MGP sites for which they may have responsibility. This effort has resulted in approximately 235 sites identified for action by the eight utilities operating in New York State.

Currently we have multi-site orders or agreements with six utilities, including National Grid, and several other individual site volunteers, to address 222 MGP sites in NYS. Multi-site agreements are under negotiation with a seventh utility and several other responsible parties which have newly-identified sites.

NYSDEC continues to seek to identify any other possible MGP sites throughout the State.

For more information about the NYSDEC's MGP program, visit:
www.dec.ny.gov/chemical/8430.html

Submit written comments to:

Mr. Anthony Karwiel, Project Manager
NYSDEC
625 Broadway, 11th Floor
Albany, NY 12233-7014
1-866-520-2334
alkarwie@gw.dec.state.ny.us

Summary of the Proposed Remedy

The proposed remedy represents the alternative preferred by NYSDEC, NYSDOH and National Grid to address site impacts. The draft cleanup plan includes:

- the solidification of approximately 13,600 cubic yards of soil containing visual indications of coal tar and contaminant levels that exceed the cleanup levels established for the site;
- removal and transport offsite of (for disposal) approximately 3,800 cubic yards of surface cover material (asphalt pavement) and the upper several feet of soil prior to the solidification process. The soil removal will allow for the soil volume increases that occur when soil is solidified and for the placing of clean backfill over the solidified material;
- installation of a series of wells to inject oxygen and/or nutrients to enhance the natural breakdown of contaminants in the groundwater beneath the site;
- an environmental easement to restrict the use of the site to industrial use; and
- development and implementation of a site management plan.

The proposed remedy was chosen following a detailed investigation of the site and evaluation of alternatives to address MGP impacts, called a "Remedial Investigation/Feasibility Study". The proposed remedy also considers that much of the contamination was removed when the Metro STP was constructed in the 1970's and expanded in 2001-2005. Other alternatives presented in the Feasibility Study include no action, capping and the removal of contaminated soil to varying degrees. The proposed remedy will achieve the remediation goals for the site by solidifying contaminated source soils at the site and by enhancing the natural degradation of contaminates in groundwater through oxygen and/or nutrient injection. The proposed remedy will greatly reduce the source of MGP impacts to groundwater, and it will create the conditions needed to restore groundwater quality to the extent possible.

The estimated cost to implement the remedy is $10,400,000, of which the cost of construction is estimated to be $7,830,000. The remainder of the cost is associated with long term monitoring and maintenance. National Grid will be financially responsible for implementation of the remedy.

Next Steps

NYSDEC will consider public comments as it finalizes the remedy for the site. The selected remedy will be described in a document called a "Record of Decision" that will explain why the remedy was selected and respond to public comments. This document will be made available to the public (see "Where to Find Information" below). The project then moves to designing and performing the cleanup action to address the site contamination. NYSDEC will keep the public informed during the cleanup of the site.

Background

The Hiawatha Blvd. plant was operated by National Grid's predecessor companies from approximately 1924 to 1958. Gas was manufactured by heating coal. Freshly-manufactured gas had to be cooled and its impurities removed before it could be used. A coal tar resulted from these processes, some of which was released to the environment. The coal tar contains a number of chemical contaminants (similar to gasoline or fuel oil), primarily benzene, toluene, ethylbenzene, xylene (BTEX) and polycyclic aromatic hydrocarbons (PAH). The extent of MGP impacts was delineated by a series of investigations conducted by National Grid. MGP impacts were found primarily in soil and groundwater within the National Grid property.

Most of the site is covered by the Metro Sewage plant structures, asphalt or vegetation and thus direct contact with MGP-related contaminants is not likely. The surrounding area is served by public water, so exposure to MGP-impacted groundwater is not likely.

FOR MORE INFORMATION

Where to Find Information

Project documents are available at the following locations to help the public stay informed. These documents include the proposed cleanup plan for the site, called the "Proposed Remedial Action Plan", and the Remedial Investigation and Feasibility Study reports.

Onondaga County Public Library
477 S. Salina Street
Syracuse, New York 13201
(315) 435-1800
M,Th,F,S 11am-4:50pm
T,W 11am-7:20pm
Closed Sunday

NYSDEC
625 Broadway
Albany, NY 12233-7014
By appointment, contact Mr. Anthony Karwiel
1-866-520-2334

Who to Contact

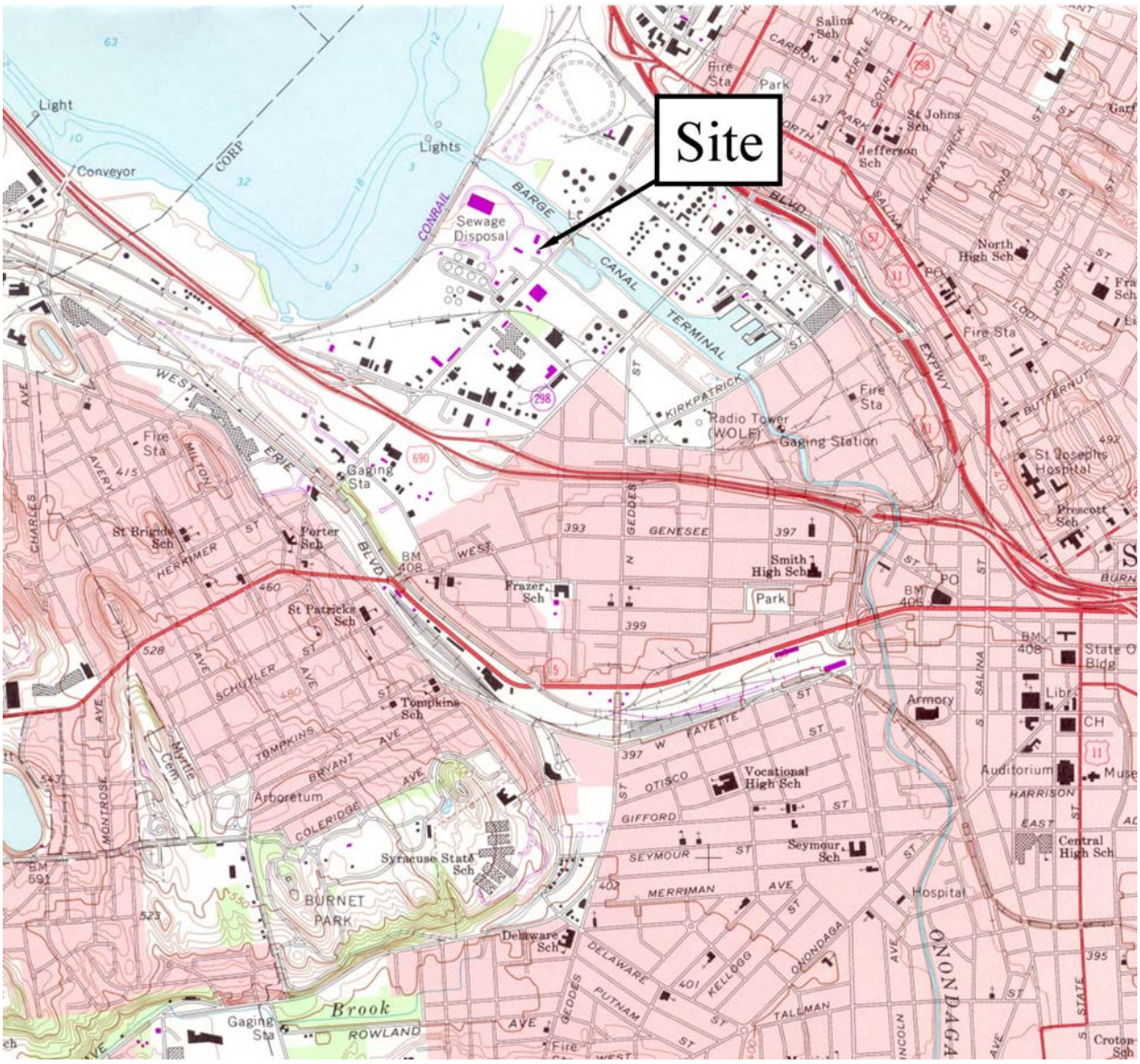
Comments and questions are always welcome and should be directed as follows:

<u>Project Related Questions</u>
Mr. Anthony Karwiel
Project Manager
NYSDEC
625 Broadway, 11th Floor
Albany, NY 12233
(518) 402-9662, alkarwie@gw.dec.state.ny.us

<u>Site-Related Health Questions</u>
Mr. Richard Jones
NYSDOH
Central Regional Office
217 S. Salina St.
Syracuse, NY 13202
(315) 477-8148, rej05@health.state.ny.us

To direct questions to National Grid, please contact:
Mr. James Morgan
Project Manager
National Grid
300 Erie Blvd., West
Syracuse, NY 13202
Phone: 315-428-3101

If you know someone who would like to be added to the site contact list, have them contact the NYSDEC project manager listed above. We encourage you to share this fact sheet with neighbors and tenants, and/or post this fact sheet in a prominent area of your building for others to see.



PROPOSED REMEDIAL ACTION PLAN
NM - Hiawatha Boulevard
Former MGP Site
Syracuse (C), Onondaga County, New York
Site No. 7-34-059

February 2010

Prepared by:

Division of Environmental Remediation
New York State Department of Environmental Conservation

PROPOSED REMEDIAL ACTION PLAN

NM - Hiawatha Boulevard Former MGP Site
Syracuse (C), Onondaga County, New York
Site No. 7-34-059
February 2010

SECTION 1: SUMMARY AND PURPOSE OF THE PROPOSED PLAN

The New York State Department of Environmental Conservation (NYSDEC), in consultation with the New York State Department of Health (NYSDOH), is proposing a remedy of the NM-Hiawatha Boulevard Former Manufactured Gas Plant (MGP) site. The presence of hazardous waste has created threats to human health and/or the environment that are addressed by this proposed remedy. As more fully described in Sections 3 and 5 of this document, the production of manufactured gas and the generation of related by-products have resulted in the disposal of hazardous wastes, including MGP tars and purifier waste. These wastes contain benzene, toluene, ethylbenzene and xylene (BTEX), as well as a number of polycyclic aromatic hydrocarbons (PAHs) and cyanide. These wastes have contaminated soils and groundwater at the site. To eliminate or mitigate this contamination, the Department proposes in-situ solidification (ISS) of on-site source areas, enhanced bioremediation of on-site groundwater contamination, development of a site management plan and institutional controls.

The proposed remedy, discussed in detail in Section 8, is intended to attain the remediation goals identified for this site in Section 6. The remedy must conform with officially promulgated standards and criteria that are directly applicable, or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, criteria and guidance are hereafter called SCGs.

This Proposed Remedial Action Plan (PRAP) identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for this preference. The NYSDEC will select a final remedy for the site only after careful consideration of all comments received during the public comment period.

The Department has issued this PRAP as a component of the Citizen Participation Plan developed pursuant to the New York State Environmental Conservation Law; Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375; Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended; and Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This document is a summary of the information that can be found in greater detail in the October 2006 "Remedial Investigation (RI) Report", the October 2009 "Feasibility Study" (FS), and other relevant documents. The public is encouraged to review the project documents, which are available at the following repositories:

Onondaga County Public Library
447 South Salina Street
Syracuse, N.Y. 13202-2499

(315) 435-1900
Hours: Daily 9:00AM - 5:00PM
Tues/Wed extended hours until 8:30PM

NYSDEC Region 7
615 Erie Boulevard West
Syracuse, New York 13204-2400

Anthony Karwiel
NYSDEC Albany Office
625 Broadway
Albany, New York 12233-7014
(518) 402-9662
Monday- Friday 8:00AM - 4:00PM

The Department seeks input from the community on all PRAPs. A public comment period has been set from February 25, 2010 through March 27, 2010 to provide an opportunity for public participation in the remedy selection process. A public meeting is scheduled for March 18, 2010 at the NYSDEC Region 7 Office Building, 615 Erie Blvd. West, Syracuse, NY beginning at 7:00 pm.

At the meeting, the results of the RI/FS will be presented along with a summary of the proposed remedy. After the presentation, a question-and-answer period will be held, during which verbal or written comments may be submitted on the PRAP. Written comments may also be sent to Mr. Karwiel at the above address through March 27, 2010.

The Department may modify the proposed remedy or select another of the alternatives presented in this PRAP, based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives identified here.

Comments will be summarized and addressed in the responsiveness summary section of the Record of Decision (ROD). The ROD is the NYSDEC's final selection of the remedy for this site.

SECTION 2: SITE LOCATION AND DESCRIPTION

The NM Hiawatha Boulevard Former MGP Site is located in an industrial area at the southeast end of Onondaga Lake, within the City of Syracuse, Onondaga County, New York (see Figure 1). The former MGP was located on the northern portion of property currently owned by Onondaga County and occupied by the Metropolitan Sewage Treatment Plant (Metro STP). Much of the site is currently occupied by sewage treatment structures, including clarifiers, aeration tanks and an ammonia and phosphorus removal facility. The remainder of the site is primarily covered by driveways, paved parking lots, and a county maintenance building. The existing site layout and limits of the former MGP are shown on Figure 2. The former MGP is approximately twenty three acres in area, and is bounded to the north by the barge canal, to the east by Hiawatha Boulevard, to the south by the Metro STP, and to the west by Onondaga Lake. The site is a potential subsite of the Onondaga Lake National Priorities List (NPL) site.

In the years after gas production ceased, former MGP structures were razed and the Metro STP used the site for expansion of the treatment plant. Today, much of the property is paved with asphalt or covered with structures associated with the treatment plant.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

The site, Onondaga Lake and the surrounding areas have been significantly altered over the last two centuries through human activities. The lake level was lowered in the early 1800s to drain marsh lands adjacent to the lake in order to accommodate the construction of the Erie Canal, and again raised in the 1850s to its present day elevation. The salt industry, chemical industry, urban development and transportation corridors have all changed the lake and its shoreline.

The original site area was the result of filling into low-lying areas associated with the construction of the Erie Canal and the eventual rerouting of Onondaga Creek. In the late 1800s, the site was used as a fill area for Solvay Process waste. Later a fertilizer manufacturer, the Syracuse Reduction and Manufacturing Company, operated on this site in the early 1900s. The dates of operation of the fertilizer plant are not known but the facility is shown on a 1911 Sanborn map.

A manufactured gas plant (MGP) is a facility where gas for lighting and heating homes and businesses was produced. Manufactured gas was produced at this site using both the coal gasification and carburetted water gas processes. In 1924, the facility was operated by the Syracuse Lighting Company and was then, in 1937, consolidated into Niagara Hudson Public Service Corporation. The company was renamed in late 1937, to the Central New York Power Corporation and operated under that name until 1950 when the facility was taken over by the Niagara Mohawk Power Corporation. Coal gas was produced on site until 1947, and then carburetted water gas was produced from 1941 to 1953.

Coal gas was produced by heating coal in retorts or beehive ovens, carbonizing the coal in the absence of air. The carburetted water gas process involved the passage of steam through burning coal. This formed a gaseous mixture (water gas or blue gas) which was then passed through a super heater which had an oil spray. The oil spray would generate additional gas, enhancing the heat and light capacity of the overall gas mixture.

In each process, the gas produced was cooled and purified prior to distribution. During the cooling, an oily liquid known as coal tar would condense from the hot gas and settle in the bottom of gas holders, pipes, and other structures. Typically, these structures were built below the ground surface, and would utilize groundwater as a bottom seal for cooling and pressure purposes. Hence, these structures have a significant potential to introduce byproducts from the coal gasification and carburetted water gas processes directly into the site groundwater and subsurface.

3.2: Remedial History

Several previous investigations and remedial actions were performed at the site preceding the Remedial Investigation (RI), and reports had been prepared by the various organizations involved.

A subsurface soil investigation was conducted from March 1970 to May 1971 on a large, multi-parcel project site which included a majority of the former MGP site. This investigation was to characterize the project site for pending construction of upgrades to the Metro STP. No environmental sampling or analysis was performed as part of this investigation.

During construction of the treatment plant expansion in the 1970s, it is believed, based upon plant construction records, that the subsurface portions of the former gas distribution holder, the former relief holder, and the former tar separator were removed. The secondary clarifiers extend over the entire tar separator footprint, most of the relief holder footprint, and a portion of the distribution holder footprint. The bottom of the clarifier foundations slope from approximately 10.5 feet below ground surface (bgs) to approximately 23 feet bgs, indicating that the entire subsurface portion of these structures was completely removed. The analytical data from subsequent soil and groundwater sampling investigations, supports that there are likely no continuous or ongoing sources of impacted soils related to these structures.

In 1985, a test pit sampling program was conducted as part of the design for a proposed fuel island installation at Niagara Mohawk's service center. Three soil samples were collected from the test pit area. Laboratory analysis indicated low levels of arsenic and selenium which fell within background concentrations for the Eastern United States. In November 1987, the USEPA conducted a preliminary site assessment at the "Hiawatha Gas Plant", consisting of a site visit and walk-around, but no environmental samples were obtained for analysis.

The Hiawatha Boulevard Former MGP site was the subject of a Preliminary Site Assessment/Interim Remedial Measures (PSA/IRM) study conducted between August 1995 and September 1998. The PSA/IRM study characterized subsurface conditions and the nature and occurrence of chemical contaminants in soil and groundwater at the site, as well as near-shore sediments in Onondaga Lake. The study also included a fish and wildlife impact assessment (FWIA), and a preliminary risk assessment to evaluate potential exposure pathways of contaminants detected in soil and groundwater onsite.

SECTION 4: ENFORCEMENT STATUS

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

The Department and National Grid/Niagara Mohawk (NiMo) entered into a multi-site Consent Orders on December 7, 1992 (#D0-0001-9210) and on November 7, 2003. These Orders obligate the responsible party to implement a full remedial program for 21 former MGP sites across the State, including the Hiawatha Boulevard site. After the remedy is selected, the NYSDEC will approach the PRPs to implement the selected remedy.

SECTION 5: SITE CONTAMINATION

A remedial investigation/feasibility study (RI/FS) was conducted to evaluate the alternatives for addressing the significant threats to human health and the environment.

5.1: Summary of the Remedial Investigation

The RI was conducted in phases between 2000 and 2006 to accommodate the court-mandated Onondaga County Metro STP expansion. The RI further characterized site geology/hydrogeology and the extent of MGP-related impacts to soil and groundwater. A baseline human health risk assessment and screening level ecological risk assessment were also completed as part of the RI. The objective of the remedial investigation was to generate sufficient data to delineate the horizontal and vertical limits of hazardous materials on-site and off-site and determine the potential public health and environmental impacts as a consequence of those materials.

Subsurface investigations have identified four principle geologic units of interest. The stratigraphic units include two to five feet of fill material including sand, silt, clay, brick, wood, ash, cobbles and chucks of concrete. This unit is underlain by a layer of Solvay process waste ranging in thickness from two to 12 feet. Below the Solvay unit lies a sand layer that is present from 30 to 50 feet bgs. Below this a silt/clay unit that was encountered between 40 and 50 feet bgs. Groundwater flow beneath the site is from the southeastern corner of the site towards the northeast and northwest. Across most of the site, a slight downward vertical gradient was observed, indicating that there is a minor vertical component of flow from the fill unit through the Solvay unit and into the underlying sand unit.

The major hydrologic features near the site are Onondaga Lake and the Barge Canal, which discharges into the lake. The Barge Canal receives its flow from Onondaga Creek, which drains highly developed, heavily commercialized and industrialized landscapes as it passes south to north through the city of Syracuse. The Barge Canal in the vicinity of the site acts as a gaining stream, meaning that groundwater flows from beneath the site into the canal.

To determine the extent of contamination, the RI utilized knowledge of the gas manufacturing process, historic plans and information gained through previous preliminary investigations (including the IRM) to target probable areas of the site where MGP wastes could have been generated disposed or released. From that information, areas of the site were tested for the presence of MGP wastes.

The Remedial Investigation was completed in October 2006, and the Feasibility Study was completed in October 2009.

The following activities were conducted during the RI:

- Research of historical information;
- Installation of 64 on-site and off-site permanent groundwater monitoring wells;
- Collection of 385 subsurface soil samples from 50 soil borings, 2 test pits, 16 monitoring wells, and 14 bottom and 20 sidewall IRM verification soil sampling locations which were analyzed for organic compounds associated with former MGP site residues particularly BTEX, PAHs, metals, cyanide, pesticides, and PCBs;
- Several rounds of groundwater sampling were performed at the permanent wells monitoring for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) and total cyanide;
- Collection of sediment samples from seven off-site near-shore sampling locations in Onondaga Lake;
- A survey of public and private water supply wells in the area around the site; and
- A Soil Vapor Investigation was performed to evaluate the presence, concentration and distribution of MGP and non-MGP related VOCs in on-site soil vapor and to evaluate the potential for vapor intrusion into existing on-site buildings.

5.1.1: Standards, Criteria and Guidance (SCGs)

To determine whether the soil and groundwater on-site and off-site contain contamination at levels of concern, data from the investigation were compared to the following SCGs:

- Groundwater, drinking water, and surface water SCGs are based on the Department's "Ambient Water Quality Standards and Guidance Values" and Part 5 of the New York State Sanitary Code.

- Soil Cleanup Objectives (SCOs) are based on the Department's 6NYCRR Subpart 375-6.8 Remedial Program Soil Cleanup Objectives.

- Concentrations of VOCs in air were evaluated using the air guidelines provided in the NYSDOH guidance document titled "Guidance for Evaluating Soil Vapor Intrusion in the State of New York," dated October 2006.

Based on the RI results, in comparison to the SCGs and potential public health and environmental exposure routes, certain media and areas of the site require remediation. These are summarized in Section 5.1.2. More complete information can be found in the RI report.

5.1.2: Nature and Extent of Contamination

This section describes the findings of the investigation for all environmental media that were investigated.

As described in the RI report, many soil and groundwater samples were collected to characterize the nature and extent of contamination. The main categories of contaminants that exceed their SCGs are volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). Figure 3 illustrates the approximate extent of MGP-related source material and groundwater impacts.

Coal tar is a reddish brown to black oily liquid by-product which formed as a condensate as the gas cooled and which does not readily dissolve in water. Materials such as coal tar are commonly referred to as non-aqueous phase liquids, or NAPLs. The terms NAPL and coal tar are used interchangeably in this document. Although most coal tars are slightly more dense than water, the difference in density is slight. Consequently, this tar can either float or sink when in contact with water. Coal tar was found on-site during the remedial investigation.

Specific volatile organic compounds (VOCs) of concern are benzene, toluene, ethylbenzene, and xylenes. These are referred to as BTEX in this document. Semivolatile organic compounds of concern are the polycyclic aromatic hydrocarbons (PAHs). Total PAH concentrations are referred to in this document as the sum of individual PAH compounds.

Tars contain high levels of PAH compounds which often approach percent levels. Tars also exceed SCGs for BTEX by several orders of magnitude. In certain tar samples, enough benzene may be present to require the material to be managed as hazardous waste.

Chemical concentrations are reported parts per million (ppm) for soil and parts per billion (ppb) for groundwater. Air samples are reported in micrograms per cubic meter (ug/m3). The following are the media which were investigated and a summary of the findings of the investigation.

Waste Materials

The RI data indicate that coal tar is the major waste present at the site. Tars generated at the MGP were disposed, spilled or leaked from the former relief holders and/or the tar and ammonia tanks and associated piping and possibly other structures, at various locations throughout the site.

Visual observations of sheens or NAPL in the subsurface were identified within thin lenses located in the lower portion of the solvay waste layer and upper part of the sand unit, generally 8 to 28 feet bgs. The NAPL observed was generally brownish-black in color. Figure 4 depicts the locations where NAPL was observed within the subsurface. The greatest NAPL impacts observed were in several soil borings and monitoring well borings, primarily located in the eastern portion of the site. Soil and NAPL at several of these locations were removed during the IRM described in Section 5.2. Remaining soil exhibiting NAPL was generally found to the east and northeast of the soil/groundwater removal IRM excavation area, near MW-7, MW-8 and SB-50 (see Figures 5 and 6).

Dense non-aqueous phase liquid (DNAPL-oil /tar like liquid heavier than water) was previously identified in two wells located in the eastern portion of the site (MW-7D and MW-8D). The DNAPL measured in these wells was approximately 1.6 to 1.9 feet thick. Monitoring well MW-7D was damaged during the soil/groundwater removal IRM and replaced during the Supplemental RI. DNAPL was not encountered in the MW-7D replacement well in the 9 monitoring events completed since the well was installed. DNAPL was removed from well MW-8D in May 2006 and has not been identified in the well in the 5 monitoring events thereafter.

Historic filling that preceded MGP activities disposed large volumes of Solvay Process waste to create land in low-lying areas. This solvay waste ranges in thickness from 2 to 12 feet, and was identified in each soil boring and nearly every monitoring well boring completed at the site. Solvay waste is primarily composed of calcium chloride, which increases salinity and raises the pH of groundwater present within these fill areas.

MGP-related waste identified during the RI/FS will be addressed in the remedy selection process.

Surface Soil

The surface soils, generally sampled at 0 to 6 inches bgs and most likely to be contacted during the use of the site, are not significantly impacted by the former MGP operation. Composite surface soil samples were collected from four on-site and one off-site sample locations, and concentrations identified were less than, or generally consistent with, the unrestricted use SCOs presented in 6 NYCRR Part 375-6.8.

No site-related surface soil contamination of concern was identified during RI/FS. Today, much of the property is paved with asphalt or covered with structures associated with treatment plant. Therefore, no remedial alternatives were evaluated for surface soil.

Subsurface Soil

Analytical results for subsurface and saturated zone soil samples confirmed the general understanding of the nature and extent of impacts based on the visual observation of NAPL. The occurrence of soils exceeding the Department's recommended subsurface soil cleanup level of 500 ppm for total PAHs, as well as the distribution of NAPL, was generally found to the east and northeast of the soil/groundwater removal IRM excavation area, near MW-7, MW-8 and SB-50 (see Figures 5 and 6). These soils were found at depths generally 8 to 28 feet bgs and because of this depth are not easily contacted. The analytical results indicate that VOCs including BTEX and SVOCs (specifically PAHs) are the contaminants of concern.

The on-site subsurface soil contaminant concentrations for total VOCs ranged from 0.0002 ppm to 370 ppm, Total SVOCs ranged from 0.007 ppm to 18,000 ppm. This includes benzene levels as high as 30 ppm for the VOCs and naphthalene as high as 2800 ppm for SVOCs in sub-surface soils. Evidence of coal tar NAPL, in the form of sheens and thin lenses, was observed in the subsurface soil primarily located in the eastern portion of the site.

Subsurface soil contamination identified during the RI/FS will be addressed in the remedy selection process.

Groundwater

Groundwater at the site has been impacted by dissolved-phase BTEX compounds, PAHs and cyanide related to MGP residuals in the subsurface soil at the site. During the RI, groundwater was observed at depths ranging from five to 10 feet bgs. The shallow groundwater is found within the fill and Solvay units, which range in thickness from two to five feet and two to12 feet, respectively. The highest BTEX and PAH concentrations remaining in this unit are generally in the northeast portion of the site, near MW-11S, MW-12S, MW-23S, and MW-24S. The highest BTEX and PAH concentrations overall were identified in the sand unit, which ranges in thickness from 30 to 50 feet beneath the fill and Solvay units. The horizontal direction of groundwater flow is from the southeastern corner of the site to the northeast and the northwest. The flow directions diverge along a groundwater divide that trends northwest-southeast through the site from the area of well MW-6 to the area of well MW-22.

Total VOC concentrations in groundwater range from non-detect to 14,000 ppb, which includes individual benzene concentrations as high as 2,400 ppb . Total SVOC concentrations in groundwater range from non-detect to 20,000 ppb which includes naphthalene concentrations as high as 17,000 ppb.

Total cyanide groundwater concentrations were found as high as 1,650 ppb in the vicinity of the former MGP structures. Historic MGP structure information indicates that purifying boxes were located in close proximity to the current county maintenance building. Groundwater monitoring data suggests the potential for a source area of purifier waste based on elevated levels of cyanide in downgradient monitoring well clusters MW-12, MW-23, MW-31 and MW-32.

Groundwater is also impacted by the Solvay waste that was placed at the site before the MGP was constructed. The primary Solvay waste product, calcium chloride, has increased the salinity of groundwater beneath the site, particularly in deeper groundwater. Salinity, as represented by chloride concentration, ranges from 0.0098 to 7.04 parts per thousand (ppT) in shallow groundwater, and from 0.0015 to 95 ppT in deep groundwater. The ambient water quality standard for chloride in fresh groundwater is 0.25 ppT. Groundwater in both shallow and deep wells is also highly alkaline, with pH exceeding 12 in several locations.

MGP-related groundwater contamination identified during the RI/FS will be addressed in the remedy selection process.

Surface Water

No site-related surface water contamination of concern was identified during the RI/FS. Therefore, no remedial alternatives were evaluated for surface water.

Sediments

As a part of the PSA/IRM field investigation, sediment samples were collected from 7 off-site near-shore sampling locations in Onondaga Lake west of the site. Chemicals detected in the samples included PAHs and dichlorobenzenes. In addition, certain metals were found that were not detected in groundwater samples collected from monitoring wells along Onondaga Lake or at the site. The comparison of sediment and groundwater analytical data supports the finding that groundwater beneath the site is not impacting lake sediment and that impacts in the lake sediment are non-MGP related. Sediment samples were also collected by the US Army Corps of Engineers in 1994 from several sampling locations in the barge canal adjacent to and upstream of the site. Organic compounds and metals were identified at each sediment sampling location. Based on the concentrations and distribution of chemical contaminants, which were consistent with upstream/background conditions, no site-related sediment contamination of concern was identified. Therefore, no remedial alternatives were evaluated for sediment.

Soil Gas

In May 2008, the soil vapor investigation was implemented to evaluate the potential presence, concentration, and distribution of MGP-related volatile organic compounds (VOCs) and other non MGP-related VOCs in onsite soil vapor, and to evaluate the potential for vapor intrusion into existing onsite buildings. Based on the low VOC levels in the soil vapor samples and ongoing petroleum and solvent use necessary for normal facility operations, the investigation concluded that no further soil vapor evaluation was required. A soil vapor investigation was performed in the area of the county maintenance building within the foot print of the former MGP site. The objective of the investigation was to determine whether actions are needed to address exposures to site-related contaminants, which may move from contaminated groundwater into the indoor air of a building through a process referred to as soil vapor intrusion.

One or more VOC contaminants were identified in the soil vapor samples collected at each sampling location. Some of the VOCs identified in the soil vapor samples were unrelated to or not necessarily related to former MGP operations.

The sample results indicate the presence of BTEX and other VOCs at low levels in soil vapor. These compounds are typically associated with MGP sites, but are also commonly found in products stored in the maintenance facility. The NYSDEC and NYSDOH reviewed the sample results for this structure and determined that no further actions for soil vapor intrusion are needed at this time.

No site related soil vapor contamination of concern was identified during the RI/FS. Therefore, no remedial alternatives were evaluated for this medium.

5.2: <u>Interim Remedial Measures</u>

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS.

Concurrent with the RI activities at the site, Onondaga County implemented improvements to the Metro Sewage Treatment Plant (STP). This project necessitated the acquisition of the Niagara Mohawk property to construct the ammonia removal/stage II phosphorus facility. Work on this project began in September 2001. Preliminary results of the RI and the PSA indicated that contaminated soils were located within the proposed limits of the excavation of the foundations for the ammonia removal facility.

Based on the construction schedule required for the County's project, impacted soils in the construction zone required remediation (removal) before the RI and FS for the former MGP site could be completed. Therefore the removal of these soils was performed as an IRM between September 2001 and May 2002. The soil removal IRM included soils beneath the footprint of the County's facility upgrade, and the excavation of trenches for the 72-inch and 84-inch diameter force mains and other piping such as public water, storm and sanitary sewers, and electric utilities. Soils were excavated to a depth of approximately 15 feet throughout the footprint, and to a depth of approximately 20 feet within the area of the monitoring well MW-10 cluster and soil boring SB-4, where stained soils and NAPL lenses and globules were observed in deeper soil samples. More than 100 wood foundation pilings associated with former MGP structures were also removed from the main excavation during the IRM.

The quantity of impacted soil excavated from the site during the IRM was approximately 110,000 tons, or 73,300 cubic yards. The excavated impacted soil was transported off site to permitted disposal facilities. In February 2003, an additional 325 cubic yards of impacted soil was excavated from the area located adjacent to the northeast corner of the IRM footprint when a water line was connected to the County's administration building. Between September 2001 and May 2002, approximately 85,000,000 gallons of impacted groundwater was extracted and treated in the on-site treatment unit prior to discharge under permit to the Metro STP. Dewatering operations continued through February 2003 during the construction phase of the STP upgrade, resulting in the total extraction and treatment of more than 283,000,000 gallons of contaminated groundwater. Figure 4 indicates the IRM soil removal areas as well as historic soil removal activities associated with expansion of the Metro STP.

5.3: <u>Summary of Human Exposure Pathways</u>:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the human exposure pathways can be found in Section 7.0 of the Final Supplemental Remedial Investigation Report (October 2006) and the Human Health Risk Assessment Report (September 2009) prepared by EPA. These documents are available for review at the document repositories.

An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a site. An exposure pathway has five elements: [1] a contaminant source, [2] contaminant release and transport mechanisms, [3] a point of exposure, [4] a route of exposure, and [5] a receptor population.

The source of contamination is the location where contaminants were released to the environment (any waste disposal area or point of discharge). Contaminant release and transport mechanisms carry contaminants from the source to a point where people may be exposed. The exposure point is a location

where actual or potential human contact with a contaminated medium may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (e.g., ingestion, inhalation, or direct contact). The receptor population is the people who are, or may be, exposed to contaminants at a point of exposure.

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

No completed exposure pathways have been identified at this site. The area is served by public water, public access to the site is limited and the NYSDOH has determined that no actions are necessary to address exposures to site-related contaminants due to soil vapor intrusion. However, a potential exists for people to be exposed to site-related contaminants as follows:

- Exposure to contaminated soil could occur by either direct contact with or ingestion of soil. The majority of the site is paved and public access is limited by fencing; therefore, exposure to contaminated soil is not likely. Workers who dig or enter excavations on-site or off-site could potentially be exposed to coal tar and contaminated soil through dermal contact and/or incidental ingestion.

- Workers who dig or enter excavations on-site could potentially be exposed to coal tar and contaminated groundwater through dermal contact and/or incidental ingestion.

5.4: Summary of Environmental Assessment

This section summarizes the existing and potential future environmental impacts presented by the site. Environmental impacts include existing and potential future exposure pathways to fish and wildlife receptors, as well as damage to natural resources such as aquifers and wetlands.

The Hiawatha Boulevard former MGP site is located in an urban setting including industrial and commercial properties which are associated with large paved parking lots. These commercial and industrial properties leave very limited opportunities for wildlife resources.

Subsurface soil contamination has negatively impacted the groundwater resource in the unconsolidated geologic units beneath the site. The impacted soil has been an ongoing leaching source of contamination resulting in the down gradient migration of contamination into the groundwater offsite.

The following environmental exposure pathways and ecological risks have been identified:

- Site contamination has adversely impacted the groundwater resource in the overburden so as to render the aquifer unusable without treatment.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6NYCRR Part 375-1.10. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The remediation goals for this site are to:

Soil
- Prevent ingestion/direct contact with contaminated soil.
- Prevent migration of contaminants that would result in groundwater or surface water contamination.

Groundwater
- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with contaminated groundwater.
- Prevent discharge of contaminated groundwater to surface water.

Further, the remediation goals for the site include attaining to the extent practicable:

- Ambient groundwater quality standards.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost-effective, comply with other statutory requirements, and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the Hiawatha Boulevard Former MGP Site were identified, screened and evaluated in the FS report which is available at the document repositories established for this site.

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

All of the remedial alternatives described below include, at a frequency no exceeding five years, a periodic review.

7.1: Description of Remedial Alternatives

The following potential remedies were considered to address the contaminated source material in soils and groundwater through various remedial methods.

Soil Alternatives:

Alternative SM1: No Further Action

Alternative SM1would involve no further action beyond the extensive removal activities performed as part of the soil/groundwater removal IRM, in which 110,000 tons of soil were excavated and transported for off-site disposal and 283 million gallons of water were pumped and treated onsite prior to discharge to the Metro STP. Alternative SM1 serves as the baseline for comparison of the overall effectiveness of the other

remedial alternatives. The site would be allowed to remain in its current condition. The existing cover material (i.e., grass/vegetation, asphalt, and Metro STP structures) and fencing on the former MGP property would be maintained only as associated with the operation of the STP. This alternative could be implemented immediately and there are no costs associated with this alternative.

Alternative SM2: Institutional Controls

This alternative would not involve active remedial measures to remove, treat or contain MGP-impacted subsurface soil at the site. However, the existing cover material (i.e., grass/vegetation, asphalt and existing Metro STP structures) and fencing around the site would be maintained. Institutional controls would be implemented to limit disturbance of the ground cover materials and to place health and safety/excavation management requirements on subsurface activities. The institutional controls would include: (1) a land use and groundwater use restriction in the form of an environmental easement and (2) a site management plan (SMP).

The land use restriction would: (1) restrict future use of the site to industrial activities; (2) notify future property owners of the presence of MGP-related contaminants in soil at the site; and (3) notify future property owners of the applicability of the SMP. The SMP would be prepared to: (1) identify known locations of MGP-impacted soil at the site; (2) establish appropriate controls for future disturbances of site soil; (3) set forth the inspection and maintenance activities for the perimeter fencing and vegetation/cover materials; and (4) establish protocols and frequencies for media monitoring activities.

The SMP would be a means to address potential future soil excavation in connection with a possible future expansion to the Metro STP. The SMP would include a requirement for developing a remedial plan that would identify proposed excavation limits and details of the soil removal (*e.g.*, waste characterization sampling, verification sampling, excavation sidewall support, off-site transportation and disposal, dewatering, backfilling, *etc*.). The SMP would require that the remedial plan be provided to the NYSDEC for review and approval prior to implementation. Costs for this potential excavation are not included in the cost estimate for this alternative.

The capital costs associated with this alternative are related to preparing the appropriate documentation for the land use restriction and preparing the SMP. Annual O&M costs associated with this alternative include costs associated with inspection and maintenance of ground cover materials and preparation of a periodic certification report. This alternative could be implemented in an estimated 3 months.

Present Worth:	$344,000
Capital Cost:	$97,500
Annual Costs:	$16,000

Alternative SM3 – In-Situ Solidification and Institutional Controls

This alternative would involve treating impacted soils in place using an in-situ solidification (ISS) process. ISS would be applied to soil in the northeastern portion of the site where NAPL has been identified in lenses and total PAHs were identified at concentrations greater than 500 ppm. The approximate extent of ISS under this alternative is shown on Figure 5. ISS of the MGP-impacted zone would be performed to depths ranging from approximately 22 to 24 feet below grade within an approximate 20,500 square foot area.

ISS would be performed by mixing a fluid cement grout into a column of soil without excavating or removing the soil. ISS treatment would limit potential future impacts from soil to groundwater by: (1) reducing the leaching/mobility of contaminants in soil; (2) minimizing the amount of free liquids in the soil pore space; and (3) reducing the hydraulic conductivity of the soil. With less soil pore space and reduced conductivity, the potential mobility of pore-filling liquids (water, NAPL) would be reduced in the treated area. There are several methods for implementing ISS, including large diameter auger mixing and jet grouting.

Spoils consisting of a mixture of soil, groundwater, and grout, would be generated by ISS. These spoils would be excavated, stockpiled and sampled prior to transportation for off-site disposal.

Prior to full-scale implementation of ISS, a bench-scale study may be required to evaluate the effectiveness of various cement-bentonite mixtures (*i.e.*, soil solidifying mixtures) at reducing the leachability and permeability of the impacted soil, including Solvay waste, at the site. Solidification mixtures would be evaluated for compatibility with the contaminants of concern and tested for density, permeability, strength, and leachability of VOCs and SVOCs.

As an initial step in full-scale application of ISS, the surface cover material (asphalt pavement) and upper few feet of soil would be removed, characterized, and either transported for off-site disposal or stockpiled for re-use as backfill on the site. The soil removal would allow room for the increase in soil volume that would occur when stabilizing agents are added, and for placement of backfill and replacement of clean cover materials. Specific design details would be addressed as part of the remedial design. Utilities may be relocated and obstacles would be removed prior to ISS implementation. Alternatively, jet grouting may be performed in areas with utilities. Targeted areas that are restricted by significant underground utilities would be individually jet grouted, or would be surrounded by the remainder of the solidified area, which would serve as a containment barrier. The solidified area would be covered by backfilled soils to a sufficient depth to prevent damage to the solidified material by cycles of freezing and thawing.

Due to elevated levels of cyanide in groundwater at the northeastern corner of the site, further investigation, delineation and removal (to the extent feasible) of suspected purifier waste source areas would be conducted.
A foam spray or other vapor control measures would be used as necessary to suppress odors and volatile organic vapors originating from the initial excavation and the solidification process. A Community Air Monitoring Plan (CAMP) would be followed throughout remediation activities to ensure that airborne particulate and volatile organic vapor concentrations surrounding the excavation area are acceptable.

This alternative would also include the same institutional controls provided under Alternative SM2 because soil at the site would still contain chemical contaminants at concentrations exceeding unrestricted soil cleanup objectives. Long-term monitoring would be performed as part of site management to evaluate the expected reductions in groundwater contaminant concentrations downgradient of the ISS treatment areas. Cores would be periodically collected from the solidified material to assess the integrity of the material. This alternative would require approximately one year to implement, at which time the remedial goals for soil would be met.

Present Worth:	$6,730,000
Capital Cost:	$6,490,000
Annual Costs:	$16,000

Alternative SM4 - Focused Soil Excavation and Institutional Controls

This alternative would remove contaminated soil, as delineated in alternative SM3, from the northeastern portion of the site where NAPL has been identified in lenses, and where PAHs were identified at concentrations greater than 500 ppm. Soil would be removed from an area approximately 20,500 square feet to depths ranging between 22 and 24 feet, as shown on Figure 5. The estimated volume of soil that would be removed is 17,410 cubic yards. Prior to excavation, pre-excavation soil sampling and waste characterization sampling will be conducted. A temporary sheet pile wall will be installed around the perimeter of the proposed excavation area to stabilize excavation sidewalls (and to comply with OSHA requirements), control groundwater and permit soil removal to the targeted depths. Underground utilities in the area (including natural gas and water lines) would need to be temporarily relocated during installation of the sheet pile wall.

The majority of the soil removed under this alternative would be from beneath the water table. Therefore it would be necessary to dewater the excavation, as was done during the IRM. A temporary on-site wastewater treatment system would provide pre-treatment of the groundwater recovered during de-watering, and the treated effluent would be discharged to the Metro STP. Details concerning the water treatment, handling, and discharge would be determined during remedial design.

Due to space constraints at the site, soil removed from the excavation would be direct-loaded for off-site disposal to the extent possible. Alternatively, the soil would be stockpiled in a lined material staging area (or portion of the excavation area) for stabilization, if needed, prior to off-site disposal. Upon reaching target depths, verification soil samples would be collected from the bottom of the excavation for visual characterization and/or laboratory analysis. Following receipt of results indicating that the cleanup objectives have been achieved, the excavated areas would be backfilled, compacted and restored to grade. The paved parking lots and driveways in the area would then be restored.

Due to elevated levels of cyanide in groundwater at the northeastern corner of the site, further investigation, delineation and removal (to the extent feasible) of suspected purifier waste source areas would be conducted.
A foam spray or other vapor control measures would be used to suppress odors and volatile organic vapors originating from the excavation and the excavated soil, as needed. A CAMP would be followed throughout remediation activities to ensure that airborne particulate and volatile organic vapor concentrations surrounding the excavation area are acceptable.

This alternative would also include similar institutional controls provided under Alternative SM2 because certain soil at the site would still contain chemical contaminants at concentrations exceeding unrestricted soil cleanup objectives. This alternative would require approximately one year to implement, at which time the remedial goals for soil would be met.

Present Worth:	$18,800,000
Capital Cost:	$18,500,000
Annual Costs:	$16,000

Alternative SM5 - Soil Excavation to Industrial SCOs and Institutional Controls

Alternative SM5 would involve a more extensive removal of impacted soil than Alternative SM4, and is the most extensive soil remedial alternative under consideration. Alternative SM5 would involve the

excavation of unsaturated and saturated soil that contains NAPL or contaminants at concentrations exceeding the SCOs for industrial use.

Under this alternative soil would be removed from within an estimated 85,000 square foot area, extending to depths ranging from approximately 5 to 30 feet (see Figure 6). The volume of soil to be removed under this alternative would be approximately 60,900 cubic yards. Although soil under a portion of the Main Building Complex contains contamination that exceeds the industrial use SCOs, that soil is not accessible and would not be excavated under this alternative.

Alternative SM5 would involve the same elements included under Alternative SM4, including pre-excavation soil sampling, waste characterization sampling, utility relocation, a pre-design test boring program, installation of excavation support, excavation, air monitoring/vapor control, off-site transportation and disposal, excavation de-watering and water treatment, backfilling, and restoration. However, the excavation under Alternative SM5 would cover a larger area and extend to greater depths than under Alternative SM4. As shown on Figure 6, the excavation area for Alternative SM5 encompasses the majority of the parking lots in the eastern portion of the site, extends around the county maintenance building, and extends up to the edge of the main building complex in several places.

Based on the larger size and areas affected by this alternative, this alternative would require: (1) additional re-location of underground utilities (particularly near the main building complex); (2) installation of more sheet pile for excavation sidewall support; (3) more soil handling and off-site disposal; (4) more dewatering and water treatment; and (5) more waste characterization and verification sampling, as compared to Alternative SM4.

Due to elevated levels of cyanide in groundwater at the northeastern corner of the site, further investigation, delineation and removal (to the extent feasible) of suspected purifier waste source areas would be conducted.
A foam spray or other vapor control measures would be used to suppress odors and volatile organic vapors originating from the excavation and the excavated soil, as needed. A CAMP would be followed throughout remediation activities to ensure that airborne particulate and volatile organic vapor concentrations surrounding the excavation area are acceptable.

This alternative would also include the same institutional controls provided under Alternative SM2 because certain soil at the site would still contain chemical contaminants at concentrations exceeding unrestricted use soil cleanup objectives. This alternative would require approximately two years to implement, at which time the remedial goals for soil would be met.

Present Worth:	$54,700,000
Capital Cost:	$54,500,000
Annual Costs:	$16,000

Groundwater Alternatives

Alternative GW1 - No Further Action

Alternative GW1 would involve no further action to address groundwater contamination beyond the extensive de-watering and treatment performed as part of the IRM, in which 283 million gallons of water were pumped and treated. Alternative GW1 serves as the baseline for comparison of the overall effectiveness of the groundwater remedies. This alternative would involve natural attenuation processes to

reduce concentrations of contaminants of concern in groundwater. Natural attenuation is a variety of physical, chemical and biological processes which, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume or concentration of contaminants in soil and groundwater. These in-situ processes include biodegradation, dispersion, dilution, sorption, volatilization and chemical or biological stabilization, transformation or destruction. However, no monitoring would be performed to evaluate the effectiveness and rate of natural degradation for this alternative. There are no costs associated with this alternative.

Alternative GW2 -Institutional Controls and Monitoring

Alternative GW2 would consist of use restrictions on groundwater, natural attenuation processes to reduce concentrations of contaminants of concern in groundwater and groundwater monitoring to evaluate changes in groundwater conditions.

A land use restriction in the form of an environmental easement would be executed to notify future property owners of the presence of MGP-related contaminants in groundwater at the site, to restrict the use of on-site groundwater, and to notify the owners of the applicability of an SMP. Existing groundwater use laws [10 NYCRR 5-1.31(b)], which prohibit the installation of private wells where a public supply is available (unless approval is expressly granted by the public water authority), would continue to minimize potential human exposure to contaminants in groundwater at concentrations exceeding the groundwater quality standards/guidance values.

An SMP would be prepared under this alternative to: (1) identify areas of impacted groundwater associated with the site; and (2) manage possible future intrusive activities that could result in the potential for contact with contaminated groundwater. Long-term monitoring would be performed under this alternative to evaluate the effectiveness of the attenuation. Groundwater- sampling labor and expenses are based on semi-annual sampling events within the first five-year period. Sampling after that period will be conducted annually. This alternative would require approximately 3 months to implement.

Present Worth:		$1,060,000
Capital Cost:		$97,500
Annual Costs	(years 1-5):	$90,000
	(years 6-30)	$52,200

Alternative GW3 - Enhanced Bioremediation and Institutional Controls

Alternative GW3 involves treating impacted groundwater by enhancing microbial degradation. This alternative would also involve the monitoring and institutional controls described for Alternative GW2.

The treatment provided by this alternative would focus on the northern property boundary, upgradient of the Barge Canal and in the two areas where the highest concentrations of BTEX and PAHs were found in groundwater. Treatment would be performed in these two separate areas, as shown on Figure 5.

Enhanced bioremediation would involve the addition of nutrients, sources of oxygen, and/or other amendments to be determined through bench-scale and pilot studies. These enhancements will improve the conditions for naturally-occurring bacteria to degrade MGP-related contaminants in groundwater, thereby reducing the discharge of contaminants from site groundwater to off-site groundwater and the Barge Canal. Groundwater monitoring would be performed under this alternative to evaluate changes in groundwater

conditions and to optimize the addition of oxygen and/or nutrients. Modifications to the enhanced bioremediation treatment would be made, as needed, based on monitoring results. Groundwater-sampling labor and expenses are based on semi-annual sampling events within the first five-year period. Sampling after that period will be conducted annually. This alternative would require approximately 1 year to implement, and an estimated 10 years to achieve the remedial goals for groundwater.

Present Worth:		$3,660,000
Capital Cost:		$1,340,000
Annual Costs	(years 1-5):	$191,000
	(years 6-30)	$135,000

7.2 Evaluation of Remedial Alternatives

The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375, which governs the remediation of inactive hazardous waste disposal sites in New York State. A detailed discussion of the evaluation criteria and comparative analysis is included in the FS report.

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

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

2. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which the NYSDEC has determined to be applicable on a case-specific basis.

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

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

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

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

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary

personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

7. Cost-Effectiveness. Capital costs and operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision. The costs for each alternative are presented in Table 1.

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

8. Community Acceptance - Concerns of the community regarding the RI/FS reports and the PRAP are evaluated. A responsiveness summary will be prepared that describes public comments received and the manner in which the NYSDEC will address the concerns raised. If the selected remedy differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

SECTION 8: SUMMARY OF THE PROPOSED REMEDY

The NYSDEC is proposing Alternative SM3 – In-Situ Soil Solidification and Institutional Controls**,** and Alternative GW3 - Enhanced Bioremediation as the remedy for the site.

The proposed remedy is based on the results of the RI and the evaluation of alternatives presented in the FS. The evaluation takes into consideration each comparative analysis criteria described in Section 7.2, in addition to the overall project consideration. A remedy consisting of alternatives SM3 and GW3 is being proposed because it would protect human health and the environment and would comply with New York State SCGs. Further, it would provide the best balance of the primary balancing criteria, as described in Section 7.2, by solidifying on-site subsurface soil contamination and greatly reducing the source of contamination to on-site and off-site groundwater, as well as treating contaminated groundwater by enhancing microbial degradation. This remedy would manage remaining contamination through monitoring and institutional controls until the SCGs for the site are met.

8.1 Basis for the Selection

Soil Remedy

Alternatives SM1 (no further action) and SM2 (institutional controls) would generally rely on natural degradation processes with no removal or treatment, to meet the remedial goals for the site. The timing and degree of contaminant reduction, if any, provided by natural degradation processes in NAPL-contaminated soil is uncertain. Alternative SM1 would not adequately address the RAOs and would not be protective of human health and the environment. Alternative SM2 would protect human health through institutional controls, but would not provide any environmental protection because contaminated subsurface soils would continue to release contaminants to on-site and off-site groundwater.

Alternative SM3 (In-Situ Solidification) would protect public health and the environment by treating the soil to immobilize chemical contaminants and restrict the movement of groundwater through soils containing source material (NAPL). Alternatives SM4 and SM5 would protect public health and the environment by excavating contaminated soils and removing them from the site, to varying degrees. Alternative SM4 (excavation of source material) would remove contaminated soils that represent a source to groundwater, and would rely on institutional controls and a site management plan to prevent exposure to contamination that would remain. Alternative SM5 (excavation to industrial SCOs) would remove a larger amount of lesser contaminated soil, and would rely only on land use controls to protect public health.

Alternatives SM1 and SM2 would have no short term impacts because no active measures would be taken to address contamination. Alternative SM3 would have moderate short-term impacts, primarily related to coordination with the operation of the Metro STP during the solidification process. Activities in the affected area, primarily parking and access would be disrupted during the remediation, and utilities would be relocated or protected. Soils excavated from the upper few feet would require staging and temporary stockpiling, which would require additional space. Alternatives SM4 and SM5 would have greater short term impacts on the Metro STP operations, as increasing volumes of excavated soil would require staging and transport off the site. Excavation shoring would significantly impact site utilities. Alternatives SM4 and SM5 would have greater impacts to the surrounding community due to increased truck traffic and potential odors associated with the excavation and handling of NAPL-contaminated soils. Excavations required under Alternative SM5 could affect critical infrastructure such as buildings, treatment units and support buildings, and would have significant short-term impacts to the Metro STP, such as accidental damage to infrastructure and potential temporary shut-downs.

Alternatives SM1 and SM2 would have negligible long-term effectiveness, particularly in protecting the environment. Alternative SM3 would have a high degree of long-term effectiveness. Although treated residuals would remain at the site, the engineering and institutional controls necessary to maintain the protectiveness of the remedy are highly reliable. Alternative SM4 would have a somewhat higher degree of long-term effectiveness than SM3, because contaminated soils would be removed from the site and there would be no treated materials requiring long-term management. Alternative SM5 would provide a high degree of long-term effectiveness.

Alternatives SM1 and SM2 would not provide any reduction in toxicity, mobility or volume through treatment. Alternatives SM3 and SM4 would provide the same level of reduction because the same areas of contamination would be targeted. Treatment would be performed on-site for Alternative SM3 and off-site for SM4. Alternative SM5 would provide a somewhat greater reduction because a greater volume of soils would be treated off-site. However, these soils are less contaminated, and the additional mass of contaminants addressed would be small.

Alternatives SM1 and SM2 are readily implementable. Alternative SM3 would be moderately difficult to implement due to the presence of several utility lines in the treatment area and the coordination required with the Metro STP operations. SM3 would also require design-phase testing to determine the proper solidification mixture for site-specific soils. Alternative SM4 would be more difficult to implement due to the need to relocate critical utilities in order to construct excavation shoring and perform the excavation. The space needed for the excavation, support activities and stockpiled soils and backfill materials would present significant difficulties in coordinating with the Metro STP operations. Alternative SM5 could disrupt several critical activities of the Metro STP operations, and may not be technically or administratively feasible.

Alternatives SM1 and SM2 have no or limited costs. Alternative SM3 has moderate total costs ($6.7 million), with a somewhat higher proportion of annual costs associated with long-term monitoring of the solidified soil. The cost of Alternative SM4 ($18.8 million) is more than double the cost of SM3, even though it addresses that same area of soil contamination. Alternative SM5 would cost an additional $36 million ($54.7 million), due to the need to remove a much larger volume of less contaminated soil in close proximity to critical Metro STP infrastructure. Based on a comparison of cost to the amount of contamination addressed, Alternative SM3 provides the highest degree of cost effectiveness.

When considering all of the evaluation criteria, ISS (Alternative SM3) is the preferred alternative to address the on-site source material. Solidification/stabilization of the source material would minimize the potential mobility of source material from the site and break the soil to groundwater migration pathway, and would be less costly and disruptive than Alternatives SM4 and SM5.

Groundwater Remedy

Under each alternative, human exposure to contaminants in groundwater would be prevented by existing groundwater use laws and restrictions. The Site Management Plan (SMP) prepared under Alternatives GW2 would address potential exposures to construction workers performing intrusive activities below the water table, such as activities to repair existing, or install new, subsurface utilities/facilities. The SMP would identify requirements for use of personal protective equipment and proper management of impacted groundwater that may be encountered. An SMP would not be prepared under Alternative GW1. Alternatives GW1(No Further Action) and GW2 (Institutional Controls and Monitoring) would rely on natural processes to reduce levels of contamination over an extended period of time, and would provide limited environmental protection. Alternative GW3 would provide a higher degree of environmental protection by enhancing natural degradation processes, particularly in conjunction with one of the active soil remedial alternative (SM3, SM4 or SM5).

Alternatives GW1 and GW2 are readily implementable and would have no short-term impacts. Alternative GW3 would be slightly more difficult to implement due to the need to optimize the rate of natural degradation processes in the unique groundwater conditions associated with the high pH (elevated by Solvay waste) and naturally occurring high salinity. Alternative GW3 would have minor short-term impacts, and these would be primarily to remedial workers handling injected chemicals.

Alternatives GW1 and GW2 could reduce the toxicity, mobility, and volume of contaminated groundwater, but only over an extended period of time, by natural attenuation processes. Under Alternative GW3, enhanced bioremediation would be expected to reduce the toxicity and volume of MGP-related contaminants in groundwater to a greater degree in a shorter time frame. Similarly, Alternative GW3 would provide the greatest long-term effectiveness. All of the groundwater alternatives would require an associated source control remedy to achieve the remedial goals for groundwater.

Although Alternative GW3 has the highest total cost ($3.7 million), this additional expense is justified by the higher level of environmental protection, long-term effectiveness and reduction in contaminant volume.

The proposed remedy is believed to provide the greatest protection of human health and the environment, to provide the greatest long-term effectiveness, to be capable of achieving the SCGs more quickly, or as quickly, as the other alternatives, and to be cost-effective. Therefore, the preferred remedy would provide the best balance of tradeoffs among alternatives with respect to the evaluation criteria. NYSDEC believes that the proposed remedy would treat principal threats, be protective of human health and the environment, comply with SCGs, be cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The proposed remedy also would meet the statutory preference for the use of treatment as a principal element. EPA has reviewed this PRAP and concurs with the proposed remedy.

8.2 Elements of the Proposed Remedy

The elements of the proposed restricted use remedy are as follows:

1. A remedial design program, including a pre-design investigation and treatability studies, would be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program. Any uncertainty identified during the RI/FS would be resolved, including a more precise delineation of the lateral and vertical extent of soil requiring treatment, as well as testing to determine the optimum groundwater treatment method.

2. In-situ solidification (ISS) of subsurface soils would be conducted for soils containing visible tar or NAPL, and/or total PAHs greater than 500 ppm. Soils exhibiting odors, staining or sheens would not be treated unless they exceed the 500 ppm PAH criterion. Areas restricted by underground utilities that cannot be relocated would be jet grouted and/or surrounded by a solidified area that is sufficient to limit groundwater migration through them. The solidification mixture would be designed to account for the potential future use of this area, including expansions to the Metro STP, if any. To account for the volume expansion associated with ISS, approximately 4-6 feet of shallow soils would be removed prior to the ISS process. Of this excavated material, any MGP waste, coal tar or contaminated soils meeting one or more of the following criteria: visible tar or oil; the presence of sheens or odors with total PAHs over 500 ppm; or total BTEX concentration above 10 ppm, would be disposed of at an off-site treatment or disposal facility. Excavated materials which are below these criteria may be stockpiled and evaluated for reuse as backfill on-site. This removal of shallow soils would also include potential underground structures and obstructions that could impede the ISS process.

3. Further investigation, delineation and removal (to the extent feasible) of suspected purifier waste source areas would be conducted to the northeast of the county maintenance building.

4. Enhanced biodegradation of dissolved phase contaminants through the addition of nutrients, sources of oxygen, and/or other amendments. This would occur along the northern property boundary between the Barge Canal and areas where the highest concentrations of BTEX and PAHs were found in groundwater. Modifications to the enhanced bioremediation treatment would be made, as needed, based on monitoring results.

5. To maximize the net environmental benefit, green remediation and sustainability efforts are considered in the design and implementation of the remedy to the extent practicable, including;

   - using renewable energy sources
   - reducing greenhouse gas emissions
   - encouraging low carbon technologies
   - increase recycling and reuse of clean materials

6. Exposed surface soil would be covered with either a one-foot thick soil cover consisting of clean soil underlain by a demarcation layer; or buildings, treatment structures, pavement, etc. The cover soil may be from any re-used stockpiled soil that meets the criteria for clean cover soils. In vegetated areas, the top six inches of soil would be of sufficient quality to support vegetation. Clean soil would constitute soil that meets the Division of Environmental Remediation's criteria for backfill pursuant to 6NYCRR 375-6.7(d) or local site background. Non-vegetated areas (buildings, roadways, parking lots, etc.) would be covered by a paving system or concrete at least 6 inches thick

7. Development of a site management plan to address residual contaminated soils that may be excavated from the site during future redevelopment. The plan would require soil characterization and, where applicable, disposal/reuse in accordance with NYSDEC regulations;

8. Imposition of an institutional control in the form of an environmental easement that would require (a) limiting the use and development of the property to industrial use; (b) compliance with the approved site management plan; (c) restricting the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by NYSDOH; and (d) the property owner to complete and submit to the Department a periodic certification of institutional and engineering controls.

9. At a frequency not exceeding five years, a periodic review will be performed. The responsible party will provide a certification of institutional and engineering controls, prepared and submitted by a professional engineer or such other expert acceptable to the Department, until the Department notifies the property owner in writing that this certification is no longer needed. This submittal would: (a) contain certification that the institutional controls and engineering controls put in place are still in place and are either unchanged from the previous certification or are compliant with Department-approved modifications; (b) allow the Department access to the site; and (c) state that nothing has occurred that would impair the ability of the control to protect public health or the environment, or constitute a violation or failure to comply with the site management plan unless otherwise approved by the Department.

Table 1

Remedial Alternative Costs

Subsurface Soil Alternative	**Capital Cost** ($)	**Annual Cost ($)**	**Total Present Worth ($)**
Alternative SM1 - No Further Action	$0	$0	$0
Alternative SM2- Institutional Controls (ICs)	$97,500	$16,000	$344,000
Alternative SM3- In-Situ Soil Stabilization and ICs	$6,490,000	$16,000	$6,730,000
Alternative SM4- Focused Soil Excavation and ICs	$18,500,000	$16,000	$18,800,000
Alternative SM5- Soil Excavation to SCOs and ICs	$54,500,000	$16,000	$54,700,000
Groundwater Alternative	**Capital Cost ($)**	**Annual Cost ($)**	**Total Present Worth ($)**
Alternative GW1- No Further Action	$0	$0	$0
Alternative GW2- Institutional Controls (ICs)	$97,000	$90,000-$52,000	$1,060,000
Alternative GW3- Enhanced Bioremediation and ICs	$1,300,000	$191,000-$135,000	$3,700,000
Recommended Remedy	**Capital Cost ($)**	**Annual Cost ($)**	**Total Present Worth ($)**
Alternative SM3- In-Situ Soil Stabilization and ICs and	$6,490,000	$16,000	$6,700,000
Alternative GW3- Enhanced Bioremediation and ICs	$1,340,000	$191,000-$135,000	$3,700,000