PROPOSED REMEDIAL ACTION PLAN
Former Clifton MGP Site
Operable Unit No. 2
Richmond County, New York
Site No. 2-43-023

January 2006

Prepared by:

Division of Environmental Remediation
New York State Department of Environmental Conservation

PROPOSED REMEDIAL ACTION PLAN

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Operable Unit No. 2 - 25 Willow Avenue Parcel
Richmond County, New York
Site No. 2-43-023
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SECTION I: 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 for Operable Unit No. 2 of the Former Clifton MGP Site.

The site is currently separated into two parcels of land, 40 Willow Avenue and 25 Willow Avenue which are identified as Operable Units (OU)1 and 2, respectively, as shown on Figure 1. The property at 40 Willow Avenue is known as Operable Unit 1, where a remedy was selected in March, 2004. This document deals with the property at 25 Willow Avenue, which is identified as Operable Unit 2.

The presence of hazardous waste has created significant 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 operation of a manufactured gas plant (MGP) at the Former Clifton MGP Site has resulted in the disposal of hazardous wastes, including coal tar containing benzene, toluene, ethylbenzene, xylene and polycyclic aromatic hydrocarbons. These wastes have contaminated the soils and groundwater at the site, and have resulted in:

- a significant threat to human health associated with potential exposure to contaminated soil and groundwater.
- a significant environmental threat associated with the impacts of MGP contaminants to groundwater.

To eliminate or mitigate these threats, the NYSDEC proposes the following remedy:

- Demolition of the existing building to allow for the excavation of the impacted materials located beneath the building.
- Installation of vertical cutoff walls in the subsurface to prevent off-site migration of NAPL from the site.
- Excavation of source materials to an approximate depth of ten (10) feet below ground surface (bgs) to remove approximately 38,300 cubic yards of contaminated soils as depicted in Figure 6 of this document. A visual demarcation barrier would be installed at the bottom of the excavation for future determination of the extent of soil removal. Some portion of the areas depicted for removal may not contain levels of contaminants warranting soil removal to the proposed depth of 10 feet bgs. The actual depth of removal in these locations would be based on verifiable field conditions determined by visual observations and in concert with the NYSDEC on-site representative. Materials warranting removal would be soil saturated by coal tar or separate phase materials.

- Removal of former MGP-related structures including foundations determined to contain coal tar.

- Backfill of the excavated areas with clean soil materials from an off-site location. The top two (2) feet of the entire on-site parcel would be filled with clean top soil.

- Installation of recovery wells to allow for collection, treatment and disposal of dense non-aqueous phase liquids (DNAPL) that may remain at depth in the subsurface after the excavation work is complete.

- Institutional controls, consisting of an environmental easement which would restrict groundwater usage and future use of the land and require a site management plan, which will include long-term groundwater and DNAPL monitoring and implementation of the institutional and engineering controls necessary for the remedy.

- Development and implementation of a site management plan.

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 NYSDEC has issued this PRAP as a component of the Citizen Participation Plan developed pursuant to the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375. This document is a summary of the information that can be found in greater detail in the February 2005 Final Remedial Investigation (RI) Report and a draft September 2005 Feasibility Study (FS) Report. The public is encouraged to review the project documents, which are available at the following repositories:

Community Board 1
One Edgewater Plaza
Room 311
Staten Island, NY 10305
Phone #: (718) 981-6900
Hours of Operation: 9 am - 5 pm
Contact: Joseph Carroll

The Borough President Office
Borough Hall
Staten Island, New York 10301
Phone #: (718) 816-2057
Hours of Operation: 9 am - 4 pm
Contact: Mr. Nicholas Dmytryszyn, P.E.

NYSDEC
625 Broadway
11th Floor
Albany, NY 12233-7014
Phone #: (518) 402-9564
Hours of Operations: 8am - 4 pm
Contact: Amen M. Omorogbe, P.E.

The NYSDEC seeks input from the community on all PRAPs. A public comment period has been set from January 18 through February 22, 2006 to provide an opportunity for public participation in the remedy selection process. A public meeting is scheduled for February 9, 2006at the Public School #13,Margaret L. Lindenmeyer Elementary School Auditorium, 191 Vermont Ave, Staten Island, NY 10305 beginning at 7 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. Amen M. Omorogbe, at the above address through February 22, 2006.

The NYSDEC 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 Former Clifton MGP site occupies two parcels at the intersection of Bay Street and Willow Avenue in the Clifton section of Staten Island, Richmond County, New York (see Figures 1 and 2).

Operable Unit (OU) No. 2, which is the subject of this document, consists of the 25 Willow Avenue parcel of the Former Clifton MGP Site. An operable unit represents a portion of the site remedy that for technical or administrative reasons can be addressed separately to eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination. The remaining operable unit, (OU-1) for this site is the 40 Willow Avenue parcel of the Former Clifton MGP Site. A Record of Decision was completed for this unit in March of 2004.

The OU-2 parcel is a 3.5-acre parcel bounded to the northeast by Bay Street; to the south by Willow Avenue, and to the northwest by a wooded embankment and an associated active railroad right-of-way (ROW). The OU-2 parcel is currently owned by Keyspan Corporation and is zoned for manufacturing. The surrounding area is characterized by a combination of urban residential, industrial and commercial uses.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

The Former Clifton MGP was operated by the Richmond County Gas Light Co. from 1856 to 1901. The plant was then operated by the New York and Richmond Gas Company from 1901 until 1957. Brooklyn Union (now KeySpan) acquired the latter company in 1957, at which point MGP operations ceased.

Manufactured gas plants produced combustible gas by heating coal and petroleum products. The gas was cooled, purified, and then piped to homes and businesses in the surrounding area, where it was used for heating and cooking in much the same way that natural gas is used today. In addition, prior to the widespread availability and use of electricity, the manufactured gas was also used for lighting.

The 25 Willow Avenue parcel was the location of the main operational facility of the former MGP. The MGP consisted of a brick retort and water gas house where gas was manufactured, a purifying house, and other structures including a 75-foot-diameter relief holder. Tar and fuel oil storage tanks were also located on the site.

Over the years, by-products, such as coal tar generated from the MGP operations, have leaked or been released from the former relief holder and other structures resulting in the contamination of soil and groundwater.

3.2: Remedial History

Remedial activities at the site are being performed in accordance with a 1998 Administrative Order on Consent (Index No. D2-0001-98-04) (AOC).

In 1993, Brooklyn Union removed seven underground storage tanks from the 25 Willow Avenue parcel. These tanks had formerly contained gasoline, diesel fuel or waste oil.

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. KeySpan Corporation, the present owner of the parcel has been identified as the PRP for this site.

The NYSDEC and KeySpan entered into a Consent Order on April 14, 1998. The Order obligates Keyspan to implement a full remedial program.

SECTION 5: SITE CONTAMINATION

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

5.1: Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site. The RI was conducted in several rounds of field work between February 1999 and December 2004. The field activities and findings of the investigation are described in the RI report.

The remedial investigation at the former MGP site was performed in several rounds of field work. The following activities were conducted during the RI:

- Research of historical information
- Installation of over 100 borings and nine test pits to identify the presence/absence of former MGP structures and characterize the subsurface conditions at the site including the confining layer and to evaluate the lateral and vertical nature and extent of contamination of subsurface conditions both at the onsite locations, along Bay Street and Edgewater Street.
- Collection of 12 soil gas samples to evaluate the potential for contaminated soil vapors beneath the slab of the building at 25 Willow Avenue to enter the building. This building is currently vacant and would be demolished as part of the proposed remedy.
- Sampling of 18 new and existing monitoring wells and collection of 67 discrete groundwater samples, collection of 114 subsurface soil samples and 10 surface soil samples; and
- A survey of public and private water supply wells in the area around the site;

To determine whether the soil and groundwater 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 NYSDEC "Ambient Water Quality Standards and Guidance Values" and Part 5 of the New York State Sanitary Code.
- Soil SCGs are based on the NYSDEC "Technical and Administrative Guidance Memorandum (TAGM) 4046; Determination of Soil Cleanup Objectives and Cleanup Levels".

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 below. More complete information can be found in the RI report.

5.1.1: Site Geology and Hydrogeology

The remedial investigation identified four distinct stratigraphic units. These units are, in order of increasing depth: 1) imported fill material, which consists of silt, sand and gravel mixed with slag, coal, brick, concrete, metal ash, and clinkers, and ranges in thickness from a few inches to approximately nine feet; 2) alluvial/marsh deposits beneath the layer of fill. This unit ranges up to 20 feet thick; 3) glacial deposits beneath the alluvial deposits; and 4) beneath the glacial deposits lies a weathered bedrock layer known as saprolite. The saprolite surface was encountered at approximately 114 to 123 feet deep.

Two aquifers are present beneath the site: a shallow, unconfined water table aquifer and a deep semi-confined aquifer. The water table elevations for the shallow unconfined aquifer range from about 4 feet to approximately 9 feet bgs. Groundwater flow in the shallow aquifer is controlled by former stream and storm sewer that transverse the site. The deep aquifer is located within the glacial deposits above the saprolite. The water in the deeper aquifer is under confining (artesian) pressure. The groundwater elevations in the deep aquifer range from 10 feet to approximately 14 feet bgs. Groundwater generally flows to the northeast and discharges to New York Harbor located approximately 600 feet from the site.

5.1.2: Nature of Contamination

The principal waste product produced at MGPs was coal tar, an oily, dark colored liquid with a strong, objectionable odor. Unlike most materials labeled as "tar", this was not a viscous material. Rather, it has a physical consistency similar to motor oil, which enables it to move through the subsurface. The tar is slightly more dense than water, so it tends to sink downward through soils until it reaches some material which it cannot penetrate. The tar contains high levels of volatile and semi-volatile organic compounds (VOCs and SVOCs). Coal tar is also referred to as a dense non-aqueous phase liquid or DNAPL since it is heavier than water and will sink through the groundwater.

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

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

Specific PAHs of concern in coal tar are the following:

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(g,h,i)perylene
benzo(k)fluoranthene
dibenzo(a,h)anthracene
chrysene
fluoranthene
fluorene

indeno(1,2,3-cd) pyrene
2-methylnaphthalene
naphthalene
phenanthrene
pyrene

In this document, PAH concentrations are referred to as either total PAHs (TPAHs) or carcinogenic PAHs (cPAHs). The TPAH concentration is the sum of the concentrations of each (italicized and non-italicized) PAH listed above. The cPAH concentration is the sum of the concentrations of each italicized PAH listed above.

The contaminated material and other contaminant indicators including tar, staining, sheen, odors and chemical constituents detected in soils extends primarily in the immediate area surrounding historic structures that handled tar at the parcel. Discrete intervals of tar impacted materials were observed at depth beneath Willow Avenue and Bay Street/Edgewater Street rights of way as depicted in Figures 8 and 9.

As described in the RI report, many soil and groundwater samples were collected to characterize the nature and extent of contamination.

5.1.3: Extent of Contamination

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

Chemical concentrations are reported in parts per billion (ppb) for water, and parts per million (ppm) for soil. For comparison purposes, where applicable, SCGs are provided for each medium.

Table 1 summarizes the degree of contamination for the contaminants of concern in soil and groundwater and compares the data with the SCGs for the site. The following are the media which were investigated and a summary of the findings of the investigation.

Surface Soil

Surface soil is defined as the soil located from zero to two inches. Majority of the site is paved or covered by a building with the exception of a small grassed area. Surface soil samples collected in the grassed area show TPAH concentrations ranging from 11 ppm to 92 ppm and cPAH concentrations from 5.9 to 54 ppm. BTEX concentrations range from non-detect to 0.8 ppm. Cyanide was not detected in the surface soil samples.

Surficial soil samples were also collected in the surrounding area to determine background surficial soil concentrations in areas not impacted by the MGP site. Concentrations of compounds detected in on-site surface soils were generally higher than those detected in background soils. On site soils contained trace levels of BTEX and concentrations of TPAH rangingfrom 5.3 to 56 ppm. cPAH ranged from 3.1 to 30 ppm.

Isolated bubbles of tar which were found seeping through cracks in the parking lot pavement on the 25 Willow Avenue parcel. These tar seeps provided a complete route of exposure to site contaminants. This exposure was addressed, as an interim measure by covering the tar bubbles with steel plates in May of 2004.

Subsurface Soil

Subsurface soil contamination is generally found in the immediate vicinity of former MGP structures that handled tar (see Figure 2). Tar-saturated soils are present within and outside of the walls of former Relief Holder No.1 to a depth of approximately 44 feet bgs. Soils within and around other former MGP structures including the tar separator, tar tanks, and tar wells were found to be grossly contaminated by MGP tar. Isolated deposits of tar and tar stained soils were noted at off-site locations beneath the Edgewater Street right of way to a depth of approximately 24 feet bgs and beneath Willow Avenue to a depth of 25 feet bgs.

TPAH concentrations in subsurface soils range from non detect to a maximum of 96,090 ppm and a maxinum BTEX concentrations of 6,100 ppm.

Based on the results of the remedial investigation, it does not appear that tar is currently moving into uncontaminated areas, either on site or off site. However, some fraction of the tar could move in the future in response to changes in land use such as construction activity or groundwater pumping.

Groundwater

Groundwater contamination was detected primarily in areas near grossly impacted soils and former tar handling structures. BTEX and TPAH were detected in shallow groundwater in the vicinity of the former MGP-related structures and the levels decrease rapidly with distance away from the former tar handling structures. Shallow groundwater at the southwestern corner of the 25 Willow Avenue Parcel contains traces of BTEX and low levels of PAHs (4.6 ppb). BTEX with a concentration of 111 ppb and TPAH at 219 ppb was noted along the route of the former stream/storm sewer. No measurable amount of NAPL was observed in any of the shallow monitoring wells at the OU-2 parcel.

Deep groundwater at the OU-2 parcel does not appear to be significantly contaminated by MGP by-products based on the RI sampling results. PAHs and total cyanide were not detected in either of the deep groundwater samples collected and analyzed during the RI. Measurable tar was observed in only one well (RW-18) at the OU-2 parcel. Trace levels of BTEX were, however, noted in two deep monitoring wells at a maximum concentration of 0.7 ppb.

Off site migration of groundwater contamination at this site is not considered significant. However, source materials in site soils impacting the site groundwater would be addressed during the remedial phase of the project to allow and enhance natural attenuation of the site groundwater overtime.

Sub-Slab Vapor

Twelve (12) soil vapor samples were collected beneath the concrete floor slab of the existing building. The samples primarily contained concentrations of chlorinated VOC compounds including 1,1,1-trichloroethane ranging from non-detect to 25,000 micrograms per cubic meter (mcg/m^3). Other compounds detected were 1,1-dichloroethane, 1,1-dichloroethene and tetrachloroethene at maximum concentrations of 5,400 mcg/m^3, 2,800 mcg/m^3 and 960 mcg/m^3 respectively. These compounds are typically not associated with the operation of the MGP and are likely associated with post MGP operations. The building is currently unoccupied, therefore, there are no current receptors.

5.2: Interim Remedial Measures

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

KeySpan conducted an Interim Remedial Measure (IRM) as a temporary measure in May of 2004 to eliminate potential exposures to tar which was found seeping through cracks in the pavement on the 25 Willow Avenue parcel. The IRM included placement of steel plates over the tar bubbles in accordance with a NYSDEC-approved work plan.

5.3: Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the human exposure pathways can be found in Section 7 of the RI report.

An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a site. An exposure pathway has five elements: [1] a contaminant source, [2] contaminant release and

transport mechanisms, [3] a point of exposure, [4] a route of exposure, and [5] a receptor population.

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

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

There are no known completed exposure pathways at the site. However, potential exposure pathways are:

- Dermal contact with contaminated surface soil, subsurface soil or groundwater
- Incidental ingestion of contaminated soils or groundwater
- Inhalation of contaminated soil vapors

Surface and subsurface soils contain elevated levels of site-related contaminants. Most of the site is paved and enclosed by a locked chain link fence restricting access to contaminated surface and subsurface soils. Exposure to surface soil is not expected in the grass strip along Bay Street because of limited area of exposed surface soils. If contaminated soil is brought to the surface through excavation or other site activities, exposures could occur via inhalation of fugitive particulates, dermal contact or incidental ingestion.

No one is currently using the site groundwater for drinking or other uses and municipal water serves the area. Municipal water is obtained from reservoirs in upstate New York. Although unlikely, a well could be installed in the future. Depth to groundwater is four to nine feet, therefore incidental ingestion of and dermal contact with contaminated groundwater is possible during construction activities.

Soil vapor is contaminated with benzene, toluene, xylene and chlorinated VOCs. The on-site building is currently vacant and the proposed remedy consists of demolishing it. Any future development will include an evaluation of soil vapor and the potential for exposures associated with soil vapor intrusion. If necessary, remedial or mitigation measures will be taken to minimize potential exposures.

5.4: Summary of Environmental Impacts

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 Fish and Wildlife Impact Analysis, which is included in the RI report, presents a detailed discussion of the existing and potential impacts from the site to fish and wildlife receptors. The following environmental exposure pathways and ecological risks have been identified:

Analytical results from groundwater samples indicate that groundwater beneath the OU-2 portion of the site is impacted by contaminants resulting from the operation of the MGP. This groundwater impact has resulted in significant damage to the groundwater resource present at the site and beyond due to migration. However, there is no evidence based on the remedial investigations that contaminated groundwater has migrated into the New York Harbor which is the

nearest surface water body located approximately 600 feet northeast of the site.

The site and the immediate surrounding areas are characterized by commercial facilities, buildings and paved parking lots and therefore provide minimal habitat to wildlife. Because of the urban nature of these surrounding areas, a wildlife population is not expected. Due to the transient nature of the use of the site by birds and other small animals, the frequency and duration of exposure is limited. Therefore, contaminants present at OU 2 of the Clifton site do not pose a current or future risk to wildlife.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR 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 eliminate or reduce to the extent practicable:

- direct contact with contaminated surface and subsurface soil at concentrations exceeding SCGs;
- ingestion of contaminated surface and subsurface soil at concentrations exceeding SCGs;
- migration of NAPL in the subsurface soil; and
- the source of contamination to the groundwater with a goal of reduction in the groundwater contamination overtime.

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 former Clifton MGP Site (OU-2) were identified, screened and evaluated in the FS report which is available at the document repositories identified in Section 1.

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. The cost to implement all alternatives has been estimated using a discount rate of 5%, assuming a 30-year period of monitoring. 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.

7.1: Description of Remedial Alternatives

The following potential remedies were considered to address the contaminated soil and groundwater at the site. All alternatives with the exception of Alternative 1 share some common components, which are referred to as common elements. The common elements are: 1) institutional controls; 2) building demolition and; 3) NAPL recovery. The common elements are presented in details with each alternative as appropriate.

Alternative 1: No Action

The No Action Alternative is evaluated as a procedural requirement and as a basis for comparison. It requires continued monitoring only, allowing the site to remain in an unremediated state. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment. Although this alternative does not require active remedial action, it would require cost for annual monitoring, operation and periodic site reviews. The periodic site review would be performed to assess any changes in the risk to human health and the environment posed by the site.

The cost to implement Alternative 1, based on an annual operation and maintenance (O&M), for a period of 30 years has been estimated as follows:

Present Worth: $389,000
Capital Cost: $0
Annual OM&M: $25,000

Alternative 2: Engineered Environmental Capping and Common Elements

Alternative 2 includes actions that would preclude direct contact with impacted materials underneath the site (See Figure 3). No removal of contaminated soils would be performed. The components of Alternative 2 would include the following:

- Demolition of the existing building to allow cap construction.
- Placement of an engineered cap to prevent contact with contaminated materials in the subsurface. The actual cap type and thickness would be determined during the remedial design phase of the project.
- Installation of recovery wells for passive collection of any NAPL that would readily flow into recovery wells for removal and off-site disposal.
- Institutional controls to mitigate the threat of exposure to remaining contamination. The components of this control would include restrictions on future use of the land, maintenance of site access restrictions (e.g. fencing, lockable gates), a health and safety plan, public education and awareness programs, long-term monitoring and periodic site reviews.

The cost to implement Alternative 2, based on an annual operation and maintenance (O&M), for a period of 30 years has been estimated as follows:

Present Worth: $10,329,000
Capital Cost: $5,285,000
Annual OM&M: $328,000

Alternative 3: Vertical Barrier Cutoff Walls and Common Elements

Alternative 3 includes actions which would use surface and subsurface containment to encapsulate source materials at OU-2 (see Figure 4). The components of this alternative would include the following:

- Installation of a subsurface containment system consisting of two vertical barrier cutoff walls keyed into the underlying confining layer located approximately 44 feet bgs. The type of walls to be utilized would be evaluated during the design phase of the project. The barrier walls would isolate MGP-byproducts and prevent horizontal off-site migration of site contamination.
- Excavation of up to one foot of soil to allow for the installation of a soil cover or asphalt cap over approximately 3.5 acres of land to prevent exposure to contaminated soil and inhibit infiltration of precipitation into the subsurface.

- Installation of recovery wells for passive collection of any NAPL that would readily flow into recovery wells for removal and off-site disposal.

- Demolition of the existing building to allow cap construction.

- Institutional controls to mitigate the threat of exposure to remaining contamination. The components of this control would include restrictions on future use of the land, maintenance of site access restrictions (e.g. fencing, lockable gates), a health and safety plan, public education and awareness programs, long-term monitoring and periodic site reviews.

The cost to implement Alternative 3, based on an annual operation and maintenance (O&M), for a period of 30 years has been estimated as follows:

Present Worth: $15,404,000
Capital Cost: $7,996,000
Annual OM&M: $482,000

Alternative 4: Excavation of soils up to 10 ft below ground surface, Removal of MGP-related Structures, and Common Elements.

This alternative would include actions for removal of source materials in subsurface soil and former MGP-related structures (see Figure 5). The component of Alternative 4 would include the following:

- Excavation, treatment and disposal of approximately 38,300 cubic yards of soils determined to contain source materials to a depth of 10 feet bgs. It is noted that some portion of the areas depicted for removal may not contain levels of contaminants warranting soil removal to the proposed depth of 10 feet bgs. The actual depth of soil removal would be based on verifiable field conditions in concert with the NYSDEC on-site representative. The excavated area would be backfilled with clean soil imported from an off-site source.

- Removal of former MGP-related structural foundations determined to contain MGP-byproducts to the extent practical.

- Installation of recovery wells for passive collection of any NAPL that would readily flow into recovery wells for removal and off-site disposal.

- Demolition of the existing building to allow removal of the impacted materials located beneath.

- Institutional controls to mitigate the threat of exposure to remaining contamination. The components of these controls would include deed restrictions on future use of the land, maintenance of site access restrictions (e.g. fencing, lockable gates), a health and safety plan, public education and awareness programs, long-term monitoring and periodic site reviews.

The cost to implement Alternative 4, based on an annual operation and maintenance (O&M), for a period of 30 years has been estimated as follows:

Present Worth: $25,997,000
Capital Cost: $21,426,000
Annual OM&M: $298,000

Alternative 5: Excavation of up to 10 ft of soils below ground surface, Removal of Former MGP-related Structures, Vertical Barrier Cutoff Walls and Common Elements.

This alternative would combine components of Alternative 3 and 4. The excavation and associated backfill would allow a clean environment for the installation of subsurface features associated with any future development.

The barrier walls would contain the remaining NAPL, not removed by excavation and prevent migration into off-site areas (see Figure 6). The components of this alternative are as follows:

- Excavation, off-site treatment and disposal of approximately 38,300 cubic yards of soils determined to contain source materials. The soils would be removed to a depth of 10 feet bgs as depicted in Figure 6 of this document. A visual demarcation barrier would be installed at the bottom of the excavation for future determination of the extent of soil removal. It is noted that some portion of the areas depicted for removal may not contain level of contaminants warranting soil removal to the proposed depth of 10 feet bgs. The actual depth of removal in these locations would be based on verifiable field conditions determined by visual observations and in concert with the NYSDEC on-site representative. Materials warranting removal would be soil saturated by coal tar or separate phase materials. The excavated area would be backfilled with clean soil imported from an off-site source.

- Backfill of the excavated areas with clean soil from an off-site location. The top two (2) feet of the entire on-site parcel would be filled with clean top soil.

- Removal of former MGP-related structures determined to contain coal tar with the potential for future mobility, to the extent practicable.

- Installation of subsurface containment consisting of two vertical barrier walls keyed into the underlying confining layer located approximately 44 feet bgs. The type of wall to be utilized would be evaluated during the design phase of the project. The barrier wall would isolate coal tar and prevent horizontal off-site migration of the product at OU-2.

- Installation of recovery wells for passive collection of any NAPL that will readily flow into recovery wells, for removal and off-site disposal.

- Demolition of the existing building to allow access to the impacted materials located beneath the building.

- Institutional control to mitigate the threat of exposure to remaining contamination. The components of this control would include restrictions on future use of the land, maintenance of site access restrictions (e.g. fencing, lockable gates), a health and safety plan, public education and awareness programs, long-term monitoring and periodic site reviews.

The cost to implement Alternative 5, based on an annual operation and maintenance (O&M), for a period of 30 years has been estimated as follows:

Present Worth: $31,471,000
Capital Cost: $26,427,000
Annual OM&M: $328,000

Alternative 6: Excavation of Source Materials to full depth, Removal of Former MGP-related Structures and Common Elements

This alternative would attempt to remove all contaminated materials from the Site through excavation to a depth of approximately 44 feet bgs (see Figure 7). The material to be removed would include former MGP-related structures and foundations. Collection of NAPL would not be necessary under this alternative, since all source materials would be removed. The main components of this alternative are:

- Excavation, removal, treatment and disposal of approximately 179,000 cubic yards of soils. Soils would be removed to

a depth corresponding with the vertical confining unit located at approximately 44 feet bgs.

- Backfilling the excavated areas with clean soil imported from off-site sources. The site would be restored to a pre-disturbance grade.

The cost to implement Alternative 6, based on an annual operation and maintenance (O&M), for a period of 30 years has been estimated as follows:

Present Worth: $70,635,000
Capital Cost: $69,753,000
Annual OM&M: $57,000

The Annual OM&M cost for this alternative would be cost associated with groundwater sampling and analysis, etc. to monitor the effectiveness of the alternative.

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 2 at the end of the PRAP.

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 5 which calls for the excavation of soils up to 10 feet bgs, removal of former MGP-related structures and vertical barrier cutoff walls, and other measures, as the remedy for this site. The elements of this remedy are described at the end of this section.

The proposed remedy is based on the results of the RI and the evaluation of alternatives presented in the FS. The proposed remedy when fully implemented, would eliminate or mitigate all threats to public health and the environment presented by the contaminated materials present at the OU-2 portion of the site. The proposed remedy would achieve the remedial action objectives (RAOs) and comply with environmental laws, regulations and other standards and criteria.

Alternative 1 does not include active remedial actions and thus would not provide protection to human health and the environment over what currently exists. In addition, this alternative would not comply with SCGs, since source material and MGP related structures would remain in place and continue to pose a threat to both human health and the environment. This alternative was therefore, eliminated from further evaluation.

Alternatives 2, 3,4,5 and 6 would all provide some level of protection to public health and the environment and were retained for consideration. Balancing criteria was used to choose between them.

Alternative 2, which calls for capping of the site, would prevent human exposure through direct contact or ingestion of the impacted materials. However, this alternative would not provide any removal or treatment with the exception of some minor excavation associated with the capping. Grossly contaminated material would remain in place under this alternative. This alternative would not prevent further migration of site contamination to off-site locations. Though this alternative would include passive NAPL recovery, the majority of site contamination would be left in place, resulting in further contamination of soil and groundwater.

Alternative 3 would build on Alternative 2 by including a subsurface vertical barrier wall keyed into a confining layer located at a depth of approximately 44 feet bgs. While this alternative would provide a higher level of protection of human health and the environment compared to Alternative 2, the former MGP-related structures containing MGP by-product would not be removed to their full depth and would continue to act as sources of contamination to soil and groundwater. Alternative 3 is less desirable when compared to the proposed alternative.

Alternative 4 would remove the contamination most likely to be contacted by humans during construction work, through excavation of up to

10ft of contaminated soil and removal of MGP-related structures. However, it would not prevent off-site migration of NAPL from the site.

Alternative 6 which includes near-total removal of contaminated materials to their full depth of 44 feet, would provide a slightly greater amount of protection to human health and the environment than Alternative 5. Under this alternative, only very low levels of contaminated materials would remain following excavation. However, this alternative would create several short-term impacts during implementation. Performing excavation to a depth of 44 feet bgs would result in significant disruption to the community as a result of the need for massive dewatering, treatment and disposal of water. This alternative would, also produce a significant amount of vapors during construction. The extremely large volume of soil produced (approximately 179,000 cubic yards) would require roughly 9,000 tandem truck trips through the community to transport the contaminated material off site. Though this alternative would result in a reduction in the volume of contaminated source materials, it would result in greater short-term adverse impacts on nearby residents and commercial establishments during construction and would only provide minimal additional protection of human health and the environment over the proposed remedy. The incremental cost of over $50 million and significant community disruption associated with this alternative over Alternative 5 are not justified. The proposed remedy is expected to allow natural attenuation of remaining contamination by removing the source of contamination.

Alternative 5 is being proposed because, as described below, it satisfies the threshold criteria and provides the best balance of the primary balancing criteria described in Section 7.2. It would achieve the remediation goals for the site by removing the source of the site contamination and preventing off-site migration of NAPL by the installation of NAPL recovery wells and vertical barrier walls.

Although alternatives 2 and 3 would achieve the RAOs established for the OU-2 portion of the site, they would not provide the reduction in toxicity, mobility and volume of contaminated materials. Alternative 4 would also meet the RAOs but would not provide immediate reduction in mobility compared to Alternative 5. Alternative 6 would achieve the RAOs but the logistical and implementability issues associated with excavation do not warrant the additional period of disruptive activities and the significant increase in capital cost (over $50 million) when compared to Alternative 5.

On the basis of the above evaluations, Alternative 5 is the preferred alternative. Alternative 5 would present a more balanced and cost effective remedy when compared to the other altenatives.

The estimated present worth cost to implement the remedy is $31,471,000. The cost to construct the remedy is estimated to be $26,427,000 and the estimated average annual operation, maintenance, and monitoring costs for 30 years is $328,000.

The elements of the proposed remedy are as follows:

1. A remedial design program would be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program.

2. Demolition of the approximately 30,500 square foot existing building and associated features located in the northeastern portion of the 25 Willow Avenue Parcel to allow for the excavation of the impacted materials located beneath the building. All building materials would be disposed of in accordance with applicable Federal, State and Local regulations at a disposal facility permitted to accept these types of wastes.

3. Installation of two vertical barrier cutoff walls to prevent the migration of NAPL from the site source areas to off-site locations. The wall will be installed in two areas of the site (see Figure6) determined to be pathways for off-site NAPL migration. The type and configuration of the walls to be installed would be determined during the design of the proposed remedy. The evaluation would take into account, the constructability and compatibility of the wall with subsurface site contamination. The barrier wall may also serve to support excavation.

4. Excavation of source materials to an approximate depth of ten (10) feet below ground surface (bgs) to remove approximately 38,300 cubic yards of contaminated soils as depicted in Figure 6 of this document. A visual demarcation barrier would be installed at the bottom of the excavation for future determination of the extent of soil removal. Some portion of the areas depicted for removal may not contain levels of contaminants warranting soil removal to the proposed depth of 10 feet bgs. The actual depth of removal in these locations would be based on verifiable field conditions determined by visual observations and in concert with the NYSDEC on-site representative. Materials warranting removal would be soil saturated by coal tar or separate phase materials. In addition, dewatering prior to excavation of materials would be required for effective operations. Dewatering water generated would be pre-treated prior to discharge to a permitted facility such as publicly owned treatment works (POTW). Odor, noise and dust control measures would be implemented.

5. Former MGP-related structures including foundations determined to contain coal tar with potential for future mobility would be removed to full depth to the extent practicable.

6. Backfill of the excavated areas with clean soil materials from an off-site location. Demolished building materials determined to be free of contamination may be used to backfill the lower portion of the excavated areas. The top two (2) feet of the entire on-site parcel would be filled with clean top soil.

7. Installation of NAPL recovery wells to allow for collection, treatment and disposal of mobile NAPL that may be present in the subsurface after soil and MGP-related structures are removed. Recovery/monitoring wells would be placed immediately upgradient and downgradient of walls to ensure recovery of NAPL collecting behind the walls as well as any significant NAPL that may be present outside of the walls. The actual number and locations of wells, the screen intervals and method of recovery would be determined during the design of the proposed remedy.

8. Since the remedy results in contamination above unrestricted levels remaining at the site an institutional control in the form of an environmental easement would be required for the remedy. The environmental easement would:
(a) restrict the use of the site to "commercial use" which is a land use for the primary purpose of commercial activities.
(b) restrict the use of groundwater at the site;
(c) require the management of the site in accordance with the provisions of the site management plan, to be approved for the site by the Department; and (d) require the property owner to complete and submit to the NYSDEC a periodic certification.

9. A site management plan (SMP) would be developed and implemented. The SMP would identify the institutional controls and engineering controls (IC/ECs) required for the remedy and details their implementation. The SMP for this remedy would include:

   (a) An IC/EC control plan to establish the controls and procedures necessary to; (i) manage remaining contaminated soils that may be excavated from the site during future activities, including procedures for soil characterization, handling, health and safety of workers and the community as well as, disposal/reuse in accordance with applicable NYSDEC regulations and procedures, (ii) evaluate the potential for vapor intrusion for any buildings developed on the site, including mitigation of any impacts identified,(iii) maintain use restrictions regarding site development or groundwater use identified in the environmental easement; and (iv) require the property owner to provide an Institutional Control/ Engineering Control (IC/EC) certification, as required by regulations, on a periodic basis.

   (b) A monitoring plan to monitor the vertical barrier walls and NAPL recovery wells; and the effectiveness of the cutoff walls would be determined from sampling results obtained from a periodic long-term groundwater monitoring program; and

   (c) An operation and maintenance plan to provide the detailed procedures necessary to operate and maintain the remedy, including the NAPL recovery system. The operation of the components of the remedy would continue until the remedial objectives have been achieved, or until the NYSDEC determines that continued operation is technically impracticable or not feasible.

Additional work would be required post-ROD to address a small area of off site impacts which were identified to the northeast of the site beneath Bay Street, Edgewater Street, and the Edgewater Plaza parking lot. Two borings in this area (SB-81 and SB-93) encountered MGP contamination at depths ranging from 8 to 21 feet. Some of this material appears to be due to subsurface migration of tar from the MGP, however the material beneath the Edgewater Plaza parking lot appears to be the result of historic deposition. Additional borings have been completed to the east, and have shown no evidence that the tar has migrated into New York Harbor, which is located roughly 600 feet northeast of the site. While this proposed remedy does not address these specific areas, a remedial plan would be developed at the conclusion of a soil gas survey in the nearby commercial building. Additional borings would also be installed in the parking lot of the Edgewater Plaza to better define the extent ofcoal tar. This phase of work is scheduled for the winter months of 2005-2006. Remediation of this area would either be included in the design phase of this project or would be completed as a separate interim remedial measure.

TABLE 1
Nature and Extent of Contamination

Surface Soil	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Semi Volatile Organic Compounds (SVOCs) cPAHs	Benzo(a)anthracene	0.38 - 9.4	0.224	10/10
	Benzo(a)pyrene	0.45 - 8.8	0.061	10/10
	Benzo(b)fluoranthene	0.52 - 8.2	1.1	5/10
	Benzo(k)flouranthene	0.85 - 10	1.1	8/10
	Chrysene	0.55 - 12	0.4	10/10
	Dibenzo(a,h)anthracene	0.046 - 1.6	0.014	9/10
	Indeno(1,2,3-cd)pyrene	0.072 - 4	3.2	1/10
Subsurface Soil	**Contaminants of Concern**	**Concentration Range Detected (ppm)[a]**	**SCG[b] (ppm)[a]**	**Frequency of Exceeding SCG**
Volatile Organic Compounds (VOCs)	Benzene	0.001 - 1,000	0.06	47/127
	Toluene	0.0004- 2,100	1.5	44/127
	Ethylbenzene	0.0005 - 1,500	5.5	40/127
	Xylenes (Total)	0.001- 1,800	1.2	73/127
Semi Volatile Organic Compounds (SVOCs) cPAHs	Benzo(a)anthracene	0.004- 1,700	0.224	71/128
	Benzo(a)pyrene	0.014 - 1,500	0.061	65/128
	Benzo(b)fluoranthene	0.013 - 590	1.1	64/128
	Benzo(k)flouranthene	0.022 - 890	1.1	64/128
	Chrysene	0.003 - 2,200	0.4	65/128
	Dibenzo(a,h)anthracene	0.033 - 2,600	0.014	33/128
	indeno(1,2,3-cd)pyrene	0.012 - 3,200	3.2	46/128

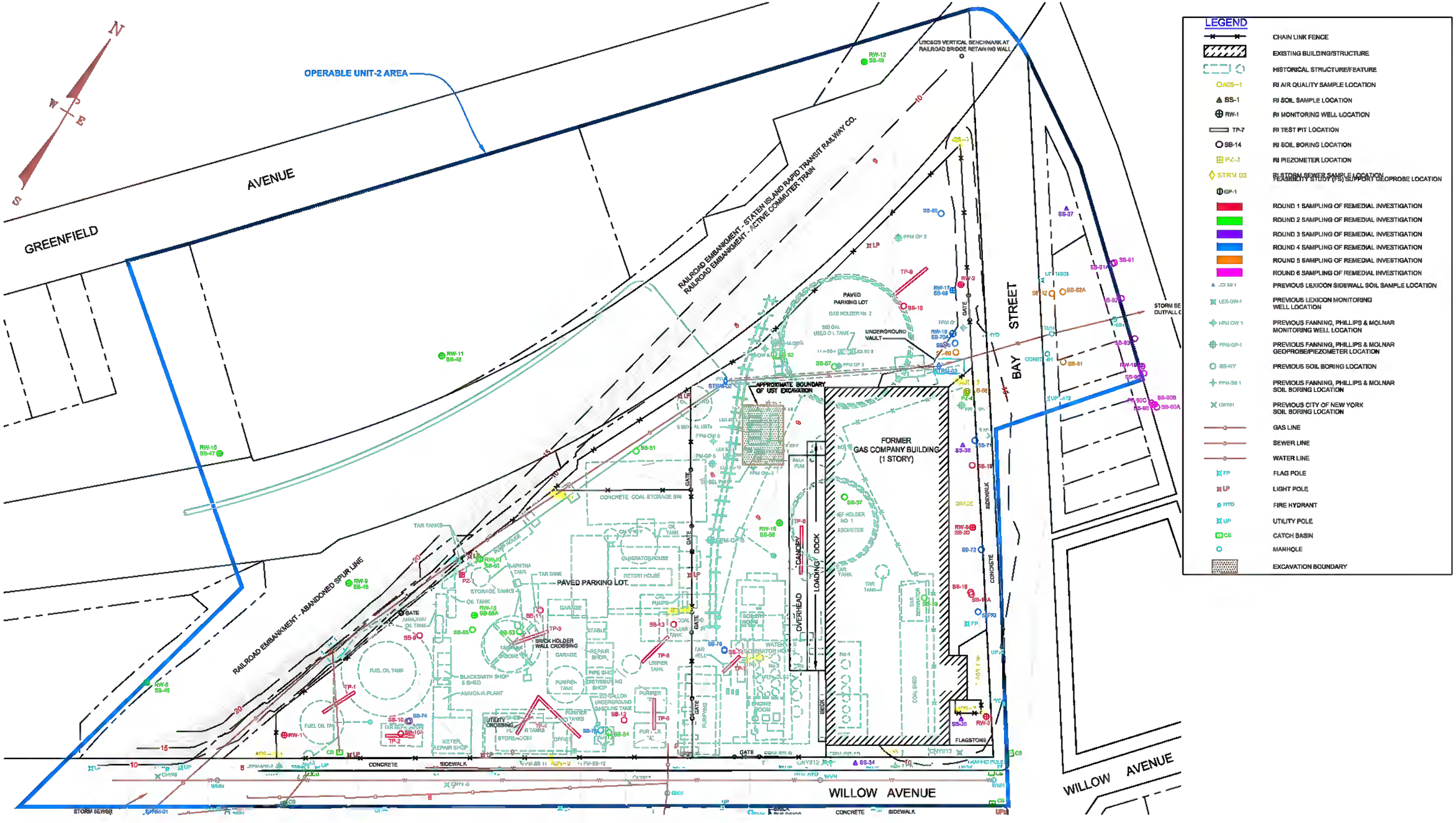
Groundwater	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Benzene	0.6 - 8,300	1	48/67
	Toluene	0.3 - 3,500	5	35/67
	Ethylbenzene	1 - 1,800	5	28/67
	Xylenes (Total)	1 - 2,000	5	42/67
Semivolatile Organic Compounds (SVOCs) cPAHs	Benzo(a)anthracene	0.2 - 6	0.002	0/24
	Benzo(a)pyrene	0.2 - 4	0.002	0/24
	Benzo(b)fluoranthene	0.2 - 3	ND	0/24
	Benzo(k)fluoranthene	0.3 - 4	0.002	0/24
	Indeno(1,2,3-cd)pyrene	0.1 - 4	0.002	1/24
	Chrysene	0.2 - 6	0.002	0/24
Sub Slab Soil Vapor	**Contaminants of Concern**	**Concentration Range Detected (mcg/m3)[a]**	**SCG[b] (mcg/m3)[a]**	**Frequency of Exceeding SCG**
VOCs	1,1,1-Trichloroethane	ND - 25,000	N/A	N/A
	1,1-Dichloroethane	ND - 5,400	N/A	N/A
	1,1-Dichloroethylene	ND - 2,800	N/A	N/A
	Tetrachloroethylene	ND - 960	N/A	N/A

[a] ppb = parts per billion, which is equivalent to micrograms per liter, mcg/L, in water;
ND = Non Detect;
N/A = Not Applicable
ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
mcg/m^3 = micrograms per cubic meter
[b] SCG = standards, criteria, and guidance values;

Table 2
Remedial Alternative Costs

Remedial Alternative	Capital Cost	Annual OM&M	Total Present Worth
Alternative 1: No Action	$0	$25,000	$389,000
Alternative 2: Capping and Common Elements	$5,285,000	$328,000	$10,329,000
Alternative 3: Vertical Barrier Cutoff Walls and Common Elements.	$7,996,000	$482,000	$15,404,000
Alternative 4: Excavation to 10 ft bgs, Removal of Former MGP-related Structures and Common Elements	$21,426,000	$298,000	$25,997,000
Alternative 5: Excavation to 10 ft bgs, Removal of Former MGP-related Structures, Vertical Barrier Cuttoff Walls and Common Elements	$26,427,000	$328,000	$31,471,000
Alternative 6: Excavation to Full Depth of Contamination and Common Elements	$69,753,000	$57,000	$70,635,000

Former Clifton MGP Site Operable Unit 2
Site No. 2-43-023
Figure 1
Site Location Map



LEGEND

- CHAIN LINK FENCE
- EXISTING BUILDING/STRUCTURE
- HISTORICAL STRUCTURE/FEATURE
- AQS-1 — RI AIR QUALITY SAMPLE LOCATION
- SS-1 — RI SOIL SAMPLE LOCATION
- RW-1 — RI MONITORING WELL LOCATION
- TP-7 — RI TEST PIT LOCATION
- SB-14 — RI SOIL BORING LOCATION
- PZ-1 — RI PIEZOMETER LOCATION
- STRM 03 — RI STORM SEWER SAMPLE LOCATION
- GP-1 — FEASIBILITY STUDY (FS) SUPPORT GEOPROBE LOCATION
- ROUND 1 SAMPLING OF REMEDIAL INVESTIGATION
- ROUND 2 SAMPLING OF REMEDIAL INVESTIGATION
- ROUND 3 SAMPLING OF REMEDIAL INVESTIGATION
- ROUND 4 SAMPLING OF REMEDIAL INVESTIGATION
- ROUND 5 SAMPLING OF REMEDIAL INVESTIGATION
- ROUND 6 SAMPLING OF REMEDIAL INVESTIGATION
- PREVIOUS LEXICON SIDEWALL SOIL SAMPLE LOCATION
- PREVIOUS LEXICON MONITORING WELL LOCATION
- PREVIOUS FANNING, PHILLIPS & MOLNAR MONITORING WELL LOCATION
- PREVIOUS FANNING, PHILLIPS & MOLNAR GEOPROBE/PIEZOMETER LOCATION
- PREVIOUS SOIL BORING LOCATION
- PREVIOUS FANNING, PHILLIPS & MOLNAR SOIL BORING LOCATION
- PREVIOUS CITY OF NEW YORK SOIL BORING LOCATION
- GAS LINE
- SEWER LINE
- WATER LINE
- FP — FLAG POLE
- LP — LIGHT POLE
- HYD — FIRE HYDRANT
- UP — UTILITY POLE
- CB — CATCH BASIN
- MANHOLE
- EXCAVATION BOUNDARY

SOURCES:

1. "FOLLOW-UP SOIL AND GROUNDWATER INVESTIGATION AT THE BROOKLYN UNION GAS COMPANY CLIFTON STATION FACILITY, 40 WILLOW AVENUE, STATEN ISLAND, NY" BY FANNING, PHILLIPS & MOLNAR, AUGUST 29, 1994.
2. "MAP OF PROPERTY, EXIST. BLDG & YARD CONNECTIONS, NEW YORK AND RICHMOND GAS COMPANY - 1921" BY FANNING, PHILLIPS & MOLNAR ENGINEERS, RONKONKOMA, NEW YORK. SCALE 1"=30'. DATED 2/8/94 - REVISED TO 2/13/98.
3. "TOPOGRAPHY AND SAMPLE LOCATIONS, #49 - #67 LYNHURST AVENUE" BY GEI CONSULTANTS, INC , COLCHESTER, CONNECTICUT FOR KEYSPAN ENERGY. SCALE 1"=10'. DATED 7/8/02.
4. "SITE PLAN, TOPOGRAPHY AND HISTORIC STRUCTURES WITHIN OPERABLE UNIT-1 (OU-1) AND OPERABLE UNIT-2 (OU-2)", PREPARED BY GEI CONSULTANTS, INC. AND DATED SEPTEMBER 2002.

SOURCE:

1. BASE MAP OF SITE PREPARED BY GEI CONSULTANTS, INC. TAKEN BOFROM PLAN ENTITLED, "SITE PLAN, TOPOGRAPHY AND HISTORIC STRUCTURES WITHIN OPERABLE UNIT-1 (OU-1) AND OPERABLE UNIT-2 (OU-2)," DATED SEPTEMBER 2002.

40 20 0 40

GRAPHIC SCALE IN FEET

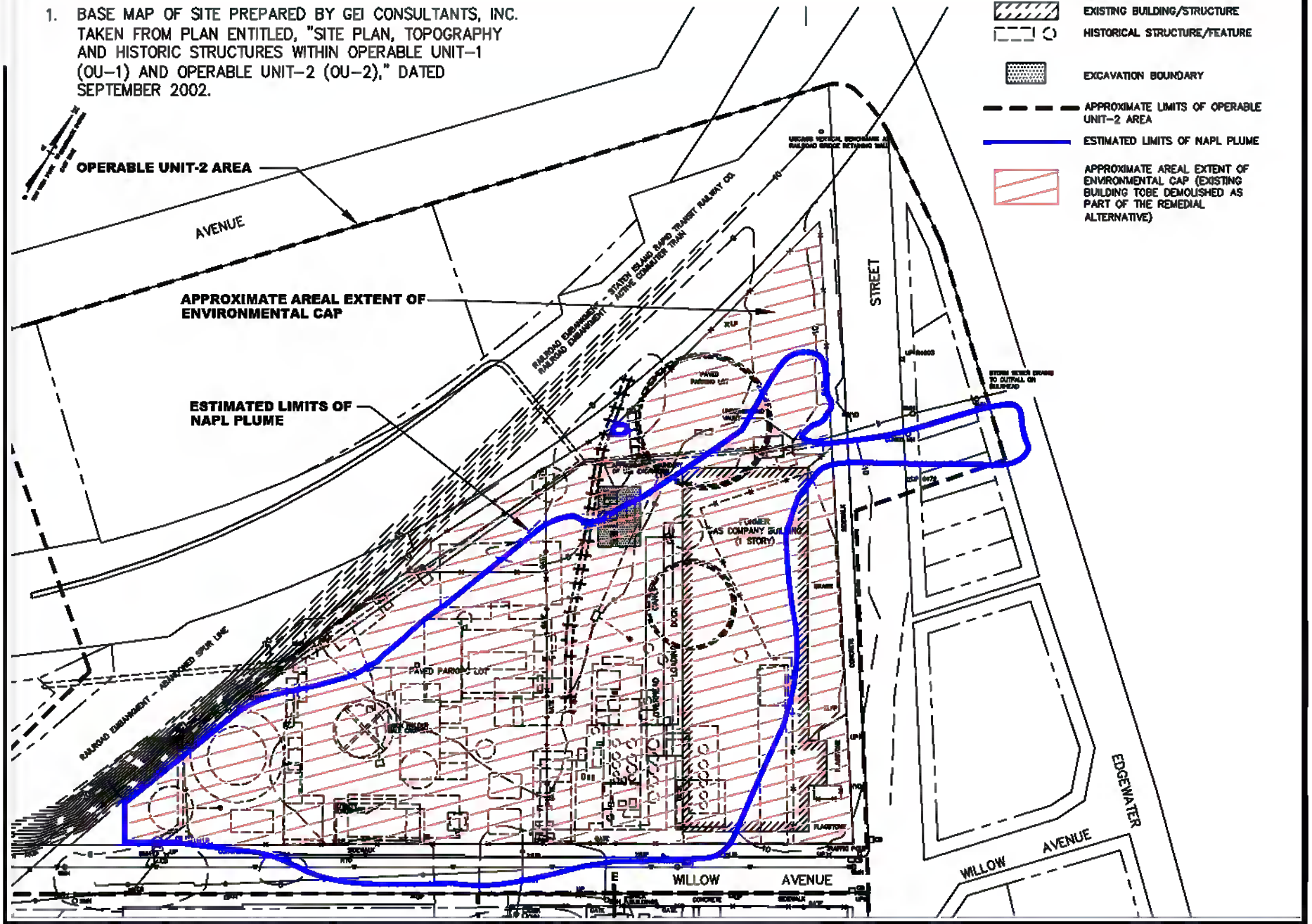
FORMER CLIFTON MGP SITE OPERABLE UNIT 2
STATEN ISLAND, RICHMOND COUNTY
SITE NO. 2-43-023

SITE LOCATION MAP

FIGURE 2

SOURCE:

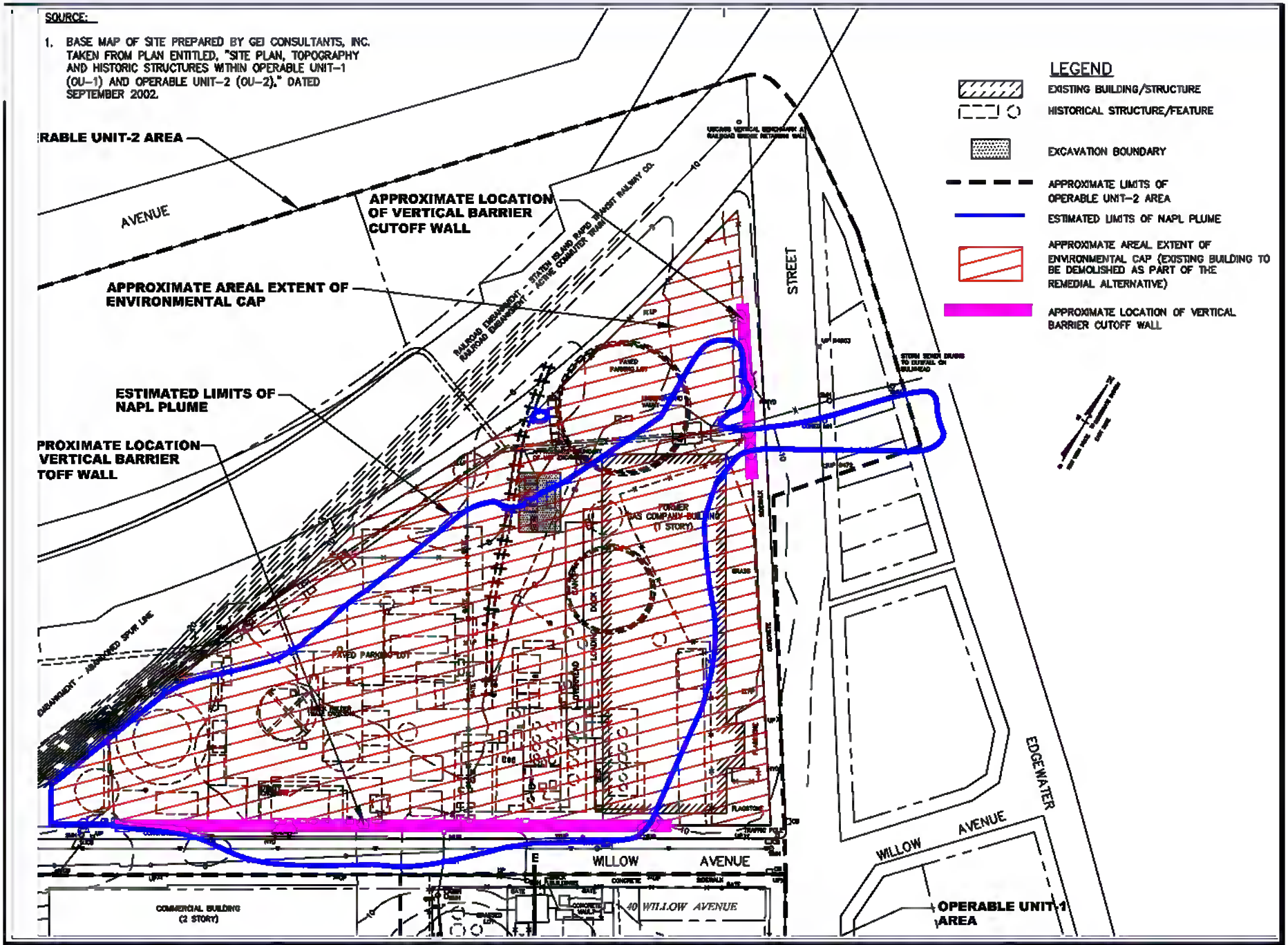
1. BASE MAP OF SITE PREPARED BY GEI CONSULTANTS, INC. TAKEN FROM PLAN ENTITLED, "SITE PLAN, TOPOGRAPHY AND HISTORIC STRUCTURES WITHIN OPERABLE UNIT–1 (OU–1) AND OPERABLE UNIT–2 (OU–2)," DATED SEPTEMBER 2002.



FORMER CLIFTON MGP SITE - OPERABLE UNIT 2
STATEN ISLAND, RICHMOND COUNTY
SITE NO. 2-43-023

ALTERNATIVE 2 - CAPPING

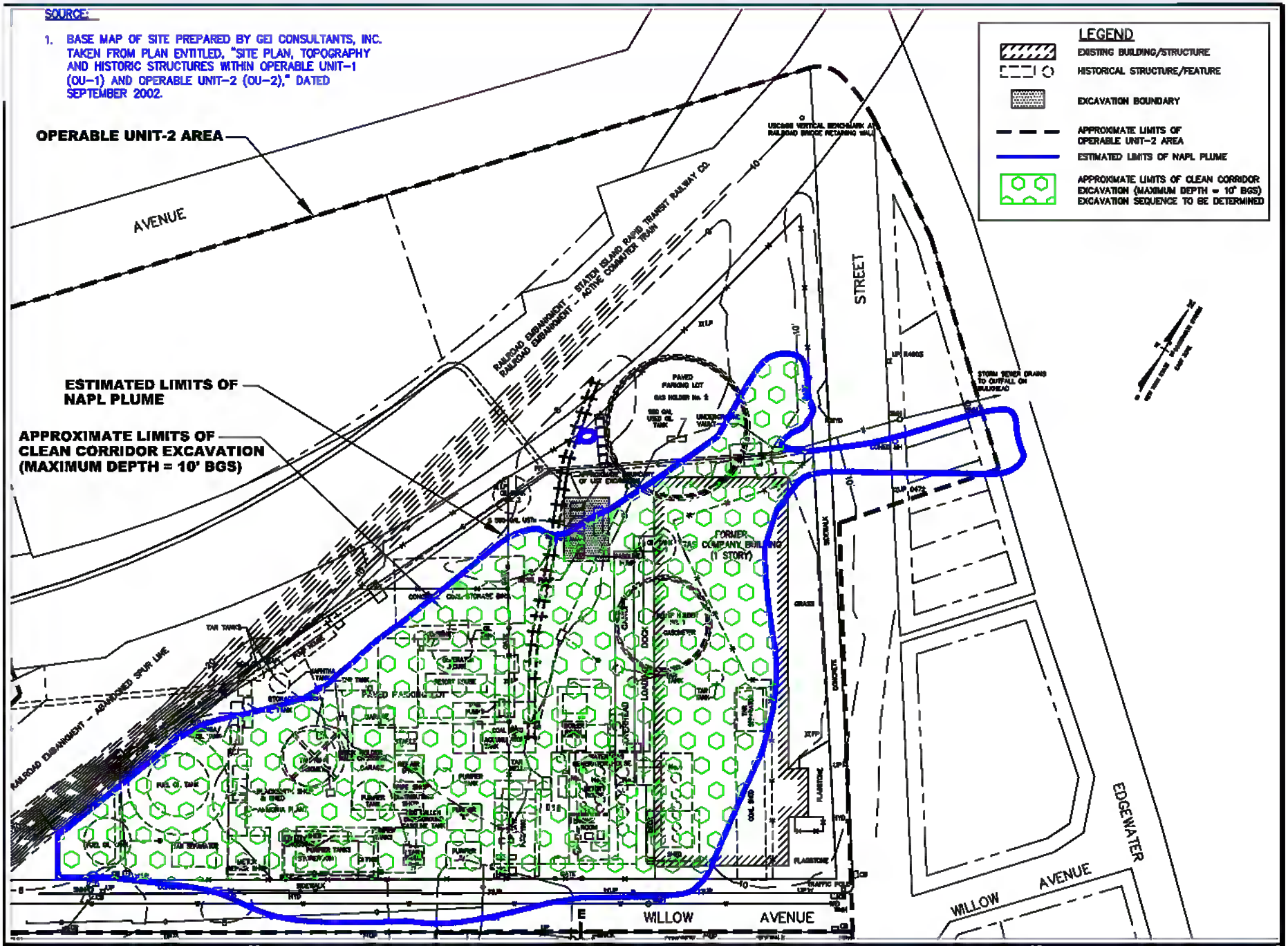
FIGURE 3



FORMER CLIFTON MGP SITE - OPERABLE UNIT 2
STATEN ISLAND, RICHMOND COUNTY
SITE NO. 2-43-023

ALTERNATIVE 2 - CAPPING

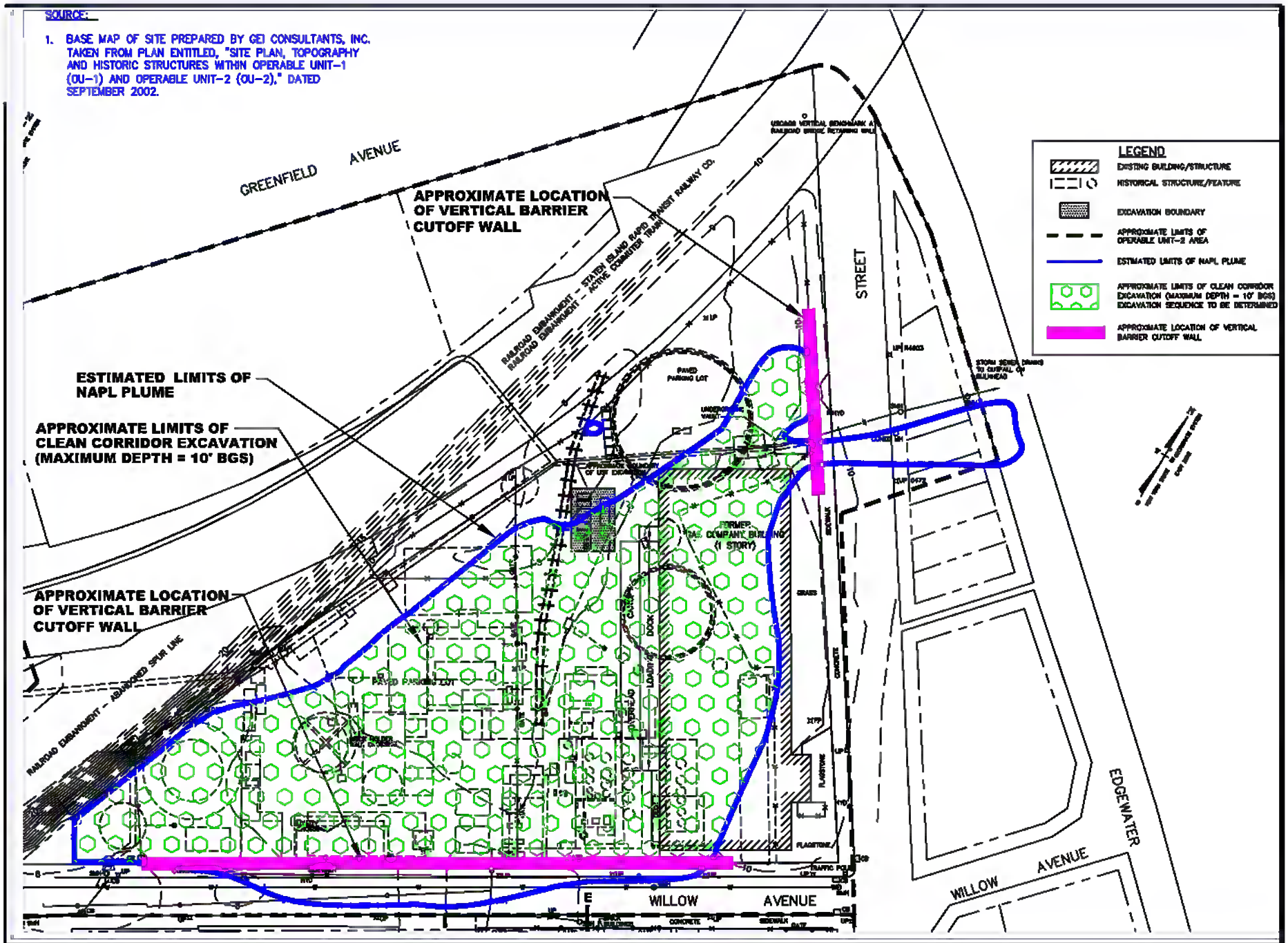
FIGURE 4



FORMER CLIFTON MGP SITE OPERABLE UNIT 2
STATEN ISLAND, RICHMOND COUNTY
SITE NO. 2-43-023

ALTERNATIVE 4: 10 FT EXCAVATION, REMOVAL OF MGP STRUCTURES

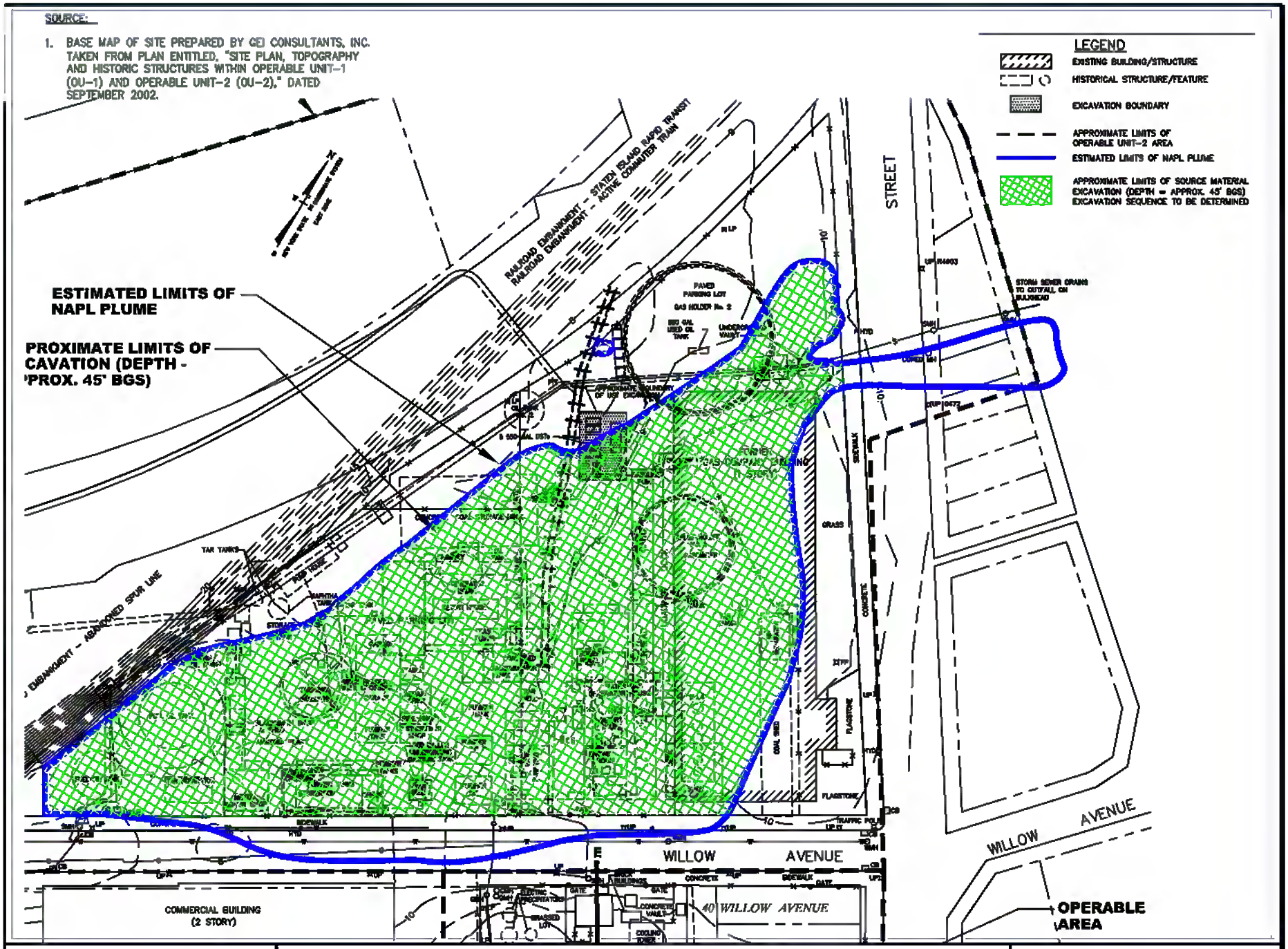
FIGURE 5



FORMER CLIFTON MGP SITE OPERABLE UNIT 3
STATEN ISLAND, RICHMOND COUNTY
SITE NO. 2-43-023

ALTERNATIVE 5: 10 FT EXCAVATION, REMOVAL OF MGP STRUCTURES, VERTICAL CUTOFF WALLS

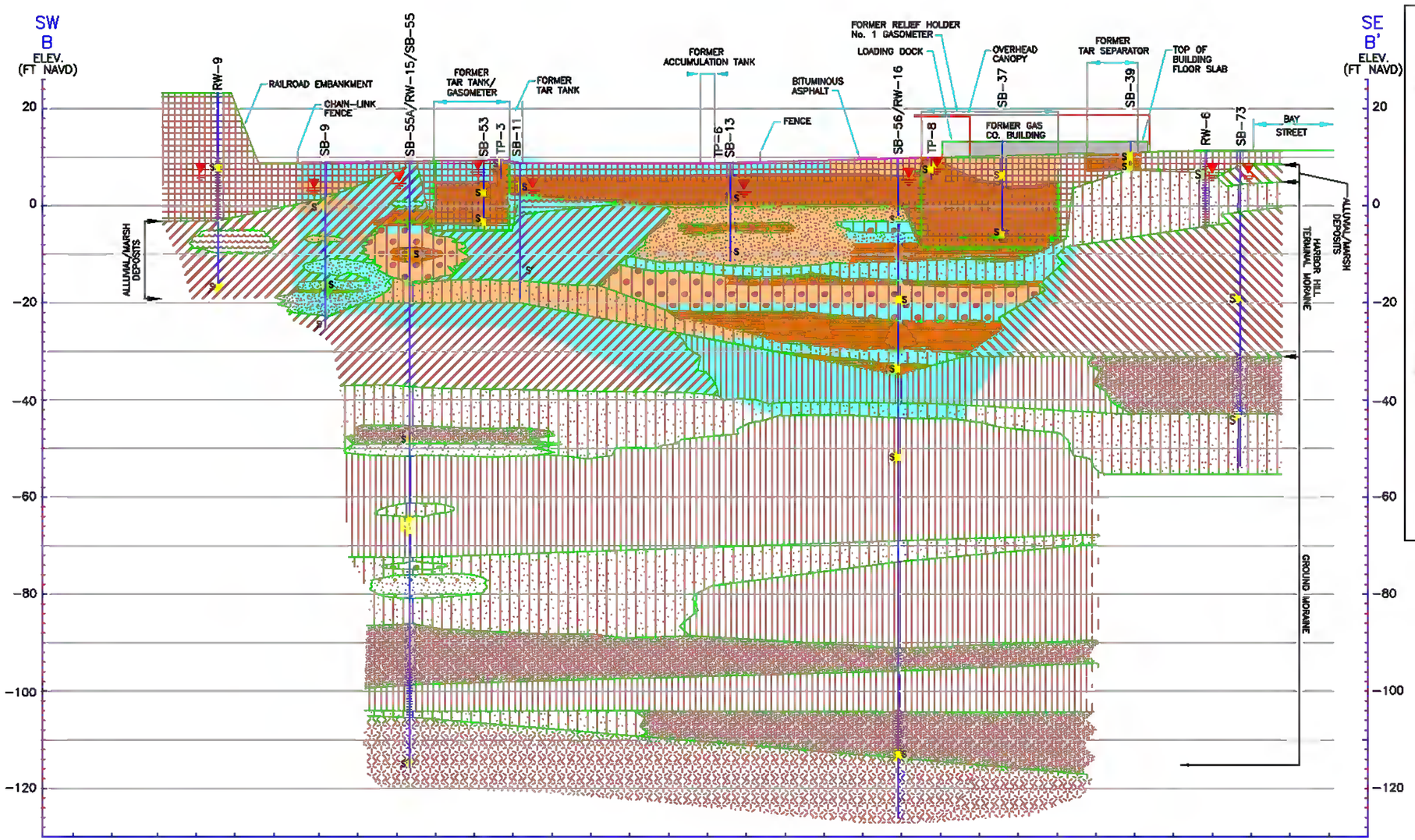
FIGURE 6



FORMER CLIFTON MGP SITE OPERABLE UNIT 2
STATEN ISLAND, RICHMOND COUNTY
SITE NO. 2-43-023

ALTERNATIVE 6: EXCAVATION TO FULL DEPTH

FIGURE 7



LEGEND

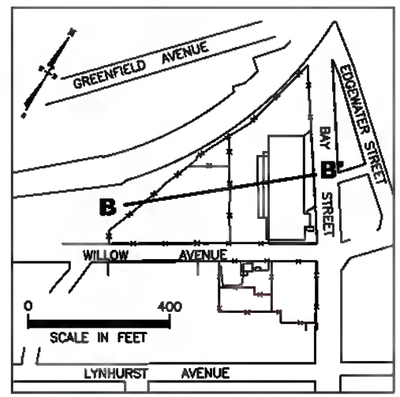
ALLUVIAL/MARSH DEPOSITS
- GRAVELLY-SAND
- SAND (shallow)
- SILT (shallow)
- SILT-CLAY
- GRAVELLY SILT
- PEAT

GLACIAL DEPOSITS
- SILT (deep)
- SILT-SAND
- SAND, SILT, CLAY
- SILT-CLAY
- SAND (deep)
- GRAVELLY-SAND

WEATHERED BEDROCK
- SAPROLITE (weathered bedrock)

FILL

- CONTACT
- OBSERVED APPARENT GROUNDWATER TABLE
- BOUNDARY IS APPROXIMATED
- SB-55/RW-15 — SOIL BORING/ MONITORING WELL IDENTIFICATION
- S — ANALYTICAL SOIL SAMPLE INTERVAL
- WELL SCREEN INTERVAL
- SHEEN AND TAR/ NAPHTHA ODORS
- TAR STAINING, TAR BLEBS/SHEEN AND TAR/NAPHTHA ODORS
- TAR SATURATED, SOIL MATRIX, TAR/NAPHTHA ODORS
- PETROLEUM STAINING, SHEENS AND ODORS



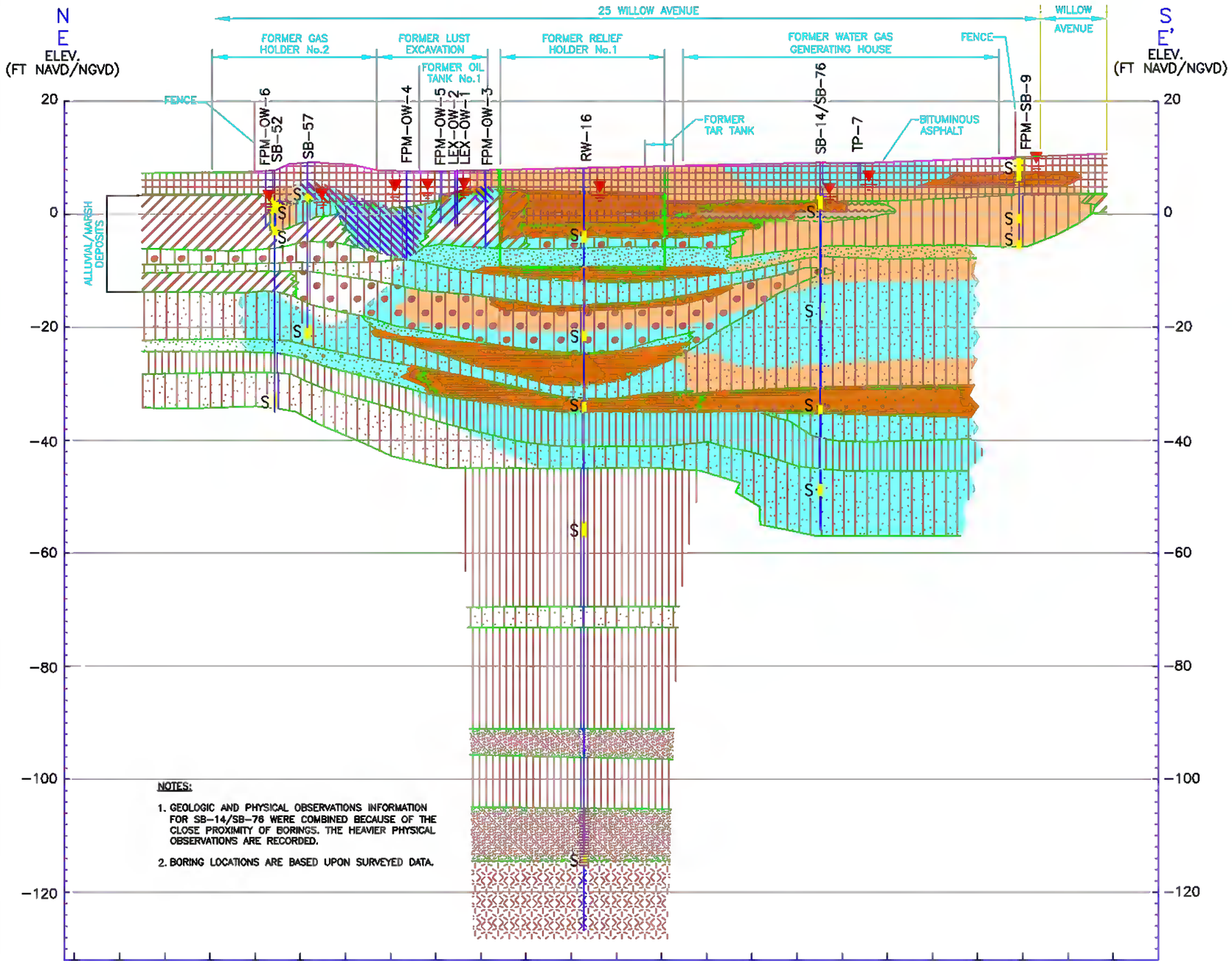
TRANSECT LOCATION

SOURCE:

1. BASE MAP OF SITE PREPARED BY GEI CONSULTANTS, INC. TAKEN FROM PLAN ENTITLED, "SITE PLAN, TOPOGRAPHY AND HISTORIC STRUCTURES WITHIN OPERABLE UNIT-1 (OU-1) AND OPERABLE UNIT-2 (OU-2)," DATED SEPTEMBER 2002.

FORMER CLIFTON MGP SITE OPERABLE UNIT 2
STATEN ISLAND, RICHMOND COUNTY
SITE NO. 2-43-023
CROSS SECTIONS

FIGURE 8



LEGEND

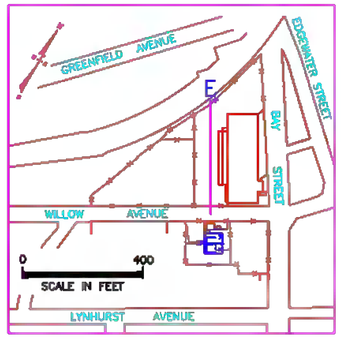
ALLUVIAL/MARSH DEPOSITS
- GRAVELLY-SAND
- SAND (shallow)
- SILT (shallow)
- SILT-CLAY
- GRAVELLY SILT
- PEAT

GLACIAL DEPOSITS
- SILT (deep)
- SILT-SAND
- SAND, SILT, CLAY
- SILT-CLAY
- SAND (deep)
- GRAVELLY-SAND

WEATHERED BEDROCK
- SAPROLITE (weathered bedrock)

FILL
- FILL

- CONTACT
- OBSERVED APPARENT GROUNDWATER TABLE
- BOUNDARY IS APPROXIMATED
- SB-55/RW-15 — SOIL BORING/ MONITORING WELL IDENTIFICATION
- S — ANALYTICAL SOIL SAMPLE INTERVAL
- WELL SCREEN INTERVAL
- SHEEN AND TAR/ NAPHTHA ODORS
- TAR STAINING, TAR BLEBS/SHEEN AND TAR/NAPHTHA ODORS
- TAR SATURATED, SOIL MATRIX, TAR/NAPHTHA ODORS
- PETROLEUM STAINING, SHEENS AND ODORS



TRANSECT LOCATION

SOURCE:

1. BASE MAP OF SITE PREPARED BY GEI CONSULTANTS, INC. TAKEN FROM PLAN ENTITLED, "SITE PLAN, TOPOGRAPHY AND HISTORIC STRUCTURES WITHIN OPERABLE UNIT-1 (OU-1) AND OPERABLE UNIT-2 (OU-2)," DATED SEPTEMBER 2002.

FORMER CLIFTON MGP SITE OPERABLE UNIT 2
STATEN ISLAND, RICHMOND COUNTY
SITE NO. 2-43-023
CROSS SECTIONS

FIGURE 9