Focused
Remedial Investigation

East 173rd Street Works
Bronx, New York

Volume I
Text, Tables, Figures, and Plate

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List of Acronyms

bgs	below ground surface
Brown's Directory	*Brown's Directory of American Gas Companies*
BTEX	Benzene, ethylbenzene, toluene, or xylene
CAMP	Community Air Monitoring Plan
cf	Cubic foot
COCs	Compounds of Concern
Con Edison	Consolidated Edison Company of New York
COI	Chemicals of Interest
DNAPL	Dense Nonaqueous Phase Liquid
DPW	Department of Public Works
EDR	Environmental Data Resources
EPA	United States Environmental Protection Agency
FID	Flame ionization detector
FRDS	Federal Reporting Data System
FRI	Focused Remedial Investigation
GEI	GEI Consultants, Inc.
GRI	Gas Research Institute
IDW	Investigation derived waste
LEL	Lower Effects Levels
MDL	Method Detection Limit
mg/kg	Milligram per kilogram
MGP	Manufactured gas plant
ml/min	Milliliters/minute
MSL	Mean Sea Level
NAPL	Nonaqueous phase liquid
NRCS	Natural Resources Conservation Service
NYSASP	New York State Analytical Services Protocols
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
NYSAWQS	New York State Ambient Water Quality Standards
PAH	Polycyclic Aromatic Hydrocarbon
ppm	Parts per million
QA/QC	Quality Assurance/Quality Control
ROW	Right-of-way
RQD	Rock quality designation
RSCOs	Recommended Soil Cleanup Objectives
Sanborn	Sanborn Fire Insurance

List of Acronyms (continued)

SEL .... Severe Effects Levels
SVOCs .... Semivolatile Organic Compounds
TAGM .... Technical and Administrative Guidance Memorandum
TAL .... Target analyte list
TCLP .... Toxicity Characteristic Leaching Procedure
USDA .... United States Department of Agriculture
USGS .... United States Geological Survey
USTs .... Underground Storage Tanks
VCA .... Voluntary Cleanup Agreement
VOCs .... Volatile Organic Compounds

1. Introduction

This Focused Remedial Investigation (FRI) report has been developed for submittal to the New York State Department of Environmental Conservation (NYSDEC) to provide documentation and a description of the procedures and findings from remedial investigation activities conducted at the East 173rd Street former manufactured gas plant (MGP) site located in the Borough of the Bronx, New York. The remedial investigation of the site is under the management of Consolidated Edison Company of New York (Con Edison). The former MGP was once owned and operated by one of Con Edison's predecessor companies, the Northern Union Gas Company. The site is currently owned by the City of New York. GEI Consultants, Inc. (GEI) has prepared this FRI report under contract to Con Edison.

The FRI report has been developed in accordance with the Voluntary Cleanup Agreement (VCA), dated August 15, 2002, Index #02-0003-02-08, between Con Edison and the NYSDEC. The investigation described in this report was conducted pursuant to the NYSDEC-approved Work Plan titled *Focused Remedial Investigation Work Plan, East 173rd Street Works Former Manufactured Gas Plant Site* (GEI, May 2002) and recommendations received from several Bronx community stakeholders. Investigation activities were conducted by Con Edison from June 2002 through August 2002.

1.1 Purpose of Report

The primary objectives of the FRI were to:

- Locate the subsurface remnants of any MGP structures or other structures that may exist in Starlight Park and that might be associated with waste source areas or serve as preferential pathways for the migration of MGP waste or other contamination
- Characterize potential MGP impacts in Starlight Park's soil and groundwater, and Bronx River sediment
- Characterize site-specific geology and hydrology
- Delineate the lateral and vertical extent of potential MGP waste impacts in the soil, groundwater, and sediment

The goals of the FRI were to confirm the presence of any former MGP structures, hazardous waste or contamination, and to provide data to be used to determine whether the site potentially poses a significant threat to public health and the environment. These goals are consistent with those of the NYSDEC's comprehensive remedial investigation process.

1.2 Report Organization

The procedures and findings of the FRI activities, presented in this FRI report, are organized into nine sections. Following this introduction, Section 2 presents the site background, including physical setting, site ownership, and operational history. The investigation methods used to collect, analyze, and present the remedial investigation data are discussed in Section 3. The geologic and hydrologic characterization of the site is discussed in Section 4. Section 5 provides an identification of potential source areas and Section 6 presents the nature and extent of MGP contaminants. Section 7 discusses contaminant fate and transport and Section 8 presents an evaluation of potential exposure pathways and receptors for compounds associated with the former MGP. Section 9 presents summary and conclusions, and Section 10 provides recommended further actions. Section 11 is a reference list. A site history report, remedial investigation technical procedures, boring and test pit logs, community air sampling results, laboratory analytical results and data usability reports, tidal survey results, and photographic documentation are included in Appendices A through G, respectively.

2. Site Background

This section provides a description of the site setting, demography and land use, surface features, and the site operational and ownership history. A portion of the site background presented in this section was excerpted from the site history report provided in Appendix A.

2.1 Property Description

The East 173rd Street Works former MGP site is located between the Sheridan Expressway and the Bronx River in the neighborhood of West Farms, Borough of the Bronx, New York. The location of the site is illustrated in Figure 1, taken from a portion of the United States Geological Survey (USGS) Topographic Map of the Central Park, New York, the New Jersey Quadrangle, and the Flushing, New York Quadrangle. The site is defined as all land occupied by former MGP operations and formerly owned by Con Edison or a Con Edison predecessor company.

Records indicate that the former MGP site occupied a single parcel of land that is currently owned by The City of New York, and is operated by the New York City Department of Parks and Recreation (Parks Department). The site is located within Starlight Park, a part of the Bronx River Park. The former MGP site is located in the middle portion of Starlight Park and was approximately 3 acres in size. Starlight Park is about 7.3 acres in size, and is currently designated by the Bronx Assessor's Office as Block 03019 Lot 0100.

The site is bordered to the west by the Sheridan Expressway, West Farms Road, and industrial/commercial properties. The northwestern portion of the site is currently occupied by the access and travel lanes of the Sheridan Expressway. The northeastern portion of the site is asphalt, and the southwestern portion of the site is a former playing field which has been stripped of topsoil. A chain-link fence is present along the western portion of the site. Construction trailers and equipment are located on the northeastern portion of the site, on the pavement. A chain-link fence surrounds this area. Figure 2 is a site layout map showing these features.

The New York State Department of Transportation (NYSDOT) has started a rehabilitation project for the Sheridan Expressway (located adjacent to and west of Starlight Park), which includes the installation of an improved drainage system for the expressway. The future site construction activities planned by NYSDOT and the Parks Department include the use of sections of Starlight Park as rights-of-way (ROW) for storm drains from the Sheridan Expressway to outfalls located along the Bronx River. NYSDOT has begun the installation of storm-drain catch basins and manholes and some of the connecting lateral piping under Starlight Park. The Parks Department is planning a multiuse facility for the site that will include ball fields, a boathouse, a river walk, and other features. The renovation is part of a greenway being built along the Bronx River that borders the site to the east. The removal of topsoil from the southern portion of the site was part of this rehabilitation project. The NYSDOT stockpiled the topsoil on site in anticipation of its reuse as soil cover for the park.

The project excavation work being conducted by the NYSDOT and its contractors in Starlight Park has been shut down due to the FRI activities being conducted at the site.

2.2 Physical Setting and Demography

The site is located in the central section of the Bronx on the west side of the Bronx River, and south of the Cross Bronx Expressway. The Bronx covers an area of approximately 42 square miles, and has an estimated population of 1,332,650 (NYC Department of City Planning, 2000 Census Summary). The site is zoned R7-1, a general residential district.

Industrial/manufacturing properties are located west of the site, across the Sheridan Expressway and West Farms Road. Asphalt pavement and handball courts of Starlight Park are located north of the site. Vacant land and the Sheridan Expressway are located further north of the site. The Bronx River abuts the eastern property boundary, with vacant land and a railroad ROW further east of the site. Residential properties are located beyond the railroad to the east. Industrial/commercial properties, the Bronx River, and vacant land are located further to the south of the site. Two figures that show the site and adjoining land uses, and an aerial photograph of the site and vicinity are included in the site history report in Appendix A.

An electronic database search was conducted to estimate the residential population within a 0.25-mile radius of the site boundaries. The estimated population within a 0.25-mile radius of the site (based on 1990 U.S. Census data) is 10,342 people.

2.3 Climate

The climate in the Borough of the Bronx is characterized as humid, modified continental, and typically exhibits warm summers and moderately cold winters. Prevailing westerly winds typically result in weather changes every few days. Indicators of climatology at the site were obtained from published data collected at Central Park, New York (10 miles southwest of the site). Climatological normals from 1961 to 1990 are summarized below.

- Minimum temperature: -2° F
- Maximum temperature: 104° F
- Mean annual precipitation: 47.2 inches
- Mean annual snow fall: 23.1 inches

The highest temperatures commonly occur in the months of July and August, and the lowest temperatures frequently occur in the months of January and February. The highest daily mean precipitation events are frequently observed in the spring. Snowfall occurs predominantly from December through March.

2.4 Surface Features

The topography of the site is relatively flat and is approximately 20 feet above mean sea level (MSL). In February of 2002, renovations to Starlight Park were started. As part of this renovation, approximately 2 feet of topsoil on the southern portion of the park was scraped and stockpiled within the park. The Bronx River abuts the eastern side of the site, is at an elevation of approximately 2 feet above MSL (i.e., approximately 18 feet below the ground surface [bgs] of the park), and flows south. The river is tidally influenced and exhibits both ebb and flood flow components. The net flow of the river is to the south toward the East River. The River bottom, in the area identified as “mud flat” on Figure 3, is partially exposed during low tides. A weir (shallow dam) controls the water elevation upstream of the site. A steep bank is located along the entire eastern and southern sides of the site and separates the relatively flat land surface of the park from the river channel. A stone-constructed river channel is in place along the entire portion of the river that borders the park property. A water outflow was observed at low tide on the west side of the river, in the area of the mud flat, at the base of the stone-constructed riverbank. The channel of the Bronx River was rerouted in the late 1950s around the same time that Starlight Park was constructed and the Sheridan Expressway was built. The current and former location of the river is illustrated on Figure 3. A photograph looking downstream showing the Bronx River, the weir, and a portion of the constructed stone river channel is included in Appendix G.

2.5 Site Ownership History

The ownership history of the site was obtained from the Bronx Assessor’s Office, a 57-year chain-of-title search (1945 through 2002) and a reference book titled, *Consolidated Gas Company of New York A History*. These records indicate that past site property owners have included the following.

- City of New York (1945 to present)
- Consolidated Edison Company (1936 to 1945)
- Consolidated Gas Company of New York (1910 to 1936)
- Northern Gas Light Company and Northern Union Gas Company (1878 to 1910)
- Suburban Gas Lighting Company (1871 to 1878)
- Westchester County Gas Lighting Company (1859 to 1871)

2.6 Past Site Operations

The history of the site was compiled from available atlas maps, USGS topographic maps, Sanborn maps, historic photographs, editions of *Brown's Directory of American Gas Companies (Brown's Directory)*, and other historical records.

The East 173rd Street Works former MGP site is located in the West Farms section of the Bronx. In the mid-19th century, the Town of West Farms was part of the 24th Ward of Westchester County. In 1874, New York City annexed the land west of the Bronx River, which included West Farms. The first gas franchise (right to produce and distribute gas) was granted to Robert Campbell and Company by the Town of West Farms in March 1859. It can be assumed that before 1859 there was no manufacturing of gas in the Town of West Farms. In November 1859, Campbell assigned his gas franchise from the Town of West Farms to the Westchester County Gas Lighting Company. Twelve years later, in 1871, the Westchester County Gas Lighting Company assigned its franchise rights for the West Farms portion of the 24th Ward to the Suburban Gas Lighting Company. Suburban changed its name to Northern Gas Light Company in June 1878. On November 16, 1897, the Northern Union Gas Company acquired all assets and property of the Northern Gas Light Company, including the East 173rd Street Works. By 1910, the Consolidated Gas Company of New York was a Con Edison subsidiary. In 1936, the Northern Union Gas Company was merged with and into Con Edison.

Records reviewed do not indicate when the first gas plant was built at East 173rd Street. The oldest map depicting the MGP was the 1893 Bromley Atlas of the 23rd and 24th Wards of New York. This atlas depicts a single U-shaped building and one gas holder on site. The Bronx River wrapped around the eastern and southern sides of the site, and an embayment was located on the western side of the site. Review of *Brown's Directory*, Sanborn maps, and historic photographs for the site in the 1890s indicate that significant plant expansion took place during this time period. By 1897, the plant included a retort house, another gas house, purifier houses, storage buildings, and an electric light plant. Two aboveground naphtha storage tanks were located north along the river next to the electric light plant. The presence of the naphtha tanks confirms the use of a petroleum feed stock in the gas making process. The presence of naphtha tanks signaled a change in technology from coal gas to carbureted water gas. Also, three gas holders are depicted. Sanborn maps show that the embayment on the western portion of the site was realigned between 1901 and 1915. A composite map of the location of historic MGP structures is shown in Figure 3. From 1897 illustrations taken from *The Great North Side, or Borough of the Bronx*, it is clear that the two smaller holders on the western portion of the site were double-lift types with subsurface water seal tanks. The holder located furthest north on the site had a capacity of 75,000 cubic feet. The capacity of the centrally located holder is estimated to have been 60,000 cubic feet. The 1897 illustrations are included in the site history report (Appendix A). The largest holder on the northeastern portion of the site (130,400 cubic feet) was built with an above-grade water seal tank.

According to *Brown's Directory*, the earliest plant was a coal gas process facility. By 1899, two different gas manufacturing processes were used (i.e., coal and Wilkinson). Wilkinson was a type of water gas process that manufactured gas in a single shell machine. According to New York State Public Service Commission reports, the coal gas equipment at the plant was withdrawn from service around 1901. In 1906, the entire plant used the Lowe carbureted water gas process, a triple shell machine. Based on *Brown's Directory*, it appears that by 1912 the plant had ceased gas manufacturing operations. This is confirmed by the 1915 Sanborn map, which indicates that the plant was idle and used only for gas storage.

Public Service Commission Reports suggest that the East 173rd Street facility was used as a standby plant until 1923. In 1924 the 130,400 cubic foot holder and 60,000 cubic foot holder were taken down and the buildings were partially removed. This is confirmed by a 1924 aerial photograph of the plant grounds, which is included in the site history report (Appendix A). A set of 1943 photographs confirms that sometime prior to 1943, the 75,000 cubic foot holder was taken down.

Con Edison used the site as a storage facility and vehicle garages until it was sold to the City of New York in December 1945. The 1950 Sanborn map shows two gasoline underground storage tanks (USTs) on the east-central portion of the site. The plant buildings remained until they were taken down in the 1950s. Starlight Park was reportedly constructed by the City of New York in the late 1950s, around the same time that the Bronx River was rechanneled and the Sheridan Expressway was built.

3. Methods of Remedial Investigation

The East 173rd Street Works FRI was conducted from June to August 2002. Table 1 presents the dates that each phase of the FRI was conducted, the primary objectives of each phase, and a summary of the field activities that occurred during each phase. These site field activities were completed in accordance with the *Focused Remedial Investigation Work Plan, East 173rd Street Works Former Manufactured Gas Plant Site*, prepared by GEI, dated May 21, 2002. Additional site investigation tasks (i.e., sediment sampling) were conducted in response to recommendations from several Bronx community stakeholders.

An integrated investigation of the site geology and hydrology, soil, sediment, and groundwater chemistry allowed identification of potential contaminant source areas, and the nature and extent of contaminants released to the environment as a result of former MGP operations. A variety of investigatory methods were utilized to collect, analyze, and present the data. The field methods and sample types collected in the study are presented in Table 2. The methods used to conduct the FRI are summarized in this section. A detailed description of the technical procedures used in the FRI is presented in the above-mentioned work plan. A detailed description of the technical procedures used during FRI activities that are not presented in the work plan (e.g., tidal survey) are presented in Appendix B.

3.1 Available Data

Available geologic, hydrologic, and physiographic data for Borough of the Bronx, New York were reviewed prior to conducting the FRI activities. Much of this information was obtained from scientific publications and a database search conducted by Environmental Data Resources, Inc. (EDR). This information was collected during the historical research conducted from March to May 2002. The data were compiled and are presented in the site history report in Appendix A. The reviewed information provides a preliminary understanding of the site geology, groundwater hydrology, and site physiography.

A review of historical maps, photographs, MGP production records, property records, and public records provided information about the ownership and operational history of the site (presented in Section 2 of this report), as well as land use and potential receptors. The following records were reviewed as part of this East 173rd Street FRI.

Property Records

- Bronx Assessor's Office Records
- Chain-of-Title Records – 1945 through 2002

- City Directories – 1940 through 2000
- Con Edison Real Estate Department Records
- *Consolidated Gas Company of New York A History*, Frederick L. Collins, 1934

Database Search/Public Records

- EDR Radius Map with GeoCheck®, Environmental Data Resources, Inc., March 14, 2002
- EDR Off-site Receptor Report, Environmental Data Resources, Inc., April 4, 2002
- EDR-City Directory Abstract, Environmental Data Resources, Inc., April 8, 2002
- NYSDEC

Production Data

- *Brown's Directory* data – 1887 through 1965
- *Moody's Analyses of Public Utilities and Industrials* – 1914 through 1945
- *New York State Public Service Commission Reports*

Maps and Plans

- Atlas of the City of New York, G.W. Bromley & Company, 1893
- Atlas of New York and Vicinity, F.W. Beers, 1868
- Bronx Tax Assessor's Map – Block 3019, Lot 100
- New York City Open Accessible Space Information System (OASIS)
- New York City Zoning Map-3d
- Proposed Utility Plans, State of New York Department of Transportation, undated
- Sanborn Fire Insurance Maps – 1896, 1901, 1915, 1950, 1978, 1981, 1985, 1989, 1993, 1996
- United States Geological Survey Topographic Maps – 7.5 Minute Series Central Park, New York, New Jersey Quadrangle – 1956, 1966, 1979, 1995, 1999

Photographs

- *The Great North Side, or Borough of The Bronx,* North Side Board of Trade, 1897 illustrations
- City of New York Board of Estimate and Apportionment, Office of Chief Engineer, July 1, 1924, Fairchild Aerial Commerce Corporation aerial photographs
- 1924 and 1943 photographs provided by Con Edison

3.2 Geologic Data

Geologic investigatory methods included test pit excavations, surface-soil sampling from existing stockpiles, subsurface-soil borings, and sediment grab sampling. The sampling location rationale is provided in Table 3 for each of the geologic investigation methods performed. Borehole drilling and test pit excavations were used to collect samples in unconsolidated materials and bedrock for visual characterization of the lithology and distribution of geologic material at the site and areas surrounding the site. Each test pit, boring, and sample collected during the FRI program was logged. Site-specific geologic characterization data were interpreted for the following.

- Identification of former MGP structures (potential source areas)
- Correlation of stratigraphic units between borings and test pits
- Identification of zones of potentially high and/or low hydraulic conductivity
- Identification and characterization of bedrock (e.g., fracture density, top of bedrock surface)
- Continuity of petrographic/textural features such as sorting and size distribution in specific stratigraphic units

A summary of each of these methods is provided below. Sample collection and analysis techniques are discussed in subsection 3.4 (Chemical Data).

3.2.1 Test Pit Excavations

Thirty-six test pits (see Table 3) were excavated at the East 173rd Street Works site. Test pits were excavated with a backhoe having a maximum reach of approximately 16 feet. Test pits were excavated to the water table (ranging from 5 to 16 feet) or to greatest depth possible. Test pit excavation locations, illustrated in Figure 4, were chosen to identify former MGP structures and source areas based on the historical information presented in Section 2 of this FRI report. Additional test pit locations were chosen to determine the extent of potential lateral impacts outside the boundaries of the site and in the area of proposed storm drain culverts, outfalls, and treatment chamber (i.e., vortex). Test pit locations were refined during the test pit program based on field observations.

3.2.2 Surface-Soil Sampling

Surface-soil samples were collected from 11 locations (Stkpile1-SE, SW, NW, NE, and Stkpile2-T1 through T7) in the two existing surface-soil stockpiles. Surface soils were excavated and stockpiled by NYSDOT prior to FRI activities. The surface-soil locations, illustrated on Figure 4, were determined using systematic grid coordinates to ensure a complete characterization of the stockpiled surface soils. A backhoe excavated trenches in the two stockpiles, to expose the soil inside the stockpile. Grab and composite soil samples were collected from each of the 11 trench locations (22 samples were collected for analysis) in accordance with NYSDEC *STARS Memo #1 Petroleum-Contaminated Soil Guidance Policy* (August 1992).

3.2.3 Borehole Drilling and Core Collection

Thirty-one subsurface-soil borings were drilled at the site and surrounding park property. Eight of the 31 borings were finished as groundwater monitoring wells (identified by "MW" in Figure 4). The remaining 23 borings were identified by "SB" in Figure 4.

All borings (SB-1 through SB-21) and deep monitoring wells (MW-1D through MW-4D) were advanced through overburden soils to the competent bedrock surface. The shallow monitoring wells (MW-1S through MW-4S) were advanced to a depth of 16 feet below grade. Soil borings and monitoring wells were drilled using continuous-flight, hollow-stem augers. Continuous soil samples were collected from each boring during drilling using a split-spoon sampler. Borings penetrating the former gas holder bottoms (SB-2 and SB-4) were advanced using multiple casing and mud rotary methods. The use of multiple casing drilling and mud rotary techniques eliminated the risk of dense nonaqueous phase liquid (DNAPL) migration during drilling by isolating shallow contaminated zones (i.e., contents of holder) from deeper zones (i.e., zones beneath the holder).

The competent bedrock surface was identified by auger refusal (i.e., vertical advancement at a rate less than 1 foot per 1/4 hour) and/or split-spoon refusal (i.e., split-spoon penetration of less than 6 inches for 50 blow counts, using a 140-pound hammer falling 30 inches); and/or bedrock core drilling.

An HQ Core Sampler, fitted with a diamond cutting-shoe, was used to collect continuous bedrock core samples for lithologic and structural characterization from borings SB-5, SB-9, SB-11, SB-12, SB-17, and SB-18. The 23 borings not completed as monitoring wells were backfilled with cement-bentonite grout upon completion.

3.2.4 Sediment Sampling

Nine sediment samples (SED-1 through SED-9) were collected for chemical analysis from selected reaches of the Bronx River (i.e., upstream of the site, along the eastern side of the site, and downstream of the site). The sediment samples were discrete samples biased toward areas of potential contamination (e.g., visible sheen) and collected using a stainless-steel hand auger and a remote sampler. The sediment samples were collected from the sediment surface to 1 foot below the sediment surface. The nine sediment sample locations are illustrated in Figure 4.

3.3 Hydrologic Data

Hydrologic data were collected from monitoring wells and piezometers installed on site. Hydrologic characterization data were interpreted for the following.

- Identification of the aquifers
- Determination of horizontal and vertical groundwater flow directions on site
- Determination of tidal influences on groundwater flow

3.3.1 Groundwater Monitoring Well and Piezometer Installation

Eight groundwater monitoring wells and two piezometers were installed during FRI activities. The well locations are illustrated on Figure 4. Table 4 presents a summary of the monitoring wells and piezometer construction details. The monitoring wells were placed at locations and depths to characterize site hydrology and to determine impacts to overburden groundwater. The well location rationale is summarized in Table 3. Subsequent to monitoring well installation, all wells were developed to restore the natural permeability of the formation in the vicinity of the well and to remove silt and clay to provide turbid-free groundwater samples. The piezometers were only used for measurements of hydraulic head and were not developed. Well development records are provided in Appendix C.

3.3.2 Identification of the Groundwater Aquifer

Identification of the aquifer in overburden deposits was essential to the design of the groundwater monitoring network and development of the conceptual site model. The presence of an overburden aquifer was established during drilling and hydrogeologic characterization activities.

3.3.3 Establishing Groundwater Flow Directions

Static water elevations in monitoring wells, piezometers, and the Bronx River were measured twice during FRI activities. These measurements were used to determine horizontal and vertical groundwater flow gradients at the site.

The procedure for Water-Level Measurement Collection is provided in Appendix B. Surface water level measurements of the Bronx River were collected from two gauging stations established along the river (RG-1 and RG-2). The locations of the gauging stations are illustrated in Figure 4. River gauge RG-2 is located on the downriver side of the weir. Water-level measurements collected from wells screened in similar stratigraphic horizons (shallow and deep) were used to construct water table surface contour maps.

GEI conducted a tidal influence study during the weeks of July 29, 2002 and August 4, 2002 to determine if fluctuations in the Bronx River are affecting the groundwater flow beneath the site. Two fixed points along the bank of the Bronx River adjacent to the park were chosen as tidal monitoring stations for the study and were surveyed at the same time as the monitoring wells and piezometers. In-Situ mini-Troll® and Solinst levellogger® pressure transducers were used to monitor groundwater elevations in selected monitoring wells and two monitoring stations in the Bronx River. Groundwater measurements were recorded for a minimum of 72 hours and included several complete tidal cycles.

3.4 Chemical Data

Chemical data were collected to identify specific contaminant concentrations throughout those media potentially impacted by MGP operations. Chemical data were generated from samples collected from surface soils, subsurface soils, sediment, groundwater, and investigation derived waste (IDW).

The number of samples collected, the analyses conducted, and the field quality assurance/quality control (QA/QC) samples are summarized in Table 5. All samples were analyzed by SciLab of Weymouth, Massachusetts.

3.4.1 Air Monitoring

In accordance with NYSDEC and New York State Department of Health (NYSDOH) requirements, a Community Air Monitoring Plan (CAMP) was implemented at the site during test pit excavation and soil boring installation activities. The objective of the CAMP was to provide a measure of protection for the downwind community (i.e., off-site receptors, including residences and businesses and on-site workers not involved with site activities) from potential airborne contaminant releases as a direct result of site activities.

Real-time air monitoring stations were set up downwind and upwind of the work area. The downwind station was used to measure potential airborne contaminants leaving the site during the site investigation. The upwind station measured background air quality data in the vicinity of the site. Wind direction was determined by flagging poles installed on site.

Volatile organic compounds (VOCs) were measured using a flame ionization detector (FID) and particulate dust was measured using a MiniRAM™ PM-10 particulate meter. Response levels were programmed in the meters which were connected to a yellow strobe light to alert site workers that targeted compounds in the ambient air had exceeded response levels. The VOC and Particulate Monitoring, Response Levels, and Actions are presented as follows.

Air Monitoring Response Levels and Actions

Response Level	Actions
	VOCs
>5 ppm above background for 15-minute average	▪ Temporarily halt work activities ▪ Continue monitoring ▪ If VOC levels decrease (per instantaneous readings) below 5 ppm over back ground, work activities can resume
Persistent levels >5 ppm over background <25 ppm	▪ Halt work activities ▪ Identify source of vapors ▪ Corrective action to abate emissions ▪ Continue monitoring ▪ Resume work activities if VOC levels 200 feet downwind of the property boundary or half the distance to the nearest potential receptor is <5 ppm for a 15-minute average ▪ If VOC levels are >25 ppm at the perimeter of the work area, activities must be shut down
	Particulate
>100 mcg/m3 above background for 15-minute average or visual dust observed leaving the site	▪ Apply dust suppression ▪ Continue monitoring ▪ Continue work if downwind PM-10 particulate levels are <150 mcg/m3 above upwind levels and no visual dust leaving site
>150 mcg/m3 above background for 15-minute average	▪ Stop work ▪ Re-evaluate activities ▪ Continue monitoring ▪ Continue work if downwind PM-10 particulate levels are <150 mcg/m3 above upwind levels and no visual dust leaving site

Sources:
New York State Department of Health Community Air Monitoring Plan, June 20, 2000.
New York State Department of Environmental Conservation Division Technical and Administrative Guidance Memorandum - Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites, October 27, 1989.

All VOC and particulate data were recorded continuously during work activities and downloaded to the project computer at the end of the day. All monitoring data is stored electronically in spreadsheets and databases. Air monitoring results are presented in Appendix D.

Records of meteorological conditions, equipment maintenance, and calibration records were also maintained.

3.4.2 Surface-Soil Sampling and Analysis

Eleven surface-soil samples were collected from the two stockpiles (see Figure 4) and were laboratory analyzed for VOCs and semivolatile organic compounds (SVOCs), target analyte list (TAL) metals, and cyanide. Samples collected for VOC analysis were collected in accordance with EPA Method 5035. Surface-soil chemical data are presented in Section 6 (Nature and Extent of MGP Contamination) of this report.

3.4.3 Subsurface-Soil Sampling and Analysis

One to three subsurface-soil samples were collected for laboratory analysis from each of the boring and monitoring well locations illustrated in Figure 4. Subsurface-soil analytical samples were not collected from the piezometers. Subsurface-soil samples were collected for laboratory analysis from the most heavily impacted soil interval (based on visual, olfactory, and PID observations), from a soil interval that underlies the most impacted area, and from soil above the most impacted area. If no impacted soils were detected in a boring, one sample was collected at the water table interface and one at or near the interface of the bedrock. Samples were analyzed for VOCs, SVOCs, TAL metals, and cyanide.

In addition, subsurface-soil samples were collected from the test pits and analyzed for VOCs, SVOCs, TAL metals, and cyanide. Soil samples collected for VOC analysis were collected and preserved in accordance with EPA Method 5035. Subsurface-soil chemical data are presented in Section 6 of this report.

3.4.4 Sediment Sampling and Analysis

Sediment sample locations included areas adjacent to the former MGP site and areas adjacent to the park (upstream and downstream of the site). The sediment samples were collected using a stainless-steel hand auger and a remote sampler. The remote sampler was only used to collect sediment from locations of the river that were not accessible using the hand auger. The sampling was conducted during low tide when there was little or no current.

Sediment samples were analyzed for VOCs, SVOCs, TAL metals, and cyanide. Samples were collected for VOC analysis in accordance with EPA Method 5035. Sediment chemical data are presented in Section 6 of this report.

3.4.5 Groundwater Sampling and Analysis

Monitoring wells were sampled two weeks after installation and development were completed as part of groundwater characterization. The sampling technique minimized stress of the aquifer using low flow pumping rates in order to provide representative water samples with minimal alterations to water chemistry. The analytical results were used to assess the effect of the former MGP operations on groundwater quality. Groundwater samples were analyzed for VOCs, SVOCs, TAL metals and cyanide. Groundwater chemical data are presented in Section 6 of this report.

3.4.6 Investigation-Derived Waste Characterization and Disposal

IDW generated during the FRI activities consisted of: (1) liquids generated by cleaning of excavating, sampling and drilling equipment, groundwater generated during drilling and development of monitoring wells, and purging of monitoring wells prior to groundwater sampling; and (2) soils generated during test pit excavations and the installation of borings and monitoring wells. The liquid IDW were stored in 55-gallon drums. Soil wastes were stored in covered rolloffs.

The liquid and soil wastes generated during the FRI were characterized to ensure proper disposal of these materials. Approximately 1,000 gallons of wastewater and 200 cubic yards of soil cuttings were generated during the FRI activities. Prior to disposal, soil cuttings were analyzed for VOCs, toxicity characteristic leaching procedure (TCLP) benzene, SVOCs, and TCLP SVOCs. Wastewater was analyzed for VOCs, SVOCs, TAL metals, and cyanide. Soil cuttings were transported off site (to Casie Protank of Franklinville, New Jersey) and treated at a thermal desorption facility. Wastewater was transported off site (by Chemical Waste Disposal of Astoria, New York) and disposed of at a wastewater treatment facility.

3.5 Survey

A site survey was performed during FRI activities by a GEI New York-licensed surveyor to obtain information necessary for production of a composite base map that accurately illustrates the locations and elevations of surface-soil samples, sediment samples, test pits, borings, monitoring wells, river gauges, and other pertinent features (e.g., stream channel, topography). Locations and elevations are referenced to Global Positioning Systems (GPS) observations. The GPS Datum is 2.43 feet below the National Geodetic Vertical Datum 1929 (NGVD 1929).

3.6 Quality Assurance/Quality Control

QA/QC protocols and procedures were performed to ensure the accuracy, precision, and completeness of all chemical data collected during FRI activities. QA/QC protocols and procedures were completed in accordance with the NYSDEC approved Quality Assurance Plan submitted as part of the FRI work plan.

3.6.1 Sample Quality Assurance/Quality Control

QA/QC samples were collected during each phase of sampling in order to evaluate the validity of the sampling, decontamination, and analytical methods used during the site investigation. QA/QC samples collected during field sampling activities included trip blanks, duplicates, and field blanks (i.e., equipment rinsates). Table 5 summarizes the number and types of QA/QC samples collected for each sample media. Field duplicates consisted of two split samples from the same source, analyzed by the laboratory as separate samples. The laboratory was not aware of duplicate samples. This precaution allowed GEI to verify the laboratory reproducibility of analytical data. Field blanks (i.e., equipment rinsate blanks) were used to monitor the adequacy of field equipment decontamination procedures that were employed to prevent cross-contamination from one sampling location to another sample location. Trip blanks were used to monitor possible sources of contamination from sample transport and storage.

Samples submitted to SciLab for analytical characterization were evaluated and reported by the laboratory according to New York State Analytical Services Protocol (NYSASP) as defined in Methodologies 95-1 (VOCs), 95-2 (SVOCs), and 6000/7000 Series (Inorganics). SciLab provided a full data evaluation package in accordance with Category B deliverable requirements. Additional data validation was performed by GEI based on the following documents.

- *USEPA Contract Laboratory Program for Organic Data Review,* EPA 540/R-99-008 (October 1999)
- *USEPA Contract Laboratory Program for Inorganic Data Review,* EPA 540/R-94-013 (February 1994)

Data usability was conducted based on the following parameters.

- Preservation and Technical Holding Times
- Calibration Verification Results
- Blanks
- Surrogate Recoveries
- Matrix Spike/Matrix Spike Duplicates
- Field Duplicates
- Laboratory Fortified Blank Recovery

Copies of the data usability reports are provided in Appendix E. Data qualifiers used in the presentation of the analytical results are included with the reports.

A standard system of sample identification was used to allow samples to be tracked in field notes, chain-of-custody forms, and laboratory reports. The identification system is as follows.

Examples: SP MW- 4S
SP SB-8 (6-8)

Where: SP = Starlight Park (site identification)
MW- 4S = Monitoring Well No. 4 location. "S" refers to the shallow aquifer where the well is screened and "D" refers to the deep aquifer where the well is screened
SB-8 = Boring No. 8 location
(6-8) = sample depth in feet (not used for groundwater)

3.6.2 Record Keeping and Documentation

The following specific documents were incorporated into the record keeping procedure.

Document	Purpose
Site Field Logs	Issued to each field member with a control number. These logs were the principal document for recording field data
Chain-of-Custody Record	To track the possession of all samples from field to laboratory
Accident Report, Daily First Aid Report, Employer's First Report of Injury, and OSHA 300 Forms.	Data sheets attached to the HASP used to document accidents occurring at the site during site characterization activities.

4. Geologic and Hydrologic Characterization

Geologic, hydrologic, and chemical characterization data identified in Section 3 provide detailed information for the evaluation of the geology, identification of specific contaminant concentrations throughout soil, sediment, and groundwater media, and potential pathways of groundwater migration and contaminant transport. The interpreted site-specific geology and hydrology data were compared to the broad model of existing local and regional data and are incorporated into a conceptual model that describes the physical characteristics of the site. A discussion of the geologic and hydrologic interpretations is presented in this section. The interpretations of these data are supplemented with data tables, geologic cross-sections, contour maps, and a site topographic map. Interpretations of the chemical data are presented in Section 6.

4.1 Geographic Setting

The topographic setting of the East 173rd Street Works site is illustrated in Figure 1, taken from a portion of the USGS topographic map for the area. As depicted by Figure 1, the site is located on the western side of the Bronx River within the Bronx River Basin. In the area of the site, the Bronx River drainage basin runs north/south and is surrounded by ridges and valleys to the west and hummocky terrain east of the site. The Bronx River discharges to the East River, located approximately 2 miles south of the site.

4.2 Regional Soils

A preliminary understanding of surficial soils present in Bronx County was obtained from a review of the *Bedrock and Engineering Geologic Maps of Bronx County and Parts of New York and Queens Counties, New York,* published by the United States Department of the Interior, USGS. The natural surficial material in Bronx County is predominantly glacial till that consists of a mixture of clay, silt, sand, gravel, and boulders. Freshwater and tidal marsh deposits, consisting predominantly of organic silt and clay, commonly overlie the glacial deposits. The glacial deposits are commonly underlain by bedrock. Miscellaneous (artificial) fill deposits in the Bronx contain mixtures of glacial soil, riprap (i.e., large blocks of rubble rock), building-demolition rubble (e.g., glass, wood, brick and concrete), and cinders.

Information on the fill deposits present on the site and surrounding park property was obtained from a review of the *Reconnaissance Soil Survey of the Boroughs of New York City,* to be published by the United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS). Soils in the area of the site belong to the LaGuardia and Ebbets Series soil classification and consist of very deep, well-drained soils with moderate permeability. These soils occur in and near major urbanized areas of New York City and are formed from construction debris intermingled with anthrotransported soil materials. Fill materials ranges in thickness from approximately 3.3 to 6.7 feet. The transported construction debris may include pieces of plastic, glass, rubber, bricks, lumber, asphalt, coal ash, unburned coal, gypsum board, concrete, and steel. LaGuardia Soils contained greater than 35% of transported construction debris. Ebbets Soils contain between 10% and 35% of transported construction debris. The transported natural soil material may originate from any geologic deposit ranging from till, outwash, alluvium, coastal plain sediments, or residuum, usually from a local source.

4.3 Regional Geology

The East 173rd Street Works site is located in the southern end of the Manhattan Prong in southeastern New York. The Manhattan Prong is one of two southwest extensions of the New England Uplands Physiographic Province of the Northern Appalachians. The Manhattan Prong is a region of low, rolling elongated ridges and valleys that are underlain by metamorphic rocks of Proterozoic and Early Paleozoic ages. The NE-SW-trending ridge-and-valley morphology present in the western part of the Bronx (i.e., west of the Bronx River) is derived from areas of resistant rock and the deep weathering and erosion of the rock. In the eastern Bronx, exposures of bedrock are rare and elongated hills (trending NNW-SSE) are composed of glacial deposits and former swamps or marshes that have been artificially filled due to urban development. The structures in the rocks of the Manhattan Prong are related to plate-tectonic activity. The rocks of the Manhattan Prong were metamorphosed primarily during the Taconic Orogeny (circa 500 million years ago).

Figure 5 is a geologic map of a portion of the Bronx in New York City. The bedrock geology of the East 173rd Street site consists entirely of metamorphic schist of the Hartland Formation. The Hartland Formation is Middle Ordovician to Middle Cambrian in age and consists predominately of muscovite-biotite quartz schist that includes some gneiss, pegmatite, and hornblende amphibolite members. The rocks of the Hartland Formation are inferred to represent deep-water oceanic sediments and interlayered volcanic rocks that have been subjected to several periods of deformation (e.g., folding and faulting). Rocks in the east Bronx, including the Hartland Formation, form a series of tight isoclinal northeast-striking folds. Faults found in the region include high-angle normal and reverse faults and low-angle thrust faults. The mapped faults nearest to the site include the NW-SE-trending Mosholu Fault (located approximately ½-mile northeast of the site) and the NE-SW-trending Cameron's Line Thrust Fault (located approximately 1 mile west of the site). The age of the faulting in this region may range from the late Middle Ordovician (Hall, 1968a, Zen, 1967) to the Triassic (Rodgers, 1967).

The landscape in southeastern New York has been subjected to glaciation several times during the Pleistocene Epoch (circa 1.8 million to 8,000 years ago). Glacial overburden deposits found in the area of the site were derived almost entirely from Late Wisconsinan glaciation that incorporated and transported large quantities of rock and soil. The Wisconsinan glacier retreated from New York State about 12,000 years ago. Postglacial processes have reshaped the landforms of New York only moderately, mainly along floodplains of streams (e.g., alluvial overburden deposits/marsh). Much of the original drainage and stream/shore line configuration of the 18th century no longer exists, due to artificial filling.

4.4 Site-Specific Geology

Overburden deposits and bedrock of the East 173rd Street site are classified into five main stratigraphic units: (1) fill; (2) MGP-era fill/former soil horizon; (3) organic-rich alluvial marsh deposits; (4) glacial deposits; and (5) competent bedrock of the Hartland Formation. The stratigraphic sequence consists predominantly of competent bedrock overlain by glacial deposits. A layer of organic rich alluvial marsh deposits overlies the glacial deposits. MGP-era fill and a historical soil horizon overlie the alluvial marsh deposits. Fill deposits overlie the historic MGP soil horizon. The fill is capped with a layer of asphalt pavement in the northern portion of the site and topsoil on the southern portion of the site. Important characteristics of each of the stratigraphic units are discussed below. The stratigraphy of the site is illustrated on Figures 6 and 7 (Geologic Cross-Sections A-A' and B-B'). The location of each cross-section is presented in Figure 4.

4.4.1 Competent Bedrock

Competent bedrock was encountered in 16 borings drilled on site and in nine borings drilled outside the site and within the boundary of the park. The competent bedrock in these areas consists predominantly of muscovite-biotite schist with some quartz-rich zones. This rock type is consistent with the lithology of the Hartland Formation.

Bedrock elevations near the site ranged from above the ground surface at bedrock outcrops southwest of the site across the Sheridan Expressway, to 39 ft bgs at the southeastern site boundary. The bedrock contours for the site are presented on Figure 8. The contour map illustrates that glacial and alluvial processes have shaped the bedrock surface. The bedrock surface dips predominantly in a south-southeastern direction toward the former location of the Bronx River. The bedrock surface on the southern side of the former river channel (i.e., the side opposite the site) dips to the northwest.

Rock Quality Designation (RQD) measurements collected from bedrock core holes SB-5 (38-43 ft bgs), SB-9 (30-35 ft bgs), SB-11 (37.5-42.5 ft bgs), SB-12 (26.5-31.5 ft bgs), SB-13

(24-29 ft bgs), SB-15 (36-41 ft bgs), SB-16 (28.5-33.5 ft bgs), SB-17 (29.5-34.5 ft bgs), and SB-18 (22.5-27.5 ft bgs) provide an indication of the fracture intensity. One bedrock core sample was collected from the bedrock surface to 5 feet below the bedrock surface. The RQD numbers for the core samples range from 52% to 100% (see boring logs in Appendix C). The higher RQD numbers are indicative of more competent rock. In general, the lower RQD numbers (indicating more broken rock) are more frequent in the area of the former and current Bronx River, with rock quality becoming more competent in the central and northwestern portions of the site.

4.4.2 Glacial Deposits

The glacial deposits are stratigraphically located between the overlying organic-rich alluvial marsh deposits and the underlying competent bedrock. The glacial deposits differ significantly from the overlying alluvial marsh deposits. The glacial deposits consist predominantly of poorly sorted, dense silt to coarse gravel. Evidence of reworking of the glacial deposits (i.e., stratification) by fluvial processes was observed in split-spoon samples. The glacial deposits at the site are thin to absent along most of the southeastern boundary of the site (near the present river channel) and in the area of the former river channel. In these areas, alluvial deposits commonly overlie the bedrock surface.

4.4.3 Alluvial Marsh Deposits

The alluvial marsh deposits overlie the glacial deposits. The alluvial unit consists predominantly of freshwater tidal marsh deposits containing organic matter bonded by a matrix of sand, organic silt and clay. These alluvial marsh deposits are identified as peat in many of the boring logs. The tidal marsh deposits range in thickness from approximately 15.5 ft near the southeastern site boundary (near the Bronx River) to less than 6.5 feet near the northwestern site property boundary. The tidal marsh deposits are absent in the areas of the site in which the subsurface holders were constructed (i.e., the marsh deposits were most likely excavated during holder construction). In the areas of the subsurface holders, MGP fill directly overlies glacial deposits. The tidal marsh deposits are also absent in the area of the former Bronx River channel.

4.4.4 MGP-Era Fill

Fill from the former MGP is present immediately above the tidal marsh deposits. The MGP horizon ranges in thickness from approximately 20 feet near the northwestern site boundary (near the subsurface holders) to less than 5 feet near the southwestern site property boundary (near the eastern bank of the former river channel). In some areas of the site, the MGP-era fill unit consists predominantly of moderately well-sorted, fine to coarse sand with variable percentages of brick, coal and ash material. The top of this unit is believed to represent the former land surface during the operations of the MGP.

4.4.5 Post-MGP Fill (Urban Fill)

Urban fill deposits overlie the MGP-era fill horizon. The urban fill consists predominantly of fine to medium sand with varying percentages of silt, coarse sand, gravel, blast rock, brick pieces, ash and other fill materials. These urban fill deposits belong to the LaGuardia and Ebbets Series soil classification (see subsection 4.2, Regional Soils). The fill deposit is laterally continuous across the site and ranges in thickness from approximately 3 ft in the southwestern portion of the site to more than 25 ft in the former area of the Bronx River. This urban fill was placed on the site and surrounding area after the MGP was shut down and MGP structures were removed, most likely during the construction of the park and surrounding roadways in the 1950s. The urban fill is covered by asphalt on the northern portion of the site. The southern portion of the site is the location of the former playing field that was recently stripped of topsoil. The southern portion of the site is presently being used as a temporary staging area for soils excavated from the Sheridan Expressway.

4.5 Subsurface Features

Test pit excavations were used to identify existing, or the remnants of, MGP subsurface structures. The test pit excavation depths were limited by the reach of the backhoe (approximately 15 ft) and the depth of the water table. As previously mentioned, the urban fill deposits (placed subsequent to the operation of the MGP) ranged in thickness from approximately 3 ft on site to more than 25 ft in the former area of the Bronx River. Therefore, most backhoe excavations located outside the former river channel trenched though the entire thickness of the former MGP-era fill and into the uppermost portion of the marsh deposits. The test pit locations are illustrated on Figure 4.

Test pit logs are provided in Appendix C. A concrete slab was encountered at a depth of 3 ft bgs in TP-1. The slab is most likely the floor of the retort house. Test pits TP-2 and TP-3 uncovered a portion of a subsurface holder rim at a depth of approximately 6 feet bgs. Test pit TP-4 uncovered a holder rim of a second subsurface holder at a depth of approximately 6 feet. The holder rims are constructed of brick and are approximately 18 inches thick. A concrete slab was encountered at a depth of 4.6 feet in test pit TP-6 and a depth of 4.1 feet in TP-7. This slab was most likely the foundation for the former above-grade holder. Test pits TP-9C and TP- 27A, excavated in the area of the former Bronx River channel, encountered a concrete slab and timbers most likely associated with the former river bulkhead that was part of the former MGP waterfront. This bulkhead is shown in historical photographs in the site history report in Appendix A. The bulkhead was encountered at 5 ft bgs in TP-9C and at 6 ft bgs in TP-27A. A brick wall was uncovered at a depth of 5 to 12 ft bgs in test pit TP-12A. This wall may be a retaining wall for the former river embayment. Test pits TP-9B, TP-9C, and TP-29 each contained massive blast rock that was imported to the site (i.e., blast rock was used to fill the former river channel). Test pits TP-16 and TP-28 uncovered a concrete slab at 4.5 ft bgs and 5.4 ft bgs, respectively. This slab is most likely the floor of the former storage building. Cast iron pipe, most likely associated with former MGP operations, was encountered at depths greater than 8 ft bgs in test pits TP-13 and TP-14. Many of the test pits contained building debris (e.g., brick, wood, wire) most likely associated with the razing of the MGP and subsequent filling of the site.

The bottom of each of the two subsurface water-seal holders was encountered during the drilling of several borings (SB-2, SB-2A, SB-4, and SB-4A). Borings B-2 and B-2A encountered the bottom of the 75,000 cu ft subsurface holder at a depth of 25 ft bgs. Borings B-4 and B-4A encountered the bottom of the 60,000 cu. ft. subsurface holder at a depth of 22 ft bgs. Boring SB-12 encountered schist fill and void space that may be associated with the blast rock fill observed in the former river channel.

4.6 Regional Surface Water Hydrology

Surface water in the Borough of the Bronx County occurs in lakes and streams. The Bronx River flows southward across the Bronx and drains the Bronx River Basin. The Bronx River Basin is a minor drainage divide between the Long Island Sound Drainage Basins and the East River and its tributaries. The Bronx River basin watershed is approximately 56 square miles (US Army Corps of Engineers, 2002). The Bronx River discharges directly into the East River, located approximately 2 miles southeast of the site. The Bronx River is fed by overland runoff and/or diffuse flow from an overburden aquifer. The base flow of the river, which is the sustained flow between flood events, is provided by groundwater. The presence of large impervious areas of urbanization results in peak runoff from storms that may be two to four times that of undeveloped areas (Lazaro, 1979). These surface waters are subject to a large amount of pollution from street refuse, such as animal droppings, leaves, dust, and industrial spills (Baskerville, 1992). The site-specific flow of groundwater from the overburden aquifer to the Bronx River and the tidal influence of the river are discussed in detail in subsection 4.8. The Bronx River has been classified as Class I Saline Surface Waters by NYSDEC. Class I waters are suitable for secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

4.6.1 Regional Surface and Groundwater Quality

Surface water and groundwater samples from the Bronx and western Queens Counties were analyzed as part of a geologic study conducted by the USGS (Baskerville, 1992). These water quality results are summarized in Table 6. Two of the samples were collected from the Bronx River and were analyzed for alkalinity, pH and inorganic compounds.

According to the analytical results of two samples, surface water from the Bronx River is basic, exhibiting pH values of 7.28 and 9.1 standard units. Sodium concentrations of 30 and 580 mg/l and chloride concentrations of 90 and 3,300 mg/l were detected. Surface water samples exhibited potassium concentrations of 2 and 40 mg/l and sulfate concentrations of 35 and 440 mg/l. Iron concentrations ranged from 0.09 to 0.9 mg/l.

Several trace elements were detected in the surface waters of the Bronx and Queens Counties at concentrations raging from <0.01 to 0.72 mg/l. Trace elements included cobalt, chromium, lithium, manganese, molybdenum, nickel, phosphorus, lead, tin, thallium, and vanadium.

4.7 Regional Groundwater Hydrology

4.7.1 Hydrogeology

General information about the hydrogeology in the area of the site was known prior to conducting the FRI. Hydrogeologic literature for New York City indicated that groundwater in the area moves predominantly from recharge areas to nearby valleys, where it typically discharges to the major rivers. Groundwater recharge is primarily from infiltration of precipitation, and minor amounts of water enter the groundwater system through leaking water mains, sewers, and sanitary disposal systems. Groundwater occurs predominantly under unconfined conditions in overburden, and confined and unconfined conditions in fractured bedrock.

4.7.2 Groundwater Use Survey

A preliminary groundwater use survey was conducted to identify potential receptors and to determine if the aquifer beneath and downgradient of the site is used for public purposes. Information on public and private water supply wells (residential and industrial) within a 1-mile radius of the site was obtained from multiple sources. An electronic database records search from EDR, which included information from the USGS, Federal Reporting Data System (FRDS) Public Water Supply System, and the New York State Database, was completed.

Groundwater in the Borough of the Bronx is used only for industry and has not been withdrawn for public water supply since 1905 (Perlmutter and Arnow, 1953). Potable water used in the Bronx is obtained entirely from the New York City water supply system. No public or private wells were identified within 1 mile of the site. The NYSDEC groundwater classification for the site is Class GA Fresh Groundwaters.

4.8 Site-Specific Groundwater Hydrogeology

Site-specific groundwater hydrogeologic characterization was conducted within the site property boundary and within the park boundary to provide specific hydrologic data on the site and surrounding area, and to determine how the site hydrology fit into the broad regional groundwater hydrogeologic model. Specifically, the hydrogeologic characterization data were used to (1) characterize the geology of the overburden aquifer; (2) define local groundwater flow in the overburden; and (3) determine the influence of the Bronx River on groundwater flow. A detailed description of the site-specific hydrogeologic characterization is presented in this section. Table 4 presents a summary of the monitoring wells installed for site characterization, and includes well identification, depth, elevations, screened interval, and annular fills. Monitoring well locations are illustrated on Figure 4.

4.8.1 Characterization of the Overburden Aquifer

The overburden aquifer at the site is unconfined and present within the glacial and alluvial marsh geologic units. The overburden aquifer extends into the MGP-era fill unit in the area of the subsurface holders. The competent bedrock surface defines the base of the overburden aquifer. The spatial distribution of each of these stratigraphic units is presented on Figure 6 (geologic cross-section A-A') and Figure 7 (geologic cross-section B-B'). Cross-section A-A' is oriented north-south across the park property. Cross-section B-B' begins at the west-central property boundary, traverses the site, and ends at the Bronx River. This orientation is roughly parallel to the direction of groundwater flow in the overburden aquifer. As illustrated in the cross sections, the alluvial and glacial stratigraphic units characterize the overburden aquifer. The alluvial marsh unit is laterally continuous across most of the site. The marsh deposits were absent only in the northwestern side of the site in the area of the subsurface holders. The glacial unit is also laterally continuous across most of the site. The glacial unit was thin or absent in some areas adjacent to the former and current Bronx River channel, where alluvial deposits directly overlie competent bedrock.

Bedrock cores drilled on site and within the park property encountered a competent bedrock geologic unit underlying the glacial unit that does not appear to be water bearing. This unit may act as a confining layer between the overburden and bedrock aquifers.

4.8.2 Groundwater Flow Within the Overburden Aquifer

The depth to groundwater and the groundwater elevations measured in August 2002 for the overburden aquifer are listed in Table 7. The groundwater level within the overburden aquifer ranges from approximately 12.5 to15 feet bgs. Figures 9A through 9D illustrate the water table surface contours and groundwater flow direction within the overburden aquifer at the park for the two groundwater level measurement events. Groundwater measurements collected from wells screened in similar stratigraphic horizons and similar depths were used to determine the groundwater flow directions. Several nests of wells were installed to evaluate vertical hydraulic gradients of the overburden aquifer. Well nests are screened at the following groundwater bearing overburden intervals.

- MGP-era fill and alluvial marsh units
- Glacial unit

Figures 6 and 7 (geologic-cross sections) illustrate the vertical difference between the water bearing units, the screen intervals, and groundwater elevations measured on August 23, 2002 for three of the four well nests located on the park property. The well nests are located in the northern portion of the park (MW-1 series), the central part of the site (MW-2 series), the northeastern corner of the site (MW-3 series), and the southeastern corner of the site (MW-4 series).

The groundwater flow directions shown in Figures 9A and 9B were collected using shallow wells screened in the MGP-era fill and alluvial marsh deposits. The river elevation upriver of the weir (collected from RG-2) was also used to calculate shallow groundwater contours on Figure 9B. The water-level measurements collected from piezometer PZ-2 were not used in the construction of the water table contour maps due to the piezometer's anomalously low water-level elevation and the uncertainty of the stratigraphic unit in which this piezometer is screened. As illustrated by the groundwater flow direction maps, groundwater within the overburden aquifer flows in a southerly direction toward the Bronx River. The average horizontal hydraulic gradient across the site is 0.006 ft/ft (based on August 1 and August 23, 2002 measurements).

The groundwater flow directions shown in Figures 9C and 9D were collected using deep wells screened in the glacial unit. Groundwater levels measured from deep monitoring well MW-2D, screened in the marsh unit, were not used to calculate deep groundwater flow directions.

During the development of each well, observations of groundwater recharge indicate that the wells screened in the glacial unit have a greater rate of recharge than wells screened in the alluvial marsh unit.

4.8.3 Tidal Survey

A tidal survey was performed at the site in August 2002. During the survey, water levels were monitored continuously at two locations in the Bronx River (River1 and River2), three shallow overburden wells (MW-1S, MW-2S, and MW-4S), and two deep overburden wells (MW-1D and MW-4D) for a minimum of 72 hours. River1 was located upstream of the weir, adjacent to monitoring well series MW-3. River 2 was located downstream of the weir. The pressure transducer used to measure water levels in monitoring well MW-4D malfunctioned during this 72-hour tidal survey. Therefore, the water levels in MW-4D were monitored for 72 hours after the 72-hour period in which the other wells were monitored. Shallow overburden wells were typically installed no greater than 16 feet bgs and were screened across the water table in MGP-era fill and the marsh deposits. Excepting monitoring well MW-2D, deep overburden wells were screened in the glacial unit that underlies the marsh deposits. Tidal survey data are compiled in Appendix F.

The tidal survey data from MW-4S (located approximately 20 feet from the river) indicates that the water level in MW-4S is tidally influenced (maximum fluctuations of 0.509 feet). The water level in monitoring well MW-2S (located approximately halfway between the Bronx River and the Sheridan Expressway) shows a slight tidal effect (maximum fluctuation of 0.069 feet). The water level fluctuation curve for MW-2S appears cyclical but not sinusoidal. However, the frequency of the water level fluctuations measured in monitoring well MW-2S is very similar to the tidal cycle of the river. The water level in MW-1S (in the northern portion of the park near the Sheridan Expressway) does not show tidal effects. These data indicate that tidal influence does not extend to the northern park property boundary in the shallow overburden aquifer. Therefore, tidal fluctuations should have a minimal effect on groundwater flow direction in the shallow overburden aquifer.

Water level measurements collected from deep overburden monitoring wells MW-1D and MW-4D show tidal impacts. The water levels collected from MW-4D (located adjacent to the river) shows the greater impact (fluctuation of approximately 1.7 feet). Water levels collected from MW-1D (located near the Sheridan Expressway) show a moderate impact (fluctuation of approximately 0.6 foot). These data indicate that tidal influence in the deep overburden aquifer extends to the northern property boundary. The tidal response times measured in MW-1D and MW-4D are similar to the tidal response times measured in the river. Therefore, tidal fluctuations should have a minimal effect on groundwater flow direction in the deep overburden aquifer.

5. Identification of Potential Source Areas

5.1 Potential MGP Waste Source Areas

Potential waste source areas at former MGP sites include locations associated with the production, purification, and storage of manufactured gas. Typical source area locations identified at MGP sites include gas purifiers, oil and by-product (e.g., tar) storage tanks, tar handling and storage areas, and gas holders. Liquid residues include tars and oils, which are complex mixtures of hydrocarbons. Organic compounds associated with these tars and oils include VOCs and polycyclic aromatic hydrocarbons (PAHs). Solid by-products found at MGP sites include ash, purifier material, and tar. Inorganic compounds associated with ash and purifier material include metals and complex cyanide. Table 8 lists compounds that may be present at MGP sites.

Results of the historical review conducted for the East 173rd Street site identified the location of several potential source areas present at the site. These potential source areas included: (1) gas purifiers and two above-grade naphtha oil tanks located in the southeastern corner of the site; (2) a 130,400-c.f. slab on grade gas holder located in the southeastern corner of the site; and (3) a 75,000-c.f. subsurface water seal holder and an estimated 60,000-c.f. capacity subsurface water seal holder located in the north-central portion of the site. In addition to these known potential source areas, other on-site areas and areas outside of the former MGP operations (e.g., former and current river channel, former river embayment) were investigated as part of the site characterization.

5.1.1 Identification of MGP Structures

As discussed in subsection 4.5, physical evidence collected during FRI activities indicates that several remnant MGP structures are present beneath the surface of the site. The rims of each of the two subsurface water-seal holders were encountered at a depth of approximately 6 ft bgs in the north-central portion of the site. The 75,000-c.f. water-seal holder bottom was encountered at a depth of 25 feet bgs, and the bottom of the estimated 60,000-c.f. water-seal holder was encountered at a depth of 22 feet bgs. The slab of the former 130,400 c.f. above-grade holder was uncovered at a depth of approximately 4.5 feet bgs in the southeastern corner of the site. The floors of several of the former MGP buildings were encountered at depths between approximately 3 and 5 feet bgs. Cast iron pipe, most likely associated with the MGP operations, was encountered at depths greater than 8 feet bgs in the central portion of the site. The top of the former river bulkhead/retaining wall was uncovered at a depth of approximately 5 feet bgs.

5.1.2 Identification of MGP Residue

Physical evidence collected during FRI activities indicates that DNAPL tar is present in discrete intervals within the subsurface MGP-era fill and the uppermost portion of the organic-rich alluvial marsh deposits on the site. The DNAPL tar observed in on-site borings and test pits is comprised of either droplets (i.e., disconnected separate-phase sphericals), horizontal seams (i.e., partial DNAPL saturation of material or soil interstitial pore spaces), or vertical veins (i.e., separate-phase DNAPL tar in small openings or root holes in fine-grained material). The viscosity of the DNAPL tar observed in seams and veins is commonly described (qualitatively) as "taffy-like" or "solidified" (i.e., viscous). DNAPL tar droplets were observed only in materials encountered in test pit TP-4, excavated inside the estimated 60,000-c.f. holder foundation. On-site and off-site borings and test pits delineated the lateral and vertical extent of DNAPL tar. DNAPL tar is limited to a few areas within the site boundary. The borings and test pits that contained DNAPL tar are illustrated on Figure 10, and included TP-4, TP-8A, TP-13, SB-15, SB-20, and MW-2S. The vertical extent of on-site DNAPL tar is presented in geologic cross sections (Figures 6 and 7). The distribution of the DNAPL tar observed in borings and test pits ranges in depth from 8 feet bgs to 20 feet bgs (i.e., DNAPL tar is present in discrete zones within a 12-foot interval). The discrete zones of observed DNAPL tar-impacted material within this 12-foot interval are between approximately 1 inch and 4 feet in thickness.

Due to the deposition of urban fill over the former MGP surface, the shallowest DNAPL encountered in soils was approximately 8 ft bgs. DNAPL tar did not extend to the glacial deposits or into the uppermost portion of the competent bedrock in on-site borings (i.e., DNAPL tar was not found to migrate through the alluvial marsh deposits). DNAPL tar was not encountered in off-site borings or test pits. The distribution and potential for the movement of DNAPL tar is discussed further in subsection 7.1.

In addition to DNAPL tar, evidence of tar impacts included staining and/or sheen and naphthalene and/or MGP tar odor. Borings and test pits that exhibited only tar staining and/or sheen included TP-2, TP-6, TP-8, TP-9C, TP-28, SB-2, SB-9, SB-19, and MW-2D. Borings and test pits that exhibited only naphthalene and/or MGP tar odor included SB-1, SB-2A, SB-3, SB-4, SB-10, SB-16, SB-17, MW-4S, and MW-4D. Physical evidence of purifier wastes was collected from two on-site test pits. Test pit TP-1 (6.5 to 8 feet bgs) contained black-stained wood chips that exhibited a slight purifier and naphthalene odor. Test pit TP-15 (8 feet bgs) contained a discrete pocket (<1 c.f.) of bluish-green stained soil. Except for the tar odor detected between 12 and 14 feet bgs in soil boring SB-17, all visual and olfactory evidence of MGP residue was observed from sample locations within the boundary of the site (i.e., former MGP property). The distribution of tar staining, sheen, and odor is illustrated in Figure 10 and geologic cross sections.

In addition to the borings and test pits conducted at the site and surrounding park property, a river inspection was conducted by GEI and the NYSDEC to provide supplemental evidence that DNAPL tar was not present along the bank of the river or within the river channel. This river inspection consisted of digging shallow excavations (less than 1 foot) along the riverbank, overturning cobbles and boulders in the river channel, and prodding the river with a threaded steel rod. A threaded rod was used to probe sediments along the western side of the river. The rod commonly penetrated to depths between 4 and 6 feet below the surface of the riverbed. DNAPL tar impacts were not detected in the river sediments adjacent to the site or park property. An iridescent sheen was noted on the surface of the river between the area of the mud flat and the weir. This sheen was noted prior to prodding the sediments with the threaded rod. Probing the uppermost portion of the mud flat sediments (from the surface to 12 inches in depth) released additional sheen from some areas of the mud flat. The sediment that exhibited sheen did not exhibit an MGP or petroleum odor.

As illustrated on cross-section B-B' (Figure 7), DNAPL tar is confined to the site in discrete zones of residual saturation and is not present in the glacial deposits, bedrock, or river channel. Soil in contact with DNAPL was sampled and analyzed for VOCs, SVOCs, inorganics, and cyanide. Sediment samples were collected from 0 to 1 foot below the sediment surface. This sediment sampling interval represents the primary exposure pathway for human and ecological exposure scenarios. The analytical results are discussed in Section 6.

6. Nature and Extent of MGP Contaminants

This section of the FRI report discusses the nature and extent of contaminants associated with MGP residuals. Samples were collected from on-site and off-site locations (i.e., within and outside the area of former MGP operations) and from all media that could potentially be impacted by MGP residues. The identified media include soils, sediments, groundwater, and air. Samples were collected from each media to identify concentrations of organic and inorganic compounds, and to determine if detected compounds are potentially derived from former MGP operations. Detected compounds are defined as any regulated VOC, SVOC, or inorganic compound detected on the site and/or surrounding off-site property at concentrations above the reported analytical Method Detection Limit (MDL). Detected compounds are evaluated to determine if regulatory standards have been met or exceeded. Compounds detected in soil, sediment, and groundwater at the site and off site include individual VOCs, SVOCs, and inorganic analytes. As mentioned in subsection 5.1, many of the inorganic and organic compounds detected in on-site and off-site media can be associated with MGP residues; however, some of these detected compounds are not commonly associated with the MGP process and also occur naturally in background soil and groundwater throughout the eastern United States (Shacklette, 1984; Bradley, et al., 1994).

Metals are naturally occurring compounds of soil, and are derived from the rocks, or parent materials, from which the soil was formed. Soils can also be enriched in metals from human activities (e.g., fertilizers and fossil fuel emissions). PAHs are by-products of combustion and are ubiquitous in the urban environment. Therefore, background PAH and metal concentrations in soils vary based on the region. Table 9 presents background concentrations of PAHs and metals in soils from the eastern United States. Given the universal presence of PAHs and metals in the urban environment, it is important to compare analytical results to both generic regulatory standards and typical background concentrations. As discussed in NYSDEC TAGM 4046, if a regulatory standard is below background, the background value is commonly used as a screening criterion.

The distribution of detected compounds in surface soils, subsurface soils, groundwater and sediments is discussed separately in this section. Ninety-six soil samples (22 surface-soil samples and 74 subsurface-soil samples), nine sediment samples, and eight groundwater samples were collected over several sampling events and analyzed for VOCs, SVOCs, and inorganics (including cyanide). Sample locations are presented in Section 3 of this FRI report. Air samples were collected and analyzed for inhalable particulates and VOCs as part of the CAMP conducted during the FRI field activities. Analytical results for each of the detected compounds for each of the sample media were compared to the appropriate New York State standard and regional background concentrations. The interpretations of these data are supplemented with data tables, figures and maps. The analytical results for each soil, water, and sediment sample are included in Appendix E. All analytical data were validated. Data usability reports are included in Appendix E. The analytical results for air sampling are presented in Appendix D.

6.1 Soil Analytical Results

Surface and subsurface soil analytical results were compared to the NYS recommended soil cleanup objectives (RSCOs) as presented in the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4046. Soil analytical results were compared to RSCOs in two subsets: surface soil (0 to approximately 2 ft bgs as represented by the topsoil stockpiles) and subsurface soil (below 2 ft bgs). The laboratory analytical results of each of these soil subsets are presented in summary Tables 10 and 11. The tables present the sample identification, sample depth, analytical result and any applicable data qualifier for the compounds detected in a sample. The organic and inorganic compounds listed on the tables are detected in soils at concentrations above the reported analytical MDL. Compounds detected in a sample are highlighted in blue. Analytical results that exceed the RSCO are highlighted in red.

6.1.1 Surface-Soil Analytical Results

Table 10 presents a comparison of the surface-soil analytical results to the RSCOs. Toluene was the only VOC detected in surface soil from the two stockpiles. Toluene was detected at a concentration of 0.36 mg/kg in one sample collected from Stockpile 2. This detected concentration is below the RSCO of 1.5 mg/kg.

Eight of the 11 surface-soil sample locations exhibited concentrations of individual PAH compounds that exceed the RSCO. Numerous PAHs were detected from each of the four surface-soil sample locations collected from Stockpile 1. One or more PAHs were detected from four of the samples collected from the seven locations sampled from Stockpile 2. Concentrations of individual PAHs that exceed RSCOs in surface-soil samples collected from both stockpiles ranged from 0.021 to 0.72 milligram per kilogram (mg/kg). PAH compounds detected in surface-soil samples are below the arithmetic mean of background concentrations for urban soils in the eastern United States.

Several metals were detected in surface-soil samples at concentrations that exceed the RSCOs. The concentrations and distribution of individual metals are similar for all samples, and concentrations are within the range expected in background soils in the eastern United States. Cyanide was not detected in surface soils. These data indicate that surface soil contain concentrations of metals and PAHs that exceed the RSCOs, but are within the range of typical background concentrations for eastern United States urban soil. Therefore, surface soils are not impacted by former MGP operations. The surface-soil samples typically consisted of fine-to-medium sand with varying percentages of silt, coarse sand, gravel, blast rock, brick pieces, ash, and other fill materials. These surface soils have been mapped by the NRCS as transported fill and were placed on site circa 1950 (most likely during the development of the park and construction of the Sheridan Expressway).

6.1.2 Subsurface-Soil Analytical Results

Table 11 presents a comparison of the subsurface-soil analytical results to the RSCOs. Table 12 lists the compounds detected above RSCOs in subsurface soil, the number of subsurface-soil samples analyzed, the maximum detected concentration and corresponding sample identification, and the percent of samples that exhibit a concentration that exceed the RSCO. Organic compounds (including VOCs and PAHs) and inorganic compounds were detected in subsurface-soil samples at concentrations that exceed RSCOs. The most prevalent VOC detected in subsurface-soil samples is benzene (i.e., benzene was detected at concentrations that exceed the RSCO of 0.06 mg/kg in 22 percent of the subsurface-soil samples). Benzene was detected at concentrations that exceed the RSCO only within the area of former MGP operations, predominantly in the area of the two subsurface holders and in an isolated area southeast of the subsurface holders. These samples were collected from depths between 8 and 20.5 ft bgs. Excepting sample TP-12 (benzene concentration = 0.36 mg/kg) and TP-15 (benzene concentration = 0.086 mg/kg), which exhibited estimated values below the laboratory practical quantitation level, benzene concentrations that exceed the RSCO are present in on-site subsurface-soil zones that contain MGP residue. The highest benzene concentration was detected in sample TP-27B (benzene concentration = 210 mg/kg), collected at a depth of 12 feet bgs in a zone of DNAPL tar-impacted soil.

SVOCs were detected at concentrations that exceed the RSCOs in 53 out of 103 (52 percent) of the subsurface-soil samples. Subsurface-soil samples collected from all off-site locations and numerous on-site locations exhibited PAH concentrations within the range expected in urban soils of the eastern United States. The most prevalent PAHs detected above RSCOs were benzo(a)pyrene (52 percent), benz(a)anthracene (48 percent), chrysene (45 percent), benzo(b)fluoranthene (40 percent), and dibenz(a,h)anthracene (15 percent). These PAHs, detected at concentrations that exceed the RSCOs, are distributed throughout subsurface-soil urban fill deposits at the site and park property. The samples exhibiting the highest PAH concentrations (i.e., exhibiting PAH concentrations above the ranges expected in urban soils) and greatest number of PAHs that exceed standards were collected from on-site MGP-era fill deposits and the uppermost portion of the alluvial marsh deposits that contained DNAPL tar. For example, soil sample SB-15 contained 15 SVOCs that exceeded standards and exhibited a total SVOC concentration of 50,146 mg/kg.

Several metals were detected at concentrations that exceed the RSCOs. Excepting selenium, these metals were detected above MDLs throughout the site and off-site property in subsurface MGP-era fill and the natural deposits (i.e., glacial and/or marsh deposits) that underlie the fill. These data indicate that subsurface soil contains concentrations of metals that exceed RSCOs, but are within the range of typical background concentrations for eastern United States urban soil. Selenium was only detected in four subsurface-soil samples. Selenium was detected at concentrations that exceed the RSCO of 2 mg/kg in two samples collected from MGP-era fill material that contained DNAPL tar (TP-8A [11.5'] and TP-27B [12']). Selenium is not identified as a compound specifically associated with MGP operations (see Table 8). However, its known presence in various coals and oils, and limited on-site distribution, suggest it is derived from former MGP operations. Cyanide was not detected in subsurface-soil samples above the EPA generic soil screening level of 1,600 mg/kg. The highest cyanide concentration detected was 1,085 mg/kg (TP-1 [10']).

6.2 Sediment Analytical Results

Sediment samples SED-1 through SED-9 were collected from 0 to 1 foot below the riverbed surface to characterize the chemistry of surficial sediments and to evaluate potential impacts of sediment contamination. Table 13 presents the laboratory analytical results compared to NYS sediment criteria presented in the *Technical Guidance For Screening Contaminated Sediments (NYSDEC, 1998)*. The organic and inorganic compounds listed on the table are the compounds detected in sediment at concentrations above the reported analytical MDL. Organic compounds are compared to benthic aquatic life acute toxicity and benthic aquatic life chronic toxicity values. Inorganic compounds are compared to Lower Effects Levels (LEL) and Severe Effects Levels (SEL).

These NYS sediment criteria are based on biological effects on benthic organisms and are derived for the protection of ecological receptors. Concentrations below the LEL value are not contaminated and within a range that would result in no effect to biological organisms. Concentrations below the SEL and above the LEL indicate moderate impacts to sediment. The sediment is considered to be severely impacted if both SEL and LEL values are exceeded. Sediments that exceed the criteria do not represent actual risks to human health or the environment or the final concentrations that must be achieved through sediment remediation. The comparisons of sediment analytical results to NYS sediment criteria values were used as preliminary screening (i.e., guidance standards) to assess the potential for ecological receptors to be exposed to contaminated sediments, and to determine if additional sediment evaluation is required. Comparisons of the sediment analytical results to the sediment criteria provide a conservative assessment of potential risk to a human receptor from sediment in the Bronx River.

In Table 13, compounds detected at concentrations that exceed LEL sediment screening criteria are highlighted in green. Analytical results that exceed the SEL criteria are highlighted in red. No VOCs were detected at concentrations above the analytical detection limits in sediment samples collected from the Bronx River. Several PAH compounds were detected in each of the nine samples at estimated concentrations below laboratory detection limits. The concentrations of PAHs detected in sediment samples are more than 1,000 times lower than the Benthic Aquatic Life Chronic Toxicity values and more than 10,000 times lower than the acute toxicity values. Twelve metals were detected in sediment samples that exceed sediment screening criteria. Cyanide was detected in each of the nine sediment samples. The concentrations of cyanide ranged from 0.39 to 44 mg/kg.

Figure 11illustrates the distribution of sediment impacts in the river. The concentration of each analyte that exceeds the sediment screening criteria is presented in a call out box adjacent to each sample location. Each of the sediment samples collected from the river exceeds the SEL and/or LEL values for eight or more metals. In other words, samples collected upgradient of the site (SED-7, SED-8, and SED-9), adjacent to the site (SED-4, SED-5, and SED-6), and downgradient of the site (SED-1, SED-2, and SED-3) exceeded the sediment criteria for eight or more metals. The concentrations of individual metals detected in each of the nine sediment samples were similar (i.e., within the same order of magnitude). These data suggest that sediment samples of the Bronx River contain background concentrations of metals that exceed LEL and SEL values. No VOCs or PAHs exceeded sediment screening criteria.

6.3 Groundwater Analytical Results

One round of groundwater samples was collected for laboratory analysis from eight monitoring wells (two on-site nested monitoring wells pairs and two off-site well pairs) to characterize groundwater chemistry. The collection of groundwater samples from each nested monitoring well pair allowed for a complete characterization of the groundwater chemistry for the overburden aquifer. Monitoring wells MW-3S, MW-3D, MW-4S, and MW-4D, illustrated in Figure 4, are located along the hydraulically downgradient site and park property boundary. Monitoring well MW-2S and MW-2D were installed on site in an area of identified DNAPL tar impacts. Monitoring well MW-1S and MW-1D are located approximately 160 feet north of the site boundary and hydraulically upgradient.

The groundwater analytical results are compared to the NYS Ambient Water Quality Standards (AWQS) and Guidance Values in Table 14. Table 14 presents the sample identification, analytical result, and applicable data qualifiers for VOCs, SVOCs, TAL metals and cyanide. The organic and inorganic compounds listed on the table are the compounds detected in groundwater at concentrations above the reported analytical MDL. Compounds detected in a sample are highlighted in blue. Analytical results that exceed the AWQS are highlighted in red. Figure 12 illustrates the distribution of compounds in groundwater. The concentration of each compound that exceeds the AWQS is presented in a call out box adjacent to each sample location.

Several VOC and PAH compounds (detected at concentrations that exceed AWQS for a GA water class) were identified during the groundwater monitoring program. Concentrations of one or more organic compounds above AWQS have been detected in groundwater samples collected from four of the eight wells screened in the overburden aquifer (MW-2S, MW-2D, MW-3D, and MW-4D). Groundwater collected from monitoring well MW-2D exhibited the highest concentrations of VOCs and PAHs, and the greatest number of detected compounds above the AWQS. Monitoring wells MW-2S and MW-2D are located adjacent to the smallest holder foundation in an area that contained MGP residue and subsurface soils that exhibited concentrations of benzene, toluene, ethylbenzene and xylene (BTEX) and PAHs above RSCOs. The highest total VOC concentrations and total SVOC concentrations in subsurface soil were detected in samples collected from soil borings SB-19 and SB-15, which are the closest hydraulically upgradient borings (located outside the holder) to monitoring well MW-2D. No organic compounds were detected above AWQS in groundwater samples collected from monitoring wells MW-3S and MW-4S, or hydraulically upgradient monitoring wells MW-1S and MW-1D.

During the FRI, both dissolved (filtered) and total (unfiltered) groundwater samples were analyzed for TAL metals. Total metals results are presented in Table 15. However, both filtered and nonfiltered results were compared to the appropriate NYSAWQS. Several metals were detected at concentrations above the AWQS, including iron, manganese, magnesium, selenium, and sodium. Cyanide was detected at a concentration of 0.722 mg/l (i.e., detected above the AWQS of 0.2 mg/l) in the groundwater sample collected from monitoring well MW-2D.

6.4 Extent of MGP Impacts

As discussed in Sections 5 and subsections 6.1 to 6.3, physical evidence of MGP residue and analytical results indicate that on-site subsurface soils and on-site groundwater are impacted by former MGP operations. This subsection presents the lateral and vertical extent of MGP impacts.

6.4.1 Extent of Subsurface-Soil MGP Impacts

As presented in NYS Technical and Administrative Guidance Memorandum (TAGM) #4046, the maximum recommended soil cleanup objectives for total VOCs is 10 mg/kg and 500 mg/kg for SVOCs. The analytical results indicate that several subsurface-soil samples exceed these maximum values. Plate 1 illustrates the subsurface soils that exceed the RSCOs for total VOCs and total SVOCs. The total concentration of VOCs and SVOCs for each subsurface-soil location and the corresponding sample depth are presented in a call out box adjacent to each sample location. The analytical results that exceed the cleanup objective are highlighted in red. Samples that exceed the total VOC and SVOC cleanup objectives are limited to the site and are present in soils below 5 feet in depth. Total SVOC concentrations greater than 500 mg/kg and total VOC concentrations greater than 10 mg/kg are present predominantly in the area of the two subsurface holders and an isolated area southeast of the subsurface holders. The subsurface-soil samples that exceed RSCOs for total VOCs and SVOCs are limited to the on-site MGP-era fill and the uppermost portions of the alluvial marsh deposits. Total VOCs and SVOCs were not detected at concentrations that exceed the RSCOs in glacial deposits.

Subsurface MGP-era fill and the uppermost portion of the marsh deposits within the site boundary are impacted by MGP residue (DNAPL tar, tar staining and/or sheen, naphthalene and/or MGP tar odor) in discrete stratigraphic zones. Excepting a tar odor detected in SB-17 (12 to 14 ft bgs), evidence of MGP residue is limited to areas within the site boundary (i.e., within the former MGP property boundary). The highest concentrations of total VOCs and SVOCs were collected from on-site soils that were impacted with DNAPL tar (e.g., SB-15 (17 ft) and TP-27B (12 ft)). The area near the two subsurface holders and an isolated area southeast of the subsurface holders exhibits the greatest degree of visual and chemical impacts. The boring and test pits that contained DNAPL tar are illustrated on Figure 10, and the vertical extent of on-site DNAPL tar is presented in geologic cross-sections (Figures 6 and 7).

A statistical analysis of the concentrations of BTEX and PAH compounds in different stratigraphic soil units at Starlight Park was performed to further illustrate where BTEX and PAH compounds are most predominant. The analysis included the following steps.

- The soil analytical data were grouped into the five overburden soil units discussed in this report; surface-soil stockpile, urban fill, MGP-era fill, alluvial marsh deposits and glacial deposits.

- For each soil unit, a minimum, maximum and arithmetic mean concentration was calculated for total BTEX and PAHs. Non-detect values were assigned a value less than the detection limit.

- Semi-logarithmic plots were constructed showing the minimum, maximum, and mean concentration for total BTEX and total PAHs for each soil unit.

Figure 13 shows the results for total BTEX compounds. The surface-soil stockpile and the transported urban fill exhibited no BTEX contamination. As mentioned in Section 6, the only detected volatile compound was toluene in one surface-soil stockpile sample. This detected concentration was below the RSCO. As previously mentioned, surface soils consist of topsoil approximately 2 feet thick that was scraped and stockpiled as part of the NYSDOT and Parks Department rehabilitation project. The urban fill is a layer of soil ranging in thickness from 3 feet in the southwestern portion of the site to more than 25 feet in the area of the former Bronx River. The urban fill was identified as belonging to the LaGuardia and Ebbets soil series and was transported to the site from off-site construction activities.

The highest concentrations of BTEX compounds are found in the soils identified as MGP-era fill. These soils underlay the urban fill and are usually found above the alluvial marsh deposits. Numerous samples of MGP-era fill collected from on-site locations are impacted by DNAPL tar from the MGP. The MGP-era fill ranges in thickness from approximately 5 feet near the southwestern site property boundary to 20 feet within the buried gas holder foundations and immediately outside these structures where soils were disturbed and backfilled during the original holder construction. The mean concentration of total BTEX in samples collected from MGP-era fill is 77 mg/kg with a maximum concentration of 1,315 mg/kg.

The concentrations of BTEX compounds decrease with depth below the MGP-era fill unit. Samples collected from the alluvial marsh deposits have a mean concentration of 36.5 mg/kg and samples collected from the deeper glacial deposit have a mean concentration of 1.56 mg/kg. These BTEX data indicate that prior to the removal of topsoil in the park, there has been at least a 5-foot layer of clean soil separating the on-site MGP-impacted areas from the ground surface at Starlight Park.

Figure 14 presents the distribution of total PAH concentrations in each soil unit. Surface-soil stockpile samples exhibit low concentrations and a somewhat uniform distribution between sample locations. The mean total PAH concentration is 1.98 mg/kg. The urban fill unit that underlies the surface soil exhibits PAH concentrations that are similar to concentrations detected in surface soils.

The mean PAH concentration detected in the MGP-era fill is three orders of magnitude higher than the mean concentration in the urban fill. The maximum values in the MGP-era fill unit represent soils with DNAPL tar. As with the BTEX compounds, the concentrations of PAHs decrease with depth below the MGP-era fill. Samples collected from the glacial deposits exhibit concentrations almost identical to that detection in the urban fill.

This statistical analysis supports the conceptual site model that a 5-foot zone of clean soil separates the MGP-impacted soils from the surface of Starlight Park. MGP impacts detected in on-site soils start at a depth of approximately 5 feet bgs and extend into the top of the alluvial marsh deposits. The on-site impacts attenuate through the marsh deposits. Concentrations of BTEX and PAHs in the lower portion of the marsh deposits, and in the deeper glacial soils, are near or within the range of typical background concentrations for the eastern United States.

6.4.2 Extent of Groundwater MGP Impacts in Overburden Aquifer

This subsection presents the lateral extent of dissolved-phase compounds detected in groundwater at concentrations exceeding the AWQSs. Monitoring wells MW-3S, MW-3D, MW-4S, and MW-4D are located along the hydraulically downgradient site and park property boundaries. Groundwater collected from two of these boundary wells contained organic compounds that exceed AWQS. Groundwater sampled from monitoring well MW-4D exhibited a benzene concentration of 660 ug/l and an acenaphthene concentration of 33 ug/l. Groundwater sampled from monitoring well MW-3D exhibited a benzene concentration of 3 ug/l. Monitoring well MW-4D is located approximately 60 feet hydraulically downgradient from an area that contained DNAPL tar (test pit TP-8A) and subsurface soils that exhibited concentrations of VOCs and PAHs that exceed RSCOs. The overburden aquifer is approximately 20 feet thick and groundwater movement within the overburden aquifer is toward the river. Since overburden groundwater discharges to the Bronx River, the river defines the lateral extent of compounds that exceed AWQSs in groundwater for the overburden aquifer.

7. Contaminant Fate and Transport

This section provides a discussion of the physical and chemical characteristics of media that exceed applicable regulatory standards, and a discussion of the sources, migration pathways, and receptors for those media associated with the East 173rd Street Works former MGP site. Compounds that are present on site at concentrations exceeding the applicable standards include BTEX, PAHs, and metals. The environmental media that are derived or impacted by former MGP operations and may serve as pathways for contaminant migration are DNAPL tar, subsurface soil, and groundwater. Surface soil and sediment are not impacted by former MGP operations. An understanding of sources, migration pathways, and potential receptors is used to evaluate the need for remedial actions to protect human health and the environment.

7.1 DNAPL Tar

For this FRI, DNAPL tar is defined as the visual observation of tar-saturated material or soil. DNAPL tar observed at this site is comprised of either droplets (i.e., disconnected separate-phase sphericals), horizontal seams (i.e., partial DNAPL saturation of material or soil interstitial pore spaces), or vertical veins (i.e., separate-phase DNAPL tar in small openings or root holes in fine-grained material). As illustrated in Figure 10, DNAPL tar was observed on site in four test pits and three borings. The primary contaminants in the DNAPL tar are BTEX and PAHs.

As discussed in Section 5, the DNAPL tar is present predominantly in the eastern portion of the site in discrete intervals within the MGP-era fill and organic-rich marsh deposits in the vadose zone and shallow overburden aquifer. Due to the presence of urban fill over the former MGP surface, the shallowest DNAPL tar encountered in soil was approximately 8 feet bgs. It appears that releases of DNAPL tar have migrated vertically on site from specific areas of the MGP-era fill into the uppermost portion of the marsh deposits. The DNAPL tar observed in the marsh deposits was present in thin veins (<1 cm) that follow the pathway of decayed roots and stems. The deepest DNAPL tar encountered in soils was approximately 20 feet bgs in the marsh deposits near the centrally located estimated 60,000-c.f. subsurface holder foundation. DNAPL tar was not found in the glacial deposits or uppermost portion of the bedrock. DNAPL tar was not encountered in any boring or test pit drilled off site. DNAPL tar was not present along the bank of the river or within the river channel.

The DNAPL tar observed at the site is limited in quantity highly viscous, and present in thin isolated zones. These data suggest that the subsurface movement of DNAPL tar has ceased and the remaining DNAPL tar that exists in the discrete DNAPL zones is residual, and no longer mobile. The release of DNAPL tar at the site was small enough to cause penetration into the marsh deposits, but insufficient for DNAPL to reach the bottom of the overburden aquifer (i.e., residual DNAPL tar exists only in the lower portion of the vadose zone and the uppermost portion of the overburden aquifer).

Residual DNAPL tar in the subsurface will continue to be an immobile source for dissolved-phase partitioning into the contiguous groundwater (i.e., a source of groundwater contamination). The contaminated groundwater emanating from the DNAPL zone will travel in the dominant direction of groundwater flow. BTEX and lighter-end PAHs will solubilize into groundwater as groundwater passes through subsurface material containing DNAPL tar. Heavier-end PAHs generally remain sorbed to the soil and typically do not dissolve into groundwater.

7.2 Surface Soil and Sediment

Surface soils of Starlight Park are comprised of urban fill and topsoil that was placed on top of the former MGP surface. Individual PAHs and metals were detected above RSCOs in surface-soil samples collected from the two stockpiles stored on the southern portion of the park. The analytical data indicate that surface soil contains concentrations of metals and PAHs within the range of typical background concentrations for eastern United States urban soils. Therefore, surface soils are not impacted by former MGP operations.

Sediment samples collected for the Bronx River did not contain VOCs or PAHs at concentrations above sediment screening criteria. The distribution and concentrations of metals detected in sediment samples suggests that sediment of the Bronx River contains background concentrations of metals that exceed screening criteria. Therefore, sediment is not impacted by former MGP operations.

7.3 Subsurface Soil

BTEX, PAHs, and metals were identified as compounds that are present in subsurface soil at concentrations that exceed RSCOs As discussed in Section 6, the distribution of BTEX and PAHs in subsurface soil coincides with the presence and absence of MGP residue. The samples exhibiting the greatest number of BTEX and PAHs that exceed RSCOs were collected from on-site subsurface soil that contained DNAPL tar. These compounds could potentially migrate through the subsurface soil by volatilization, sorption, and solubility. Each migration pathway, as it relates to the compounds identified in subsurface soil at the site, is discussed below.

- **Volatilization**. Volatilization is a process in which contaminants move from the surface of a liquid matrix to a gas or vapor phase. BTEX constituents are highly volatile and therefore may be transported from subsurface soils and groundwater to soil gas in the vadose zone and into outdoor air. PAHs and inorganic compounds do not readily volatilize; therefore, volatilization is not a likely pathway for migration of PAHs and metals. Volatilization may be a pathway for BTEX migration at the site and into the outdoor air within close proximity to BTEX-contaminated subsurface soils. However, it is unlikely that BTEX constituents are present in soil gas at concentrations that could potentially affect outdoor air quality.

- **Sorption**. Sorption is usually defined as the reversible binding of a chemical to a solid matrix. However, there is evidence in the published literature that there is a partially irreversible component related to the time that the compound has been sorbed. Sorption of these compounds limits the fraction available for other fate processes such as volatilization and/or solubility. In general, BTEX compounds have low sorption potential, coupled with high water solubility and high volatility, which make sorption a relatively minor environmental fate process for BTEX compared to other mechanisms. PAHs exhibit varying degrees of binding affinity to organic matter and soil particles; this affinity is dependent upon their individual molecular structures. In general, the higher molecular weight PAHs (e.g., benzo(a)pyrene) are strongly sorbed, whereas the lighter PAHs (e.g., naphthalene) are less strongly sorbed (EPA, 1979; EPA, 1986). Therefore, the higher molecular weight PAHs detected in subsurface soils are expected to remain sorbed to soils, while the lighter-end PAHs detected in subsurface soils may be desorbed and transported by other mechanisms. The sorption of metals to the subsurface soils is dependent upon subsurface oxidation-reduction conditions and the availability of anions. Metals that do not remain sorbed to subsurface soils could be available for transport through the groundwater system in solution (see below).

- **Solubility**. BTEX has a relatively high solubility. PAHs have varying degrees of solubility. The lighter-end PAHs are more soluble while the heavier-end PAHs are less soluble and typically do not dissolve into groundwater. Since DNAPL tar was encountered below the water table and BTEX and lighter-end PAHs are compounds that are present in subsurface soil at concentrations that exceed RSCOs, dissolution of these contaminants from soil to groundwater is expected to be a principal migration pathway. Groundwater sampled from a monitoring well located adjacent to the Bronx River exhibited benzene and acenaphthene concentrations that exceed AWQS. Groundwater movement of the overburden aquifer is toward the river. Groundwater containing dissolved benzene and acenaphthene may discharge to the Bronx River surface water. If benzene- and acenaphthene-impacted groundwater discharges to the surface water system, volatilization, biodegradation, and dilution processes would most likely result in rapid dissipation of benzene and acenaphthene concentrations in the river. Therefore, no impact to Bronx River surface water is anticipated.

Metals in the subsurface soils could dissolve and leach to the groundwater system. However, the solubility of metals is highly dependent upon the oxidation-reduction conditions of the aquifer, the valance state of the specific metal, and the availability of anions that the metals could bind with to become immobile. Dissolution of metals in the subsurface soils and transport in the dissolved state through the groundwater system is not considered to be a major transport mechanism.

In summary, the presence of DNAPL tar in subsurface soils at the site will likely result in the persistent presence of BTEX and lighter-end PAHs in groundwater in the area of tar and immediately downgradient of the tar. BTEX constituents in subsurface soils are not persistent outside the areas of MGP residue impacts due to their high volatility, low adsorption to soils, and high water solubility. PAHs detected throughout the subsurface soils on site will be relatively persistent in the soil matrix primarily due to their generally low water solubility and high sorption to soils. Metals in soil are also anticipated to be relatively immobile.

7.4 Groundwater

Organic compounds have been detected at concentrations that exceed AWQS in groundwater samples collected from four of the eight monitoring wells. Groundwater impacts (BTEX and light-end PAHs) are present within the immediate areas where DNAPL tar was observed (e.g., MW-2S and MW-2D). Groundwater collected from monitoring well MW-2D exhibited the highest concentration of BTEX and PAHs, and the greatest number of compounds at concentrations that exceed AWQS. Monitoring well MW-2D is located adjacent to the former estimated 60,000-c.f. on-site holder in an area of MGP residue and subsurface soils that exhibited concentrations of BTEX and PAHs above RSCOs. Groundwater sampled from monitoring well MW-4D exhibited benzene and acenaphthene concentrations that exceeded AWQS. Monitoring well MW-4D is located approximately 60 feet hydraulically downgradient from an area that contained DNAPL tar and subsurface soils that exhibited concentrations of VOCs and PAHs that exceed RSCOs. The DNAPL tar may act as a continuing source of groundwater contamination. As the groundwater and/or surface water infiltration flows through an area of DNAPL tar, it will continue to dissolve and diffuse BTEX and light-end PAH compounds into the surrounding matrix, creating a groundwater plume that would migrate in the direction of groundwater flow. The absences of dissolved-phase BTEX and PAH components that exceed AWQS in groundwater samples collected from MW-1S, MW-1D, MW-3S and MW-4S suggests that the plume is limited to the areas of DNAPL tar impacts and that dissolved-phase groundwater contaminants are migrating south (within the glacial deposits of the overburden aquifer) toward the Bronx River. Since DNAPL tar zones are present in the upper portion of a relatively thin overburden aquifer (approximately 20 feet thick) and the overburden groundwater discharges to the Bronx River, the river defines the extent of the plume.

The dissolved-phase groundwater contaminant concentrations within the area of DNAPL tar impacts are likely in a steady-state condition, where the rate of dilution from inflowing water equals the rate of dissolution of contaminants from the DNAPL. The likely age of the release (on the order of 100 years) and the natural hydrologic boundary of the Bronx River would have allowed the groundwater system on the site to reach steady state. Therefore, the dissolved-phase plume would have already obtained its ultimate size.

Volatilization of BTEX compounds in groundwater may be a pathway for BTEX migration at the site and into outdoor air. However, it is unlikely that BTEX constituents are present in soil gas at concentrations that could potentially affect outdoor air quality.

8. Qualitative Exposure Assessment

In this section, potential exposure pathways and receptors are identified and evaluated for each of the MGP-related compounds that exceed regulatory standards identified for each MGP-impacted media. Exposure pathways are evaluated to determine the qualitative risk to a receptor from all compounds (present at concentrations above the selected standard for each media impacted by former MGP operations) along a transport pathway. Potential transport pathways are defined as any mechanism by which a receptor could contact an impacted media. As defined by the NYSDOH (Qualitative Human Health Exposure Assessment Memorandum, November 9, 2000), a complete exposure pathway exists when the following elements are documented: (1) a contaminant source; (2) a contaminant release and transport mechanism; (3) a point of exposure; (4) a route of exposure; and (5) a receptor population. Sections 5, 6 and 7 of this report document the source of the contamination, the nature of the contaminants, and the potential transport mechanisms that account for the distribution of contamination associated with the former MGP. This information is used in this section to present a summary of complete exposure pathways.

8.1 Potential Exposure Points and Screening Criteria

Section 6 of this report identifies the detected compounds for each media and identifies whether the screening criteria are exceeded. A potential point of exposure exists if one or more compounds exceed the screening criteria for an MGP-impacted media.

Con Edison and its predecessor companies owned the land at Starlight Park prior to selling the land to the City of New York. Circa 1950, the city placed urban fill and topsoil over the former MGP land surface. This urban fill and topsoil represents the surface of the park since its creation through the recent construction activities being undertaken by NYSDOT. As part of the NYSDOT construction project, approximately the upper 2 feet of soil was scraped off and stockpiled within the park. The stockpiled urban fill and topsoil represents the surface soils that potential receptors (park users) could have contacted prior to the start of the NYSDOT construction project.

The stockpiled topsoil and urban fill materials were sampled and chemically analyzed as part of the FRI scope of work. The results of these analyses were used to evaluate whether the surface soils (currently stockpiled) could have represented an exposure point to the users of the park. Physical observations of the stockpiled soils and the chemical results of the stockpile samples indicate that the upper soils (stockpiled top 2 feet of the park) were not impacted by former MGP operations. Except for toluene detected below the RSCO in one sample, VOCs were not detected in the stockpiled (surface soil) samples. The concentrations and distribution of individual PAHs and metals indicate that stockpiled surface soils contain concentrations of these chemicals that are within the range of typical background concentrations for the eastern United States urban soils (Shacklette, 1984; Bradley, et al., 1994). Therefore, the surface soils of the park (currently stockpiled) do not represent a potential point of exposure to current or former users of the park.

Following the completion of construction activities at the site, these stockpiled surface soils may be placed back on top of the land surface of the park, or depending on the nature of construction activities, additional clean fill materials may be placed on the surface. Therefore, future users of the park (following completion of the construction activities) will not be exposed to surface soil material that represent a potential point of exposure.

Sediment at Starlight Park contains metals that exceed NYS sediment criteria. However, physical and chemical evidence collected during the FRI indicate that sediment is not impacted by former MGP operations. The concentrations of individual metals in each sediment sample were similar and suggest that sediments of the Bronx River contain background concentrations of metals that exceed NYS sediment criteria. Therefore, sediment was not identified as a potential point of exposure.

Subsurface soil that underlie the urban fill and groundwater are impacted by former MGP operations and contain compounds that exceed regulatory screening criteria within the study area. Therefore, subsurface-soil and groundwater are potential points of exposure. It is important to note that these screening criteria are used to make a preliminary assessment of the risk posed by MGP-impacted media to human health and the environment and do not necessarily represent the final concentrations that must be achieved through remediation. A site-specific evaluation procedure must be employed to quantify the level of risk, establish remediation goals, and determine appropriate risk management actions.

8.2 Potential Receptors and Routes of Exposure

The potential human receptors for each compound that exceeded regulatory screening criteria in each media impacted by former MGP operations were determined based on current land use and foreseeable potential future land uses. The former MGP site is owned and controlled by the City of New York. The site is located within Starlight Park and a portion of the Sheridan Expressway. Future site construction activities include the use of sections of the park as ROWs for storm drains from the expressway to outfalls located along the Bronx River. The Parks Department is planning a multiuse recreational facility that will include ball fields, a river walk, and other features. The current and future land uses for the park property (including the site) indicate that the primary potential human receptors for subsurface soil and groundwater include construction workers, maintenance workers, and park recreators. Specifically, the following potential human receptors were identified and evaluated as part of the qualitative exposure assessment.

- **Maintenance Workers** – includes a park worker who periodically maintains park property (including facility maintenance and groundskeeping). A maintenance worker would also periodically clean out and service the sewer lines and the catch basins. A sewer maintenance worker may be exposed to compounds that exceed standards in groundwater through dermal contact and incidental ingestion.

- **Construction Worker** – includes individuals who would install sewers, build foundations, or perform other park improvements or redevelopment construction activities (e.g., NYSDOT workers, NYC Parks Department workers). These individuals may be exposed to compounds that exceed standards in subsurface soils during excavation activities through incidental ingestion, dermal contact, and inhalation of volatilized compounds and fugitive dust. These workers may be exposed to compounds that exceed standards in groundwater through dermal contact and incidental ingestion.

- **Recreator** – includes visitors to the park. Potentially, park recreators could be exposed to volatilizing compounds if storm drains were installed in areas containing DNAPL tar.

Recreators also include boaters, fishermen, and swimmers. Benzene and acenaphthene were identified in overburden groundwater that could potentially migrate from the site into the surface water of the Bronx River. The overburden aquifer at the site discharges to the Bronx River; therefore, potential off-site receptors to overburden groundwater are the potential receptors to surface water in the river. These potential receptors may be exposed to contaminants that may be present in surface water of the Bronx River through incidental ingestion and dermal contact. However, it is unlikely that dissolved-phase analyte concentrations above AWQS, or even above very low detection limits, are present in the river.

8.3 Assessment of Exposure Pathways

Using the data collected during the FRI sampling programs, each potential exposure pathway identified above is assessed in the following section. A complete exposure pathway exists when a compound is present in an MGP-impacted media above the screening criteria (potential exposure point) and a potential receptor can be exposed to that compound through one or more of the exposure routes identified in subsection 8.2. For purposes of this qualitative exposure assessment, a potential exposure point was identified if the analytical results for at least one constituent in MGP-impacted subsurface soils or groundwater exceeded the screening criteria identified in subsection 8.1. A complete human exposure pathway exists if, based on specific land use and impacted media, there is a potential for a receptor to be exposed (through one or more exposure routes) to a potential exposure point.

An example of a complete exposure pathway would be an on-site NYSDOT construction worker excavating an 8-foot- deep pit to install a sewer drainpipe. If the soils contain MGP-impacted media and compounds (BTEX, PAHs, or metals) at concentrations greater than the RSCOs and typical background, then a complete exposure pathway exists for the construction worker potentially contacting those soils, or potentially inhaling volatilized compounds or particulates from the excavation (route of exposure).

Table 16 is a matrix for each sampled media in the study area. The matrices identify the sample media that contain concentrations of compounds that exceed screening criteria, and indicate if a complete exposure pathway exists for the potential receptors.

8.4 Exposure Summary

Con Edison and Con Edison's predecessor companies owned the land at Starlight Park prior to selling the land to the City of New York. The city placed urban fill and topsoil over the former land surface circa 1950. This fill and topsoil are the surface soils that potential receptors could currently contact and could have contacted prior to the start of the NYSDOT construction project. The NYSDOH typically considers the upper 2-inches of soil when evaluating a potential receptors exposure to surface soils. The top 2 feet of these materials have been stockpiled and were analyzed as part of the FRI. Analyses of the stockpiled top 2 feet of soils allowed an evaluation of more materials than the NYSDOH typically considered accessible surface soils. The surface-soil stockpiles and insitu urban fill (i.e., urban fill below 2 feet bgs) are not impacted by former MGP operations and do not represent a complete exposure pathway.

- Sediment in the Bronx River is not impacted by former MGP operations and do not represent a complete exposure pathway.

- Subsurface soils that underlie the transported urban fill in the area of the former MGP are impacted by former MGP operations and represent a complete exposure pathway.

- Groundwater located onsite in the areas of MGP-impacted subsurface soils is impacted by former MGP operations and represent a complete exposure pathway.

A site-specific evaluation of subsurface soils and groundwater will be employed to quantify the level of risk, establish remediation goals, and determine appropriate risk management actions.

9. Summary and Conclusions

The FRI conducted at the East 173rd Street former MGP site determined the nature, concentration, extent, and potential for movement of all contaminants present on the site and outside the boundary of the former MGP property. An integrated investigation of the site geology and hydrology, soil, sediment, and groundwater chemistry allowed identification of potential contaminant source areas and the nature and extent of contamination in on-site media. The goal of the FRI was to provide the necessary data to be used to assess the potential risk posed by MGP-impacted media to human health and the environment, establish remediation goals, and determine appropriate risk management actions. The results of the FRI are summarized below.

9.1 Surface Soils

- Excepting toluene detected below the RSCO in one sample, VOCs were not present in surface soils.
- Cyanide was not detected above the laboratory detection limit or the EPA Generic Soil Screening Level in surface soil samples collected from stockpiles..
- The uppermost soils (i.e., 40 to 80 inches in thickness) at Starlight Park have been mapped as transported fill by the Natural Resources Conservation Service (NRCS). The concentrations and distribution of individual PAHs and metals indicate that surface soils contain concentrations of PAHs and metals that are within the range of typical background concentrations for eastern United States urban soil. Therefore, surface soils are not impacted by former MGP operations

9.2 Subsurface Soils

- VOCs, PAHs and metals were detected in subsurface-soil samples at concentrations that exceed the RSCOs.
- The most prevalent VOC detected in subsurface-soil samples was benzene. Benzene was detected at concentrations that exceed the RSCO only within the area of former MGP operations, predominantly in discrete subsurface-soil zones (between 8 and 20.5 feet bgs) that contained DNAPL tar.
- The concentrations and distribution of individual PAHs and VOCs indicate that subsurface soils outside the area of identified on-site MGP residue contain

concentrations of organic compounds within the range of typical background concentrations for eastern United States urban soils.

- The samples exhibiting the highest concentrations (exhibiting PAH concentrations above the ranges expected in urban soils) and the greatest number of PAHs that exceed standards were collected from on-site subsurface soils containing DNAPL tar.

- DNAPL tar is limited to the site in discrete intervals between 8 and 20 feet bgs. The DNAPL tar at the site is limited in quantity, which is characteristic of residual conditions.

- With the exception of selenium, metals were detected at concentrations that exceed RSCOs throughout the site and park property in subsurface fill and natural (e.g., glacial and/or marsh deposits) deposits. Selenium was only detected above RSCOs in two subsurface samples containing DNAPL tar. The concentrations and distribution of individual metals suggest that subsurface soils contain concentrations of metals that exceed RSCOs, but are within the range of typical background concentrations for eastern United States soils.

- Cyanide was not detected in subsurface soils above the EPA generic soil screening level of 1,600 mg/kg.

9.3 Sediment

- No VOCs were detected at concentrations above analytical detection limits in sediment samples collected from the Bronx River.

- No PAHs were detected in sediment samples at concentrations above sediment screening criteria

- Cyanide was not detected in sediments above the EPA generic soil screening level of 1,600 mg/kg.

- Metals were detected in sediment samples that exceed sediment-screening criteria. The concentrations of individual metals in each of the samples were similar (within the same order of magnitude). These data suggest that sediment of the Bronx River contains background concentrations of metals that exceed screening criteria, and sediment is not impacted by former MGP operations.

9.4 Groundwater

- No organic compounds were detected above AWQS in groundwater samples collected from monitoring wells MW-3S and MW-4S, or hydraulically upgradient monitoring wells MW-1S and MW-1D.

- Groundwater collected from monitoring wells MW-2S and MW-2D (located on site in an area of MGP-impacted subsurface soils) exhibited the highest concentrations of VOCs and PAHs, and the greatest number of detected compounds above the AWQS. The DNAPL tar may act as a continuing source of groundwater contamination.

- Groundwater samples collected from monitoring wells located along the hydraulically downgradient site boundaries (MW-3D and MW-4D) exhibited acenaphthene and/or benzene concentrations that exceed AWQS. Groundwater containing dissolved benzene and acenaphthene may discharge to the Bronx River surface water. It is unlikely that benzene or acenaphthene is present in surface water at concentrations that could potentially affect surface water quality.

- Cyanide was detected at a concentration of 0.722 mg/l (i.e., detected above the AWQS of 0.2 mg/l) in the groundwater sample collected from monitoring well MW-2D. Cyanide was not detected in groundwater samples collected from monitoring wells located along the hydraulically downgradient site boundary.

9.5 Qualitative Exposure Assessment

A qualitative human health exposure assessment was conducted to identify complete exposure pathways to MGP-contaminated media. Based on the distribution of contaminants and the land use of the site, there are complete exposure pathways posed to maintenance workers and construction workers at the site and park property. The primary points of exposure are on-site subsurface soils at approximately 8 to 20 feet bgs.

10. Recommendations

This section presents recommendations for future work.

10.1 Additional FRI Activities

10.1.1 Surface Water

Groundwater level measurements collected during the FRI indicate that the groundwater flow direction is to the south, toward the Bronx River, and groundwater discharges to the river. Groundwater samples collected from monitoring wells located along the hydraulically downgradient site boundary exhibited acenaphthene and/or benzene concentrations that exceed AWQSs. It is unlikely that these compounds in groundwater are present in surface water at concentrations that could potentially affect surface water quality. However, the surface water quality of the Bronx River should be evaluated to determine if surface water quality standards are being achieved. The evaluation of surface water would be performed using a mass balance analysis or surface water sampling and analysis. A mass balance analysis could be used to calculate the concentrations of regulated compounds in river surface water. The mass balance analysis would require additional hydraulic characterization data to determine saturated hydraulic conductivities, groundwater flow velocities, and river flow rates. Surface water sampling would include the collection and analysis of surface water from selected reaches of the Bronx River (i.e., upriver, adjacent to the park property, and downriver).

10.1.2 Sediment

VOCs and PAHs were not detected above laboratory detection limits in sediment samples. The validation of the analytical data indicate that several of the non-detect results for sediment samples SED-1 and SED-9 were rejected (identified by an "R" validation code on Table 13) because one of the laboratory surrogate recoveries was less than 10 percent. Surrogate recoveries are used to evaluate the extraction efficiency of the laboratory analysis. Surrogate recovery of less than 10 percent can indicate a possible loss of analyte during the extraction process. Rejected results are not useable for project objectives. The data usability report for these samples is presented in Appendix E. An additional sediment sample should be collected from sediment sample location SED-1 and SED-9 to confirm that SVOCs are not detected above laboratory detection limits at these river locations. Additional sediment samples should also be collected upriver and downriver from the site to determine background chemical concentrations that are representative of natural or existing background concentrations not in the area of the former MGP.

10.1.3 Groundwater

The water-level measurements collected from piezometer PZ-2 were not used in the construction of the water table contour maps due to the piezometer's anomalously low water levels that may not be representative of the stratigraphic unit in which the shallow overburden monitoring wells are screened. This piezometer should be developed to assess its usability.

10.2 Remedial Action

Con Edison is committed to the development of a remedy to address the contamination identified at Starlight Park from the former manufactured gas plant. The intent of the remediation will be to satisfy the requirements of the NYSDEC and NYSDOH so that an unrestricted use determination is granted to Con Edison and the property owner.

Based on the findings of the focused remedial investigation, the following components are being evaluated as part of the site remediation.

- Excavation and removal of soils impacted by visible tar
- Removal of tar-impacted subsurface structures
- Transportation of impacted soils to a commercial thermal facility for treatment and disposal
- Placement of clean backfill into the excavations that will be compatible with the future use of the site
- On-site odor and fugitive air emission control throughout the remedial activities
- Installation of new storm drain lines and appurtenances during the excavation backfilling activity
- Determination of all required permits early in the development of the remediation plan
- Grading and surface preparation suitable to allow the park to be developed by the city
- Groundwater monitoring

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Tables

Figures

Plate

Table 1
Field Investigations
East 173rd Street Works
Bronx, New York

Date	Action	Objective(s)
June 12 to June 18, 2002	Subsurface-soil sampling from test pits	Initial site characterization to determine presence/absence of MGP impacts
June 12 to July 10, 2002	Air monitoring	Protect off-site receptors from airborne contaminant downwind during investigation activities
June 19 to July 11, 2002	Subsurface-soil sampling from soil borings	Initial site characterization to determine presence/absence of MGP impacts
June 20 and July 12, 2002	Surface-soil sampling from stockpiles	Characterize the surface soil excavated and stockpiled to determine if the soil is re-usable
July 3 to July 10, 2002	Monitoring well and piezometer installation	Initial site characterization to determine presence/absence of MGP impacts to the groundwater
July 16, 2002	Bronx River Inspection	Visual inspection to determine presence/absence of MGP impacts along Bronx River
July 16 to July 18, 2002	Well Development	To restore the natural permeability of the formation in the vicinity of the well and to remove silt and clay to provide a turbid-free groundwater sample
July 26, 2002	Site survey	Illustrates locations and elevations of former MGP structures and investigation points
August 1 to August 2, 2002	Water level measurements	Groundwater flow direction
	1st round groundwater sampling	Groundwater characterization
August 2 to August 6, 2002	Data logging using pressure transducers	Water level measurements collected to determine if groundwater is tidally influenced
August 20 and August 23, 2002	Sediment sampling	Characterize Bronx River sediments
August 23, 2002	Water level measurements	Groundwater flow direction

Table 2
Field Methods and Sample Summary
East 173rd Street Works
Bronx, New York

Investigatory Method	Number of Data Points
Geologic Data	
Surface-soil samples (stockpiled)	11
Subsurface-soil borings*	31
Subsurface test pits	34
Sediment samples	9
Hydrologic Data	
Overburden aquifer monitoring wells	8
Piezometers	2
River gauges	2
Chemical Data	
Subsurface-soil samples (test pit)	32
Subsurface-soil samples (soil boring)	71
Surface-soil samples (stockpiled)	11
Groundwater samples	8
Sediment samples	9

Note:
 * does not include piezometers

Table 3
Sampling Location Rationale
East 173rd Street Works
Bronx, New York

Sample Location Identification	Location Rationale/Structure or Area of Investigation
Test Pits	**Identify former MGP structures and source areas and determine lateral extent of shallow subsurface contamination**
TP-2, TP-3, TP-4, TP-12A, TP-12B, TP-6, TP-7	Former gas holders
TP-12B	Lateral extent at western site boundary
TP-12A	Former embayment area
TP-1	Former Retort House
TP-16	Former Storage Room
TP-13, TP-27B, TP-28	Former Engine Room
TP-10, TP-26	Former Purifying House
TP-11	Former Naphtha Tanks
TP-8, TP-8A	Former Gas House
TP-9A, TP-9B, TP-9C, TP-20A, TP-20B, TP-27A	Former Bronx River channel
TP-21	Proposed footbridge footing
TP-22	Proposed boathouse footing
TP-24, TP-25	Proposed comfort station area and sewer laterals
TP-23	Lateral extent at eastern site boundary
TP-14, TP-17, TP-18	Proposed sewer laterals
TP-11, TP-15, TP-19	Proposed sewer drain outfall
Soil Borings	**Characterize source area and downgradient impacts to soil, and determine lateral extent of impacts on site**
SB-2, SB-2A, SB-3, SB-4, SB-4A, SB-5	Former gas holders
SB-1, SB-6, SB-21	Former Bronx River channel
SB-7, SB-8, SB-10, SB-11	Western property boundary
SB-12, SB-13, SB-14, SB-15, SB-16, SB-18	Proposed sewer laterals
SB-9, SB-17	Proposed vortex system
SB-19	Delineate tar impacts found in TP-28
SB-20	Delineate tar impacts found in TP-27B
Surface Soil	**Characterize stockpiled surface soil**
Stkpile1-SE, SW, NW, NE	Systemic grid coordinates
Stkpile2-T1 through T7	Systemic grid coordinates
Sediment Samples	**Characterize MGP impacts to Bronx River sediments**
SED-8 and SED-9	Characterize upgradient sediment impacts
SED-5 through SED-7	Characterize sediment impacts adjacent to the site
SED-1 through SED-4	Characterize sediment impacts downgradient of the site
Wells	**Characterize site hydrology and determine impacts to soil and overburden groundwater**
MW-2S, MW-2D, MW-3S, MW-3D	Downgradient of former gas holders
MW-4S, MW-4D	Downgradient property boundary groundwater monitoring
MW-1S, MW-1D	Upgradient property boundary groundwater monitoring
PZ-1, PZ-2	Determine shallow groundwater flow direction

Table 4
Groundwater Monitoring Well Construction Details
East 173rd Street Works
Bronx, New York

Well ID	Well Depth (feet bgs)	Total Depth (feet bgs)	Ground Surface Elevation (feet)	Top of Riser Elevation (feet)	Outer Casing Diameter (inches)	Screen Interval (feet bgs)	Screen Type	Annular Fills	
								Interval (feet bgs)	Fill Type
MW-1S	16.00	16.00	18.13	20.77	2.00	6-16	Slotted PVC	0-1 1-4 4-16	Native Material Bentonite Seal Sand Filter
MW-1D	26..00	26.00	18.29	21.37	2.00	21-26	Slotted PVC	0-1 1-19.5 19.5-26	Native Material Bentonite Seal Sand Filter
MW-2S	16.00	16.00	16.58	19.21	2.00	10-16	Slotted PVC	0-8 8-16	Grout Seal Sand Filter
MW-2D	29.50	29.50	16.58	19.31	2.00	24.5-29.5	Slotted PVC	0-1 1-22.5 22.5-29.5	Native Material Grout Seal Sand Filter
MW-3S	16.00	16.00	16.48	18.84	2.00	6-16	Slotted PVC	0-1 1-4 4-16	Native Material Bentonite Seal Sand Filter
MW-3D	39.00	39.00	16.44	18.58	2.00	34-39	Slotted PVC	0-1 1-32 32-39	Native Material Grout Seal Sand Filter
MW-4S	16.00	16.00	19.44	18.65	2.00	6-16	Slotted PVC	0-1 1-4 4-16	Native Material Bentonite Seal Sand Filter
MW-4D	28.00	28.00	19.24	18.57	2.00	23-28	Slotted PVC	0-1 1-19 19-21 21-28	Native Material Grout Seal Bentonite Seal Sand Filter
PZ-1	16.00	16.00	16.92	19.75	2.00	6-16	Slotted PVC	0-1 1-4 4-16	Native Material Bentonite Seal Sand Filter
PZ-2	16.00	16.00	16.47	18.69	2.00	6-16	Slotted PVC	0-1 1-4 4-16	Native Material Bentonite Seal Sand Filter

Table 5
Sample Collection and Analytical Summary
East 173rd Street Works
Bronx, New York

Medium	Sampling Method	Analytical Parameters	Number of Samples	Number of Field Blanks	Number of Trip Blanks	Number of Field Duplicates
Surface Soil	Grab from stockpiles	VOCs SVOCs TAL Metals Cyanide	11	0	2	2
Subsurface Soil	Split spoon from borings	VOCs SVOCs TAL Metals Cyanide	72	6	11	3
	Grab from test pit	VOCs SVOCs TAL Metals Cyanide	32	1	5	2
Sediment	Grab from river bottom	VOCs SVOCs TAL Metals Cyanide	9	2	2	1
Groundwater	Bailer	VOCs	8	1	1	1
	Peristaltic pump	SVOCs TAL Metals Cyanide	8	1	1	1
Investigation Derived Waste: Soil Boring Cuttings and Excavated Test Pit Material	Grab from roll offs and composited	VOCs TCLP Benzene SVOCs TCLP SVOCs	1	0	1	0
Investigation Derived Waste: Wastewater	Grab from drums and composited	VOCs SVOCs TAL metals Cyanide	1	0	1	0

Notes:
VOCs – volatile organic compounds
SVOCs – semivolatile organic compounds
TAL – target analyte list
TCLP – toxicity characteristic leaching procedure

Table 6. - Chemical analyses of surface and subsurface water samples from Bronx and western Queens Counties

Sample number	pH	Ions in solution (ppm)										Total alkalinity (CO_3 + HCO_3) reported as mg of Na_2CO_3 per 10 ml of sample	Sample localities
		SO_4	Ca	Al	K	Mg	Na	Si	Cl	F	Fe		
NY1	7.2	43	40	<1.0	7	14	70	7	-	-	-	1.6	Stream crossing Van Cortlandt Park golf course about 200 ft south of Henry Hudson Parkway-Saw Mill River Parkway interchange
NY2	7.29	25	10	<1.0	10	3	50	4	-	-	-	1.7	Stream east of Wilder Avenue off E. 233d Street, in Seton Falls Park
NY3	7.72	130	150	<1.0	20	50	250	6	-	-	-	1.6	Ground-water spring in Fordham Gneiss on Palisade Avenue just east of Henry Hudson Parkway bridge
NY4	>6	98	100	<1.0	10	30	100	15	-	-	-	3.1	Seep from fault on Transit Authority level of 63d Street tunnels beneath 41st Avenue, Queens
NY5	7.28	35	30	<1.0	2	10	30	2	90	-	0.09	1.3	Lower Bronx River falls about 200 ft north of E. 180th Street
NY6	7.19	8.3	60	<1.0	6	10	60	6	150	-	.4	2.4	Ground water from a Webster Avenue sewer trench near Mosholu Parkway South
NY7	9.1	440	60	<1.0	40	90	580	0.3	3,300	-	.9	1.6	Bronx River at fishing boat docks south of Westchester Avenue bridge
NY8	6.8	13	120	<1.0	10	30	110	7	410	-	.2	3.9	Ground water from Oak Point Conrail yards south of Longwood Avenue
NY9	7.7	2,300	180	<1.0	140	160	990	1	16,000	-	.4	1.1	Sea water from lagoon between Hunter Island and Pelham Bay Park golf course
NY10	6.28	33	20	.72	1	10	40	4	20	-	5	.8	Freshwater marsh between Major Deegan Expressway and Van Cortlandt Park East
NY11	7.61	1,900	170	<.1	140	160	990	.5	15,000	-	.07	1.1	Hutchinson River between New England Thruway and Boston Post Road bridges
NY12	8.11	2,100	200	<.1	140	170	990	.5	18,000	-	.2	1.3	Sea water off the northeast shore of Big Twin Island
NY20	6.3	350	700	.1	13	110	1,900	5.0	3,700	62.0	.3	-	Seep from joint in tunnel roof at station 1659+00 of City Water Tunnel No. 3 about 750 ft beneath Rainey Park, Queens, approximately 350 ft west of Vernon Boulevard
NY21	6.4	360	550	.1	12	80	800	13.0	1,700	5.9	.2	-	Seep from joint in tunnel at station 1681+20 of City Water Tunnel No. 3 about 750 ft beneath 34th Avenue, Queens, approximately 200 ft west of 21st Street

[Tests were run at U.S. Geological Survey laboratories, Reston, Va. Measurements of pH were made in the field with a Sargent-Welch pH meter, model PBX. Abbreviations used: ppm, parts per million; -, no data. Bronx samples: NY1-3, 5-12. Queens samples: NY 4, 20, and 21. Trace elements determined were Co, Cr, Cu, Li, Mn, Mo, Ni, P, Pb, Sn, Ti, and V; concentrations ranged from 0.72 to <0.01 ppm]

Source: Bedrock and Geologic Maps of Bronx County and Parts of New York and Queens Counties, New York, Charles A. Baskerville, USGS, 1992.

Table 7
Groundwater Elevation Data
East 173rd Street Works
Bronx, New York

Location	Surveyed Top of Casing Elevation	Measurement Date 08/01/02 Depth to Groundwater (feet)	08/01/02 Groundwater Elevation (feet)	08/23/02 Depth to Groundwater (feet)	08/23/02 Groundwater Elevation (feet)
MW-1S	20.77	13.38	7.39	13.44	7.33
MW-1D	21.37	15.32	6.05	15.43	5.94
MW-2S	19.21	12.96	6.25	13.05	6.16
MW-2D	19.31	14.72	4.59	14.98	4.33
MW-3S	18.84	12.78	6.06	12.79	6.05
MW-3D	18.58	14.04	4.54	14.86	3.72
MW-4S	18.65	13.21	5.44	13.29	5.36
MW-4D	18.57	13.70	4.87	14.18	4.39
PZ-1	19.75	12.74	7.01	12.63	7.12
PZ-2	18.69	14.10	4.59	15.78	2.91
RG-1	10.86	NM	NM	5.20	5.66
RG-2	9.09	NM	NM	6.40	2.69

Notes:
MW- Monitoring Well
PZ - Piezometer
RG - River Gauge
NM - Not measured
Top of casing elevations surveyed July 2002

Table 8
Compounds Expected at MGP Sites

Volatile Organic Compounds	
Benzene	Xylenes
Toluene	Ethylbenzene
Phenolics	
Phenols	
Methylphenols	
Dimethylphenols	
Polynuclear Aromatic Hydrocarbons	
Acenaphthene	Benzo(g,h,i)perylene
Acenaphthalene	Dibenzo(a,h)anthracene
Benz(a)anthracene	Carbazole
Benzo(a)pyrene	Benzo(e)pyrene
Chrysene	Biphenyl
Anthracene	Dibenzofuran
Fluorene	Methyl Phenanthrene
Fluoranthene	Benzo(b)fluoranthene
Phenanthrene	Naphthalene
Pyrene	Methylnaphthalene
Benzo(k)fluoranthene	Dimethylnaphthalene
Inorganics	
Aluminum	Lead
Antimony	Manganese
Arsenic	Nickel
Boron	Vanadium
Cadmium	Zinc
Cobalt	Cyanide
Copper	Sulfide
Iron	

Source: GRI, 1996, *Management of Manufactured Gas Plant Sites, The Gas Research Institute's Two-Volume Practical Reference Guide.*

Table 9

Background Concentrations of PAH and Metals in Soil From the Eastern United States

Compounds	Background Concentration Range (mg/kg)	Arithmetic Means (mg/kg)
PAH [1]		
2-Methylnaphthalene	0.017 - 0.64	0.151
Acenaphthene	0.024 - 0.34	0.201
Acenaphthylene	0.018 - 1.10	0.173
Anthracene	0.029 - 5.70	0.351
Benz(a)anthracene	0.048 - 15.00	1.319
Benzo(a)pyrene	0.040 - 13.00	1.323
Benzo(b)fluoranthene	0.049 - 12.00	1.435
Benzo(g,h,i)perylene	0.200 - 5.90	0.891
Benzo(k)fluoranthene	0.043 - 25.00	1.681
Chrysene	0.038 - 21.00	1.841
Dibenz(a,h)anthracene	0.020 - 2.90	0.388
Fluoranthene	0.110 - 39.00	3.047
Fluorene	0.022 - 3.30	0.214
Indeno(1,2,3-c,d)pyrene	0.093 - 6.00	0.987
Naphthalene	0.018 - 0.66	0.125
Phenanthrene	0.071 - 36.00	1.838
Pyrene	0.082 - 11.00	2.398
Total PAH	2.292 - 166.65	18.361
Metals [2]		
Aluminum	700 - > 10,000	72,000
Antimony	<1 - 8.8	0.66
Arsenic	<0.1 - 97	7.2
Barium	10 - 5,000	580
Beryllium	<1 - 15	0.92
Cadmium[3]	0.01 - 22	-
Calcium	100 - 320,000	24,000
Chromium	1 - 2,000	54
Cobalt	<3 - 70	9.1
Copper	<1 - 700	25
Iron	100 - 100,000	26,000
Lead	<10 - 700	19
Magnesium	50 - >100,000	9,000
Manganese	<2 - 7,000	550
Mercury	0.01 - 4.6	0.09
Nickel	<5 - 700	19
Potassium	50 - 63,000	15,000
Selenium	<0.1 - 4.3	0.39
Silver[3]	0.01 - 5	0.05
Sodium	<500 - 100,000	12,000
Thallium	70 - 20,000	2,900
Vanadium	<7 - 500	80
Zinc	<5 - 2,900	60

Note:

Source: [1]Bradley, B.H., et al. 1994. "Background Levels of Polycyclic Aromatic Hydrocarbons (PAH) and Selected Metals in New England Urban Soils," Journal of Soil Contamination, 3(4), p. 349-361.

[2]. H.T. Shacklette and J.G. Boerngen, USGS Professional Paper 1270, 1984

[3]. USEPA, *Metals in Soils: A Brief Summary* , 1980

- Not presented in source

Table 10
Surface Soil Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	Cleanup Objective	Sample ID							
		STKPILE 1-NE-C	STKPILE 1-NE-G	STKPILE 1-NW-C	STKPILE 1-NW-G	STKPILE 1-SE-C	STKPILE 1-SE-G	STKPILE 1-SW-C	STKPILE 1-SW-G
Volatile Organic Compounds (VOCs) mg/kg									
Benzene	0.06	NA	<0.46U	NA	<0.49U	<0.41U	<0.54U	NA	<0.53U
Carbon disulfide	2.7	NA	<0.46U	NA	<0.49U	<0.41U	<0.54U	NA	<0.53U
Ethylbenzene	5.5	NA	<0.46U	NA	<0.49U	<0.41U	<0.54U	NA	<0.53U
Methylene chloride	0.1	NA	<0.46U	NA	<0.49U	<0.41U	<0.54U	NA	<0.53U
Styrene	NE	NA	<0.46U	NA	<0.49U	<0.41U	<0.54U	NA	<0.53U
Toluene	1.5	NA	<0.46U	NA	<0.49U	<0.41U	<0.54U	NA	<0.53U
Xylene, m,p-	1.2	NA	<0.46U	NA	<0.49U	<0.41U	<0.54U	NA	<0.53U
Xylene,o-	1.2	NA	<0.46U	NA	<0.49U	<0.41U	<0.54U	NA	<0.53U
Semivolatile Organic Compounds (SVOCs) mg/kg									
Acenaphthene	50	**0.047J**	NA	**0.033J**	NA	<0.37U	<0.38U	<0.36U	NA
Acenaphthylene	41	<0.37U	NA	<0.36U	NA	<0.37U	<0.38U	<0.36U	NA
Anthracene	50	**0.12J**	NA	**0.061J**	NA	**0.052J**	<0.38U	**0.057J**	NA
Benz[a]anthracene	0.224	**0.4**	NA	**0.31J**	NA	**0.23J**	**0.17J**	**0.26J**	NA
Benzo[a]pyrene	0.061	**0.37**	NA	**0.29J**	NA	**0.23J**	**0.17J**	**0.23J**	NA
Benzo[b]fluoranthene	1.1	**0.72**	NA	**0.5**	NA	**0.41**	**0.31J**	**0.4**	NA
Benzo[g,h,i]perylene	50	**0.28J**	NA	**0.23J**	NA	**0.18J**	**0.15J**	**0.19J**	NA
Benzo[k]fluoranthene	1.1	<0.37U	NA	<0.36U	NA	<0.37U	<0.38U	<0.36U	NA
Butyl benzyl phthalate	50	<0.37U	NA	<0.36U	NA	<0.37U	<0.38U	<0.36U	NA
Carbazole	NE	**0.051J**	NA	**0.032J**	NA	<0.37U	<0.38U	**0.021J**	NA
Chrysene	0.4	**0.4**	NA	**0.3J**	NA	**0.23J**	**0.18J**	**0.25J**	NA
Dibenz[a,h]anthracene	0.014	<0.37U	NA	**0.056J**	NA	**0.041J**	<0.38U	<0.36U	NA
Dibenzofuran	6.2	**0.022J**	NA	<0.36U	NA	<0.37U	<0.38U	<0.36U	NA
Dimethylphenol, 2,4-	NE	<0.37U	NA	<0.36U	NA	<0.37U	<0.38U	<0.36U	NA
Di-n-butyl phthalate	8.1	<0.37U	NA	<0.36U	NA	<0.37U	<0.38U	<0.36U	NA
Fluoranthene	50	**0.75**	NA	**0.58**	NA	**0.43**	**0.31J**	**0.46**	NA
Fluorene	50	**0.041J**	NA	**0.024J**	NA	**0.02J**	<0.38U	**0.021J**	NA
Indeno[1,2,3-cd]pyrene	3.2	**0.22J**	NA	**0.18J**	NA	**0.14J**	<0.38U	**0.15J**	NA
Methylnaphthalene,2-	36.4	<0.37U	NA	**0.027J**	NA	<0.37U	<0.38U	<0.36U	NA
Methylphenol, 4-	0.9	<0.37U	NA	<0.36U	NA	<0.37U	<0.38U	<0.36U	NA
Methylphenol, 2-	0.1	<0.37U	NA	<0.36U	NA	<0.37U	<0.38U	<0.36U	NA
Naphthalene	13	**0.037J**	NA	**0.026J**	NA	**0.055J**	<0.38U	**0.033J**	NA
N-Nitrosodi-n-propylamine	NE	R	NA	R	NA	R	R	R	NA
Phenanthrene	50	**0.45**	NA	**0.3J**	NA	**0.21J**	**0.15J**	**0.22J**	NA
Pyrene	50	**0.77**	NA	**0.55**	NA	**0.42**	**0.35J**	**0.41**	NA

Table 10 (continued)
Surface Soil Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	Cleanup Objective	Sample ID							
		STKPILE 1-NE-C	STKPILE 1-NE-G	STKPILE 1-NW-C	STKPILE 1-NW-G	STKPILE 1-SE-C	STKPILE 1-SE-G	STKPILE 1-SW-C	STKPILE 1-SW-G
Inorganic Compounds (mg/kg)									
Cyanide, Total	TBE	<0.32U	NA	<0.31U	NA	<0.32U	<0.33U	<0.31U	NA
Aluminum	NE	**8290**	NA	**7410**	NA	**8060**	**9010**	**7220**	NA
Antimony	NE	<1.2U	NA	<0.55U	NA	**1.2**	**1.2**	<0.54U	NA
Arsenic	7.5	**5.6**	NA	**3.4**	NA	**6.5**	**5.2**	**4.4**	NA
Barium	300	**206**	NA	**139**	NA	**214**	**215**	**142**	NA
Beryllium	0.16	<0.53U	NA	<0.43U	NA	<0.6U	<0.53U	<0.41U	NA
Cadmium	1	**1.2J**	NA	<1UJ	NA	**1.3J**	**1.3J**	<0.99UJ	NA
Calcium	NE	**28500**	NA	**15000**	NA	**12700**	**12600**	**7230**	NA
Chromium	10	**24.1**	NA	**20.6**	NA	**26.6**	**26.9**	**21.8**	NA
Cobalt	30	**8.9J**	NA	**8J**	NA	**8.9J**	**10J**	**7.8J**	NA
Copper	25	**82.7**	NA	**64.7**	NA	**107**	**1140**	**1090**	NA
Iron	2000	**17900**	NA	**18300**	NA	**21400**	**21600**	**20400**	NA
Lead	NE	**340**	NA	**289**	NA	**396**	**446**	**225**	NA
Magnesium	NE	**5550**	NA	**5450**	NA	**5570**	**5910**	**4770**	NA
Manganese	NE	**275**	NA	**229**	NA	**245**	**273**	**247**	NA
Mercury	0.1	**0.19**	NA	**0.21**	NA	**0.18**	**0.16**	**0.22**	NA
Nickel	13	**19.6**	NA	**17.5**	NA	**22.1J**	**21.6**	**17.6J**	NA
Potassium	NE	**2410**	NA	**2330**	NA	**2330**	**2620**	**2550**	NA
Selenium	2	<1.4UJ	NA	<0.88UJ	NA	<1.7UJ	<0.57UJ	<0.54UJ	NA
Silver	NE	<0.3U	NA	<0.33U	NA	<0.33U	<0.34U	<0.32U	NA
Sodium	NE	**402J**	NA	<328U	NA	**401J**	**485J**	<323U	NA
Thallium	NE	<0.5U	NA	**0.64**	NA	**0.61**	**0.38J**	**0.67**	NA
Vanadium	150	**29.8**	NA	**24.5**	NA	**29.3**	**34.5**	**25.7**	NA
Zinc	20	**305**	NA	**237**	NA	**342**	**331**	**218**	NA

Notes:

Only those compounds detected are shown
NA - not analyzed
NE - cleanup objective not established
mg/kg - milligram per kilogram
U - not detected at the detection limit provided
J - estimated value below laboratory detection limit
B - analyte detected in blank
TBE - to be established
Blue - compound detected in sample
Red - concentration exceeds NYSDEC-recommended cleanup objective
R - sample rejected

Table 10 (continued)
Surface Soil Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	Cleanup Objective	Sample ID						
		STKPILE2-T1C	STKPILE2-T1G	STKPILE2-T2C	STKPILE2-T2G	STKPILE2-T3C	STKPILE2-T3G	STKPILE2-T4C
Volatile Organic Compounds (VOCs) mg/kg								
Benzene	0.06	NA	<0.56U	NA	<0.6U	NA	<0.56U	<0.61U
Carbon disulfide	2.7	NA	<0.56U	NA	<0.6U	NA	<0.56U	<0.61U
Ethylbenzene	5.5	NA	<0.56U	NA	<0.6U	NA	<0.56U	<0.61U
Methylene chloride	0.1	NA	<0.56U	NA	<0.6U	NA	<0.56U	<0.61U
Styrene	NE	NA	<0.56U	NA	<0.6U	NA	<0.56U	<0.61U
Toluene	1.5	NA	<0.56U	NA	**0.36J**	NA	<0.56U	<0.61U
Xylene, m,p-	1.2	NA	<0.56U	NA	<0.6U	NA	<0.56U	<0.61U
Xylene,o-	1.2	NA	<0.56U	NA	<0.6U	NA	<0.56U	<0.61U
Semivolatile Organic Compounds (SVOCs) mg/kg								
Acenaphthene	50	<0.33UJ	NA	<0.39UJ	NA	<0.38UJ	<0.39UJ	<0.38UJ
Acenaphthylene	41	<0.33U	NA	<0.39U	NA	<0.38U	<0.39U	<0.38U
Anthracene	50	<0.33U	NA	<0.39U	NA	<0.38U	<0.39U	**0.21J**
Benz[a]anthracene	0.224	<0.33U	NA	<0.39U	NA	**0.08J**	**0.041J**	**0.72**
Benzo[a]pyrene	0.061	<0.33U	NA	<0.39U	NA	<0.38U	<0.39U	**0.56**
Benzo[b]fluoranthene	1.1	**0.14J**	NA	**0.14J**	NA	**0.16J**	**0.079J**	**0.87**
Benzo[g,h,i]perylene	50	<0.33U	NA	<0.39U	NA	<0.38U	<0.39U	**0.37J**
Benzo[k]fluoranthene	1.1	<0.33U	NA	<0.39U	NA	<0.38U	<0.39U	<0.38U
Butyl benzyl phthalate	50	<0.33U	NA	<0.39U	NA	<0.38U	<0.39U	<0.38U
Carbazole	NE	<0.33U	NA	<0.39U	NA	<0.38U	<0.39U	<0.38U
Chrysene	0.4	<0.33U	NA	<0.39U	NA	**0.091J**	**0.047J**	**0.72**
Dibenz[a,h]anthracene	0.014	<0.33U	NA	<0.39U	NA	<0.38U	<0.39U	<0.38U
Dibenzofuran	6.2	<0.33U	NA	<0.39U	NA	<0.38U	<0.39U	<0.38U
Dimethylphenol, 2,4-	NE	<0.33U	NA	<0.39U	NA	<0.38U	<0.39U	<0.38U
Di-n-butyl phthalate	8.1	<0.33U	NA	<0.39U	NA	<0.38U	<0.39U	<0.38U
Fluoranthene	50	**0.11J**	NA	**0.14J**	NA	**0.17J**	**0.083J**	**1.2**
Fluorene	50	<0.33U	NA	<0.39U	NA	<0.38U	<0.39U	<0.38U
Indeno[1,2,3-cd]pyrene	3.2	<0.33U	NA	<0.39U	NA	<0.38U	<0.39U	**0.29J**
Methylnaphthalene,2-	36.4	<0.33U	NA	<0.39U	NA	<0.38U	<0.39U	<0.38U
Methylphenol, 4-	0.9	<0.33U	NA	**0.099J**	NA	<0.38U	**0.15J**	<0.38U
Methylphenol, 2-	0.1	<0.33U	NA	<0.39U	NA	<0.38U	<0.39U	<0.38U
Naphthalene	13	<0.33U	NA	<0.39U	NA	<0.38U	<0.39U	<0.38U
N-Nitrosodi-n-propylamine	NE	<0.33UJ	NA	<0.39UJ	NA	<0.38UJ	<0.39UJ	<0.38UJ
Phenanthrene	50	<0.33U	NA	<0.39U	NA	<0.38U	<0.39U	**0.89**
Pyrene	50	<0.33UJ	NA	**0.11J**	NA	**0.15J**	**0.067J**	**1.5J**

Table 10 (continued)
Surface Soil Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	Cleanup Objective	Sample ID						
		STKPILE2-T1C	STKPILE2-T1G	STKPILE2-T2C	STKPILE2-T2G	STKPILE2-T3C	STKPILE2-T3G	STKPILE2-T4C
Inorganic Compounds (mg/kg)								
Cyanide, Total	TBE	NA	NA	NA	NA	NA	NA	NA
Aluminum	NE	NA	NA	NA	NA	NA	NA	NA
Antimony	NE	NA	NA	NA	NA	NA	NA	NA
Arsenic	7.5	NA	NA	NA	NA	NA	NA	NA
Barium	300	NA	NA	NA	NA	NA	NA	NA
Beryllium	0.16	NA	NA	NA	NA	NA	NA	NA
Cadmium	1	NA	NA	NA	NA	NA	NA	NA
Calcium	NE	NA	NA	NA	NA	NA	NA	NA
Chromium	10	NA	NA	NA	NA	NA	NA	NA
Cobalt	30	NA	NA	NA	NA	NA	NA	NA
Copper	25	NA	NA	NA	NA	NA	NA	NA
Iron	2000	NA	NA	NA	NA	NA	NA	NA
Lead	NE	NA	NA	NA	NA	NA	NA	NA
Magnesium	NE	NA	NA	NA	NA	NA	NA	NA
Manganese	NE	NA	NA	NA	NA	NA	NA	NA
Mercury	0.1	NA	NA	NA	NA	NA	NA	NA
Nickel	13	NA	NA	NA	NA	NA	NA	NA
Potassium	NE	NA	NA	NA	NA	NA	NA	NA
Selenium	2	NA	NA	NA	NA	NA	NA	NA
Silver	NE	NA	NA	NA	NA	NA	NA	NA
Sodium	NE	NA	NA	NA	NA	NA	NA	NA
Thallium	NE	NA	NA	NA	NA	NA	NA	NA
Vanadium	150	NA	NA	NA	NA	NA	NA	NA
Zinc	20	NA	NA	NA	NA	NA	NA	NA

Notes:

Only those compounds detected are shown

NA - not analyzed

NE - cleanup objective not established

mg/kg - milligram per kilogram

U - not detected at the detection limit provided

J - estimated value below laboratory detection limit

B - analyte detected in blank

TBE - to be established

Blue - compound detected in sample

Red - concentration exceeds NYSDEC-recommended cleanup objective

R - sample rejected

Table 10 (continued)
Surface Soil Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	Cleanup Objective	Sample ID						
		STKPILE2-T4G	STKPILE2-T5C	STKPILE2-T5G	STKPILE2-T6C	STKPILE2-T6G	STKPILE2-T7C	STKPILE2-T7G
Volatile Organic Compounds (VOCs) mg/kg								
Benzene	0.06	<0.62U	NA	<0.61U	NA	<0.62U	<0.62U	<0.59U
Carbon disulfide	2.7	<0.62U	NA	<0.61U	NA	<0.62U	<0.62U	<0.59U
Ethylbenzene	5.5	<0.62U	NA	<0.61U	NA	<0.62U	<0.62U	<0.59U
Methylene chloride	0.1	<0.62U	NA	<0.61U	NA	<0.62U	<0.62U	<0.59UJB
Styrene	NE	<0.62U	NA	<0.61U	NA	<0.62U	<0.62U	<0.59U
Toluene	1.5	<0.62U	NA	<0.61U	NA	<0.62U	<0.62U	<0.59U
Xylene, m,p-	1.2	<0.62U	NA	<0.61U	NA	<0.62U	<0.62U	<0.59U
Xylene,o-	1.2	<0.62U	NA	<0.61U	NA	<0.62U	<0.62U	<0.59U
Semivolatile Organic Compounds (SVOCs) mg/kg								
Acenaphthene	50	NA	<0.39UJ	NA	<0.35UJ	<0.41UJ	<0.35UJ	NA
Acenaphthylene	41	NA	<0.39U	NA	<0.35U	<0.41U	<0.35U	NA
Anthracene	50	NA	<0.39U	NA	<0.35U	**0.065J**	<0.35U	NA
Benz[a]anthracene	0.224	NA	**0.13J**	NA	**0.077J**	**0.14J**	**0.066J**	NA
Benzo[a]pyrene	0.061	NA	**0.13J**	NA	**0.08J**	**0.12J**	**0.067J**	NA
Benzo[b]fluoranthene	1.1	NA	**0.23J**	NA	**0.15J**	**0.23J**	**0.13J**	NA
Benzo[g,h,i]perylene	50	NA	**0.11J**	NA	**0.079J**	**0.094J**	**0.062J**	NA
Benzo[k]fluoranthene	1.1	NA	<0.39U	NA	<0.35U	<0.41U	<0.35U	NA
Butyl benzyl phthalate	50	NA	<0.39U	NA	<0.35U	<0.41U	<0.35U	NA
Carbazole	NE	NA	<0.39U	NA	<0.35U	<0.41U	<0.35U	NA
Chrysene	0.4	NA	**0.14J**	NA	**0.094J**	**0.15J**	**0.072J**	NA
Dibenz[a,h]anthracene	0.014	NA	<0.39U	NA	<0.35U	<0.41U	<0.35U	NA
Dibenzofuran	6.2	NA	<0.39U	NA	<0.35U	<0.41U	<0.35U	NA
Dimethylphenol, 2,4-	NE	NA	<0.39U	NA	<0.35U	<0.41U	<0.35U	NA
Di-n-butyl phthalate	8.1	NA	<0.39U	NA	<0.35U	<0.41U	<0.35U	NA
Fluoranthene	50	NA	**0.27J**	NA	**0.17J**	**0.34J**	**0.14J**	NA
Fluorene	50	NA	<0.39U	NA	<0.35U	<0.41U	<0.35U	NA
Indeno[1,2,3-cd]pyrene	3.2	NA	**0.081J**	NA	**0.061J**	**0.082J**	**0.048J**	NA
Methylnaphthalene,2-	36.4	NA	<0.39U	NA	<0.35U	<0.41U	<0.35U	NA
Methylphenol, 4-	0.9	NA	<0.39U	NA	<0.35U	**0.22J**	<0.35U	NA
Methylphenol, 2-	0.1	NA	<0.39U	NA	<0.35U	<0.41U	<0.35U	NA
Naphthalene	13	NA	<0.39U	NA	<0.35U	**0.073J**	<0.35U	NA
N-Nitrosodi-n-propylamine	NE	NA	<0.39UJ	NA	<0.35UJ	<0.41UJ	<0.35UJ	NA
Phenanthrene	50	NA	**0.13J**	NA	**0.071J**	**0.23J**	**0.072J**	NA
Pyrene	50	NA	**0.2J**	NA	**0.13J**	**0.25J**	**0.1J**	NA

Table 10 (continued)
Surface Soil Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	Cleanup Objective	Sample ID						
		STKPILE2-T4G	STKPILE2-T5C	STKPILE2-T5G	STKPILE2-T6C	STKPILE2-T6G	STKPILE2-T7C	STKPILE2-T7G
Inorganic Compounds (mg/kg)								
Cyanide, Total	TBE	NA	NA	NA	NA	NA	NA	NA
Aluminum	NE	NA	NA	NA	NA	NA	NA	NA
Antimony	NE	NA	NA	NA	NA	NA	NA	NA
Arsenic	7.5	NA	NA	NA	NA	NA	NA	NA
Barium	300	NA	NA	NA	NA	NA	NA	NA
Beryllium	0.16	NA	NA	NA	NA	NA	NA	NA
Cadmium	1	NA	NA	NA	NA	NA	NA	NA
Calcium	NE	NA	NA	NA	NA	NA	NA	NA
Chromium	10	NA	NA	NA	NA	NA	NA	NA
Cobalt	30	NA	NA	NA	NA	NA	NA	NA
Copper	25	NA	NA	NA	NA	NA	NA	NA
Iron	2000	NA	NA	NA	NA	NA	NA	NA
Lead	NE	NA	NA	NA	NA	NA	NA	NA
Magnesium	NE	NA	NA	NA	NA	NA	NA	NA
Manganese	NE	NA	NA	NA	NA	NA	NA	NA
Mercury	0.1	NA	NA	NA	NA	NA	NA	NA
Nickel	13	NA	NA	NA	NA	NA	NA	NA
Potassium	NE	NA	NA	NA	NA	NA	NA	NA
Selenium	2	NA	NA	NA	NA	NA	NA	NA
Silver	NE	NA	NA	NA	NA	NA	NA	NA
Sodium	NE	NA	NA	NA	NA	NA	NA	NA
Thallium	NE	NA	NA	NA	NA	NA	NA	NA
Vanadium	150	NA	NA	NA	NA	NA	NA	NA
Zinc	20	NA	NA	NA	NA	NA	NA	NA

Notes:

Only those compounds detected are shown

NA - not analyzed

NE - cleanup objective not established

mg/kg - milligram per kilogram

U - not detected at the detection limit provided

J - estimated value below laboratory detection limit

B - analyte detected in blank

TBE - to be established

Blue - compound detected in sample

Red - concentration exceeds NYSDEC-recommended cleanup objective

R - sample rejected

Table 11
Subsurface Soil Sample Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	NYSDEC Cleanup Objectives	Sample ID (ft below grade)				
		SP-MW1S (10-11)	SP-MW1D (21-22)	SP-MW2S (10.7-11.1)	SP-MW2D (16-16.5)	SP-MW2D (29-29.5)
Volatile Organic Compounds (mg/kg)						
Benzene	0.06	<0.72U	<0.65U	**0.31J**	**0.17J**	<6.2U
Carbon disulfide	2.7	<0.72UJ	<0.65UJ	<0.73U	<0.71U	<6.2U
Ethylbenzene	5.5	<0.72U	<0.65U	<0.73U	<0.71U	**6.8**
Methylene chloride	0.1	<0.72U	<0.65U	<0.73U	<0.71U	<6.2U
Styrene	NE	<0.72U	<0.65U	<0.73U	<0.71U	<6.2U
Toluene	1.5	<0.72U	<0.65U	<0.73U	**0.075J**	**4.6J**
Xylene, m,p-	1.2	<0.72U	<0.65U	**0.15J**	**0.13J**	**15**
Xylene,o-	1.2	<0.72U	<0.65U	**0.12J**	<0.71U	**5J**
Total VOCs	**10**	**U**	**U**	**0.58**	**0.375**	**31.4**
Semivolatile Organic Compounds (mg/kg)						
Acenaphthene	50	<0.47U	<0.4U	<100U	**0.63**	**1.8**
Acenaphthylene	41	<0.47U	<0.4U	<100U	**0.087J**	**0.27J**
Anthracene	50	<0.47U	<0.4U	**100**	**1.6**	**2.4**
Benz[a]anthracene	0.224	<0.47U	<0.4U	**120**	**2**	**1.8**
Benzo[a]pyrene	0.061	<0.47U	<0.4U	**110**	**1.7J**	**1.4**
Benzo[b]fluoranthene	1.1	<0.47U	<0.4U	**160**	**2.7J**	**2.1**
Benzo[g,h,i]perylene	50	<0.47U	<0.4U	<100U	**1.1J**	**0.88**
Benzo[k]fluoranthene	1.1	<0.47U	<0.4U	<100U	<0.39UJ	<0.38U
Butyl benzyl phthalate	50	<0.47U	<0.4U	**64J**	<0.39U	<0.38U
Carbazole	NE	<0.47U	<0.4U	<100U	**0.5**	**0.84**
Chrysene	0.4	<0.47U	<0.4U	**100**	**1.7**	**1.6**
Dibenz[a,h]anthracene	0.014	<0.47U	<0.4U	<100U	**0.13J**	**0.075J**
Dibenzofuran	6.2	<0.47U	<0.4U	**45J**	**0.64**	**1.6**
Dimethylphenol, 2,4-	NE	<0.47U	<0.4U	<100U	<0.39UJ	<0.38U
Di-n-butyl phthalate	8.1	<0.47U	<0.4U	<100U	<0.39U	<0.38U
Fluoranthene	50	<0.47U	<0.4U	**320**	**3.6**	**3.2**
Fluorene	50	<0.47U	<0.4U	**42J**	**1**	**1.6**
Indeno[1,2,3-cd]pyrene	3.2	<0.47U	<0.4U	**61J**	**1J**	**0.83**
Methylnaphthalene,2-	36.4	<0.47U	<0.4U	<100U	**0.36J**	**1.8**
Methylphenol, 4-	0.9	<0.47U	<0.4U	<100U	<0.39UJ	<0.38U
Methylphenol,2-	0.1	<0.47UJ	<0.4UJ	<100U	<0.39UJ	<0.38U
Naphthalene	13	<0.47U	<0.4U	<100U	**0.83**	**12**
N-Nitrosodi-n-propylamine	NE	<0.47UJ	<0.4UJ	<100UJ	<0.39UJ	<0.38UJ
Phenanthrene	50	<0.47U	<0.4U	**150**	**4.3**	**4.7**
Pyrene	50	<0.47U	<0.4U	**220J**	**2.8**	**2.7**
Total SVOCs	**500**	**U**	**U**	**1492**	**26.68**	**41.60**
Inorganics (mg/kg)						
Cyanide, Total	1600*	<0.4U	<0.37U	**15.71**	**4.5**	<0.33U
Aluminum	NE	**4050**	**8050**	**9130**	**7460**	**7000**
Antimony	NE	<0.72UJ	<0.64UJ	<0.73UJ	<0.67UJ	<1.1UJ
Arsenic	7.5	**8.3**	<0.69UJ	**6.1**	<1.7UJ	<0.59UJ
Barium	300	**146**	**26.4**	**48.5**	**59.9**	**28.1**
Beryllium	0.16	**0.54**	**0.32**	**0.55J**	**0.39J**	**0.27J**
Cadmium	1	<0.14U	<0.13UJ	**0.48J**	<0.12U	<0.11U
Calcium	NE	<4240U	<2550U	**4870**	**39100**	**2180**
Chromium	10	**6.6J**	**18.7J**	**25.3**	**29.1**	**19.7**
Cobalt	30	**5.5J**	**6.2J**	**9.1**	**6.1**	**7.2**
Copper	25	**32.6J**	<10.3UJ	**25.9J**	**27.1J**	**24.7J**
Iron	2000	**8830J**	**15700J**	**21900**	**14600**	**11400**
Lead	NE	**109J**	**19.4J**	**152**	**41.8J**	<2.7UJ
Magnesium	NE	<788U	**2980**	**4040**	**5060**	**3120**
Manganese	NE	**130J**	**379J**	**148**	**221**	**83.9**
Mercury	0.1	**0.11**	<0.043U	**1.6**	**0.4**	<0.038U
Nickel	13	**9.3**	**6.9**	**18**	**12.7**	**13.5**
Potassium	NE	<565U	**638**	**1760**	**1620**	**2020**
Selenium	2	<2.9UJ	<0.64UJ	<0.73U	<0.62U	<0.56U
Silver	NE	<0.43U	<0.38U	<0.44U	<0.37U	<0.34U
Sodium	NE	<388U	<99.3U	**712J**	**675J**	**687**
Thallium	NE	<0.28U	<0.26U	<1.52U	**0.3J**	<0.21U
Vanadium	150	**25**	**19.6**	**32.6**	**17.1**	**30.4**
Zinc	20	**95**	**40**	**73.2**	**56.7J**	**28.8J**

Table 11 (continued)
Subsurface Soil Sample Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	NYSDEC Cleanup Objectives	Sample ID (ft below grade)				
		SP-MW3D (37.5-38)	SP-MW3S (10-10.5)	SP-MW4D (19-19.5)	SP-MW4D (26.5-27)	SP-MW4S (10.5-11)
Volatile Organic Compounds (mg/kg)						
Benzene	0.06	<0.53U	<0.66U	0.22J	0.17J	<0.66U
Carbon disulfide	2.7	<0.53U	<0.66U	<0.9UJ	<0.81U	<0.66UJ
Ethylbenzene	5.5	<0.53U	<0.66U	0.26J	0.41J	<0.66U
Methylene chloride	0.1	<0.53U	<0.66U	<0.9U	<0.81U	<0.66U
Styrene	NE	<0.53U	<0.66U	<0.9U	<0.81U	<0.66U
Toluene	1.5	<0.53U	<0.66U	0.2J	0.14J	<0.66U
Xylene, m,p-	1.2	<0.53U	<0.66U	0.12J	0.24J	<0.66U
Xylene,o-	1.2	<0.53U	<0.66U	0.33J	0.16J	<0.66U
Total VOCs	**10**	**U**	**U**	**1.13**	**1.12**	**U**
Semivolatile Organic Compounds (mg/kg)						
Acenaphthene	50	<0.37U	<0.42U	<14U	0.34J	R
Acenaphthylene	41	<0.37U	<0.42U	<14U	<0.45U	<4.5U
Anthracene	50	<0.37U	<0.42U	86	0.76	<4.5U
Benz[a]anthracene	0.224	<0.37U	0.37J	20	1.3	4.2J
Benzo[a]pyrene	0.061	<0.37U	0.34J	18	1.18	3.9J
Benzo[b]fluoranthene	1.1	<0.37U	0.67	18	1.7	6.9
Benzo[g,h,i]perylene	50	<0.37U	0.31J	8.6J	0.89	3.2J
Benzo[k]fluoranthene	1.1	<0.37U	<0.42U	<14U	<0.45U	<4.5U
Butyl benzyl phthalate	50	<0.37U	<0.42U	<14U	<0.45U	<4.5U
Carbazole	NE	<0.37U	<0.42U	<14U	<0.45U	<4.5U
Chrysene	0.4	<0.37U	0.34J	17	1.1	3.7J
Dibenz[a,h]anthracene	0.014	<0.37U	<0.42U	<14U	<0.45U	<4.5U
Dibenzofuran	6.2	<0.37U	<0.42U	<14U	0.21J	<4.5U
Dimethylphenol, 2,4-	NE	<0.37U	<0.42U	<14U	<0.45U	<4.5U
Di-n-butyl phthalate	8.1	<0.37U	<0.42U	<14U	<0.45U	<4.5U
Fluoranthene	50	<0.37U	0.44	63	2.7	8.2
Fluorene	50	<0.37U	<0.42U	6.6J	0.5	<4.5U
Indeno[1,2,3-cd]pyrene	3.2	<0.37U	0.27J	5.8J	0.8	2.7J
Methylnaphthalene,2-	36.4	<0.37U	<0.42U	<14U	<0.45U	<4.5U
Methylphenol, 4-	0.9	<0.37U	<0.42U	<14U	<0.45U	<4.5U
Methylphenol,2-	0.1	<0.37U	<0.42U	<14UJ	<0.45U	<4.5UJ
Naphthalene	13	0.3J	0.65	20	0.83	<4.5U
N-Nitrosodi-n-propylamine	NE	<0.37UJ	<0.42UJ	<14UJ	<0.45UJ	R
Phenanthrene	50	<0.37U	0.105J	25	2.3	2.7J
Pyrene	50	<0.37UJ	0.5J	78	2.8J	7.8J
Total SVOCs	**500**	**0.3**	**4.04**	**366**	**17.41**	**43.3**
Inorganics (mg/kg)						
Cyanide, Total	1600*	<0.32U	23.85	15.05	1.71	9.79
Aluminum	NE	4450	11400	23900	10000	8630
Antimony	NE	<0.54UJ	<0.62UJ	<4.1UJ	<0.74UJ	<2.6UJ
Arsenic	7.5	<0.54U	4.4	26.6	5.5	8.7J
Barium	300	29.1	79.8	249	153	86.6
Beryllium	0.16	0.19J	0.62J	0.87	0.57J	0.4
Cadmium	1	<0.11U	0.97J	14.7J	1.3J	<0.13UJ
Calcium	NE	3330	4450	10900	3590	<2070U
Chromium	10	16.9	29.6	51.1J	46.9	92.7J
Cobalt	30	8.6	9.2	29.6J	9.9	6.9J
Copper	25	27.4J	251J	179J	93.6J	92.3J
Iron	2000	11100	25200	33200J	24400	34500J
Lead	NE	2.2J	239	1220J	236	228J
Magnesium	NE	3990	3630	<1820U	4220	3540
Manganese	NE	71.3	138	153J	228	183J
Mercury	0.1	<0.21U	0.72	0.97	0.3	0.63
Nickel	13	19	22.1	114	23	12.4
Potassium	NE	1650	1350	796	2900	1760
Selenium	2	0.63J	<0.62U	<1.3UJ	<0.61U	<0.67UJ
Silver	NE	<0.32U	<0.37U	<0.52U	<0.37U	<0.4U
Sodium	NE	348J	515J	<1760U	758	<839U
Thallium	NE	<0.21U	<0.24U	<0.33UJ	0.29J	<0.28U
Vanadium	150	23.5	28.2	21.7	32.5	26.4
Zinc	20	27.6	126	1950	263	63.7

Table 11 (continued)
Subsurface Soil Sample Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	NYSDEC Cleanup Objectives	Sample ID (ft below grade)					
		SP-SB1 (6-8)	SP-SB1 (11-12)	SP-SB1 (23.5-24)	SP-SB2A (16-16.5)	SP-SB2 (18-18.5)	SP-SB2 (19.5-20)
Volatile Organic Compounds (mg/kg)							
Benzene	0.06	<1.3U	<0.87U	<0.54U	<0.67U	**0.064J**	**0.12J**
Carbon disulfide	2.7	<1.3U	<0.87U	<0.54U	<0.67U	<0.56U	<0.61U
Ethylbenzene	5.5	<1.3U	<0.87U	<0.54U	<0.67U	<0.56U	<0.61U
Methylene chloride	0.1	<1.3U	<0.87U	<0.54U	<0.67U	<0.56U	<0.61U
Styrene	NE	<1.3U	<0.87U	<0.54U	<0.67U	<0.56U	<0.61U
Toluene	1.5	<1.3U	<0.87U	<0.54U	<0.67U	<0.56U	<0.61U
Xylene, m,p-	1.2	<1.3U	<0.87U	<0.54U	<0.67U	<0.56U	**0.063J**
Xylene,o-	1.2	<1.3U	<0.87U	<0.54U	<0.67U	<0.56U	<0.61U
Total VOCs	**10**	**U**	**U**	**U**	**U**	**0.064**	**0.183**
Semivolatile Organic Compounds (mg/kg)							
Acenaphthene	50	<4.2UJ	**0.48J**	<0.39UJ	<0.41U	**1.2J**	<0.34UJ
Acenaphthylene	41	<4.2UJ	<0.59U	<0.39U	<0.41U	<4.1U	<0.34U
Anthracene	50	**1.6J**	**0.68**	<0.39U	**0.23J**	**3.6J**	<0.34U
Benz[a]anthracene	0.224	**18J**	**1.3**	<0.39U	**0.34J**	**6.7**	<0.34U
Benzo[a]pyrene	0.061	**25J**	**1.3**	<0.39U	**0.22J**	**4.8**	<0.34U
Benzo[b]fluoranthene	1.1	**49**	**2**	<0.39U	**0.46**	**9.7**	<0.34U
Benzo[g,h,i]perylene	50	**29J**	**0.7J**	<0.39U	<0.41U	**2.2J**	<0.34U
Benzo[k]fluoranthene	1.1	<4.2UJ	<0.59U	<0.39U	<0.41U	<4.1U	<0.34U
Butyl benzyl phthalate	50	<4.2UJ	<0.59U	<0.39U	<0.41U	<4.1U	<0.34U
Carbazole	NE	<4.2U	<0.59U	<0.39U	<0.41U	<4.1U	<0.34U
Chrysene	0.4	**21J**	**1.1**	<0.39U	**0.31J**	**6.1**	<0.34U
Dibenz[a,h]anthracene	0.014	**5.7J**	<0.59U	<0.39U	<0.41U	<4.1U	<0.34U
Dibenzofuran	6.2	<4.2UJ	**0.18J**	<0.39U	<0.41U	<4.1U	<0.34U
Dimethylphenol, 2,4-	NE	<4.2U	<0.59U	<0.39UJ	<0.41U	<4.1U	<0.34U
Di-n-butyl phthalate	8.1	<4.2UJ	<0.59U	<0.39U	<0.41U	<4.1U	<0.34U
Fluoranthene	50	**6.5J**	**2.5**	<0.39U	<0.41U	**1.3J**	<0.34U
Fluorene	50	<4.2UJ	**0.37J**	<0.39U	**0.25J**	**1.7J**	<0.34U
Indeno[1,2,3-cd]pyrene	3.2	**20J**	**0.67**	<0.39U	**0.13J**	**2.4J**	<0.34U
Methylnaphthalene,2-	36.4	<4.2UJ	<0.59U	<0.39U	<0.41U	<4.1U	<0.34U
Methylphenol, 4-	0.9	<4.2U	<0.59U	<0.39UJ	<0.41U	<4.1U	<0.34U
Methylphenol,2-	0.1	<4.2U	<0.59U	<0.39UJ	<0.41U	<4.1U	<0.34U
Naphthalene	13	**3.4J**	**0.33J**	<0.39U	**0.26J**	**1.3J**	**0.088J**
N-Nitrosodi-n-propylamine	NE	<4.2UJ	<0.59U	R	<0.41UJ	R	<0.34UJ
Phenanthrene	50	**3J**	2	<0.39U	1	**11**	<0.34U
Pyrene	50	**15J**	2	<0.39U	<0.41U	R	<0.34U
Total SVOCs	**500**	**197.2**	**15.61**	**U**	**3.2**	**52**	**0.09**
Inorganics (mg/kg)							
Cyanide, Total	1600*	**24**	**2.6**	<0.31U	**0.99**	**0.64**	<0.35U
Aluminum	NE	**3870**	**18900**	**9020**	**12500J**	**7840J**	**10600**
Antimony	NE	**8.7J**	<0.87UJ	<0.5UJ	<0.61UJ	<0.56UJ	<0.59UJ
Arsenic	7.5	**62.6**	**10.4J**	<0.5UJ	<1.5UJ	<3.6UJ	<0.83UJ
Barium	300	**15.7**	**75.7**	**71.3**	**123**	**62**	**37.5**
Beryllium	0.16	<0.82U	<0.92U	<0.25U	**0.5**	**0.28**	**0.52J**
Cadmium	1	<0.24U	**0.24J**	**0.19J**	<0.12UJ	<0.11UJ	<0.12U
Calcium	NE	**4300**	**2880**	**2200**	**8720J**	**15500J**	**1370J**
Chromium	10	**120**	**48.1**	**20**	**29.3J**	**30.3J**	**35.3**
Cobalt	30	**72.5**	**15**	**13.1**	**11.8J**	**8.7J**	**6.8J**
Copper	25	**840**	**47**	**27.9**	**39.1J**	**24.5J**	<10.7UJ
Iron	2000	**59200**	**33800**	**16800**	**27400J**	**19000J**	**12300**
Lead	NE	**197**	**97.2**	<2.2UJ	**89.6J**	**74.6J**	**5J**
Magnesium	NE	**813**	**7740**	**4810**	**5850J**	**5990J**	**4140**
Manganese	NE	**208J**	**439J**	**112J**	**410J**	**189J**	**103**
Mercury	0.1	**0.13**	**0.38**	<0.037U	**0.082**	**0.041J**	<0.04U
Nickel	13	**61.3**	**29.6**	**21.1**	**20.2**	**16.9**	**13.5**
Potassium	NE	<1390U	**3900**	**4380**	**3260**	**2790**	**967**
Selenium	2	<1.2UJ	<0.9UJ	<0.53UJ	<0.61UJ	<0.6UJ	<0.59UJ
Silver	NE	<0.73U	<0.52U	<0.3U	<0.37U	<0.33U	<0.35U
Sodium	NE	**1390J**	**889J**	<299U	**565J**	**364J**	**359J**
Thallium	NE	<1U	<1.65U	<1.07U	<0.25UJ	<0.22UJ	<0.25U
Vanadium	150	**17.9**	**45**	**28.9**	**36.6**	**33**	**26.7**
Zinc	20	**142**	**103**	**43.5**	**184**	**161**	**46.9**

Table 11 (continued)
Subsurface Soil Sample Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	NYSDEC Cleanup Objectives	SP-SB2 (24-24.5)	SP-SB3 (12-12.5)	SP-SB3 (19.5-20)	SP-SB3 (34.5-35)	SP-SB4 (20-20.5)	SP-SB4 (25-25.5)
		Sample ID (ft below grade)					
Volatile Organic Compounds (mg/kg)							
Benzene	0.06	<0.64U	<0.67U	<0.61U	<0.57U	0.14J	<0.52U
Carbon disulfide	2.7	<0.64U	<0.67U	<0.61U	<0.57U	<0.55UJ	<0.52U
Ethylbenzene	5.5	<0.64U	<0.67U	<0.61U	<0.57U	<0.55U	<0.52U
Methylene chloride	0.1	<0.64U	<0.67U	<0.61U	<0.57U	<0.55U	<0.52U
Styrene	NE	<0.64U	<0.67U	<0.61U	<0.57U	<0.55U	<0.52U
Toluene	1.5	<0.64U	<0.67U	<0.61U	<0.57U	0.066J	<0.52U
Xylene, m,p-	1.2	<0.64U	<0.67U	<0.61U	<0.57U	0.065J	<0.52U
Xylene,o-	1.2	<0.64U	<0.67U	<0.61U	<0.57U	<0.55U	<0.52U
Total VOCs	**10**	**U**	**U**	**U**	**U**	**0.271**	**U**
Semivolatile Organic Compounds (mg/kg)							
Acenaphthene	50	<0.4UJ	<47U	<0.39U	<0.36U	<9U	0.052J
Acenaphthylene	41	<0.4U	<47U	<0.39U	<0.36U	<9U	<0.36U
Anthracene	50	<0.4U	16J	<0.39U	<0.36U	4.3J	0.097J
Benz[a]anthracene	0.224	<0.4U	18J	<0.39U	<0.36U	5.3J	0.054J
Benzo[a]pyrene	0.061	<0.4U	<47U	<0.39U	<0.36U	4.2J	0.04J
Benzo[b]fluoranthene	1.1	<0.4U	22J	<0.39U	<0.36U	6.8J	0.07J
Benzo[g,h,i]perylene	50	<0.4U	<47U	<0.39U	<0.36U	<9U	0.038J
Benzo[k]fluoranthene	1.1	<0.4U	<47U	<0.39U	<0.36UJ	<9U	<0.36UJ
Butyl benzyl phthalate	50	<0.4U	<47U	<0.39U	<0.36U	<9U	<0.36U
Carbazole	NE	<0.4U	<47U	<0.39U	<0.36U	<9U	0.1J
Chrysene	0.4	<0.4U	15J	<0.39U	<0.36U	5J	0.052J
Dibenz[a,h]anthracene	0.014	<0.4U	<47U	<0.39U	<0.36U	<9U	<0.36U
Dibenzofuran	6.2	<0.4U	<47U	<0.39U	<0.36U	<9U	0.039J
Dimethylphenol, 2,4-	NE	<0.4U	<47U	<0.39U	<0.36U	<9U	<0.36U
Di-n-butyl phthalate	8.1	<0.4U	<47U	<0.39U	<0.36U	<9U	<0.36U
Fluoranthene	50	<0.4U	47	<0.39U	<0.36U	14	0.22J
Fluorene	50	<0.4U	<47U	<0.39U	<0.36U	<9U	0.068J
Indeno[1,2,3-cd]pyrene	3.2	<0.4U	<47U	<0.39U	<0.36U	<9U	<0.36U
Methylnaphthalene,2-	36.4	<0.4U	<47U	<0.39U	<0.36U	<9U	<0.36U
Methylphenol, 4-	0.9	<0.4U	<47U	<0.39U	<0.36U	<9U	<0.36U
Methylphenol,2-	0.1	<0.4U	<47U	<0.39U	<0.36U	<9UJ	<0.36U
Naphthalene	13	<0.4U	38J	<0.39U	<0.36U	<9U	0.058J
N-Nitrosodi-n-propylamine	NE	R	<47UJ	<0.39UJ	<0.36UJ	<9UJ	<0.36UJ
Phenanthrene	50	<0.4U	56	<0.39U	<0.36U	14	0.26J
Pyrene	50	<0.4U	33J	<0.39U	<0.36U	12	0.17J
Total SVOCs	**500**	**U**	**245**	**U**	**U**	**65.6**	**1.32**
Inorganics (mg/kg)							
Cyanide, Total	1600*	<0.34U	12.57	<0.35U	<0.31U	1.48	0.36
Aluminum	NE	3670	4640	12700	6310	7850J	6290
Antimony	NE	<0.6UJ	<0.69UJ	<0.6UJ	<0.5UJ	<0.8UJ	<0.51UJ
Arsenic	7.5	<0.6U	7.3	<0.6U	<0.88UJ	<1.9UJ	<0.54UJ
Barium	300	55	82.7	25.3	55.9	98	57.8
Beryllium	0.16	0.16J	0.27J	0.38J	0.28J	0.38	0.33J
Cadmium	1	<0.12U	0.5J	<0.12U	<0.1U	0.19J	<0.24U
Calcium	NE	1220	3260	486	1450	10100	2810
Chromium	10	11.3	18.9	25	16.2	14J	16.4
Cobalt	30	14.6J	4.2	9.6	8	15J	7.8
Copper	25	17.8	46.5J	15.8J	26.8J	93.4J	10.3J
Iron	2000	9010	27400	14100	16400	18000	8930
Lead	NE	<1.9U	102	<4.4UJ	<3.1UJ	66J	17.7J
Magnesium	NE	1710	1800	4920	2920	6860	3130
Manganese	NE	944	93.6	172	109	137J	96.3
Mercury	0.1	<0.04U	0.12	<0.041U	<0.037U	<0.085U	<0.037U
Nickel	13	14.9J	7.6	16.9	15.9	28.1	13.2
Potassium	NE	1010	1340	727J	2730	4550J	2020
Selenium	2	<0.6UJ	<0.69U	<0.6U	<0.5U	<1UJ	<0.51U
Silver	NE	<0.36U	<0.42U	<0.36U	<0.3U	<0.34U	<0.3U
Sodium	NE	<358U	565J	<363U	<303U	<506U	605J
Thallium	NE	<0.23U	0.3J	<0.24U	<0.22U	0.3J	<0.22U
Vanadium	150	13.2	40.4	26.6	30.8	25.4	13.9
Zinc	20	<23.1U	50.2	54.5J	30.6J	102	46.5J

Table 11 (continued)
Subsurface Soil Sample Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	NYSDEC Cleanup Objectives	Sample ID (ft below grade)					
		SP-SB4 (32-32.5)	SP-SB5 (10-10.5)	SP-SB5 (31-31.4)	SP-SB6 (16)	SP-SB6 (27-27.5)	SP-SB7 (13-14)
Volatile Organic Compounds (mg/kg)							
Benzene	0.06	<0.58U	<1.5U	<0.53U	<0.57U	<0.58U	<0.72U
Carbon disulfide	2.7	<0.58U	<1.5U	<0.53U	<0.57U	<0.58U	<0.72U
Ethylbenzene	5.5	<0.58U	<1.5U	<0.53U	<0.57U	<0.58U	<0.72U
Methylene chloride	0.1	<0.58U	<1.5U	<0.53U	<0.57U	<0.58U	<0.72U
Styrene	NE	<0.58U	<1.5U	<0.53U	<0.57U	<0.58U	<0.72U
Toluene	1.5	<0.58U	<1.5U	<0.53U	<0.57U	<0.58U	<0.72U
Xylene, m,p-	1.2	<0.58U	<1.5U	<0.53U	<0.57U	<0.58U	<0.72U
Xylene,o-	1.2	<0.58U	<1.5U	<0.53U	<0.57U	<0.58U	<0.72U
Total VOCs	**10**	**U**	**U**	**U**	**U**	**U**	**U**
Semivolatile Organic Compounds (mg/kg)							
Acenaphthene	50	<0.33UJ	<0.77U	<0.35U	<0.38U	<0.39UJ	<4.7UJ
Acenaphthylene	41	<0.33U	<0.77U	<0.35U	<0.38U	<0.39U	<4.7U
Anthracene	50	<0.33U	<0.77U	<0.35U	<0.38U	<0.39U	**1.6J**
Benz[a]anthracene	0.224	<0.33U	<0.77U	<0.35U	**0.19J**	**0.39J**	**5**
Benzo[a]pyrene	0.061	<0.33U	<0.77U	<0.35U	**0.17J**	**0.33J**	**4.2J**
Benzo[b]fluoranthene	1.1	<0.33U	<0.77U	<0.35U	**0.29J**	**0.54**	**6.1**
Benzo[g,h,i]perylene	50	<0.33U	<0.77U	<0.35U	**0.12J**	**0.2J**	**2.4J**
Benzo[k]fluoranthene	1.1	<0.33U	<0.77U	<0.35U	<0.38U	<0.39U	<4.7U
Butyl benzyl phthalate	50	<0.33U	<0.77U	<0.35U	<0.38U	<0.39U	<4.7U
Carbazole	NE	<0.33U	<0.77U	<0.35U	<0.38U	<0.39U	<4.7U
Chrysene	0.4	<0.33U	<0.77U	<0.35U	**0.18J**	**0.35J**	**4.6J**
Dibenz[a,h]anthracene	0.014	<0.33U	<0.77U	<0.35U	<0.38U	<0.39U	<4.7U
Dibenzofuran	6.2	<0.33U	<0.77U	<0.35U	<0.38U	<0.39U	<4.7U
Dimethylphenol, 2,4-	NE	<0.33U	<0.77U	<0.35U	<0.38U	<0.39U	<4.7U
Di-n-butyl phthalate	8.1	<0.33U	<0.77U	<0.35U	<0.38U	<0.39U	<4.7U
Fluoranthene	50	<0.33U	<0.77U	<0.35U	**0.37J**	**0.91**	**7.7**
Fluorene	50	<0.33U	<0.77U	<0.35U	<0.38U	<0.39U	<4.7U
Indeno[1,2,3-cd]pyrene	3.2	<0.33U	<0.77U	<0.35U	<0.38U	**0.18J**	**1.9J**
Methylnaphthalene,2-	36.4	<0.33U	<0.77U	<0.35U	<0.38U	<0.39U	<4.7U
Methylphenol, 4-	0.9	<0.33U	<0.77U	<0.35U	<0.38U	<0.39U	<4.7U
Methylphenol,2-	0.1	<0.33U	<0.77U	<0.35U	<0.38U	<0.39U	<4.7U
Naphthalene	13	<0.33U	<0.77U	<0.35U	<0.38U	<0.39U	<4.7U
N-Nitrosodi-n-propylamine	NE	<0.33UJ	R	R	<0.38U	R	R
Phenanthrene	50	<0.33U	<0.77U	<0.35U	**0.25J**	**0.16J**	**5**
Pyrene	50	<0.33U	<0.77U	<0.35U	**0.34J**	**0.72**	**10**
Total SVOCs	**500**	**U**	**U**	**U**	**1.91**	**3.78**	**48.5**
Inorganics (mg/kg)							
Cyanide, Total	1600*	<0.31U	<0.72U	<0.32U	<0.33U	<0.34U	<0.4U
Aluminum	NE	**5130**	**12500**	**7110**	**6760**	**3010**	**5520**
Antimony	NE	<0.53UJ	<1.3UJ	<0.57UJ	**0.9J**	<0.62UJ	**1.1J**
Arsenic	7.5	<0.53UJ	<1.5UJ	<0.57UJ	**5J**	<0.62UJ	**7.6**
Barium	300	**29.5**	**59.8**	**27**	**160**	**26.8J**	**494J**
Beryllium	0.16	**0.23J**	<0.82U	<0.32U	<0.28U	<0.12U	<0.4U
Cadmium	1	<0.11U	<0.25U	<0.17UJ	**2.3J**	**0.13J**	**0.49J**
Calcium	NE	**1560J**	**4950J**	**3990J**	**2180**	**1240J**	**17100J**
Chromium	10	**20.3**	**24.7**	**24.3**	**22.3**	**10.5**	**15.7**
Cobalt	30	**7.4J**	**8.2J**	**6.9J**	**7.8**	**4.1**	**5.9**
Copper	25	**28.4J**	**15.5**	**27.8**	**82.7**	**17.7J**	**151J**
Iron	2000	**12000**	**17600**	**12000**	**27200**	**6540**	**12800**
Lead	NE	**2.7J**	**14.1**	**4.1**	**305**	**33.9J**	**775J**
Magnesium	NE	**2790**	**4740**	**3380**	**2460**	**1540**	**3620**
Manganese	NE	**79.6**	**110**	**81.1**	**185J**	**57.6**	**320**
Mercury	0.1	<0.036U	<0.081U	<0.036U	**0.37**	<0.039U	**0.38**
Nickel	13	**17.7**	**14.6**	**16.5**	**17.1**	**7.6**	**12.4**
Potassium	NE	**1610**	**1560**	**1980**	**1400**	<666UJ	**1180J**
Selenium	2	<0.53UJ	<1.3UJ	<0.57UJ	<0.57UJ	<0.65UJ	<0.63UJ
Silver	NE	<0.32U	<0.75U	<0.34U	<0.35U	<0.37U	**0.45J**
Sodium	NE	**321J**	**1870**	**557J**	**402J**	<370UJ	**1350J**
Thallium	NE	<0.21U	<0.5UJ	<0.21U	<1.1U	<0.22U	<0.28U
Vanadium	150	**25.3**	**26.7**	**29.2**	**18.7**	**10.2**	**24.2**
Zinc	20	<25.7U	**49.4**	**27.5**	**391**	**48.8**	**625**

Table 11 (continued)
Subsurface Soil Sample Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	NYSDEC Cleanup Objectives	Sample ID (ft below grade)					
		SP-SB7 (16.5-17)	SP-SB7 (27.5-28)	SP-SB8 (11-11.5)	SP-SB8 (14.5-15)	SP-SB8 (21.5-22)	SP-SB9 (14)
Volatile Organic Compounds (mg/kg)							
Benzene	0.06	<1.2U	<0.62U	<0.7U	<0.92U	<0.6U	<0.55U
Carbon disulfide	2.7	<1.2U	<0.62U	<0.7U	<0.92U	<0.6U	<0.55U
Ethylbenzene	5.5	<1.2U	<0.62U	<0.7U	<0.92U	<0.6U	<0.55U
Methylene chloride	0.1	<1.2U	<0.62U	<0.7U	<0.92U	<0.6U	<0.55U
Styrene	NE	<1.2U	<0.62U	<0.7U	<0.92U	<0.6U	<0.55U
Toluene	1.5	<1.2U	<0.62U	<0.7U	<0.92U	<0.6U	<0.55U
Xylene, m,p-	1.2	<1.2U	<0.62U	<0.7U	<0.92U	<0.6U	<0.55U
Xylene,o-	1.2	<1.2U	<0.62U	<0.7U	<0.92U	<0.6U	<0.55U
Total VOCs	**10**	**U**	**U**	**U**	**U**	**U**	**U**
Semivolatile Organic Compounds (mg/kg)							
Acenaphthene	50	<0.72UJ	<0.38UJ	<0.46UJ	<0.59UJ	<0.39UJ	**0.55J**
Acenaphthylene	41	<0.72U	<0.38U	<0.46U	<0.59U	<0.39U	R
Anthracene	50	<0.72U	<0.38U	<0.46U	<0.59U	<0.39U	**1.4J**
Benz[a]anthracene	0.224	<0.72U	<0.38U	**0.14J**	<0.59U	<0.39U	**1.7J**
Benzo[a]pyrene	0.061	<0.72U	<0.38U	<0.46U	<0.59U	<0.39U	R
Benzo[b]fluoranthene	1.1	<0.72U	<0.38U	**0.19J**	<0.59U	<0.39U	**2.3J**
Benzo[g,h,i]perylene	50	<0.72U	<0.38U	<0.46U	<0.59U	<0.39U	**0.63J**
Benzo[k]fluoranthene	1.1	<0.72U	<0.38U	<0.46U	<0.59U	<0.39U	R
Butyl benzyl phthalate	50	<0.72U	<0.38U	<0.46U	<0.59U	<0.39U	R
Carbazole	NE	<0.72U	<0.38U	<0.46U	<0.59U	<0.39U	**0.45J**
Chrysene	0.4	<0.72U	<0.38U	**0.15J**	<0.59U	<0.39U	**1.6J**
Dibenz[a,h]anthracene	0.014	<0.72U	<0.38U	<0.46U	<0.59U	<0.39U	R
Dibenzofuran	6.2	<0.72U	<0.38U	<0.46U	<0.59U	<0.39U	**0.4J**
Dimethylphenol, 2,4-	NE	<0.72U	<0.38U	<0.46U	<0.59U	<0.39U	R
Di-n-butyl phthalate	8.1	<0.72U	<0.38U	<0.46U	<0.59U	<0.39U	R
Fluoranthene	50	<0.72U	<0.38U	**0.28J**	<0.59U	<0.39U	**5.1J**
Fluorene	50	<0.72U	<0.38U	<0.46U	<0.59U	<0.39U	**1.2J**
Indeno[1,2,3-cd]pyrene	3.2	<0.72U	<0.38U	<0.46U	<0.59U	<0.39U	**0.62J**
Methylnaphthalene,2-	36.4	<0.72U	<0.38U	<0.46U	<0.59U	<0.39U	R
Methylphenol, 4-	0.9	<0.72U	<0.38U	**0.58**	<0.59U	<0.39U	R
Methylphenol,2-	0.1	<0.72U	<0.38U	<0.46U	<0.59U	<0.39U	R
Naphthalene	13	<0.72U	<0.38U	<0.46U	<0.59U	<0.39U	**0.62J**
N-Nitrosodi-n-propylamine	NE	R	R	R	R	R	R
Phenanthrene	50	<0.72U	<0.38U	**0.22J**	<0.59U	<0.39U	**5.7J**
Pyrene	50	<0.72U	<0.38U	**0.28J**	<0.59U	<0.39U	**3.2J**
Total SVOCs	**500**	**U**	**U**	**1.84**	**U**	**U**	**25.47**
Inorganics (mg/kg)							
Cyanide, Total	1600*	<0.62U	<0.34U	<0.39U	<0.51U	**2.82**	<0.33U
Aluminum	NE	**15200**	**5280**	**6060**	**16100**	**7580**	**7010**
Antimony	NE	<1UJ	<0.56UJ	<0.68UJ	<0.83UJ	<0.6UJ	<0.55UJ
Arsenic	7.5	**2.9J**	**1.2J**	**3.3J**	**3.1J**	<0.6UJ	**1.1J**
Barium	300	**55.2J**	**38.8J**	**81.2J**	**53.8J**	**32.2J**	**70.5J**
Beryllium	0.16	<0.69U	<0.17U	<0.24U	<0.64U	<0.19U	<0.26U
Cadmium	1	<0.21UJ	<0.11UJ	**0.14J**	<0.17UJ	**0.17J**	<0.11U
Calcium	NE	**3500J**	**1660J**	**5100J**	**2010J**	**1170J**	**13100J**
Chromium	10	**34.8**	**15.6**	**14.6**	**31.9**	**11.5**	**17.9**
Cobalt	30	**13.8**	**5.8**	**8.5**	**13.9**	**8.5**	**7.8**
Copper	25	**16.2J**	**23.2J**	**29.7J**	**22.6J**	**11.4J**	**19.2J**
Iron	2000	**22400**	**7830**	**15000**	**26300**	**10800**	**15400**
Lead	NE	**21.4J**	**115J**	**91.8J**	**17.8J**	<2UJ	**18**
Magnesium	NE	**7050**	**1980**	**2770**	**5330**	**3320**	**7480J**
Manganese	NE	**210**	**72.1**	**176**	**185**	**133**	**156**
Mercury	0.1	<0.073U	<0.038U	0.08	<0.059U	<0.038U	<0.037U
Nickel	13	**25.6**	**12.6**	**13**	**22.6**	**9.5**	**11.6**
Potassium	NE	**2650J**	**1230J**	**2300J**	**2110J**	<1010UJ	**2900**
Selenium	2	<1UJ	<0.56UJ	<0.66UJ	<0.87UJ	<0.58UJ	<0.55UJ
Silver	NE	<0.63U	<0.34U	<0.41U	<0.5U	<0.36U	<0.33UJ
Sodium	NE	**1340J**	**346J**	<406UJ	**1820J**	<358UJ	**373J**
Thallium	NE	<0.43UJ	<0.24U	<0.26UJ	<0.34UJ	<0.23U	<0.21U
Vanadium	150	**42.2**	**16.6**	**22.3**	**37.7**	**21.6**	**22.8**
Zinc	20	**132**	**182**	**117**	**77.7**	**46.7**	**66.3J**

Table 11 (continued)
Subsurface Soil Sample Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	NYSDEC Cleanup Objectives	Sample ID (ft below grade)					
		SP-SB9 (21)	SP-SB9 (25)	SP-SB10 (12-13)	SP-SB10 (20-21)	SP-SB10 (30-30.5)	SP-SB11 (13.5)
Volatile Organic Compounds (mg/kg)							
Benzene	0.06	<0.55U	**0.058J**	<0.61U	<0.65U	<1.4U	<0.76U
Carbon disulfide	2.7	<0.55U	<0.55U	<0.61U	<0.65U	<1.4U	<0.76U
Ethylbenzene	5.5	<0.55U	<0.55U	<0.61U	<0.65U	<1.4U	<0.76U
Methylene chloride	0.1	<0.55U	<0.55U	<0.61U	<0.65U	<1.4U	<0.76U
Styrene	NE	<0.55U	<0.55U	<0.61U	<0.65U	<1.4U	<0.76U
Toluene	1.5	<0.55U	<0.55U	<0.61U	<0.65U	<1.4U	<0.76U
Xylene, m,p-	1.2	<0.55U	<0.55U	<0.61U	<0.65U	<1.4U	<0.76U
Xylene,o-	1.2	<0.55U	<0.55U	<0.61U	<0.65U	<1.4U	<0.76U
Total VOCs	**10**	**U**	**0.058**	**U**	**U**	**U**	**U**
Semivolatile Organic Compounds (mg/kg)							
Acenaphthene	50	<8.5UJ	<3.4UJ	<0.36UJ	<0.41UJ	<0.39UJ	<0.41UJ
Acenaphthylene	41	<8.5U	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41UJ
Anthracene	50	<8.5U	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41UJ
Benz[a]anthracene	0.224	**3J**	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41UJ
Benzo[a]pyrene	0.061	<8.5U	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41UJ
Benzo[b]fluoranthene	1.1	<8.5U	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41UJ
Benzo[g,h,i]perylene	50	<8.5U	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41UJ
Benzo[k]fluoranthene	1.1	<8.5U	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41UJ
Butyl benzyl phthalate	50	<8.5U	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41UJ
Carbazole	NE	<8.5U	<3.4U	<0.36U	<0.41UJ	<0.39U	<0.41U
Chrysene	0.4	**3J**	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41UJ
Dibenz[a,h]anthracene	0.014	<8.5U	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41UJ
Dibenzofuran	6.2	<8.5U	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41UJ
Dimethylphenol, 2,4-	NE	<8.5U	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41U
Di-n-butyl phthalate	8.1	<8.5U	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41UJ
Fluoranthene	50	<8.5U	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41UJ
Fluorene	50	<8.5U	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41UJ
Indeno[1,2,3-cd]pyrene	3.2	<8.5U	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41UJ
Methylnaphthalene,2-	36.4	<8.5U	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41UJ
Methylphenol, 4-	0.9	<8.5U	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41U
Methylphenol,2-	0.1	<8.5U	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41U
Naphthalene	13	<8.5U	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41UJ
N-Nitrosodi-n-propylamine	NE	<8.5UJ	<3.4UJ	R	R	R	R
Phenanthrene	50	**7.3J**	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41UJ
Pyrene	50	**4.7J**	<3.4UJ	<0.36U	<0.41UJ	<0.39U	<0.41UJ
Total SVOCs	**500**	**18**	**U**	**U**	**U**	**U**	**U**
Inorganics (mg/kg)							
Cyanide, Total	1600*	<0.31U	<0.3U	<0.31U	<0.36U	<0.33U	<0.42U
Aluminum	NE	**4690**	**4110**	**7080**	**10000**	**6580**	**8490**
Antimony	NE	<0.52UJ	<0.53UJ	<0.56UJ	<0.59UJ	<0.55UJ	**2.6J**
Arsenic	7.5	**4.3**	<0.53U	**3.7J**	<0.59UJ	<0.55UJ	**25.6**
Barium	300	**64.6**	**32.3**	**74.2J**	**33.5J**	**61.1J**	**56**
Beryllium	0.16	**0.18J**	**0.11J**	<0.34U	<0.34U	<0.24U	**0.64**
Cadmium	1	<0.1U	<0.11U	**0.21J**	**0.19J**	<0.11UJ	<0.13U
Calcium	NE	**14300**	**8420**	**1010J**	**693J**	**1320J**	**2220**
Chromium	10	**14.2**	**9.2**	**20.5**	**25.8**	**20.3**	**164**
Cobalt	30	**7.9**	**5.1**	**8.6**	**11.6**	**10.3**	**9.9**
Copper	25	**52.6**	**11.2**	**26.8J**	**11.8J**	**22.1J**	**59.3**
Iron	2000	**26800**	**11000**	**13500**	**13600**	**14200**	**20800**
Lead	NE	**264**	**624**	**43.1J**	<2.8UJ	<2.3UJ	<52.5U
Magnesium	NE	**4590**	**4910**	**2760**	**4270**	**3150**	**3170**
Manganese	NE	**180J**	**117**	**116**	**119**	**219**	**246J**
Mercury	0.1	<0.036U	<0.035U	**0.22**	<0.042U	<0.04U	**0.2**
Nickel	13	**14.5**	**6.8**	**13.3**	**14.3**	**18.4**	**19.6**
Potassium	NE	**2380**	**1650**	**3300J**	**1210J**	**2580J**	**2230**
Selenium	2	<0.52UJ	<0.53UJ	<0.54UJ	<0.59UJ	<0.64UJ	<0.67UJ
Silver	NE	<0.31U	<0.32U	<0.33U	<0.35U	<0.33U	<0.4U
Sodium	NE	<314U	<318U	**671J**	<352UJ	<327UJ	**1340**
Thallium	NE	**0.39J**	<0.2U	<0.2U	<0.24U	<0.22U	<0.3U
Vanadium	150	**20.1**	**14.8**	**18.5**	**24.7**	**25.8**	**18.6**
Zinc	20	**271**	<33.9U	**109**	**58.2**	**40.9**	**145**

Table 11 (continued)
Subsurface Soil Sample Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	NYSDEC Cleanup Objectives	Sample ID (ft below grade)					
		SP-SB11 (37)	SP-SB12 (19.5-20)	SP-SB12 (9.5-10)	SP-SB13 (13-14)	SP-SB13 (23-24)	SP-SB14 (10-11)
Volatile Organic Compounds (mg/kg)							
Benzene	0.06	<0.61U	<0.64U	<0.88U	<0.69U	<0.64U	<1U
Carbon disulfide	2.7	<0.61UJ	<0.64U	<0.88U	<0.69U	<0.64U	<1U
Ethylbenzene	5.5	<0.61U	<0.64U	<0.88U	<0.69U	<0.64U	<1U
Methylene chloride	0.1	**0.07J**	<0.64U	<0.88U	<0.69U	<0.64U	<1U
Styrene	NE	<0.61U	<0.64U	<0.88U	<0.69U	<0.64U	<1U
Toluene	1.5	<0.61U	<0.64U	<0.88U	<0.69U	<0.64U	<1U
Xylene, m,p-	1.2	<0.61U	<0.64U	<0.88U	<0.69U	<0.64U	**0.12J**
Xylene,o-	1.2	<0.61U	<0.64U	<0.88U	<0.69U	<0.64U	<1U
Total VOCs	**10**	**0.07**	**U**	**U**	**U**	**U**	**0.12**
Semivolatile Organic Compounds (mg/kg)							
Acenaphthene	50	<0.38U	<0.38UJ	<0.45UJ	<1.4U	<0.38U	<0.6U
Acenaphthylene	41	<0.38U	<0.38UJ	<0.45UJ	<1.4U	<0.38U	<0.6U
Anthracene	50	<0.38U	<0.38UJ	<0.45UJ	<1.4U	<0.38U	<0.6U
Benz[a]anthracene	0.224	<0.38U	<0.38UJ	**0.092J**	**1.7**	<0.38U	<0.6U
Benzo[a]pyrene	0.061	<0.38U	<0.38UJ	<0.45UJ	**2.1**	<0.38U	<0.6U
Benzo[b]fluoranthene	1.1	<0.38U	<0.38UJ	**0.17J**	**3.1**	<0.38U	<0.6U
Benzo[g,h,i]perylene	50	<0.38U	<0.38UJ	<0.45UJ	**2.4J**	<0.38UJ	<0.6UJ
Benzo[k]fluoranthene	1.1	<0.38U	<0.38UJ	<0.45UJ	<1.4U	<0.38U	<0.6U
Butyl benzyl phthalate	50	<0.38U	<0.38UJ	<0.45UJ	<1.4U	<0.38U	<0.6U
Carbazole	NE	<0.38U	<0.38UJ	<0.45UJ	<1.4U	<0.38U	<0.6U
Chrysene	0.4	<0.38U	<0.38UJ	<0.45UJ	**1.5**	<0.38U	<0.6U
Dibenz[a,h]anthracene	0.014	<0.38U	<0.38UJ	<0.45UJ	<1.4U	<0.38U	<0.6U
Dibenzofuran	6.2	<0.38U	<0.38UJ	<0.45UJ	<1.4U	<0.38U	<0.6U
Dimethylphenol, 2,4-	NE	<0.38U	<0.38U	<0.45U	<1.4U	<0.38U	<0.6U
Di-n-butyl phthalate	8.1	<0.38U	<0.38UJ	<0.45UJ	<1.4U	<0.38U	<0.6U
Fluoranthene	50	<0.38U	<0.38UJ	**0.15J**	**2.5**	<0.38U	<0.6U
Fluorene	50	<0.38U	<0.38UJ	<0.45UJ	<1.4U	<0.38U	<0.6U
Indeno[1,2,3-cd]pyrene	3.2	<0.38U	<0.38UJ	<0.45UJ	**1.8**	<0.38U	<0.6U
Methylnaphthalene,2-	36.4	<0.38U	<0.38UJ	<0.45UJ	<1.4U	<0.38U	**0.56J**
Methylphenol, 4-	0.9	<0.38U	<0.38U	<0.45U	<1.4U	<0.38U	<0.6U
Methylphenol,2-	0.1	<0.38U	<0.38U	<0.45U	<1.4U	<0.38U	<0.6U
Naphthalene	13	<0.38U	<0.38UJ	<0.45UJ	<1.4U	<0.38U	**2.8**
N-Nitrosodi-n-propylamine	NE	<0.38UJ	<0.38UJ	<0.45UJ	<1.4UJ	<0.38UJ	<0.6UJ
Phenanthrene	50	<0.38U	<0.38UJ	<0.45UJ	**1J**	<0.38U	<0.6U
Pyrene	50	<0.38U	<0.38UJ	**0.12J**	**2.2**	<0.38U	<0.6U
Total SVOCs	**500**	**U**	**U**	**0.53**	**18.3**	**U**	**3.36**
Inorganics (mg/kg)							
Cyanide, Total	1600*	<0.34U	<0.36U	<0.43U	**3.23**	<0.35U	<0.57U
Aluminum	NE	**18700**	**8300**	**12800**	**3620**	**3800**	**18200**
Antimony	NE	**0.75J**	<0.62UJ	<0.78UJ	<0.62U	<0.62U	<1U
Arsenic	7.5	<0.61U	<0.62U	**4.9**	**6.1J**	**0.73J**	**3J**
Barium	300	**235**	**36.1J**	**107J**	**60.6**	**14.5**	**73.9**
Beryllium	0.16	**0.28**	<0.22U	<0.79U	**0.34**	**0.16J**	**1.1**
Cadmium	1	**0.75J**	<0.12U	<0.33U	**0.96J**	<0.12U	**0.44J**
Calcium	NE	**2450**	**1140J**	**2370J**	**31800**	**738**	**1450**
Chromium	10	**39J**	**19**	**34.4**	**12.9**	**12**	**35.2**
Cobalt	30	**25.6**	**7.9**	**8.7**	**4.3**	**3.7**	**12.8**
Copper	25	**41.8**	<11.9UJ	**22.7J**	**42.2J**	**7.7**	**12.3J**
Iron	2000	**26400**	**11400**	**24000**	**18500**	**5650**	**23000**
Lead	NE	**6J**	**2.1**	**67.6**	**106**	**6.5**	**12.8**
Magnesium	NE	**9910**	**3330J**	**4970J**	**2090**	**1630**	**5390**
Manganese	NE	**178**	**121**	**251**	**270**	**58**	**122**
Mercury	0.1	<0.04U	<0.04U	**0.11J**	**0.12**	<0.042U	<0.067U
Nickel	13	**39.1**	**14.9**	**19.2**	**11.3**	**7.6**	**23.8**
Potassium	NE	**10200J**	**489**	**2130**	**813**	**486**	**1590**
Selenium	2	<0.61UJ	<0.62UJ	<0.78UJ	<2.5UJ	<0.62UJ	<1UJ
Silver	NE	<0.36U	<0.37UJ	<0.47UJ	<0.37U	<0.37U	<0.6U
Sodium	NE	**379J**	<374U	<466U	<370U	<374U	**1340**
Thallium	NE	<0.4U	<0.24U	<0.3U	<0.24U	<0.23U	<0.39U
Vanadium	150	**61.4**	**16.8**	**38.6**	**15.6**	**12.6**	**35.5**
Zinc	20	**80.8**	**39J**	**81.3J**	**355J**	**27.3J**	**68.6J**

Table 11 (continued)
Subsurface Soil Sample Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	NYSDEC Cleanup Objectives	Sample ID (ft below grade)					
		SP-SB14 (23-24)	SP-SB14 (24-24.5)	SP-SB15 (10-11)	SP-SB15 (17)	SP-SB15 (20-20.5)	SP-SB15 (22-22.5)
Volatile Organic Compounds (mg/kg)							
Benzene	0.06	<0.58U	<0.58U	<0.7U	**79.5**	**0.3J**	<0.54U
Carbon disulfide	2.7	<0.58U	<0.58U	<0.7U	**22J**	<0.66U	<0.54U
Ethylbenzene	5.5	<0.58U	<0.58U	<0.7U	**23J**	**0.13J**	<0.54U
Methylene chloride	0.1	<0.58U	<0.58U	<0.7U	<79U	<0.66U	<0.54U
Styrene	NE	<0.58U	<0.58U	<0.7U	<79U	<0.66U	<0.54U
Toluene	1.5	<0.58U	<0.58U	<0.7U	**140**	**0.18J**	<0.54U
Xylene, m,p-	1.2	<0.58U	<0.58U	<0.7U	**270**	**0.73**	<0.54U
Xylene,o-	1.2	<0.58U	<0.58U	<0.7U	**99**	**0.28J**	<0.54U
Total VOCs	**10**	**U**	**U**	**U**	**633.5**	**1.62**	**U**
Semivolatile Organic Compounds (mg/kg)							
Acenaphthene	50	<0.37U	<0.3U	<9.9U	<1700U	**5.3J**	<0.29U
Acenaphthylene	41	<0.37U	<0.3U	<9.9U	**960J**	<9U	<0.29U
Anthracene	50	<0.37U	<0.3U	**4.5J**	**2700**	**8.4J**	<0.29U
Benz[a]anthracene	0.224	<0.37U	<0.3U	**25**	**1900**	**8J**	<0.29U
Benzo[a]pyrene	0.061	<0.37U	<0.3U	**24**	**1700J**	**7.1J**	<0.29U
Benzo[b]fluoranthene	1.1	<0.37U	<0.3U	**34**	**2300**	**9.5**	<0.29U
Benzo[g,h,i]perylene	50	<0.37U	<0.3UJ	**14J**	**930J**	**4.3J**	<0.29UJ
Benzo[k]fluoranthene	1.1	<0.37U	<0.3U	<9.9U	<1700U	<9U	<0.29U
Butyl benzyl phthalate	50	<0.37U	<0.3U	<9.9U	<1700U	<9U	<0.29U
Carbazole	NE	<0.37U	<0.3U	<9.9U	**710J**	**2.9J**	<0.29U
Chrysene	0.4	<0.37U	<0.3U	**21**	**1740**	**6.1J**	<0.29U
Dibenz[a,h]anthracene	0.014	<0.37U	<0.3U	<9.9U	<1700U	<9U	<0.29U
Dibenzofuran	6.2	<0.37U	<0.3U	<9.9U	**1700J**	**5.7J**	<0.29U
Dimethylphenol, 2,4-	NE	<0.37U	<0.3U	<9.9U	<1700U	<9U	<0.29U
Di-n-butyl phthalate	8.1	<0.37U	<0.3U	<9.9U	<1700U	<9U	<0.29U
Fluoranthene	50	<0.37U	<0.3U	**53**	**5100**	**18**	<0.29U
Fluorene	50	<0.37U	<0.3U	<9.9U	**1900**	**6.8J**	<0.29U
Indeno[1,2,3-cd]pyrene	3.2	<0.37U	<0.3U	**11**	**790J**	**3.5J**	<0.29U
Methylnaphthalene,2-	36.4	<0.37U	<0.3U	<9.9U	**2400**	**8.3J**	<0.29U
Methylphenol, 4-	0.9	<0.37U	<0.3U	<9.9U	<1700U	<9U	<0.29U
Methylphenol,2-	0.1	<0.37U	<0.3U	<9.9U	<1700U	<9U	<0.29U
Naphthalene	13	<0.37U	**0.27J**	**14**	**10172.57**	**40.9**	**0.26J**
N-Nitrosodi-n-propylamine	NE	R	<0.3UJ	<9.9UJ	<1700UJ	<9UJ	<0.29UJ
Phenanthrene	50	<0.37U	<0.3U	**9.2J**	**10043.11**	**36**	**0.091J**
Pyrene	50	<0.37U	<0.3U	**41**	**5100**	**21**	**0.09J**
Total SVOCs	**500**	**U**	**0.27**	**250.7**	**50145.68**	**191.8**	**0.44**
Inorganics (mg/kg)							
Cyanide, Total	1600*	<0.32U	0.5	**0.95**	**12.23**	<0.36U	<0.31U
Aluminum	NE	**4540**	**3890**	**12300**	**9310**	**6110**	**6980**
Antimony	NE	<0.56UJ	<0.55U	<0.7U	<0.79U	<0.62U	<0.53U
Arsenic	7.5	<0.56UJ	<0.55UJ	**2.6J**	**3.7J**	<0.62UJ	<0.53UJ
Barium	300	**24.3**	**14.8**	**66.4**	**39.4**	**17.1**	**46.8**
Beryllium	0.16	<0.19U	**0.22J**	**0.47**	**0.44**	**0.25J**	**0.32**
Cadmium	1	<0.11U	<0.11U	**0.76J**	<0.37U	**0.13J**	**0.14J**
Calcium	NE	**2500J**	**1530**	**3340**	**1380**	**538**	**1070**
Chromium	10	**15.8**	**10.9**	**27.9**	**18.6**	**14**	**16.3**
Cobalt	30	**4.2J**	**3.6**	**7.4**	**7.8**	**4.5**	**6.5**
Copper	25	**25.4**	**10.1**	**23.9J**	**8.8**	**5.8**	**13J**
Iron	2000	**7710**	**6250**	**17500**	**14300**	**6950**	**12000**
Lead	NE	**14.1**	**2**	**31.5**	**7.4**	**2.3**	**2.3J**
Magnesium	NE	**1790**	**1350**	**4510**	**4100**	**2040**	**2540**
Manganese	NE	**68.3**	**52.5**	**151**	**143**	**74.3**	**97**
Mercury	0.1	<0.038U	<0.038U	<0.056U	**0.073**	<0.042U	<0.036U
Nickel	13	**8.2**	**6.6**	**17.1**	**14.5**	**8.3**	**12.2**
Potassium	NE	**986**	**593**	**1470**	**1060**	**352**	**2040**
Selenium	2	<0.56UJ	<0.55UJ	<0.76UJ	<2.1UJ	<0.62UJ	<0.53UJ
Silver	NE	<0.34U	<0.33U	<0.42U	<0.47U	<0.37U	<0.32U
Sodium	NE	<338U	<328U	**570J**	<471U	<372U	<317U
Thallium	NE	<0.22U	<0.21U	<0.27U	<0.32UJ	<0.24U	<0.2U
Vanadium	150	**18.2**	**23.5**	**34.2**	**20.1**	**14.4**	**24.9**
Zinc	20	**55.5**	**24.5J**	**75.7J**	**50.3J**	**31.8J**	**36.5J**

Table 11 (continued)
Subsurface Soil Sample Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	NYSDEC Cleanup Objectives	Sample ID (ft below grade)					
		SP-SB15 (36-36.4)	SP-SB16 (13.5)	SP-SB16 (20.7-21)	SP-SB16 (26.5-27)	SP-SB17 (12)	SP-SB17 (20)
Volatile Organic Compounds (mg/kg)							
Benzene	0.06	<0.59U	**0.61J**	<0.56U	<0.55U	<0.59U	<0.5U
Carbon disulfide	2.7	<0.59U	<0.71UJ	<0.56UJ	<0.55UJ	<0.59UJ	<0.5UJ
Ethylbenzene	5.5	<0.59U	**0.22J**	<0.56U	<0.55U	<0.59U	<0.5U
Methylene chloride	0.1	<0.59U	**0.083J**	**0.081J**	**0.083J**	**0.084J**	**0.071J**
Styrene	NE	<0.59U	<0.71U	<0.56U	<0.55U	<0.59U	<0.5U
Toluene	1.5	<0.59U	**0.12J**	<0.56U	<0.55U	<0.59U	<0.5U
Xylene, m,p-	1.2	<0.59U	**0.11J**	<0.56U	<0.55U	<0.59U	<0.5U
Xylene,o-	1.2	<0.59U	**0.073J**	<0.56U	<0.55U	<0.59U	<0.5U
Total VOCs	**10**	**U**	**1.216**	**0.081**	**0.083**	**0.084**	**0.071**
Semivolatile Organic Compounds (mg/kg)							
Acenaphthene	50	<0.36U	**27J**	<0.35UJ	<0.35U	**0.65**	<0.37U
Acenaphthylene	41	<0.36U	<69U	<0.35U	<0.35U	<0.39U	<0.37U
Anthracene	50	**0.18J**	**90**	<0.35U	<0.35U	1	<0.37U
Benz[a]anthracene	0.224	**0.21J**	**91**	<0.35U	<0.35U	**1**	**0.13J**
Benzo[a]pyrene	0.061	**0.18J**	**74**	<0.35U	<0.35U	**0.33J**	**0.19J**
Benzo[b]fluoranthene	1.1	**0.26J**	**120**	<0.35U	<0.35U	**0.82**	**0.33J**
Benzo[g,h,i]perylene	50	<0.36UJ	**37J**	<0.35U	<0.35U	**0.17J**	**0.13J**
Benzo[k]fluoranthene	1.1	<0.36U	<69U	<0.35U	<0.35U	<0.39U	<0.37U
Butyl benzyl phthalate	50	<0.36U	<69U	<0.35U	<0.35U	<0.39U	<0.37U
Carbazole	NE	<0.36U	<69U	<0.35U	<0.35U	**0.41**	<0.37U
Chrysene	0.4	**0.18J**	**73**	<0.35U	<0.35U	**0.89**	**0.14J**
Dibenz[a,h]anthracene	0.014	<0.36U	<69U	<0.35U	<0.35U	<0.39U	<0.37U
Dibenzofuran	6.2	<0.36U	**30J**	<0.35U	<0.35U	**1.1**	<0.37U
Dimethylphenol, 2,4-	NE	<0.36U	<69U	<0.35U	<0.35U	<0.39U	<0.37U
Di-n-butyl phthalate	8.1	<0.36U	<69U	<0.35U	<0.35U	<0.39U	<0.37U
Fluoranthene	50	**0.48**	**220**	<0.35U	<0.35U	**2.9J**	**0.3J**
Fluorene	50	**0.12J**	**42J**	<0.35U	<0.35U	**0.63**	<0.37U
Indeno[1,2,3-cd]pyrene	3.2	<0.36U	**36J**	<0.35U	<0.35U	**0.16J**	**0.12J**
Methylnaphthalene,2-	36.4	**0.12J**	<69U	<0.35U	<0.35U	<0.39U	<0.37U
Methylphenol, 4-	0.9	<0.36U	<69U	<0.35U	<0.35U	<0.39U	<0.37U
Methylphenol,2-	0.1	<0.36U	<69U	<0.35U	<0.35U	<0.39U	<0.37U
Naphthalene	13	**0.67**	**22J**	<0.35U	<0.35U	**1.4**	<0.37U
N-Nitrosodi-n-propylamine	NE	<0.36UJ	<69UJ	R	R	**0.21J**	<0.37UJ
Phenanthrene	50	**0.61**	**260**	<0.35U	<0.35U	**4.8**	**0.22J**
Pyrene	50	**0.44**	**160**	<0.35U	<0.35U	**2.5**	**0.28J**
Total SVOCs	**500**	**3.45**	**1282**	**U**	**U**	**18.97**	**1.84**
Inorganics (mg/kg)							
Cyanide, Total	1600*	<0.32U	**1.25**	<0.31U	<0.32U	<0.34U	<0.32U
Aluminum	NE	**8080**	**7930**	**7270**	**11500**	**9500**	**46400**
Antimony	NE	<0.55U	<0.7UJ	**0.64J**	<0.56UJ	<0.57UJ	**1.1J**
Arsenic	7.5	<0.55UJ	**5.9**	<0.56U	<0.56U	**1.6**	**2.3J**
Barium	300	**82.1**	**44.3**	**61.5**	**103**	**107**	**296**
Beryllium	0.16	**0.34**	**0.41**	**0.15J**	**0.52**	**0.36**	**1.6**
Cadmium	1	**0.34J**	**0.14J**	**0.14J**	**0.38J**	**0.64J**	**1.7J**
Calcium	NE	**1620**	**1820**	**1050**	**1510**	**14500**	**22600**
Chromium	10	**17.5**	**18.9J**	**37.9J**	**30.6J**	**17.8J**	**58.6J**
Cobalt	30	**11.1**	**7.8**	7	**18.3**	**9.3**	**21.6**
Copper	25	**27.8J**	**17.9**	5	**27.7**	**31.8**	**63.8**
Iron	2000	**15600**	**12000**	**8140**	**27000**	**16400**	**30300**
Lead	NE	**2.6J**	**111**	**2.7**	**3.5J**	**114**	**25.4**
Magnesium	NE	**4640**	**2520**	**2890**	**6050**	**4320**	**10700**
Manganese	NE	**92.8**	**112**	**62.3**	**158**	**192**	**373**
Mercury	0.1	<0.037U	**0.37**	<0.037U	<0.04U	**0.16**	**0.13**
Nickel	13	**20.5**	**15.3**	**12.6**	**33.2**	**16.5**	**38.1**
Potassium	NE	**4200**	**1040J**	**752J**	**7020J**	**2460J**	**13500J**
Selenium	2	<0.55UJ	<2.9UJ	<0.56UJ	<0.56UJ	<0.57UJ	<0.55UJ
Silver	NE	<0.33U	<0.42U	<0.34U	<0.34U	<0.34U	<0.33U
Sodium	NE	**330J**	**869**	<336U	<336U	**2310**	**3950**
Thallium	NE	<0.22U	<0.27U	<0.22U	<0.23U	<0.23U	<0.46U
Vanadium	150	**23.4**	**20.9**	**16.3**	<34.3U	**26**	**86.8**
Zinc	20	**51.3J**	**55.7**	**37.6**	**60.2**	**114**	**86.9**

Table 11 (continued)
Subsurface Soil Sample Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	NYSDEC Cleanup Objectives	Sample ID (ft below grade)					
		SP-SB17 (26)	SP-SB17 (3)	SP-SB18 (11)	SP-SB18 (20)	SP-SB19 (12-12.5)	SP-SB19 (17.5-18)
Volatile Organic Compounds (mg/kg)							
Benzene	0.06	<0.98U	<0.49U	<1.2U	<0.78U	**0.062J**	**120**
Carbon disulfide	2.7	<0.98UJ	<0.49UJ	<1.2UJ	<0.78UJ	<0.6U	<13U
Ethylbenzene	5.5	<0.98U	<0.49U	<1.2U	<0.78U	<0.6U	**20**
Methylene chloride	0.1	<0.98U	**0.065J**	**0.14J**	**0.091J**	<0.6U	<13U
Styrene	NE	<0.98U	<0.49U	<1.2U	<0.78U	<0.6U	**28**
Toluene	1.5	<0.98U	<0.49U	<1.2U	<0.78U	<0.6U	**210**
Xylene, m,p-	1.2	<0.98U	<0.49U	<1.2U	<0.78U	<0.6U	**250**
Xylene,o-	1.2	<0.98U	<0.49U	<1.2U	<0.78U	<0.6U	**85**
Total VOCs	**10**	**U**	**0.065**	**0.14**	**0.091**	**0.062**	**713**
Semivolatile Organic Compounds (mg/kg)							
Acenaphthene	50	<17U	<9.3U	<0.64U	<0.54U	**0.18J**	**18**
Acenaphthylene	41	<17U	<9.3U	<0.64U	<0.54U	**0.24J**	**68**
Anthracene	50	<17U	<9.3U	<0.64U	<0.54U	**1.1**	**90**
Benz[a]anthracene	0.224	<17U	<9.3U	<0.64U	<0.54U	**2.4**	**75**
Benzo[a]pyrene	0.061	<17U	<9.3U	<0.64U	<0.54U	**2.1**	**59**
Benzo[b]fluoranthene	1.1	**10J**	<9.3U	<0.64U	<0.54U	**3.5**	**85**
Benzo[g,h,i]perylene	50	<17U	<9.3U	<0.64U	<0.54U	**1.5**	**38**
Benzo[k]fluoranthene	1.1	<17U	<9.3U	<0.64U	<0.54U	<0.44U	<11U
Butyl benzyl phthalate	50	<17U	<9.3U	<0.64U	<0.54U	<0.44U	<11U
Carbazole	NE	<17U	<9.3U	<0.64U	<0.54U	**0.32J**	**45**
Chrysene	0.4	**6.1J**	<9.3U	<0.64U	<0.54U	**2**	**56**
Dibenz[a,h]anthracene	0.014	<17U	<9.3U	<0.64U	<0.54U	**0.13J**	<11U
Dibenzofuran	6.2	<17U	<9.3U	<0.64U	<0.54U	**0.35J**	**75**
Dimethylphenol, 2,4-	NE	<17U	<9.3U	<0.64U	<0.54U	<0.44U	**7.2J**
Di-n-butyl phthalate	8.1	<17U	<9.3U	<0.64U	<0.54U	<0.44U	<11U
Fluoranthene	50	**12J**	<9.3U	<0.64U	<0.54U	**3.7J**	**200**
Fluorene	50	<17U	<9.3U	<0.64U	<0.54U	**0.41J**	**83**
Indeno[1,2,3-cd]pyrene	3.2	<17U	<9.3U	<0.64U	<0.54U	**1.4**	**34**
Methylnaphthalene,2-	36.4	<17U	<9.3U	<0.64U	<0.54U	**0.18J**	**74**
Methylphenol, 4-	0.9	<17U	<9.3U	<0.64U	<0.54U	<0.44U	<11U
Methylphenol,2-	0.1	<17U	<9.3U	<0.64U	<0.54U	<0.44U	<11U
Naphthalene	13	<17U	<9.3U	<0.64U	<0.54U	**0.69**	**87**
N-Nitrosodi-n-propylamine	NE	<17UJ	<9.3UJ	<0.64UJ	<0.54UJ	<0.44UJ	<11UJ
Phenanthrene	50	**6.1J**	<9.3U	<0.64U	<0.54U	**3J**	**310**
Pyrene	50	**9.9J**	<9.3U	<0.64U	<0.54U	**2.7J**	**130J**
Total SVOCs	**500**	**44.1**	**U**	**U**	**U**	**25.9**	**1534.2**
Inorganics (mg/kg)							
Cyanide, Total	1600*	**0.56**	<0.33U	<0.56U	<0.47U	**6.97**	<0.39U
Aluminum	NE	**18300**	**12300**	**13200**	**14550**	**8480**	**11800**
Antimony	NE	**3.1J**	**0.64J**	<1UJ	<0.84UJ	<0.58UJ	<0.65UJ
Arsenic	7.5	**33**	**4.7**	**3.6J**	**4.8J**	**5.7**	<1.3UJ
Barium	300	**310**	**127**	**49.1**	**56.1**	**286**	**37**
Beryllium	0.16	**0.83**	**0.39**	**0.72**	**0.69**	**0.59J**	**0.54J**
Cadmium	1	**7.9**	**1.5**	<0.2U	<0.17U	**1.9J**	**0.18J**
Calcium	NE	**8060**	**3840**	**2510**	**1640**	**37500**	**1010**
Chromium	10	**145J**	**45.4J**	**29.7J**	**34.3J**	**24.8**	**27.7**
Cobalt	30	**15.7**	**14.1**	**13.5**	**13.6**	**7.6**	**8.6**
Copper	25	**1660**	**90.8**	**12.8**	**14.3**	**85.8J**	**13.6J**
Iron	2000	**36000**	**22800**	**30300**	**29000**	**20900**	**13700**
Lead	NE	**625**	**140**	**9.1J**	**9.5J**	**360**	**3.8J**
Magnesium	NE	**7710**	**6380**	**5040**	**6820**	**14600**	**3750**
Manganese	NE	**390**	**185**	**221**	**261**	**342**	**136**
Mercury	0.1	**1.8**	**0.39**	<0.067U	<0.055U	**6.2**	<0.045U
Nickel	13	**44.1**	**25.6**	**22.8**	**26.3**	**16.6**	**13.9**
Potassium	NE	**3500J**	**4170J**	**1880J**	**2750J**	**1830**	**513**
Selenium	2	<1UJ	<0.57UJ	<1UJ	<0.84UJ	<0.58U	<0.65U
Silver	NE	**3.4**	<0.34U	<0.6U	<0.5U	<0.35U	<0.39U
Sodium	NE	**3550**	**656**	**1620**	**1680**	**576J**	**752J**
Thallium	NE	<0.4UJ	<0.23U	<0.37UJ	<0.31UJ	**0.84**	<0.26UJ
Vanadium	150	**52.7**	**38.1**	**31.6**	**33.7**	**31**	**30.2**
Zinc	20	**942**	**199**	**66**	**79.1**	**419**	**46.2**

Table 11 (continued)
Subsurface Soil Sample Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	NYSDEC Cleanup Objectives	Sample ID (ft below grade)				
		SP-SB19 (30-30.5)	SP-SB20 (14-14.5)	SP-SB20 (20-20.5)	SP-SB20 (24-24.5)	SP-SB21 (14-14.5)
Volatile Organic Compounds (mg/kg)						
Benzene	0.06	**1.7**	**110**	**4.2**	<0.61U	<0.58U
Carbon disulfide	2.7	<1.2U	<9.9U	<1U	<0.61U	<0.58U
Ethylbenzene	5.5	<1.2U	**34**	<1U	<0.61U	<0.58U
Methylene chloride	0.1	<1.2U	<9.9U	<1U	<0.61U	<0.58U
Styrene	NE	0.37J	**2.2J**	<1U	<0.61U	<0.58U
Toluene	1.5	**2.8**	**75**	<1U	<0.61U	<0.58U
Xylene, m,p-	1.2	**3.7**	**150**	**0.73J**	<0.61U	<0.58U
Xylene,o-	1.2	**1.3**	**50**	**0.26J**	<0.61U	<0.58U
Total VOCs	**10**	**9.87**	**421.2**	**5.19**	**U**	**U**
Semivolatile Organic Compounds (mg/kg)						
Acenaphthene	50	<3.7U	**13**	**0.08J**	<0.38U	<0.39U
Acenaphthylene	41	<3.7U	**5.5J**	<0.62U	<0.38U	<0.39U
Anthracene	50	<3.7U	**24**	**0.17J**	<0.38U	**0.058J**
Benz[a]anthracene	0.224	<3.7U	**24**	**0.12J**	<0.38U	**0.098J**
Benzo[a]pyrene	0.061	<3.7U	**18**	**0.092J**	<0.38U	**0.081J**
Benzo[b]fluoranthene	1.1	<3.7U	**26**	**0.15J**	<0.38U	**0.16J**
Benzo[g,h,i]perylene	50	<3.7U	**11**	**0.064J**	<0.38U	**0.061J**
Benzo[k]fluoranthene	1.1	<3.7U	<5.6UJ	<0.62UJ	<0.38UJ	<0.39UJ
Butyl benzyl phthalate	50	<3.7U	<5.6U	<0.62U	<0.38U	<0.39U
Carbazole	NE	<3.7U	**11**	**0.075J**	<0.38U	**0.042J**
Chrysene	0.4	<3.7U	**17**	**0.11J**	<0.38U	**0.1J**
Dibenz[a,h]anthracene	0.014	<3.7U	**1.4J**	<0.62U	<0.38U	<0.39U
Dibenzofuran	6.2	<3.7U	**18**	**0.11J**	<0.38U	<0.39U
Dimethylphenol, 2,4-	NE	<3.7U	**5.8**	<0.62U	<0.38U	<0.39U
Di-n-butyl phthalate	8.1	<3.7U	<5.6U	<0.62U	<0.38U	<0.39U
Fluoranthene	50	<3.7U	**61**	**0.32J**	<0.38U	**0.22J**
Fluorene	50	<3.7U	**23**	**0.14J**	<0.38U	**0.041J**
Indeno[1,2,3-cd]pyrene	3.2	<3.7U	**11**	<0.62U	<0.38U	**0.056J**
Methylnaphthalene,2-	36.4	<3.7U	**12**	**0.17J**	<0.38U	**0.04J**
Methylphenol, 4-	0.9	<3.7U	**5.1J**	<0.62U	<0.38U	<0.39U
Methylphenol,2-	0.1	<3.7U	**1.4J**	<0.62U	<0.38U	<0.39U
Naphthalene	13	**5.4**	**33**	**1.8**	**0.12J**	**0.29J**
N-Nitrosodi-n-propylamine	NE	<3.7UJ	<5.6UJ	<0.62UJ	<0.38UJ	<0.39UJ
Phenanthrene	50	**1.8J**	**90**	**0.51J**	<0.38U	**0.19J**
Pyrene	50	<3.7UJ	**37**	**0.24J**	<0.38U	**0.16J**
Total SVOCs	**500**	**7.2**	**448.2**	**4.2**	**0.12**	**1.6**
Inorganics (mg/kg)						
Cyanide, Total	1600*	<0.31U	**22.62**	<0.54U	**0.47**	**0.53**
Aluminum	NE	**8760**	**11800**	**14000**	**8740**	**11200**
Antimony	NE	<0.49UJ	<0.81UJ	<0.88UJ	<0.51UJ	<0.58UJ
Arsenic	7.5	<0.86UJ	<4.6UJ	<5.3U	<0.51U	<1.2UJ
Barium	300	**38**	**72.4**	**47.4**	**49.7**	**141**
Beryllium	0.16	**0.38J**	**0.58J**	**0.89J**	**0.39J**	**0.43J**
Cadmium	1	**0.22J**	<0.16U	<0.18U	<0.1U	**0.26J**
Calcium	NE	**2270**	**6370**	**1790**	**2200**	**5190**
Chromium	10	**20.2**	**30.9**	**34.4**	**30.3**	**30.1**
Cobalt	30	**8.8**	**7.9**	**12.6**	**10.8**	**15.8**
Copper	25	**34.2J**	**23.2J**	**15.4J**	**40.4J**	**30.8J**
Iron	2000	**12300**	**22700**	**29800**	**14900**	**20800**
Lead	NE	**3.1**	**45.4J**	**11.3J**	<4UJ	**23.8J**
Magnesium	NE	**3540**	**5590**	**6940**	**4410**	**8070**
Manganese	NE	**95.2**	**194**	**296**	**77.8**	**792**
Mercury	0.1	<0.036U	**0.17**	<0.063U	<0.037U	<0.038U
Nickel	13	**18.6**	**16.1**	**27**	**23.4**	**26**
Potassium	NE	**2070**	**2460**	**2700**	**3690**	**7740**
Selenium	2	<0.49U	**1.7J**	<0.88U	<0.51U	<0.58U
Silver	NE	<0.29U	<0.49U	<0.53U	<0.3U	<0.35U
Sodium	NE	**581J**	**1620**	**2060**	**420J**	**1030**
Thallium	NE	<0.22U	<0.31UJ	<0.36U	<0.23U	<0.22U
Vanadium	150	**24.1**	**32.4**	**36.9**	**37.9**	**38.4**
Zinc	20	**33.2**	**99.6J**	**75.3J**	**44.4J**	**86.5J**

Table 11 (continued)
Subsurface Soil Sample Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	NYSDEC Cleanup Objectives	Sample ID (ft below grade)							
		SP-SB21 (19-19.5)	SP-SB21 (27-27.5)	SP-TP1 (10)	SP-TP2 (13)	SP-TP3 (11)	SP-TP4 (5.5)	SP-TP4 (9)	SP-TP4 (12)
Volatile Organic Compounds (mg/kg)									
Benzene	0.06	<0.58U	<0.56U	<1.6U	**0.086J**	<0.67U	<0.6U	<0.66U	<0.73U
Carbon disulfide	2.7	<0.58U	<0.56U	<1.6U	<0.77U	<0.67U	<0.6U	<0.66U	<0.73U
Ethylbenzene	5.5	<0.58U	<0.56U	<1.6U	<0.77U	<0.67U	<0.6U	<0.66U	<0.73U
Methylene chloride	0.1	<0.58U	<0.56U	<1.6U	<0.77U	<0.67U	<0.6U	<0.66U	<0.73U
Styrene	NE	<0.58U	<0.56U	<1.6U	<0.77U	<0.67U	<0.6U	<0.66U	<0.73U
Toluene	1.5	<0.58U	<0.56U	<1.6U	<0.77U	**0.12J**	<0.6U	<0.66U	<0.73U
Xylene, m,p-	1.2	<0.58U	<0.56U	<1.6U	<0.77U	**0.11J**	<0.6U	<0.66U	<0.73U
Xylene,o-	1.2	<0.58U	<0.56U	<1.6U	<0.77U	<0.67U	<0.6U	<0.66U	<0.73U
Total VOCs	**10**	**U**	**U**	**U**	**0.086**	**0.23**	**U**	**U**	**U**
Semivolatile Organic Compounds (mg/kg)									
Acenaphthene	50	<0.77U	<0.33UJ	R	**0.084J**	**0.2J**	**26J**	**0.23J**	**0.54J**
Acenaphthylene	41	<0.77U	<0.33U	R	<0.51U	**0.28J**	<10U	<0.44U	<2.4U
Anthracene	50	**0.084J**	**0.071J**	R	**0.16J**	**2.1**	**81**	**0.56**	**1.4J**
Benz[a]anthracene	0.224	**0.22J**	**0.21J**	**4J**	**0.57**	**7.2J**	**120J**	**1.6**	**3.5**
Benzo[a]pyrene	0.061	**0.25J**	**0.17J**	**8.9J**	**0.55**	**6J**	**94**	**2.2**	**3.1**
Benzo[b]fluoranthene	1.1	**0.71J**	**0.3J**	**15J**	**0.85**	**9.8J**	**150J**	**3.4**	**5.2**
Benzo[g,h,i]perylene	50	**0.15J**	**0.11J**	**6.8J**	**0.26J**	**2.5**	**50**	**1.4**	**2J**
Benzo[k]fluoranthene	1.1	<0.77U	<0.33U	R	<0.51U	<0.44U	<10U	<0.44U	<2.4U
Butyl benzyl phthalate	50	<0.77U	<0.33U	R	<0.51U	<0.44U	<10U	<0.44U	<2.4U
Carbazole	NE	**0.085J**	<0.33U	R	**0.04J**	**0.28J**	**32**	**0.22J**	<2.4U
Chrysene	0.4	<0.77U	**0.2J**	**4.9J**	**0.56**	**6.1 J**	**110J**	**1.5**	**3**
Dibenz[a,h]anthracene	0.014	<0.77U	**0.034J**	R	<0.51U	<0.44UU	<10U	**0.49**	<2.4U
Dibenzofuran	6.2	<0.77U	<0.33U	R	**0.039J**	**0.24J**	**22**	<0.44U	**0.55J**
Dimethylphenol, 2,4-	NE	<0.77U	<0.33U	R	<0.51U	<0.44U	<10U	<0.44U	<2.4U
Di-n-butyl phthalate	8.1	<0.77U	<0.33U	R	<0.51U	<0.44U	<10U	<0.44U	<2.4U
Fluoranthene	50	1	**0.38**	R	**1.1**	**15**	**270J**	**2.4**	**7.4**
Fluorene	50	<0.77U	<0.33U	R	**0.073J**	**0.62**	**37**	**0.24J**	**0.92J**
Indeno[1,2,3-cd]pyrene	3.2	**0.15J**	**0.1J**	**5.1J**	**0.24J**	**2.7J**	**45J**	**1.3J**	**1.8J**
Methylnaphthalene,2-	36.4	<0.77U	<0.33U	R	**0.043J**	<0.44U	**11**	<0.44U	<2.4U
Methylphenol, 4-	0.9	<0.77U	<0.33U	R	<0.51U	<0.44U	<10U	<0.44U	<2.4U
Methylphenol,2-	0.1	<0.77U	<0.33U	R	<0.51U	<0.44U	<10U	<0.44U	<2.4U
Naphthalene	13	<0.77U	**0.053J**	R	**0.29J**	<0.44U	**24**	**0.23J**	**1.4J**
N-Nitrosodi-n-propylamine	NE	<0.77UJ	<0.33UJ	R	R	R	<10U	R	<2.4U
Phenanthrene	50	**0.79**	**0.21J**	R	**0.39J**	**5.4J**	**330J**	**2.1**	**5.7**
Pyrene	50	**0.71J**	**0.37**	**3J**	**1J**	**14J**	**250J**	**2.3J**	**6.1J**
Total SVOCs	**500**	**4.149**	**2.208**	**47.7**	**6.25**	**72.42**	**1652**	**20.17**	**42.61**
Inorganics (mg/kg)									
Cyanide, Total	1600*	<0.33U	<0.32U	**1085**	<0.43U	**0.43**	**0.35**	<0.38U	**2.16**
Aluminum	NE	**10800**	**6010**	**8050**	**14200**	**8570**	**12100**	**10500**	**4850**
Antimony	NE	**4.7J**	<0.52UJ	**13.5J**	**12.2J**	<0.65UJ	**1.8J**	<0.65UJ	<0.74UJ
Arsenic	7.5	**3.9**	<1.3U	**62.2J**	**22**	**5.9J**	**25J**	<2.3UJ	**4.3J**
Barium	300	**195**	**53.8**	**44.1**	**235J**	**117**	**431**	**143**	**162**
Beryllium	0.16	**1J**	**0.28J**	**2.3**	**0.75**	**0.59**	**1.2**	**0.79**	**0.27J**
Cadmium	1	**0.46J**	**0.24B**	**2.2J**	<0.14UJ	**1.3J**	**3.5J**	**0.51J**	**0.34J**
Calcium	NE	**12000**	**8110J**	**3450**	**3520**	**8230J**	**35700J**	**15400J**	**20900J**
Chromium	10	**30.5**	**21.3**	**377J**	**731**	**23.3J**	**86J**	**29.2J**	**16.1J**
Cobalt	30	**11.1**	**7.3J**	**30.2**	**13.8**	**8.7**	**6.4**	**12.3**	**6**
Copper	25	**125J**	**64.2J**	**1070J**	**210J**	**45.5J**	**199J**	**52.6J**	**79.4J**
Iron	2000	**21700**	**11600**	**69900**	**27100**	**17200J**	**32300J**	**18600J**	**20500J**
Lead	NE	**347J**	**35.4**	**145J**	**192**	**167J**	**1470J**	**135J**	**480J**
Magnesium	NE	**6700**	**3380**	**1570**	**6400**	**3930**	**15300**	**5990**	**3970**
Manganese	NE	**265**	**144**	**230J**	**285J**	**194J**	**1540J**	**294J**	**224J**
Mercury	0.1	**0.2**	**0.16**	**0.29J**	**1.3J**	**0.14J**	**0.19J**	**0.22J**	**0.36J**
Nickel	13	**28.6**	**15.2**	**57.2**	**27.3**	**17.6**	**26.9**	**21.7**	**15.7**
Potassium	NE	**2250**	**2490**	**1210J**	**2940**	**1530**	**1880**	**2380**	**1240**
Selenium	2	<0.5U	<0.52UJ	<1.5UJ	<0.7UJ	<1.8UJ	<1.1UJ	<0.85UJ	<0.99UJ
Silver	NE	<0.3U	<0.31U	<0.89U	<0.41U	<0.39U	<0.35U	<0.39U	<0.44U
Sodium	NE	**965**	**366J**	**1600J**	**1130**	<389U	**811**	<388U	**601J**
Thallium	NE	<0.23U	**0.27J**	<1.86UJ	<0.28UJ	<0.27U	**0.44J**	**0.3J**	**0.36J**
Vanadium	150	**33.2**	**20.3**	**25.5**	**36.4**	**26.8**	**89.6**	**39.2**	**18.7**
Zinc	20	**838J**	**59.6**	**947J**	**323**	**211J**	**575J**	**161J**	**274J**

Table 11 (continued)
Subsurface Soil Sample Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	NYSDEC Cleanup Objectives	Sample ID (ft below grade)						
		SP-TP6 (9.8)	SP-TP8 (12)	SP-TP8A (11.5)	SP-TP-9A (13)	SP-TP9C (8.5)	SP-TP10 (7.7)	SP-TP12 (14)
Volatile Organic Compounds (mg/kg)								
Benzene	0.06	<0.78U	1.3J	1.6J	<0.54U	0.082J	<0.6U	0.36J
Carbon disulfide	2.7	<0.78U	<7.7U	<7U	<0.54U	<0.67U	<0.6U	<0.81U
Ethylbenzene	5.5	<0.78U	15	110	<0.54U	<0.67U	<0.6U	<0.81U
Methylene chloride	0.1	<0.78U	<7.7U	<7U	<0.54U	<0.67U	<0.6U	0.12J
Styrene	NE	<0.78U	<7.7U	<7U	<0.54U	<0.67U	<0.6U	<0.81U
Toluene	1.5	<0.78U	1.3J	6.3J	<0.54U	0.088J	<0.6U	<0.81U
Xylene, m,p-	1.2	<0.78U	23	150	<0.54U	<0.67U	<0.6U	<0.81U
Xylene,o-	1.2	<0.78U	13	89	<0.54U	<0.67U	<0.6U	<0.81U
Total VOCs	**10**	**U**	**53.6**	**356.9**	**U**	**0.17**	**U**	**0.48**
Semivolatile Organic Compounds (mg/kg)								
Acenaphthene	50	<4.9U	<48U	18	<0.38UJ	<43UJ	<0.37U	5.8
Acenaphthylene	41	<4.9U	<48U	21	<0.38U	6J	<0.37U	<5.5U
Anthracene	50	1.8J	27J	38	<0.38U	37J	0.12J	14.2
Benz[a]anthracene	0.224	8.4	33J	32	0.019J	200	1.6	25
Benzo[a]pyrene	0.061	11	25J	26	<0.38U	180	1.1	29
Benzo[b]fluoranthene	1.1	20	51	39	0.024J	290	2.9	40
Benzo[g,h,i]perylene	50	10	18J	14	<0.38U	99	1.9	18
Benzo[k]fluoranthene	1.1	<4.9U	<48U	<12U	<0.38U	<43U	<0.37U	<5.5U
Butyl benzyl phthalate	50	<4.9U	<48U	<12U	<0.38U	<43U	<0.37U	<5.5U
Carbazole	NE	<4.9U	<0.41U	7.8J	<0.38U	<43U	<0.37U	2.1J
Chrysene	0.4	8.1	29J	24	<0.38U	160	1.7	22
Dibenz[a,h]anthracene	0.014	<4.9U	<48U	3.1J	<0.38U	<43U	0.32J	1.8J
Dibenzofuran	6.2	<4.9U	21J	19	<0.38U	5J	<0.37U	2.6J
Dimethylphenol, 2,4-	NE	R	<48U	<12U	<0.38U	<43U	<0.37U	<5.5U
Di-n-butyl phthalate	8.1	<4.9U	<48U	<12U	<0.38U	<43U	<0.37U	<5.5U
Fluoranthene	50	10	86	91	0.026J	580	2.1	66
Fluorene	50	<4.9U	23J	42	<0.38U	9.3J	0.085J	5.6
Indeno[1,2,3-cd]pyrene	3.2	9.3	17J	12	<0.38U	97	1.4	15
Methylnaphthalene,2-	36.4	<4.9U	<48U	100	<0.38U	<43U	0.085J	1.1J
Methylphenol, 4-	0.9	R	<48U	<12U	<0.38U	<43U	<0.37U	<5.5U
Methylphenol,2-	0.1	R	<48U	<12U	<0.38U	<43U	<0.37U	<5.5U
Naphthalene	13	2.8J	40J	380	<0.38U	9.1J	0.23J	2.8J
N-Nitrosodi-n-propylamine	NE	<4.9UJ	<48UJ	<12UJ	R	R	<0.37UJ	<5.5UJ
Phenanthrene	50	6.2	93	110	<0.38U	98	0.9	57
Pyrene	50	9.9	61	83	0.042J	570J	3.1	38
Total SVOCs	**500**	**97.5**	**524**	**1059.9**	**0.11**	**2340.4**	**17.54**	**346**
Inorganics (mg/kg)								
Cyanide, Total	1600*	5.7	769	117	<0.33U	0.94	1.57	<0.46U
Aluminum	NE	1270	2810	7120	6530	3880	1310J	12500
Antimony	NE	R	20.1J	<0.87UJ	<0.55UJ	R	R	R
Arsenic	7.5	10.2J	26.7J	<6.1UJ	<1.6UJ	11.2	7.3	3.1J
Barium	300	166J	113	61.6	47.2J	62.1J	105J	49.5J
Beryllium	0.16	<0.15U	0.38	0.36	0.24	0.35	<0.13U	0.38
Cadmium	1	<0.15UJ	8.1J	0.69J	<0.11UJ	3J	<0.13UJ	<0.14UJ
Calcium	NE	4320	2000	218000	859	3770	5050J	2490
Chromium	10	5.1	8.4J	13.7J	19.5	18.9	4.9	29.6
Cobalt	30	3.1	4.6	4.9	6.7	5.2	<2.2U	9
Copper	25	94.2	278J	40J	26.8J	59.2J	44.8J	14.2
Iron	2000	31600	38600	10600	10400	16500	19500	20300
Lead	NE	152J	542J	71.8J	22.6	147	670J	17.9J
Magnesium	NE	551	545	3920	2590	741	388	4440
Manganese	NE	323	54J	197J	117J	167J	154J	177
Mercury	0.1	0.5	0.52J	0.76J	0.083J	0.32J	0.12	0.22
Nickel	13	7.4	<4.4U	9	16.1	14.5	8	17.6
Potassium	NE	689J	930	1220J	1060	368J	316J	1810
Selenium	2	<0.73UJ	<0.71UJ	14.9J	<0.55U	<0.67UJ	<0.63U	<0.72UJ
Silver	NE	<0.44U	1.7J	<2.6U	<0.33U	<0.35U	<0.38U	<0.43U
Sodium	NE	808J	754	2570	440J	<351U	<381U	2020
Thallium	NE	<0.29U	<1.4UJ	0.44J	<0.21U	<0.23U	<0.24U	<0.3U
Vanadium	150	13.1	13.8	<4.3U	16	32.2	10.8	35.4
Zinc	20	61.2J	2320J	116J	41	353	109J	52.6J

Table 11 (continued)
Subsurface Soil Sample Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	NYSDEC Cleanup Objectives	Sample ID (ft below grade)						
		SP-TP13 (12)	SP-TP14 (10)	SP-TP15 (8)	SP-TP17 (6.5)	SP-TP18 (10)	SP-TP18 (3)	SP-TP19 (13.5)
Volatile Organic Compounds (mg/kg)								
Benzene	0.06	**0.24J**	<0.67U	**0.086J**	<0.5U	<0.59U	<0.57U	<0.58U
Carbon disulfide	2.7	<0.83U	<0.67U	<0.61U	<0.5U	<0.59U	<0.57U	<0.58U
Ethylbenzene	5.5	<0.83U	<0.67U	<0.61U	<0.5U	<0.59U	<0.57U	<0.58U
Methylene chloride	0.1	**0.15J**	<0.67U	**0.13J**	<0.5U	<0.59U	<0.57U	**0.069J**
Styrene	NE	<0.83U	<0.67U	<0.61U	<0.5U	<0.59U	<0.57U	<0.58U
Toluene	1.5	<0.83U	<0.67U	**0.12J**	<0.5U	<0.59U	<0.57U	<0.58U
Xylene, m,p-	1.2	**1.2**	<0.67U	<0.61U	<0.5U	<0.59U	<0.57U	<0.58U
Xylene,o-	1.2	<0.83U	<0.67U	<0.61U	<0.5U	<0.59U	<0.57U	<0.58U
Total VOCs	**10**	**1.59**	**U**	**0.336**	**U**	**U**	**U**	**0.069**
Semivolatile Organic Compounds (mg/kg)								
Acenaphthene	50	<0.56UJ	**0.03J**	<3.8U	<0.41UJ	<0.4UJ	<3.7UJ	<0.37U
Acenaphthylene	41	<0.56U	<0.44U	<3.8U	<0.41U	<0.4U	<3.7UJ	<0.37U
Anthracene	50	**0.25J**	**0.084J**	**2.6J**	<0.41U	<0.4U	<3.7UJ	<0.37U
Benz[a]anthracene	0.224	**1.5**	**0.49**	**13**	**0.36J**	<0.4U	<3.7UJ	<0.37U
Benzo[a]pyrene	0.061	**1.6**	**0.67**	**10**	**0.34J**	<0.4U	<3.7UJ	<0.37U
Benzo[b]fluoranthene	1.1	**2.5**	**0.99**	**24**	**0.72J**	<0.4U	<3.7UJ	<0.37U
Benzo[g,h,i]perylene	50	**1.2**	**0.35J**	**9**	**0.27J**	<0.4U	<3.7UJ	<0.37U
Benzo[k]fluoranthene	1.1	<0.56U	<0.44U	<3.8U	<0.41U	<0.4U	<3.7UJ	<0.37U
Butyl benzyl phthalate	50	<0.56U	<0.44U	<3.8U	<0.41U	<0.4U	<3.7UJ	<0.37U
Carbazole	NE	<0.56U	**0.026J**	**0.92J**	<0.41U	<0.4U	<3.7UJ	<0.37U
Chrysene	0.4	**1.2**	**0.44J**	**13**	**0.39J**	<0.4U	<3.7UJ	<0.37U
Dibenz[a,h]anthracene	0.014	**0.25J**	**0.035J**	**0.78J**	<0.41U	<0.4U	<3.7UJ	<0.37U
Dibenzofuran	6.2	<0.56U	**0.025J**	<3.8U	<0.41U	<0.4U	<3.7UJ	<0.37U
Dimethylphenol, 2,4-	NE	<0.56U	<0.44U	R	<0.41U	<0.4U	<3.7UJ	<0.37U
Di-n-butyl phthalate	8.1	<0.56U	<0.44U	<3.8U	<0.41U	<0.4U	<3.7UJ	<0.37U
Fluoranthene	50	**2.3**	**0.59**	**25**	**0.52J**	<0.4U	<3.7UJ	<0.37U
Fluorene	50	<0.56U	**0.036J**	<3.8U	<0.41U	<0.4U	<3.7UJ	<0.37U
Indeno[1,2,3-cd]pyrene	3.2	**1**	**0.34J**	**8.6**	**0.25J**	<0.4U	<3.7UJ	<0.37U
Methylnaphthalene,2-	36.4	<0.56U	**0.029J**	<3.8U	<0.41U	<0.4U	<3.7UJ	<0.37U
Methylphenol, 4-	0.9	<0.56U	<0.44U	R	<0.41U	<0.4U	<3.7UJ	<0.37U
Methylphenol,2-	0.1	<0.56U	<0.44U	R	<0.41U	<0.4U	<3.7UJ	<0.37U
Naphthalene	13	**3.8**	**0.063J**	**0.94J**	<0.41U	<0.4U	<3.7UJ	<0.37U
N-Nitrosodi-n-propylamine	NE	<0.56UJ	R	<3.8UJ	R	R	R	<0.37UJ
Phenanthrene	50	**0.69**	**0.3J**	**16**	**0.19J**	<0.4U	<3.7UJ	<0.37U
Pyrene	50	**2J**	**0.6J**	**21**	**0.53J**	<0.4UJ	<3.7UJ	<0.37U
Total SVOCs	**500**	**18.29**	**5.10**	**144.84**	**3.57**	**U**	**U**	**U**
Inorganics (mg/kg)								
Cyanide, Total	1600*	<0.48U	<0.39U	**16.5**	<0.34U	<0.31U	<0.32U	**0.51**
Aluminum	NE	**13300**	**11300**	**1510**	**12000**	**12600**	**12400**	**12800**
Antimony	NE	R	<1.8UJ	R	R	<0.61UJ	<0.74UJ	R
Arsenic	7.5	**6.7J**	**11.4**	**7.1J**	**5**	<2.7UJ	**3.8**	**1.7J**
Barium	300	**149J**	**119J**	**120J**	**475J**	**125J**	**131J**	**15.2J**
Beryllium	0.16	**0.4**	**0.9**	<0.11U	**0.45**	**0.44**	**0.44**	**0.47**
Cadmium	1	<0.16UJ	<0.42UJ	<0.11UJ	<0.12UJ	<0.11UJ	**0.27J**	<0.1UJ
Calcium	NE	**2350**	**12000**	**1880**	**11700**	**4830**	**4480**	**1320**
Chromium	10	**33**	**156**	**9**	**22.8**	**26.6**	**38.7**	**28.7**
Cobalt	30	**9.3**	**11.6**	**3.6**	**13.3**	**14.6**	**14.6**	**22.7**
Copper	25	**18.5**	**69.9J**	**28.5**	**62.6**	**47.3J**	**80.4J**	**23.8**
Iron	2000	**19400**	**29200**	**24800**	**21700**	**20900**	**22300**	**19100**
Lead	NE	**18.6J**	**216**	**264J**	**473**	**92**	**142**	**27.9J**
Magnesium	NE	**5410**	**4830**	**851**	**5040**	**6690**	**6130**	**2840**
Manganese	NE	**204**	**348J**	**59.7**	**402J**	**431J**	**189J**	**1000**
Mercury	0.1	**1.2**	**0.87J**	**0.2**	**0.29J**	**0.36J**	**0.23J**	<0.037U
Nickel	13	**18.5**	**18**	**4.2**	**24.7**	**24.6**	**25.4**	**14.7**
Potassium	NE	**2060**	**2060**	**2500**	**2740**	**4070**	**4390**	**608**
Selenium	2	<0.79UJ	<0.7U	<0.55UJ	<0.59U	<0.56U	<0.55U	<0.5UJ
Silver	NE	<0.47U	<0.42U	<0.33U	<0.35U	<0.34U	<0.33U	<0.3U
Sodium	NE	**1410**	<418U	**1160**	<355U	**1130**	<329U	<299U
Thallium	NE	<0.32U	<0.25U	<0.23UJ	<0.24U	<0.23U	<0.22UJ	<0.23U
Vanadium	150	**34.4**	**35.3**	**11.4**	**30.4**	**34.7**	**36.2**	**30**
Zinc	20	**78.8J**	**134**	**80.7J**	**366**	**119**	**174**	**45.6J**

Table 11 (continued)
Subsurface Soil Sample Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	NYSDEC Cleanup Objectives	Sample ID (ft below grade)						
		SP-TP20A (3.5)	SP-TP20B (12)	SP-TP21 (10)	SP-TP23 (11)	SP-TP25 (9.4)	SP-TP26 (10)	SP-TP26 (4.4)
Volatile Organic Compounds (mg/kg)								
Benzene	0.06	<0.64U	<0.63U	<0.57U	<0.59U	<0.64U	<1.1U	<0.65U
Carbon disulfide	2.7	<0.64U	<0.63U	<0.57U	<0.59U	<0.64U	<1.1U	<0.65U
Ethylbenzene	5.5	<0.64U	<0.63U	<0.57U	<0.59U	<0.64U	<1.1U	<0.65U
Methylene chloride	0.1	<0.64U	<0.63U	<0.57U	<0.59U	<0.64U	<1.1U	<0.65U
Styrene	NE	<0.64U	<0.63U	<0.57U	<0.59U	<0.64U	<1.1U	<0.65U
Toluene	1.5	<0.64U	0.091J	<0.57U	<0.59U	<0.64U	<1.1U	<0.65U
Xylene, m,p-	1.2	<0.64U	<0.63U	<0.57U	<0.59U	<0.64U	<1.1U	<0.65U
Xylene,o-	1.2	<0.64U	<0.63U	<0.57U	<0.59U	<0.64U	<1.1U	<0.65U
Total VOCs	**10**	**U**	**0.091**	**U**	**U**	**U**	**U**	**U**
Semivolatile Organic Compounds (mg/kg)								
Acenaphthene	50	<3.9U	R	<0.37UJ	<0.35U	<0.4U	<0.7U	<4.1U
Acenaphthylene	41	<3.9U	0.24J	<0.37U	<0.35U	<0.4U	<0.7U	<4.1U
Anthracene	50	<3.9U	0.32J	<0.37U	0.073J	<0.4U	<0.7U	0.83J
Benz[a]anthracene	0.224	0.95J	0.46J	<0.37U	0.15J	<0.4U	<0.7U	4J
Benzo[a]pyrene	0.061	0.85J	0.38J	<0.37U	0.15J	<0.4U	<0.7U	3.2J
Benzo[b]fluoranthene	1.1	1.8J	0.63J	<0.37U	0.27J	<0.4U	<0.7U	6.4
Benzo[g,h,i]perylene	50	<3.9U	R	<0.37U	0.1J	<0.4U	<0.7U	2.4J
Benzo[k]fluoranthene	1.1	<3.9U	R	<0.37U	<0.35U	<0.4U	<0.7U	<4.1U
Butyl benzyl phthalate	50	<3.9U	R	<0.37U	<0.35U	<0.4U	<0.7U	<4.1U
Carbazole	NE	<3.9U	R	<0.37U	<0.35U	<0.4U	<0.7U	<4.1U
Chrysene	0.4	1.1J	0.42J	<0.37U	0.17J	<0.4U	<0.7U	3.9J
Dibenz[a,h]anthracene	0.014	<3.9U	R	<0.37U	<0.35U	<0.4U	<0.7U	<4.1U
Dibenzofuran	6.2	<3.9U	0.23J	<0.37U	<0.35U	<0.4U	<0.7U	<4.1U
Dimethylphenol, 2,4-	NE	<3.9U	<3.7U	<0.37U	<0.35U	<0.4U	<0.7U	<4.1UJ
Di-n-butyl phthalate	8.1	<3.9U	<3.7U	<0.37U	<0.35U	<0.4U	<0.7U	<4.1U
Fluoranthene	50	2.2J	1J	<0.37U	0.32J	<0.4U	<0.7U	8.1
Fluorene	50	<3.9U	0.32J	<0.37U	<0.35U	<0.4U	<0.7U	<4.1U
Indeno[1,2,3-cd]pyrene	3.2	0.53J	R	<0.37U	0.078J	<0.4U	<0.7U	2.1J
Methylnaphthalene,2-	36.4	<3.9U	0.6J	<0.37U	<0.35U	<0.4U	<0.7U	<4.1U
Methylphenol, 4-	0.9	<3.9U	<3.7U	<0.37U	<0.35U	<0.4U	<0.7U	<4.1UJ
Methylphenol,2-	0.1	<3.9U	<3.7U	<0.37U	<0.35U	<0.4U	<0.7U	<4.1UJ
Naphthalene	13	0.47J	4.2J	<0.37U	<0.35U	<0.4U	<0.7U	0.83J
N-Nitrosodi-n-propylamine	NE	<3.9UJ	R	R	<0.35UJ	<0.4UJ	<0.7UJ	<4.1UJ
Phenanthrene	50	0.86J	1.2J	<0.37U	0.24J	<0.4U	<0.7U	2.9J
Pyrene	50	1.9J	0.97J	0.03J	0.29J	<0.4U	<0.7U	5.8
Total SVOCs	**500**	**10.66**	**10.97**	**0.03**	**1.84**	**U**	**U**	**40.46**
Inorganics (mg/kg)								
Cyanide, Total	1600*	0.33	9.7	<0.31U	<0.4U	<0.39U	3.9	<0.34U
Aluminum	NE	13200	13400	10100	6140J	6300J	14500J	4280J
Antimony	NE	<0.79UJ	<0.54UJ	R	R	R	R	0.79J
Arsenic	7.5	<4.3UJ	<2.4UJ	<1.6UJ	7.1	5	7.9	8.1
Barium	300	135	133	88.1J	270J	211J	104J	477J
Beryllium	0.16	0.51	0.4	0.36	0.32	0.52	0.8	0.27
Cadmium	1	2.3J	1.8J	<0.11UJ	0.8J	<0.41UJ	<0.2U	2.4J
Calcium	NE	4020	1870	1410	34000J	5670J	3540J	11300J
Chromium	10	45.8J	40.1	23.1	27.4	13.6	29.6	25.6
Cobalt	30	15	16.6	13.1	6.3	7.6	15.1	6.5
Copper	25	88.4J	66.7J	34.6J	127J	66J	<17UJ	191J
Iron	2000	24100	23700	16800	18800	20700	18400	23100
Lead	NE	140J	101J	16.4	493J	3040J	33.8J	1160J
Magnesium	NE	6160	6690	5100	4330	2330	4100	3560
Manganese	NE	204J	192J	140J	248J	307J	170J	467J
Mercury	0.1	0.35J	0.16J	0.041J	0.44	0.26	<0.07U	0.52
Nickel	13	26	23.9	23.7	24.8	16.4	30.6	33.1
Potassium	NE	3920J	5350J	3420	763J	689J	1360J	930J
Selenium	2	<0.57UJ	<0.54UJ	<0.54U	<0.7U	<0.6U	<1.1UJ	<0.6U
Silver	NE	0.4J	<0.32U	<0.32U	<0.42U	0.68J	<0.61U	<0.36U
Sodium	NE	<342U	787	<321U	<421U	<414U	766J	<362U
Thallium	NE	<0.22U	<0.22U	<0.21U	<0.27U	<0.28U	<0.41U	<0.24U
Vanadium	150	41.2	41.7	27.9	30.2	30.9	31.9	79.8
Zinc	20	202J	174J	52.9	508J	244J	428J	791J

Table 11 (continued)
Subsurface Soil Sample Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Chemical Name	NYSDEC Cleanup Objectives	Sample ID (ft below grade)				
		SP-TP27A (10)	SP-TP27B (12)	SP-TP28 (10)	SP-TP29 (3)	SP-TP29 (7)
Volatile Organic Compounds (mg/kg)						
Benzene	0.06	<0.71U	210	<0.82U	<0.52U	<0.56U
Carbon disulfide	2.7	<0.71U	<45U	<0.82U	<0.52U	<0.56U
Ethylbenzene	5.5	<0.71U	42J	<0.82U	<0.52U	<0.56U
Methylene chloride	0.1	<0.71U	<45U	<0.82U	<0.52U	<0.56U
Styrene	NE	<0.71U	20J	<0.82U	<0.52U	<0.56U
Toluene	1.5	<0.71U	500	0.14J	<0.52U	<0.56U
Xylene, m,p-	1.2	<0.71U	390	0.19J	<0.52U	<0.56U
Xylene,o-	1.2	<0.71U	160	<0.82U	<0.52U	<0.56U
Total VOCs	**10**	**U**	**1322**	**0.33**	**U**	**U**
Semivolatile Organic Compounds (mg/kg)						
Acenaphthene	50	2.7J	260J	<1.8U	0.12J	<0.37U
Acenaphthylene	41	6.4J	730J	<1.8U	<0.38U	<0.37U
Anthracene	50	41J	1200	<1.8U	0.3J	<0.37U
Benz[a]anthracene	0.224	97	910J	0.78J	1.1	<0.37U
Benzo[a]pyrene	0.061	77	700J	0.78J	1	<0.37U
Benzo[b]fluoranthene	1.1	130	1000	1.3J	1.9	<0.37U
Benzo[g,h,i]perylene	50	32J	270J	0.56J	0.7	<0.37U
Benzo[k]fluoranthene	1.1	<42U	<940U	<1.8U	<0.38U	<0.37U
Butyl benzyl phthalate	50	<42U	<940U	<1.8U	<0.38U	<0.37U
Carbazole	NE	5JD	460J	<1.8U	0.11J	<0.37U
Chrysene	0.4	81	690J	0.73J	1.3	<0.37U
Dibenz[a,h]anthracene	0.014	3.6J	<940U	<1.8U	0.17J	<0.37U
Dibenzofuran	6.2	7.4J	1000	<1.8U	0.077J	<0.37U
Dimethylphenol, 2,4-	NE	<42U	<940U	<1.8U	<0.38U	<0.37U
Di-n-butyl phthalate	8.1	<42U	<940U	<1.8U	<0.38U	<0.37U
Fluoranthene	50	210	2200	1.6J	1.6	<0.37U
Fluorene	50	12J	1200	<1.8U	0.16J	<0.37U
Indeno[1,2,3-cd]pyrene	3.2	32J	270J	<1.8U	0.63	<0.37U
Methylnaphthalene,2-	36.4	<42U	1700	<1.8U	0.093J	<0.37U
Methylphenol, 4-	0.9	<42U	<940U	<1.8U	<0.38U	<0.37U
Methylphenol,2-	0.1	<42U	<940U	<1.8U	<0.38U	<0.37U
Naphthalene	13	6.2J	7500	<1.8U	0.18J	<0.37U
N-Nitrosodi-n-propylamine	NE	<42UJ	<940UJ	<1.8UJ	<0.38UJ	<0.37UJ
Phenanthrene	50	150	3800	0.56J	1.3	<0.37U
Pyrene	50	180	1900	1.3J	2.3	<0.37U
Total SVOCs	**500**	**1073.3**	**25790**	**7.61**	**13.04**	**U**
Inorganics (mg/kg)						
Cyanide, Total	1600*	32.1	169	15.5	<0.33U	<0.31U
Aluminum	NE	7310	3170	13900J	10400J	13800J
Antimony	NE	<0.83UJ	<0.76UJ	R	R	R
Arsenic	7.5	12.5J	<3.7UJ	3.5	4.9	<0.53U
Barium	300	49.7	20.5	105J	117J	132J
Beryllium	0.16	0.61	0.17J	0.73	0.37	0.46
Cadmium	1	1.1J	0.33J	<0.14UJ	0.74J	<0.11UJ
Calcium	NE	34100	194000	13200J	4050J	1590J
Chromium	10	47.3J	3.9J	28.8	46.1	27.7
Cobalt	30	11	1.5J	12.2	13.3	14.8
Copper	25	51.4J	25.6J	36.5J	113J	44.6J
Iron	2000	15200	4760	21600	20500	24700
Lead	NE	86.1J	32.7J	138J	163J	14.5J
Magnesium	NE	3110	1750	9660	4990	7060
Manganese	NE	351J	102J	616J	193J	142J
Mercury	0.1	2.1J	0.13J	2.1J	0.46	<0.036U
Nickel	13	21.4	2.8	20.7	27.1	18.2
Potassium	NE	947J	443J	1600J	3040J	6690J
Selenium	2	<0.68UJ	13.4J	<0.7U	<0.58U	<0.53U
Silver	NE	<0.41U	<2.3U	<0.42U	<0.35U	<0.32U
Sodium	NE	641J	1970	439J	752	<318U
Thallium	NE	<0.26UJ	<0.29U	0.3J	<0.23U	<0.22U
Vanadium	150	21.8	5.4	31.7	31	39.7
Zinc	20	201J	32.8J	169J	181J	65J

Table 11 (continued)
Subsurface Soil Sample Analytical Results Summary
Comparison to NYSDEC-Recommended Soil Cleanup Objectives
East 173rd Street Works
Bronx, New York

Notes:

Only those compounds detected are shown
mg/kg - milligram per kilogram
TBE - to be established
NE - cleanup objective not established
B - analyte detected in blank
U - not detected at the detection limit provided
J - estimated value below laboratory detection limit
R - sample rejected
Blue - compound detected in sample
Red - concentration exceeds NYSDEC-recommended cleanup objective
E - result exceeded calibration range of instrument, secondary dilution required
*EPA generic soil screening level (EPA, 1996a)

Table 12
Subsurface Soil Summary Statistics
East 173rd Street Works
Bronx, New York

Compound Name	Number of Samples Analyzed	NYSDEC Cleanup Objective	Number of Samples that Exceed NYS RSCO	Maximum Detected Concentration (mg/kg)	Sample with Maximum Detected Concentration	Percent Detected that Exceeded RSCO
Volatile Organic Compounds (VOCs) (mg/kg)						
Benzene	103	0.06	23	210	TP-27B (12)	22
Carbon Disulfide	103	2.7	1	22	SB-15 (17)	1
Ethylbenzene	103	5.5	7	110	TP-8A (11.5)	7
Methylene Chloride	103	0.1	4	0.15	TP-13 (12)	4
Toluene	103	1.5	7	500	TP-27B (12)	7
Xylene, m,p-	103	1.2	8	390	TP-27B (12)	8
Xylene, o-	103	1.2	8	160	TP-27B (12)	8
Semivolatile Organic Compounds (SVOCs) (mg/kg)						
2-Methyl Naphthalene	103	36.4	4	2400	SB-15 (17)	4
2-Methyl Phenol	103	0.1	1	1.4	SB-20 (14-14.5)	1
4-Methylphenol	103	0.9	1	5.1	SB-20 (14-14.5)	1
Acenaphthylene	103	41	3	960	SB-15 (17)	3
Acenapthene	103	50	1	260	TP-27B (12)	1
Anthracene	103	50	7	2700	SB-15 (17)	7
Benzo(g,h,i)perylene	103	50	4	930	SB-15 (17)	4
Benzo(a)anthracene	103	0.224	49	1900	SB-15 (17)	48
Benzo(a)pyrene	103	0.061	53	1700	SB-15 (17)	52
Benzo(b)fluoranthene	103	1.1	41	2300	SB-15 (17)	40
Butyl Benzyl Phthalate	103	50	1	64	MW-2S (10.7-11.1)	1
Chrysene	103	0.4	46	1740	SB-15 (17)	45
Dibenzo(a,h)anthracene	103	0.014	15	5.7	SB-1 (6-8)	15
Dibenzofuran	103	6.2	10	1700	SB-15 (17)	10
Fluoranthene	103	50	14	5100	SB-15 (17)	14
Fluorene	103	50	3	1900	SB-15 (17)	3

Table 12 (continued)
Subsurface Soil Summary Statistics
East 173rd Street Works
Bronx, New York

Compound Name	Number of Samples Analyzed	NYSDEC Cleanup Objective	Number of Samples that Exceed NYS RSCO	Maximum Detected Concentration (mg/kg)	Sample with Maximum Detected Concentration	Percent Detected that Exceeded RSCO
Indeno(1,2,3-cd)pyrene	103	3.2	20	790	SB-15 (17)	19
Naphthalene	103	13	12	10172.57	SB-15 (17)	12
Phenanthrene	103	50	13	10043.11	SB-15 (17)	13
Pyrene	103	50	11	5100	SB-15 (17)	11
Inorganic Compounds (mg/kg)						
Cyanide	103	1600*	0	1085	TP-1 (10)	0
Arsenic	103	7.5	18	62.6	SB-1(6-8)	18
Barium	103	300	5	494	SB-7 (13-14)	5
Beryllium	103	0.16	78	2.3	TP-1 (10)	76
Cadmium	103	1	16	14.7	MW-4D (19-19.5)	16
Chromium	103	10	96	731	TP-2 (13)	93
Cobalt	103	30	2	72.5	SB-1 (6-8)	2
Copper	103	25	66	1660	SB-17 (26)	64
Iron	103	2000	103	69900	TP-1 (10)	100
Mercury	103	0.1	52	6.2	SB-19 (12-12.5)	51
Nickel	103	13	79	114	MW-4D (19-19.5)	77
Selenium	103	2	2	14.9	TP-8A (11.5)	2
Zinc	103	20	100	2320	TP-8 (12)	97

Note:
NYS RSCO - New York State Recommended Soil Cleanup Objective
*EPA Generic Soil Screening Level (EPA, 1996a)

Table 13
Sediment Sample Analytical Results Summary
Comparison to NYSDEC - Sediment Screening Criteria
East 173rd Street Works
Bronx, New York

Chemical Name	NYSDEC Sediment Screening Criteria				Sample ID								
	BAT	BCT	LEL	SEL	SP-SED 1	SP-SED 2	SP-SED 3	SP-SED 4	SP-SED 5	SP-SED 6	SP-SED 7	SP-SED 8	SP-SED 9
Semivolatile Organic Compounds (mg/kg)													
Pyrene	8775	961	NA	NA	0.49J	0.66J	0.18J	0.42J	0.59J	0.8	0.65J	0.39J	<1.2U
Fluoranthene	NE	1020	NA	NA	0.46J	0.69J	0.18J	0.44J	0.67J	0.73J	0.65J	0.42J	0.45J
Phenanthrene	NE	120	NA	NA	R	0.33J	<0.48U	<0.8U	0.25J	0.33J	0.39J	<0.67U	R
Benzo(a)anthracene	94	12	NA	NA	R	0.31J	<0.48U	<0.8U	0.24J	0.31J	0.28J	0.18J	R
Chrysene	NE	NE	NA	NA	R	0.42J	<0.48U	0.23J	0.34J	0.42J	0.36J	0.24J	R
Benzo(b)fluoranthene	NE	NE	NA	NA	R	0.8J	0.25J	0.44J	0.6J	0.72J	0.69J	0.45J	0.49J
Benzo(a)pyrene	NE	NE	NA	NA	R	0.34J	<0.48U	0.8J	0.26J	0.34J	0.3J	0.19J	R
Benzo(g,h,i)perylene	NE	NE	NA	NA	R	<0.87U	<0.48U	<0.8U	0.24J	0.28J	0.28J	0.18J	R
Indeno(1,2,3-cd)pyrene	NE	NE	NA	NA	R	<0.87U	<0.48U	<0.8U	<0.77U	0.23J	R	<0.67U	R
Inorganics (mg/kg)													
Aluminum	NA	NA	NE	NE	14600	11600	8440	12000	13800	21300	17000J	11100	14600J
Antimony	NA	NA	2	25	**2.3J**	1.4J	<0.63U	1.5J	1.7J	1.9J	**2.2J**	1.6J	**2.4J**
Arsenic	NA	NA	6	33	**14.3**	**9.4**	6	**7.5J**	**6.3J**	**18.9**	**8.6J**	5.5J	**8.2J**
Barium	NA	NA	NE	NE	193	271	35.9	122	186	225	149J	124	184J
Beryllium	NA	NA	NE	NE	0.78	0.62	0.46	0.52	0.65	0.99	0.74J	0.43J	0.56J
Cadmium	NA	NA	0.6	9	**2.9**	**1.3**	**0.79**	**1.9**	**2**	**6.7**	**1.7J**	**1.3**	**2.0J**
Calcium	NA	NA	NE	NE	11900	10400	2580	13200	17900	5910	18700J	11400	19800J
Chromium	NA	NA	26	110	**64.1J**	**54.7J**	**30.2J**	**53.8**	**60.6**	**75.5**	**73.6J**	**47.3**	**62.6J**
Cobalt	NA	NA	NE	NE	13.9	11.4	6.3	12.6	14.8	16.4	17.1J	12	14.7J
Copper	NA	NA	16	110	**64.1J**	**64.1J**	**97.5J**	**177J**	**196J**	**353J**	**247J**	**155J**	**221J**
Iron	NA	NA	20000	40000	**39400**	**36300**	**16300**	**26900**	**30300**	**34600**	**40500J**	**23600**	**31400J**
Lead	NA	NA	31	110	**526J**	**462J**	**208J**	**317J**	**456J**	**693J**	**454J**	**318J**	**373J**
Magnesium	NA	NA	NE	NE	12000	10100	3620	12100	13500	10600	16100J	10100	14700J
Manganese	NA	NA	460	1100	283J	283J	283J	417J	301J	**519J**	**550J**	303J	**746J**
Mercury	NA	NA	0.15	1.3	**0.94**	**0.58**	**0.25**	**0.71**	**0.7**	**2.1**	**0.81J**	**1.4**	**0.71J**
Nickel	NA	NA	16	50	**44.6**	**35.2**	**19.6**	**36.6**	**42.5**	**55.1**	**49.3J**	**33.2**	**45.2J**
Potassium	NA	NA	NE	NE	2760	2340J	1240J	2500J	2870J	3870J	3070J	2770J	2450J
Silver	NA	NA	1	2.2	**9.1**	**1.2J**	<0.38U	**1.6**	**2.8**	**2.7**	**2.3J**	1.0J	**2.5J**
Sodium	NA	NA	NE	NE	10200	8020	2660	10100J	7160J	10500J	9610J	4050J	11700J
Thallium	NA	NA	NE	NE	0.63J	<0.52	0.27J	0.54J	0.44	0.73	<0.67U	0.42	0.69J
Vanadium	NA	NA	NE	NE	52.7	45	32.7	42.3	50.3	89	61.5J	40.1	51.1J
Zinc	NA	NA	120	270	**939J**	**713J**	**227J**	**561**	**684**	**701**	**771J**	**484**	**712J**
Cyanide, Total	NA	NA	NE	NE	44	8.78J	5.4	8.79	9.05	<0.68U	1.15	4.28	7.77

Notes:

Only those compounds detected are shown
NA - not applicable
BAT - Benthic Acute Toxicity
BCT - Benthic Chronic Toxicity
LEL - Lowest effect level
SEL - Severe effect level

NE - criteria not established
U - not detected at the detection limit provided
J - estimated value below laboratory detection limit
R - sample rejected
Green - concentration exceeds LEL sediment screening criteria
Red - concentration exceeds SEL sediment screening criteria

Table 14
Groundwater Sample Analytical Results Summary
Comparison to NYSDEC Ambient Water Quality Standards
East 173rd Street Works
Bronx, New York

Chemical Name	NYSDEC AWQS	Sample ID							
		SP-MW1D	SP-MW1S	SP-MW2D	SP-MW2S	SP-MW3D	SP-MW3S	SP-MW4D	SP-MW4S
Volatile Organic Compounds (ug/l)									
Benzene	1	<10U	<10U	**1300**	**17**	**3J**	<10U	**660**	<10U
cis-1,2-Dichloroethene	5	<10U	<10U	<200U	<10U	**4J**	<10U	<10U	<10U
Ethylbenzene	5	<10U	<10U	**1400**	<10U	<10U	<10U	**2J**	<10U
Styrene	5	<10U	<10U	**40J**	<10U	<10U	<10U	<10U	<10U
Toluene	5	<10U	<10U	**4000**	**3J**	<10U	<10U	<10U	<10U
Xylene, m,p-	5	<10U	<10U	**2900**	**3J**	<10U	<10U	**2J**	<10U
Xylene,o-	5	<10U	<10U	**1100**	**2J**	<10U	<10U	**2J**	<10U
Semivolatile Organic Compounds (ug/l)									
Acenaphthene	20	<10U	<11U	**68J**	**6J**	<12U	<10U	**33**	<11U
Naphthalene	10	<10U	<11U	**2800**	**32**	**2J**	**3J**	**2J**	<11U
2,4-Dimethylphenol	50	<10U	<11U	<540U	**1J**	<12U	<10U	<11U	<11U
Dibenzofuran	NE	<10U	<11U	**60J**	**2J**	<12U	<10U	<11U	<11U
Phenanthrene	50	<10U	<11U	<540U	**1J**	<12U	<10U	<11U	<11U
Fluoranthene	50	<10U	<11U	<540U	**3J**	<12U	<10U	<11U	<11U
Pyrene	50	<10UJ	<11U	<540UJ	**2J**	<12UJ	<10UJ	<11UJ	<11UJ
Carbazole	NE	<10U	<11U	**170J**	**7J**	<12U	<10U	<11U	<11U
2-Methylnaphthalene	NE	<10U	<11U	**250J**	<11U	<12U	<10U	<11U	<11U
Acenaphthylene	NE	<10U	<11U	**77J**	<11U	<12U	<10U	<11U	<11U
Fluorene	50	<10U	<11U	<540U	**2J**	<12U	<10U	**4J**	<11U
Inorganics (mg/L)									
Aluminum	NE	<0.05U	<0.05U	<0.05U	<0.05U	**2.7J**	<0.05U	<0.05U	<0.05U
Barium	1	**0.269J**	**0.427**	**0.0927**	**0.323**	**0.0922**	**0.28**	**0.0832**	**0.166J**
Calcium	NE	**211**	**184**	**156**	**180**	**55.1**	**146J**	**115**	**180J**
Chromium	0.05	<0.005U	<0.005U	<0.005U	<0.005U	**0.0101J**	<0.005U	<0.005U	<0.005U
Iron	0.3	**2.58**	**2.79**	**0.791**	**38.7**	**8.26**	**22.8**	**2.33**	**17.4**
Magnesium	35	**23.4J**	**21.8**	**87.6**	**35.3**	**47.1**	**38.7**	**48.5**	**73.2**
Manganese	0.3	**0.878**	**0.928**	**0.392**	**1.28**	**0.326**	**1.7**	**1.5**	**0.459**
Potassium	NE	**22.5**	**19.3**	**43.3J**	**23.1**	**31.6**	**26.8**	**24.3**	**32.3J**
Selenium	0.01	**0.0074J**	**0.009J**	**0.0136J**	<0.005UJ	<0.005UJ	<0.005UJ	**0.0088J**	**0.0071J**
Sodium	20	**797**	**780**	**727**	**621**	**652**	**436**	**476**	**720**
Vanadium	NE	<0.005U	**0.0077J**	**0.012**	**0.005J**	**0.0158**	<0.005U	**0.0106**	**0.0101**
Cyanide, Total	0.2	<0.007U	<0.007U	**0.722**	**0.067**	**0.109**	**0.095**	**0.034**	**0.138**

Notes:
Only the compounds detected are shown
mg/l - milligrams per liter
ug/l - micrograms per liter
U - not detected at the detection limit provided
AWQS - Ambient Water Quality Standard (if no AWQS is established, the guidance value was used)
NE - standard not established
U - not detected at the detection limit provided
J - estimated value below laboratory detection limit
Blue - compound detected in sample
Red - concentration exceeds NYS AWQS

Table 15
Groundwater Sample Target Analyte List Metals Analytical Results
Comparison of Filtered and Non-Filtered Results
East 173rd Street Works
Bronx, New York

Analyte	SP-MW1D		SP-MW1S		SP-MW2D		SP-MW2S	
	Non-Filtered	Filtered	Non-Filtered	Filtered	Non-Filtered	Filtered	Non-Filtered	Filtered
Inorganics (mg/L)								
Aluminum	<0.15U	<0.15U	<0.15U	<0.15U	<0.15U	<0.15U	<0.15U	<0.15U
Antimony	<0.01U	<0.01U	<0.01U	<0.01U	<0.01U	<0.01U	<0.01U	<0.01U
Arsenic	<0.01U	<0.01U	<0.01U	<0.01U	<0.01U	<0.01U	<0.01U	<0.01U
Barium	0.269	0.339	0.427	0.426	0.0927	0.0783	0.323	0.319
Beryllium	<0.001U	<0.001U	<0.001U	<0.001U	<0.001U	<0.001U	<0.001U	<0.001U
Cadmium	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U
Calcium	211	225	184	185	156	131	180	183
Chromium	<0.006U	<0.006U	<0.006U	<0.006U	<0.006U	<0.006U	<0.006U	<0.006U
Cobalt	<0.05U	<0.05U	<0.05U	<0.05U	<0.05U	<0.05U	<0.05U	<0.05U
Copper	0.0121	<0.005U	0.0105	<0.005U	0.00945	0.011	0.00968	0.0101
Iron	2.58	2	2.79	2.93	0.791	0.344	38.7	36.6
Lead	0.00512	<0.003U	<0.003U	<0.003U	<0.003U	<0.003U	<0.003U	<0.003U
Manganese	0.878	1.16	0.928	0.935	0.392	0.323	1.28	1.3
Mercury	<0.0002U	<0.0002U	<0.0002U	<0.0002U	<0.0002U	<0.0002U	<0.0002U	<0.0002U
Nickel	<0.04U	<0.04U	<0.04U	<0.04U	<0.04U	<0.04U	<0.04U	<0.04U
Potassium	22.5	23.4	19.3	18.6	43.3	60.3	23.1	18.9
Selenium	0.00735	0.00902	0.00899	0.012	0.0136	0.0113	<0.005U	<0.005U
Silver	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U
Sodium	797	779	780	801	727	717	621	668
Thallium	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U
Vanadium	<0.05U	<0.05U	<0.05U	<0.05U	<0.05U	<0.05U	<0.05U	<0.05U
Zinc	<0.02U	0.0383	0.0236	0.0344	<0.02U	0.0205	<0.02U	0.0232

Notes:
U = not detected at the detection limit provided
mg/L = milligrams/liter

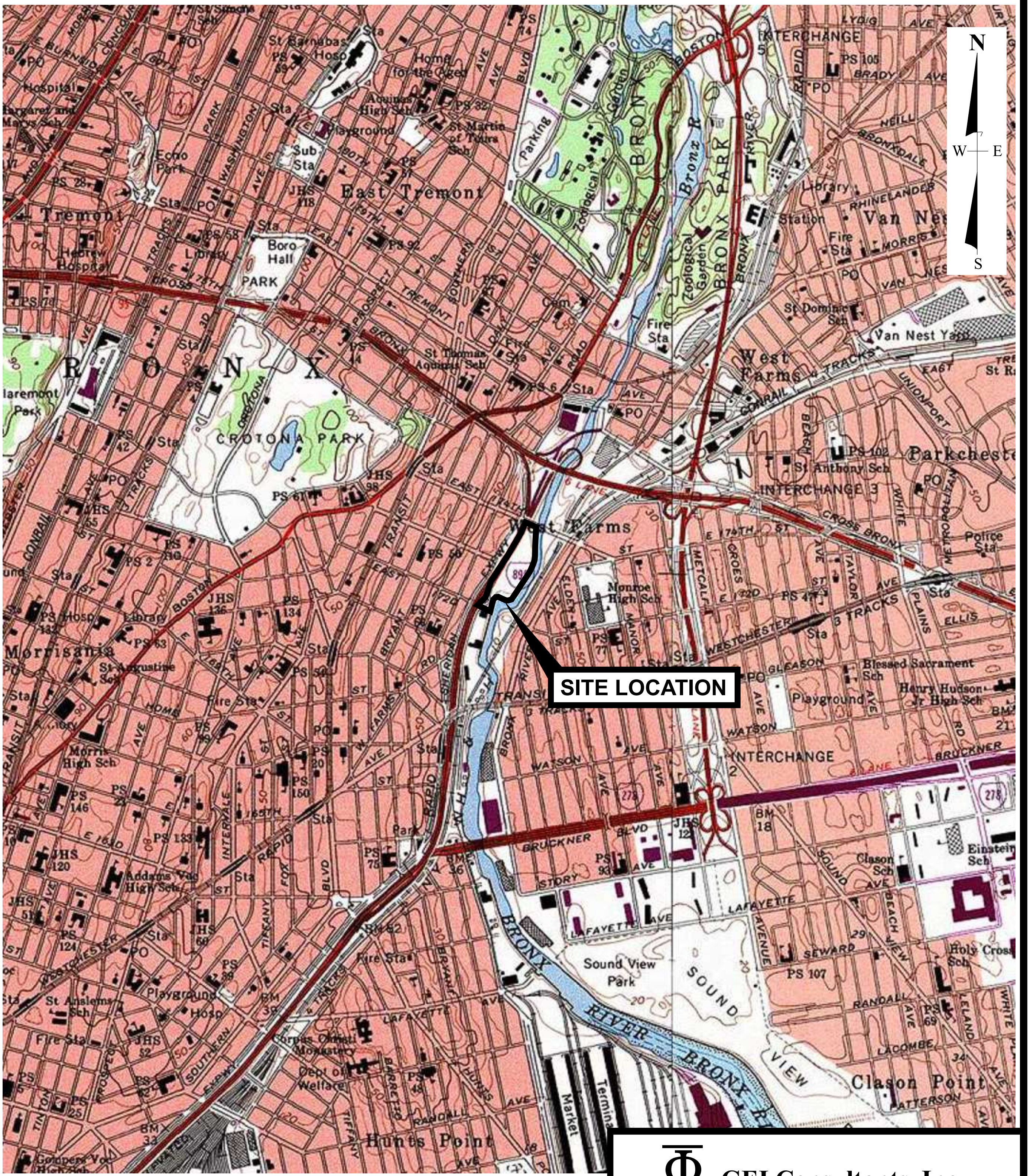
Table 15
Groundwater Sample Target Analyte List Metals Analytical Results
Comparison of Filtered and Non-Filtered Results
East 173rd Street Works
Bronx, New York

Analyte	SP-MW3D		SP-MW3S		SP-MW4D		SP-MW4S	
	Non-Filtered	Filtered	Non-Filtered	Filtered	Non-Filtered	Filtered	Non-Filtered	Filtered
Inorganics (mg/L)								
Aluminum	2.7	<0.15U	<0.15U	<0.15U	<0.15U	<0.15U	<0.15U	<0.15U
Antimony	<0.01U	<0.01U	<0.01U	<0.01U	<0.01U	<0.01U	<0.01U	<0.01U
Arsenic	<0.01U	<0.01U	<0.01U	<0.01U	<0.01U	<0.01U	<0.01U	<0.01U
Barium	0.0922	0.0743	0.28	0.291	0.0832	0.0773	0.166	0.183
Beryllium	<0.001U	<0.001U	<0.001U	<0.001U	<0.001U	<0.001U	<0.001U	0.00206
Cadmium	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U
Calcium	55.1	52.9	146	184	115	111	180	209
Chromium	0.0101	<0.006U	<0.006U	<0.006U	<0.006U	<0.006U	<0.006U	<0.006U
Cobalt	<0.05U	<0.05U	<0.05U	<0.05U	<0.05U	<0.05U	<0.05U	<0.05U
Copper	<0.005U	0.00525	0.012	0.00863	0.011	<0.005U	0.0102	0.00966
Iron	8.26	2.3	22.8	20.7	2.33	2.54	17.4	15.4
Lead	0.00387	<0.003U	<0.003U	<0.003U	<0.003U	<0.003U	<0.003U	<0.003U
Manganese	0.326	0.279	1.7	1.81	1.5	1.43	0.459	0.51
Mercury	<0.0002U	<0.0002U	<0.0002U	<0.0002U	<0.0002U	<0.0002U	<0.0002U	<0.0002U
Nickel	<0.04U	<0.04U	<0.04U	<0.04U	<0.04U	<0.04U	<0.04U	<0.04U
Potassium	31.6	32.1	26.8	26.8	24.3	25.2	32.3	38.1
Selenium	<0.005U	<0.005U	<0.005U	<0.005U	0.00875	0.00543	0.00714	0.00834
Silver	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U
Sodium	652	664	436	449	476	445	720	719
Thallium	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U	<0.005U
Vanadium	<0.05U	<0.05U	<0.05U	<0.05U	<0.05U	<0.05U	<0.05U	<0.05U
Zinc	0.0337	0.0337	0.023	0.0354	<0.02U	0.0351	0.0241	0.0657

Notes:
U = not detected at the detection limit provided
mg/L = milligrams/liter

Table 16
Exposure Pathway Assessment
East 173rd Street Works
Bronx, New York

Compound Group	Media	Screening Criteria	Exceeds Criteria?	Potential Receptors	Complete Exposure Pathway?
VOCs	Surface Soil	TAGM 4046	No	Maintenance Worker	No
				Construction Worker	No
				Recreator	No
	Sediment	NYSDEC Technical Guidance	No	Maintenance Worker	No
				Construction Worker	No
				Recreator	No
	Subsurface Soil	TAGM 4046	Yes	Maintenance Worker	No
				Construction Worker	Yes
				Recreator	No
	Groundwater	NYSWQS	Yes	Maintenance Worker	Yes
				Construction Worker	Yes
				Recreator	No
SVOCs	Surface Soil	TAGM 4046 and Background	No	Maintenance Worker	No
				Construction Worker	No
				Recreator	No
	Sediment	NYSDEC Technical Guidance	No	Maintenance Worker	No
				Construction Worker	No
				Recreator	No
	Subsurface Soil	TAGM 4046	Yes	Maintenance Worker	No
				Construction Worker	Yes
				Recreator	No
	Groundwater	NYSWQS	Yes	Maintenance Worker	Yes
				Construction Worker	Yes
				Recreator	No
Metals	Surface Soil	TAGM 4046 and Background	No	Maintenance Worker	No
				Construction Worker	No
				Recreator	No
	Sediment	NYSDEC Technical Guidance and Background	No	Maintenance Worker	No
				Construction Worker	No
				Recreator	No
	Subsurface Soil	TAGM 4046	Yes	Maintenance Worker	No
				Construction Worker	Yes
				Recreator	No
	Groundwater	NYSWQS	Yes	Maintenance Worker	Yes
				Construction Worker	Yes
				Recreator	No
Cyanide	Surface Soil	EPA Generic Soil Screening Level (1,600 ppm) EPA, 1996a	No	Maintenance Worker	No
				Construction Worker	No
				Recreator	No
	Sediment	EPA Generic Soil Screening Level (1,600 ppm) EPA, 1996a	No	Maintenance Worker	No
				Construction Worker	No
				Recreator	No
	Subsurface Soil	EPA Generic Soil Screening Level (1,600 ppm) EPA, 1996a	No	Maintenance Worker	No
				Construction Worker	No
				Recreator	No
	Groundwater	NYSWQS	Yes	Maintenance Worker	Yes
				Construction Worker	Yes
				Recreator	No



SOURCE: MAP CREATED WITH TOPO!™ ©2000 WILDFLOWER PRODUCTIONS (www.topo.com)

2000 1000 0 2000 4000

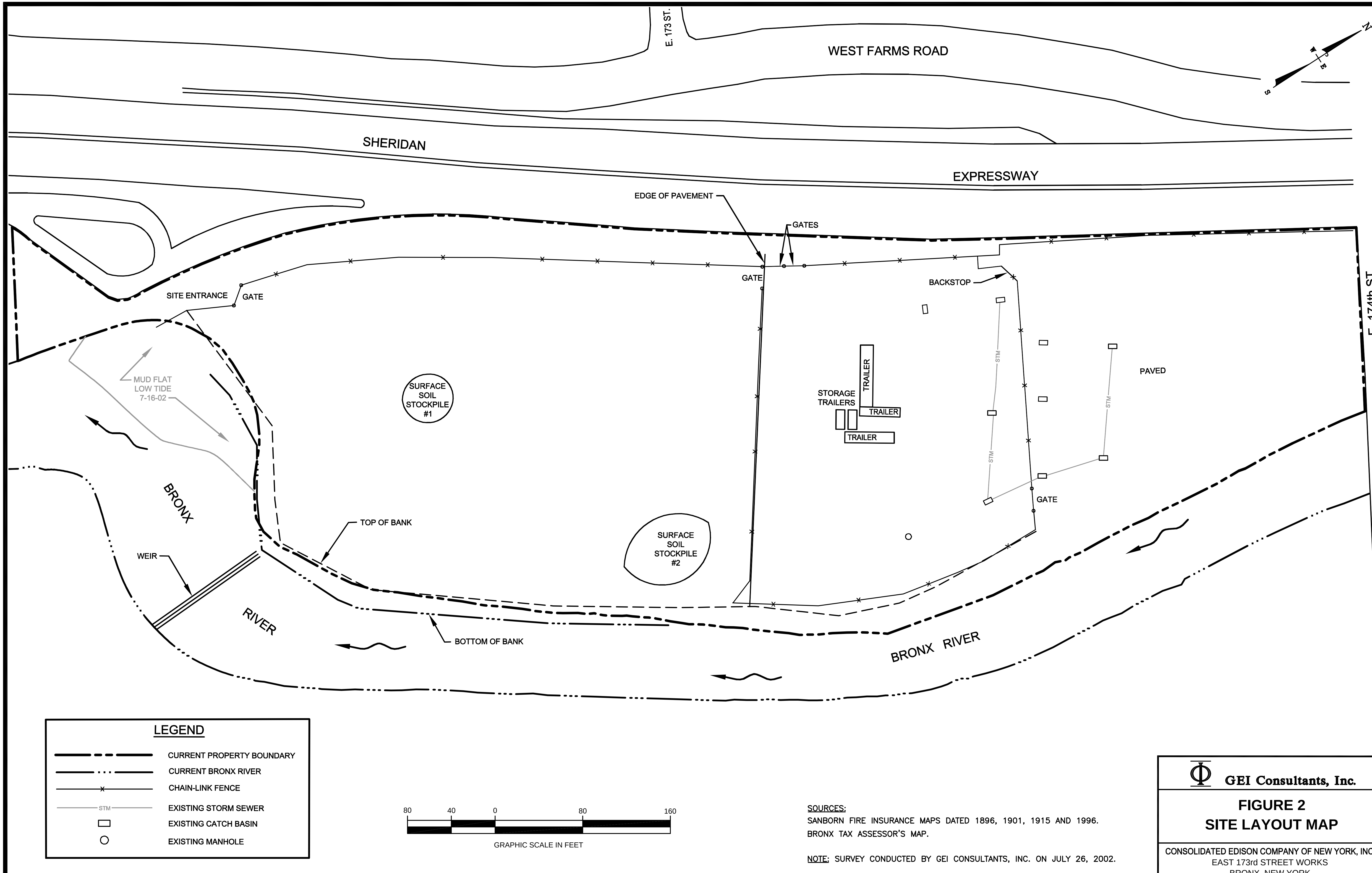
GRAPHIC SCALE IN FEET

Φ GEI Consultants, Inc.

FIGURE 1
SITE LOCATION MAP

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
EAST 173rd STREET WORKS
BRONX, NEW YORK

CON_ED\013940\E173\FIG\E173-LOC.CDR



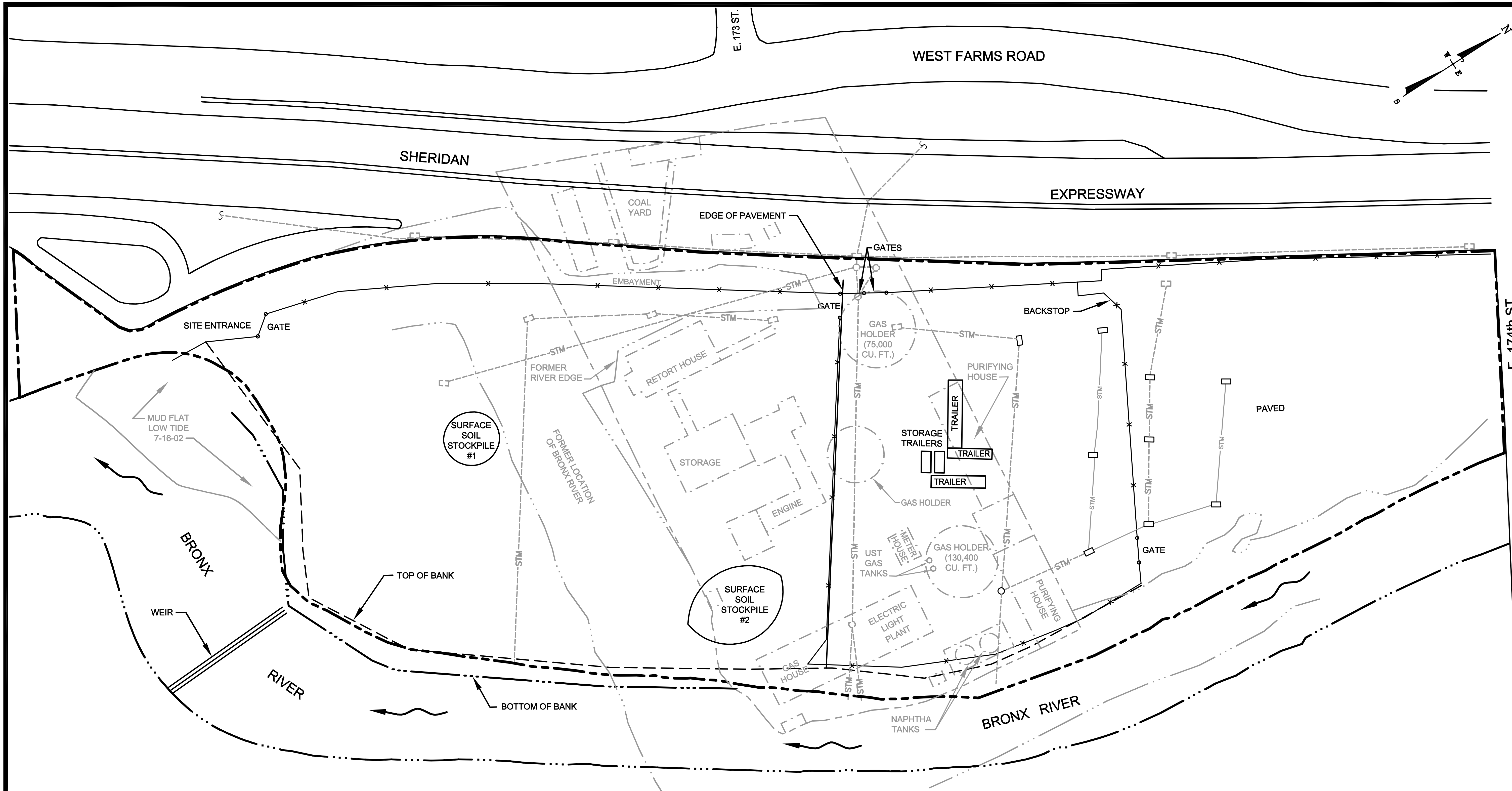
SOURCES:
SANBORN FIRE INSURANCE MAPS DATED 1896, 1901, 1915 AND 1996.
BRONX TAX ASSESSOR'S MAP.

NOTE: SURVEY CONDUCTED BY GEI CONSULTANTS, INC. ON JULY 26, 2002.

GEI Consultants, Inc.

FIGURE 2
SITE LAYOUT MAP

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
EAST 173rd STREET WORKS
BRONX, NEW YORK



LEGEND

- CURRENT PROPERTY BOUNDARY
- APPROXIMATE FORMER MGP BOUNDARY
- CURRENT BRONX RIVER
- CHAIN-LINK FENCE
- FORMER EDGE OF BRONX RIVER
- FORMER BUILDING OR STRUCTURE
- STM — PROPOSED STORM SEWER
- PROPOSED CATCH BASIN
- PROPOSED MANHOLE
- STM — EXISTING STORM SEWER
- EXISTING CATCH BASIN
- EXISTING MANHOLE

80 40 0 80 160

GRAPHIC SCALE IN FEET

SOURCES:
SANBORN FIRE INSURANCE MAPS DATED 1896, 1901, 1915 AND 1996.
BRONX TAX ASSESSOR'S MAP.

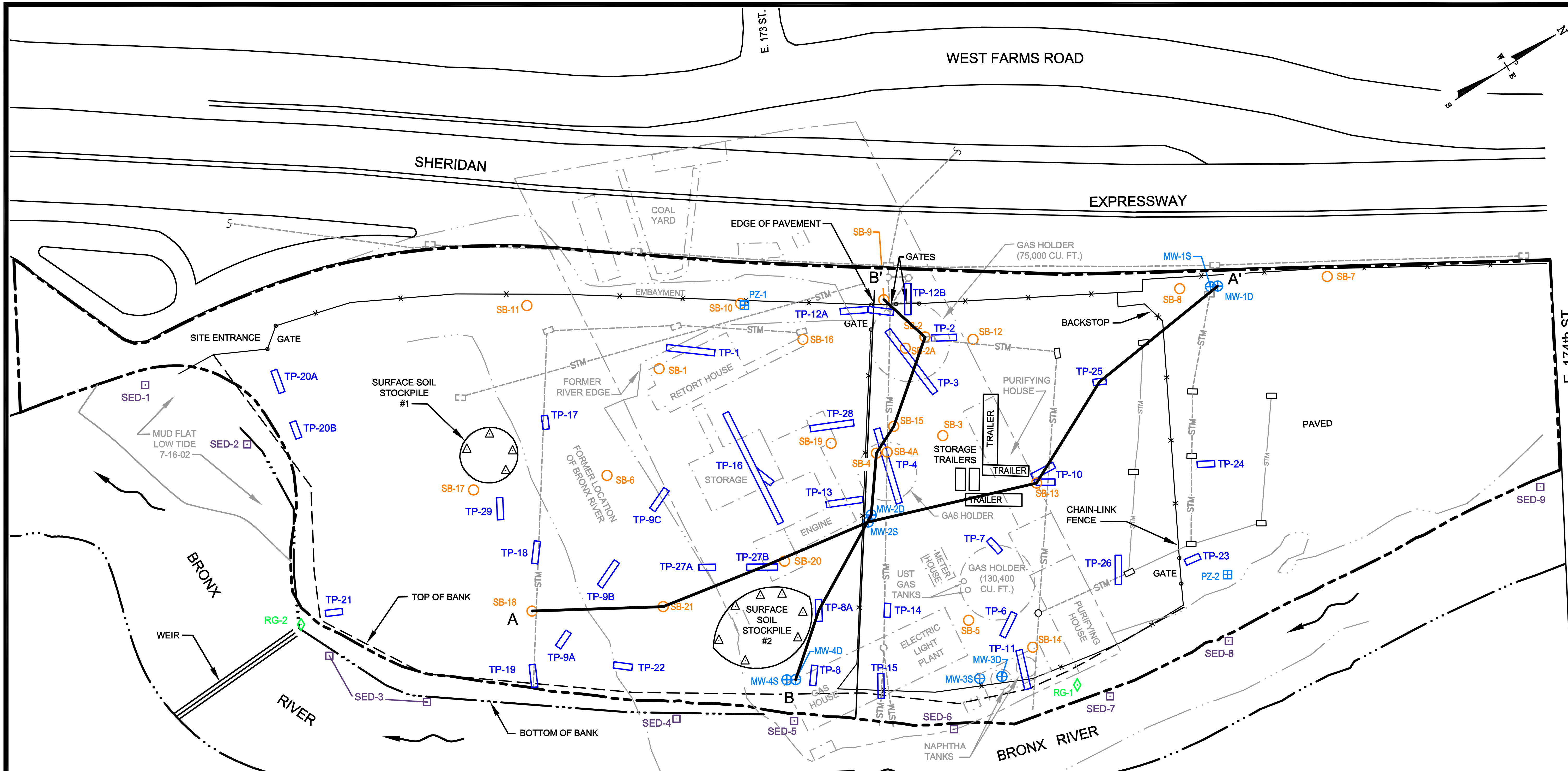
NOTE: SURVEY CONDUCTED BY GEI CONSULTANTS, INC. ON JULY 26, 2002.

GEI Consultants, Inc.

FIGURE 3
HISTORIC STRUCTURES AND CURRENT SITE LAYOUT

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
EAST 173rd STREET WORKS
BRONX, NEW YORK

CON_ED\013942\RI\E173-SITE



LEGEND

MW-1S	MONITORING WELL LOCATION
SB-17	TEST BORING LOCATION
PZ-1	PIEZOMETER LOCATION
△	SURFACE SOIL SAMPLE LOCATION
SED-1	SEDIMENT SAMPLE LOCATION
RG-1	RIVER GAUGE LOCATION
TP-17	TEST PIT LOCATION
STM	EXISTING STORM SEWER
▭	EXISTING CATCH BASIN
○	EXISTING MANHOLE
STM	PROPOSED STORM SEWER
	PROPOSED CATCH BASIN
○	PROPOSED MANHOLE
	CURRENT PROPERTY BOUNDARY
	APPROXIMATE FORMER MGP BOUNDARY
A — A'	CROSS SECTION LOCATIONS
	CURRENT BRONX RIVER
	FORMER EDGE OF BRONX RIVER
	FORMER BUILDING OR STRUCTURE

80 40 0 80 160

GRAPHIC SCALE IN FEET

SOURCES:
SANBORN FIRE INSURANCE MAPS DATED 1896, 1901, 1915 AND 1996.
BRONX TAX ASSESSOR'S MAP.

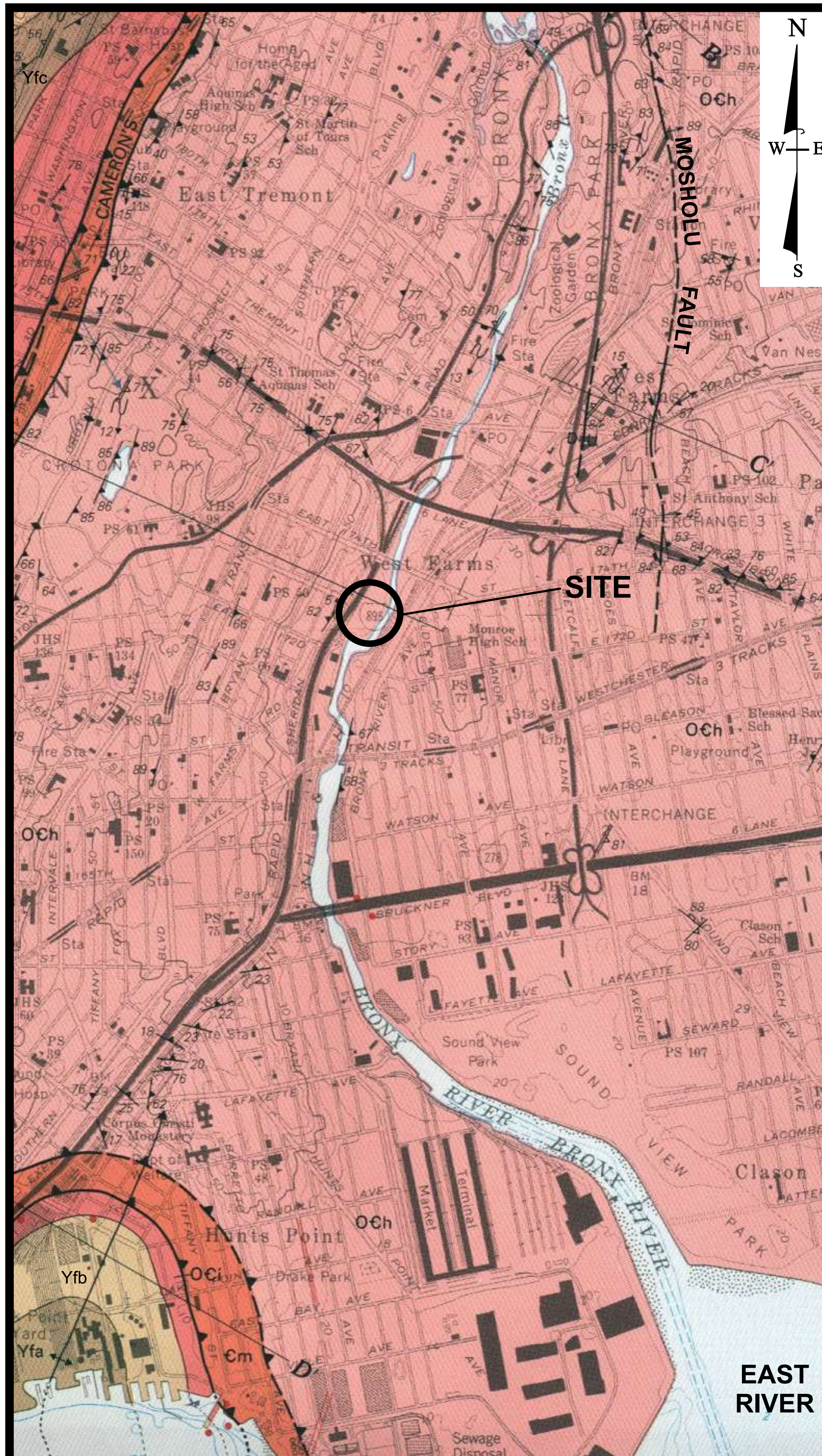
NOTE:
SURVEY CONDUCTED BY GEI CONSULTANTS, INC. ON JULY 26, 2002.

GEI Consultants, Inc.

FIGURE 4
SAMPLE LOCATIONS AND CROSS SECTION LOCATIONS

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
EAST 173rd STREET WORKS
BRONX, NEW YORK

CON_ED\013942\RI\E173-SAMS



DESCRIPTION OF MAP UNITS

ALLOCHTHONOUS UNITS—EAST OF CAMERON'S LINE

OCh

Hartland Formation (Middle Ordovician to Lower Cambrian)—Consists of the following:

1. Gray and gray-weathering, thinly laminated muscovite-biotite-quartz schist with minor garnet;
2. Medium-gray, black-weathering, fine-grained biotite-muscovite-quartz schist; the muscovite flakes are commonly large and may give outcrops a "spangled" or shiny metallic appearance;
3. White to pinkish-white, light-green-weathering, fine- to medium-grained gneissic quartz-microcline-muscovite-biotite-plagioclase granite with minor garnet; occurs in layers as much as several feet thick, and locally has large feldspar crystals 2 in. or more across. Some of the granite shows gneissic banding; the bands are about 0.8 in. thick separated by discontinuous stripes of biotite 0.04–0.08 in. thick;
4. Dark greenish-black quartz-biotite-hornblende amphibolite, with some white and (or) pink granite pegmatite; occurs in belts 30–60 ft wide; weathers black and rusty along fractures;
5. Gray, rusty-weathering, unevenly foliated sillimanite-plagioclase-muscovite-biotite-microcline-quartz gneissic schist with minor garnet, and mica-feldspar-quartz boudins.

These rocks are interlayered with coarse quartz-plagioclase-muscovite pegmatite, hornblende amphibolite, and coarse granoblastic-textured amphibolite gneiss; the gneiss is similar in composition to an igneous diorite

ALLOCHTHONOUS UNIT—WEST OF CAMERON'S LINE

Cm

Manhattan Schist (Lower Cambrian)—Gray, medium- to coarse-grained, layered sillimanite-muscovite-biotite-kyanite schist and gneiss interlayered with layered tourmaline-garnet-plagioclase-biotite-quartz schist and gneiss with black amphibolite layers 3 ft or more thick. Weathers gray, tan, rusty and maroon. The sillimanite occurs as lenses and nodules, commonly with kyanite, and also with magnetite or quartz. The sillimanite nodules average 0.8 in. in length. Unit locally contains interlayered thin quartz-mica-plagioclase-garnet granofels. Sparse garnet and (or) plagioclase porphyroblasts present; the garnets average 0.4 in. across. In places the foliation surfaces bear lustrous white mica having a gray metallic sheen. This unit generally has a local magnetic field that affects compass readings.

Unit is in thrust contact with the Walloomsac Formation, which can be seen in the railroad cut west of the Grand Concourse at E. 153d Street

AUTOCHTHONOUS UNITS

OCi

Inwood Marble (Lower Ordovician to Lower Cambrian)—Composed of the following units, whose distribution is not shown on the map because of poor exposure:

1. White, coarse-grained calcitic dolomite marble interlayered with bands of silicates (phlogopite, stretched granular quartz lenses, diopside, tremolite and actinolite) approximately 0.8–2.0 in. apart. Calcite and dolomite crystals average 0.3 in. across. Outcrop surfaces become coarsely sugar-textured and light to medium gray or tan on weathering;
2. Alternating bands of blue-gray medium-grained and white fine-grained calcite and dolomite marble. Brown phlogopite, tremolite and actinolite occur in variably spaced bands about 2 in. wide. In medium-grained rock, crystals of calcite and dolomite range from 0.08 to 0.4 in. across. In fine-grained rock, calcite crystals average 0.04–0.12 in. across. Weathers dark gray and tan. Develops fine sugary texture on weathering;
3. White and bluish-gray, predominantly fine-grained calcite marble with scattered dolomite and phlogopite crystals. Crystals range from less than 0.04 to 0.2 in. in diameter, with most being less than 0.12 in. across. Weathers medium gray with a fine, sugary-textured surface;
4. White, fine-grained dolomite marble with subordinate calcite and minor phlogopite. Grain size averages 0.12–0.16 in.

The Inwood Marble varies in thickness from about 100 ft to nearly 1000 ft. Its upper surface is in unconformable contact with the overlying Walloomsac Formation and its base is apparently conformable with the underlying Lowerre Quartzite, and unconformable with the Fordham Gneiss where the Lowerre is absent

Yfc

Member C—Medium-gray, fine-grained quartz-biotite-plagioclase-muscovite schist interlayered with gray biotite-muscovite-quartz granofels. Some schist layers are thin and fissile. Intrusions of coarse white granite and granite pegmatite are common toward the contacts with adjacent rock units. Extensive plagioclase-biotite-hornblende amphibolite layers (up to several feet thick) are common. Amphibolites are black; in some places are rusty weathering. Granofels surfaces weather to a sandy texture and locally are slabby and black weathering. The unit overall may weather black, tan and locally maroon or dark gray

Yfb

Member B—Complex, black and white banded gneiss; bands are generally 0.04–0.12 in. wide. Black bands are composed of quartz, plagioclase and biotite; white bands consist of garnet, quartz, plagioclase, muscovite and microcline. Broader bands in this gneiss are up to 2 in. wide and contain numerous interspersed laminae 0.04 in. thick. Unit contains quartz-feldspar veins approximately 4.7 in. thick and boudin-like structures approximately 9 in. wide and about 3 ft long. The boudins contain almandine and grossular garnet, quartz and biotite. Garnetiferous inclusions of this composition have been observed in tunnel excavations through this unit (Baskerville and others, 1987). Similar garnetiferous inclusions have been observed in the Ravenswood Granodiorite (Ziegler, 1911).

Where the amount of granite (narrow white bands) is low, the unit appears dark gray and pinstriped; where the granite content exceeds 50 percent (wider white bands), the rock appears light gray and broadly banded. Locally, tan- and rusty-weathering biotite-hornblende gneiss is interlayered.

A coarse-grained siliceous dolomite (Yfm) was found to be interlayered with this unit in the Jerome Park Reservoir excavation (Berkey, 1911; Manchester, 1931). The dolomite is not shown on the map due to the uncertainty of its exact location

Yfa

Member A—Pinkish-white to salmon-red and medium-gray banded muscovite-biotite-plagioclase-microcline-quartz gneiss. Forms an aureole around the Yonkers Gneiss. Crosscutting and concordant pegmatites consisting of pink potassium feldspar and quartz are common in Van Cortlandt Park. Unit derived its present composition probably when the Yonkers Gneiss intruded the Fordham Gneiss, which allowed some magmatic gases and liquid to permeate the Fordham surrounding the intrusion. Local weathering of less-resistant darker biotite-rich bands leaves granitic bands in relief.

A coarse-grained siliceous dolomite (Yfm) interlayered with this unit extends from the north end of Hell Gate in the East River northward to about E. 136th Street. Fluhr (1969), stating that Berkey considered the marble in the east or Hell Gate channel of the East River to be interbedded with the Fordham Gneiss, named it Hell Gate Dolomite. Fluhr in the same report considered the marble to be an infold of the Inwood Marble. In this report this marble is considered to be a part of the Fordham Gneiss

EXPLANATION OF MAP SYMBOLS

Contact—Dashed where approximately located; dotted where under water; queried where uncertain. Where shown solid under water, was located by test borings and tunnel data

30 U D **Fault**—Showing dip; short line normal to fault trace indicates vertical dip; paired arrows show relative movement; U, upthrown side; D, downthrown side. Dashed where approximately located; dotted where under water. Where observed in tunnels is shown solid. On cross sections only, relative movement is shown by: a, away from observer; t, toward observer

Thrust fault—Sawteeth on upper plate. Dashed where approximately located; dotted where under water. Where observed in tunnels is shown solid. Shows dip where known

FOLDS

Folds show trace of axial surface. They are dashed where approximately located; dotted where under water

Antiform—Showing direction of plunge where known. Where asymmetric, shorter arrow indicates steeper limb

MINOR FOLDS

Strike and dip of axial surface of folds

10 15 Inclined—Arrow, where shown, indicates bearing and plunge of axis

Vertical

12 **Minor fold deforming earlier foliation**—Showing bearing and plunge

PLANAR FEATURES

May be combined with linear features. Shown open where measured in excavations and tunnels

Strike and dip of foliation

15 Inclined

Vertical

Strike and dip of joints

15 Inclined

Vertical

Horizontal

SCALE 1:24 000

1 ½ 0 1 MILE

SOURCE:

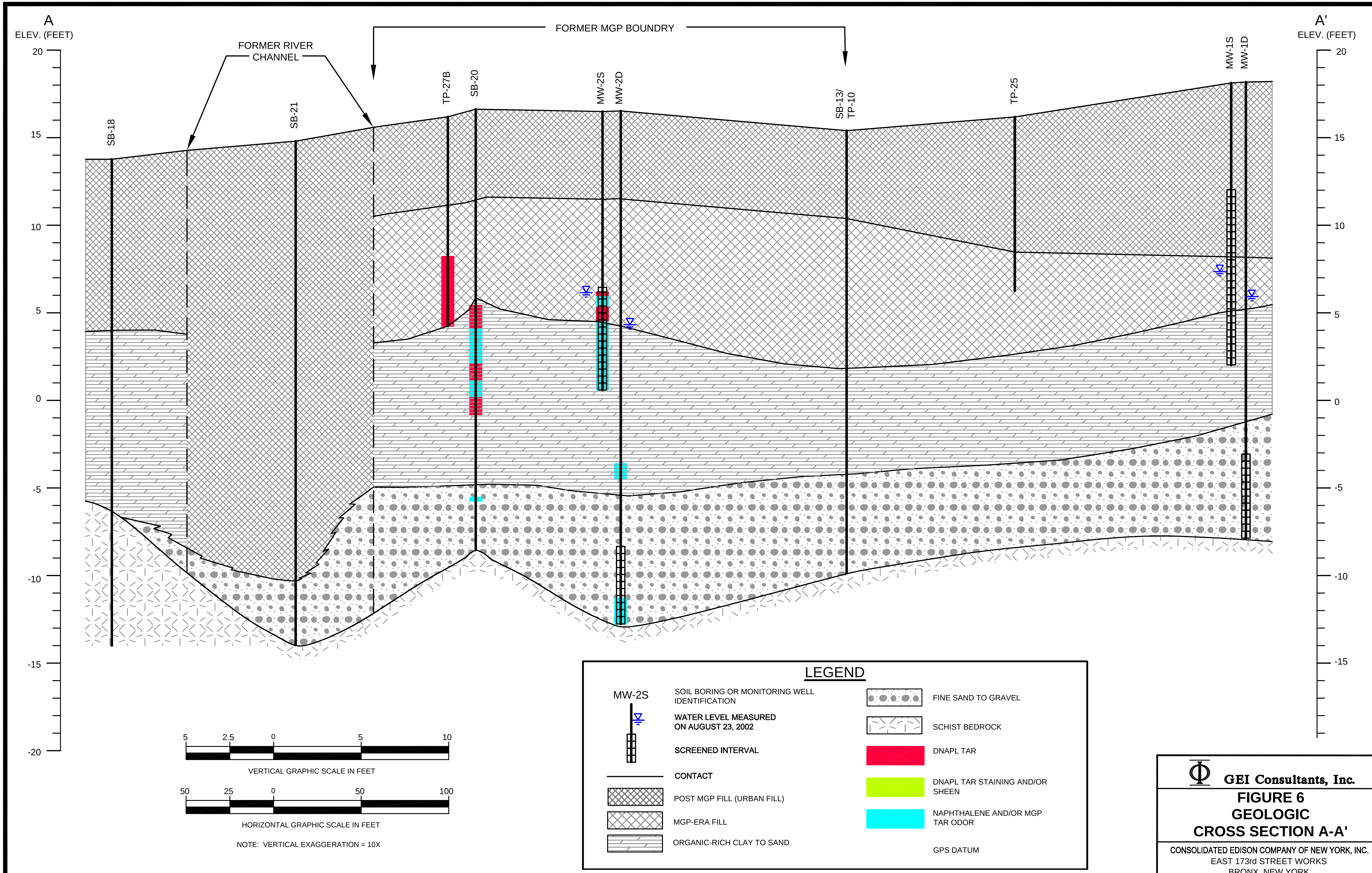
BEDROCK AND ENGINEERING GEOLOGIC MAPS OF BRONX COUNTY AND PARTS OF NEW YORK AND QUEENS COUNTIES, NEW YORK, BY CHARLES A. BASKERVILLE, 1992.

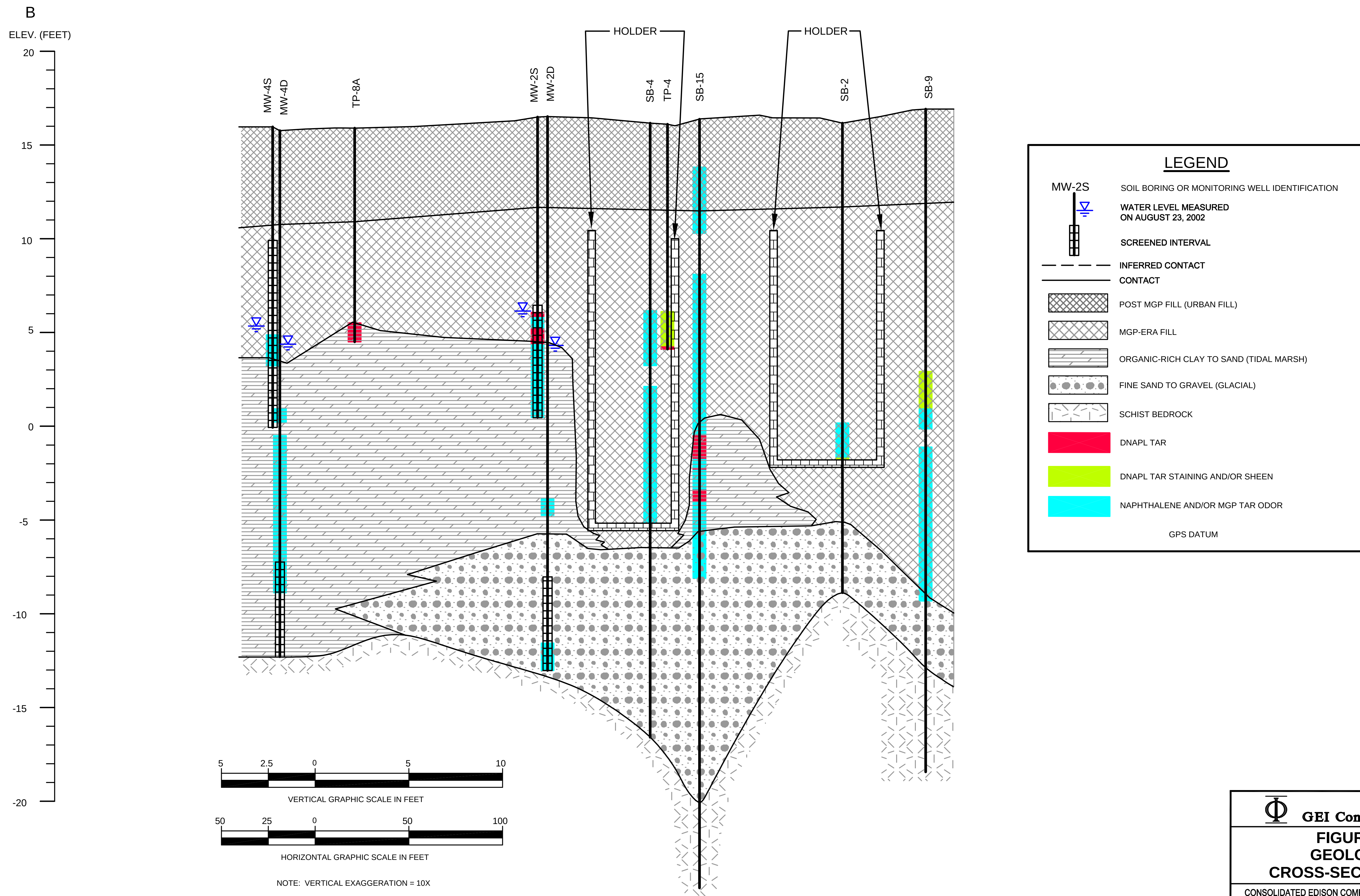
GEI Consultants, Inc.

FIGURE 5
BEDROCK GEOLOGY MAP

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
EAST 173rd STREET WORKS
BRONX, NEW YORK

CON_ED\013942\E173\RI REPORT\E173-BED_GEO.CDR


A
ELEV. (FEET)
A'
ELEV. (FEET)
FORMER MGP BOUNDRY
FORMER RIVER CHANNEL
SB-18
SB-21
TP-27B
SB-20
MW-2S
MW-2D
SB-13/ TP-10
TP-25
MW-1S
MW-1D
20
15
10
5
0
-5
-10
-15
-20
5
2.5
0
5
10
VERTICAL GRAPHIC SCALE IN FEET
50
25
0
50
100
HORIZONTAL GRAPHIC SCALE IN FEET
NOTE: VERTICAL EXAGGERATION = 10X
LEGEND
MW-2S
SOIL BORING OR MONITORING WELL IDENTIFICATION
WATER LEVEL MEASURED ON AUGUST 23, 2002
SCREENED INTERVAL
CONTACT
POST MGP FILL (URBAN FILL)
MGP-ERA FILL
ORGANIC-RICH CLAY TO SAND
FINE SAND TO GRAVEL
SCHIST BEDROCK
DNAPL TAR
DNAPL TAR STAINING AND/OR SHEEN
NAPHTHALENE AND/OR MGP TAR ODOR
GPS DATUM
GEI Consultants, Inc.
FIGURE 6
GEOLOGIC CROSS SECTION A-A'
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
EAST 173rd STREET WORKS
BRONX, NEW YORK
CON_ED\013942\E173\RI\E173-XSEC

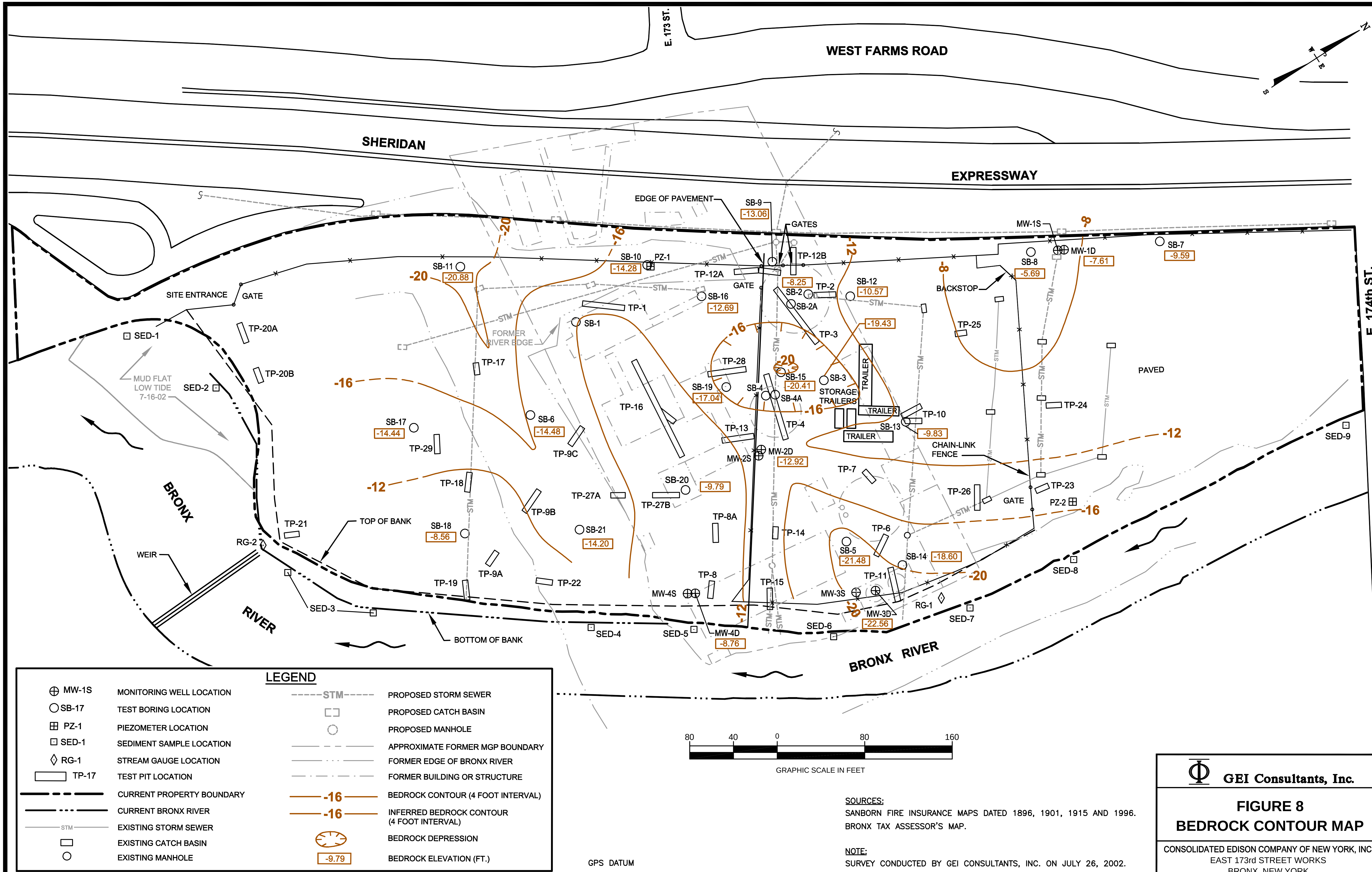


GEI Consultants, Inc.

FIGURE 7
GEOLOGIC CROSS-SECTION B-B'

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
EAST 173rd STREET WORKS
BRONX, NEW YORK

CON_ED\013942\E173\RI\E173-XSEC



LEGEND

MW-1S	MONITORING WELL LOCATION	----STM----	PROPOSED STORM SEWER
SB-17	TEST BORING LOCATION		PROPOSED CATCH BASIN
PZ-1	PIEZOMETER LOCATION		PROPOSED MANHOLE
SED-1	SEDIMENT SAMPLE LOCATION		APPROXIMATE FORMER MGP BOUNDARY
RG-1	STREAM GAUGE LOCATION		FORMER EDGE OF BRONX RIVER
TP-17	TEST PIT LOCATION		FORMER BUILDING OR STRUCTURE
	CURRENT PROPERTY BOUNDARY	-16	BEDROCK CONTOUR (4 FOOT INTERVAL)
	CURRENT BRONX RIVER	-16	INFERRED BEDROCK CONTOUR (4 FOOT INTERVAL)
STM	EXISTING STORM SEWER		BEDROCK DEPRESSION
	EXISTING CATCH BASIN	-9.79	BEDROCK ELEVATION (FT.)
	EXISTING MANHOLE		

GPS DATUM

80 40 0 80 160
GRAPHIC SCALE IN FEET

SOURCES:
SANBORN FIRE INSURANCE MAPS DATED 1896, 1901, 1915 AND 1996.
BRONX TAX ASSESSOR'S MAP.

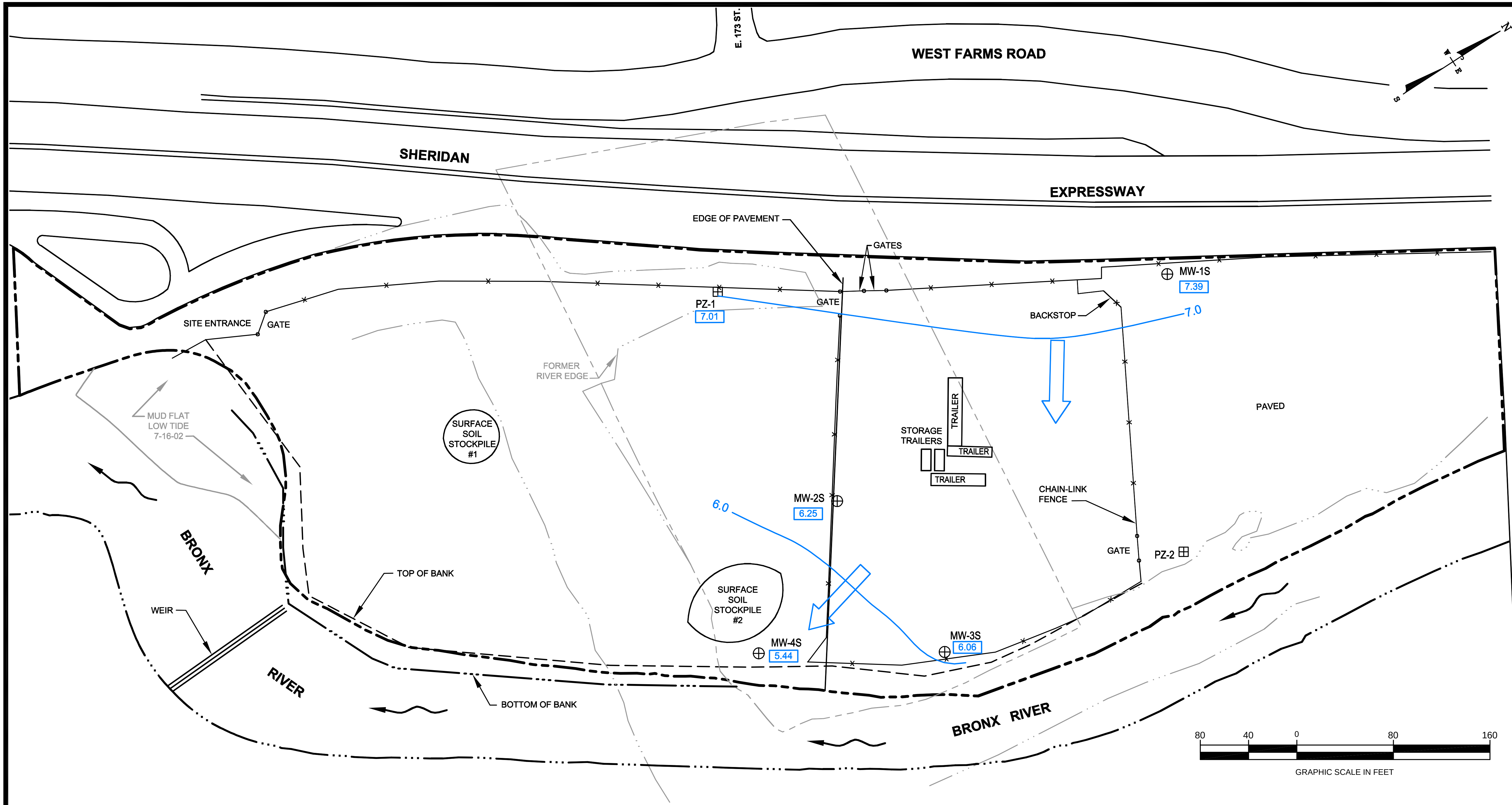
NOTE:
SURVEY CONDUCTED BY GEI CONSULTANTS, INC. ON JULY 26, 2002.

GEI Consultants, Inc.

FIGURE 8
BEDROCK CONTOUR MAP

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
EAST 173rd STREET WORKS
BRONX, NEW YORK

CON_ED\013942\RI\E173-BEDROCK



LEGEND

FORMER EDGE OF BRONX RIVER	
CURRENT PROPERTY BOUNDARY	
APPROXIMATE FORMER MGP BOUNDARY	
CURRENT BRONX RIVER	
MW-1S	MONITORING WELL LOCATION
PZ-1	PIEZOMETER LOCATION
5.44	GROUNDWATER ELEVATION (FT.)
	GROUNDWATER FLOW DIRECTION
5.0	GROUNDWATER CONTOUR (1 FOOT INTERVAL)

SOURCES:

SANBORN FIRE INSURANCE MAPS DATED 1896, 1901, 1915 AND 1996.

BRONX TAX ASSESSOR'S MAP.

NOTES:

SURVEY CONDUCTED BY GEI CONSULTANTS, INC. ON JULY 26, 2002.

GROUNDWATER ELEVATION FOR PZ-2 NOT USED FOR GROUNDWATER CONTOUR MAPPING.

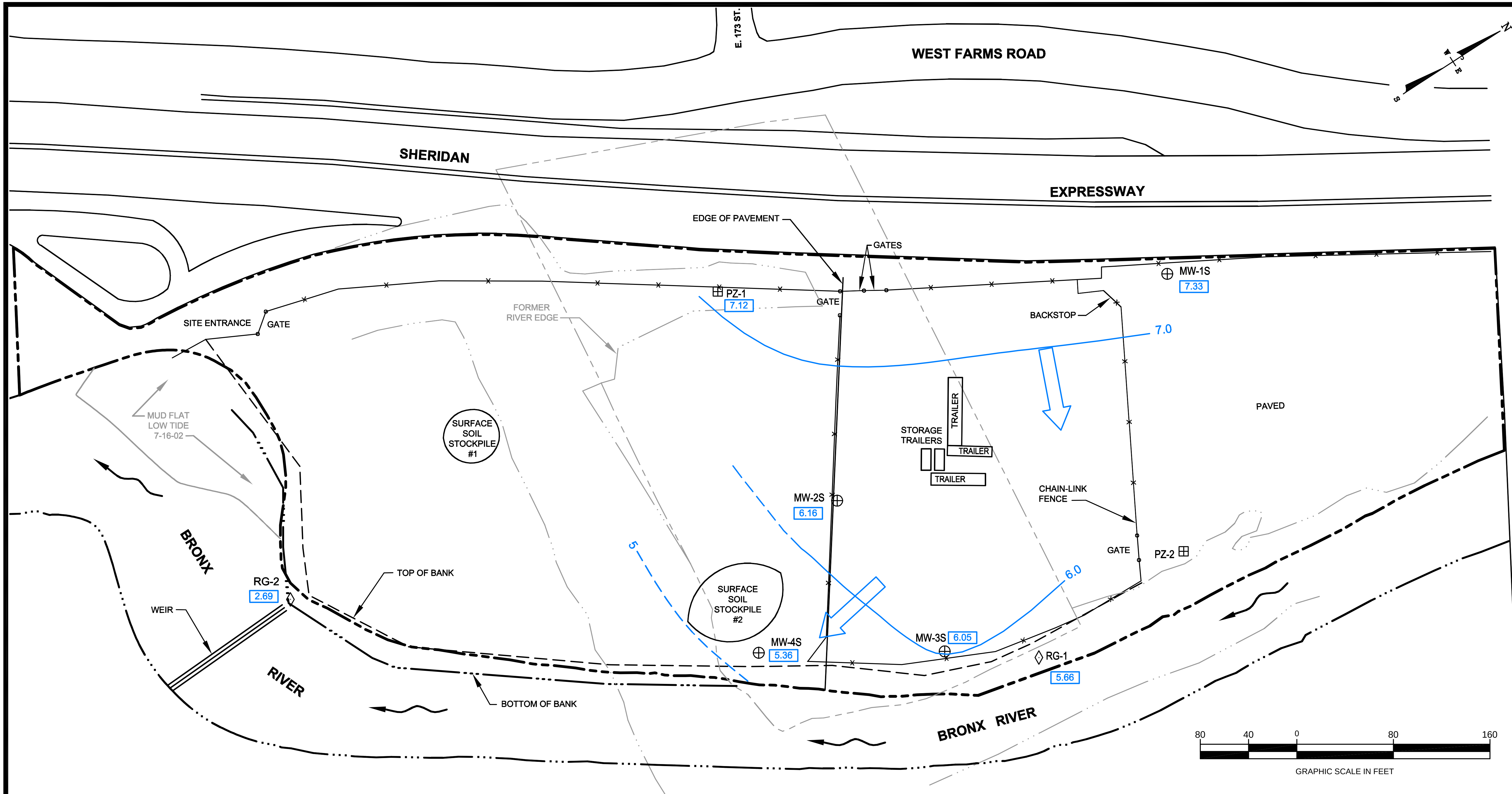
GPS DATUM

GEI Consultants, Inc.

FIGURE 9A
SHALLOW OVERBURDEN GROUNDWATER CONTOURS AND FLOW DIRECTION (AUGUST 1, 2002)

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
EAST 173rd STREET WORKS
BRONX, NEW YORK

CON_ED\013942\RI\E173-SW-8-1-02



LEGEND

FORMER EDGE OF BRONX RIVER	⊕ MW-1S MONITORING WELL LOCATION
CURRENT PROPERTY BOUNDARY	⊞ PZ-1 PIEZOMETER LOCATION
APPROXIMATE FORMER MGP BOUNDARY	◇ RG-2 RIVER GAUGE LOCATION
CURRENT BRONX RIVER	5.36 GROUNDWATER/RIVER ELEVATION (FT.)
GROUNDWATER FLOW DIRECTION	5.0 GROUNDWATER CONTOUR (1 FOOT INTERVAL)
	5.0 INFERRED GROUNDWATER CONTOUR (1 FOOT INTERVAL)

SOURCES:

SANBORN FIRE INSURANCE MAPS DATED 1896, 1901, 1915 AND 1996.

BRONX TAX ASSESSOR'S MAP.

NOTES:

SURVEY CONDUCTED BY GEI CONSULTANTS, INC. ON JULY 26, 2002.

RIVER ELEVATION AT RG-2 MEASURED ON DOWN RIVER SIDE OF WEIR.

GROUNDWATER ELEVATION FOR PZ-2 NOT USED FOR GROUNDWATER CONTOUR MAPPING.

GPS DATUM

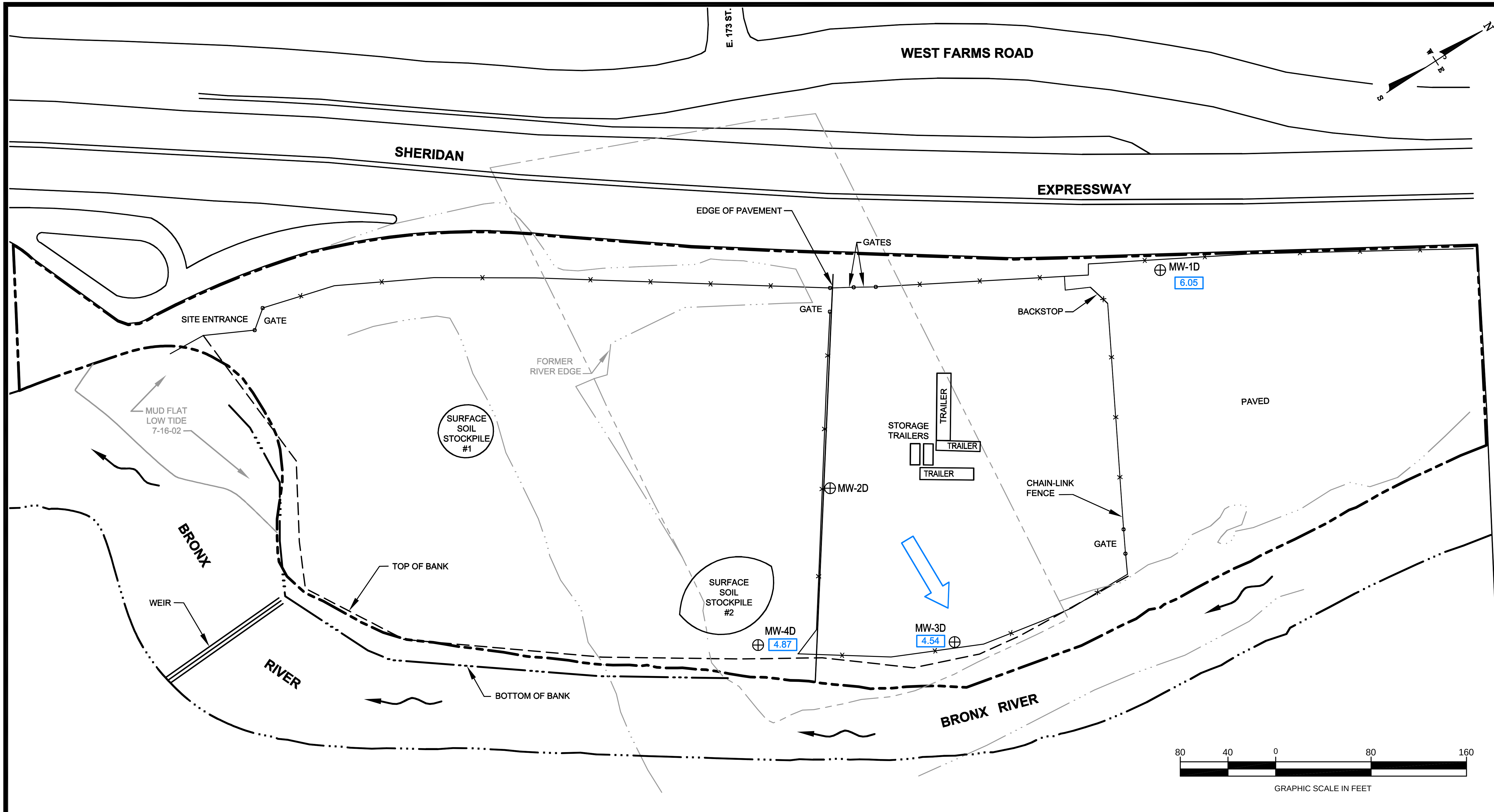
GEI Consultants, Inc.

FIGURE 9B

SHALLOW OVERBURDEN GROUNDWATER CONTOURS AND FLOW DIRECTION (AUGUST 23, 2002)

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
EAST 173rd STREET WORKS
BRONX, NEW YORK

CON_ED\013942\RI\E173-SW-8-23-02



LEGEND

FORMER EDGE OF BRONX RIVER	MW-1D MONITORING WELL LOCATION
CURRENT PROPERTY BOUNDARY	4.87 GROUNDWATER ELEVATION (FT.)
APPROXIMATE FORMER MGP BOUNDARY	GROUNDWATER FLOW DIRECTION
CURRENT BRONX RIVER	

SOURCES:

SANBORN FIRE INSURANCE MAPS DATED 1896, 1901, 1915 AND 1996.

BRONX TAX ASSESSOR'S MAP.

NOTES:

SURVEY CONDUCTED BY GEI CONSULTANTS, INC. ON JULY 26, 2002.

GROUNDWATER ELEVATION FOR MW-2D NOT USED FOR FLOW DIRECTION.

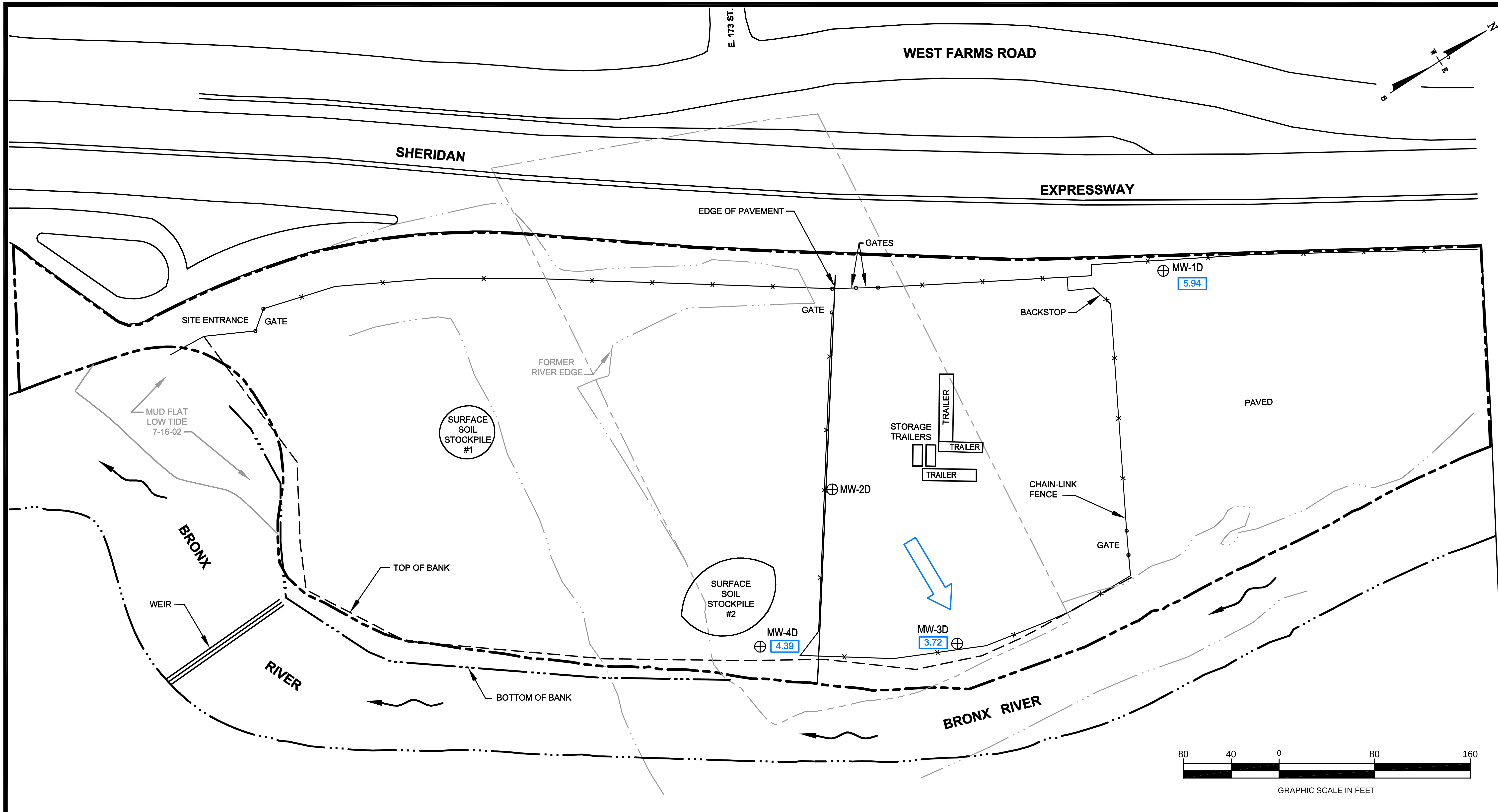
GPS DATUM

GEI Consultants, Inc.

FIGURE 9C
DEEP OVERBURDEN GROUNDWATER CONTOURS AND FLOW DIRECTION (AUGUST 1, 2002)

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
EAST 173rd STREET WORKS
BRONX, NEW YORK

CON_ED\013942\RI\E173-DP-8-1-02



LEGEND

FORMER EDGE OF BRONX RIVER	⊕ MW-1D MONITORING WELL LOCATION
CURRENT PROPERTY BOUNDARY	4.39 GROUNDWATER ELEVATION (FT.)
APPROXIMATE FORMER MGP BOUNDARY	GROUNDWATER FLOW DIRECTION
CURRENT BRONX RIVER	

SOURCES:
SANBORN FIRE INSURANCE MAPS DATED 1896, 1901, 1915 AND 1996.
BRONX TAX ASSESSOR'S MAP.

NOTES:
SURVEY CONDUCTED BY GEI CONSULTANTS, INC. ON JULY 26, 2002.
GROUNDWATER ELEVATION FOR MW-2D NOT USED FOR FLOW DIRECTION.

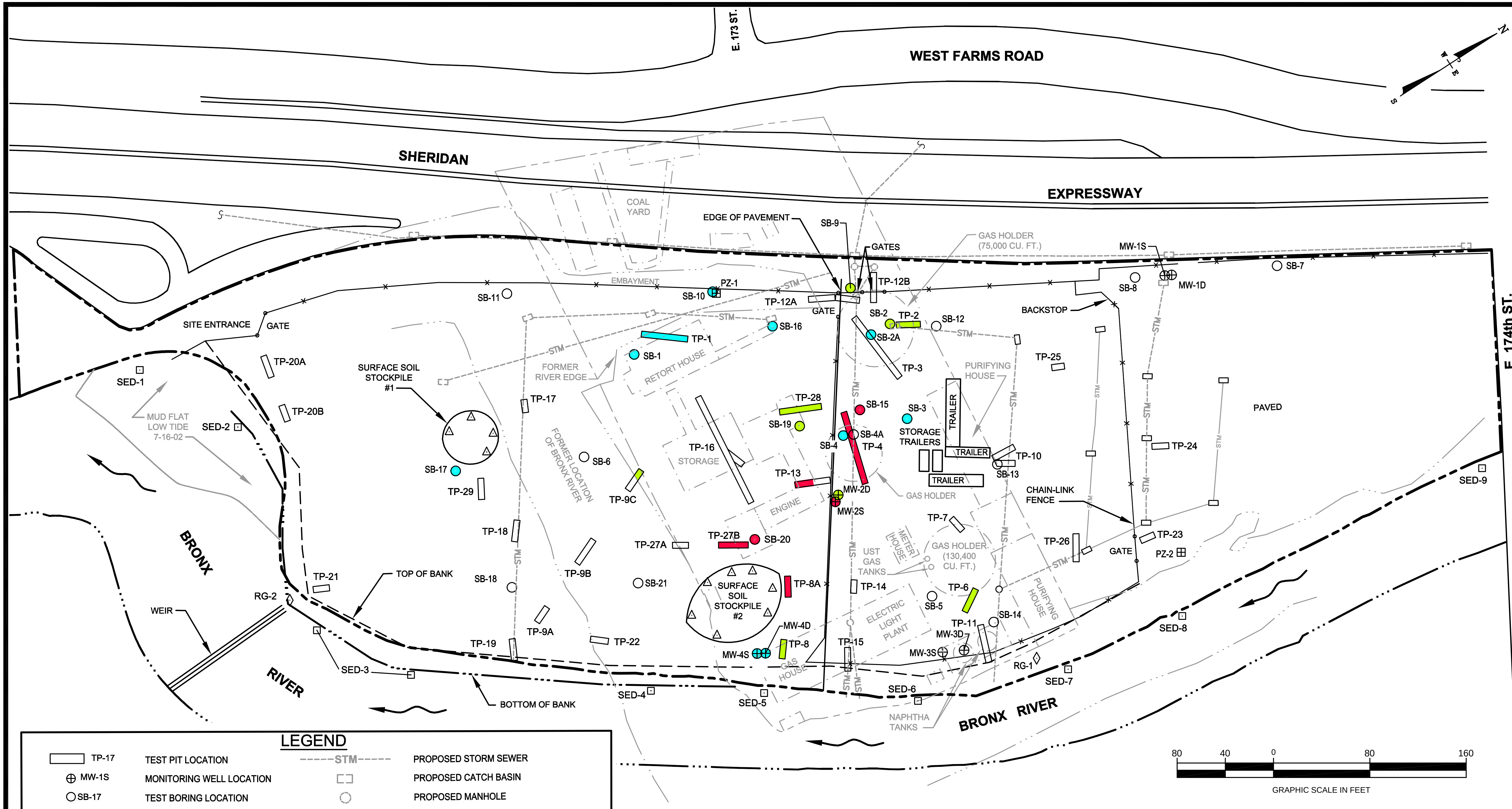
GPS DATUM

Φ GEI Consultants, Inc.

FIGURE 9D
DEEP OVERBURDEN GROUNDWATER CONTOURS AND FLOW DIRECTION (AUGUST 23, 2002)

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
EAST 173rd STREET WORKS
BRONX, NEW YORK

CON_ED\013942\RI\E173-DP-8-23-02



LEGEND

TP-17	TEST PIT LOCATION	---STM---	PROPOSED STORM SEWER
MW-1S	MONITORING WELL LOCATION		PROPOSED CATCH BASIN
SB-17	TEST BORING LOCATION		PROPOSED MANHOLE
PZ-1	PIEZOMETER LOCATION		CURRENT PROPERTY BOUNDARY
RG-1	RIVER GAUGE LOCATION		APPROXIMATE FORMER MGP BOUNDARY
	SURFACE SAMPLE LOCATION		FORMER EDGE OF BRONX RIVER
STM	EXISTING STORM SEWER		FORMER BUILDING OR STRUCTURE
	EXISTING CATCH BASIN		DNAPL TAR
	EXISTING MANHOLE		DNAPL TAR STAINING AND/OR SHEEN
	CURRENT BRONX RIVER		NAPHTHALENE AND/OR MGP TAR ODOR

SOURCES:

SANBORN FIRE INSURANCE MAPS DATED 1896, 1901, 1915 AND 1996.
BRONX TAX ASSESSOR'S MAP.

NOTES:

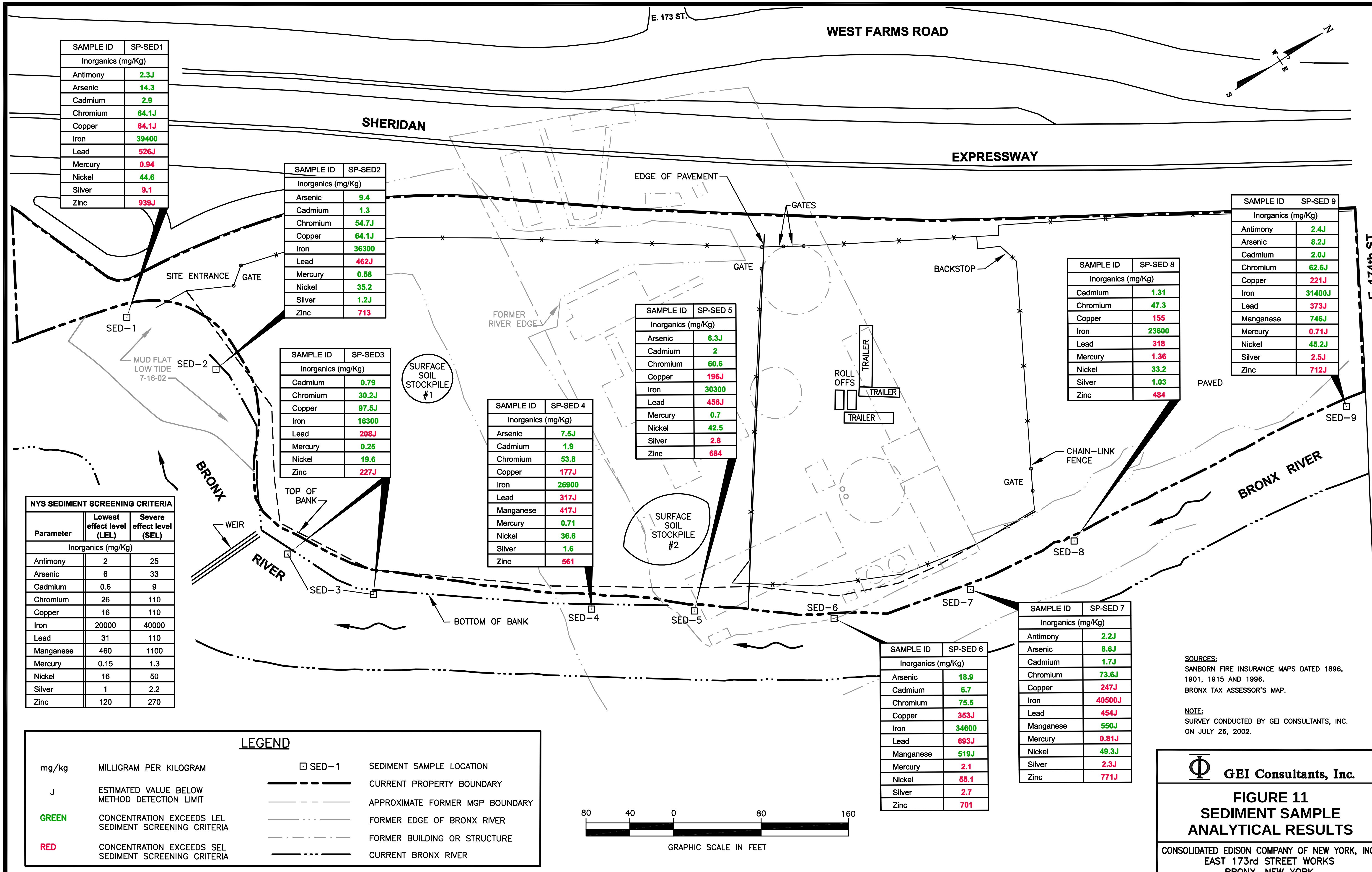
EVIDENCE OF PURIFIER WASTES WERE OBSERVED IN TEST PITS TP-1 AND TP-15.
SURVEY CONDUCTED BY GEI CONSULTANTS, INC. ON JULY 26, 2002.

GEI Consultants, Inc.

FIGURE 10 DISTRIBUTION OF MGP RESIDUE

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
EAST 173rd STREET WORKS
BRONX, NEW YORK

CON_ED\013942\E173\RI\E173-MGPS



SAMPLE ID	SP-SED1
Inorganics (mg/Kg)	
Antimony	2.3J
Arsenic	14.3
Cadmium	2.9
Chromium	64.1J
Copper	64.1J [RED]
Iron	39400
Lead	526J [RED]
Mercury	0.94
Nickel	44.6
Silver	9.1 [RED]
Zinc	939J [RED]

SAMPLE ID	SP-SED2
Inorganics (mg/Kg)	
Arsenic	9.4
Cadmium	1.3
Chromium	54.7J
Copper	64.1J
Iron	36300
Lead	462J [RED]
Mercury	0.58
Nickel	35.2
Silver	1.2J
Zinc	713 [RED]

SAMPLE ID	SP-SED3
Inorganics (mg/Kg)	
Cadmium	0.79
Chromium	30.2J
Copper	97.5J
Iron	16300
Lead	208J [RED]
Mercury	0.25
Nickel	19.6
Zinc	227J

SAMPLE ID	SP-SED 4
Inorganics (mg/Kg)	
Arsenic	7.5J
Cadmium	1.9
Chromium	53.8
Copper	177J [RED]
Iron	26900
Lead	317J [RED]
Manganese	417J
Mercury	0.71
Nickel	36.6
Silver	1.6
Zinc	561 [RED]

SAMPLE ID	SP-SED 5
Inorganics (mg/Kg)	
Arsenic	6.3J
Cadmium	2
Chromium	60.6
Copper	196J [RED]
Iron	30300
Lead	456J [RED]
Mercury	0.7
Nickel	42.5
Silver	2.8 [RED]
Zinc	684 [RED]

SAMPLE ID	SP-SED 6
Inorganics (mg/Kg)	
Arsenic	18.9
Cadmium	6.7
Chromium	75.5
Copper	353J [RED]
Iron	34600
Lead	693J [RED]
Manganese	519J
Mercury	2.1 [RED]
Nickel	55.1 [RED]
Silver	2.7 [RED]
Zinc	701 [RED]

SAMPLE ID	SP-SED 7
Inorganics (mg/Kg)	
Antimony	2.2J
Arsenic	8.6J
Cadmium	1.7J
Chromium	73.6J
Copper	247J [RED]
Iron	40500J [RED]
Lead	454J [RED]
Manganese	550J
Mercury	0.81J
Nickel	49.3J
Silver	2.3J [RED]
Zinc	771J [RED]

SAMPLE ID	SP-SED 8
Inorganics (mg/Kg)	
Cadmium	1.31
Chromium	47.3
Copper	155 [RED]
Iron	23600
Lead	318 [RED]
Mercury	1.36 [RED]
Nickel	33.2
Silver	1.03
Zinc	484 [RED]

SAMPLE ID	SP-SED 9
Inorganics (mg/Kg)	
Antimony	2.4J
Arsenic	8.2J
Cadmium	2.0J
Chromium	62.6J
Copper	221J [RED]
Iron	31400J
Lead	373J [RED]
Manganese	746J
Mercury	0.71J [RED]
Nickel	45.2J
Silver	2.5J [RED]
Zinc	712J [RED]

NYS SEDIMENT SCREENING CRITERIA

Parameter	Lowest effect level (LEL)	Severe effect level (SEL)
Inorganics (mg/Kg)		
Antimony	2	25
Arsenic	6	33
Cadmium	0.6	9
Chromium	26	110
Copper	16	110
Iron	20000	40000
Lead	31	110
Manganese	460	1100
Mercury	0.15	1.3
Nickel	16	50
Silver	1	2.2
Zinc	120	270

LEGEND

mg/kg	MILLIGRAM PER KILOGRAM
J	ESTIMATED VALUE BELOW METHOD DETECTION LIMIT
GREEN	CONCENTRATION EXCEEDS LEL SEDIMENT SCREENING CRITERIA
RED	CONCENTRATION EXCEEDS SEL SEDIMENT SCREENING CRITERIA
⊡ SED-1	SEDIMENT SAMPLE LOCATION
	CURRENT PROPERTY BOUNDARY
	APPROXIMATE FORMER MGP BOUNDARY
	FORMER EDGE OF BRONX RIVER
	FORMER BUILDING OR STRUCTURE
	CURRENT BRONX RIVER

SOURCES:
SANBORN FIRE INSURANCE MAPS DATED 1896, 1901, 1915 AND 1996.
BRONX TAX ASSESSOR'S MAP.

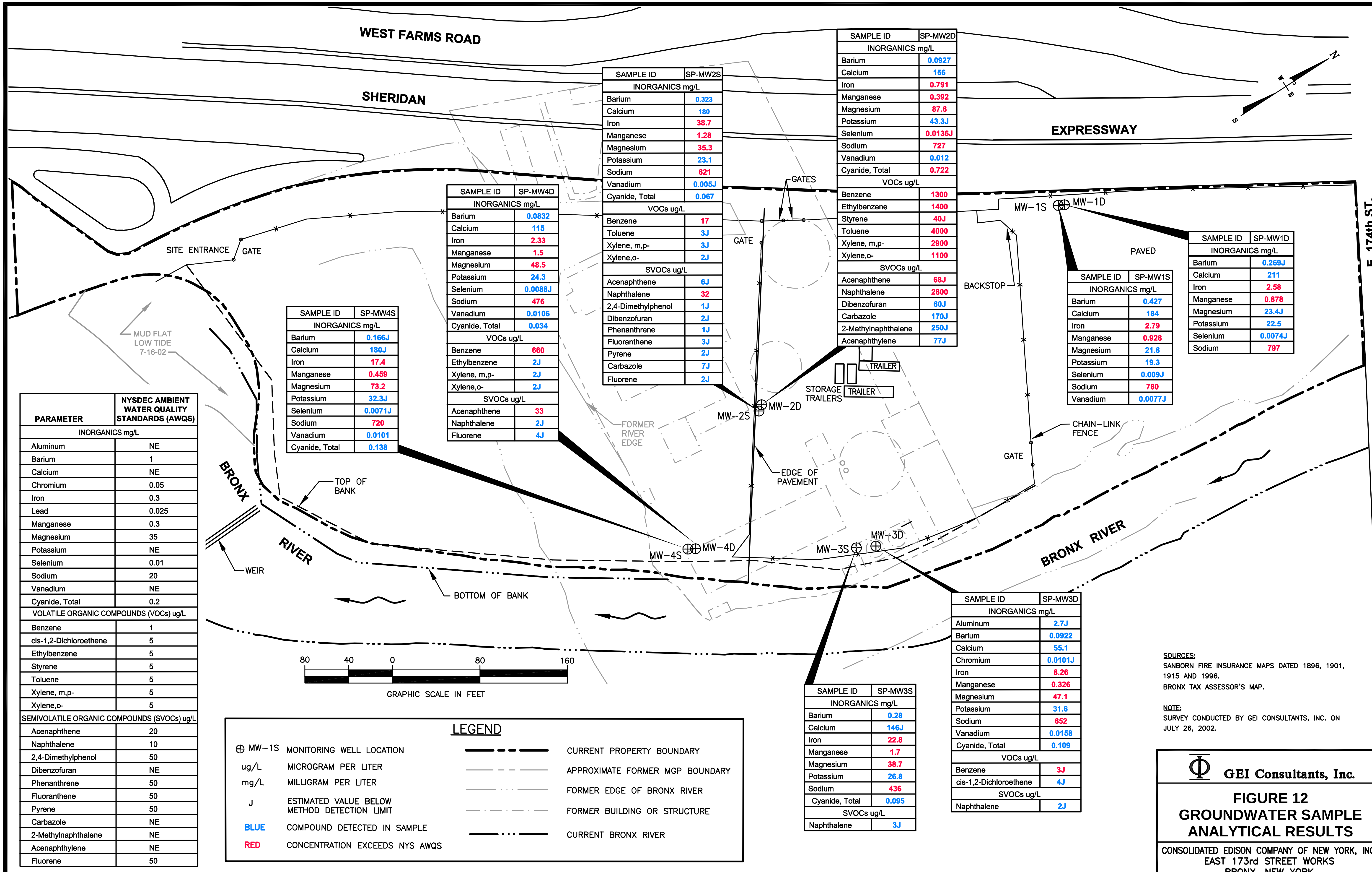
NOTE:
SURVEY CONDUCTED BY GEI CONSULTANTS, INC. ON JULY 26, 2002.

GEI Consultants, Inc.

FIGURE 11
SEDIMENT SAMPLE ANALYTICAL RESULTS

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
EAST 173rd STREET WORKS
BRONX, NEW YORK

CON_ED\013942\RI REPORT\E173-SED-ANAL



PARAMETER	NYSDEC AMBIENT WATER QUALITY STANDARDS (AWQS)
INORGANICS mg/L	
Aluminum	NE
Barium	1
Calcium	NE
Chromium	0.05
Iron	0.3
Lead	0.025
Manganese	0.3
Magnesium	35
Potassium	NE
Selenium	0.01
Sodium	20
Vanadium	NE
Cyanide, Total	0.2
VOLATILE ORGANIC COMPOUNDS (VOCs) ug/L	
Benzene	1
cis-1,2-Dichloroethene	5
Ethylbenzene	5
Styrene	5
Toluene	5
Xylene, m,p-	5
Xylene,o-	5
SEMIVOLATILE ORGANIC COMPOUNDS (SVOCs) ug/L	
Acenaphthene	20
Naphthalene	10
2,4-Dimethylphenol	50
Dibenzofuran	NE
Phenanthrene	50
Fluoranthene	50
Pyrene	50
Carbazole	NE
2-Methylnaphthalene	NE
Acenaphthylene	NE
Fluorene	50

SAMPLE ID	SP-MW4S
INORGANICS mg/L	
Barium	0.166J
Calcium	180J
Iron	17.4
Manganese	0.459
Magnesium	73.2
Potassium	32.3J
Selenium	0.0071J
Sodium	720
Vanadium	0.0101
Cyanide, Total	0.138

SAMPLE ID	SP-MW4D
INORGANICS mg/L	
Barium	0.0832
Calcium	115
Iron	2.33
Manganese	1.5
Magnesium	48.5
Potassium	24.3
Selenium	0.0088J
Sodium	476
Vanadium	0.0106
Cyanide, Total	0.034
VOCs ug/L	
Benzene	660
Ethylbenzene	2J
Xylene, m,p-	2J
Xylene,o-	2J
SVOCs ug/L	
Acenaphthene	33
Naphthalene	2J
Fluorene	4J

SAMPLE ID	SP-MW2S
INORGANICS mg/L	
Barium	0.323
Calcium	180
Iron	38.7
Manganese	1.28
Magnesium	35.3
Potassium	23.1
Sodium	621
Vanadium	0.005J
Cyanide, Total	0.067
VOCs ug/L	
Benzene	17
Toluene	3J
Xylene, m,p-	3J
Xylene,o-	2J
SVOCs ug/L	
Acenaphthene	6J
Naphthalene	32
2,4-Dimethylphenol	1J
Dibenzofuran	2J
Phenanthrene	1J
Fluoranthene	3J
Pyrene	2J
Carbazole	7J
Fluorene	2J

SAMPLE ID	SP-MW2D
INORGANICS mg/L	
Barium	0.0927
Calcium	156
Iron	0.791
Manganese	0.392
Magnesium	87.6
Potassium	43.3J
Selenium	0.0136J
Sodium	727
Vanadium	0.012
Cyanide, Total	0.722
VOCs ug/L	
Benzene	1300
Ethylbenzene	1400
Styrene	40J
Toluene	4000
Xylene, m,p-	2900
Xylene,o-	1100
SVOCs ug/L	
Acenaphthene	68J
Naphthalene	2800
Dibenzofuran	60J
Carbazole	170J
2-Methylnaphthalene	250J
Acenaphthylene	77J

SAMPLE ID	SP-MW1S
INORGANICS mg/L	
Barium	0.427
Calcium	184
Iron	2.79
Manganese	0.928
Magnesium	21.8
Potassium	19.3
Selenium	0.009J
Sodium	780
Vanadium	0.0077J

SAMPLE ID	SP-MW1D
INORGANICS mg/L	
Barium	0.269J
Calcium	211
Iron	2.58
Manganese	0.878
Magnesium	23.4J
Potassium	22.5
Selenium	0.0074J
Sodium	797

SAMPLE ID	SP-MW3S
INORGANICS mg/L	
Barium	0.28
Calcium	146J
Iron	22.8
Manganese	1.7
Magnesium	38.7
Potassium	26.8
Sodium	436
Cyanide, Total	0.095
SVOCs ug/L	
Naphthalene	3J

SAMPLE ID	SP-MW3D
INORGANICS mg/L	
Aluminum	2.7J
Barium	0.0922
Calcium	55.1
Chromium	0.0101J
Iron	8.26
Manganese	0.326
Magnesium	47.1
Potassium	31.6
Sodium	652
Vanadium	0.0158
Cyanide, Total	0.109
VOCs ug/L	
Benzene	3J
cis-1,2-Dichloroethene	4J
SVOCs ug/L	
Naphthalene	2J

LEGEND

- MW-1S — MONITORING WELL LOCATION
- ug/L — MICROGRAM PER LITER
- mg/L — MILLIGRAM PER LITER
- J — ESTIMATED VALUE BELOW METHOD DETECTION LIMIT
- BLUE — COMPOUND DETECTED IN SAMPLE
- RED — CONCENTRATION EXCEEDS NYS AWQS
- CURRENT PROPERTY BOUNDARY
- APPROXIMATE FORMER MGP BOUNDARY
- FORMER EDGE OF BRONX RIVER
- FORMER BUILDING OR STRUCTURE
- CURRENT BRONX RIVER

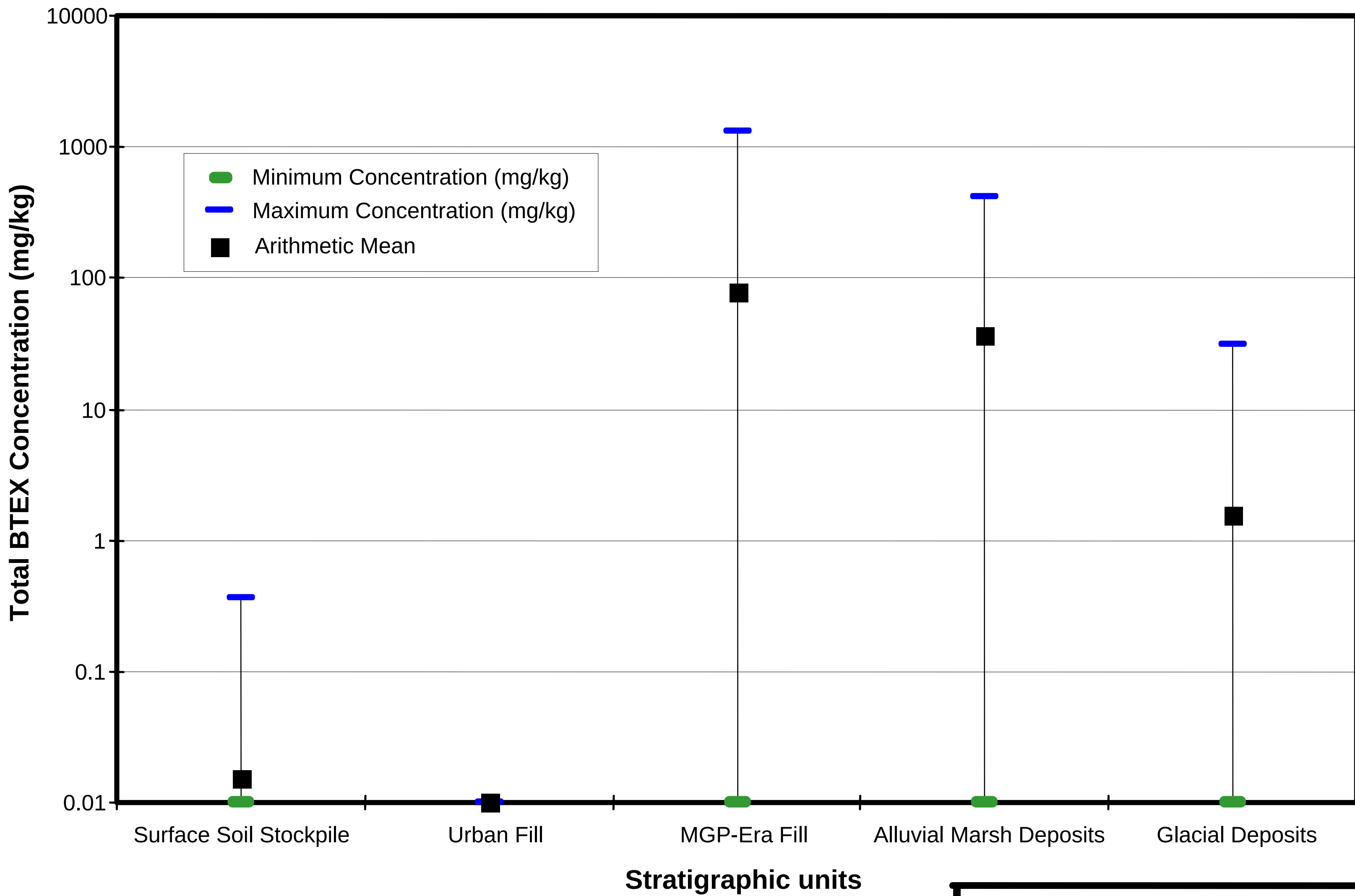
SOURCES:
SANBORN FIRE INSURANCE MAPS DATED 1896, 1901, 1915 AND 1996.
BRONX TAX ASSESSOR'S MAP.

NOTE:
SURVEY CONDUCTED BY GEI CONSULTANTS, INC. ON JULY 26, 2002.

GEI Consultants, Inc.

FIGURE 12
GROUNDWATER SAMPLE ANALYTICAL RESULTS

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
EAST 173rd STREET WORKS
BRONX, NEW YORK

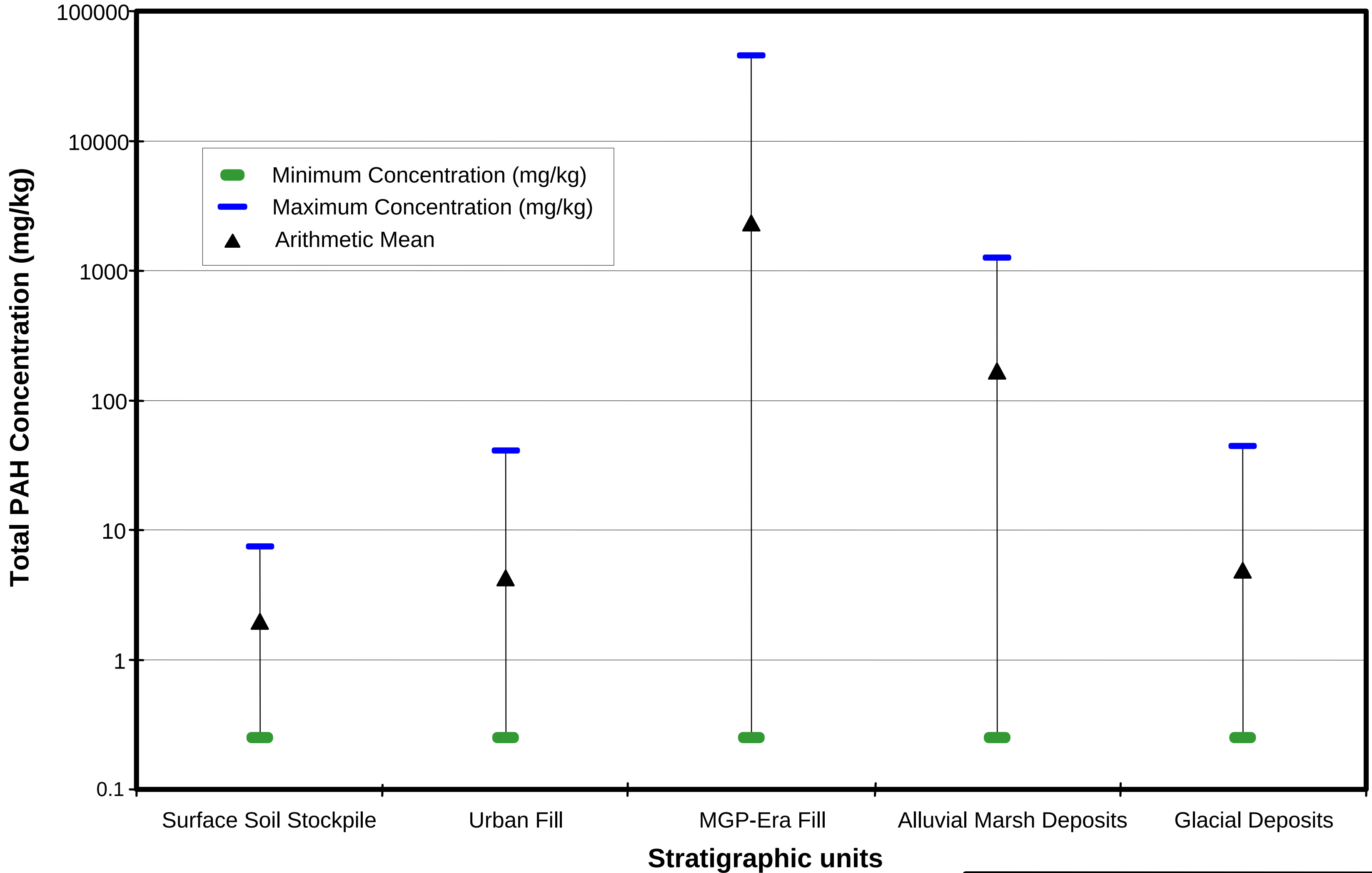


CON_ED013942\FIGS\ E173-GRAPH.PPT

GEI Consultants, Inc.

FIGURE 13
TOTAL BTEX CONCENTRATIONS IN OVERBURDEN STRATIGRAPHIC UNITS

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
EAST 173rd STREET WORKS
BRONX, NEW YORK



CON_ED013942\FIGS\ E173-GRAPH.PPT

GEI Consultants, Inc.

FIGURE 14
TOTAL PAH CONCENTRATIONS IN OVERBURDEN STRATIGRAPHIC UNITS

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
EAST 173rd STREET WORKS
BRONX, NEW YORK

Sample ID	SP-SB16 (13.5)	SP-SB16 (20.7-21)	SP-SB16 (26.5-27)
Total VOC (mg/kg)	1.2	0.1	0.1
Total SVOC (mg/kg)	1282	ND	ND

Sample ID	SP-SB19 (12-12.5)	SP-SB19 (17.5-18)	SP-SB19 (30-30.5)
Total VOC (mg/kg)	0.1	713	9.8
Total SVOC (mg/kg)	25.9	1534.2	7.2

Sample ID	SP-TP1 (10)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	47.7

Sample ID	SP-SB1 (11-12)	SP-SB1 (6-8)
Total VOC (mg/kg)	ND	ND
Total SVOC (mg/kg)	15.6	197.2

Sample ID	SP-SB4 (20-20.5)	SP-SB4 (25-25.5)
Total VOC (mg/kg)	0.3	ND
Total SVOC (mg/kg)	65.6	1.3

Sample ID	SP-SB9 (14)	SP-SB9 (21)	SP-SB9 (25)
Total VOC (mg/kg)	ND	ND	0.1
Total SVOC (mg/kg)	25.5	18	ND

Sample ID	SP-SB2 (18-18.5)	SP-SB2 (19.5-20)
Total VOC (mg/kg)	0.1	0.2
Total SVOC (mg/kg)	52.0	0.1

Sample ID	SP-SB2A (16-16.5)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	3.2

Sample ID	SP-TP2 (13)
Total VOC (mg/kg)	0.1
Total SVOC (mg/kg)	6.3

Sample ID	SP-TP3 (11)
Total VOC (mg/kg)	0.2
Total SVOC (mg/kg)	72.4

Sample ID	SP-TP12 (14)
Total VOC (mg/kg)	0.5
Total SVOC (mg/kg)	346

Sample ID	SP-SB12 (9.5-10)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	0.5

Sample ID	SP-SB15 (10-11)	SP-SB15 (17)	SP-SB15 (20-20.5)	SP-SB15 (22-22.5)	SP-SB15 (36-36.4)
Total VOC (mg/kg)	ND	633.5	1.6	ND	ND
Total SVOC (mg/kg)	250.7	50145.7	191.8	0.4	3.5

Sample ID	SP-SB8 (11-11.5)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	1.8

Sample ID	SP-SB7 (13-14)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	48.5

Sample ID	SP-SB11 (37)
Total VOC (mg/kg)	0.1
Total SVOC (mg/kg)	ND

Sample ID	SP-SB6 (16)	SP-SB6 (27-27.5)
Total VOC (mg/kg)	ND	ND
Total SVOC (mg/kg)	1.9	3.8

Sample ID	SP-TP17 (6.5)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	3.6

Sample ID	SP-TP28 (10)
Total VOC (mg/kg)	0.3
Total SVOC (mg/kg)	7.6

Sample ID	SP-SB3 (12-12.5)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	245

Sample ID	SP-TP4 (12)	SP-TP4 (5.5)	SP-TP4 (9)
Total VOC (mg/kg)	ND	ND	ND
Total SVOC (mg/kg)	42.6	1652	20.2

Sample ID	SP-TP20 (3.5)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	10.7

Sample ID	SP-TP20B (12)
Total VOC (mg/kg)	0.1
Total SVOC (mg/kg)	11.0

Sample ID	SP-TP10 (7.7)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	17.5

Sample ID	SP-TP23 (11)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	1.8

Sample ID	SP-SB17 (12)	SP-SB17 (20)	SP-SB17 (26)	SP-SB17 (3)
Total VOC (mg/kg)	0.1	0.1	ND	0.1
Total SVOC (mg/kg)	19	1.8	44.1	ND

Sample ID	SP-TP9C (8.5)
Total VOC (mg/kg)	0.2
Total SVOC (mg/kg)	2340.4

Sample ID	SP-TP29 (3)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	13

Sample ID	SP-SB18 (11)	SP-SB18 (20)
Total VOC (mg/kg)	0.1	0.1
Total SVOC (mg/kg)	ND	ND

Sample ID	SP-SB13 (13-14)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	18.3

Sample ID	SP-TP6 (9.8)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	97.5

Sample ID	SP-TP26 (4.4)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	40.5

Sample ID	SP-TP21 (10)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	0.03

Sample ID	SP-SB14 (10-11)	SP-SB14 (24-24.5)
Total VOC (mg/kg)	0.1	ND
Total SVOC (mg/kg)	3.4	0.3

Sample ID	SP-TP19 (13.5)
Total VOC (mg/kg)	0.1
Total SVOC (mg/kg)	ND

Sample ID	SP-MW2D (16-16.5)	SP-MW2D (29-29.5)
Total VOC (mg/kg)	0.4	31.4
Total SVOC (mg/kg)	26.7	41.6

Sample ID	SP-MW3D (37.5-38)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	0.3

Sample ID	SP-TP13 (12)
Total VOC (mg/kg)	1.6
Total SVOC (mg/kg)	18.3

Sample ID	SP-TP-9A (13)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	0.1

Sample ID	SP-MW3S (10-10.5)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	4.04

Sample ID	SP-TP8A (11.5)
Total VOC (mg/kg)	356.9
Total SVOC (mg/kg)	1059.9

Sample ID	SP-SB21 (14-14.5)	SP-SB21 (19-19.5)	SP-SB21 (27-27.5)
Total VOC (mg/kg)	ND	ND	ND
Total SVOC (mg/kg)	1.6	4.2	2.2

Sample ID	SP-MW4S (10.5-11)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	43.3

Sample ID	SP-MW2S (10.7-11.1)
Total VOC (mg/kg)	0.6
Total SVOC (mg/kg)	1492

Sample ID	SP-MW4D (19-19.5)	SP-MW4D (26.5-27)
Total VOC (mg/kg)	1.1	1.1
Total SVOC (mg/kg)	366	17.4

Sample ID	SP-TP8 (12)
Total VOC (mg/kg)	53.6
Total SVOC (mg/kg)	524

Sample ID	SP-TP27A (10)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	1073.3

Sample ID	SP-TP14 (10)
Total VOC (mg/kg)	ND
Total SVOC (mg/kg)	5.1

Sample ID	SP-TP27B (12)
Total VOC (mg/kg)	1322
Total SVOC (mg/kg)	25790

Sample ID	SP-SB20 (14-14.5)	SP-SB20 (20-20.5)	SP-SB20 (24-24.5)
Total VOC (mg/kg)	421.2	5.2	ND
Total SVOC (mg/kg)	448.2	4.2	0.1

Sample ID	SP-TP15 (8)
Total VOC (mg/kg)	0.3
Total SVOC (mg/kg)	144.8

PARAMETER	SOIL CLEANUP STANDARDS (mg/Kg)
Total VOCs	100
Total SVOCs	500

LEGEND

TP-17	TEST PIT LOCATION
MW-1S	MONITORING WELL LOCATION
SB-17	TEST BORING LOCATION
PZ-1	PIEZOMETER LOCATION
RG-1	RIVER GAUGE LOCATION
STM	EXISTING STORM SEWER
	EXISTING CATCH BASIN
	EXISTING MANHOLE
STM	PROPOSED STORM SEWER
	PROPOSED CATCH BASIN
	PROPOSED MANHOLE
	CURRENT PROPERTY BOUNDARY
	APPROXIMATE FORMER MGP BOUNDARY
	CURRENT BRONX RIVER
	FORMER EDGE OF BRONX RIVER
	FORMER BUILDING OR STRUCTURE
VOC	VOLATILE ORGANIC COMPOUNDS
SVOC	SEMI-VOLATILE ORGANIC COMPOUNDS
mg/kg	MILLIGRAM PER KILOGRAM
ND	NOT DETECTED
(19-19.5)	SAMPLE DEPTH (FEET BELOW GRADE)
1068.3	CONCENTRATION EXCEEDS RECOMMENDED CLEANUP OBJECTIVE

40 20 0 40 80

GRAPHIC SCALE IN FEET

SOURCES:

1. SANBORN FIRE INSURANCE MAPS DATED 1896, 1901, 1915 AND 1996.
2. BRONX TAX ASSESSOR'S MAP.

NOTES:

1. SURVEY CONDUCTED BY GEI CONSULTANTS, INC. ON JULY 26, 2002.
2. ONLY SAMPLES THAT EXHIBITED DETECTED VOCs AND/OR SVOCs ARE SHOWN.

GEI Consultants, Inc.

PLAN PREPARED FOR

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.

EAST 173rd STREET WORKS

BRONX, NEW YORK

SUBSURFACE SOIL ANALYTICAL RESULTS

TOTAL VOCs AND SVOCs

SCALE: 1" = 40'	DRN BY: SCG	PLATE 1
DATE: SEP 2002	013942-1008	

CON_ED\013942\RI\PLATE\E173-VOC