

**Consolidated Edison Company of
New York, Inc.**

Remedial Investigation Report

West 18th Street Former Gas Works
Block 715 Lot 59

May 2009



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Works
Block 715 Lot 59

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Acronyms and Abbreviations

AOC	area of concern
AST	aboveground storage tank
AWQS	Ambient Water Quality Standard
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene and xylene
CN	cyanide
CO	carbon monoxide
COC	constituent of concern
Con Edison	Consolidated Edison Company of New York, Inc.
DO	dissolved oxygen
DOT	Department of Transportation
DNAPL	dense nonaqueous-phase liquid
DUSR	data usability summary report
EDD	electronic data deliverable
EDR	Environmental Data Resources Inc.
EnviroTrac	EnviroTrac Ltd.
ESA	Environmental Site Assessment
Gasoline Installations	Gasoline Installations, Inc. of Inwood, New York
GC	gas chromatograph
HASP	<i>Health and Safety Plan Former West 18th Street Works Manhattan, New York VCA Site #00530</i>

H ₂ S	hydrogen sulfide
ID	inside diameter
IDW	investigation-derived waste
Langan	Langan Engineering
LEL	Lower Explosive Limit
LNAPL	light nonaqueous-phase liquid
LUST	leaking underground storage tank
MGP	manufactured gas plant
MTBE	methyl tert-butyl ether
NAPL	nonaqueous phase liquid
NAVD 1988	North American Vertical Datum of 1988
NYSDEC	New York State Department of Environmental Conservation
O ₂	oxygen
OLM	oil-like material
ORP	oxidation-reduction potential
OVM	organic vapor meter
PAH	polycyclic aromatic hydrocarbon
PIANOS	paraffins, isoparaffins, aromatics, naphthenes, olefins and sulfur heterocyclic hydrocarbons
PID	photo ionization detector
ppb	parts per billion
ppm	parts per million

property	Block 715, Lot 59 of the site
PSC	Public Service Commission
psi	pounds per square inch
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
report	<i>Remedial Investigation Report</i>
Retaco	Retaco Holding Corporation
RI	remedial investigation
RIWP	<i>Remedial Investigation Work Plan</i>
RSCO	Recommended Soil Cleanup Objective
Sanborn	Sanborn Fire Insurance map
SCO	Soil Cleanup Objective
SCS	Site Characterization Study
site	West 18 th Street Former Gas Works, in Manhattan, New York
SOP	Standard Operating Procedure
Subsurface Investigation Report	<i>Subsurface Investigation Report Former Parking Garage 438 W. 18th Street New York New York NYSDEC # 01-03363</i>
STARS	Spill Technology and Remediation Series
SVOC	semivolatile organic compound
TA	Test America Laboratories
TCL	Target Compound List

TPH-D	total petroleum hydrocarbons as diesel
TRC	TRC Environmental Corporation
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VCA	Voluntary Cleanup Agreement
Verizon	Verizon Communications
VOC	volatile organic compound
Worldwide	Worldwide Geosciences, Inc.
µg/kg	micrograms per kilogram
µg/L	micrograms per liter

Executive Summary

In 2002, Consolidated Edison Company of New York, Inc. (Con Edison) entered into a Voluntary Cleanup Agreement (VCA) with the New York State Department of Environmental Conservation (NYSDEC). Under the agreement, Con Edison agreed to investigate and, if necessary, remediate former manufactured gas plant (MGP) sites that were operated by its predecessor companies. One such site is the 18th Street Former Gas Works, in Manhattan, New York (the site). The Remedial Investigation (RI) described in this Remedial Investigation Report (report) relates to a portion of that site. From approximately 1845 to 1914, Block 715, Lot 59 of the site (the property) housed two gas holders on a 20,700-square-foot (½ acre) lot located east of (and disconnected from) the main operations area of the former MGP. Con Edison is currently preparing a separate RI report that addresses the entire site, including the property. This report has been completed in advance of the site-wide RI to support pending remediation decisions related to MGP and post-MGP impacts to the property, as described below.

Background

Historically, the property was used for a variety of purposes. A predecessor company operated two gas holders at the property for nearly 70 years. The gas holders were used to store coal gas generated at the nearby former gas plant to the west. With the end of MGP operations, the holders were razed and the property was redeveloped as a commercial garage housed in a single building that covers nearly the entire property. At some time prior to 1993, six underground storage tanks (USTs) that contained various petroleum products including gasoline and diesel fuel were installed. These six USTs were removed in December 1993. At present, the property is owned by Retaco Holding Corporation, who leases it to Verizon Communications for use as a service garage.

Multiple environmental investigations have been performed at the property by the owner and Con Edison. In 2001, the owner initiated a site investigation to evaluate apparent releases of petroleum from the USTs. The owner's investigation, which is ongoing, entailed drilling 12 soil borings, installing 13 groundwater monitoring wells, and collecting and analyzing soil and groundwater samples. Since 2004, Con Edison conducted several rounds of investigation at the property to characterize potential impacts due to the former MGP, culminating in this report. The first investigation, referred to as the Site Characterization Study, was part of a larger, preliminary investigation of the entire former MGP. The second investigation consisted of the work required to complete this RI. In total, nine soil borings were drilled, four well clusters

were installed and two test pits were excavated. The boring and wells were completed to characterize the nature and extent of MGP-related impacts to the property. The test pits were excavated to determine if remnants of the former gas holder foundations were present in the subsurface.

Findings

Findings of the RI activities conducted at the property are summarized below:

- The water table at the property averages about 8 feet below ground surface, but varies significantly though time. Major fluctuations in the water table (as much as 8.5 feet inside the holders and 4.5 feet outside the holders) are interpreted to reflect on-property and/or off-property changes in recharge and/or pumping.
- The subgrade portions of the gas holders remain and contain groundwater at levels typically higher than the surrounding water table.
- Leaking utilities, such as water lines and drains, are the most likely source of ongoing recharge to the holders.
- Water inside the holders is inferred to mix with water outside the holders by moving through cracks, and other localized penetrations or breaches in the holder walls.
- Documented releases of petroleum from the former USTs have created a “smear zone” in subsurface soils by floating on, and rising/falling with, the water table.
- The concentrations of selected petroleum-related compounds in some soil and groundwater samples in and near the smear zone exceed applicable criteria.
- MGP-related impacts to soil and groundwater are generally limited to near the bottoms of the holders, where localized deposits of residual coal tar are present. No evidence of potentially mobile coal tar was found, and no coal tar was identified outside the holders.

Conclusions

Based on the results of RI activities conducted at the property, ARCADIS presents the following conclusions:

- Former USTs located inside the east holder foundation are a source of the petroleum hydrocarbons observed in soil and shallow groundwater. Based on the distribution of petroleum impacts, the presence of other unidentified leaking USTs cannot be ruled out.
- Impacts to the vadose zone and shallow groundwater are limited to petroleum products. Large fluctuations in the water table appear to have produced a smear zone of petroleum impacts.
- MGP residuals on the property do not pose a meaningful exposure risk to humans given their depth below the water table, and have only a localized effect on groundwater quality.

No further investigation or remedial actions are required to address MGP-related impacts.

1. Introduction

This *Remedial Investigation Report* (report) summarizes the findings for a remedial investigation (RI) conducted on a portion of the West 18th Street Former Gas Works, in Manhattan, New York (the site). This report describes work completed at Block 715, Lot 59 (the property), a parcel in the western portion of the site. The RI was conducted by ARCADIS on behalf of the Consolidated Edison Company of New York, Inc. (Con Edison) as part of the site-wide remedial investigation.

1.1 Project Background

Con Edison conducted the RI for the site in accordance with New York State Department of Environmental Conservation (NYSDEC) Voluntary Cleanup Agreement (VCA) No. D2-0003-02-08. This report is being submitted in advance of the Site-wide RI Report for the entire West 18th Street Former Gas Works Site. It has been prepared to provide insight into site subsurface conditions as they relate to pending and ongoing remediation decisions for impacted groundwater and soil associated with the former underground storage tanks (USTs) and the historical operations of two gas holders at the property. The information presented in this report will be summarized in the Site-wide RI Report for the W. 18th St. Former Gas Works Site.

Con Edison conducted an initial investigation of the site from 2004 to 2005 via the Site Characterization Study (SCS). Results of the SCS were presented in the Site Characterization Report prepared by TRC Environmental Corporation (TRC) in 2006 (TRC 2006a). The SCS found that soil and groundwater beneath several areas of the property had been impacted by former manufactured gas plant (MGP) operations and other sources, such as leaking underground storage tanks (LUSTs). Based on these findings, and in accordance with the terms of the VCA, Con Edison initiated an RI for the site (including the property). A *Remedial Investigation Work Plan* (RIWP) was prepared by TRC (TRC 2006b) and submitted to the NYSDEC in January 2006. The NYSDEC approved the RIWP in April 2006.

1.2 Remedial Investigation Objectives

The objectives of the RI, as outlined in the RIWP (TRC 2006b), were to:

- delineate the horizontal and vertical extent of MGP-impacted soil and groundwater identified during the SCS

- determine if soil and/or groundwater conditions pose an acute health risk and if so, whether the conditions warrant implementation of interim remedial measures
- provide sufficient data with which to develop a proposed site remediation strategy, if necessary

The project objectives outlined above were achieved at the property by conducting the following activities:

- installing soil borings to further evaluate subsurface conditions, for collection and analysis of soil samples, to further delineate subsurface geology and to further delineate the areas of the site containing MGP-affected soil, as identified during the SCS
- installing shallow (water table) groundwater monitoring wells and shallow/deep groundwater monitoring well clusters
- measuring groundwater elevations to clarify groundwater flow direction
- evaluating the presence of nonaqueous phase liquids (NAPLs) in the subsurface
- collecting groundwater samples from the complete groundwater monitoring well network for laboratory analysis

The RIWP (TRC 2006b) specified the number, type and location of samples and the protocols and procedures that were used during the RI. It is noted that the RI for the site is ongoing; however, soil and groundwater activities at the property have been completed, as discussed in this report.

1.3 Report Organization

This report is organized as follows:

- **Section 1, Introduction**, discusses the project background and objectives.
- **Section 2, Property Background**, describes the property, a history of property operation and ownership, and the previous investigations.

- **Section 3, Remedial Investigation Activities**, discusses the activities performed during this RI.
- **Section 4, Remedial Investigation Results**, presents field and analytical data collected during the RI; the conceptual model of the property subsurface based on the SCS and RI field observations, measurements and data; and a comparison of analytical data to applicable cleanup objectives.
- **Section 5, Conclusions**, summarizes the findings of the RI and the conclusions drawn.

2. Property Description and History

2.1 Property Description

The site is located in the Borough of Manhattan, New York (see Figure 1). The former MGP covers portions of five modern city blocks, parts of Route 9A and parts of the Chelsea Pier Entertainment Complex along the Hudson River bulkhead. The portion of the site that is the focus of this investigation (the property) is Block 715, tax Lot 59, which is a small parcel located along the south side of West 18th Street, between 9th and 10th Avenues.

Block 715, Lot 59 (aka 442 West 18th Street) is currently owned by Retaco Holding Corporation and is leased to Verizon Communications (Verizon). Verizon uses the property for equipment storage, vehicle storage and office space. According to the current New York City tax map, the lot is rectangular with dimensions of 225 feet along West 18th Street and 92 feet perpendicular to West 18th Street. The lot is completely covered by a 2-story brick building. Each story has a concrete floor. Access to the second story is via a concrete ramp located on the eastern side of the property.

The property is classified by New York City as 07 land use, zoned commercial (C6-3) and is part of the special West Chelsea district. Residential and commercial properties are located adjacent to the property. The property is relatively flat, with ground elevations outside the building (on the adjacent sidewalk) of approximately 11.5 feet Relative Mean Sea Level (RMSL)¹. The slab floor inside the building is approximately 2.5 feet higher than street level.

2.2 Operational History of Site – MGP Operations

The following operational history of the property is based on a variety of sources, cited below, including Sanborn Fire Insurance Maps. The available Sanborn map coverage for the property is included in Appendix A. MGP operations began at the site in 1834. The West 18th Street Gas Works was the second gas plant built in New York City, and the first erected by the Manhattan Gas Light Company. Construction of the West 18th Street Gas Works began during fall 1833, and continued for the next year. By November 1834, the plant was manufacturing and distributing coal gas to customers (Collins 1934). During the nineteenth century, the West 18th Street Gas

¹ All elevations presented in this report are based on the North American Vertical Datum of 1988 (NAVD 88).

Works grew in size as the Manhattan Gas Light Company continued to purchase land and construct additional facility structures.

In 1845 and 1846, the Manhattan Gas Light Company purchased lots on Block 715 (including the property) and built two gas holders, enclosed in a brick warehouse-type structure along the south side of West 18th Street. According to historical records, the lots appeared to include the addresses of 438, 440 and 454 West 18th Street. The gas holders were each approximately 84 feet in diameter and had a storage capacity of approximately 205,000 cubic feet of gas each (Public Service Commission [PSC] 1909 and Collins 1934). Additional historical information during the period of MGP operations is summarized below:

- 1852 – The earliest map depicting the property illustrates a rectangular-shaped building occupying the south side of West 18th Street between 9th and 10th Avenues (Dripps 1852). As noted above, this building enclosed the two gas holders.
- 1859 – The Manhattan Gas Co. Gas Holder House is depicted along with a stable (Perris and Browne 1859).
- 1870s – In the early 1870s, the two gas holders on the property were replaced (PSC 1909 and Collins 1934). The 1895 Sanborn Fire Insurance map (Sanborn) indicates that the two gas holders occupied 440 and 454 West 18th Street. A store house and three unidentified structures are present on 438 and 440 West 18th Streets. The 1904 Sanborn map identifies the three unidentified structures as paint shops.
- 1885 – The Manhattan Gas Light Co. sold Tax Lots 51 and 59 to the Consolidated Gas Company.
- 1895 – Two gas holders associated with the Consolidated Gas Company are depicted between 440 and 454 West 18th Street (Sanborn 1895). The stable is now identified as a Store House and is located between 438 and 440 West 18th Street. Three unidentified structures are located at 438 West 18th Street.
- 1897 – The Consolidated Gas Company occupies Block 715, Lot 59 (Bromley 1897). The shaded area depicting the Consolidated Gas Company includes 200 feet of property along West 18th street south of 456 West 18th Street, in addition to the area of the Store House identified above. The property (438 West 18th Street)

containing the three unidentified structures noted above is identified as Block 715, Lot 51. Lot 51 is illustrated as measuring 25 feet wide.

- 1899 – The property has the same configuration as in 1897 (Bromley 1897).
- 1904 – Two gas holders of the Consolidated Gas Company are depicted (Sanborn 1904). The two gas holders, each with a capacity of 200,000 cubic feet, are contained inside a single 1-story brick building. The Store House remains and the unidentified structures at 438 West 18th Street (noted above) are identified as paint shops.
- 1911 – The property has the same configuration as in 1899 (Bromley 1911).
- 1914 – The gas holders on the property were razed.

2.3 Operational History of Site – Post-MGP Operations

The following summarizes the post-MGP ownership and use of the property:

- 1916 – The Consolidated Gas Company property occupies Block 715, Lot 59.
- 1920 – The Commercial Garage Co. occupies Block 715, Lot 59, which is illustrated as a rectangular property extending from 440 to 438 – 454 West 18th Street (Bromley 1920). The lot size along West 18th Street is noted as 225 feet.
- 1921 – A garage occupies the property from 442 to 454 West 18th Street (Sanborn 1921). Ten wire-glass skylights are located along the south side of the Garage. The map notes that the garage has a capacity of 235 cars. Four 500-gallon buried gasoline tanks are noted along the eastern half of the site.
- 1944 – Consolidated Gas Company sells Lot 59 to 440 West 18th St. Realty Corporation.
- 1965 – The National Auto Renting Company, Inc. becomes a tenant of the property.
- 1969 – Avis Truck Rental is depicted as the tenant (Sanborn 1969). The notation “Built 1915” indicates that a second floor may have been added to the property

after the gas holders were removed. A ramp to the second floor is shown at the location corresponding to 438 West 18th Street. An auto repair and boiler room are shown at 440 West 18th Street.

- 1975 – No changes are depicted on the 1975 Sanborn map (Sanborn 1975).
- 1979 – The property is identified as a taxi garage (Sanborn 1979). The auto repair facility is not shown. The buried gasoline tanks are not shown. All of features remain the same as depicted in 1975.
- 1980 – No changes are depicted on the 1980 Sanborn map (Sanborn 1980).
- 1983 – The property is sold to Retaco Holding Corporation (Retaco). No changes are depicted on the 1983 Sanborn map (Sanborn 1983).
- 1985 – No changes are depicted on the 1985 Sanborn map (Sanborn 1985).
- 1993 – Six USTs were removed from the property on December 12, 1993 (EnviroTrac Ltd. [EnviroTrac] 2001). Among the USTs were five 550-gallon gasoline tanks and one 4,000-gallon diesel fuel tank. The gasoline tanks were located under the northeast corner of the garage building and the diesel tank was located along the west side of the building (EnviroTrac 2001). Note that, based on personal communication between Con Edison and the current property owner (Retaco), Retaco believes the diesel tank was located on the east side of the property. The tanks were removed by Gasoline Installations, Inc. of Inwood, New York (Gasoline Installations) and, according to a notarized affidavit from December 28, 1993, no evidence of soil contamination was observed during removal of the USTs (EnviroTrac 2007). The final disposition of the USTs is unknown.
- 2001 – EnviroTrac Ltd. (EnviroTrac) of Ronkonkoma, NY, on behalf of Verizon, investigated suspect contaminated soil at the site in June 2001 (EnviroTrac 2001). Petroleum-impacted soil was identified and a Verizon representative contacted the NYSDEC Spill Hotline. The property was assigned Spill No. 01-03363 as a result of this incident.

2.4 Environmental Records Search Summary

An Environmental Data Resources Inc. (EDR) Radius Map[™] Report (EDR 2009) was reviewed to identify documented spills/releases as well as registered USTs and

aboveground storage tanks (ASTs) in the vicinity of the property. The complete EDR report is provided as Electronic Attachment 1.

A review of the New York Leaking Storage Tank Incident Reports (LTANKS) section of the January 2009 EDR report indicated six documented petroleum spills located topographically upgradient and within approximately ¼ mile of the property. Note that each documented spill was located more than 0.125 miles (i.e., approximately 600 feet) from the property. The following table lists the location, NYSDEC spill number, spill date, closure date and distance/direction from the property for each of the documented spills.

Location	Spill ID	Spill Date	Closure Date	Distance (miles)/ Direction
166-35 9 th Avenue	8803864	Not reported	09/30/92	0.14 ENE
415 W. 21 st Street	9412289	12/14/94	12/14/94	0.15 NE
415 W. 21 st Street	9411689	12/02/94	12/02/94	0.15 NE
440 West 22 nd Street	0512757	02/03/06	03/10/06	0.19 NE
310 West 18 th Street	9612959	02/01/97	02/09/00	0.25 ESE
308 West 18 th Street	9511332	12/07/95	12/08/95	0.25 ESE

Notes:

ENE = East-northeast.
NE = Northeast.
ESE = East-southeast.

Additional information on spills and releases near the property is presented in Electronic Attachment 1.

The following table lists the location of in-service USTs or ASTs located topographically upgradient and within ½ mile of the property.

Location	UST/AST	Distance (miles)/ Direction
435 West 18 th Street	UST	0.01 ESE
440 West 19 th Street	UST	0.05 NNE
458 West 20 th Street	AST	0.1 N
110 9 th Avenue	AST	0.1 SE
422 West 20 th Street	AST	0.12 NNE

Notes:

NNE = North-northeast.
N = North.
SE = Southeast.

2.5 Previous Investigations

Several investigations and monitoring programs have been completed at the property that primarily focused on the known petroleum impacts. The findings of these investigations are summarized below. Copies of all available investigation reports and monitoring data are provided on the CD that accompanies this report.

2.5.1 2000 – Phase I Environmental Site Assessment

Langan Engineering (Langan) completed a Phase I Environmental Site Assessment (ESA) of the property in 2000. The report for this investigation is not available; however, the findings were later summarized in the *Subsurface Investigation Report Former Parking Garage 438 W. 18th Street New York New York NYSDEC # 01-03363* (Subsurface Investigation Report) prepared by EnviroTrac (EnviroTrac 2001). During the Phase I ESA, Langan is reported to have identified five areas of concern (AOCs) including the former USTs, former hydraulic lift system, floor drains, previous property use and asbestos-containing insulation.

2.5.2 2001 – Property Renovation and Construction

In 2001, EnviroTrac observed and documented excavation activities that were conducted on the first floor of the property under the direction of Tishman Interiors. The following activities and observations were noted by EnviroTrac and are discussed in the Subsurface Investigation Report (EnviroTrac 2001):

- During construction activities, EnviroTrac noted that a rectangular excavation area, measuring approximately 20 feet by 17 feet wide and 6 feet deep, was located along the north side of the property near the current elevator shaft. Trenches to accommodate future drainage pipes were also excavated throughout the first floor of the property. Trenches measured approximately 3 feet wide and 1- to 4-feet deep.
- EnviroTrac noted the presence of conduits and pipes protruding into the south end of the excavation approximately 1 to 3 feet below the garage floor.
- On June 28, 2001, EnviroTrac (on behalf of Verizon) identified petroleum-impacted soil during renovation and construction activities at the property. As a result, Verizon contacted the NYSDEC Spill Hotline. The NYSDEC assigned spill number 01-03363 to this release.

- Photo ionization detector (PID) readings taken by EnviroTrac along the excavation walls ranged from 33 parts per million (ppm) to 403 ppm. A PID reading of 634 ppm was observed in one of the trenches. The location of this reading is unknown.
- Based on the PID readings, EnviroTrac collected five soil grab samples for laboratory analysis of volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs). Two grab samples (G-1 and G-2) were collected from within the excavation and three grab samples (G-3, G-4 and G-5) were collected within the trenches. In addition, one groundwater sample was collected from the base of the excavation for VOC and hydrocarbon fingerprint analysis.
- The highest total VOC concentration in soil (34,481 micrograms per kilogram [$\mu\text{g/kg}$]) was detected in G-1, located at the base of the excavation. VOCs were also detected in G-3 and G-4. SVOCs were detected in each soil sample. The levels of several VOCs and SVOCs in these three samples exceed their respective Spill Technology and Remediation Series (STARS) criteria (NYSDEC, 1992). Methyl tert-butyl ether (MTBE), a gasoline additive, was detected in G-3; but did not exceed its STARS criterion.
- Fingerprint analysis of the groundwater indicated a match with gasoline.
- On July 12, 2001, EnviroTrac removed and disposed of 85¼ tons of nonhazardous petroleum-impacted soil from the excavation area and trenches. Soil was disposed of at the Soil Remediation of Philadelphia facility located in Philadelphia, Pennsylvania.
- Confirmation samples outside of the excavated areas were not collected.

2.5.3 2001 – Subsurface Site Investigation

In August 2001, EnviroTrac was retained by Retaco to conduct a subsurface investigation at the property. Results of the subsurface site investigation are presented in the Subsurface Investigation Report (EnviroTrac 2001) and summarized below:

- The objective of the investigation activities was to delineate the petroleum-contaminated soil and groundwater at the property.

- A GeoProbe® drill rig was used to advance 12 soil borings (B-1 through B-12, see Figure 2 for locations) to a depth of 8 feet below grade; except B-1, which is reported to have been drilled to a depth of 12 feet. One soil and one groundwater sample were collected and analyzed for VOCs and SVOCs from each soil boring. Note that, although the report indicates that the groundwater samples were collected at depths ranging from 8 to 14 feet bgs, none of the borings appear to have been drilled to that depth.
- Sample results showed that VOCs and SVOCs in soil were detected above NYSDEC TAGM 4046 Soil Cleanup Objectives (SCOs) in nine of the 12 borings. Total VOC concentrations ranged from nondetect in sample B-12 (8 feet bgs) to 235,000 micrograms per kilogram (µg/kg) in sample B-6 (8 feet bgs).
- MTBE was detected in two soil samples: B-5 at 8 feet bgs and B-7 at 8 feet bgs, at 138 µg/kg and 9.7 µg/kg, respectively. The sample at B-5 exceeded the relevant STARS criterion for MTBE of 120 µg/kg (NYSDEC, 1992). Groundwater analytical results indicated that VOCs in all samples exceeded their respective Ambient Water Quality Standard (AWQS; NYSDEC, 1998).
- Total VOC concentrations in groundwater ranged from 27.8 µg/L in B-1 (14 feet bgs) to 117,396 µg/L in B-12 (12 feet bgs). The BTEX compounds, along with isopropylbenzene, 1,3,5-trimethylbenzene, n-propylbenzene, 1,2,4-trimethylbenzene, MTBE were the predominant VOCs, found in 8 of the 11 samples collected
- MTBE was detected in each groundwater sample, with concentrations ranging from 23 µg/L in B-1 (14 feet bgs) to 2,205 µg/L in B-12 (12 feet bgs).
- EnviroTrac recommended additional soil and groundwater sampling to delineate the extent of soil impacts for remedial design.
- An additional 60 cubic yards (estimated 90 tons) of petroleum-impacted soil were excavated from the property in August and September 2001². The impacted soil was disposed at AB Oil Service by National Waste Disposal Corporation.

² EnviroTrac (2001) makes no mention of post-excavation sampling.

2.5.4 2001 Monitoring Well Installation

In December 2001, EnviroTrac installed 10 monitoring wells at the property on behalf of Retaco (Figure 2). Monitoring well construction details were not provided to ARCADIS; however, well gauging conducted in 2008 indicated that wells were completed to depths from 13 feet to 15 feet bgs and were likely screened across the water table. Water levels and product thickness gauging was completed on January 10, 2002, January 18, 2002, and March 6, 2002. Groundwater samples were collected on January 18, 2002 and March 6, 2002. Results of the groundwater sampling and monitoring are provided in the *Update Report December 2001 through January 2002 Retaco Holding Corporation 438 West 18th Street New York, NY* (EnviroTrac 2002), and summarized below:

- The water table depth ranged from approximately 4 to 12 feet bgs (equivalent to approximately 0.7 to 8.2 feet RMSL, based a revised survey completed for Con Edison in 2007).
- Light nonaqueous-phase liquid (LNAPL) was detected in MW-8 during each round of gauging. The LNAPL thickness increased from 0.01 feet on January 10, 2002 to 0.12 feet on March 6, 2002.
- The highest total VOC and total SVOC concentrations were detected in MW-8 (54,931 µg/L and 5,624,770 µg/L, respectively).
- MTBE was detected at least once in each monitoring well. Detected MTBE concentrations ranged from 24.3 µg/L in MW-7 to 1,980 µg/L in MW-4.

2.5.5 2002 Fingerprint Analysis

In October 2002, EnviroTrac collected and submitted one NAPL sample from MW-8 to Worldwide Geosciences, Inc. (Worldwide) of Houston, Texas for fingerprint analysis. Worldwide concluded that the sample represented a residual 15 percent fraction of unleaded gasoline (Worldwide 2003). Worldwide also concluded the following:

"If coal tar derived, the hydrocarbon assemblage dissolved in this water sample would be dominated by naphthalene, methyl naphthalenes, and heavier unsubstituted polynuclear aromatic hydrocarbons. This is not the case. The naphthalene and methylnaphthalene peaks are minor peaks. The chromatographic signature shows no heavier polynuclear

aromatic peaks, which would elute beyond or to the right, of the methylnaphthalene peaks. There is no indication of a coal tar contribution to the MW-8 sample.”

2.5.6 2004 Groundwater Sampling

EnviroTrac collected groundwater samples from each of the monitoring wells in January 2004. Samples were submitted to South Mall Analytical Labs, Inc. of Plainview, NY for VOC analysis. A review of the analytical reports indicates that VOCs (including MTBE) were detected in groundwater samples collected from each of the wells sampled. MTBE concentrations ranged from 105 µg/L in MW-1 to 543 µg/L in MW-5.

2.5.7 2005 Monitoring Well Installation

In February 2005, EnviroTrac installed three additional monitoring wells (MW-11, MW-12 and MW-13) at the property on behalf of Retaco. Wells MW-11 and MW-12 are located on the sidewalk adjacent to the property and MW-13 is located on the north side of West 18th Street across from the property. Each well is screened across the water table. Note that at the time of the RI, MW-13 was not accessible due to ongoing construction activities across from the property (Tax Block 716, Lot 9).

Results of the monitoring well installation and groundwater sampling are provided in the Subsurface Investigation Report (EnviroTrac 2005) and summarized below:

- Groundwater samples were collected from MW-8, MW-11, MW-12 and MW-13 and submitted for VOC and SVOC analysis. VOCs, including MTBE were detected in MW-8, MW-11 and MW-13. Only MTBE was detected in MW-13.
- Naphthalene was the only polycyclic aromatic hydrocarbon (PAH) detected in the monitoring wells sampled.
- The water table depth ranged from approximately 6 to 13 feet bgs (equivalent to approximately 0.5 to 7.1 feet RMSL, based a revised survey completed for Con Edison in 2007). Groundwater gauging indicated no measureable “product” in any of the wells.
- MW-6 was not sampled because it had been previously abandoned. The well was reported to have periodically overflowed. This phenomenon is interpreted to reflect

an efficient connection to a leaking drain pipe, which the drill rig may have nicked during installation. It is noted that of the wells installed at the property, MW-6 is the only one known to have overflowed, though all wells installed by EnviroTrac were similarly screened across the water table.

- EnviroTrac concluded “...*that off-site sources are responsible for the groundwater contamination beneath the site.*”
- The EnviroTrac (2001) report provides the first mention (among previously submitted reports) that the property was formerly part of an MGP.

EnviroTrac submitted the Subsurface Investigation Report to the NYSDEC Region 2 for review and comment on April 1, 2005 (EnviroTrac 2005). The NYSDEC’s response comments were provided in a letter dated May 26, 2005, and are summarized below:

- The NYSDEC disagrees with EnviroTrac’s conclusion regarding the source of contamination being from off site and not from beneath the site.
- The NYSDEC believes that the wells with the greatest groundwater impacts (MW-8 and MW-11) are located downgradient of the former USTs.
- The NYSDEC concluded “*that the subject spill is the result of petroleum contamination associated with the five 550-gallon USTs and one 4000-gallon diesel UST at the site – and not the result of the MGP process*” (NYSDEC 2005).

2.5.8 2007 Groundwater Sampling

EnviroTrac collected groundwater samples from MW-1 through MW-5 and MW-7 through MW-12 in March 2007 on behalf of Retaco. Samples were submitted to EcoTest Laboratories, Inc. of Babylon, NY for VOC and SVOC analysis. Results of the groundwater sampling are provided in the *Status Report Former Parking Garage 438 West 18th Street New York, New York NYSDEC # 01-03363* (EnviroTrac 2007), and are summarized below:

- Elevated concentrations of VOCs and SVOCs were detected in each well that was sampled.
- MTBE was detected in MW-1 through MW-5 and MW-10 through MW-12 at concentrations ranging from 18 µg/L in MW-4 to 390 µg/L in MW-11. While there is

no NYSDEC AWQS for MTBE, there is a guidance value, which is 10 µg/L (NYSDEC, 1998).

- Note that MTBE was not detected in MW-8 or MW-9; however, the detection limit for MTBE for these samples was 500 µg/L due to the elevated concentrations of other VOCs, including the benzene, toluene, ethylbenzene and xylene (BTEX) compounds, isopropylbenzene, n-propylbenzene, 1,3,5,-trimethylbenzene, 1,2,4,-trimethylbenzene, sec-butylbenzene and naphthalene that were present in the samples.
- PAHs were detected in each groundwater sample. Except for naphthalene and 2-methylnaphthalene, the concentration of detected PAH compounds was less than or equal to 10 µg/L.
- “Free product” was not detected in any of the monitoring wells.

3. Remedial Investigation Activities

This section presents the methodologies used during the field investigation of the property, as part of Con Edison's ongoing site-wide RI.

ARCADIS conducted the majority of the RI activities between August 2008 and December 2008. Relevant investigations of the property were also performed for Con Edison during the 2004 to 2005 site characterization. The scope and specific methods of the SC were reported in the Site Characterization Report (TRC 2006a), included as an Electronic Attachment 2).

Specific activities completed as part of the RI of the property to meet the objectives listed in Section 1 included:

- underground utility clearance
- community air monitoring
- subsurface soil investigation
- groundwater monitoring
- field survey
- management of investigation-derived waste (IDW)
- data validation

Each of these activities is discussed in the following subsections.

Several subcontractors performed various services during the RI of the property, as presented in the table below.

Subcontractor	Office Location	Service Provided
Summit Drilling Company, Inc.	Bound Brook, NJ	Utility clearance
Naeva Geophysics	Congers, NY	Utility clearance
Boart Longyear Corp.	North Reading, MA	Rotary sonic drilling
Alpha Analytical – Woods Hole	Mansfield, MA	Analytical services
Test America Laboratories	Shelton, CT	Analytical services
Munoz Engineering, P.C.	New York, NY	Surveying
Clean Earth of North Jersey	South Kearny, NJ	Waste transport and disposal

All work conducted during the RI was completed in general conformance with the following documents:

- *Draft DER-10 Technical Guidance for Site Investigation and Remediation* (NYSDEC 2002)
- RIWP (TRC 2006b)
- *Remedial Investigation Letter Work Plan for the West 18th Street Former Gas Works* (ARCADIS 2008)
- *Field Sampling Plan for the Remedial Investigation of the Former West 18th Street Works* (TRC 2006)
- *Health and Safety Plan Former West 18th Street Works Manhattan, New York VCA Site #00530* (HASP; ARCADIS 2006)

3.1 Underground Utility Clearance

Prior to initiating intrusive investigation activities, sample locations were cleared in accordance with Con Edison's utility clearance procedures. As an initial step, the New York City "One Call" organization was contacted to request utility mark-outs in accordance with Code 753, a minimum of 3 working days prior to the start of fieldwork. All mark outs by Code 753 participating companies were completed in the specified timeframes in advance of all field-intrusive activities. Renewal calls were made in accordance with the timeframes allowed in the regulations.

Subsequent to completion of the Code 753 mark outs and review of NYCDEP drawings and Con Edison utility plates for gas and electric service, the inside of the building was inspected to determine the distribution/layout of the various utilities that were identified entering the building as well as building-specific utilities (e.g., roof and or floor drains).

As an added precaution for worker safety and to minimize the potential for damage to subsurface utilities, proposed boring locations were cleared by nonmechanical means (e.g., hand digging and vacuum extraction). Soil was excavated, typically to a minimum depth of 5 feet bgs, by nonmechanical means to physically confirm the presence/absence of subsurface utilities at each of the proposed boring locations. If proposed sample locations were determined to be too close to subsurface utilities to safely

conduct the field investigations, the boring was relocated to achieve the same investigative objective

3.2 Community Air Monitoring

Community air monitoring was conducted in accordance with the site-specific HASP (ARCADIS 2006). This monitoring entailed monitoring for VOC vapors (using a PID) and particulates (using a PDR100 particulate meter) at dedicated stations – one located upwind and one located downwind of the work zone. Work space air monitoring was also conducted in accordance with the HASP, using real-time, hand-held monitoring instruments including a multi-gas (Lower Explosive Limit [LEL], oxygen [O₂], carbon monoxide [CO] and hydrogen sulfide [H₂S]) monitor and a particulate meter).

3.3 Subsurface Soil Sampling

3.3.1 Drilling Methods

Subsurface soil investigation activities conducted at the property included drilling soil borings and conducting subsurface soil sampling. As presented in the Site Characterization Report (TRC 2006a), borings completed by TRC were advanced by direct-push (i.e., GeoProbe[®]) drilling methods. Soil samples were collected continuously with a 2-inch-diameter stainless steel Macro Core sampler with associated polyethylene liner). At locations where monitoring wells were installed, soil borings were completed using a hollow stem auger drill rig with 4.25-inch-inside-diameter (ID) augers.

For the RI, six soil borings were completed to a maximum depth of 42 feet between August 2008 and September 2008 using rotary sonic (rotasonic) drilling methods. Figure 2 presents the locations of soil borings drilled during the RI. Note that the soil borings completed during the previous investigation by EnviroTrac are also shown on Figure 2. Soil boring logs describing the soils encountered and soil boring depth are provided in Appendix B.

During rotasonic drilling, soil samples were collected continuously from the ground surface to the bottom of the borings using 2-foot-long, 4-inch-diameter core barrels lined with a plastic sleeve. The completion of the soil borings followed a consistent methodology, as follows:

- Soil samples were retrieved continuously from grade to the total boring depth using plastic-lined core barrels. Recovered soil samples were reviewed and screened for VOCs using an organic vapor meter (OVM) equipped with a PID.
- Selected samples were submitted for laboratory analyses, as described in Section 3.3.2.
- Upon completion, each soil boring was backfilled with bentonite or completed as a monitoring well.

3.3.2 Sample Collection and Analysis

Up to four soil samples were collected from each soil boring and submitted under chain of custody protocols to Test America Laboratories (TA) of Shelton, CT, for analysis of the following parameters:

- Target Compound List (TCL) VOCs by United States Environmental Protection Agency (USEPA) Method 8260B
- TCL SVOCs by USEPA Method 8270C
- total and amenable cyanide by USEPA Method 9012B

Analytical reports from TA are provided on the accompanying CD. The selection rationale for soil samples for analysis followed the procedures presented in the RI Letter Work Plan (ARCADIS 2008). Samples were selected for analysis as follows:

- one sample from within the first 5 feet of the boring if impacts are observed
- one sample from the soil/water table interface
- one sample from the interval exhibiting the highest PID readings and/or exhibiting the highest visual evidence of MGP impacts
- one sample from below visually impacted soils (for vertical delineation)
- one sample from the bottom of the boring, typically at the base of the gas holder or above the silty clay layer

In addition to the analyses listed above, seven soil samples were analyzed for fingerprint analysis using a suite of volatile hydrocarbons collectively called PIANOS compounds. This suite of more than 100 compounds represents paraffins, isoparaffins, aromatics, naphthenes, olefins and sulfur heterocyclic hydrocarbons. PIANOS analysis has been found to be essential for identifying the sources of hydrocarbons (e.g., gasoline, diesel, coal tar) of concern when VOCs are present in environmental samples (Stout et al. 2002; Sauer and Costa 2003).

In general, samples submitted for PIANOS analyses were selected from material that appeared to contain both potentially non-MGP- and MGP-related impacts, based on visual and olfactory observations as well as PID readings.

The specific soil samples collected during the RI along with the sample date, sample depth and analysis performed are listed in Table 1. Analytical methods, sample handling procedures and laboratory protocols are outlined in the RIWP (TRC 2006b). Sample analyses followed the NYSDEC ASP-2000 analytical protocol and included quality assurance/quality control (QA/QC) samples as required by the Quality Assurance/Quality Control Project Plan (QAPP) included with the RIWP (TRC 2006b).

3.4 Groundwater Monitoring

3.4.1 Monitoring Well Installation/Development

Nine groundwater monitoring wells were installed at the property during the RI to better characterize groundwater quality, patterns of groundwater flow and the presence of NAPL. SCS and RI monitoring well locations are shown on Figure 2. Table 2 summarizes the monitoring well construction details for each well installed at the property. Appendix B includes the monitoring well construction logs.

Each monitoring well was installed and constructed in conformance with the following specifications:

- Wells were constructed with 2-inch-ID, threaded, flush-joint, schedule 40 PVC casing and screen.
- Screens were 2 or 4 feet long with 10-slot (0.01-inch) openings.

- The annulus around the screens was backfilled with appropriately sized clean silica sand (e.g., Morie No. 1) to a minimum height of 1 foot above the top of the screen.
- The remainder of the annular space was filled with bentonite to near the ground surface. The bentonite was allowed to hydrate for a minimum of 24 hours before well development.
- Each monitoring well was fitted with a sealed cap (J-plug) and was contained in a flush-mounted vault. The J-plug keeps surface water from infiltrating into the well during rain events, high water conditions, and other weather events.
- The concrete seal or pad was sloped slightly to channel water away from the well, and was deep enough to remain stable during freezing and thawing of the ground.

Monitoring wells were developed a minimum of 24 hours after installation using pump and surge methods. Prior to development, fluid levels and the total depth for each well were measured to the nearest 0.01 foot using a clean electronic oil/water interface probe. No LNAPL or dense nonaqueous-phase liquid (DNAPL) was observed in any of the wells to be developed.

Dedicated polyethylene tubing, 2-inch submersible pumps and a surge block were used to develop the wells. The surge block was fastened to a 1-inch threaded PVC pipe, and then lowered to the well screen interval. The surge block was repeatedly lifted and dropped (surged) across a short section of the well screen, then lifted out of the well to allow the pump to be dropped to remove the suspended material. This process of surging/pumping was repeated until all sections of the well screen had been developed. Development continued until a minimum of three well volumes had been evacuated and/or for a maximum of 2 hours. Periodic groundwater quality field parameters were measured during the well purging. These parameters included pH, temperature, conductivity and turbidity. Well development logs are included in Appendix C. Purge water was contained within 55-gallon drums and staged at the site.

3.4.2 Groundwater Level Measurements and Sampling

From September 30 through October 2, 2008, ARCADIS collected groundwater samples from 18 monitoring wells on the property and adjacent sidewalk on West 18th Street. The wells sampled are summarized in Table 1. Groundwater samples were

submitted under chain of custody protocols to TA of Shelton, Connecticut for analysis of the following parameters:

- VOCs by USEPA Method 8260B
- SVOCs by USEPA Method 8270C
- total cyanide by USEPA Method 9012B

Prior to sample collection, each monitoring well was gauged to measure and record the static groundwater level and to determine the presence or absence of NAPL. Measurements were recorded in the field notebook. Water level and NAPL measurements are presented in Table 4.

Low-flow purge and sampling was conducted using bladder and/or peristaltic pumps. Bladder pumps were used in the majority of the wells, but in situations where insufficient water was present in the well (i.e. < 1 foot) a peristaltic pump was used. Groundwater field parameters measured during purging include conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP), pH, temperature and turbidity. Field parameters were monitored until stabilized following the criteria set forth in the USEPA's Standard Operating Procedure (SOP) #GW0001 for Low Stress/Flow Groundwater Sampling. The final water quality parameters for each well sampled are provided in Table 3.

Analytical reports from TA and Alpha Analytical are provided on the accompanying CD as Electronic Attachment 4.

3.4.3 Groundwater Elevation Study

Pressure transducers were deployed in eight monitoring wells to continuously measure and record changes in groundwater elevation for 2 weeks. This information was used to further characterize patterns of groundwater flow patterns on the property and to determine the relationship between groundwater levels inside and outside the gas holder structures. Eight miniTROLL[®] data logging pressure transducers were installed on November 20, 2008 and retrieved on December 3, 2008. Pressure ratings for the transducers were 30 pounds per square inch (psi) for all transducers, except for MW-B3, which was 15 psi. Pressure transducers were deployed in five Con Edison

monitoring wells (MW-B3, MW-C3, MW-5A, MW-5B and MW-A3) and in three Retaco monitoring wells (MW-8, MW-9 and MW-A)³.

Prior to installation, each probe was programmed to measure and record water levels continuously at 5-minute intervals. In addition, all probe tests were programmed to start simultaneously. Digital data files of the transducer output are included on the accompanying CD as Electronic Attachment 3.

3.5 Property Survey

Munoz Engineering, P.C. completed a survey of all SCS and RI soil boring and monitoring well locations, as well as all monitoring wells installed on the property by others. The survey included the position, surface elevation and, in the case of monitoring wells, measuring-point elevations. Note that elevations used in this report are referenced to NAVD 88, as described in Section 2.1.

3.6 Management of Investigation-Derived Waste

IDW generated during the RI included:

- drill cuttings
- decontamination fluids
- development and purge water
- personal protective equipment
- sampling equipment

All IDW was placed in Department of Transportation- (DOT-) approved 55-gallon open or closed-topped drums. The drums were labeled as IDW and temporarily stored in a secured area designated by Con Edison. The drums were stored on the property until waste characterization results were received from the analytical laboratory (TA). Once the waste characterization results were received, the IDW was transported off site and disposed of at a Con Edison-approved disposal facility.

³ Well MW-A was installed by Retaco in late 2008, approximately 35 east of MW-12 on the sidewalk adjacent to West 18th Street. Construction details, survey or other data from MW-A were not available at the time of this submittal.

3.7 Data Management

All electronic data deliverables (EDDs) received from the laboratory were entered into a Microsoft® Office Access-based project-specific database maintained by ARCADIS.

3.8 Data Validation/Data Usability Summary Report

ARCADIS validated all analytical data. The review criteria for the RI data are from the following USEPA Region 2 guidance documents:

- *SOP Number HW-24, Revision 1, June 1999, Validating Volatile Organic Compounds by SW-846 Method 8260B* (USEPA 1999)
- *SOP Number HW-22, Revision 2, June 2001, Validating Semi-Volatile Organic Compounds by SW-846 Method 8270* (USEPA 2001)
- *SOP Number HW-2, Revision 11, January 1992, Evaluation of Metals Data for the CLP Program* (USEPA 1992) (Note this reference applies to validation of CN analytical data)

In accordance with the Quality Assurance Project Plan (QAPP; TRC 2004), quality assurance/quality control (QA/QC) samples were collected periodically throughout the RI. Analytical results for the blind duplicate samples and corresponding sample are presented in the data summary tables (Tables 7, 8, 11, and 12). Data usability summary reports (DUSRs) for all laboratory sample delivery groups are presented on the accompanying CD as Electronic Attachment 5. Complete laboratory reports are provided on the CD that accompanies this report.

4. Remedial Investigation Results

This section summarizes the findings of the RI. These findings include interpretations of the property geology and hydrogeology based on field observations, the occurrence and distribution of potential MGP and non-MGP impacts to soil and groundwater based on field screening and laboratory sample results, and a forensic data analysis to evaluate the nature of sources contributing to the impacts reported in soil and groundwater.

4.1 Regional Geology

The geology of Manhattan is characterized by crystalline metamorphic bedrock overlain by glacial deposits that, in turn, are typically overlain by post-glacial alluvial deposits and fill. The bedrock beneath the site is the Cambrian-aged Hartland Formation schist (Merguerian 1983), which is encountered at approximately 72 feet bgs. The surficial deposits have been mapped locally as till (Cadwell 1989), though no till has been observed in borings completed on the property or on site. The uppermost native sediments in the area are interpreted to be post-glacial fluvial deposits. These native sediments are typically overlain by urban fill, most significantly along the coastal areas of Manhattan, which is where the site is located. The site and vicinity are extensively developed, such that constructed features are now also significant components of the surficial geologic environment.

4.2 Property Geology

Based on observations at 14 soil borings completed during the SCS and RI, the stratigraphy of the property may be divided into four units. From the surface-down, the units are:

- **Fill Unit**, an approximately 20-foot-thick, highly heterogeneous interval that encompasses the remnant foundations of the east and west gas holders
- **Silty Clay Unit**, a thin and discontinuous unit present beneath the fill at the property and interpreted to be contiguous with similar materials observed in other portions of the site located to the west
- **Sand Unit**, an approximately 40-foot-thick, laterally extensive section of stratified alluvial sands
- **Bedrock**, inferred to be schist of the Hartland Formation

These units are depicted on two cross-sections (Figures 3 and 4). Section A-A' trends east to west, parallel to West 18th Street through the two gas holders. Section B-B' trends north-south, perpendicular to West 18th Street. The sections also depict the shallow water table surface, and show the approximate location of former MGP structures and underground petroleum storage tanks. Each of the stratigraphic units encountered at the property is described in further detail below.

4.2.1 Fill Unit

The Fill Unit comprises materials typically found in urban environments. The fill observed at the property is highly heterogeneous, consisting of construction debris (e.g., slag, coal and rock fragments, brick, wood, glass) intermingled with brown to black sand, gravel and silt. The Fill Unit includes buried utilities and intact foundations, most significantly the circular foundations of Gas Holders 1 (east) and 2 (west) that encompass a large portion of the property's footprint. The thickness of the Fill Unit (and the assumed depth of the holders) is between 20 and 23 feet, and is fairly consistent across the property.

4.2.2 Silty Clay Unit

The Silty Clay Unit underlies the fill on the western edge of the property, but appears to pinch out toward the east. The Silty Clay Unit, a gray to tan silty clay with trace fine sand, is interpreted to be contiguous with similar soil observed west of the property in other portions of the site. The Silty Clay Unit was encountered in two borings (SB-5 and SB-6) on the western edge of the property at 20 and 26 feet bgs, respectively. The Silty Clay Unit is 6 feet thick at SB-5 and 2 feet thick at SB-6 (Figure 3).

4.2.3 Sand Unit

The Sand Unit immediately underlies the Fill Unit across the majority of the center and eastern portions of the property as the intervening Silty Clay Unit there is discontinuous or absent. The Sand Unit consists of stratified layers of well-sorted, fine-to-medium sands interbedded with poorly sorted sand. Lenses of silt and gravel observed at SB-6 (the only boring to have reached the bottom of the Sand Unit at the property) suggest a high degree of heterogeneity, consistent with deposition in a fluvial environment. The Sand Unit is interpreted to be laterally continuous beneath the property, approximately 45 feet thick extending to the bedrock surface, and at a depth of approximately 72 feet at soil boring SB-6.

4.2.4 Bedrock

Regional geology literature indicates that the site is underlain by schist of the Hartland Formation. One boring (SB-6) was completed to bedrock in which schist was encountered at 72 feet bgs.

4.3 Property Hydrogeology

This section describes the hydrogeology of the property, including recharge, hydrostratigraphy and groundwater flow.

4.3.1 Runoff and Recharge

The property is located approximately 800 feet east of the Hudson River. The Hudson River at this location is at sea level, with a mean tidal range of 4.3 feet. Though the Hudson River forms the natural base-level discharge, the surface and shallow groundwater systems in Manhattan have been significantly altered by urban development. The property and most of the surrounding areas are covered by impervious surfaces, and the majority of stormwater runoff is captured by storm or combined sewers.

Groundwater recharge in the vicinity is likely dominated by indirect sources such as leaking water distribution and sewer lines, and improperly plumbed floor or roof drains. Limited direct recharge may also occur in grass-covered portions of adjacent parcels. Older sewers (storm, sanitary or combined sewers), in particular, can leak several gallons per foot of drain.

4.3.2 Hydrostratigraphy

The water table at the property occurs in the Fill Unit at depths that have ranged historically from approximately 4 to 15 feet bgs. The Fill and underlying Sand Units form distinct hydrostratigraphic intervals, as discussed below.

The saturated portion of the fill is highly heterogeneous, consisting of a variety of fill types. The fill is interpreted, in general, as a highly permeable medium; however, isolated zones such as utility corridors are anticipated to form preferential pathways. The fill is also laterally discontinuous. Within the bounds of the property, the fill is parceled into several disconnected or poorly connected cells divided by the fully penetrating foundations of the east and west holders. The holder foundations are

interpreted to be somewhat leaky (likely via discrete breaches rather than general porosity). As a result of the discrete breaches or flow pathways for each of the holder foundations, the ability of water levels to equilibrate with the ambient groundwater levels is different for each of the holders.

The Sand Unit is a stratified system, and therefore highly anisotropic. Permeability is interpreted to be greatest in the horizontal plane focused in the most coarse-grained sand beds. Interbedded fine-grained sands and silts will inhibit vertical migration.

4.3.3 Groundwater Flow

Groundwater flow in the Fill Unit is tightly constrained by the geometry of available flow paths through and around the holder foundations. As discussed below, each holder foundation forms a semi-enclosed vessel. Flow through the foundations is interpreted to occur only through discrete breaches resulting from cracks, mortar degradation, construction excavations (e.g., elevator pit excavation), or other penetrations of the walls for utilities such as roof drains or water service lines.

Groundwater elevations measured at the property's monitoring wells on seven occasions between January 2002 and September 2008 (summarized in Table 4) repeatedly fall into three separate populations with similar water levels: wells completed inside the east holder, wells completed inside the west holder and wells outside the holders. The following table summarizes the average water-level elevation in each group to illustrate several observations about groundwater flow.

Location	Average Head in Well Groupings in Each Gauging Round (feet RMSL)						
	1/10/02	1/18/02	3/6/02	1/27/04	2/15/05	3/19/07	9/29/08
East Holder	8.3	7.9	8.2	6.1	6.3	5.7	-0.3
West Holder	6.4	6.2	6.9	5.9	5.7	4.8	1.7
Outside Holders	3.0	1.2	1.8	0.2	0.6	-0.4	-0.7

Note:

East holder average excludes water-levels recorded at well MW-6.

Water level elevations for each group identified in the above table along with observations about groundwater flow, are discussed below:

- During each gauging round, water levels measured within the former gas holder foundations were higher than the water levels measured outside of the former holders. Groundwater levels inside the holders, therefore, are interpreted to not be in equilibrium with the water table outside the holders, most likely because the holder foundations restrict free movement of groundwater. The higher heads observed within the holders may be explained in several ways:
 - A localized source of recharge exists for each holder (i.e., to maintain the higher heads), such as a leaking water distribution lines or drains.
 - Short-term spikes in water-levels outside the holders due to intense rain events may periodically overtop the holder walls (or bring levels to the height of significant breaches in the foundations), thereby filling the holders from the outside. The levels observed during the seven gauging rounds reflect temporal snapshots after the levels outside the holders have equilibrated. Because the holder foundations retard groundwater flow, levels inside the holders equilibrate more slowly and remain higher than levels outside the holder until the next large recharge event.
- Water levels in the east holder typically averaged 1 to 2 feet higher than in the west holder (until September 2008). This consistent water-level difference suggests that, historically, either the rate of recharge to the east holder is greater than west holder or the east holder leaks less than the west holder.
- Groundwater elevations declined significantly in each location in September 2008. This observation suggests that external conditions changed, that either a source of recharge was removed (e.g., a leaking pipe was repaired) or groundwater pumping was initiated (e.g., for basement or excavation dewatering). Because the external change clearly had effects inside both holders, it demonstrates that the holders are not completely isolated from the outside aquifer.
- Of the water-level changes observed in September 2008, the head in the east holder dropped most radically (an average of 6 feet relative to the prior round in March 2007). Despite the significant water-level drop, levels inside the holder are still greater than those outside the holder. The significant decline in levels in the east holder suggests that, in addition to the external change mentioned above,

either a source of recharge to the east holder was eliminated, or the holder foundation was further breached. The trend could also be explained by pumping inside the holder (e.g., if a dewatering system was installed inside the Verizon building).

- For three water level rounds completed between January and March 2002, well MW-6 had a head 2 to 3 feet lower than the heads at the other wells completed inside the east holder (all of which typically had heads within 0.1 feet of each other). Well MW-6 is suspected to have breached a drain pipe, and was decommissioned shortly after installation. Although water levels in MW-6 were the lowest within the east holder during the three reported gauging events, the well is also reported to have overflowed periodically. Both the high and low cases are best explained by the influence of the drain pipe. During rain events, flow in the pipe discharged from the breach at MW-6 and temporarily drove water levels above ground surface (allowing the well to flow). Under equilibrated conditions, the low head at MW-6 likely reflects that the well is adjacent to an efficient breach in the holder. The breach may be the pipe itself, the fill around the pipe, or a gap in the foundation where the pipe exits to the street. It is worth noting that the well is located in the northwest portion of the holder near the building elevator shaft, where it is inferred that excavation for building construction may have removed a portion of the holder wall.

Under the hydraulic conditions observed, groundwater is interpreted to discharge outward from each of the holders into the surrounding fill materials (Figures 5 and 6). This relationship did not change even after the significant drop in heads that occurred in all locations in September 2008. Flow is expected to be focused in a few discrete breaches in the holder walls rather than be evenly distributed radially. As noted above, short-term spikes in water levels outside the holders due to intense rain events may periodically overtop the holder walls (or bring levels to the height of significant breaches in the foundations), thereby filling the holders from the outside. In this manner, water from within each holder could be exchanged indirectly. To account for the observed distribution of petroleum-related constituents (discussed below), including impacts inside the western holder, either periodic flow such as this must occur into the holders from the surrounding formation, or additional sources of petroleum must exist above or connected to the western holder.

Outside the holders, the direction of groundwater flow in the fill is expected to be driven by preferential pathways (such as utility corridors) and off-site pumping stresses. Under natural gradient conditions, flow is expected to be directed toward and discharge to the

Hudson River. Because groundwater elevations are currently below sea level, shallow groundwater is inferred as being captured in a dewatering system.

4.3.4 Continuous Water Level Survey

Continuous water-level monitoring was completed over 12 days in November and December 2008 to further assess temporal trends in groundwater elevations inside and outside the two holders. Eight wells were included in the survey:

- MW-B3, located inside the east holder
- MW-C3 and MW-A3, located inside the west holder
- MW-8, MW-9 and MW-A⁴ located outside the holders to the north
- MW-5A and MW-5B, located outside the holders to the west.

Figure 7 is a hydrograph illustrating the water-level trends observed in the eight wells during the 12-day monitoring period. Digital files of the transducer data are included on the accompanying CD as Electronic Attachment 3. As indicated on Figure 7, the groundwater elevations in most wells (i.e., MW-C3, MW-8, MW-9 MW-5A and MW-5B) fluctuated less than ± 0.5 feet during the 12-day monitoring period. Groundwater elevations at MW-B3 decreased approximately 3 feet during the same 12-day monitoring period, though this decrease is suspected to represent a transducer malfunction. A similarly anomalous rise in water levels at MW-A3 during this period is also suspected to reflect transducer malfunction.

No tidal influences were observed, despite the proximity of the tidally influenced Hudson River. Two precipitation events that occurred during the monitoring period created a limited hydraulic response at three of the wells, including the two wells installed inside the holders. (The response observed at MW-9, outside the holders, does not clearly show the influence of the recharge events.) The observed response to recharge confirms that, despite the preponderance of impervious surfaces in the vicinity, stormwater recharges shallow groundwater, presumably through leakage of storm or combined sewers or roof drains. The generally uniform response to recharge events observed inside and outside the holders supports the inference that the holders are hydraulically connected with the surrounding fill materials.

⁴ As noted previously, construction and survey details for well MW-A (installed by Retaco in late 2008) are not available. For this reason, transducer data from this well have not been reduced, but are provided digitally as Electronic Attachment 3.

4.4 Nature and Extent of Impacts

Soil and groundwater at the site are impacted by a combination of petroleum compounds and MGP materials. Field observations, analytical results and forensic data analysis, discussed in this section, show that:

- The majority of vadose zone and shallow groundwater impacts are petroleum-related, and are derived from leaking USTs above the water table.
- MGP impacts are less significant and less widespread, limited to the base of the gas holder foundations, where slow diffusion occurs from isolated pockets of highly weathered residual coal tar.

The following subsections describe the nature and extent of petroleum and MGP-related impacts at the property.

4.4.1 Field Screening and Direct Observations of Impacts

During the SCS and RI, direct physical evidence of both petroleum and MGP-related impacts was documented in subsurface soils. Observational evidence of impacts included odors, staining, sheens and oil-like material (OLM). Field screening for VOCs in soil using a PID also provided strong evidence of the distribution of impacted soils.

In general, visual and olfactory evidence of petroleum impacts was widespread in vadose zone soil and in shallow groundwater. Evidence of MGP-related impacts was typically found near the base of the gas holders, if at all. Field observations recorded during the SCS and RI related to petroleum and/or MGP-related impacts are summarized in Table 5.

From the Site Characterization Study (2006a), TRC found that, with the exception of SB-1, which could not be advanced to the water table, the soil encountered in the remaining six borings revealed evidence of petroleum, fuel oil, gasoline, and/or MGP-related odors. Petroleum odors were most frequently observed in the soil borings (SB-2, SB-4, SB-5A, SB-5B, and SB-6). A petroleum sheen was also observed in soil samples from SB-4, SB-5A, SB-5B, and SB-6). MGP related odors were observed in only two borings (SB-2 and SB-4), and OLM was observed in SB-4 between 19-21 feet bgs.

Several key field observations include:

- Sheens, accompanied by petroleum- or gasoline-like odors, were observed in SB-4, SB-5, SB-6, MW-5A and MW-5B. Sheens were observed in depths ranging from 6 to 22 feet bgs.
- Trace NAPL, accompanied by a strong petroleum-like odor, was observed in soil at SB-6 at a depth of 13 to 16 feet bgs. SB-6 is located adjacent and to the west of the east holder.
- OLM accompanied by a strong MGP-related odor was observed at SB-4 at a depth of 19 to 21 feet bgs, just above the holder bottom. SB-4 is located in the northeast quadrant of the east holder.
- PID readings for total VOCs recorded during the SCS and RI ranged across the full scale of the monitoring instrument (i.e., 0 to >9,999 ppm). PID readings greater than 1,000 ppm were typically associated with petroleum- or gasoline-impacted material, and occurred between 11 and 19 feet bgs. Coal tar impacts are interpreted to have produced one PID reading greater than 1,000 ppm, from the 19- to 21-foot interval in SB-4.

The observed petroleum impacts are consistent with releases from USTs in the vadose zone. Where detected, petroleum-related impacts, present as sheens, LNAPL, petroleum (gasoline) odors and/or elevated total VOCs concentrations based on PID, were detected in the shallower soils. The majority of these impacts were detected in the vicinity of the water table and the associated smear zone resulting from wide historical fluctuations of the water table, which ranged over as much as 8.5 feet during the site investigations (as discussed in Section 4.3). In general, field evidence of MGP-related impacts was limited to deeper intervals near the base of the remnant holder foundations. No evidence of MGP-related impacts has been observed outside the gas holders.

Figure 8 illustrates the distribution of PID readings recorded during the SC and RI as a function of depth. Each slice represents the maximum PID reading recorded at each soil boring within the represented 5-foot elevation interval. Note that only PID readings greater than 10 ppm are depicted. Figure 8 also includes summaries of the soil PIANOS analyses presented as pie charts, in which each slice represents the total concentration of each of the PIANOS compound groups. These data are discussed in Section 4.5.6 and in Appendix D, and are summarized below:

- In the 0- to 10-foot interval (top slice), PID values greater than 1,000 ppm were recorded in unsaturated soils (top slice) near the location of the former USTs in the east holder.
- In the 10- to 14-foot interval (second slice), PID values greater than 1,000 ppm are more widely distributed, reflecting smearing and lateral transport on the water table. The hot-spot beneath the UST in the east holder extends northwest of the holder, suggesting preferential flow out of the east holder to the northwest. Additional significant impacts are present inside the west holder and immediately outside the holder's west side. These observations suggest an additional source or sources contributing petroleum inside and/or adjacent to the west holder. PIANOS results for soil samples collected within the 10- to 14-foot interval indicated a distinct gasoline chemical signature. Strong petroleum-like odors were also noted within this interval.
- In the 14- to 20-foot interval (third slice), the gasoline/petroleum signature is still dominant and correlated with elevated PID impacts; however, impacts are decreasing with depth below the water table.
- From 20 to 25 feet (bottom slice), elevated PID readings (greater than 1,000 ppm) are associated with a gasoline-impacted soil downgradient of the two gas holders, as well as gasoline-/coal-tar-impacted soil and OLM within the west holder.

4.4.2 LNAPL

Measurable thicknesses of LNAPL have been observed periodically in monitoring wells on the property. Measurable DNAPL has not been observed. During the most recent round of groundwater measurements (September 29, 2008), 0.02 foot of LNAPL was measured in monitoring well MW-9 (Table 4). Historically, measurable LNAPL has also been detected in MW-8. Note that both wells are located hydraulically outside the gas holders, northwest of the known former UST locations inside the east holder.

As discussed in Section 2, six USTs were removed from the property on December 12, 1993. Among the USTs were five 550-gallon gasoline tanks and one 4,000-gallon diesel fuel tank, all located within the footprint of the former east holder (Figure 2). Based on test trenches completed during the SCS and soil borings completed during the SCS and RI, the areas of the two former gas holders investigated appeared to be locally intact. As such, the most likely sources of petroleum-related constituents at the property are the former USTs, while the two gas holders are the most likely source of

MGP-related impacts. No evidence of the former USTs were observed or detected during the SCS and RI.

The occurrence of measurable LNAPL outside the holders to the north (but not within the holders themselves) suggests that a preferential pathway may exist in the vadose zone connecting the known USTs to the region outside the holder to the northwest. The observation of petroleum NAPL in soil at SB-6 (also outside the holder foundation, but northwest of west holder) implies high mobility of LNAPL in the smear zone. The observation of LNAPL may also reflect the presence of as-yet undetected leaking USTs.

4.5 Analytical Results

4.5.1 Review of Historical Groundwater Analytical Data

As discussed in Section 2.5, EnviroTrac conducted five rounds of groundwater sampling on behalf of Retaco. The results discussed below are based on reports provided by EnviroTrac and reviewed by ARCADIS. Note that the specific groundwater sampling protocol used by EnviroTrac is unknown, but based on reports, there is no mention of purging to stabilization prior to sampling. Therefore, the groundwater samples collected by EnviroTrac are considered to be grab samples, which are not necessarily representative of water quality in the aquifer. It is also noted that the analytical data provided by EnviroTrac was not validated.

VOCs and PAHs were detected in historical groundwater samples. Table 6 provides the total number of samples, maximum detected concentration, number of detects and frequency (percentage) of detections for each compound that was detected. VOCs were the most frequently detected compounds, with ethylbenzene, naphthalene (reported as a VOC⁵) and xylenes detected in each groundwater sample. Other VOCs detected in at least 90 percent of the groundwater samples include 1,2,4-trimethylbenzene, benzene, isopropylbenzene, MTBE (a gasoline additive), n-propylbenzene and toluene. Fluorene and naphthalene were the most frequently detected PAH compounds. These compounds are also found in diesel and fuel oil.

⁵ EnviroTrac reported naphthalene concentrations resulting from two different analyses: USEPA Method 8260 (VOCs) and Method 8270 (SVOCs). The results are similar but not identical. In the TRC 2005 Site Investigation Report, for example, groundwater analyzed from MW-8 was reported to contain naphthalene concentrations of 70 ppb using Method 8260 and 130 ppb using Method 8270. For ARCADIS sampling results, naphthalene is reported only as an SVOC.

The historical sampling results indicate widespread impacts of petroleum compounds, particularly BTEX compounds and MTBE, in shallow groundwater. Elevated concentrations of naphthalene may indicate a minor comingled component derived from MGP residuals and/or diesel/fuel oil. Figure 9 presents the distribution of detected VOCs in groundwater for sampling conducted by EnviroTrac. In addition, the MTBE and total VOC concentration for the March 2007 sampling event is graphically represented by colored circles placed next to each monitoring well location. Circles are color-coded according to the magnitude of the concentration as shown in the legend. The distribution of detected VOCs in groundwater is summarized below:

- MTBE concentrations have historically occurred at greater than 100 µg/L in all shallow groundwater locations shown (including locations inside the holders and outside to the north of the holders). Because MTBE is a gasoline additive, it is a clear tracer for gasoline impacts. Note that, where the MTBE concentration for MW-9 was reported as nondetect, the analysis was subject to an elevated detection limit of 500 µg/L.
- Concentrations of VOCs (including MTBE) are highly variable with time. Because the petroleum source material appears to be distributed in a broad smear zone across the water table and vadose zone, VOC dissolution into groundwater is interpreted to vary over short time periods due to changes in water table elevation or in response to recharge occurring through impacted soils.
- In March 2007, total VOC concentrations of greater than 10,000 µg/L were detected in MW-8, MW-9 and MW-11, outside the holder to the north. Wells MW-8 and MW-9 were most impacted with petroleum range hydrocarbons, consistent with the periodic observations of LNAPL in those wells.

4.5.2 SCS and RI Analytical Data Summary

The following sections summarize the environmental conditions at the property based on soil and groundwater analytical data collected during the SCS and RI. Soil analytical data are compared to the Recommended Soil Cleanup Objectives (RSCOs) provided in TAGM 4046 (NYSDEC 1994). Groundwater analytical data are compared to the AWQS, Class GA criteria (NYSDEC 1998).

4.5.3 Data Usability Assessment Summary

DUSRs for the RI analytical data were prepared according to NYSDEC guidelines and are provided on the accompanying CD as Electronic Attachment 5.. The results of the data review conducted by ARCADIS indicate that the analytical data are acceptable for use in the assessment of soil and groundwater environmental conditions at the property.

4.5.4 Soil Analytical Results

The following discussion of soil analytical results is based on 24 soil samples (including seven samples submitted for forensics via PIANOS analysis) collected during RI activities at the property. Validated soil analytical results for VOCs, SVOCs and cyanide are provided in Tables 7a, 7b and 7c respectively. PIANOS results are provided in Table 8. Applicable RSCOs are also provided in the data tables. Soil concentrations that exceed applicable RSCOs are shaded gray in the data tables. Summary statistics, including the minimum detected concentration, maximum detected concentration, number of samples analyzed, number of samples with a detected concentration, frequency of detects, number of samples detected above the RSCO and frequency of detected samples above the RSCO for each constituent are provided in Table 9.

4.5.4.1.1 VOCs

Nine VOCs were detected in soil samples. Seven of these VOCs (acetone, benzene, ethylbenzene, methylene chloride, tetrachloroethene and total xylenes) exceeded their respective RSCOs. Acetone and methylene chloride are common laboratory contaminants and, as such, are excluded from further discussion.

From Table 9, BTEX compounds are the most prevalent VOCs detected in soil. Benzene, total xylenes, ethylbenzene, and total VOCs were detected at concentrations that exceeded their respective RSCO in at least 50 percent of the samples. Figure 10 presents the distribution of the major VOCs in subsurface soil, for each soil boring completed during the SCS and RI. Concentrations that exceed the RSCO are shaded yellow. Data boxes are not shown for borings SB-1, SB-3 and SB-D, because no VOCs were detected in soil at those locations. The distribution of VOCs in subsurface soil at the property is summarized below:

- At least one sample from each soil boring completed during the SCS and RI contained at least one BTEX compound, except for SB-1, SB-3 and SB-D (all located on the south side of the property).
- In general, BTEX and total VOCs were detected above their respective RSCOs from approximately 11 feet to 22 feet bgs within each of the two former gas holders and between the holders to the north.
- The highest VOC concentrations detected are interpreted to reflect a combination of petroleum and MGP-related impacts. Elevated detections at 11- to 17-foot depths (i.e., at MW-A, SB-C) are attributed to gasoline impacts. Elevated VOC detections at depths of 20 to 21 feet (i.e., samples from SB-2, SB-4 and SB-A taken at the base of the gas holders) are attributed to MGP-impacts. The high VOC concentrations detected at SB-C at 22 feet bgs (outside the holder) is attributed to gasoline, and is considered evidence of vertical smearing resulting from periodic low water-table occurring outside the holders. Forensic analysis supporting the attribution of gasoline or MGP source materials is presented in Section 4.5.6 and in Appendix D.

4.5.4.1.2 SVOCs

All 16 PAH compounds and approximately 10 additional SVOCs have been detected in soil samples collected on the property. Analytical results are summarized in Table 7b; a statistical analysis of SVOC detections is provided in Table 9.

Fourteen of the 16 PAHs (all except acenaphthene and benzo(g,h,i)perylene) were detected at least once at a concentration greater than the RSCO. The non-PAH SVOCs 2-methylnaphthalene, dibenzofuran, 2-methylphenol, 4-methylphenol and phenol also exceeded their respective RSCOs at least once. Total SVOC concentrations also exceeded the 500,000 µg/kg criterion listed in TAGM 4046 in one sample (Well Cluster C, 21 ft bgs). Note that substituted phenols, including 2-methylphenol and 4-methylphenol, are considered to be degradation products of coal tar. Naphthalene and benzo(a)pyrene exceeded RSCOs most frequently. Other SVOCs that were detected above their respective RSCO in at least 20 percent of the samples include dibenzo(a,h)anthracene, benzo(a)anthracene and chrysene.

Figure 11 presents the distribution of total SVOCs, total PAHs and the individual PAH compounds naphthalene and benzo(a)pyrene for each soil boring completed during the SCS and RI. Concentrations that exceed the RSCO are shaded yellow. The

distribution of total SVOCs, total PAHs and individual PAHs (naphthalene and benzo(a)pyrene) is summarized below:

- Soil samples collected from soil borings for well clusters WC-A, WC-B and WC-C and from soil borings SB-A, SB-C, SB-2 and SB-4 contained at least one PAH at a concentration above its respective RSCO.
- SB-D contained several phenolic compounds above their respective RSCO; however, no PAHs were detected at concentrations above their RSCO.
- In general, PAHs and total SVOCs were detected above their respective RSCOs from approximately 12 feet to 22 feet bgs within each of the two former gas holders. Within this interval, the total PAH concentration typically increased with depth, reflecting a residual source located in the base of the holders.
- The highest total SVOC (2,800 mg/kg) and PAH concentrations were detected in a sample collected at the base of the east holder at Well Cluster C. As noted above, this sample was described as stained and, based on PIANOS analysis, had a fingerprint resembling coal tar. The second highest total SVOC (728 mg/kg) concentration was detected in one sample collected at SB-4, also at the base of the east holder (19 to 21 feet bgs). This sample was described as having a strong MGP-related odor and as containing OLM.
- Note that the majority of samples collected at the base of the holders contained significantly lower total PAH concentrations (relative to SB-4). This variation in concentrations supports observations that coal tar is not uniformly distributed across the holder bases (e.g., as in a DNAPL pool), but rather exists only in isolated residual pockets.
- Total SVOC and PAH concentrations in samples collected below 22 feet bgs (i.e., SB-A and SB-C) are less than their respective RSCOs.

4.5.4.2 Cyanide

Total cyanide (CN) was detected in approximately 60 percent of the samples collected during the RI (Tables 7c and 9). Amenable CN was detected in two samples.

The highest concentration of total CN (58,000 µg/kg) was detected in SB-A at a depth of 21 feet bgs. This sample location is at the base of the west holder. Amenable CN

was not detected in any samples collected from SB-A. Total CN was also detected in the SB-B (the east holder), SB-C (outside and between the former gas holders), Well Cluster A (the west holder), and Well Cluster C (the west holder) at concentrations less than 27,700 µg/kg.

Amenable CN was detected in well cluster C at a depth of 11 feet bgs (2,000 µg/kg) and 21 feet bgs (7,400 µg/kg). The percent amenable to total CN for each sample was 91 percent in the sample collected at 11 feet bgs and 27 percent for the sample collected at 21 feet bgs.

4.5.5 Groundwater Analytical Results

The following discussion of the groundwater analytical results is based on one round of groundwater sampling completed in September 2008. Groundwater samples were collected from seven monitoring wells installed during the RI (Well Cluster A, Well Cluster B and Well Cluster C), two wells installed during the SC (MW-5A and MW-5B), and 10 wells installed by EnviroTrac on behalf of Retaco (MW-1 through MW-10).

Groundwater samples were analyzed for VOCs, SVOCs and CN. In addition, eight groundwater samples were submitted for PIANOS forensics analysis from the six RI wells (well clusters A, B and C.) and two wells installed by EnviroTrac (MW-4 and MW-8). Validated groundwater analytical results for VOCs, SVOCs and CN are provided in Tables 10a, 10b and 10c respectively. PIANOS results are provided in Table 11.

Summary statistics, including the minimum detected concentration, maximum detected concentration, number of samples analyzed, number of samples with a detected concentration, frequency of detects, number of samples detected above the class GA standard and the frequency of detected samples above the class GA standard for each constituent are provided in Table 12.

4.5.5.1 VOCs

The VOCs detected in groundwater include the BTEX compounds, acetone, 4-methyl-2-pentanone, styrene, 1,1,1-trichloroethane, 2-butanone, 2-hexanone and tetrachloroethene. Of these analytes, the BTEX compounds styrene and 1,1,1-trichloroethane are the only VOCs that exceed the Class GA standard. As noted above, acetone is a common laboratory contaminant and is excluded from further discussion. Analytical results are presented in Table 10a.

Benzene was the most prevalent VOC detected in groundwater (Table 12). The concentration of benzene exceeded the class GA groundwater standard (1 µg/L) in 25 of 26 (96 percent) of the groundwater samples. The concentration of total xylenes, ethylbenzene and toluene exceeded their respective standard in 92, 77 and 73 percent of the samples, respectively. It is noted that BTEX is a significant component of gasoline. Figure 12 presents the distribution of the VOC in groundwater. Concentrations that exceed the GA standard are shaded yellow. The distribution of VOCs in groundwater is summarized below:

- Except for MW-5B, which is screened from 32 to 42 feet bgs, at least one VOC exceeded criteria in each monitoring well sampled in September 2008.
- Benzene concentrations in samples collected from wells screened across the water table ranged from 21 µg/L in MW-5A to 7,400 µg/L in MW-11.
- Benzene concentrations in samples collected from shallow wells located within the west holder ranged from 390 µg/L in MW-7 to 2,500 µg/L in MW-3. Benzene concentrations in samples collected from shallow wells located within the east holder ranged from 52 µg/L in MW-C2 to 4,000 µg/L in MW-A2. Benzene concentrations in samples collected from shallow wells located outside the two former gas holders ranged from 21 µg/L in MW-5A to 7,400 µg/L in MW-11.
- Elevated BTEX concentrations are associated with both shallow petroleum impacts and deeper impacts related to MGP residuals. In this context, the VOC impacts to groundwater are consistent with the distribution of impacts discussed previously. As detailed in Section 4.5.6 and Appendix D, forensic analysis encompassing the broader suite of PIANOS analyses can clearly distinguish the separate sources of impacts.

The gasoline additive MTBE was also detected in all but one (MW-5B) of the monitoring wells sampled in October 2008. Figure 13 summarizes the detections. Detected MTBE concentrations ranged from 13 µg/L in MW-4 (inside the east holder) to 490 µg/L in MW-11 (north and outside of the west holder), indicating widespread MTBE impacts throughout the property. There is no Class GA standard for MTBE; however, there is a guidance value of 10 µg/L (NYSDEC, 1998). The spatial distribution of MTBE detections in conjunction with groundwater flow at the site provides further evidence that one or more undocumented LUSTs or petroleum source material may exist in the western holder and/or outside the holders to the north.

MTBE has been detected in both shallow groundwater, as expected based on its association with a petroleum (gasoline) source, and in deeper groundwater samples where MGP residuals represent the predominant impacts. The vertical distribution of the MTBE, particularly inside both holders, is interpreted to reflect a combination of downward diffusion (from a shallow source) and possibly mixing of water in the holders during periods when they received focused recharge (e.g., during storm events).

MTBE concentrations have decreased through time in some locations (see Figure 9). The latest round of groundwater sampling results provided by Retaco (March 2007) indicates similar concentrations of MTBE to the September 2008 sampling results. This may indicate that dissolved MTBE has reached equilibrium with groundwater. However, because MTBE concentrations have not decreased since March 2007, an ongoing subsurface residual source of MTBE may also be present. Note that the only soil sample that contained a detectable concentration of MTBE (17 µg/kg) was collected at Well Cluster A at a depth of 17 feet bgs. As noted above, the highest concentration of MTBE in groundwater was detected at the same location (MW-A2).

4.5.5.2 SVOCs

Eight PAHs, four phenols and five additional SVOCs have been detected in groundwater at the property (Table 10b). Of these compounds, four PAHs (naphthalene, fluorene, acenaphthene and phenanthrene) and four phenols (phenol, 4-methylphenol, 2-methylphenol and 2,4-dimethylphenol) exceed Class GA guidance values at least once in site groundwater. Naphthalene was the most prevalent SVOC, detected in groundwater in 92 percent of samples and exceeding criteria in 62 percent of samples (Table 12). It is noted that naphthalene is a common component of fuel oil, diesel and coal tar. The compound phenol exceeded criteria most frequently (72 percent of samples). The other constituents of concern (COCs) listed above were detected at concentrations greater than their respective Class GA standard or guidance values in less than 30 percent of the samples.

Figure 14 presents the distribution of the SVOC COCs in groundwater. On Figure 14, data boxes containing the concentration of each COC are provided for each monitoring well sampled during the RI. Concentrations that exceed the GA standard or guidance value are shaded yellow. The distribution of the SVOC COCs in groundwater is summarized below:

- The highest concentrations of both phenol and naphthalene occur at well MW-C3, a location interpreted to be screened near MGP residuals at the base of the east holder.
- Low to moderate concentrations of SVOCs are present throughout the site, with some correlation to the distribution of BTEX compounds, as discussed previously.

The forensic analysis (Section 4.5.6) shows that the distribution of SVOCs in groundwater is consistent with a shallow, widespread petroleum source and a deeper coal-tar source in the base of the former gas holders. The modest concentrations of SVOCs in wells screened near the base of the gas holders (excluding MW-C3, discussed above) supports observational evidence that coal tar is present only in residual pockets .

4.5.5.3 Cyanide

Validated total CN groundwater analytical results are provided in Table 10c and show that total CN was detected in each groundwater sample. Total CN concentrations ranged from 3.8 µg/L in MW-5B to 540 µg/L in MW-A3. Less than 50 percent of the samples contained a total CN concentration greater than the Class GA groundwater standard of 200 µg/L.

4.5.6 Forensics Results

The following discussion is based on the results of the forensic analysis performed on select soil and groundwater samples collected during the RI. The forensics analysis and results are discussed in *Forensic Evaluation to Differentiate Petroleum Product Volatile Hydrocarbons (e.g., BTEX) From Those of Coal Tar in Soils and Groundwater at the Con Edison Former West 18th Street MGP Site (Verizon Property) in New York, New York* (ARCADIS 2009). The complete forensics report is provided in Appendix D and summarized below.

Tables 8 and 11 summarize the PIANOS and total petroleum hydrocarbons as diesel (TPH-D) results for soil and groundwater, respectively. Table 13 summarizes the PIANOS results and TPH fingerprint interpretation of the soil and groundwater samples along with the relative percent of the major hydrocarbon groups in the soil and groundwater samples containing gasoline and/or coal tar.

Compositional histograms of PIANOS compounds for soil and groundwater results (Figures 15 and 16) were generated for the site. The histograms also include representative samples of gasoline and coal tar NAPL in soil.

Figures 15 and 16 reveal that the gasoline standard and coal tar NAPL compositional characteristics of the two products are quite contrasting. Coal tar contains almost exclusively aromatic compounds with relatively trace amounts of the thiophenes and high-molecular-weight *n*-alkanes, whereas the petroleum product is represented by all of the PIANOS groups.

These histograms, along with the gas chromatograph (GC) fingerprints from the TPH-D analysis helped determine the predominant product type in the samples collected during the RI. Results of the evaluation of GC fingerprints of the samples tested are summarized in Table 13.

Via the PIANOS analysis, samples may be distinguished as having gasoline, coal tar or mixed source. The major conclusions include:

- The sample locations at SB-C, Well Cluster A (shallow), SB-B (shallow) and MW-8 contain chemical signatures for both soil and groundwater that most closely resemble gasoline products.
- Well cluster A and SB-B deeper soil and groundwater reveal chemical signatures resembling a mixture of gasoline and coal tar.
- Well cluster C (shallow/deep) reveals coal tar products in soil and groundwater samples.

These forensic conclusions agree with spatial patterns observed in other data discussed throughout this report. In particular:

- Gasoline/petroleum impacts are present in shallow groundwater inside and outside the former gas holders.
- The spatial distribution of gasoline/petroleum impacts supports a source derived from the known former USTs in the east holder, but also suggests that other unknown LUSTs or off-site sources may exist.

- Inside the holders, samples show stratification of impacts: petroleum shallow, an intermediate zone of mixed sources and a deeper zone predominantly impacted by MGP residuals.
- Significant MGP-sourced impacts have not been observed outside the holders.
- Outside the holders (e.g., at SB-C), significant BTEX and SVOC impacts detected in soil to a depth 22 feet bgs are consistent with a gasoline source. The vertical distribution observed here is attributed to the fluctuating water table, creating a smear zone of gasoline-impacted soil.

4.6 Risk Evaluation

A formal risk evaluation was not performed for this RI; however, the levels of MGP-related impacts noted above are consistent with those identified, evaluated, and documented in the site-wide SCS report (TRC 2006a). That study, which included the property, found the following:

In summary, subsurface soil and groundwater are mediums of concern that could contribute to potentially complete exposure pathways. The only receptors who may be directly exposed to subsurface soils is [sic] the construction worker. It is noted that on-Site tenants/residents and off-site tenants may be indirectly exposed to subsurface soil containing COCs if this media [sic] becomes airborne as dust (e.g., particulate inhalation during construction activities). The only receptor who may be exposed to groundwater is the construction worker. The potential for a complete exposure pathway in association with sub-slab vapors exists across the Site due to the presence of elevated VOCs in subsurface soil and groundwater. However, the majority of the VOCs detected in the shallow subsurface soil and groundwater are not attributed to MGP residues but rather are most directly to the numerous documented and suspected petroleum spills throughout and in the vicinity of the Site.

These conditions are similar to those encountered in the subsurface at the property. Because the property is predominantly covered by concrete and is used for vehicle parking, and because shallow impacts are related to petroleum sources unrelated to the MGP, soil and/or groundwater conditions related to the MGP do not appear to pose an acute health risk.

5. Summary and Conclusions

An RI was conducted at the site in compliance with VCA No. D2-0003-02-08, between Con Edison and the NYSDEC. The objectives of the RI were to:

- delineate the horizontal and vertical extent of MGP-impacted soil and groundwater identified during the SCS
- determine if soil and/or groundwater conditions pose an acute health risk and, if so, if these conditions warrant implementation of interim remedial measures
- provide sufficient data with which to develop a proposed site remediation strategy, if necessary

As a result of the field sampling efforts and the analysis of environmental data collected during the field sampling efforts, the objectives of the RI have been satisfied.

5.1 Summary of Findings

The following summarizes findings ascertained from the data collected during the SCS and RI.

5.1.1 Property History

The property history is summarized below:

- The property was associated with an MGP from 1845 to 1914.
- Two 84-foot-diameter subgrade gas holders associated with the former MGP were built on the property and enclosed in a brick building.
- The aboveground infrastructure of each gas holder was razed in 1914. The subsurface infrastructure of each gas holder remains intact and has been filled with miscellaneous urban fill.
- No other MGP structures have been identified on the property.
- Since 1921, the property has had multiple uses. Site development included the installation of five 550-gallon gasoline USTs and one 4,000-gallon diesel UST.

- Petroleum-impacted soil associated with the USTs was identified in 1993. The LUSTs were removed in 1993. Approximately 120 cubic yards of petroleum-impacted soil was removed and disposed of off site.
- In 1993, EnviroTrac (on behalf of the property owner [Retaco Holding]) began multiple soil and groundwater investigations at the property.
- Con Edison performed an SCS at the property in 2005 and an RI at the property in 2008 to address the objectives stated above.

5.1.2 Property Hydrogeology

The hydrogeology at the property is summarized below:

- Four stratigraphic units were identified at the property: fill, silty clay, sand and bedrock.
- The water table is within the Fill Unit, at depths that have ranged between 4 and 15 feet bgs.
- The primary source of recharge to shallow groundwater is inferred to be leaking drains, sewers and water distribution lines. Precipitation primarily recharges shallow groundwater indirectly, by leaking out of sewers.
- Based on the available data, water levels inside the holders are higher than levels observed outside the holders. This indicates that a local source of recharge contributes water directly into the holders and that leakage of water from the holders outward could occur. The presence of petroleum impacts (including MTBE, a gasoline additive) in both holders provides additional insight into possible groundwater movement patterns. Petroleum USTs are documented to have been present only in the eastern holder. These observations suggest that either there are times when the level of water inside the holders is lower than the level outside the holders (allowing groundwater to leak into the holders), that there may be one or more undocumented LUSTs in the western holder, or a combination of both. A condition that could cause the level of water inside the holders to be lower than outside could occur during seasonally wet periods or after storm events, when water levels outside the holder rise faster than levels inside the holders. Under such conditions, water from outside the holders could move into the holders.

- Movement of water into or out of the holders is expected to occur through a few discrete breaches in the holder walls, rather uniformly through the holder walls in a radial distribution.
- There is no evidence of a hydraulic connection that would permit groundwater to flow from one holder to the other.

5.1.3 Sources of Impacts

Three sources of known impacts have been identified at the property:

- five 550-gallon gasoline USTs – petroleum hydrocarbons
- one 4,000-gallon diesel UST – petroleum hydrocarbons
- two former gas holders – coal tar compounds

Each of these sources share similar organic compounds (e.g., BTEX and naphthalene); however, fingerprint analysis can be used to differentiate between petroleum and coal tar impacts because gasoline and diesel sources contain organic compounds that are not associated with coal tar sources (e.g. MTBE, paraffins).

5.1.4 Environmental Conditions

As observed during the RI, environmental conditions at the property are summarized below:

- Field evidence of petroleum and coal tar impacts, including odors, staining, sheen and NAPL, were noted during SCS and RI field activities.
- Soil and groundwater analytical data indicate widespread exceedances of VOC and SVOC SCOs due to the multiple sources.
- Petroleum impacts in soil and groundwater are present throughout the unsaturated and saturated zones to depths greater than 19 feet. Weight of evidence includes:
 - visual and olfactory observations during field sampling
 - LNAPL detected in MW-9 in September 2008
 - LNAPL detected in MW-8 in 2002 by EnviroTrac and fingerprinted as gasoline

- widespread occurrence of MTBE in groundwater
 - detection of MTBE in soil at depths up to 19 feet bgs
 - decreasing concentrations of BTEX compounds after the USTs were removed
 - documented changes in groundwater elevations of more than 8 feet indicating the potential for a large petroleum smear zone
 - fingerprint analysis is consistent with field observations and other analytical data
 - dynamic chemical equilibrium conditions in groundwater is consistent with the effects of a recent source removal
- Coal tar impacts are primarily limited to the base of the gas holders. Weight of evidence includes:
 - visual and olfactory observations of MGP impacts during field sampling
 - visual and olfactory MGP impacts are noted only in the borings completed inside the gas holders
 - SVOC analytical data
 - fingerprint analysis is consistent with field observations and other analytical data
 - MGP constituents have existed at the property for more than 90 years; therefore, steady-state equilibrium conditions are expected if no other sources are present

5.2 Final Conclusions

Based on the results of RI activities conducted at the property, ARCADIS presents the following conclusions:

- The extent of coal tar NAPL is limited to isolated residual pockets located in the base of the holder foundations. MGP residuals on the property have only a localized effect on groundwater quality in the deeper portions of the water-table aquifer (i.e., near the bases of the holders).
- Former USTs located inside the east holder foundation are a source of the petroleum hydrocarbons observed in soil and shallow groundwater. Based on the distribution of petroleum impacts, other unidentified LUSTs are suspected in the west holder and/or outside of holder foundations.
- Impacts to the vadose zone and shallow groundwater are primarily limited to petroleum-related sources that are unrelated to the former MGP. Large fluctuations in the water table appear to have produced a large smear zone of petroleum impacts.
- Groundwater typically flows outward from holders, but may periodically reverse during high-water periods. Water levels in holders may be related to leakage of roof drains from subslab conveyances and restricted flow through the holder walls.
- Based on the current configuration of the site and the findings discussed herein, MGP-related impacts pose no meaningful exposure risk to people; therefore, remedial measures for MGP-related impacts are not warranted.

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Table 1. Sample Analytical Summary, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID	Sample Depth (feet bgs)	Sample Date	TCL VOCs	TCL SVOCs	Total Cyanide	Amenable CN	TPH-DRO	PIANO
Subsurface Soil								
SB-A	2	9/5/2008	X	X	X	X		
SB-A	8	9/5/2008	X	X	X	X		
SB-A	21	9/5/2008	X	X	X	X		
SB-A	32	9/5/2008	X	X	X	X		
SB-B	1	08/20/08	X	X	X	X		
SB-B	10	08/22/08	X	X	X	X	X	X
SB-B	20	08/22/08	X	X	X	X		
SB-C	14	09/08/08	X	X	X	X	X	X
SB-C	22	09/08/08	X	X	X	X	X	X
SB-C	36	09/08/08	X	X	X	X		
SB-D	12	9/4/2008	X	X	X	X		
SB-D	24	9/4/2008	X	X	X	X		
WELL CLUSTER A	12	08/20/08	X	X	X	X	X	X
WELL CLUSTER A	17	08/21/08	X	X	X	X	X	X
WELL CLUSTER A	20	08/21/08	X	X	X	X	X	X
WELL CLUSTER C	11	08/26/08	X	X	X	X		
WELL CLUSTER C	21	08/26/08	X	X	X	X	X	X
Groundwater								
MW-1	NA	10/02/08	X	X	X			
MW-10	NA	10/02/08	X	X	X			
MW-11	NA	09/30/08	X	X	X			
MW-12	NA	09/30/08	X	X	X			
MW-2	NA	10/02/08	X	X	X			
MW-3	NA	10/01/08	X	X	X			
MW-4	NA	10/01/08	X	X	X			
MW-5	NA	10/02/08	X	X	X			
MW-5A	NA	10/02/08	X	X	X			
MW-5B	NA	10/02/08	X	X	X			
MW-7	NA	10/02/08	X	X	X			
MW-8	NA	10/01/08	X	X	X		X	X
MW-9	NA	09/29/08					X	
WELL CLUSTER A2	NA	09/30/08	X	X	X		X	X
WELL CLUSTER A3	NA	09/30/08	X	X	X		X	X
WELL CLUSTER B2	NA	10/01/08	X	X	X		X	X
WELL CLUSTER B3	NA	10/01/08	X	X	X		X	X
WELL CLUSTER C2	NA	09/30/08	X	X	X		X	X
WELL CLUSTER C3	NA	09/30/08	X	X	X		X	X

Notes:

bgs = below ground surface.

CN = Cyanide.

DRO = Diesel Range Organic Compounds.

NA = not applicable.

PIANO = Paraffin, Isoparaffin, Aromatic, Naphthene, or Olefin.

SVOCs = Semi-Volatile Organic Compounds.

TCL = Target Compound List.

TPH = Total Petroleum Hydrocarbons.

VOCs = Volatile Organic Compounds.

Table 2. Soil Boring/Monitoring Well Construction Summary, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID	Date Completed	Installed on Behalf	Unit Screened	Northing Coordinate	Easting Coordinate	Measuring Point Elev.	Ground Surface Elev.	Well Diameter	Casing/Screen Type	Screen Slot Size	Screen Length	Sump Length	Depth to Screened Interval (ft. bgs)		Well Depth feet bgs	Borehole Depth feet bgs
				feet	feet	feet (MVD)	feet (NAVD)						Top	Bottom		
MW-1	1-Dec-01	Retaco	Fill	696348.364	629038.05	13.06	13.63	4	PVC	NA	NA	NA	NA	NA	13.2	NA
MW-2	1-Dec-01	Retaco	Fill	696326.7858	629078.3363	13.127	13.76	4	PVC	NA	NA	NA	NA	NA	15.1	NA
MW-3	1-Dec-01	Retaco	Fill	696301.228	629122.646	12.60	13.50	4	PVC	NA	NA	NA	NA	NA	14.7	NA
MW-4	1-Dec-01	Retaco	Fill	696316.537	629148.657	12.265	12.99	4	PVC	NA	NA	NA	NA	NA	14.35	NA
MW-5	1-Dec-01	Retaco	Fill	696330.95	629120.129	12.979	13.17	4	PVC	NA	NA	NA	NA	NA	14.1	NA
MW-6	1-Dec-01	Retaco	Fill	NA				4	PVC	NA	NA	NA	NA	NA	NR	NA
MW-7	1-Dec-01	Retaco	Fill	696357.213	629171.895	11.975	12.50	4	PVC	NA	NA	NA	NA	NA	13.44	NA
MW-8	1-Dec-01	Retaco	NA	696383.4066	629150.7432	NA	11.64	4	PVC	NA	NA	NA	NA	NA	17	NA
MW-9	1-Dec-01	Retaco	NA	696373.302	629131.6719	NA	13.33	4	PVC	NA	NA	NA	NA	NA	NR	NA
MW-10	1-Dec-01	Retaco	Fill	696377.8682	629077.4973	12.674	13.10	4	PVC	NA	NA	NA	NA	NA	NR	NA
MW-11	15-Feb-05	Retaco	NA	696415.0391	629090.5043	11.02	11.16	1.5	PVC	0.20	9.0	0.0	10	19	19.0	19.0
MW-12	15-Feb-05	Retaco	Sand	696353.2863	629203.5356	12.164	12.37	1.5	PVC	0.20	9.0	0.0	10	19	19.0	19.0
MW-13	15-Feb-05	Retaco		NA				1.5	PVC	0.20	NA	0.0	10	19	19.0	19.0
MW-5A	2-May-05	Con Edison	Silt	696368.5487	629026.9493	13.346	13.84	2	PVC	NA	10.0	2.0	9	19	19.0	22.0
MW-5B	2-May-05	Con Edison	Sand	696370.0902	629024.1166	13.265	13.80	2	PVC	NA	10.0	2.0	32	42	42.0	42.0
Well Cluster A1	21-Aug-08	Con Edison	Fill	696383.8404	629084.7592	12.98	13.18	2	PVC	0.02	4.0	2.0	7	11	11.0	21.0
Well Cluster A2	21-Aug-08	Con Edison	Fill	696383.042	629086.614	12.92	13.18	2	PVC	0.02	2.0	2.0	13.5	15.5	15.5	21.0
Well Cluster A3	21-Aug-08	Con Edison	Fill	696382.049	629088.454	12.95	13.20	2	PVC	0.02	2.0	2.0	17.7	19.7	19.7	21.0
Well Cluster B1	22-Aug-08	Con Edison	Fill	696343.597	629134.927	13.09	13.34	2	PVC	0.02	4.0	2.0	7	11	11.0	20.5
Well Cluster B2	22-Aug-08	Con Edison	Fill	696344.617	629133.371	13.08	13.34	2	PVC	0.02	2.0	2.0	14	16	16.0	20.5
Well Cluster B3	22-Aug-08	Con Edison	Fill	696345.859	629131.98	12.89	13.26	2	PVC	0.02	2.0	2.0	18.5	20.5	20.5	20.5
Well Cluster C1	26-Aug-08	Con Edison	Fill	696346.32	629094.088	13.12	13.46	2	PVC	0.02	4.0	2.0	7	11	11.0	21.0
Well Cluster C2	26-Aug-08	Con Edison	Fill	696345.032	629096.366	13.15	13.39	2	PVC	0.02	2.0	2.0	13.5	15.5	13.5	21.0
Well Cluster C3	26-Aug-08	Con Edison	Fill	696343.789	629098.528	13.05	13.34	2	PVC	0.02	2.0	2.0	19	21	19.0	21.0

Notes:

bgs = below ground surface.

in. = inches.

NA = not available; well likely installed prior to SC.

NR = Not Recorded.

PVC = polyvinyl chloride.

RI = Remedial Investigation.

SC = Site Characterization.

All elevations shown are in feet above mean sea level.

Northing and Easting coordinates in NAVD 88 Vertical Datum.

Table 3. Groundwater Sampling Field Parameters Summary, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID	Date Sampled	Time	Minutes Elapsed	Purge/Sample Flow Rate	Temperature	pH	Specific Conductivity	Oxidation Reduction Potential	Dissolved Oxygen	Turbidity	Depth to Water
				(mL/min)	(degrees C)	(s.u.)	(mS/cm)	(mV)	(mg/L)	(NTU)	(ft bmp)
MW-1	10/02/08	11:20	20	300	20.21	7.18	2.69	-326.8	0.29	50	13.55
MW-2	10/02/08	14:16	20	225	20.57	6.76	2.51	-60.1	1.27	160	13
MW-3	10/01/08	14:15	20	450	20.4	6.53	1.57	-126.9	1.55	9.8	13.02
MW-4	10/01/08	12:55	25	300	18.6	6.68	1.11	-131.8	1.69	27	12.42
MW-5	10/02/08	15:10	35	225	21.75	6.73	2.22	-88.3	1.12	45	13.88
MW-5A	10/02/08	13:05	35	150	19.95	7.18	1.73	-333.6	0.38	50	16.41
MW-5B	10/02/08	10:58	40	450	18.19	7.08	0.19	1.8	1.67	34	14.3
MW-7 ¹	10/02/08	16:45	NA	NA	NA	NA	NA	NA	NA	NA	12.32
MW-8	10/01/08	15:45	20	225	21.03	5.99	5.71	-127.8	0.2	20	13.95
MW-9	0.02 FEET OF LNAPL PRESENT IN WELL. NO SAMPLE COLLECTED.										13.75
MW-10	10/02/08	12:15	25	200	20.25	6.58	5.56	-61.6	1.25	55	12.42
MW-11	09/30/08	16:40	25	500	19.38	6.48	5.64	-169.7	2.01	12	12.63
MW-12	09/30/08	17:30	25	500	18.92	6.48	2.17	-156.2	1.68	6.2	13.64
MW-A1	WELL WAS DRY. NO SAMPLE WAS COLLECTED.										
MW-A2	09/30/08	11:40	30	100	21.24	7.47	3.01	-124	1.86	680	14.5
MW-A3	09/30/08	11:30	25	500	18.75	6.69	3.285	-281.3	1.76	23	11.4
MW-B1	WELL WAS DRY. NO SAMPLE WAS COLLECTED.										
MW-B2	10/01/08	11:40	40	100	21.58	7.03	2.1	-89.9	4.75	>999	14.5
MW-B3	10/01/08	11:08	30	450	17.98	6.78	1.51	-151.1	1.7	18	13.6
MW-C1	WELL WAS DRY. NO SAMPLE WAS COLLECTED.										
MW-C2	09/30/08	13:50	25	100	21.42	7.54	1.28	-96.8	2.18	160	14.5
MW-C3	09/30/08	13:30	35	300	18.68	7.8	1.53	-149.8	2.28	50	15.69

Notes:

ft bmp = feet below measuring point.

in. = inches.

mg/L = milligram per liter.

mL/min = milliliters per minute.

mS/cm = milliSiemens per centimeter.

mV = millivolts.

NTU = Nephelometric Turbidity Units.

s.u. = standard units.

¹No water quality parameters were collected because of elevated turbidity in well due to removal of sediment in the well by EnviroTrac the previous day.

Table 4. Groundwater Elevation Gauging, Remedial Investigation, Former West 18th Street Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID	Location	Measuring Point Elev. feet (NAVD)	Depth to Water							Water Elevation - feet (MVD)							Measured NAPL - feet			
			01/10/02	01/18/02	03/06/02	01/27/04	02/15/05	03/19/07	09/29/08	01/10/02	01/18/02	03/06/02	01/27/04	02/15/05	03/19/07	09/29/08	01/10/02	01/18/02	03/06/02	09/29/08
MW-9	Adjacent to East Holder	13.17	9.27	11.69	10.2	12.93	12.64	12.93	13.75	3.9	1.48	2.97	0.24	0.53	0.24	-0.58	NA	NA	NA	0.02
MW-5A	Adjacent to West Holder	13.35	NA	NA	NA		NA		14.28	NA	NA	NA	NA	NA	NA	-0.93	NA	NA	NA	0
MW-5B	Adjacent to West Holder	13.27	NA	NA	NA		NA		14.2	NA	NA	NA	NA	NA	NA	-0.93	NA	NA	NA	0
MW-3	East Holder	12.6	4.33	4.68	4.36	6.45	5.5	6.94	12.91	8.27	7.92	8.24	6.15	7.1	5.66	-0.31	NA	NA	NA	0
MW-4	East Holder	12.27	4.04	4.38	4.09	6.17	6.21	6.64	12.6	8.23	7.89	8.18	6.1	6.06	5.63	-0.33	NA	NA	NA	0
MW-5	East Holder	12.98	4.75	5.08	4.78	6.86	6.91	7.45	13.32	8.23	7.9	8.2	6.12	6.07	5.53	-0.34	NA	NA	NA	0
MW-6	East Holder	13 ¹	6.36	8.07	7.6		NA		NA	6.64	4.93	5.4	NA	NA	NA	NG	NA	NA	NA	NA
MW-7	East Holder	11.98	3.7	4.04	3.72	5.86	5.88	5.88	12.23	8.28	7.94	8.26	6.12	6.1	6.1	-0.25	NA	NA	NA	0
MW-B1	East Holder	13.09	NA	NA	NA		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NM
MW-B2	East Holder	13.08	NA	NA	NA		NA		13.38	NA	NA	NA	NA	NA	NA	-0.3	NA	NA	NA	0
MW-B3	East Holder	12.89	NA	NA	NA		NA		13.2	NA	NA	NA	NA	NA	NA	-0.31	NA	NA	NA	0
MW-1	West Holder	13.06	6.69	6.81	6.16	7.24	NA	8.19	11.4	6.37	6.25	6.9	5.82	NA	4.87	1.66	NA	NA	NA	0
MW-2	West Holder	13.13	6.75	6.88	6.22	7.23	7.48	8.27	11.47	6.38	6.25	6.91	5.9	5.65	4.86	1.66	NA	NA	NA	0
MW-10	West Holder	12.67	6.32	6.48	5.78	6.78	NG	7.87	NG	6.35	6.19	6.89	5.89	NA	4.8	NA	NA	NA	NA	NM
MW-A1	West Holder	NA	NA	NA	NA		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NM
MW-A2	West Holder	12.92	NA	NA	NA		NA		11.27	NA	NA	NA	NA	NA	NA	1.65	NA	NA	NA	0
MW-A3	West Holder	12.95	NA	NA	NA		NA		11.3	NA	NA	NA	NA	NA	NA	1.65	NA	NA	NA	0
MW-C1	West Holder	13.12	NA	NA	NA		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NM
MW-C2	West Holder	13.15	NA	NA	NA		NA		11.44	NA	NA	NA	NA	NA	NA	1.71	NA	NA	NA	0
MW-C3	West Holder	13.05	NA	NA	NA		NA		11.38	NA	NA	NA	NA	NA	NA	1.67	NA	NA	NA	0
MW-8	Sidewalk	11.5	9.41	10.59	10.84	11.25	10.85	11.35	12.05	2.09	0.91	0.66	0.25	0.65	0.15	-0.55	0.01	0.01	0.12	0
MW-11	Sidewalk	11.02	NA	NA	NA		10.35	13.51	11.64	NA	NA	NA	NA	0.67	-2.49	-0.62	NA	NA	NA	0
MW-12	Sidewalk	12.16	NA	NA	NA		11.58	11.73	12.96	NA	NA	NA	NA	0.58	0.43	-0.8	NA	NA	NA	0
MW-13	Sidewalk	NA	NA	NA	NA		10.26		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

¹ Estimated value based on MW-B1, MW-B2, and MW-B3

NA = not available/not applicable

All elevations shown are in NAVD 88 (NAVD) vertical datum

Table 5. Summary of Field Observations, Remedial Investigation, Former West 18th Street Gas Works, Block 715, Lot 59, Manhattan, New York

Boring/ Well ID	Dates Completed	Boring Depth (ft bgs)	Field Observations		
			Depth Interval (ft bgs)	Description	Maximum PID Reading (ppm)
SB-1	14-May-05	6	NA	No petroleum or MGP impacts were noted.	NA
SB-2	6-May-05	20.5	0.8-2	Strong gasoline-like odor, N/S	22.1
			13-15	Petroleum odor, N/S	0.8
			15-17	MGP-related odor, N/S	0.5
			17-19	Strong MGP-related odor	124
			19-21	Strong MGP-related odor	19.2
			20.5	Refusal due to rocks - possible bottom of Former Gas Holder #1	NA
SB-3	6-May-05	20	13-15	Strong gasoline-like odor, N/S	63
SB-4	5-May-05	21	6.5-9	Strong gasoline-like odor, black staining, sheen	5.7
			9-11	Slight gasoline-like odor, N/S, trace sheen	0.9
			11-13	Slight petroleum odor, trace black staining, trace sheen	4.4
			13-15	Petroleum odor, N/S, sheen	30.5
			15-17	Slight MGP-related odor, N/S, sheen	9.8
			17-19	MGP-related odor, N/S, sheen	12.9
			19-21	Very strong MGP-related odor, heavy black staining, visible OLM	3,124
			21	Refusal due to rocks and brick - possible bottom of Former Gas Holder #2	NA
SB-5	3-Jun-05	31	10-11	Strong petroleum-like odor, sheen, N/S	387
			11-15	Very strong petroleum-like odor, black staining, sheen	4,085
			15-19	Strong petroleum-like odor, sheen, black staining on wood, trace NAPL	198
			19-20	Trace petroleum-like odor, N/S	6.8
			20-25	Very slight petroleum-like odor, N/S	8.4
SB-6	13-May-05	72	10-13	Slight petroleum-like odor (stronger at tip), trace black staining	2,060
			13-16	Strong petroleum-like odor, some black staining, sheen, trace NAPL	3,520
			16-19	Slight petroleum-like odor, N/S	134
			72	Refusal due to rock (schist fragments in spoon)	NA
MW-5A	2-May-05	22	10-11	Strong petroleum-like odor, N/S, sheen	387
			11-15	Very strong petroleum-like odor, black staining, sheen	4,085
			15-20	Very strong petroleum-like odor, N/S, sheen	1,222
			20-21	Slight petroleum-like odor, N/S, sheen	55
			21-22	Slight petroleum-like odor, N/S, trace sheen	12.4
			22	Refusal due to brick/concrete	NA
MW-5B	8-Jun-05	42	10-11	Strong petroleum-like odor, N/S, sheen	387
			11-15	Very strong petroleum-like odor, black staining, sheen	4,085
			15-19	Very strong petroleum-like odor, N/S, sheen	1,222
			19-21	Sheen	NA
			32-36	Very slight non-MGP-related odor, N/S	0.0
TP-1B	4-May-05	3	0-1	Gasoline-like odor, N/S	667
			2-3	Gasoline-like odor, black staining on wood timbers	78.2
			3	Gasoline-like odor, N/S	46.0
Well Cluster A	8/20/2008, 8/21/2008	21	11-12	Staining	2042
			15-17	Dark brown medium to coarse SAND, wet.	683
			17-20	Timber	88
			20-21	Concrete	83

See Notes on Page 2.

Table 5. Summary of Field Observations, Remedial Investigation, Former West 18th Street Gas Works, Block 715, Lot 59, Manhattan, New York

Boring/ Well ID	Dates Completed	Boring Depth (ft bgs)	Field Observations		
			Depth Interval (ft bgs)	Description	Maximum PID Reading (ppm)
Well Cluster B	22-Aug-08	20.5	0-5.6	Strong odors, slight staining	9999
			5.6-6	Strong odors	1523
			8-10	Strong odors	1981
			10-12	Strong odors	908
Well Cluster C	26-Aug-08	25	19-21	Staining	787
			21-23	Concrete (Possible holder bottom)	232
SB-A	5-Sep-08	32	2-4	Wood, moderate odor	605
			4-6	Wood, faint odor	64
			6-8	Faint odor	100
			8-10	Trace wood, moderate odor	159
			10-12	Trace wood, faint odors	72
			14-16	Trace wood, faint odors	21
			20.8 - 21.2	Black staining, strong odors	79
			22-22.5	Moderate odors	511
SB-C	8-Sep-08	42	9-10	Staining, strong odors	861
			10-14	Sheen, trace staining, strong odors	3747
			16-18	Slight sheen, strong odors	2523
			18-22	Strong odors	2522
			22-24	Faint odors	30
			24-26	Moderate odors	212
			26-28	Moderate odors	238
			34-36	Faint odors	6.1
SB-D	4-Sep-08	26		No petroleum or MGP impacts noted	18.4

Notes:

NAPL = Nonaqueous Phase Liquid.

MGP = Manufactured Gas Plant.

N/S = No staining.

ppm = parts per million.

ft bgs = Feet below ground surface.

OLM = Oil-like Material.

Updated January 23, 2009.

Table 6. Summary Statistics for Historical SVOC and VOC Analytical Groundwater Data, Dates of Sample Collection: 3/19/2007, 2/15/05, 1/27/04, 3/6/03, 1/18/02, 8/21/01, Block 715, Lot 59, Manhattan, New York

Analyte	Minimum Detected Concentration (ug/l)	Maximum Detected Concentration (ug/l)	Total Number of Samples	Number Detected	Frequency of Detections
Volatile Organic Compounds					
1,2,4-Trimethylbenzene	ND	77000	44	40	91%
1,3,5-Trimethylbenzene	ND	29000	44	34	77%
Benzene	ND	9600	44	42	95%
Ethylbenzene	ND	18000	44	44	100%
Isopropylbenzene	ND	2900	44	41	93%
MTBE	ND	1980	44	42	95%
Naphthalene	ND	1300	44	44	100%
n-Butylbenzene	ND	<500	44	26	59%
n-Propylbenzene	ND	8900	44	42	95%
p-Isopropyltoluene	ND	970	44	33	75%
sec-Butylbenzene	ND	850	44	25	57%
tert-Butylbenzene	ND	<500	44	24	55%
Toluene	ND	20000	44	41	93%
Total Xylenes	ND	106000	44	44	100%
Total VOCs	50	<136250	44	44	100%
Semi-Volatile Organic Compounds					
Acenaphthene	ND	39.6	33	23	70%
Acenaphthylene	ND	<10	16	4	25%
Anthracene	ND	13500	36	20	56%
Benzo(a)anthracene	ND	5360	36	10	28%
Benzo(a)pyrene	ND	3930	36	8	22%
Benzo(b)fluoranthene	ND	2500	36	8	22%
Benzo(g,h,i)perylene	ND	0.75	36	6	17%
Benzo(k)fluoranthene	ND	3100	36	8	22%
Carbazole	ND	100.8	12	4	33%
Chrysene	ND	5730	36	10	28%
Dibenzo(a,h)anthracene	ND	<10	36	4	11%
Dibenzofuran	ND	2.7	12	4	33%
Fluoranthene	ND	16700	36	12	33%
Fluorene	ND	50500	36	32	89%
Indeno(1,2,3-cd)pyrene	ND	0.64	36	6	17%
Naphthalene	ND	5980000	36	32	89%
Phenanthrene	ND	67000	36	30	83%
Pyrene	ND	19500	36	20	56%
Total SVOCs	2.7	6203630	36	36	100%

Notes:

VOC = Volatile Organic Compounds.

SVOC = Semi Volatile Organic Compounds.

ND = Not Detected.

ug/l = micrograms per liter.

Table 7a. VOCs Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID: Sample Depth (ft bgs): Date Collected:	NY TAGM Rec Soil Cleanup Objectives	Units	MW-5B 34 - 36 06/07/05	MW-5B (DUP) 34 - 36 06/07/05	SB-1 5 - 5.5 05/03/05	SB-2 1 - 1.5 05/02/05	SB-2 2 - 2.5 05/02/05	SB-2 5 - 7 05/06/05	SB-2 13 - 15 05/06/05	SB-2 19 - 20.5 05/06/05	SB-3 3 - 3.5 04/29/05	SB-3 5 - 7 05/06/05	SB-3 13 - 15 05/06/05
Volatile Organics													
1,2-Dichloropropane	--	ug/kg	0.50 U	0.48 U	0.40 U	0.43 U	43	0.50 U	0.45 U	510 U	0.43 UR	0.44 U	46 U
1,4-Dichlorobenzene	8,500	ug/kg	0.69 U	0.66 U	0.55 U	0.58 U	0.59 U	0.68 U	0.62 U	630 U	0.59 UR	0.61 U	56 U
2-Butanone	300	ug/kg	3.6 U	3.4 U	2.9 U	3.0 U	3.1 U	3.5 U	3.2 U	4,600 U	3.0 UR	3.1 U	410 U
4-Methyl-2-pentanone	1,000	ug/kg	2.5 U	2.4 U	2.0 U	2.1 U	2.1 U	2.5 U	2.2 U	2,100 U	2.1 UR	2.2 U	190 U
Acetone	200	ug/kg	16 J	4.1 U	6.0 JB	3.7 J	3.6 U	13 JB	15 JB	5,400 U	12 J	7.0 JB	480 U
Benzene	60	ug/kg	0.50 U	0.49 U	0.40 U	0.43 U	0.43 U	0.50 U	1.7 J	22,000	0.43 UR	0.44 U	35 U
Carbon Disulfide	2,700	ug/kg	0.46 U	0.45 U	0.37 U	0.39 U	0.40 U	0.46 U	0.42 U	630 U	0.40 UR	0.41 U	56 U
Cyclohexane	--	ug/kg	0.41 U	0.39 U	0.33 U	0.35 U	0.35 U	0.40 U	0.37 U	1,600 J	0.35 UR	0.36 U	53 U
Ethylbenzene	5,500	ug/kg	3.0 J	2.6 J	0.36 U	0.38 U	0.38 U	0.44 U	0.40 U	35,000	0.38 UR	0.39 U	59 U
Isopropylbenzene	--	ug/kg	0.52 U	0.51 U	0.42 U	0.45 U	0.45 U	0.52 U	0.47 U	28,000	0.45 UR	0.46 U	48 U
Methyl tert-butyl ether	--	ug/kg	0.46 U	0.45 U	0.37 U	0.39 U	0.40 U	0.46 U	5.1 J	580 U	0.40 UR	0.41 U	52 U
Methylcyclohexane	--	ug/kg	0.53 U	0.51 U	0.42 U	0.45 U	0.46 U	0.52 U	0.48 U	3,500 J	0.45 UR	0.47 U	1,300
Methylene Chloride	100	ug/kg	2.3 U	5.1 JB	1.8 U	6.1	5.9 B	2.3 U	2.1 U	1,000 U	2.0 UR	2.0 U	89 U
m-Xylene & p-Xylene	--	ug/kg	1.4 J	1.1 U	0.87 U	0.93 U	1.2 J	1.1 U	0.98 U	13,000 J	0.93 UR	0.96 U	140 U
o-Xylene	--	ug/kg	4.4 J	4.2 J	0.39 U	0.41 U	0.42 U	0.48 U	0.43 U	600 U	0.41 UR	0.43 U	53 U
Tetrachloroethene	1,400	ug/kg	2.6 J	1.5 J	0.74 U	0.78 U	0.79 U	0.91 U	0.83 U	540 U	0.79 UR	0.81 U	47 U
Toluene	1,500	ug/kg	0.51 U	0.49 U	0.41 U	0.43 U	0.44 U	0.51 U	0.46 U	630 U	0.44 UR	0.45 U	56 U
Total VOCs	--	ug/kg	22 J	9.2 J	6.0 J	9.8 J	49	13 J	17 J	57,000	12 J	7.0 J	ND

See Notes on Page 4.

Table 7a. VOCs Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID: Sample Depth (ft bgs): Date Collected:	NY TAGM Rec Soil Cleanup Objectives	Units	SB-3 17 - 19 05/06/05	SB-4 5 - 5.5 05/03/05	SB-4 7 - 9 05/05/05	SB-4 9 - 13 05/05/05	SB-4 17 - 19 05/05/05	SB-4 19 - 21 05/05/05	SB-5A 17 - 19 05/02/05	SB-5A 19 - 20 05/02/05	SB-5A 26 - 28 05/03/05	SB-5A 31 - 33 05/03/05	SB-5B 10 - 11 05/02/05
Volatile Organics													
1,2-Dichloropropane	--	ug/kg	0.46 U	0.44 U	0.45 U	0.46 U	0.47 U	50 U	2.4 U	0.45 U	0.48 U	0.46 U	0.43 U
1,4-Dichlorobenzene	8,500	ug/kg	0.63 U	0.61 U	0.62 U	0.64 U	0.65 U	60 U	3.3 U	0.62 U	0.66 U	0.64 U	0.58 U
2-Butanone	300	ug/kg	3.3 U	3.1 U	3.2 U	3.3 U	3.3 U	440 U	17 U	3.2 U	3.4 U	3.3 U	3.0 U
4-Methyl-2-pentanone	1,000	ug/kg	2.3 U	2.2 U	2.2 U	2.3 U	2.3 U	210 U	12 U	2.3 U	2.4 U	2.3 U	2.1 U
Acetone	200	ug/kg	13 JB	8.1 JB	19 JB	28 JB	19 JB	520 U	20 U	3.8 U	16 JB	17 JB	3.6 U
Benzene	60	ug/kg	0.46 U	0.44 U	0.45 U	2.4 J	0.47 U	19,000	14 J	0.45 U	0.48 U	0.47 U	0.43 U
Carbon Disulfide	2,700	ug/kg	0.43 U	0.41 U	0.42 U	0.43 U	0.44 U	61 U	2.2 U	0.42 U	0.44 U	0.43 U	0.39 U
Cyclohexane	--	ug/kg	0.38 U	0.36 U	0.37 U	1.4 J	0.38 U	57 U	1.9 U	0.37 U	0.39 U	0.38 U	0.35 U
Ethylbenzene	5,500	ug/kg	0.41 U	0.39 U	0.40 U	0.41 U	0.42 U	48,000 D	60	0.40 U	0.43 U	0.41 U	0.38 U
Isopropylbenzene	--	ug/kg	0.48 U	0.46 U	0.47 U	2.1 J	2.2 J	3,000	2.5 U	0.47 U	0.50 U	0.49 U	0.45 U
Methyl tert-butyl ether	--	ug/kg	2.1 J	0.41 U	0.42 U	0.43 U	0.44 U	56 U	2.2 U	2.7 J	0.44 U	0.43 U	0.39 U
Methylcyclohexane	--	ug/kg	0.49 U	0.47 U	5.7	5.0 J	0.50 U	230 J	100	0.48 U	0.51 U	0.49 U	0.45 U
Methylene Chloride	100	ug/kg	2.1 U	2.5 JB	2.4 JB	2.1 U	2.8 J	97 U	37	6.9	2.2 U	3.7 JB	2.0 U
m-Xylene & p-Xylene	--	ug/kg	1.0 U	0.96 U	0.98 U	1.4 J	1.0 U	56,000	250	3.9 J	1.0 U	1.0 U	0.93 U
o-Xylene	--	ug/kg	0.45 U	0.43 U	0.43 U	0.45 U	0.46 U	22,000	8.7 J	0.44 U	0.46 U	0.45 U	0.41 U
Tetrachloroethene	1,400	ug/kg	0.85 U	0.81 U	0.83 U	0.85 U	0.87 U	52 U	4.4 U	0.83 U	0.88 U	0.85 U	0.78 U
Toluene	1,500	ug/kg	0.47 U	0.45 U	0.46 U	0.47 U	0.48 U	29,000	2.4 U	0.46 U	0.49 U	0.47 U	0.43 U
Total VOCs	--	ug/kg	13 J	11 J	21 J	30 J	22 J	96,000	110 J	6.9	16 J	21 J	ND

See Notes on Page 4.

Table 7a. VOCs Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID: Sample Depth (ft bgs): Date Collected:	NY TAGM Rec Soil Cleanup Objectives	Units	SB-5B 11 - 12 05/02/05	SB-5B 21 - 22 05/02/05	SB-6 10 - 12 05/12/05	SB-6 13 - 15 05/12/05	SB-6 19 - 21 05/12/05	SB-6 24 - 26 05/12/05	SB-6 28.5 - 30.5 05/12/05	TP-1B 1 - 1.5 05/04/05
Volatile Organics										
1,2-Dichloropropane	--	ug/kg	34 U	0.48 U	0.45 U	48 U	0.49 U	0.48 U [0.48 U]	0.47 U	0.44 U [0.43 UJ]
1,4-Dichlorobenzene	8,500	ug/kg	42 U	1.8 J	0.61 U	58 U	0.67 U	0.66 U [0.66 U]	0.65 U	0.60 U [6.0 J]
2-Butanone	300	ug/kg	300 U	3.4 U	3.2 U	430 U	3.5 U	3.4 U [3.4 U]	3.3 U	3.1 U [15 J]
4-Methyl-2-pentanone	1,000	ug/kg	140 U	2.6 J	2.2 U	200 U	2.4 U	2.4 U [2.4 U]	2.3 U	2.2 U [2.2 UJ]
Acetone	200	ug/kg	360 U	4.0 U	7.9 JB	500 U	34 BJ	19 JB [19 JB]	12 JB	8.2 JB [81 BJ]
Benzene	60	ug/kg	26 U	2.0 J	0.45 U	36 U	87	0.49 U [0.48 U]	0.47 U	0.44 U [0.44 UJ]
Carbon Disulfide	2,700	ug/kg	42 U	0.44 U	0.41 U	59 U	7.0	0.45 U [0.45 U]	0.44 U	0.41 U [0.40 UJ]
Cyclohexane	--	ug/kg	39 U	0.39 U	0.36 U	55 U	5.7 J	0.39 U [0.39 U]	0.38 U	0.36 U [0.35 UJ]
Ethylbenzene	5,500	ug/kg	18,000	5.5 J	0.40 U	70,000 DJ	0.44 U	2.7 J [0.43 U]	2.8 J	0.39 U [4.4 J]
Isopropylbenzene	--	ug/kg	4,000	0.50 U	0.47 U	7,700	4.1 J	0.51 U [0.50 U]	0.49 U	0.46 U [0.46 UJ]
Methyl tert-butyl ether	--	ug/kg	39 U	0.44 U	0.41 U	54 U	23	0.45 U [0.45 U]	0.44 U	0.41 U [0.40 UJ]
Methylcyclohexane	--	ug/kg	2,800	0.51 U	0.47 U	20,000	6.0 J	0.51 U [0.51 U]	0.50 U	0.47 U [4.1 J]
Methylene Chloride	100	ug/kg	67 U	6.7	2.0 U	94 U	2.3 U	2.2 U [2.2 U]	2.2 U	3.6 JB [2.2 J]
m-Xylene & p-Xylene	--	ug/kg	74,000 D	22	0.97 U	320,000 DJ	2.1 J	13 [4.4 J]	15	0.96 U [67 J]
o-Xylene	--	ug/kg	18,000	5.3 J	0.43 U	120,000 DJ	0.47 U	4.0 J [1.2 J]	5.1 J	0.43 U [150 J]
Tetrachloroethene	1,400	ug/kg	35 U	0.88 U	0.82 U	50 U	0.90 U	0.89 U [0.88 U]	0.86 U	0.81 U [0.80 UJ]
Toluene	1,500	ug/kg	42 U	3.0 J	0.45 U	59,000 DJ	5.0 J	3.6 J [1.7 J]	2.1 J	0.45 U [5.7 J]
Total VOCs	--	ug/kg	18,000	20 J	7.9 J	130,000 J	130 J	25 J [21 J]	17 J	12 J [110 J]

See Notes on Page 4.

Table 7a. VOCs Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Notes:

- - = no SCO exists for the specified compound.

B = Detected in Equipment Blank.

bgs = below ground surface.

D = compounds analyzed at a dilution.

E = Analyte exceeds equipment calibration range.

J = indicates an estimated value.

ND = None detected.

NYS DEC = New York State Department of Environmental Conservation.

SVOCs=Semivolatile organic compounds.

TAGM = NYSDEC Soil Cleanup Objective as per NYS Technical Administrative Guidance Memo (TAGM) 4046, 1994.

U = indicates the constituent was not detected at the PQL. The value preceding the U indicates the PQL.

ug/Kg = micrograms per Kilogram.

UJ = estimated non-detect.

VOCs = volatile organic compounds.

Total VOC concentrations exclude MTBE.

MW-5B (34-36) duplicate refers to field sample ID MW-55B (34-36).

Table 7b. SVOCs Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID: Sample Depth (ft BGS): Date Collected:	NY TAGM Rec Soil Cleanup Objectives	Units	SB-1 5 - 5.5 05/03/05	SB-2 1 - 1.5 05/02/05	SB-2 2 - 2.5 05/02/05	TP-1B 1 - 1.5 05/04/05	SB-2 5 - 7 05/06/05	SB-2 13 - 15 05/06/05	SB-2 19 - 20.5 05/06/05	SB-3 5 - 7 05/06/05	SB-3 13 - 15 05/06/05	SB-3 17 - 19 05/06/05	SB-4 5 - 5.5 05/03/05	SB-4 7 - 9 05/05/05	SB-4 9 - 13 05/05/05	SB-4 17 - 19 05/05/05	SB-4 19 - 21 05/05/05
Semivolatile Organics																	
1,1-Biphenyl	--	ug/kg	54 U	58 U	59 U	60 U [59 UJ]	68 U	62 U	520	60 U	62 U	63 U	60 U	61 U	63 U	63 U	8,600
2,4-Dimethylphenol	--	ug/kg	52 U	56 U	56 U	58 U [57 UJ]	65 U	59 U	67 U	58 U	59 U	61 U	58 U	58 U	61 U	61 U	650 U
2-Methylnaphthalene	36,400	ug/kg	55 U	120 J	59 U	1,700 [1,700]	69 U	63 U	5,300 D	61 U	63 U	64 U	61 U	61 U	99 J	64 U	60,000 D
2-Methylphenol	100	ug/kg	55 U	59 U	59 U	61 U [60 UJ]	68 U	62 U	71 U	60 U	62 U	63 U	61 U	61 U	64 U	64 U	680 U
4-Methylphenol	900	ug/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	50,000	ug/kg	59 U	76 J	63 U	65 UJ [64 UJ]	73 U	67 U	870	65 U	67 U	68 U	65 U	65 U	68 U	68 U	19,000
Acenaphthylene	41,000	ug/kg	54 U	57 U	58 U	59 U [58 UJ]	67 U	61 U	250 J	59 U	61 U	62 U	59 U	60 U	62 U	62 U	9,100
Anthracene	50,000	ug/kg	50 U	53 U	91 J	55 U [54 UJ]	62 U	57 U	880	55 U	57 U	58 U	55 U	55 U	58 U	58 U	32,000 DJ
Benzo(a)anthracene	224	ug/kg	46 U	49 U	88 J	51 U [50 UJ]	58 U	52 U	770	51 U	52 U	53 U	51 U	51 U	54 U	59 J	23,000
Benzo(a)pyrene	61	ug/kg	53 U	62 J	110 J	79 J [74 J]	66 U	60 U	480	58 U	60 U	61 U	58 U	59 U	61 U	61 U	18,000 J
Benzo(b)fluoranthene	1,100	ug/kg	36 U	65 J	180 J	84 J [84 J]	45 U	41 U	460	40 U	41 U	42 U	44 J	40 U	42 U	49 J	20,000 J
Benzo(g,h,i)perylene	50,000	ug/kg	55 U	58 UJ	59 U	130 J [110 J]	68 U	62 U	170 J	60 U	62 U	63 U	60 U	61 U	64 U	63 U	3,600 J
Benzo(k)fluoranthene	1,100	ug/kg	73 U	78 UJ	82 J	80 U [79 UJ]	91 U	82 U	170 J	80 U	82 U	84 U	80 U	81 U	85 U	84 U	6,900 J
bis(2-Ethylhexyl)phthalate	50,000	ug/kg	63 U	68 U	68 U	410 [280 J]	150 J	140 J	82 U	270 J	72 U	160 J	70 U	84 J	74 U	74 U	790 U
Butylbenzylphthalate	50,000	ug/kg	53 U	57 U	58 U	280 J [190 J]	74 J	130 J	69 U	59 U	61 UR	88 J	59 U	59 U	62 U	62 U	660 U
Carbazole	--	ug/kg	50 U	54 U	54 U	56 U [55 UJ]	63 U	57 U	560	55 U	57 U	58 U	56 U	56 U	59 U	59 U	12,000
Chrysene	400	ug/kg	59 U	63 U	110 J	66 U [64 UJ]	74 U	67 U	660	65 U	67 U	68 U	66 U	66 U	69 U	69 U	20,000
Dibenzo(a,h)anthracene	14	ug/kg	41 U	44 UJ	45 U	46 U [45 UJ]	52 U	47 U	53 U	46 U	47 U	48 U	46 U	46 U	48 U	48 U	680 J
Dibenzofuran	6,200	ug/kg	55 U	100 J	59 U	60 U [59 UJ]	68 U	62 U	1,200	60 U	62 U	63 U	60 U	61 U	64 U	63 U	24,000
Di-n-Butylphthalate	8,100	ug/kg	50 U	54 U	54 U	56 U [55 UJ]	63 U	57 U	65 U	55 U	57 U	58 U	56 U	56 U	59 U	58 U	620 U
Di-n-Octylphthalate	50,000	ug/kg	56 U	60 U	61 U	62 U [61 UJ]	70 U	64 U	72 U	62 U	64 U	65 U	62 U	63 U	65 U	65 U	700 U
Fluoranthene	50,000	ug/kg	49 U	52 U	250 J	54 U [53 UJ]	69 J	56 U	1,700	54 U	56 U	57 U	85 J	55 U	57 U	83 J	50,000 D
Fluorene	50,000	ug/kg	56 U	64 J	60 U	62 U [60 UJ]	69 U	63 U	1,400	61 U	63 U	64 U	62 U	62 U	65 U	65 U	35,000 D
Indeno(1,2,3-cd)pyrene	3,200	ug/kg	42 U	45 U	45 U	100 J [93 J]	52 U	48 U	190 J	46 U	48 UJ	48 U	46 U	47 U	49 U	49 U	2,400 J
Naphthalene	13,000	ug/kg	56 U	110 J	61 U	1,400 [1,200]	70 U	64 U	11,000 D	62 U	64 U	65 U	82 J	63 U	370 J	66 U	220,000 D
Phenanthrene	50,000	ug/kg	53 U	91 J	280 J	92 J [88 J]	67 J	60 U	3,800 JD	58 U	83 J	61 U	110 J	59 U	65 J	71 J	110,000 D
Phenol	30	ug/kg	50 U	53 U	54 U	55 U [54 UJ]	62 U	57 U	64 U	55 U	57 U	58 U	55 U	56 U	58 U	58 U	620 U
Pyrene	50,000	ug/kg	58 U	62 U	380	100 J [100 J]	74 J	66 U	1,800	64 U	66 U	67 U	88 J	65 U	68 U	79 J	54,000 D
Total SVOCs	--	ug/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Table 7b. SVOCs Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID: Sample Depth (ft BGS): Date Collected:	NY TAGM Rec Soil Cleanup Objectives	Units	MW-5B 17 - 19 05/02/05	MW-5B 19 - 20 05/02/05	MW-5B (DUP) 19 - 20 05/02/05	MW-5B 26 - 28 05/03/05	MW-5B 31 - 33 05/03/05	MW-5B 34 - 36 06/07/05	MW-5A 10 - 11 05/02/05	MW-5A 11 - 12 05/02/05	MW-5A 21 - 22 05/02/05	TP-1B 1 - 1.5 05/04/05	SB-6 10 - 12 05/12/05	SB-6 13 - 15 05/12/05	SB-6 19 - 21 05/12/05	SB-6 24 - 26 05/12/05
Semivolatile Organics																
1,1-Biphenyl	--	ug/kg	65 U	62 U	63 U	65 U	63 U	68 U	58 U	58 U	66 U	60 U [59 UJ]	61 U	150 J	67 U	66 U [66 U]
2,4-Dimethylphenol	--	ug/kg	62 U	60 U	61 U	63 U	60 U	66 U	56 U	56 U	63 U	58 U [57 UJ]	59 U	63 U	64 U	63 U [64 U]
2-Methylnaphthalene	36,400	ug/kg	86 J	63 U	64 U	66 U	64 U	69 U	79 J	4,700 D	67 U	1,700 [1,700]	62 U	3,800 D	68 U	67 U [67 U]
2-Methylphenol	100	ug/kg	65 U	63 U	64 U	66 U	63 U	69 U	59 U	58 U	66 U	61 U [60 UJ]	61 U	66 U	67 U	66 U [67 U]
4-Methylphenol	900	ug/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	50,000	ug/kg	70 U	67 U	69 U	70 U	68 U	74 U	63 U	62 U	71 U	65 UJ [64 UJ]	66 U	70 U	72 U	71 U [71 U]
Acenaphthylene	41,000	ug/kg	64 U	61 U	63 U	64 U	62 U	67 U	57 U	57 U	65 U	59 U [58 UJ]	60 U	64 U	66 U	65 U [65 U]
Anthracene	50,000	ug/kg	59 U	57 U	58 U	59 U	57 U	62 U	53 U	53 U	60 U	55 U [54 UJ]	56 U	60 U	61 U	60 U [60 U]
Benzo(a)anthracene	224	ug/kg	55 U	53 U	54 U	55 U	53 U	58 U	49 U	49 U	56 U	51 U [50 UJ]	52 U	55 U	57 U	56 U [56 U]
Benzo(a)pyrene	61	ug/kg	63 U	61 U	62 U	63 U	61 U	66 U	57 U	56 U	64 U	79 J [74 J]	59 U	63 U	65 U	64 U [64 U]
Benzo(b)fluoranthene	1,100	ug/kg	43 U	42 U	42 U	43 U	42 U	45 U	39 U	39 U	44 U	84 J [84 J]	41 U	44 U	45 U	44 U [44 U]
Benzo(g,h,i)perylene	50,000	ug/kg	65 U	63 U	64 U	65 U	63 U	68 U	58 U	58 U	66 U	130 J [110 J]	61 U	65 U	67 U	66 U [66 U]
Benzo(k)fluoranthene	1,100	ug/kg	86 U	83 U	85 U	87 U	84 U	91 U	78 U	77 U	88 U	80 U [79 UJ]	81 U	87 U	89 U	88 U [88 U]
bis(2-Ethylhexyl)phthalate	50,000	ug/kg	75 U	73 U	74 U	76 U	88 J	79 U	68 U	92 J	76 U	410 [280 J]	71 U	210 JB	160 J	170 J [140 JB]
Butylbenzylphthalate	50,000	ug/kg	63 U	61 U	62 U	64 U	62 U	67 U	57 U	57 U	64 U	280 J [190 J]	60 U	64 U	66 U	64 U [65 U]
Carbazole	--	ug/kg	60 U	58 U	59 U	60 U	58 U	63 U	54 U	53 U	61 U	56 U [55 UJ]	56 U	60 U	62 U	61 U [61 U]
Chrysene	400	ug/kg	70 U	68 U	69 U	71 U	68 U	74 U	63 U	63 U	71 U	66 U [64 UJ]	66 U	71 U	73 U	71 U [72 U]
Dibenzo(a,h)anthracene	14	ug/kg	49 U	48 U	48 U	49 U	48 U	52 U	44 U	44 U	50 U	46 U [45 UJ]	46 U	50 U	51 U	50 U [50 U]
Dibenzofuran	6,200	ug/kg	65 U	63 U	64 U	65 U	63 U	68 U	58 U	58 U	66 U	60 U [59 UJ]	61 U	65 U	67 U	66 U [66 U]
Di-n-Butylphthalate	8,100	ug/kg	60 U	58 U	59 U	60 U	70 J	63 U	54 U	53 U	61 U	56 U [55 UJ]	56 U	60 U	62 U	61 U [61 U]
Di-n-Octylphthalate	50,000	ug/kg	67 U	64 U	66 U	67 U	65 U	70 U	60 U	60 U	68 U	62 U [61 UJ]	63 U	67 U	69 U	68 U [68 U]
Fluoranthene	50,000	ug/kg	58 U	56 U	57 U	59 U	57 U	61 U	53 U	52 U	59 U	54 U [53 UJ]	55 U	59 U	60 U	59 U [60 U]
Fluorene	50,000	ug/kg	66 U	64 U	65 U	67 U	64 U	70 U	60 U	79 J	67 U	62 U [60 UJ]	62 U	110 J	68 U	67 U [68 U]
Indeno(1,2,3-cd)pyrene	3,200	ug/kg	50 U	48 U	49 U	50 U	48 U	52 U	45 U	44 U	51 U	100 J [93 J]	47 U	50 U	51 U	51 U [51 U]
Naphthalene	13,000	ug/kg	190 J	65 U	66 U	67 U	65 U	71 U	73 J	6,900 DJ	68 U	1,400 [1,200]	63 U	6,600 D	69 U	68 U [68 U]
Phenanthrene	50,000	ug/kg	63 U	60 U	61 U	63 U	61 U	66 U	56 U	100 J	63 U	92 J [88 J]	59 U	120 J	65 U	63 U [64 U]
Phenol	30	ug/kg	59 U	57 U	58 U	60 U	58 U	63 U	54 U	53 U	60 U	55 U [54 UJ]	56 U	60 U	61 U	60 U [61 U]
Pyrene	50,000	ug/kg	69 U	67 U	68 U	70 U	67 U	73 U	63 U	62 U	70 U	100 J [100 J]	65 U	70 U	72 U	70 U [71 U]
Total SVOCs	--	ug/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Table 7b. SVOCs Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID: Sample Depth (ft BGS): Date Collected:	NY TAGM Rec Soil Cleanup Objectives	Units	SB-6 28.5 - 30.5 05/12/05	SB-A 2 09/05/08	SB-A 8 09/05/08	SB-A 21 09/05/08	SB-A 32 09/05/08	SB-C 14 09/08/08	SB-C 22 09/08/08	SB-C 36 09/09/08	SB-D 12 09/04/08	SB-D 24 09/04/08	WELL CLUSTER A 12 08/20/08	WELL CLUSTER A 17 08/21/08	WELL CLUSTER A 20 08/21/08
Semivolatile Organics															
1,1-Biphenyl	--	ug/kg	54 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	--	ug/kg	52 U	300 U	300 U	300 U	270 U	280 U	300 U	330 U	300 U [290 U]	310 U	300 U	340 U	320 U
2-Methylnaphthalene	36,400	ug/kg	55 U	300 U	300 U	7,200 D	270 U	16,000 D	22,000 D	330 U	300 U [290 U]	110 J	5,100 D	1,200	540
2-Methylphenol	100	ug/kg	55 U	300 U	300 U	300 U	270 U	280 U	300 U	330 U	300 U [290 U]	520	300 U	340 U	320 U
4-Methylphenol	900	ug/kg	NA	300 U	300 U	300 U	270 U	280 U	300 U	330 U	300 U [290 U]	1,700	300 U	340 U	320 U
Acenaphthene	50,000	ug/kg	58 U	300 U	300 U	2,300	270 U	130 J	120 J	330 U	300 U [290 U]	110 J	850	130 J	360
Acenaphthylene	41,000	ug/kg	53 U	300 U	300 U	1,800 D	270 U	280 U	300 U	330 U	300 U [290 U]	310 U	300 U	120 J	180 J
Anthracene	50,000	ug/kg	50 U	300 U	88 J	3,800	270 U	280 U	110 J	330 U	300 U [290 U]	91 J	350	220 J	450
Benzo(a)anthracene	224	ug/kg	46 U	170 J	120 J	2,700	270 U	280 U	110 J	330 U	77 J [60 J]	310 U	240 J	600	310 J
Benzo(a)pyrene	61	ug/kg	52 U	290 J	300 U	1,900	270 U	280 U	68 J	330 U	300 U [61 J]	310 U	200 J	500	230 J
Benzo(b)fluoranthene	1,100	ug/kg	36 U	270 J	120 J	1,600	270 U	280 U	300 U	330 U	100 J [71 J]	310 U	270 J	610	250 J
Benzo(g,h,i)perylene	50,000	ug/kg	54 U	450	93 J	1,100	270 U	280 U	300 U	330 U	86 J [68 J]	310 U	91 J	180 J	73 J
Benzo(k)fluoranthene	1,100	ug/kg	72 U	85 J	300 U	590	270 U	280 U	300 U	330 U	300 U [290 U]	310 U	95 J	250 J	110 J
bis(2-Ethylhexyl)phthalate	50,000	ug/kg	63 U	300 U	300 U	300 UB	650 UB	280 U	2,300	6,200	330 UB [550 UB]	310 UB	88 J	210 J	300 J
Butylbenzylphthalate	50,000	ug/kg	53 U	300 U	300 U	300 U	270 U	280 U	300 U	330 U	300 U [290 U]	310 U	300 U	340 U	320 U
Carbazole	--	ug/kg	50 U	300 U	300 U	1,100	270 U	280 U	73 J	330 U	300 U [290 U]	310 U	450	140 J	270 J
Chrysene	400	ug/kg	59 U	200 J	100 J	2,500	270 U	280 U	86 J	330 U	82 J [65 J]	310 U	250 J	550	290 J
Dibenzo(a,h)anthracene	14	ug/kg	41 U	270 J	300 U	300 U	270 U	280 U	300 U	330 U	300 U [290 U]	310 U	300 U	54 J	320 U
Dibenzofuran	6,200	ug/kg	54 U	300 U	300 U	2,500	270 U	280 U	150 J	330 U	300 U [290 U]	73 J	440	74 J	290 J
Di-n-Butylphthalate	8,100	ug/kg	50 U	300 U	300 U	300 U	270 U	280 U	300 U	330 U	300 U [290 U]	310 U	300 U	340 U	320 U
Di-n-Octylphthalate	50,000	ug/kg	56 U	300 U	300 U	300 U	270 U	280 U	300 U	330 U	300 U [290 U]	310 U	300 U	340 U	320 U
Fluoranthene	50,000	ug/kg	49 U	210 J	300 J	5,000	270 U	280 U	240 J	330 U	150 J [110 J]	110 J	900	1,500	790
Fluorene	50,000	ug/kg	55 U	300 U	300 U	4,000 D	270 U	180 J	420	330 U	300 U [290 U]	110 J	660	130 J	480
Indeno(1,2,3-cd)pyrene	3,200	ug/kg	42 U	430	300 U	1,300	270 U	280 U	300 U	330 U	300 U [73 J]	310 U	100 J	220 J	87 J
Naphthalene	13,000	ug/kg	56 U	73 J	170 J	24,000 D	270 U	22,000 D	47,000 D	330 U	300 U [290 U]	180 J	10,000 D	2,600	760
Phenanthrene	50,000	ug/kg	52 U	180 J	290 J	11,000 D	270 U	250 J	510	330 U	100 J [92 J]	260 J	1,100	760	1,300
Phenol	30	ug/kg	50 U	300 U	300 U	300 U	270 U	280 U	300 U	330 U	300 U [290 U]	1,500	300 U	340 U	320 U
Pyrene	50,000	ug/kg	58 U	250 J	240 J	4,900	270 U	280 U	220 J	330 U	140 J [110 J]	120 J	460	640	390
Total SVOCs	--	ug/kg	NA	2,900 J	1,500 J	79,000	ND	39,000 J	73,000 J	6,200	740 J [710 J]	4,900 J	22,000 J	11,000 J	7,500 J

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Table 7b. SVOCs Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID: Sample Depth (ft BGS): Date Collected:	NY TAGM Rec Soil Cleanup Objectives	Units	WELL CLUSTER B 1 08/20/08	WELL CLUSTER B 10 08/22/08	WELL CLUSTER B 20 08/22/08	WELL CLUSTER C 11 08/26/08	WELL CLUSTER C 21 08/26/08
Semivolatile Organics							
1,1-Biphenyl	--	ug/kg	NA	NA	NA	NA	NA
2,4-Dimethylphenol	--	ug/kg	120 J	290 U	300 U	300 U	6,300 U
2-Methylnaphthalene	36,400	ug/kg	5,500 D	5,000	3,900	94 J	270,000 E
2-Methylphenol	100	ug/kg	300 U	290 U	300 U	300 U	2,900 J
4-Methylphenol	900	ug/kg	300 U	290 U	300 U	300 U	6,300 U
Acenaphthene	50,000	ug/kg	300 U	490	730	300 U	33,000
Acenaphthylene	41,000	ug/kg	300 U	290 U	900	300 U	130,000 D
Anthracene	50,000	ug/kg	98 J	170 J	2,100	96 J	140,000 D
Benzo(a)anthracene	224	ug/kg	110 J	170 J	1,200	81 J	110,000
Benzo(a)pyrene	61	ug/kg	130 J	170 J	770	74 J	78,000
Benzo(b)fluoranthene	1,100	ug/kg	260 J	140 J	710	88 J	63,000
Benzo(g,h,i)perylene	50,000	ug/kg	75 J	140 J	440	83 J	34,000
Benzo(k)fluoranthene	1,100	ug/kg	54 J	49 J	280 J	300 U	27,000
bis(2-Ethylhexyl)phthalate	50,000	ug/kg	1,800	77 J	840	27,000 D	1,500 J
Butylbenzylphthalate	50,000	ug/kg	300 U	290 U	300 U	300 U	6,300 U
Carbazole	--	ug/kg	300 U	290 U	660	300 U	59,000
Chrysene	400	ug/kg	130 J	210 J	1,100	95 J	100,000
Dibenzo(a,h)anthracene	14	ug/kg	51 J	62 J	160 J	300 U	14,000
Dibenzofuran	6,200	ug/kg	300 U	170 J	1,500	300 U	100,000
Di-n-Butylphthalate	8,100	ug/kg	300 U	290 U	300 U	300 U	6,300 U
Di-n-Octylphthalate	50,000	ug/kg	300 U	290 U	300 U	64 J	6,300 U
Fluoranthene	50,000	ug/kg	140 J	400	2,500	200 J	220,000 D
Fluorene	50,000	ug/kg	91 J	390	1,700	70 J	150,000 D
Indeno(1,2,3-cd)pyrene	3,200	ug/kg	140 J	100 J	490	77 J	38,000
Naphthalene	13,000	ug/kg	5,800	2,500	16,000 D	300 U	640,000 E
Phenanthrene	50,000	ug/kg	180 J	840	5,900 D	350	420,000 D
Phenol	30	ug/kg	300 U	290 U	300 U	300 U	6,300 U
Pyrene	50,000	ug/kg	100 J	370	2,300	210 J	190,000 D
Total SVOCs	--	ug/kg	15,000 J	11,000 J	44,000 J	29,000 J	2,800,000 J

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Table 7b. SVOCs Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Notes:

- - = no SCO exists for the specified compound.

B = Detected in Equipment Blank.

bgs = below ground surface.

D = compounds analyzed at a dilution.

E = Analyte exceeds equipment calibration range.

J = indicates an estimated value.

ND = None detected.

NYS DEC = New York State Department of Environmental Conservation.

R = Data rejected based upon TRC data validation.

SCO = Soil Cleanup Objectives.

SVOCs=Semivolatile organic compounds.

TAGM = NYSDEC Soil Cleanup Objective as per NYS Technical Administrative Guidance Memo (TAGM) 4046, 1994.

U = indicates the constituent was not detected at the PQL. The value preceding the U indicates the PQL.

ug/Kg = micrograms per Kilogram.

UJ = estimated non-detect.

VOCs = volatile organic compounds.

MW-5B (19-20) duplicate refers to field sample ID SB-85A (19-20).

Table 7c. Cyanide Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID:	Depth (ft bgs)	Date Collected	Amenable Cyanide (ug/kg)	Cyanide (ug/kg)
SB-1	5 - 5.5	5/3/2005	510 UJ	508 U
SB-2	1 - 1.5	5/2/2005	539 U	539 U
	2 - 2.5	5/2/2005	543 U	543 U
	5 - 7	5/6/2005	630 U	628 U
	13 - 15	5/6/2005	570 U	569 U
	19 - 20.5	5/6/2005	650 U	190,000
TP-1B	1 - 1.5	5/4/2005	560 [550]	2,180 J [1,770]
SB-3	5 - 7	5/6/2005	560 U	556 U
	13 - 15	5/6/2005	580 U	577 U
	17 - 19	5/6/2005	580 U	581 U
SB-4	5 - 5.5	5/3/2005	560 UJ	556 U
	7 - 9	5/5/2005	560 U	564 U
	9 - 13	5/5/2005	590 U	588 U
	17 - 19	5/5/2005	590 U	590 U
	19 - 21	5/5/2005	5,600	627 U
MW-5B	17 - 19	5/2/2005	604 U	604 U
	19 - 20	5/2/2005	577 U	577 U
	26 - 28	5/3/2005	600 UJ	600 U
	31 - 33	5/3/2005	580 UJ	583 U
	34 - 36	6/7/2005	610 U	613 U
MW-5A	10 - 11	5/2/2005	1,800	2,890
	11 - 12	5/2/2005	537 U	1,070
	21 - 22	5/2/2005	600 U	660
SB-6	10 - 12	5/12/2005	1,400 J	3,080 J
	13 - 15	5/12/2005	600 U	1,630
	19 - 21	5/12/2005	620 U	616
	24 - 26	5/12/2005	610 U [610 U]	609 U [610 U]
	28.5 - 30.5	5/12/2005	590 U	590 U

Notes:

bgs = below ground surface.

J = Indicates an estimated value.

U = Indicates the constituent was not detected at the Practical Quantitation Limit (PQL). The value preceding the U indicates the PQL.

ug/kg = micrograms per kilogram.

Table 8. Results of PIANOS Analyses for Subsurface Soil, Remedial Investigation, Block 175, Lot 59, Manhattan, New York

Location ID: Sample Depth (Feet): Date Collected:	Units	SB-B 10 08/22/08	SB-C 14 09/08/08	DUP-01 SB-C(14) 09/09/08	SB-C 22 09/08/08	WELL CLUSTER A 12 08/20/08	WELL CLUSTER A 17 08/21/08	WELL CLUSTER A 20 08/21/08	WELL CLUSTER C 21 08/26/08
VOCs - PIANOS									
1,1,4-Trimethylcyclohexane	ug/kg	390 U	2100	2000	5,900	430 U	94 U	94 U	6,100 U
1,1-Dimethylcyclopentane	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	6,100 U
1,2,3,4-Tetramethylbenzene	ug/kg	5,000	12000	8900	26,000	6,200	1,300	79 J	4,800 J
1,2,3,5-Tetramethylbenzene	ug/kg	16,000	42000	38000	100,000	22,000	4,900	170	6,500
1,2,3-TMCP(ccc)/2-Octene (trans)	ug/kg	520 J	1,600 J	1600	4,500	1,200	350	190 U	12,000 U
1,2,3-Trimethylbenzene	ug/kg	22,000	61000	59000	160,000	16,000	7,500	260	21,000
1,2,3-Trimethylcyclopentane (ctc)	ug/kg	880	3900	4600	25,000	2,100	790	94 U	6,100 U
1,2,4,5-Tetramethylbenzene	ug/kg	11,000	27000	25000	64,000	17,000	3,500	130	3,800 J
1,2,4-Triethylbenzene	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	6,100 U
1,2,4-Trimethylbenzene	ug/kg	85,000 B	300000	300000	780,000	110,000 B	38,000 B	1,300 B	86,000 B
1,2-Dibromoethane	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	6,100 U
1,2-Dichloroethane	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	6,100 U
1,2-Diethylbenzene	ug/kg	1,400	3700	3400	10,000	1,900	470	21 J	6,100 U
1,2-Dimethyl-3-ethylbenzene	ug/kg	4,500	12000	10000	29,000	2,900	1,300	39 J	1,000 J
1,2-Dimethyl-4-ethylbenzene	ug/kg	17,000	47000	44000	130,000	13,000	5,500	160	5,000 J
1,2-Dimethylcyclohexane (cis)	ug/kg	1,700	6500	5300	21,000	3,800	1,100	32 J	6,100 U
1,2-Dimethylcyclohexane (trans)	ug/kg	750	3500	2200	16,000	1,900	350	23 J	6,100 U
1,3,5-Triethylbenzene	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	6,100 U
1,3,5-Trimethylbenzene	ug/kg	25,000	82000	82000	240,000	24,000	11,000	360	34,000
1,3-Diethylbenzene	ug/kg	8,500	21000	20000	54,000	11,000	2,900	100	1,300 J
1,3-Dimethyl-2-ethylbenzene	ug/kg	1,700	3600	4200	10,000	2,200	530	21 J	550 J
1,3-Dimethyl-4-ethylbenzene	ug/kg	11,000	28000	26000	78,000	11,000	3,500	99	2,400 J
1,3-Dimethyl-5-ethylbenzene	ug/kg	22,000 B	55000	52000	140,000	32,000 B	7,400 B	280 B	4,700 JB
1,3-Dimethylcyclopentane (cis)	ug/kg	700	5300	6300	51,000	2,400	1,300	37 J	6,100 U
1,3-DMCP (trans)/2-Methyl-1-hexene	ug/kg	1,200	8900	11000	82,000	3,900	2,100	46 J	12,000 U
1,4-Dimethyl-2-ethylbenzene	ug/kg	13,000	34000	32000	89,000	15,000	4,200	110	2,400 J
1,4-Dimethylcyclohexane (trans)	ug/kg	690	3200	3100	12,000	2,100	550	18 J	6,100 U
1-Decene	ug/kg	390 U	5200	6800	16,000	430 U	94 U	94 U	6,700
1-Heptene/1,2-DMCP (trans)	ug/kg	760 J	5300	6400	84,000	2,700	1,600	27 J	12,000 U
1-Hexene	ug/kg	390 U	930 U	790 U	7,100	430 U	30 J	94 U	6,100 U
1-Methyl-2-ethylbenzene	ug/kg	11,000	52000	51000	150,000	9,900	8,100	210	6,900
1-Methyl-2-isopropylbenzene	ug/kg	260 J	650 J	610 J	1,800	460	120	94 U	6,100 U
1-Methyl-2-propylbenzene	ug/kg	5,600	15000	14000	49,000	5,300	2,000	58 J	700 J
1-Methyl-3-ethylbenzene	ug/kg	34,000	150000	150000	440,000	23,000	18,000	580	22,000
1-Methyl-3-isopropylbenzene	ug/kg	2,400	8000	7500	28,000	2,000	1,100	27 J	950 J
1-Methyl-3-propylbenzene	ug/kg	13,000	39000	38000	130,000	9,500	5,200	150	1,700 J
1-Methyl-4-ethylbenzene	ug/kg	22,000	70000	70000	220,000	21,000	9,500	330	12,000
1-Methyl-4-propylbenzene	ug/kg	7,800 B	21,000 B	20,000 B	69,000 B	12,000 B	3,100 B	96 B	1,200 JB
1-Methylnaphthalene	ug/kg	8,900 B	14,000 B	12,000 B	17,000 B	7,100 B	1,200 B	470 B	170,000 B
1-Nonene	ug/kg	980 U	2,300 U	2,000 U	2,600 U	1,100 U	240 U	230 U	3,000 J
1-Octene	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	6,100 U
1-Pentene	ug/kg	390 U	930 U	790 U	4,100	430 U	94 U	94 U	6,100 U
1-t-Butyl-3,5-Dimethylbenzene	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	6,100 U
2,2,3-Trimethylbutane	ug/kg	390 U	170 J	210 J	3,600	74 J	68 J	94 U	6,100 U
2,2,3-Trimethylpentane	ug/kg	590	2100	2400	17,000	1,100	350	6.6 J	6,100 U
2,2,4-Trimethylpentane	ug/kg	7,600	29000	34000	260,000	7,400	2,500	91 J	6,100 U
2,2-Dimethylbutane	ug/kg	390 U	240 J	270 J	7,900	430 U	130	94 U	6,100 U
2,2-Dimethylhexane	ug/kg	220 J	1600	1800	13,000	960	340	11 J	6,100 U
2,2-Dimethylpentane	ug/kg	390 U	510 J	610 J	9,000	230 J	240	94 U	6,100 U
2,3,3-Trimethylpentane	ug/kg	7,200	22000	25000	170,000	11,000	3,500	120	6,100 U
2,3,4-Trimethylpentane	ug/kg	8,200	25000	28000	180,000	10,000	3,200	110	6,100 U
2,3-Dimethylbutane	ug/kg	390 U	710 J	950	46,000	290 J	600	94 U	6,100 U
2,3-Dimethylheptane	ug/kg	2,400	7300	8200	36,000	7,900	1,800	64 J	6,100 U
2,3-Dimethylhexane	ug/kg	3,900	14000	15000	83,000	8,800	2,800	97	6,100 U
2,3-Dimethylpentane	ug/kg	1,800	13000	15000	180,000	4,800	2,700	82 J	6,100 U
2,4-Dimethylhexane	ug/kg	3,500	15000	17000	97,000	9,400	3,300	120	6,100 U
2,4-Dimethylpentane	ug/kg	300 J	3900	4600	61,000	1,200	1,100	34 J	6,100 U
2,5-Dimethylheptane	ug/kg	4,700	15000	15000	67,000	18,000	4,500	160	6,100 U
2,5-Dimethylhexane	ug/kg	2,700	12000	14000	94,000	7,600	2,500	83 J	6,100 U
2-Ethylthiophene	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	800 J
2-Heptene (cis)	ug/kg	390 U	2300	2700	15,000	180 J	330	94 U	6,100 U
2-Heptene (trans)	ug/kg	160 J	1900	2200	14,000	140 J	340	94 U	6,100 U

See Notes on Page 3.

Table 8. Results of PIANOS Analyses for Subsurface Soil, Remedial Investigation, Block 175, Lot 59, Manhattan, New York

Location ID: Sample Depth (Feet): Date Collected:	Units	SB-B 10 08/22/08	SB-C 14 09/08/08	DUP-01 SB-C(14) 09/09/08	SB-C 22 09/08/08	WELL CLUSTER A 12 08/20/08	WELL CLUSTER A 17 08/21/08	WELL CLUSTER A 20 08/21/08	WELL CLUSTER C 21 08/26/08
VOCs - PIANOS (Cont.)									
2-Hexene (cis)	ug/kg	390 U	630 J	730 J	16,000	430 U	150	94 U	6,100 U
2-Hexene (trans)	ug/kg	390 U	930	1100	24,000	62 J	220	94 U	6,100 U
2-Methyl-1,3-butadiene	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	6,100 U
2-Methyl-1-butene	ug/kg	390 U	930 U	790 U	7,700	430 U	30 J	94 U	6,100 U
2-Methyl-2-pentene	ug/kg	51 J	1500	1800	40,000	230 J	400	94 U	6,100 U
2-Methylheptane	ug/kg	10,000	37000	42000	200,000	33,000	8,000	350	6,100 U
2-Methylhexane	ug/kg	2,800	23000	27000	260,000	13,000	7,600	230	6,100 U
2-Methylnaphthalene	ug/kg	18,000 B	31,000 B	26,000 B	41,000 B	13,000 B	2,200 B	660 B	300,000 B
2-Methylnonane	ug/kg	8,100	23000	25000	83,000	19,000	4,100	170	6,100 U
2-Methyloctane	ug/kg	9,500	29000	29000	110,000	32,000	7,900	290	6,100 U
2-Methylpentane	ug/kg	100 J	5000	5300	250,000	2,000	3,400	100	6,100 U
2-Methylthiophene	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	1,100 J
2-Nonene	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	6,100 U
2-Octene (cis)	ug/kg	450	2100	2100	7,000	430 U	240	94 U	6,100 U
2-Pentene (cis)	ug/kg	390 U	930 U	790 U	7,400	430 U	94 U	94 U	6,100 U
2-Pentene (trans)	ug/kg	390 U	930 U	790 U	16,000	430 U	31 J	94 U	6,100 U
3,3-Diethylpentane	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	6,100 U
3,3-Dimethylheptane	ug/kg	310 J	1300	1400	8,900	1,600	400	8.4 J	6,100 U
3,3-Dimethyloctane	ug/kg	390 U	980	1000	4,900	880	200	94 U	6,100 U
3,3-Dimethylpentane	ug/kg	68 J	780 J	900	9,200	440	310	94 U	6,100 U
3,4-Dimethylheptane	ug/kg	2,600	4400	4200	15,000	11,000	2,600	98	6,100 U
3,5-Dimethylheptane	ug/kg	1,300	3900	3700	18,000	5,400	1,300	46 J	6,100 U
3-Ethylhexane	ug/kg	1,800	6200	7300	36,000	6,200	1,700	78 J	6,100 U
3-Ethylpentane	ug/kg	360 J	2600	2900	22,000	1,600	700	94 U	6,100 U
3-Heptene (cis)	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	6,100 U
3-Heptene (trans)	ug/kg	300 J	3000	3200	15,000	240 J	440	94 U	6,100 U
3-Methyl-1-butene	ug/kg	390 U	930 U	790 U	930 J	430 U	94 U	94 U	6,100 U
3-Methylheptane	ug/kg	10,000	37000	42000	210,000	36,000	9,300	470	6,100 U
3-Methylhexane	ug/kg	3,400	26000	30000	270,000	15,000	7,400	250	6,100 U
3-Methylnonane	ug/kg	6,100	18000	19000	56,000	19,000	4,000	130	6,100 U
3-Methyloctane	ug/kg	9,400	27000	30000	110,000	34,000	8,000	320	6,100 U
3-Methylpentane	ug/kg	88 J	4000	4600	180,000	1,600	2,800	75 J	6,100 U
3-Methylthiophene	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	890 J
3-Nonene (cis)	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	6,100 U
3-Nonene (trans)	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	6,100 U
4-Methyl-1-pentene	ug/kg	390 U	930 U	790 U	3,200	430 U	18 J	94 U	6,100 U
4-Methylheptane	ug/kg	3,900	15000	17000	78,000	14,000	4,200	160	6,100 U
4-Methyloctane	ug/kg	6,600	20000	23000	90,000	26,000	6,200	250	6,100 U
Benzene	ug/kg	340 J	1100	1400	1,900	870	2,000	910	220,000
Benzothiophene	ug/kg	1,200	2300	2000	5,100	550	130	49 J	47,000
Cyclohexane	ug/kg	110 J	1900	2200	47,000	470	450	94 U	6,100 U
Cyclopentane	ug/kg	390 U	930 U	79 J	15,000	430 U	69 J	94 U	6,100 U
Diisopropyl Ether (DIPE)	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	6,100 U
Ethyl Tertiary Butyl Ether (ETBE)	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	6,100 U
Ethylbenzene	ug/kg	19,000	70,000 B	73,000 B	240,000 B	25,000	13,000	470	180,000
Ethylcyclopentane	ug/kg	1,400	6800	8100	44,000	3,700	1,500	45 J	6,100 U
Hexylbenzene	ug/kg	800	1500	1400	2,600	430	82 J	94 U	6,100 U
Indane	ug/kg	15,000	37000	36000	97,000	23,000	7,000	1,400	28,000
Isobutylbenzene	ug/kg	1,500	4400	4500	19,000	3,000	740	23 J	6,100 U
Isobutylcyclohexane	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	6,100 U
Isopentane	ug/kg	390 U	930 J	420 J	170,000	220 J	600	46 J	1,000 JB
Isopropylbenzene	ug/kg	3,300	13000	12000	44,000	7,900	2,300	120	3,500 J
Isopropylcyclohexane	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	6,100 U
Isopropylcyclopentane	ug/kg	600	1700	1600	5,800	1,300	380	94 U	6,100 U
Methyl tert-butyl ether	ug/kg	390 U	930 U	790 U	1,100 U	430 U	17 J	94 U	6,100 U
Methylcyclohexane	ug/kg	2,500	16000	18000	190,000	6,700	2,900	87 J	6,100 U
Methylcyclopentane	ug/kg	270 J	5200	6100	160,000	1,600	2,100	51 J	6,100 U
MMT	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	6,100 U
Naphthalene	ug/kg	18,000	39000	36000	88,000	23,000	5,000	950	1,100,000
n-Butylbenzene	ug/kg	5,500	15,000 B	14,000 B	50,000 B	8,700	2,100	72 J	1,300 JB
n-Decane	ug/kg	8,000	24000	25000	89,000	6,700	2,800	97	7,700

See Notes on Page 3.

Table 8. Results of PIANOS Analyses for Subsurface Soil, Remedial Investigation, Block 175, Lot 59, Manhattan, New York

Location ID: Sample Depth (Feet): Date Collected:	Units	SB-B 10 08/22/08	SB-C 14 09/08/08	DUP-01 SB-C(14) 09/09/08	SB-C 22 09/08/08	WELL CLUSTER A 12 08/20/08	WELL CLUSTER A 17 08/21/08	WELL CLUSTER A 20 08/21/08	WELL CLUSTER C 21 08/26/08
VOCs - PIANOS (Cont.)									
n-Dodecane	ug/kg	6,300 B	13,000 B	13,000 B	34,000 B	2,300 B	570 B	36 JB	6,200 B
n-Heptane	ug/kg	4,100	32000	36000	420,000	15,000	6,200	210	6,100 U
n-Hexane	ug/kg	180 J	6100	7100	270,000	1,900	2,900	83 J	6,100 U
n-Octane	ug/kg	9,700	37000	35000	240,000	26,000	8,100	290	2,300 J
Nonane	ug/kg	8,300	28000	30000	130,000	14,000	5,200	180	4,100 J
n-Propylbenzene	ug/kg	14,000	43000	44000	150,000	31,000	8,500	260	2,700 J
n-Propylcyclopentane	ug/kg	1,300	3600	3600	14,000	2,400	680	94 U	6,100 U
n-Undecane	ug/kg	7,300	17000	16000	48,000	3,300	1,100	41 J	6,800 B
o-Xylene	ug/kg	17,000	94000	99000	300,000	8,900	15,000	410	100,000
p/m-Xylene	ug/kg	67,000	300000	300000	980,000	45,000	47,000	1,400	260,000
Pentadecane	ug/kg	1,300	1,200 J	890 J	360 J	240 J	40 J	230 U	2,500 J
Pentane	ug/kg	390 U	960 B	480 JB	93,000 B	230 JB	320 B	41 JB	2,200 JB
Pentylbenzene	ug/kg	1,500 B	3,100 B	3,000 B	7,300 B	1,200 B	230 B	15 JB	670 JB
p-Isopropyltoluene	ug/kg	1,100	2900	2600	7,900	1,500	440	14 J	670 J
sec-Butylbenzene	ug/kg	1,500	4200	4000	17,000	3,000	720	24 J	6,100 U
Styrene	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	4,300 J
TAME	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	6,100 U
tert-Butylbenzene	ug/kg	68 J	160 J	160 J	310 J	430 U	94 U	94 U	6,100 U
Tertiary butanol	ug/kg	980 U	2,300 U	2,000 U	2,600 U	1,100 U	240 U	230 U	15,000 U
Tetradecane	ug/kg	2,300	2800	1800	2,600	440	66 J	94 U	2,800 J
Thiophene	ug/kg	390 U	930 U	790 U	1,100 U	430 U	94 U	94 U	1,700 J
Toluene	ug/kg	4,800 B	39,000 B	43,000 B	47,000 B	190 JB	650 B	26 JB	240,000 B
Tridecane	ug/kg	4,400	6900	6100	14,000	870	180	11 J	3,900 J
DRO									
C10-C28 DRO	ug/kg	918000	1260000	1780000	3420000	613000	202000	96500	15300000

Notes:

DRO = Diesel Range Organics.

PIANOS = Paraffin, Isoparaffin, Aromatic, Naphthene, or Olefin, Sulfur.

ug/kg = micrograms per kilogram.

VOCs = volatile organic compounds.

Table 9. Summary Statistics for Subsurface Soil Analytical Results, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Analyte	Result Units	NY TAGM Rec Soil Cleanup Objectives (ug/kg)	Total Number of Samples	Minimum Detected Concentration (ug/kg)	Maximum Detected Concentration (ug/kg)	Number Detected	Frequency of Detects	Detected Above TAGM	Frequency of Detects Above TAGM
VOCs									
1,1,1-Trichloroethane	ug/Kg	800	47	29	29	1	2.1%	0	0.0%
1,2-Dichloropropane	ug/kg		47	43	43	1	2.1%		
1,4-Dichlorobenzene	ug/kg	8500	30	1.8	1.8	1	3.3%	0	0.0%
2-Butanone	ug/Kg	300	47	21	21	1	2.1%	0	0.0%
4-Methyl-2-pentanone	ug/kg	1000	47	2.6	2.6	1	2.1%	0	0.0%
Acetone	ug/kg	200	47	3.7	120000	25	53.2%	4	8.5%
Benzene	ug/Kg	60	47	0.75	600000	17	36.2%	18	38.3%
Carbon Disulfide	ug/Kg	2700	47	3.15	7	4	8.5%	0	0.0%
Cyclohexane	ug/kg		30	1.4	1600	3	10.0%		
Ethylbenzene	ug/Kg	5500	47	1.3	620000	21	44.7%	15	31.9%
Isopropylbenzene	ug/kg		30	2.1	28000	7	23.3%		
Methyl tert-butyl ether	ug/kg		30	2.1	23	5	16.7%		
Methylcyclohexane	ug/kg		30	5	20000	9	30.0%		
Methylene Chloride	ug/kg	100	47	2.3	2000	17	36.2%	1	2.1%
m-Xylene & p-Xylene	ug/kg		30	1.2	320000	13	43.3%		
o-Xylene	ug/kg		30	2.6	120000	9	30.0%		
Styrene	ug/Kg		47	17000	17000	1	2.1%		
Tetrachloroethene	ug/kg	1400	47	1.5	2.6	2	4.3%	0	0.0%
Toluene	ug/Kg	1500	47	2.1	690000	17	36.2%	11	23.4%
Xylenes (total)	ug/Kg	1200	17	56	1100000	11	64.7%	10	58.8%
Total VOCs	ug/Kg		13	3.15	3030000	10	76.9%		
SVOCs									
1,1-Biphenyl	ug/kg		30	150	8600	3	10.0%		
2,4-Dimethylphenol	ug/Kg		47	120	120	1	2.1%		
2-Methylnaphthalene	ug/Kg	36400	47	79	270000	21	44.7%	4	8.5%
2-Methylphenol	ug/Kg	100	47	520	2900	2	4.3%	2	4.3%
4-Methylphenol	ug/Kg	900	17	1700	1700	1	5.9%	1	5.9%
Acenaphthene	ug/Kg	50000	47	76	33000	13	27.7%	0	0.0%
Acenaphthylene	ug/kg	41000	47	120	130000	7	14.9%	1	2.1%
Anthracene	ug/Kg	50000	47	88	140000	15	31.9%	1	2.1%
Benzo(a)anthracene	ug/Kg	224	47	59	110000	17	36.2%	8	17.0%
Benzo(a)pyrene	ug/Kg	61	47	62	78000	16	34.0%	16	34.0%
Benzo(b)fluoranthene	ug/Kg	1100	47	44	63000	19	40.4%	3	6.4%
Benzo(g,h,i)perylene	ug/Kg	50000	47	73	34000	15	31.9%	0	0.0%
Benzo(k)fluoranthene	ug/Kg	1100	47	49	27000	12	25.5%	2	4.3%
bis(2-Ethylhexyl)phthalate	ug/Kg	50000	47	77	27000	21	44.7%	0	0.0%
Butylbenzylphthalate	ug/kg	50000	47	74	235	4	8.5%	0	0.0%
Carbazole	ug/kg		47	73	59000	9	19.1%		
Chrysene	ug/Kg	400	47	73.5	100000	16	34.0%	6	12.8%
Dibenzo(a,h)anthracene	ug/Kg	14	47	51	14000	7	14.9%	7	14.9%
Dibenzofuran	ug/Kg	6200	47	73	100000	12	25.5%	2	4.3%
Di-n-Butylphthalate	ug/kg	8100	47	70	70	1	2.1%	0	0.0%
Di-n-Octylphthalate	ug/Kg	50000	47	64	64	1	2.1%	0	0.0%
Fluoranthene	ug/Kg	50000	47	69	220000	20	42.6%	1	2.1%

Table 9. Summary Statistics for Subsurface Soil Analytical Results, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Analyte	Result Units	NY TAGM Rec Soil Cleanup Objectives (ug/kg)	Total Number of Samples	Minimum Detected Concentration (ug/kg)	Maximum Detected Concentration (ug/kg)	Number Detected	Frequency of Detects	Detected Above TAGM	Frequency of Detects Above TAGM
SVOCs (Cont.)									
Fluorene	ug/Kg	50000	47	64	150000	17	36.2%	1	2.1%
Indeno(1,2,3-cd)pyrene	ug/Kg	3200	47	77	38000	13	27.7%	1	2.1%
Naphthalene	ug/kg	13000	47	73	640000	23	48.9%	11	23.4%
Phenanthrene	ug/kg	50000	47	65	420000	27	57.4%	2	4.3%
Phenol	ug/Kg	30	47	1500	1500	1	2.1%	1	2.1%
Pyrene	ug/Kg	50000	47	74	190000	21	44.7%	2	4.3%
Total SVOCs	ug/Kg		17	722.5	2820000	16	94.1%		
Cyanide									
Amenable Cyanide	ug/Kg		30	555	5600	4	13.3%		
Cyanide	ug/Kg		30	616	190000	8	26.7%		

Table 10a. VOCs Detected in Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID: Date Collected:	NYSDEC Class GA Standard	Units	MW-1 10/02/08	MW-2 10/02/08	MW-3 10/01/08	MW-4 10/01/08	MW-5 10/02/08	MW-5A 10/02/08	MW-5B 10/02/08	MW-7 10/02/08	MW-8 10/01/08	MW-10 10/02/08	MW-11 09/30/08	MW-12 09/30/08
Volatile Organics														
1,1,1-Trichloroethane	5	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	50 U	5.0 U	5.0 U	20 U
2-Butanone	50	ug/L	10 U	10 U	10 UJ	10 U	10 U	23	10 U	10 U	100 U	10 U	10 U	40 U
2-Hexanone	50	ug/L	10 U	10 UJ	10 UJ	10 U	10 UJ	10 UJ	10 UJ	10 U	100 U	10 U	12 J	40 UJ
4-Methyl-2-pentanone	- -	ug/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	4.8 J	34 J	10 U	10 U	40 U
Acetone	50	ug/L	2.4 J	1.7 J	10 UJ	17	3.0 J	10 U	1.3 J	3.0 J	42 J	6.4 J	11	40 U
Benzene	1	ug/L	1,400 D	420 D	2,500 D	840 D	700 D	21	5.0 U	390 D	3,500 D	240 D	7,400 D	1,400 D
Ethylbenzene	5	ug/L	6.4	2.2 J	49	110	16	17	5.0 U	5.1	2,100 D	1.8 J	1,100 D	22
Methyl tert-butyl ether	10	ug/L	83	53	58	30	20 J	24	0.48 J	21	37 J	39	500 D	22
Methylene Chloride	5	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 UB	50 U	5.0 U	5.0 U	20 U
Styrene	5	ug/L	5.0 UJ	5.0 U	5.0 UJ	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	50 UJ	5.0 UJ	5.0 U	20 U
Tetrachloroethene	5	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	1.4 J	5.0 U	5.0 U	5.0 U	50 U	5.0 U	5.0 U	20 U
Toluene	5	ug/L	2.0 J	1.8 J	26	82	8.0	5.0 U	5.0 U	12	4,700 D	0.96 J	260 DJ	30
Xylenes (total)	5	ug/L	23	10	89 J	850	40	23	5.0 U	48	14,000	5.1	3,400	130
Total VOCs	- -	ug/L	1,400 J	440 J	2,700 J	1,900	770 J	84	1.3 J	460 J	24,000 J	250 J	12,000 J	1,600

See Notes on Page 3.

Table 10a. VOCs Detected in Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID: Date Collected:	NYSDEC Class GA Standard	Units	SB-B2 10/01/08	SB-B3 10/01/08	WELL CLUSTER A2 09/30/08	WELL CLUSTER A3 09/30/08	WELL CLUSTER B2 10/01/08	WELL CLUSTER B3 10/01/08	WELL CLUSTER C2 09/30/08	WELL CLUSTER C3 09/30/08
Volatile Organics										
1,1,1-Trichloroethane	5	ug/L	20 U	20 U	5.0 U	20 J	20 U	20 U [25 U]	5.0 U	20 U
2-Butanone	50	ug/L	40 U	40 U	10 UJ	40 UJ	40 U	40 U [50 U]	10 UJ	40 U
2-Hexanone	50	ug/L	40 U	40 U	10 UJ	40 UJ	40 UJ	40 UJ [50 UJ]	10 UJ	40 UJ
4-Methyl-2-pentanone	-	ug/L	40 U	40 U	10 U	40 UJ	40 U	40 U [50 U]	10 U	40 U
Acetone	50	ug/L	20 J	40 U	9.0 J	40 UJ	20 J	40 U [50 U]	12 J	8.1 J
Benzene	1	ug/L	640	4,700	4,000 D	15,000 D	640 D	4,700 D [4,300 D]	58	3,500 D
Ethylbenzene	5	ug/L	120	65	1,200 D	360 J	120	65 [52]	3.1 J	940 D
Methyl tert-butyl ether	10	ug/L	32	79	110 DJ	120 J	NA	NA	30	37
Methylene Chloride	5	ug/L	3.9 J	20 U	5.0 U	20 UJ	20 UB	20 U [25 U]	5.0 U	20 UB
Styrene	5	ug/L	20 U	20 U*	5.0 UJ	20 UJ	20 U	20 UJ [25 UJ]	5.0 UJ	37
Tetrachloroethene	5	ug/L	20 U	20 U	5.0 U	20 UJ	20 U	20 U [25 U]	5.0 U	20 U
Toluene	5	ug/L	91	26	26	12 J	91	26 [25 J]	6.1	1,700 D
Xylenes (total)	5	ug/L	1,000	120	2,000 J	640 J	1,000	120 J [89 J]	9.4 J	2,100
Total VOCs	-	ug/L	1,900 J	4,900	7,200 J	16,000 J	1,900 J	4,900 J [4,500 J]	89 J	8,300 J

See Notes on Page 3.

Table 10a. VOCs Detected in Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Notes:

{G} = indicates a guidance value.

D = compounds analyzed at a dilution.

J = indicates an estimated value.

U = indicates the constituent was not detected at the PQL. The value preceding the U indicates the PQL.

ug/L = micrograms per liter.

- - = no criterion exists for the specified compound.

PQL = practical quantitation limit.

Bolded and shaded values exceed the New York State Technical and Operational Guidance Class GA Standards or Guidance Values, June 1998.

NYSDEC = New York State Department of Environmental Conservation.

Total VOC concentrations exclude MTBE.

Table 10b. SVOCs Detected in Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID: Date Collected:	NYSDEC Class GA Standard	Units	MW-1 10/02/08	MW-2 10/02/08	MW-3 10/01/08	MW-4 10/01/08	MW-5 10/02/08	MW-5A 10/02/08	MW-5B 10/02/08	MW-7 10/02/08	MW-8 10/01/08	MW-10 10/02/08	MW-11 09/30/08	MW-12 09/30/08
Semivolatile Organics														
2,4-Dimethylphenol	1	ug/L	4.0 U	4.4 U	4.0 U	4.0 U	6.1 U	4.7 U	4.4 U	6.1 U	42 U	4.6 U	81 D	4.7 U
2-Methylnaphthalene	- -	ug/L	20	6.9	16	14	9.0	4.7 U	4.4 U	7.3	180 D	4.6 U	89 D	3.2 J
2-Methylphenol	1	ug/L	4.0 U	4.4 U	4.0 U	4.0 U	6.1 U	4.7 U	4.4 U	6.1 U	42 U	4.6 U	16	4.7 U
4-Methylphenol	1	ug/L	4.0 U	4.4 U	4.0 U	4.0 U	6.1 U	4.7 U	4.4 U	6.1 U	320 D	4.6 U	14	4.7 U
Acenaphthene	20	ug/L	21	9.6	21	12	2.0 J	4.7 U	4.4 U	1.7 J	42 U	3.1 J	4.3 U	0.95 J
Acenaphthylene	- -	ug/L	4.0 U	4.4 U	4.0 U	4.0 U	6.1 U	4.7 U	4.4 U	6.1 U	42 U	4.6 U	4.3 U	4.7 U
Anthracene	50	ug/L	1.7 J	0.58 J	1.5 J	0.80 J	6.1 U	4.7 U	4.4 U	6.1 U	42 U	4.6 U	4.3 U	4.7 U
Benzyl Alcohol	- -	ug/L	4.0 U	4.4 U	4.0 U	4.0 U	6.1 U	4.7 U	4.4 U	6.1 U	42 U	4.6 U	4.3 U	4.7 U
bis(2-Ethylhexyl)phthalate	5	ug/L	4.0 U	4.4 U	4.0 U	4.0 U	6.1 U	4.7 U	4.4 U	6.1 U	42 U	4.6 U	4.3 U	4.7 U
Carbazole	- -	ug/L	48	4.7	5.3	3.3 J	6.1 U	4.7 U	4.4 U	6.1 U	42 U	1.3 J	2.7 J	4.7 U
Dibenzofuran	- -	ug/L	8.7	3.5 J	8.8	3.0 J	6.1 U	4.7 U	4.4 U	6.1 U	42 U	4.6 U	0.45 J	0.81 J
Di-n-Butylphthalate	50	ug/L	4.0 U	4.4 U	4.0 U	4.0 U	6.1 U	4.7 U	4.4 U	6.1 U	42 U	4.6 U	4.3 U	4.7 U
Fluoranthene	50	ug/L	4.0 U	4.4 U	0.78 J	0.61 J	6.1 U	4.7 U	4.4 U	1.0 J	42 U	4.6 U	4.3 U	4.7 U
Fluorene	50	ug/L	9.0	3.7 J	13	6.2	1.3 J	4.7 U	4.4 U	1.1 J	42 U	1.2 J	4.3 U	1.2 J
Naphthalene	10	ug/L	18	3.7 J	10	5.2	7.9	3.2 J	4.4 U	11	660 D	4.6 U	510 D	25
Phenanthrene	50	ug/L	14	2.9 J	10	3.9 J	1.4 J	4.7 U	4.4 U	1.8 J	42 U	4.6 U	0.49 J	4.7 U
Phenol	1	ug/L	3.5 J	3.3 J	7.9	3.6 J	3.8 J	4.7 U	4.4 U	6.1 U	59	4.6 U	45	13
Pyrene	50	ug/L	4.0 U	4.4 U	0.49 J	0.44 J	6.1 U	4.7 U	4.4 U	0.97 J	42 U	4.6 U	4.3 U	4.7 U
Total SVOCs	- -	ug/L	140 J	39 J	95 J	53 J	25 J	3.2 J	ND	25 J	1,200	5.6 J	760 J	44 J

See Notes on Page 3.

Table 10b. SVOCs Detected in Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID: Date Collected:	NYSDEC Class GA Standard	Units	WELL CLUSTER A2 09/30/08	WELL CLUSTER A3 09/30/08	WELL CLUSTER B2 10/01/08	WELL CLUSTER B3 10/01/08	WELL CLUSTER C2 09/30/08	WELL CLUSTER C3 09/30/08
Semivolatile Organics								
2,4-Dimethylphenol	1	ug/L	4.3 U	4.4 U	51	4.0 U [4.0 U]	4.2 U	22 U
2-Methylnaphthalene	- -	ug/L	49	110 D	8.4	37 [36]	3.1 J	310
2-Methylphenol	1	ug/L	0.91 J	4.4 U	4.5 U	1.5 J [1.1 J]	4.2 U	170
4-Methylphenol	1	ug/L	2.2 J	4.4 U	3.9 J	4.0 U [4.0 U]	0.59 J	340
Acenaphthene	20	ug/L	4.0 J	58	2.0 J	18 [18]	3.4 J	59
Acenaphthylene	- -	ug/L	4.3 U	4.4 U	4.5 U	1.2 J [4.0 U]	4.2 U	110
Anthracene	50	ug/L	0.48 J	3.2 J	4.5 U	1.8 J [1.6 J]	4.2 U	19 J
Benzyl Alcohol	- -	ug/L	0.96 J	4.4 U	4.5 U	4.0 U [4.0 U]	4.2 U	22 U
bis(2-Ethylhexyl)phthalate	5	ug/L	4.3 U	4.4 U	4.5 U	4.0 U [4.0 U]	0.92 J	22 U
Carbazole	- -	ug/L	9.7	70	1.1 J	6.2 [5.3]	2.1 J	140
Dibenzofuran	- -	ug/L	1.8 J	26	4.5 U	6.9 [6.9]	1.0 J	68
Di-n-Butylphthalate	50	ug/L	4.3 U	4.4 U	4.5 U	4.0 U [4.0 U]	1.5 J	22 U
Fluoranthene	50	ug/L	4.3 U	0.90 J	4.5 U	0.91 J [0.88 J]	4.2 U	6.9 J
Fluorene	50	ug/L	2.1 J	29	0.90 J	11 [11]	1.8 J	81
Naphthalene	10	ug/L	200 D	200 D	36	99 D [85 D]	9.2	3,000 D
Phenanthrene	50	ug/L	1.8 J	20	0.83 J	10 [9.9]	1.7 J	75
Phenol	1	ug/L	16	59	6.4	8.7 J [25 J]	4.2 U	180
Pyrene	50	ug/L	4.3 U	4.4 U	4.5 U	0.67 J [0.63 J]	0.50 J	5.5 J
Total SVOCs	- -	ug/L	290 J	580 J	110 J	200 J [200 J]	26 J	4,600 J

See Notes on Page 3.

Table 10b. SVOCs Detected in Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Notes:

D = compounds analyzed at a dilution.

J = indicates an estimated value.

U = indicates the constituent was not detected at the PQL. The value preceding the U indicates the PQL.

ug/L = micrograms per liter.

- - = no criterion exists for the specified compound.

PQL = practical quantitation limit.

Bolded and shaded values exceed the New York State Technical and Operational Guidance Class GA Standards or Guidance Values, June 1998.

NYSDEC = New York State Department of Environmental Conservation.

Table 10c. Cyanide Detected in Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID	Date Collected	NYSDEC Class GA Standard	Units	Total Cyanide
MW-1	10/02/08	200	ug/L	370
MW-2	10/02/08	200	ug/L	510
MW-3	10/01/08	200	ug/L	260
MW-4	10/01/08	200	ug/L	120
MW-5	10/02/08	200	ug/L	150
MW-5A	10/02/08	200	ug/L	470
MW-5B	10/02/08	200	ug/L	3.8 J
MW-7	10/02/08	200	ug/L	93
MW-8	10/01/08	200	ug/L	7 J
MW-10	10/02/08	200	ug/L	200
MW-11	09/30/08	200	ug/L	49
MW-12	09/30/08	200	ug/L	4.9 J
WELL CLUSTER-B2	10/01/08	200	ug/L	200
WELL CLUSTER-B3	10/01/08	200	ug/L	380 J
DUP-02 WELL CLUSTER-B3	10/01/08	200	ug/L	350
WELL CLUSTER A2	09/30/08	200	ug/L	430
WELL CLUSTER A3	09/30/08	200	ug/L	540
WELL CLUSTER C2	09/30/08	200	ug/L	100
WELL CLUSTER C3	09/30/08	200	ug/L	450

Notes:

J = indicates an estimated value.

ug/L = micrograms per liter.

NYSDEC = New York State Department of Environmental Conservation.

Bolded and shaded values exceed the New York State Technical and Operational Guidance Class GA Standards or Guidance Values, June 1998.

Table 11. Results of PIANOS Analyses for Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID: Date Collected:	Units	MW-4 10/01/08	MW-8 10/01/08	WELL CLUSTER B2 10/01/08	WELL CLUSTER B3 10/01/08	DUP-02 WELL CLUSTER B3 10/02/08	WELL CLUSTER A2 09/30/08	WELL CLUSTER A3 09/30/08	WELL CLUSTER C2 09/30/08	WELL CLUSTER C3 09/30/08
VOCs - PIANOS										
1,1,4-Trimethylcyclohexane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
1,1-Dimethylcyclopentane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
1,2,3,4-Tetramethylbenzene	ug/L	3.0 J	110	11 J	13 J	11 J	26	18 J	0.23 J	8.2 J
1,2,3,5-Tetramethylbenzene	ug/L	0.55 J	340	28	2.2 J	100 U	57	22 J	2.0 U	8.2 J
1,2,3-TMCP(ccc)/2-Octene (trans)	ug/L	20 U	200 U	40 U	40 U	200 U	40 U	200 U	4.0 U	80 U
1,2,3-Trimethylbenzene	ug/L	1.4 J	1,100	150	11 J	11 J	320	66 J	0.49 J	70
1,2,3-Trimethylcyclopentane (ctc)	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
1,2,4,5-Tetramethylbenzene	ug/L	3.7 J	200	17 J	14 J	13 J	36	20 J	0.20 J	5.8 J
1,2,4-Triethylbenzene	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
1,2,4-Trimethylbenzene	ug/L	1.0 JB	3,800 B	510 B	19 JB	20 JB	1,300 B	190 B	0.68 JB	240 B
1,2-Dibromoethane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
1,2-Dichloroethane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
1,2-Diethylbenzene	ug/L	0.65 JB	27 JB	3.2 JB	2.9 JB	100 U	6.6 JB	100 U	2.0 U	40 U
1,2-Dimethyl-3-ethylbenzene	ug/L	10 U	91 J	9.1 J	20 U	100 U	17 J	100 U	2.0 U	40 U
1,2-Dimethyl-4-ethylbenzene	ug/L	10 U	310	29	1.4 J	100 U	48	14 J	2.0 U	6.4 J
1,2-Dimethylcyclohexane (cis)	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
1,2-Dimethylcyclohexane (trans)	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
1,3,5-Triethylbenzene	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
1,3,5-Trimethylbenzene	ug/L	0.80 J	1,000	130	6.4 J	100 U	310	71 J	0.19 J	82
1,3-Diethylbenzene	ug/L	3.4 J	130	16 J	13 J	10 J	28	17 J	2.0 U	40 U
1,3-Dimethyl-2-ethylbenzene	ug/L	1.1 J	34 J	4.4 J	4.2 J	100 U	8.9 J	5.0 J	2.0 U	40 U
1,3-Dimethyl-4-ethylbenzene	ug/L	10 U	190	18 J	20 U	100 U	33	8.0 J	2.0 U	3.0 J
1,3-Dimethyl-5-ethylbenzene	ug/L	6.8 JB	380 B	39 B	31 B	24 JB	78 B	40 JB	0.29 JB	7.0 JB
1,3-Dimethylcyclopentane (cis)	ug/L	10 U	69 J	20 U	20 U	100 U	12 J	100 U	2.0 U	40 U
1,3-DMCP (trans)/2-Methyl-1-hexene	ug/L	20 U	86 J	40 U	40 U	200 U	19 J	200 U	4.0 U	80 U
1,4-Dimethyl-2-ethylbenzene	ug/L	10 U	230	22	1.6 J	100 U	43	12 J	2.0 U	3.2 J
1,4-Dimethylcyclohexane (trans)	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
1-Decene	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
1-Heptene/1,2-DMCP (trans)	ug/L	20 U	61 J	40 U	40 U	200 U	11 J	200 U	4.0 U	80 U
1-Hexene	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
1-Methyl-2-ethylbenzene	ug/L	4.0 J	850	110	14 J	11 J	230	53 J	0.29 J	23 J
1-Methyl-2-isopropylbenzene	ug/L	10 U	100 U	20 U	20 U	100 U	1.8 J	100 U	2.0 U	40 U
1-Methyl-2-propylbenzene	ug/L	10 U	87 J	8.2 J	1.7 J	100 U	17 J	6.5 J	2.0 U	40 U
1-Methyl-3-ethylbenzene	ug/L	10 U	1,800	240	6.5 J	100 U	480	67 J	0.26 J	55
1-Methyl-3-isopropylbenzene	ug/L	10 U	41 J	4.8 J	20 U	100 U	9.9 J	100 U	2.0 U	40 U
1-Methyl-3-propylbenzene	ug/L	10 U	190	18 J	20 U	100 U	33	10 J	2.0 U	40 U
1-Methyl-4-ethylbenzene	ug/L	10 U	780	98	6.7 J	100 U	280	66 J	2.0 U	36 J
1-Methyl-4-propylbenzene	ug/L	0.50 JB	91 JB	7.7 JB	2.2 JB	100 U	21 B	8.0 JB	2.0 U	40 U
1-Methylnaphthalene	ug/L	11 JB	91 JB	14 JB	41 JB	36 JB	27 JB	140 JB	0.93 JB	170 B
1-Nonene	ug/L	25 U	250 U	50 U	50 U	250 U	50 U	250 U	5.0 U	100 U
1-Octene	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
1-Pentene	ug/L	10 U	33 J	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U

See Notes on Page 4.

Table 11. Results of PIANOS Analyses for Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID: Date Collected:	Units	MW-4 10/01/08	MW-8 10/01/08	WELL CLUSTER B2 10/01/08	WELL CLUSTER B3 10/01/08	DUP-02 WELL CLUSTER B3 10/02/08	WELL CLUSTER A2 09/30/08	WELL CLUSTER A3 09/30/08	WELL CLUSTER C2 09/30/08	WELL CLUSTER C3 09/30/08
VOCs - PIANOS (Cont.)										
1-t-Butyl-3,5-Dimethylbenzene	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2,2,3-Trimethylbutane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2,2,3-Trimethylpentane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2,2,4-Trimethylpentane	ug/L	10 U	82 J	20 U	20 U	100 U	5.1 J	100 U	2.0 U	40 U
2,2-Dimethylbutane	ug/L	10 U	36 J	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2,2-Dimethylhexane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2,2-Dimethylpentane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2,3,3-Trimethylpentane	ug/L	10 U	57 J	20 U	20 U	100 U	7.4 J	100 U	2.0 U	40 U
2,3,4-Trimethylpentane	ug/L	10 U	48 J	20 U	20 U	100 U	4.2 J	100 U	2.0 U	40 U
2,3-Dihydro-1-methylindene	ug/L	NA	NA	NA	NA	0.00	NA	NA	NA	NA
2,3-Dimethylbutane	ug/L	2.7 J	98 J	20 U	20 U	100 U	8.2 J	100 U	2.0 U	40 U
2,3-Dimethylheptane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2,3-Dimethylhexane	ug/L	10 U	20 J	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2,3-Dimethylpentane	ug/L	10 U	98 J	20 U	2.6 J	100 U	17 J	100 U	2.0 U	40 U
2,4-Dimethylhexane	ug/L	10 U	20 J	20 U	20 U	100 U	4.0 J	100 U	2.0 U	40 U
2,4-Dimethylpentane	ug/L	10 U	42 J	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2,5-Dimethylheptane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2,5-Dimethylhexane	ug/L	10 U	15 J	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2-Ethylthiophene	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	6.0 J
2-Heptene (cis)	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2-Heptene (trans)	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2-Hexene (cis)	ug/L	10 U	82 J	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2-Hexene (trans)	ug/L	10 U	85 J	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2-Methyl-1,3-butadiene	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2-Methyl-1-butene	ug/L	10 U	65 J	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2-Methyl-2-pentene	ug/L	2.1 J	120	20 U	7.0 J	100 U	5.8 J	100 U	2.0 U	40 U
2-Methylheptane	ug/L	10 U	46 J	20 U	20 U	100 U	8.0 J	100 U	2.0 U	40 U
2-Methylhexane	ug/L	10 U	140	20 U	20 U	100 U	28	100 U	2.0 U	40 U
2-Methylnaphthalene	ug/L	8.3 JB	170 JB	16 JB	33 JB	31 JB	35 JB	140 JB	0.74 JB	220 B
2-Methylnonane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2-Methyloctane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2-Methylpentane	ug/L	6.8 J	420	20 U	12 J	100 U	46	100 U	2.0 U	40 U
2-Methylthiophene	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	12 J
2-Nonene	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2-Octene (cis)	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2-Pentene (cis)	ug/L	10 U	140	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
2-Pentene (trans)	ug/L	10 U	250	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
3,3-Diethylpentane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
3,3-Dimethylheptane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
3,3-Dimethyloctane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
3,3-Dimethylpentane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
3,4-Dimethylheptane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U

See Notes on Page 4.

Table 11. Results of PIANOS Analyses for Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID: Date Collected:	Units	MW-4 10/01/08	MW-8 10/01/08	WELL CLUSTER B2 10/01/08	WELL CLUSTER B3 10/01/08	DUP-02 WELL CLUSTER B3 10/02/08	WELL CLUSTER A2 09/30/08	WELL CLUSTER A3 09/30/08	WELL CLUSTER C2 09/30/08	WELL CLUSTER C3 09/30/08
VOCs - PIANOS (Cont.)										
3,5-Dimethylheptane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
3-Ethylhexane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
3-Ethylpentane	ug/L	10 U	13 J	20 U	20 U	100 U	3.4 J	100 U	2.0 U	40 U
3-Heptene (cis)	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
3-Heptene (trans)	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
3-Methyl-1-butene	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
3-Methylheptane	ug/L	10 U	93 J	20 U	20 U	100 U	19 J	100 U	2.0 U	40 U
3-Methylhexane	ug/L	10 U	150	20 U	20 U	100 U	33	100 U	2.0 U	40 U
3-Methylnonane	ug/L	10 U	13 J	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
3-Methyloctane	ug/L	10 U	29 J	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
3-Methylpentane	ug/L	6.2 J	280	20 U	11 J	100 U	38	100 U	2.0 U	40 U
3-Methylthiophene	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	10 J
3-Nonene (cis)	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
3-Nonene (trans)	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
4-Methyl-1-pentene	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
4-Methylheptane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
4-Methyloctane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
Benzene	ug/L	690	3,100	920	4400	4200.00	4,000	13,000	39	3,500
Benzofuran, 7-methyl-	ug/L	NA	NA	NA	NA	0.00	NA	NA	NA	NA
Benzothiophene	ug/L	10 U	75 J	20 U	6.6 J	100 U	10 J	48 J	2.0 U	200
Cyclohexane	ug/L	9.2 J	170	20 U	22	100 U	18 J	100 U	2.0 U	40 U
Cyclopentane	ug/L	18	230	8.4 J	39	22 J	4.1 J	100 U	2.0 U	40 U
Diisopropyl Ether (DIPE)	ug/L	3.8 J	100 U	14 J	10 J	100 U	20 U	100 U	0.87 J	40 U
Ethyl Tertiary Butyl Ether (ETBE)	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
Ethylbenzene	ug/L	10 U	2,500	150	57	50 J	1,500	370	1.4 J	1,100
Ethylcyclopentane	ug/L	10 U	39 J	20 U	20 U	100 U	8.8 J	100 U	2.0 U	40 U
Hexylbenzene	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
Indane	ug/L	280	930	310	1100	930.00	570	2,600	36	590
Indene	ug/L	NA	NA	NA	NA	0.00	NA	NA	NA	NA
Isobutylbenzene	ug/L	10 U	17 J	20 U	1.3 J	100 U	5.3 J	100 U	2.0 U	40 U
Isobutylcyclohexane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
Isopentane	ug/L	28	910	6.2 J	38	44 J	32	100 U	2.0 U	40 U
Isopropylbenzene	ug/L	20	150	24	69	65 J	91	120	0.61 J	28 J
Isopropylcyclohexane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
Isopropylcyclopentane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
Methyl tert-butyl ether	ug/L	13	33 J	28	72	65 J	110	110	24	32 J
Methylcyclohexane	ug/L	5.2 J	180	20 U	13 J	100 U	33	100 U	2.0 U	40 U
Methylcyclopentane	ug/L	25	560	6.8 J	55	51 J	71	25 J	2.0 U	40 U
MMT	ug/L	25 U	250 U	50 U	50 U	250 U	50 U	250 U	5.0 U	100 U
Naphthalene	ug/L	4.9 JB	770 B	68 B	130 B	110 B	240 B	390 B	3.7 B	3,300 B
n-Butylbenzene	ug/L	0.80 JB	58 JB	3.4 JB	3.1 JB	100 U	14 JB	6.5 JB	2.0 U	40 U
n-Decane	ug/L	10 U	32 J	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U

See Notes on Page 4.

Table 11. Results of PIANOS Analyses for Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Location ID: Date Collected:	Units	MW-4 10/01/08	MW-8 10/01/08	WELL CLUSTER B2 10/01/08	WELL CLUSTER B3 10/01/08	DUP-02 WELL CLUSTER B3 10/02/08	WELL CLUSTER A2 09/30/08	WELL CLUSTER A3 09/30/08	WELL CLUSTER C2 09/30/08	WELL CLUSTER C3 09/30/08
VOCs - PIANOS (Cont.)										
n-Dodecane	ug/L	10 U	72 JB	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
n-Heptane	ug/L	10 U	120	20 U	20 U	100 U	15 J	100 U	2.0 U	40 U
n-Hexane	ug/L	1.8 J	230	20 U	2.8 J	100 U	23	100 U	2.0 U	40 U
n-Octane	ug/L	10 U	38 J	20 U	20 U	100 U	4.7 J	100 U	2.0 U	40 U
Nonane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
n-Propylbenzene	ug/L	12	340	24	50	36 J	200	59 J	2.0 U	6.4 J
n-Propylcyclopentane	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
n-Undecane	ug/L	10 U	48 J	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
o-Xylene	ug/L	1.3 J	4,600	430	22	23 J	970	120	1.2 J	590
p/m-Xylene	ug/L	6.3 JB	11,000 B	950 B	77 B	76 JB	3,400 B	500 B	3.1 JB	1,300 B
Pentadecane	ug/L	25 U	250 U	50 U	50 U	250 U	50 U	250 U	5.0 U	100 U
Pentane	ug/L	9.4 J	510	20 U	15 J	100 U	14 J	100 U	2.0 U	40 U
Pentylbenzene	ug/L	10 U	14 JB	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
p-Isopropyltoluene	ug/L	10 U	12 J	1.6 J	20 U	100 U	4.3 J	100 U	2.0 U	40 U
sec-Butylbenzene	ug/L	10 U	19 J	20 U	20 U	100 U	6.8 J	100 U	2.0 U	40 U
Styrene	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	22 J
TAME	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
tert-Butylbenzene	ug/L	10 U	100 U	20 U	20 U	100 U	20 U	100 U	2.0 U	40 U
Tertiary butanol	ug/L	860	250 U	7,200	4300	4700.00	250	250 U	29	100 U
Tetradecane	ug/L	25 U	250 U	50 U	50 U	250 U	50 U	250 U	5.0 U	100 U
Thiopene	ug/L	7.3 J	100 U	8.1 J	37	33 J	47	140	1.0 J	36 J
Toluene	ug/L	2.8 JB	4,500 B	120 B	28 B	33 JB	28 B	13 JB	2.9 B	1,900 B
Tridecane	ug/L	25 U	250 U	50 U	50 U	250 U	50 U	250 U	5.0 U	100 U
DRO										
C10-C28 DRO	ug/L	884	141000	2360	2810	2970.00	4990	8170	1380	10900

Notes:

B = compounds detected in equipment blank.

D = compounds analyzed at a dilution.

J = indicates an estimated value.

U = indicates the constituent was not detected at the PQL. The value preceding the U indicates the PQL.

ug/L = micrograms per liter.

DRO = Diesel Range Organics.

PIANOS = Paraffin, Isoparaffin, Aromatic, Naphthene, Olefin , or Sulfur.

VOCs = Volatile Organic Compounds.

Table 12. Summary Statistics for Groundwater Analytical Results, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Analyte	NYSDEC Class GA Standard (ug/L)	Total Number of Samples	Minimum Detected Concentration (ug/kg)	Maximum Detected Concentration (ug/kg)	Number Detected	Frequency of Detects	Detected Above Class GA Standard	Frequency of Detects above Class GA Standard
VOCs								
Benzene	1	26	21	15000	25	96%	25	96%
Xylenes (total)	5	26	4.3	15600	25	96%	24	92%
Ethylbenzene	5	26	1.4	2500	24	92%	20	77%
Toluene	5	26	0.96	4700	24	92%	19	73%
Acetone	50	18	1.3	42	13	72%	0	0%
4-Methyl-2-pentanone	NA	18	4.8	34	2	11%	0	0%
Styrene	5	26	22	37	2	8%	2	8%
1,1,1-Trichloroethane	5	18	20	20	1	6%	1	6%
2-Butanone	50	18	23	23	1	6%	0	0%
2-Hexanone	50	18	12	12	1	6%	0	0%
Tetrachloroethene	5	18	1.4	1.4	1	6%	0	0%
Total VOCs	NA	26	1.3	25700	26	100%	0	0%
SVOCs								
Naphthalene	10	26	3.2	3300	24	92%	16	62%
2-Methylnaphthalene	NA	26	0.74	310	23	88%	0	0%
Fluorene	50	18	0.9	81	14	78%	1	6%
Acenaphthene	20	18	0.95	59	14	78%	4	22%
Phenol	1	18	3.3	180	13	72%	13	72%
Phenanthrene	50	18	0.49	75	13	72%	1	6%
Carbazole	NA	18	1.1	140	12	67%	0	0%
Dibenzofuran	NA	18	0.45	68	11	61%	0	0%
Anthracene	50	18	0.48	19	8	44%	0	0%
Pyrene	50	18	0.44	5.5	6	33%	0	0%
Fluoranthene	50	18	0.61	6.9	6	33%	0	0%
4-Methylphenol	1	18	0.59	340	6	33%	5	28%
2-Methylphenol	1	18	0.91	170	4	22%	3	17%
Acenaphthylene	NA	18	1.2	110	2	11%	0	0%
2,4-Dimethylphenol	1	18	51	81	2	11%	2	11%
Benzyl Alcohol	NA	18	0.96	0.96	1	6%	0	0%
Di-n-Butylphthalate	50	18	1.5	1.5	1	6%	0	0%
bis(2-Ethylhexyl)phthalate	5	18	0.92	0.92	1	6%	0	0%
Total SVOCs	NA	26	3.2	4600	25	96%	0	0%
Cyanide								
Total Cyanide	200	18	3.8	540	18	100%	8	44%

See Notes on Page 2.

Table 12. Summary Statistics for Groundwater Analytical Results, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

Notes:

NA = A GA Standard is not provided for this analyte.

DRO = Diesel Range Organics.

NYSDEC GA 2 = New York State Technical and Operational Guidance Class GA Standards Guidance Values, June 1998.

NYSDEC = New York State Department of Environmental Conservation.

PIANO = Paraffin, Isoparaffin, Aromatic, Naphthene, or Olefin.

VOCs = Volatile Organic Compounds.

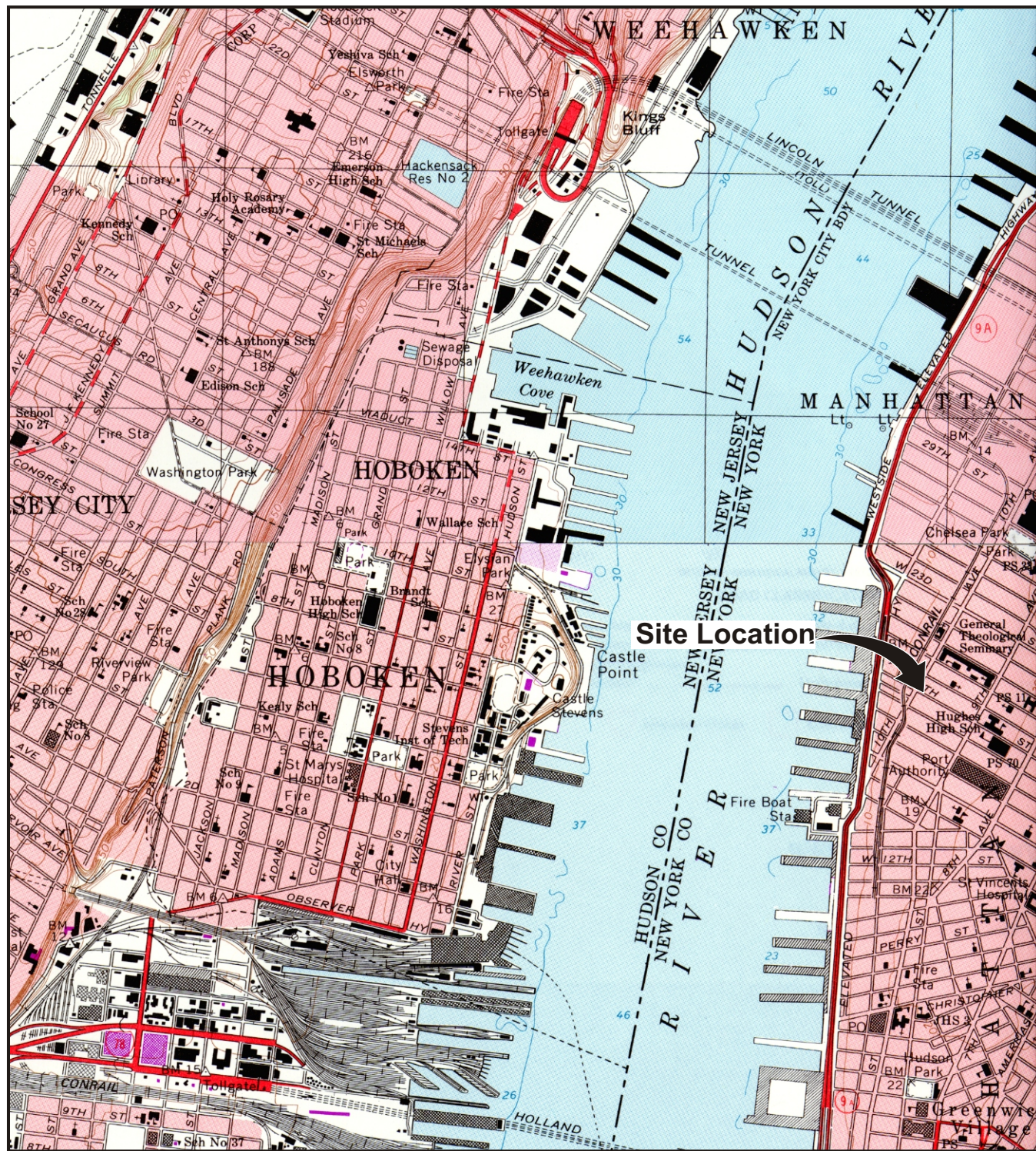
SVOCs = Semi-Volatile Organic Compounds.

ug/L = micrograms per liter.

See Notes on Page 2.

Table 13. Summary of Forensic Evaluation and Sample Fingerprint Interpretation, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York

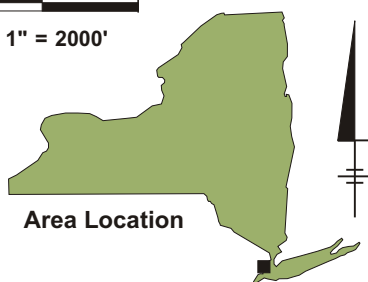
Sample Location	Percent						TPH Fingerprint Interpretation
	Paraffins (P)	Isoparaffins (I)	Aromatics (A)	Naphthenes (N)	Olefins (O)	Sulfur (S)	
<u>SB-C Area</u>							
<i>Soil</i>							
SB-C (14)	6.9 (6.9)	18.4 (20.2)	70.7 (68.8)	2.5 (2.6)	1.4 (1.6)	0.1 (0.1)	Gasoline Only
SB-C (22)	12.5	32.5	46.2	5.5	3.4	0.05	Gasoline Only
<i>Groundwater</i>							
MW-8	2.3	5.8	86.9	2.8	2.1	0.17	Gasoline Only, negligible peaks after C13 Same as MW-8
MW-9	0	0	0	0	0	0	
<u>Well Cluster A Area</u>							
<i>Soil</i>							
WC-A (12)	7.1	36.1	53	2.8	0.9	0.05	Gasoline
WC-A (17)	7	28	60.4	3.1	1.6	0.03	Gasoline
WC-A (20)	6.5	26.7	64.1	1.9	0.5	0.32	Mix, mostly gasoline
<i>Groundwater</i>							
MW-A2	0.4	1.7	96.3	1	0.24	0.4	Weathered gasoline
MW-A3	0	0	98.8	0.14	0	1.1	Similar to MW-C3
<u>SB-B Area</u>							
<i>Soil</i>							
SB-B (10)	7.6	17.7	72.4	1.6	0.5	0.17	Gasoline
<i>Groundwater</i>							
MW-B2	0	0.14	99.3	0.34	0	0.18	Similar to MW-A2
MW-B3	0.3(0.0)	1.0 (0.8)	95.8 (97.4)	2.1 (1.3)	0.11 (0.0)	0.7 (0.6)	Mix
<u>Well Cluster C Area</u>							
<i>Soil</i>							
WC-C (21)	2.9	0.08	93.1	0	0.2	3.8	Fresh coal tar
<i>Groundwater</i>							
MW-C2 (low conc)	0	0	98.8	0	0	1.2	Weathered coal tar
MW-C3	0	0	97.3	0	0	2.7	Coal tar
<u>UST (4000 gal.) Area</u>							
<i>Groundwater</i>							
MW-4 (low conc)	1	3.7	89.6	4.9	0.2	0.6	Similar to MW-B3
<u>Gasoline Standards</u>							
Regular	10.0	43.9	34.9	7.1	4.1	Not Analyzed	-
Plus	8.3	50.4	30.2	6.5	4.7	Not Analyzed	-
Super	5.9	58.7	26.4	4.9	4.1	Not Analyzed	-
<u>Coal Tar in Soil (from another location)</u>							
NAPL	0.3	0.1	90.6	0.0	0.0	9.1	-



REFERENCE: BASE MAP USGS 7.5 MIN. QUADS., JERSEY CITY, AND WEEHAWKEN, NJ - NY, 1967.



Approximate Scale: 1" = 2000'



Area Location

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
REMEDIAL INVESTIGATION BLOCK 715, LOT 59

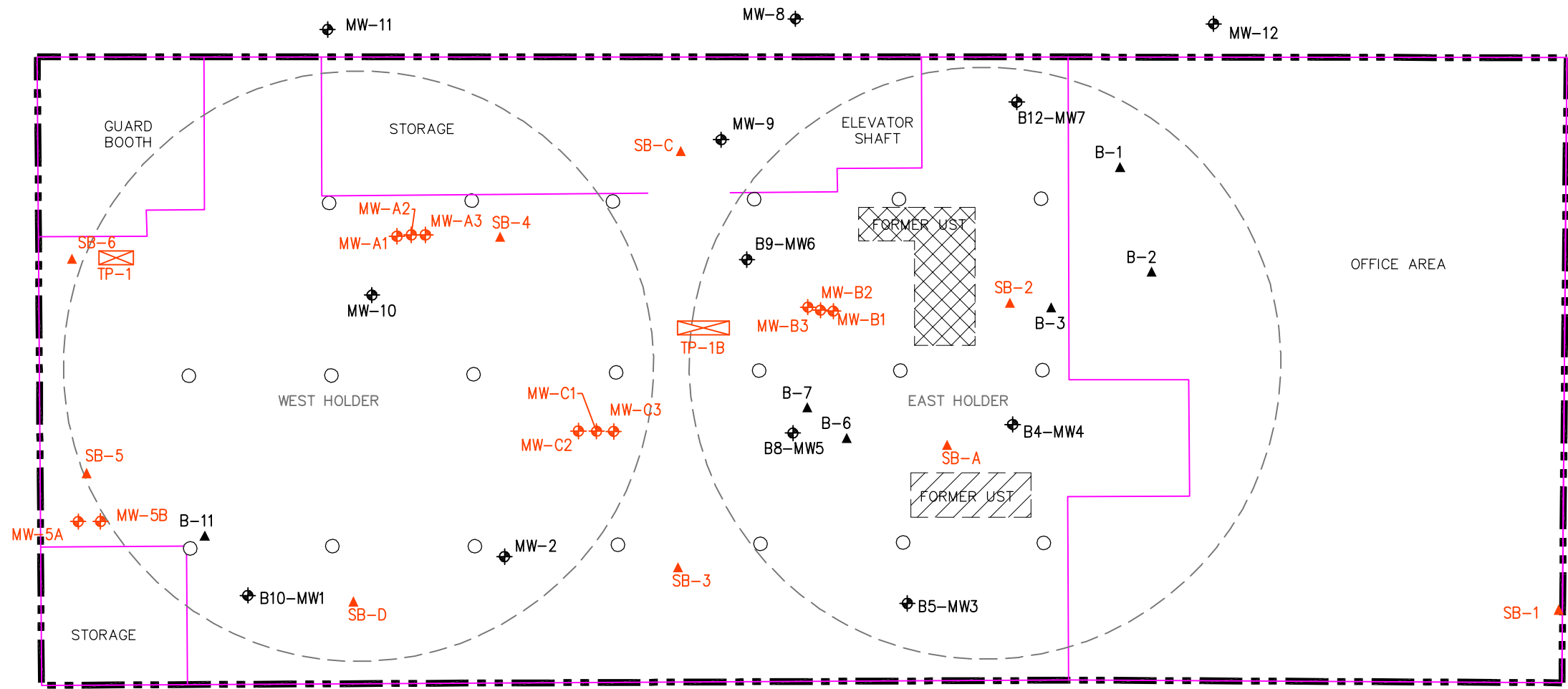
SITE LOCATION MAP



FIGURE

1

WEST 18th STREET



LEGEND:

- PROPERTY LINE
- SOIL BORING (RETACO)
- MONITORING WELL (RETACO)
- TEST PIT (CON EDISON)
- MONITORING WELL/SOIL BORING LOCATION (CON EDISON)
- BUILDING COLUMN
- APPROXIMATE LOCATION OF FIVE FORMER 550-GALLON UNDERGROUND GASOLINE STORAGE TANKS
- APPROXIMATE LOCATION OF FORMER 4000-GALLON UNDERGROUND GASOLINE (DIESEL) TANK
- APPROXIMATE LOCATION OF FORMER GAS HOLDERS
- APPROXIMATE LOCATION OF BUILDING WALLS

NOTES:

1. SURVEY CONTROL WAS TAKEN FROM SITE WIDE BASE SURVEY PREPARED BY MUNOZ ENGINEERING, P.C. DATED APRIL 2007.
2. ALL ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM AS DERIVED FROM GPS.
3. HORIZONTAL COORDINATES ARE IN NYS COORDINATE SYSTEM (EAST) NAD 83 AS DERIVED FROM GPS.
4. BENCH MARK EL=12.91 X-CUT IN METAL LIGHT POLE ROUND BASE BOLT IN FRONT OF VERIZON BUILDING ON WEST 18th STREET.
5. LOCATIONS OF FORMER GAS HOLDERS ARE BASED ON SANBORN FIRE INSURANCE MAPS, DATED 1904-1985.
6. RETACO BORING AND MONITORING WELL LOCATIONS ARE BASED ON REPORTS ISSUED BY ENVIROTRAC ON BEHALF OF RETACO BETWEEN 2001 AND 2008.
7. UST LOCATIONS ARE BASED ON A SITE SUMMARY REPORT, ISSUED BY ENVIROTRAC, DATED AUGUST 2003.
8. BUILDING INTERIOR LAYOUT BASED ON FIELD RECONNAISSANCE.



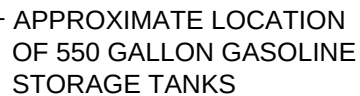
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
REMEDIAL INVESTIGATION REPORT
BLOCK 715, LOT 59

SAMPLE LOCATION MAP

ARCADIS

FIGURE
2

CITY:SYRACUSE, NY GROUP:ENVCAD DB: A. SCHILLING, N. SMITHGALL, P. LISTER LDA: SCHILLING TR: R. ARCO LVR: ON=OFF=REF: (FRZ)
G:\ENVCAD\SYRACUSE\ACT\B0043011000100004\DWG\43011B03.DWG LAYOUT: 2. SAVER: 4/22/2009 12:14 PM ACADVER: 17.05 (LMS TECH) PAGES: 17
XREFS: 43011X00 43011X01 PROJECTNAME: PLT: FULLCTB PLOTTED: 4/22/2009 12:15 PM BY: LISTER, PAUL



- WELL/BORING ID
- LOCAL GROUND SURFACE
- MAXIMUM WATER TABLE OBSERVED (1/10/2002)
- MINIMUM WATER TABLE OBSERVED (9/28/2008)
- LITHOLOGICAL CONTACT
- WELL SCREEN WITH WATER TABLE ELEVATION (9/28/2008)
- BOTTOM OF BORING

- | | | | |
|---|----------------|---|----------------------------------|
|  | STAINING/SHEEN |  | FILL |
|  | OLM/TLM |  | POST-GLACIAL
STRATIFIED SANDS |
| | |  | SILT AND CLAY |
| | |  | GRAVEL |
| | |  | BEDROCK (HARTLAND
FORMATION) |

NOTES:

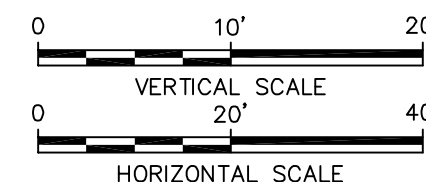
1. ELEVATIONS REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)
2. HORIZONTAL LOCATION OF HOLDER WALLS BASED ON SANBORN MAPS. DEPTH TO HOLDER FLOORS ESTIMATED BASED ON DRILLING OBSERVATIONS.

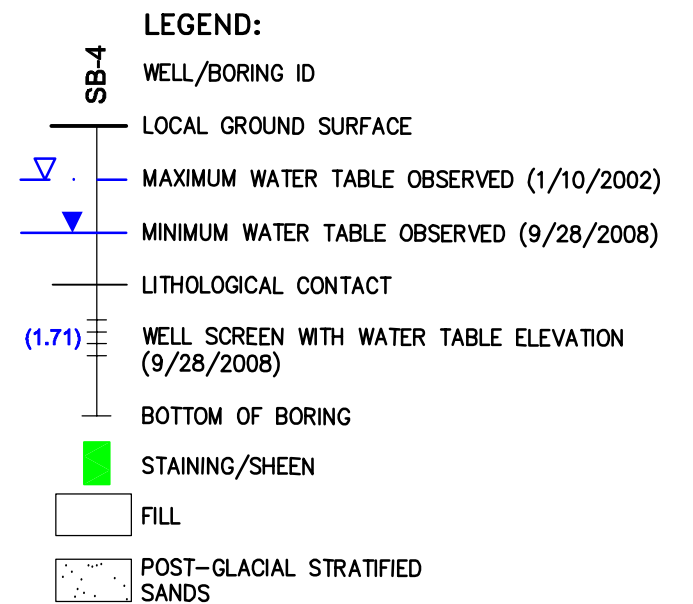
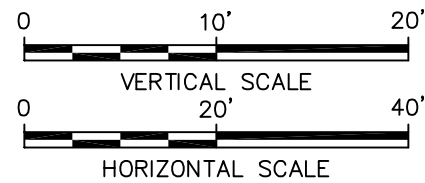
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
REMEDIAL INVESTIGATION REPORT
BLOCK 715, LOT 59

CROSS SECTION A - A'



FIGURE 3



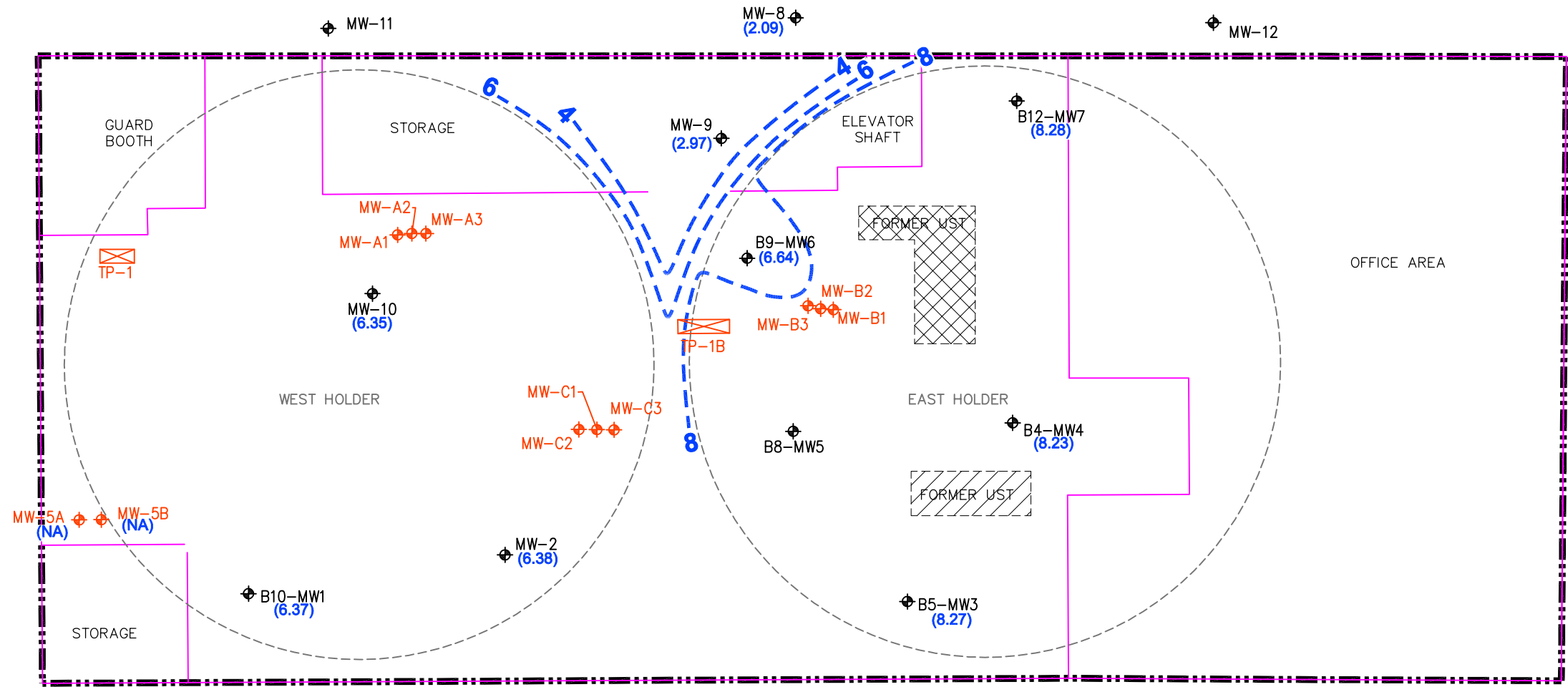
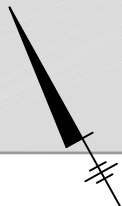


1. ELEVATIONS REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
2. HORIZONTAL LOCATION OF HOLDER WALLS BASED ON SANBORN MAPS. DEPTH TO HOLDER FLOORS ESTIMATED BASED ON DRILLING OBSERVATIONS.

CROSS SECTION B - B'



WEST 18th STREET

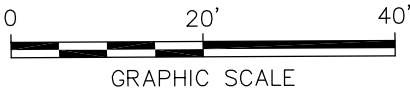


LEGEND:

- PROPERTY LINE
- MW-1 MONITORING WELL (RETACO)
- MW-A1 MONITORING WELL (CON EDISON)
- TP-2S TEST PIT (CON EDISON)
- APPROXIMATE LOCATION OF FIVE FORMER 550-GALLON UNDERGROUND GASOLINE STORAGE TANKS
- APPROXIMATE LOCATION OF FORMER 4000-GALLON UNDERGROUND GASOLINE (DIESEL?) TANK
- APPROXIMATE LOCATION OF FORMER GAS HOLDER
- APPROXIMATE LOCATION OF INTERIOR WALLS
- (89.79) WATER TABLE ELEVATION (FT RMSL)
- 8- - - - WATER TABLE ELEVATION CONTOUR

NOTES:

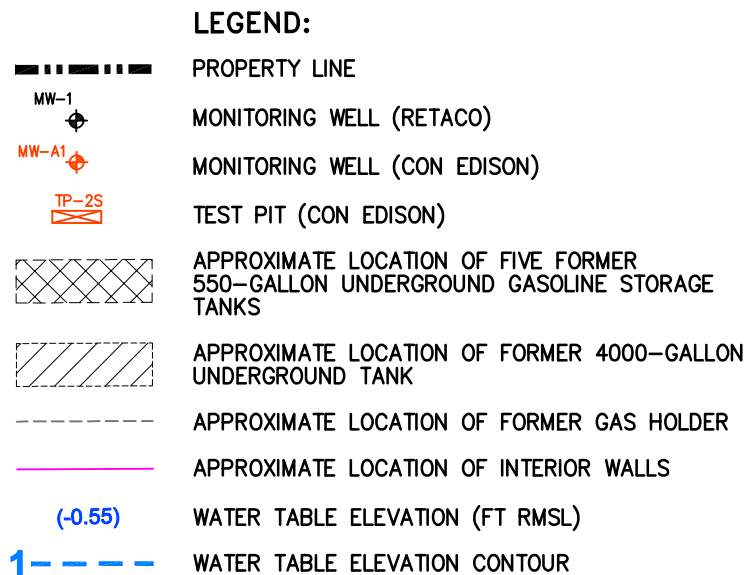
1. SURVEY CONTROL WAS TAKEN FROM SITE WIDE BASE SURVEY PREPARED BY MUNOZ ENGINEERING, P.C. DATED APRIL 2007.
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6. UST LOCATIONS ARE BASED ON A SITE SUMMARY REPORT, ISSUED BY ENVIROTRAC, DATED AUGUST 2003.
7. BUILDING INTERIOR LAYOUT BASED ON FIELD MEASUREMENTS.



CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
REMEDIAL INVESTIGATION REPORT
BLOCK 715, LOT 59

SHALLOW GROUNDWATER ELEVATION
CONTOUR MAP
JANUARY 10, 2002





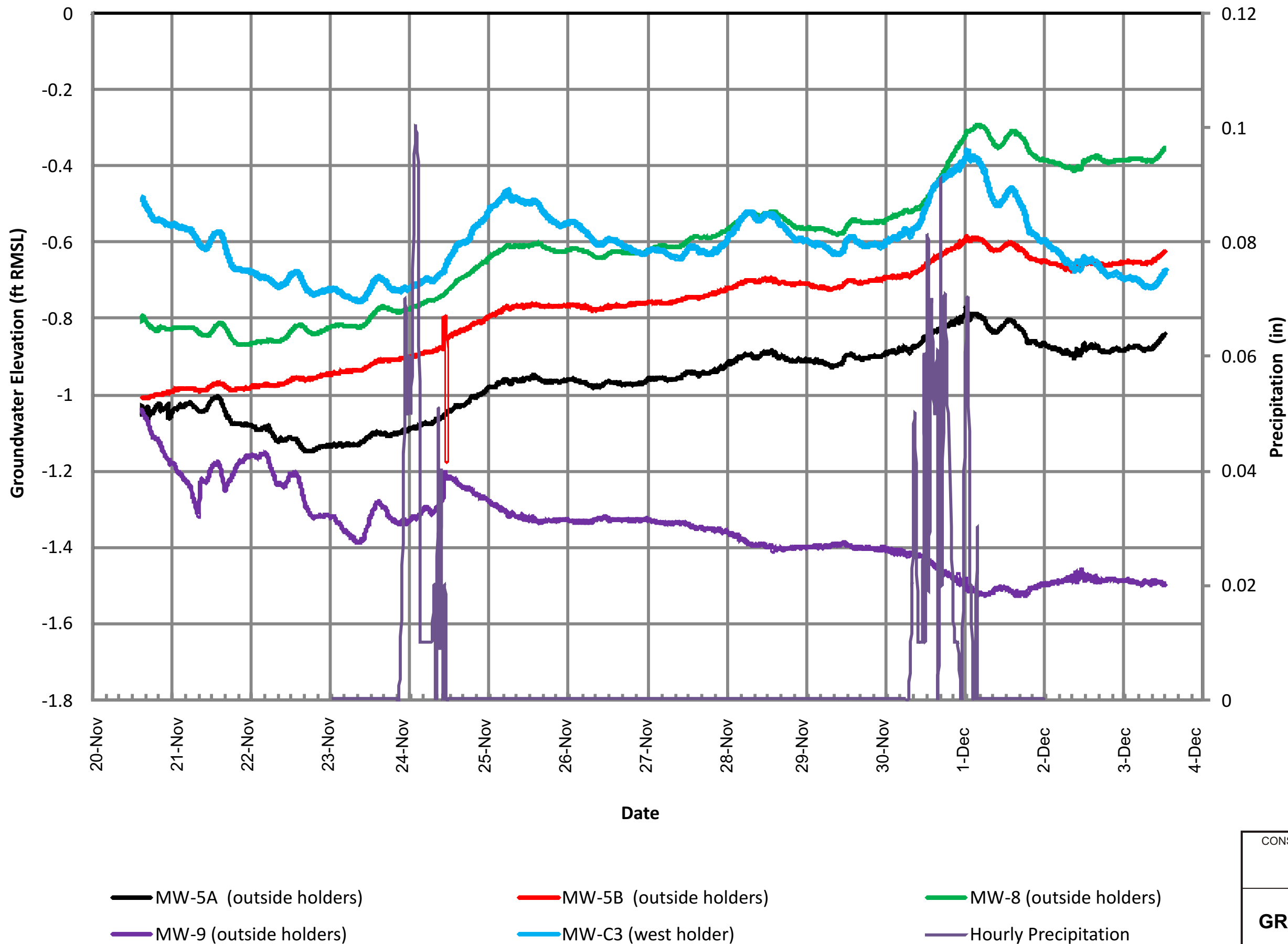
1. SURVEY CONTROL WAS TAKEN FROM SITE WIDE BASE SURVEY PREPARED BY MUNOZ ENGINEERING, P.C. DATED APRIL 2007.
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7. BUILDING INTERIOR LAYOUT BASED ON FIELD MEASUREMENTS.



CITY:SYRACUSE GROUP:ENVCAD DB: A. SCHILLING, P. LISTER TR: M. COBB Lyr: ON="OFF=REF (FRZ)
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KREFS:	IMAGES:	PROJECTNAME:
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XREFS:
43011X00
43011X01



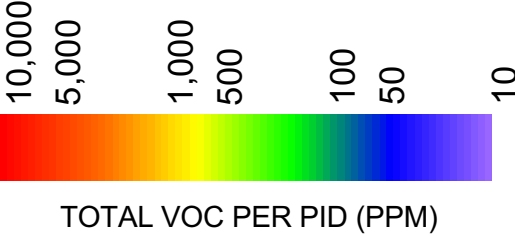
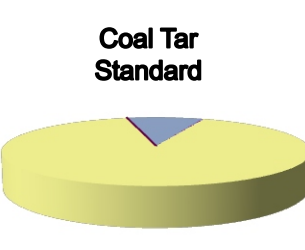
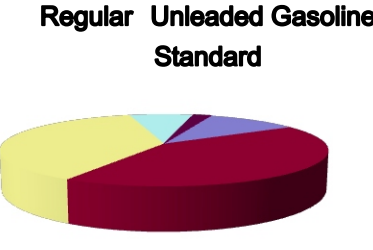
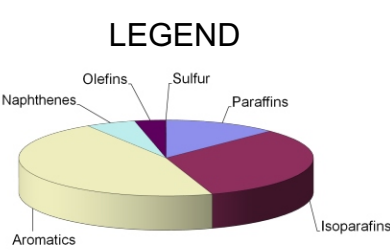
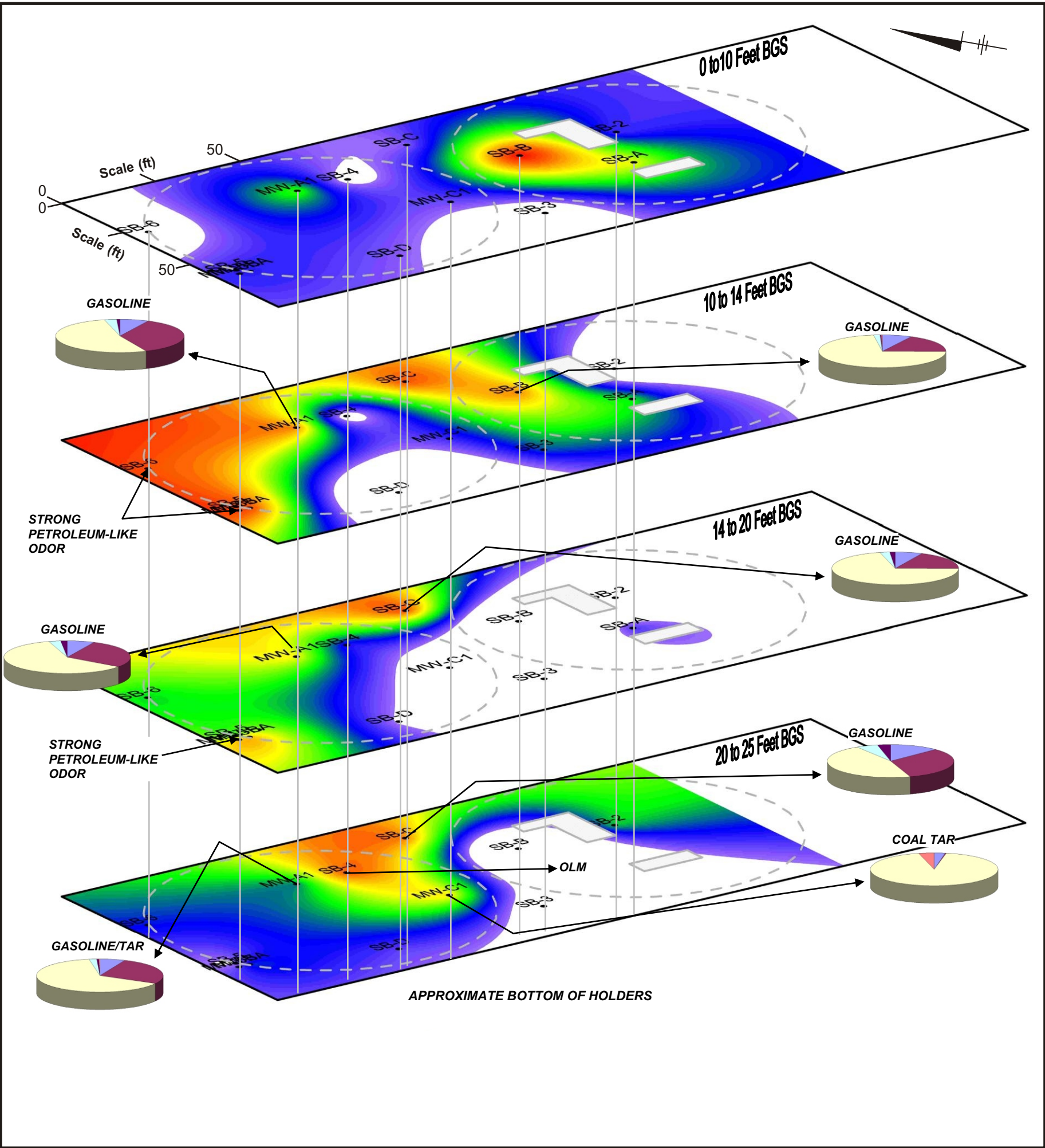
- NOTES:**
1. Precipitation data obtained from National Oceanic and Atmospheric Administration website.
 2. Groundwater elevation measurements collected by ARCADIS between November 20, 2008 and December 4, 2008.
 3. Groundwater elevations measurements were collected using an In-Situ MiniTROLL Datalogger.

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
REMEDIAL INVESTIGATION REPORT
BLOCK 715 LOT 59

GROUNDWATER HYDROGRAPHS



FIGURE
7



NOTE:
BGS = Below Ground Surface

SB-C			
Depth(Feet)	14	22	36
Date	9/8/2008	9/8/2008	9/9/2008
Benzene (ug/kg)	ND	ND	ND
Ethyl Benzene (ug/kg)	100000	210000 D	11
Toluene (ug/kg)	54000	18000 J	11
Xylenes (total) (ug/kg)	1100000	250000 J	56
Total VOCs (ug/kg)	1300000 J	590000 J	81 J

SB-6					
Depth(Feet)	10 to 12	13 to 15	19 to 21	24 to 26	28.5 to 30.5
Date	6/7/2005	5/12/2005	5/12/2005	5/12/2005	5/12/2005
Benzene	ND	ND	87E	0.49 J	ND
Ethyl Benzene	ND	7000	ND	2.7 J	2.8 J
Toluene	ND	5900 DJE	5 J	3.6 J	2.1 J
Xylenes (total)	ND	4400 DJE	ND	17	20.1
TVOC (ug/kg)	7.9	596700 DJE	173.9	39.3	37

MW-58				
Depth(Feet)	10 to 11	11 to 12	21 to 22	34 to 36
Date	5/2/2005	5/2/2005	5/2/2005	6/7/2005
Benzene	ND	ND	2 J	ND
Ethyl Benzene	ND	18000	5.5 J	3 J
Toluene	ND	ND	3 J	ND
Xylenes (total)	ND	92000	27.3 J	5.8 J
TVOC (ug/kg)	ND	110800	48.9	27.4

SB-2						
Depth(Feet)	1 to 1.5	2 to 2.5	5 to 7	13 to 15	19 to 20.5	
Date	5/2/2005	5/2/2005	5/6/2005	5/6/2005	5/6/2005	
Benzene	0.43 U	0.43 U	0.50 U	1.7 J	22000	
Ethyl Benzene	0.38 U	0.38 U	0.44 U	0.40 U	35000	
Toluene	0.43 U	0.44 U	0.51 U	0.46 U	630 U	
Xylenes (total)	ND	ND	ND	ND	13000 J	
TVOC (ug/kg)	9.8	50.1	13	21.8	103100	

SB-B			
Depth(Feet)	1	10	20
Date	8/20/2008	8/22/2008	8/22/2008
Benzene (ug/kg)	150 J	160 J	800 J
Ethyl Benzene (ug/kg)	1400	3700	960 J
Toluene (ug/kg)	1600	180 J	340 J
Xylenes (total) (ug/kg)	11000	5300	1300 J
Total VOCs (ug/kg)	15000 J	9800 J	3500 J

Benzene	60
Ethylbenzene	5,500
Isopropylbenzene	2,300
Toluene	1,500
Xylenes (total)	1,200
Total VOCs	10,000

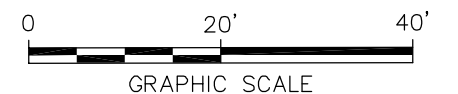
APPROXIMATE LOCATION OF FORMER
4000-GALLON UNDERGROUND
GASOLINE (DIESEL?) TANK

μg/kg MICROGRAMS PER KILOGRAM

MW-C		
Depth(Feet)	11	21
Date	8/26/2008	8/26/2008
Benzene (ug/kg)	1.5 J	600000 D
Ethyl Benzene (ug/kg)	5.7 U	620000 D
Toluene (ug/kg)	5.7 U	690000 D
Xylenes (total) (ug/kg)	5.7 U	1100000 D
Total VOCs (ug/kg)	22 J	3000000 J

SB-A				
Depth(Feet)	2	8	21	32
Date	9/5/2008	9/5/2008	9/5/2008	9/5/2008
Benzene (ug/kg)	5.5 U	5.8 U	1700 EJ	1.75 J
Ethyl Benzene (ug/kg)	5.5 U	5.8 U	36000 D	0.3 J
Toluene (ug/kg)	5.5 U	5.8 U	3200 D	5.2 U
Xylenes (total) (ug/kg)	5.5 U	5.8 U	59000 D	5.2 U
Total VOCs (ug/kg)	ND	4900	100000 J	12 J

9. ALL LOCATIONS ARE APPROXIMATE.



CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
REMEDIAL INVESTIGATION REPORT
BLOCK 715, LOT 59

VOCs DETECTED IN SOIL



FIGURE 10

CITY:SYRACUSE NY GROUP:ENVCAD DB:A SCHILLING,N SMITHGALL,P LISTER LDA:SCHILLING TR:R ARCO LVR:ON=OFF-REF:FRZ
G:\ENVCAD\SYRACUSE\ACT\B004303110001000040DWG43031C05.DWG LAYOUT: 11 SAVED: 4/14/2009 3:00 PM ACADVER: 17.05 (LMS TECH) PAGES: 11 PLOT: 11 PLOTDATE: 4/14/2009 3:00 PM BY: LISTER, PAUL

PROJECTNAME: WEST 18th STREET REMEDIAL INVESTIGATION
XREFS: 4301X00 4301X01

WEST 18th STREET

SB-4					
Depth(Feet)	5 to 5.5	7 to 9	9 to 13	17 to 19	19 to 21
Date	5/3/2005	5/5/2005	5/5/2005	5/5/2005	5/5/2005
Benzo(a)pyrene (ug/kg)	ND	ND	ND	ND	18000 JE
Naphthalene (ug/kg)	ND	ND	370 J	ND	220000 DE
Total PAHs	409	ND	435	341	623680
Total SVOCs (ug/kg)	409	84	534	341	728280E

SB-C			
Depth(Feet)	14	22	36
Date	9/8/2008	9/8/2008	9/9/2008
Benzo(a)pyrene (ug/kg)	280 U	68 J	330 U
Naphthalene (ug/kg)	22000 D	47000 D	330 U
Total PAHs	22560	46884	ND
Total SVOCs (ug/kg)	39000 J	73000 J	6200

SB-2					
Depth(Feet)	1 to 1.5	2 to 2.5	5 to 7	13 to 15	19 to 20.5
Date	5/2/2005	5/2/2005	5/6/2005	5/6/2005	5/6/2005
Benzo(a)pyrene (ug/kg)	62 JE	110 JE	ND	ND	770E
Naphthalene (ug/kg)	110 J	ND	ND	ND	11000
Total PAHs	468	1571	210	ND	24600
Total SVOCs (ug/kg)	688	1571	434	270	32180

MW-A			
Depth(Feet)	12	17	20
Date	8/20/2008	8/21/2008	8/21/2008
Benzo(a)pyrene (ug/kg)	200 J	500	230 J
Naphthalene (ug/kg)	10,000	2,600	760
Total PAHs	15566	9064	6060
Total SVOCs (ug/kg)	22000 J	11000 J	7500 J

MW-C		
Depth(Feet)	11	21
Date	8/26/2008	8/26/2008
Benzo(a)pyrene (ug/kg)	74 J	78000
Naphthalene (ug/kg)	300 U	640000 E
Total PAHs	1424	2387000
Total SVOCs (ug/kg)	29000 J	2800000 J

MW-B			
Depth(Feet)	1	10	20
Date	8/20/2008	8/22/2008	8/22/2008
Benzo(a)pyrene (ug/kg)	130 J	170 J	770
Naphthalene (ug/kg)	5800	2500	16000 D
Total PAHs	7359	6201	37280D
Total SVOCs (ug/kg)	15000 J	11000 J	44000 J

Soil Cleanup Objectives according to Technical and Administrative Guidance Memorandum #4046 (ug/kg)	
Benzo(a)anthracene	224
Benzo(a)pyrene	61
Chrysene	400
Dibenzo(a,h)anthracene	14
Naphthalene	13,000
Total PAHs	-
Total SVOCs	500,000

LEGEND:



PROPERTY LINE



RETACO SOIL BORING



TSVOC >500,000 ug/kg AND CONCENTRATIONS ABOVE TAGM 4046 SOIL CLEANUP OBJECTIVES



TSVOC <500,000 ug/kg AND CONCENTRATIONS ABOVE TAGM 4046 SOIL CLEANUP OBJECTIVES



NO CONCENTRATIONS ABOVE TAGM 4046 SOIL CLEANUP OBJECTIVES



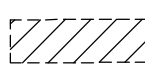
EXCEEDANCE OF NEW YORK STATE TECHNICAL AND OPERATION SOIL CLEANUP OBJECTIVES AND CLEANUP LEVELS (TAGM 4046)



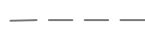
BUILDING COLUMN



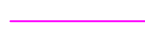
APPROXIMATE LOCATION OF FIVE FORMER 550-GALLON UNDERGROUND GASOLINE STORAGE TANKS



APPROXIMATE LOCATION OF FORMER 4000-GALLON UNDERGROUND GASOLINE (DIESEL?) TANK



APPROXIMATE LOCATION OF FORMER GAS HOLDER



APPROXIMATE LOCATION OF BUILDING WALLS

SVOCs SEMI-VOLATILE ORGANIC COMPOUNDS

J INDICATES AN ESTIMATED VALUE

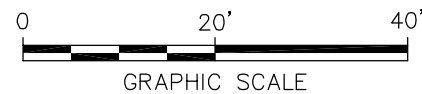
D COMPOUND ANALYZED AT DILUTION

U INDICATES THE CONSTITUENT WAS NOT DETECTED AT THE PQL. THE PRECEDING THE U INDICATES THE PQL

ug/kg MICROGRAMS PER KILOGRAMS

NOTES:

1. SURVEY CONTROL WAS TAKEN FROM SITE WIDE BASE SURVEY PREPARED BY MUNOZ ENGINEERING, P.C. DATED APRIL 2007.
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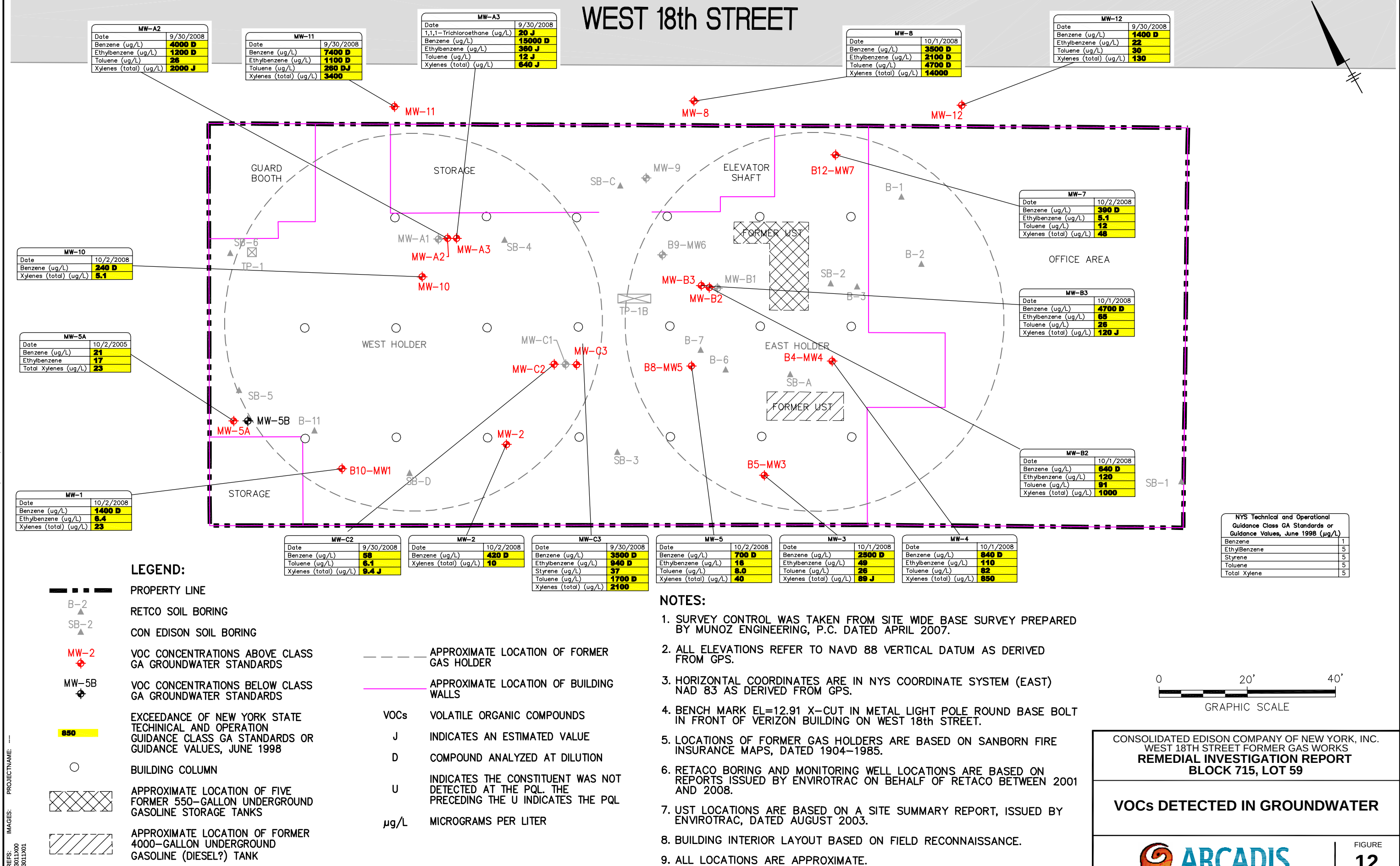
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
REMEDIAL INVESTIGATION REPORT
BLOCK 715, LOT 59

SVOCs DETECTED IN SOIL



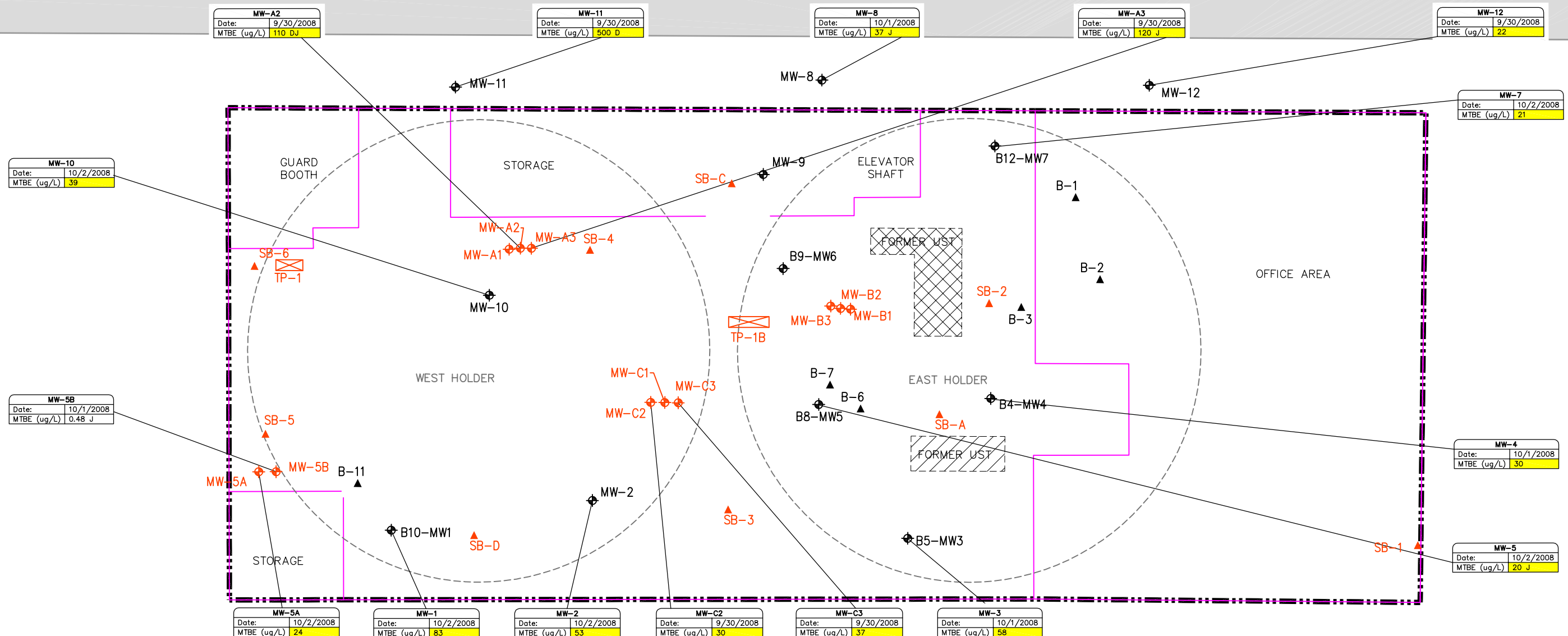
FIGURE
11

CITY: Syracuse DIV: GROUP: Env-141 DE: AMS NES: AMS LDA: Schilling PIC: (Opt) PM: (Rept) TM: (Opt) LVR: (Opt) ON: "OFF" = REF* XREFS: 43011X00 43011X01 G:\ENVCAD\SYRACUSE\ACT\B0043011000100004\DWG\43011C02.DWG LAYOUT: 12 SAVER: 4/14/2009 3:08 PM ACADVER: 17.05 (LMS TECH) PAGES: 12 PLOT: PLT: FULL CBTB PLOTTED: 4/14/2009 3:08 PM BY: LISTER, PAUL



CITY:SYRACUSE NY GROUP:ENVCAD DE:A.SCHILLING P:LISTER W:JONES LD:A.SCHILLING TR:R.ARCO LYR:ONE*OFF=REF (FRZ)
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XREFS: 43011X00 43011X01
IMAGES: PROJECTNAME: ---

WEST 18th STREET



LEGEND:

- PROPERTY LINE
- SOIL BORING (RETACO)
- MONITORING WELL (RETACO)
- TEST PIT (CON EDISON)
- MONITORING WELL/SOIL BORING LOCATION (CON EDISON)
- APPROXIMATE LOCATION OF FIVE FORMER 550-GALLON UNDERGROUND GASOLINE STORAGE TANKS
- APPROXIMATE LOCATION OF FORMER 4000-GALLON UNDERGROUND GASOLINE (DIESEL?) TANK
- APPROXIMATE LOCATION OF FORMER GAS HOLDER

APPROXIMATE LOCATION OF BUILDING WALLS

- D COMPOUND ANALYZED AT DILUTION
- J ESTIMATED CONCENTRATION
- ND NOT DETECTED
- µg/L MICROGRAMS PER LITER
- MTBE METHYL TERTIARY BUTYL ETHER

NYS TECHNICAL AND OPERATIONAL GUIDANCE CLASS GA STANDARDS OR GUIDANCE VALUES, JUNE 1998, AS AMENDED IN APRIL 2000 (µg/kg)	
MTBE (GUIDANCE VALUE)	10

YELLOW SHADING INDICATES THAT THE DETECTED CONCENTRATION EXCEEDS THE GUIDANCE VALUE.

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- ALL ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM AS DERIVED FROM GPS.
- HORIZONTAL COORDINATES ARE IN NYS COORDINATE SYSTEM (EAST) NAD 83 AS DERIVED FROM GPS.
- BENCH MARK EL=12.91 X-CUT IN METAL LIGHT POLE ROUND BASE BOLT IN FRONT OF SUBJECT BUILDING ON WEST 18th STREET.
- LOCATIONS OF FORMER GAS HOLDERS ARE BASED ON SANBORN FIRE INSURANCE MAPS, DATED 1904-1985.
- RETACO BORING AND MONITORING WELL LOCATIONS ARE BASED ON REPORTS ISSUED BY ENVIROTRAC ON BEHALF OF RETACO BETWEEN 2001 AND 2008.
- UST LOCATIONS ARE BASED ON A SITE SUMMARY REPORT, ISSUED BY ENVIROTRAC, DATED AUGUST 2003.
- BUILDING INTERIOR LAYOUT BASED ON FIELD RECONNAISSANCE.
- GROUNDWATER SAMPLES COLLECTED BY ARCADIS.

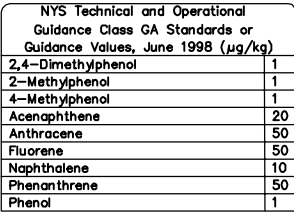


CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
REMEDIAL INVESTIGATION REPORT
BLOCK 715, LOT 59

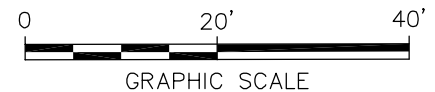
MTBE CONCENTRATIONS IN
GROUNDWATER,
SEPTEMBER/OCTOBER 2008



FIGURE
13



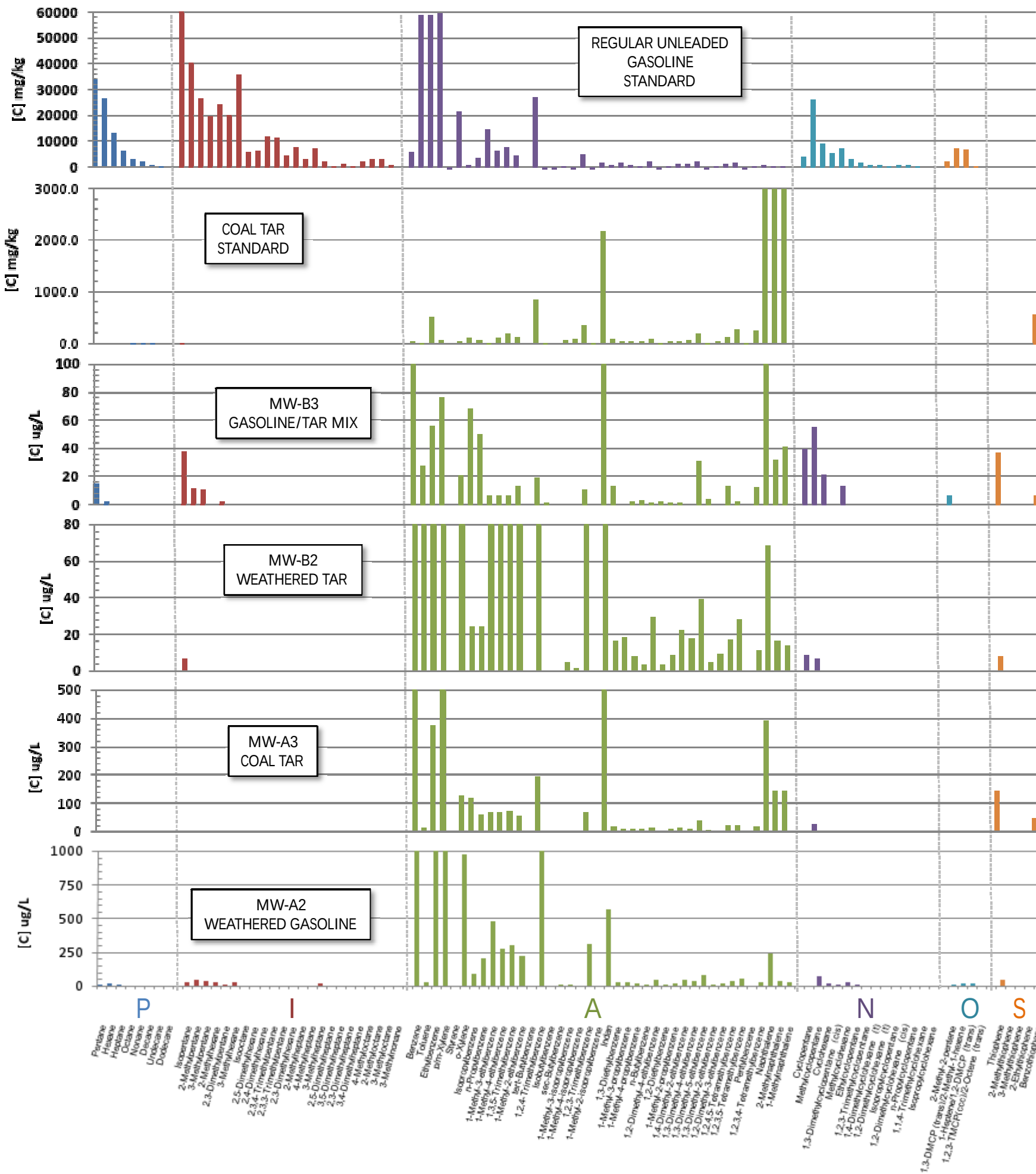
1. SURVEY CONTROL WAS TAKEN FROM SITE WIDE BASE SURVEY PREPARED BY MUNOZ ENGINEERING, P.C. DATED APRIL 2007.
2. ALL ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM AS DERIVED FROM GPS.
3. HORIZONTAL COORDINATES ARE IN NYS COORDINATE SYSTEM (EAST) NAD 83 AS DERIVED FROM GPS.
4. BENCH MARK EL=12.91 X-CUT IN METAL LIGHT POLE ROUND BASE BOLT IN FRONT OF VERIZON BUILDING ON WEST 18th STREET.
5. LOCATIONS OF FORMER GAS HOLDERS ARE BASED ON SANBORN FIRE INSURANCE MAPS, DATED 1904-1985.
6. RETACO BORING AND MONITORING WELL LOCATIONS ARE BASED ON REPORTS ISSUED BY ENVIROTRAC ON BEHALF OF RETACO BETWEEN 2001 AND 2008.
7. UST LOCATIONS ARE BASED ON A SITE SUMMARY REPORT, ISSUED BY ENVIROTRAC, DATED AUGUST 2003.
8. BUILDING INTERIOR LAYOUT BASED ON FIELD RECONNAISSANCE.
9. ALL LOCATIONS ARE APPROXIMATE.



SVOCs DETECTED IN GROUNDWATER



FIGURE 14



CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
REMEDIAL INVESTIGATION REPORT
BLOCK 715 LOT 59

DISTRIBUTION OF PIANOS
COMPOUNDS IN GROUNDWATER



ARCADIS

APPENDICES

Appendix A

Historical Sanborn Fire
Insurance Maps



"Linking Technology with Tradition"®

Sanborn® Map Transmittal

Ship To: Mike C. Ferri

Blasland, Bouck & Lee

6723 Towpath Road

Syracuse, NY 13214

Order Date: 2/17/2006 **Completion Date:** 2/20/2006

Inquiry #: 1616555.2S

P.O. #: NA

Site Name: 17th Street/10th Avenue

Address: 17th Street/10th Avenue

City/State: NEW YORK, NY 10011

Cross Streets:

Customer Project: NA

1042387ERK 315-446-2570

Based on client-supplied information, fire insurance maps for the following years were identified

1895 - 2 Maps	1983 - 2 Maps
1904 - 2 Maps	1985 - 2 Maps
1921 - 2 Maps	
1950 - 2 Maps	
1969 - 2 Maps	
1975 - 2 Maps	
1979 - 2 Maps	
1980 - 2 Maps	

Limited Permission to Photocopy

Total Maps: 20

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USER'S GUIDE

This User's Guide provides guidelines for accessing Sanborn Map® images and for transferring them to your Word Processor.

Reading Sanborn Maps

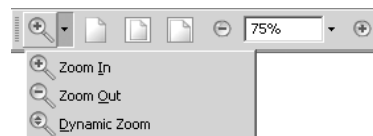
- Sanborn Maps document historical property use by displaying property information through words, abbreviations, and map symbols. The Sanborn Map Key provides information to help interpret the symbols and abbreviations used on Sanborn Maps. The Key is available from EDR's Web Site at: <http://www.edrnet.com/reports/samples/key.pdf>

Organization of Electronic Sanborn Image File

- Sanborn Map Report, listing years of coverage
- User's Guide
- Oldest Sanborn Map Image
- Most recent Sanborn Map Image

Navigating the Electronic Sanborn Image File

1. Open file on screen.
2. Identify TP (Target Property) on the most recent map.
3. Find TP on older printed images.
4. Using Acrobat® Reader®, zoom to 250% in order to view more clearly. (200-250% is the approximate equivalent scale of hardcopy Sanborn Maps.)
 - A. On the menu bar, click "View" and then "Zoom to..."
 - B. Or, use the magnifying tool and drag a box around the TP



Printing a Sanborn Map From the Electronic File

- EDR recommends printing images at 300 dpi (300 dpi prints faster than 600 dpi)
- To print only the TP area, cut and paste from Acrobat to your word processor application.

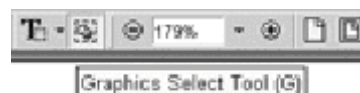
Acrobat Versions 6 and 7

1. Go to the menu bar
2. Click the "Select Tool"
3. Draw a box around the area selected
4. "Right click" on your mouse
5. Select "Copy Image to Clipboard"
6. Go to Word Processor such as Microsoft Word, paste and print.



Acrobat Version 5

1. Go to the menu bar
2. Click the "Graphics Select Tool"
3. Draw a box around the area selected
4. Go to "Menu"
5. Highlight "Edit"
6. Highlight "Copy"
7. Go to Word Processor such as Microsoft Word, paste and print.

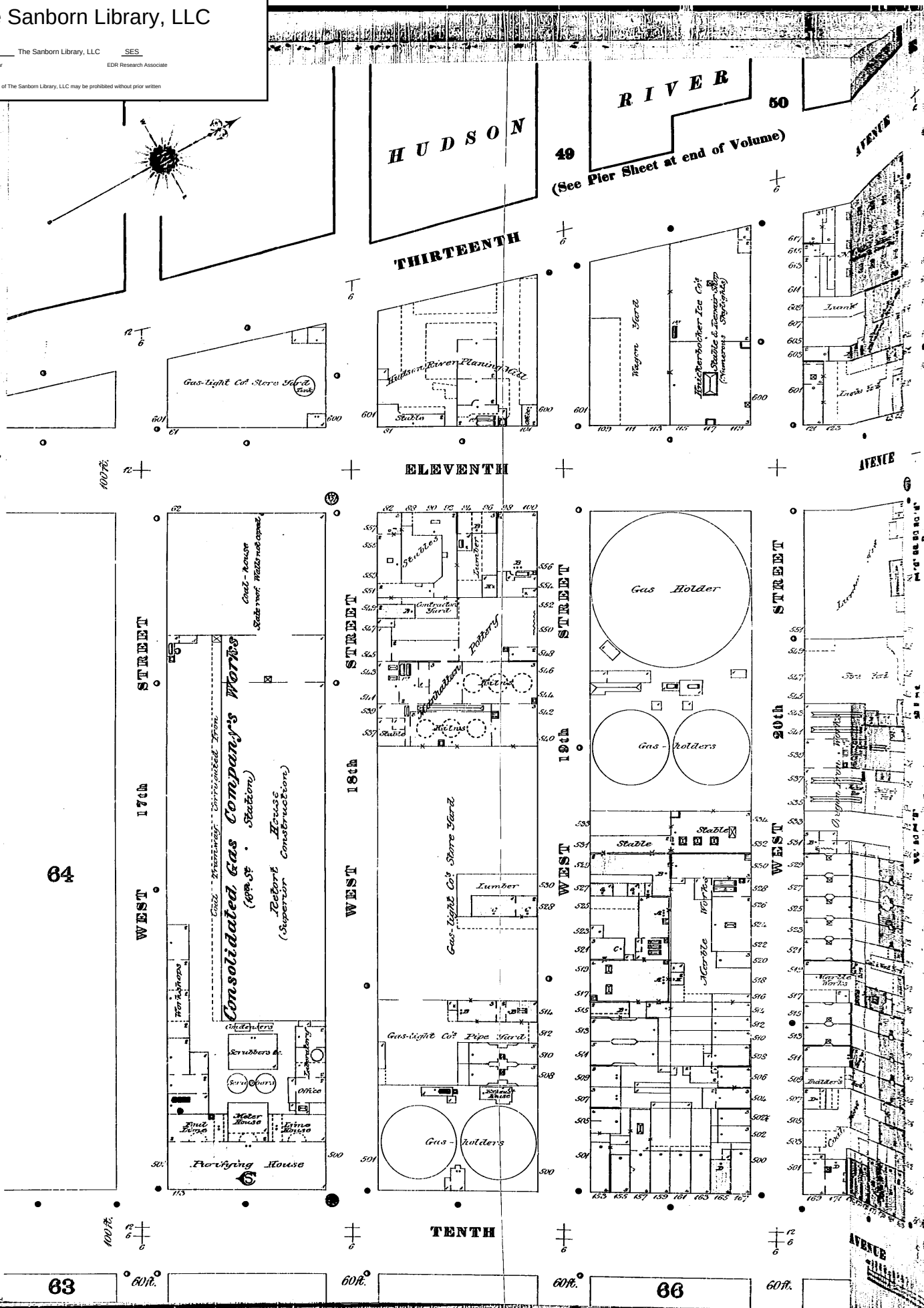


Important Information about Email Delivery of Electronic Sanborn Map Images

- Images are grouped into one file, up to 2MB.
- In cases where in excess of 6-7 map years are available, the file size typically exceeds 2MB. In these cases, you will receive multiple files, labeled as "1 of 3", "2 of 3", etc. including all available map years.
- Due to file size limitations, certain ISPs, including AOL, may occasionally delay or decline to deliver files. Please contact your ISP to identify their specific file size limitations.



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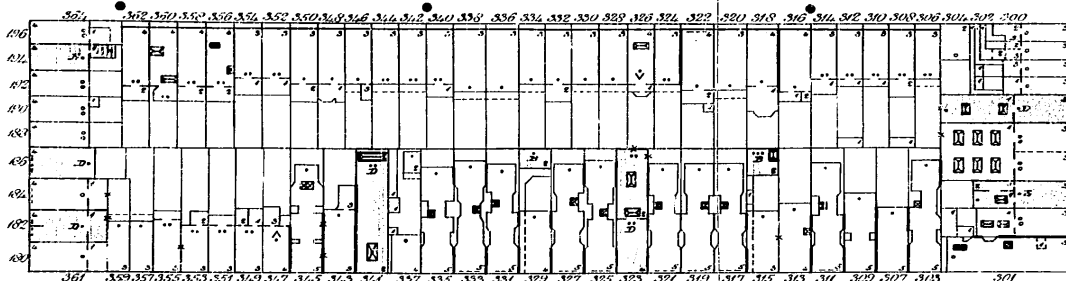
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Year EDR Research Associate

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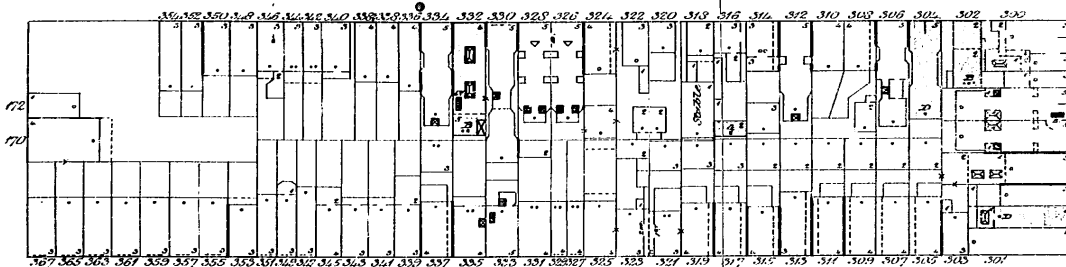
86

66

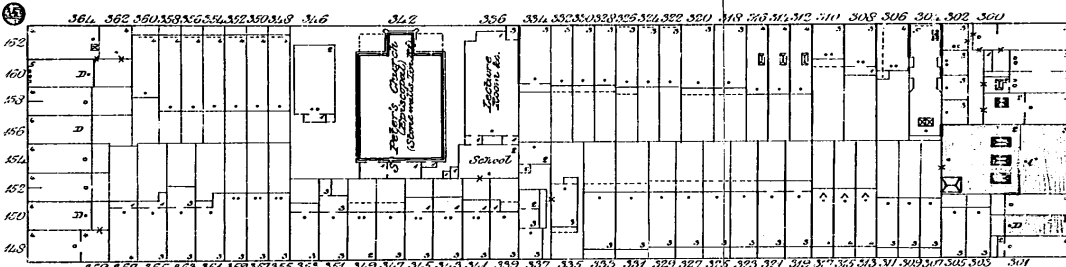
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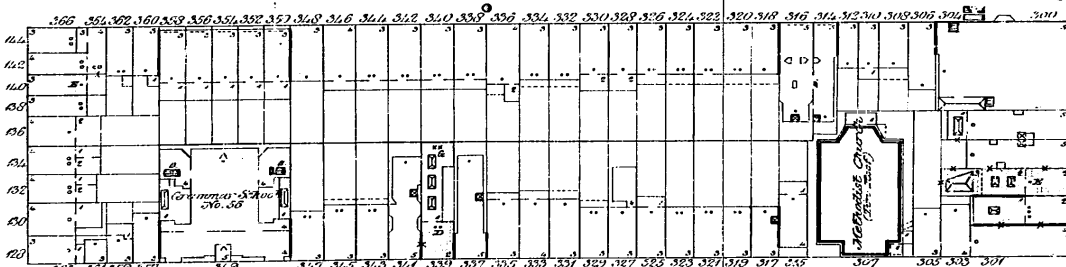
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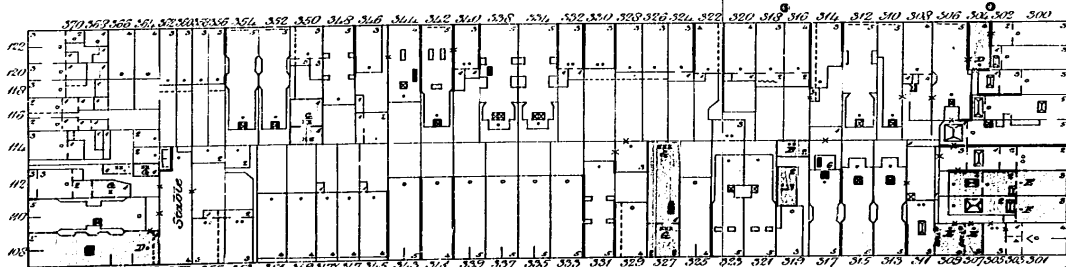
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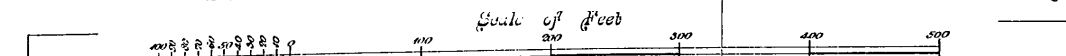
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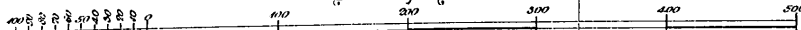
STREET



STREET



Scale of Feet



63

100 ft.



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AVENUE

THIRTEENTH AVE.

66½

AVENUE

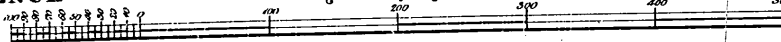
ELEVENTH AVE.

87

AVENUE

TENTH AVE.

Scale of Feet



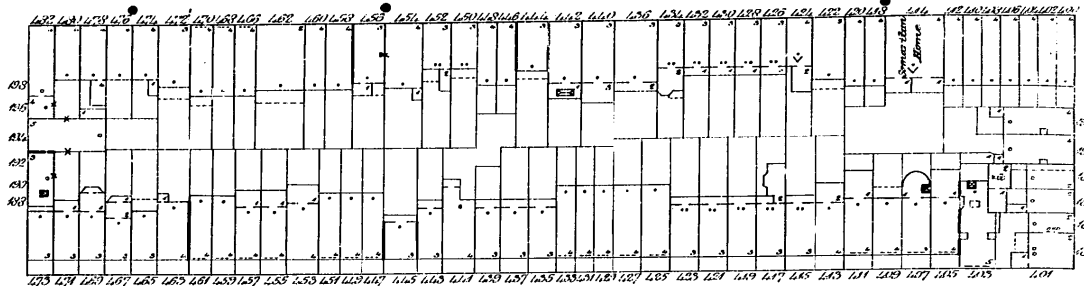
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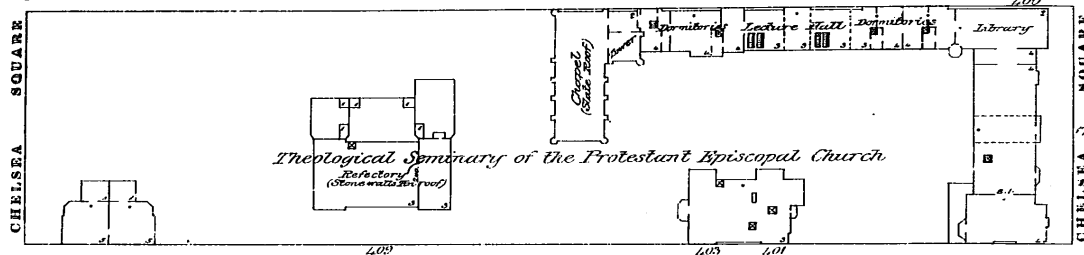


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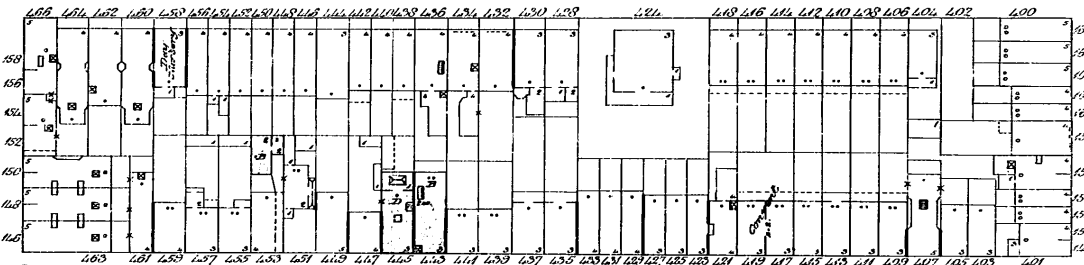
WEST 22nd



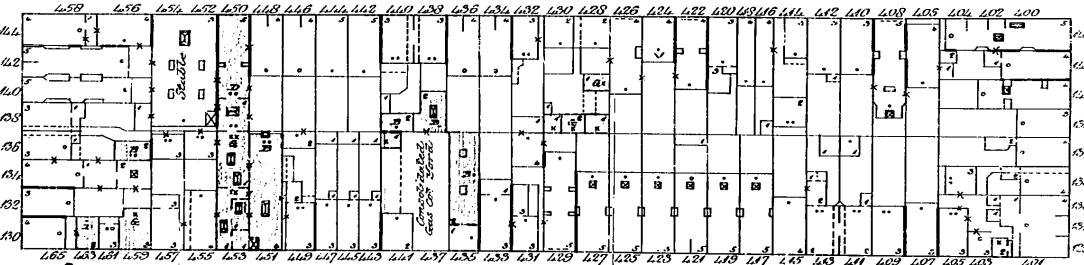
WEST 21st



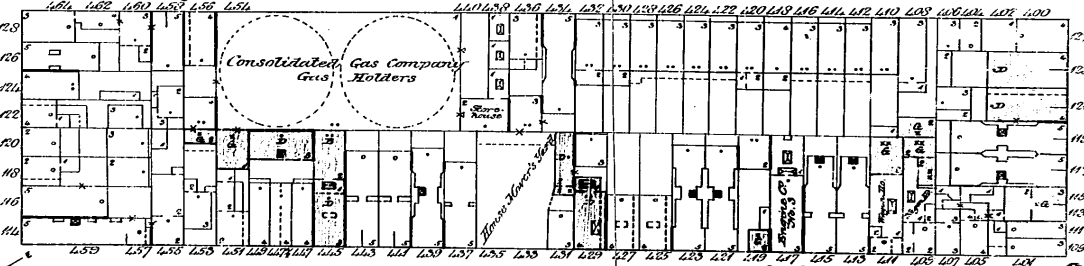
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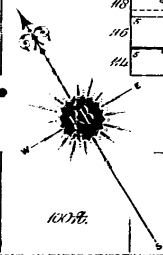
WEST 19th



WEST 18th



WEST 17th

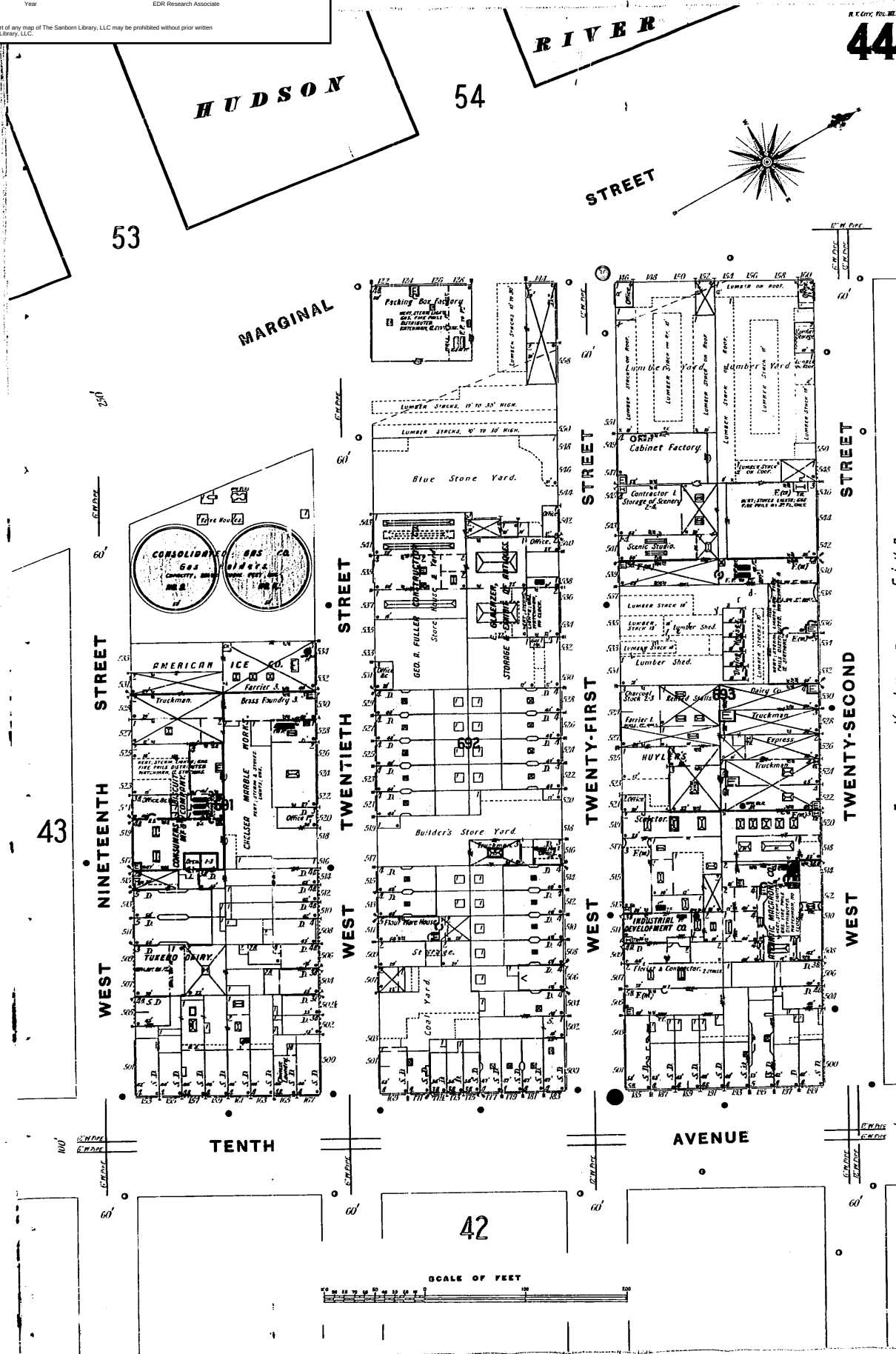


63



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41

43

TENTH

AVENUE

STREET

STREET

STREET

STREET

40

SIXTEENTH

SEVENTEENTH

EIGHTEENTH

NINETEENTH

42

WEST

WEST

WEST

WEST

NINTH

AVENUE

37

Scale of Feet.

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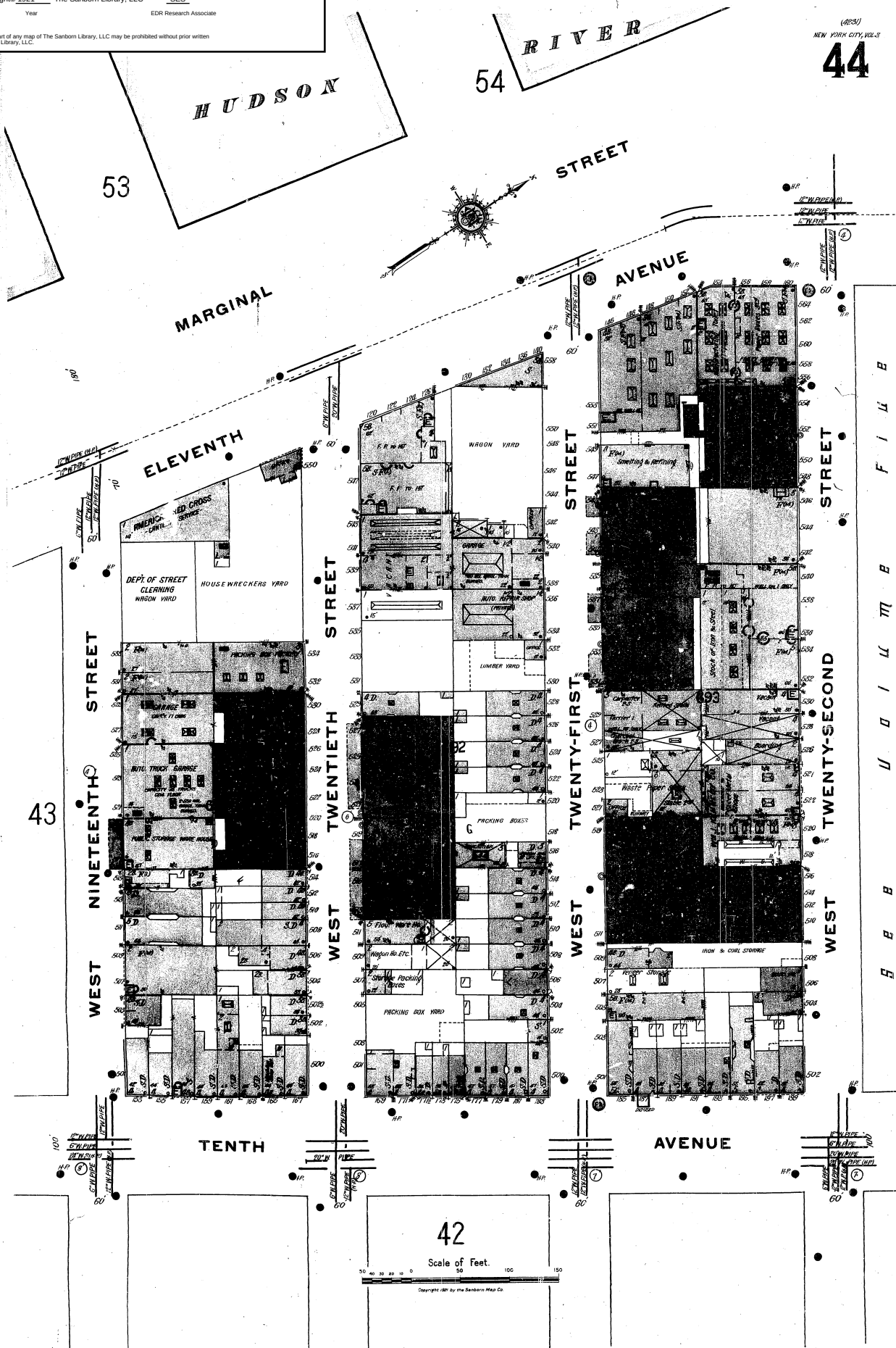
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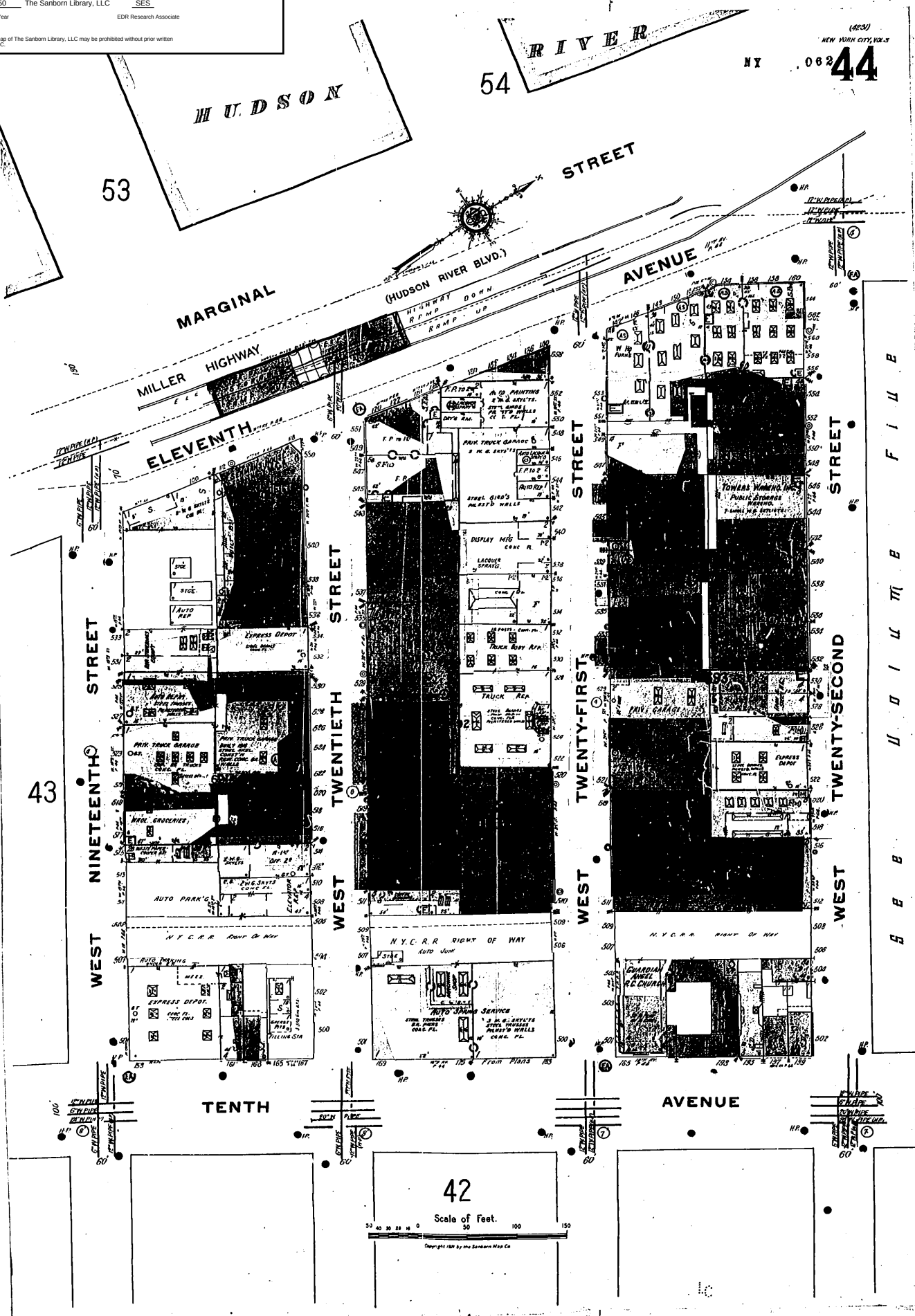




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41

NY 069

43

TENTH

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AVENUE

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Scale of Feet.

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AVENUE

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Scale of Feet

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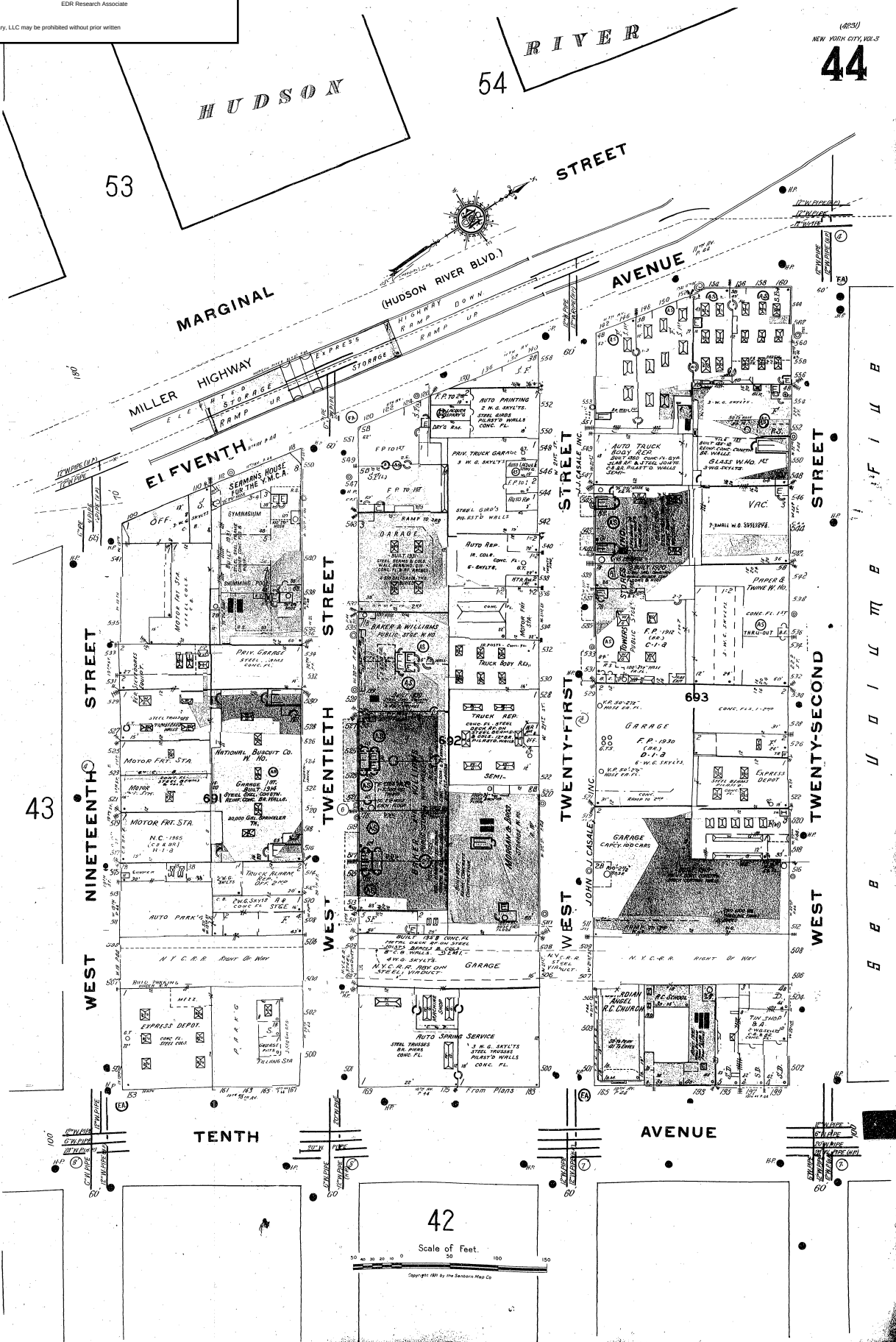
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Scale of Feet.

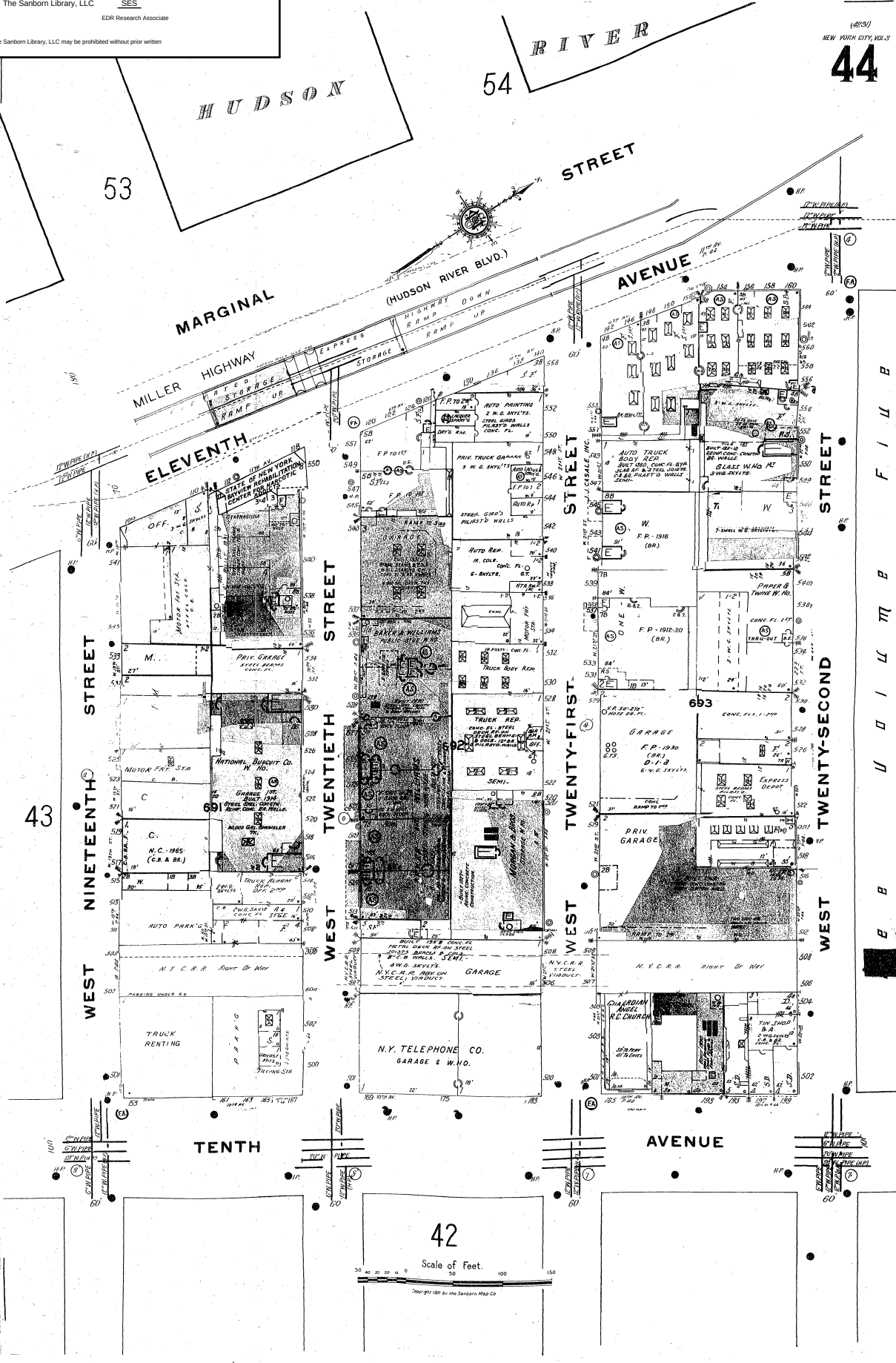
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WEST EIGHTEENTH

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STREET

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NINTH

AVENUE

37

Scale of Feet.

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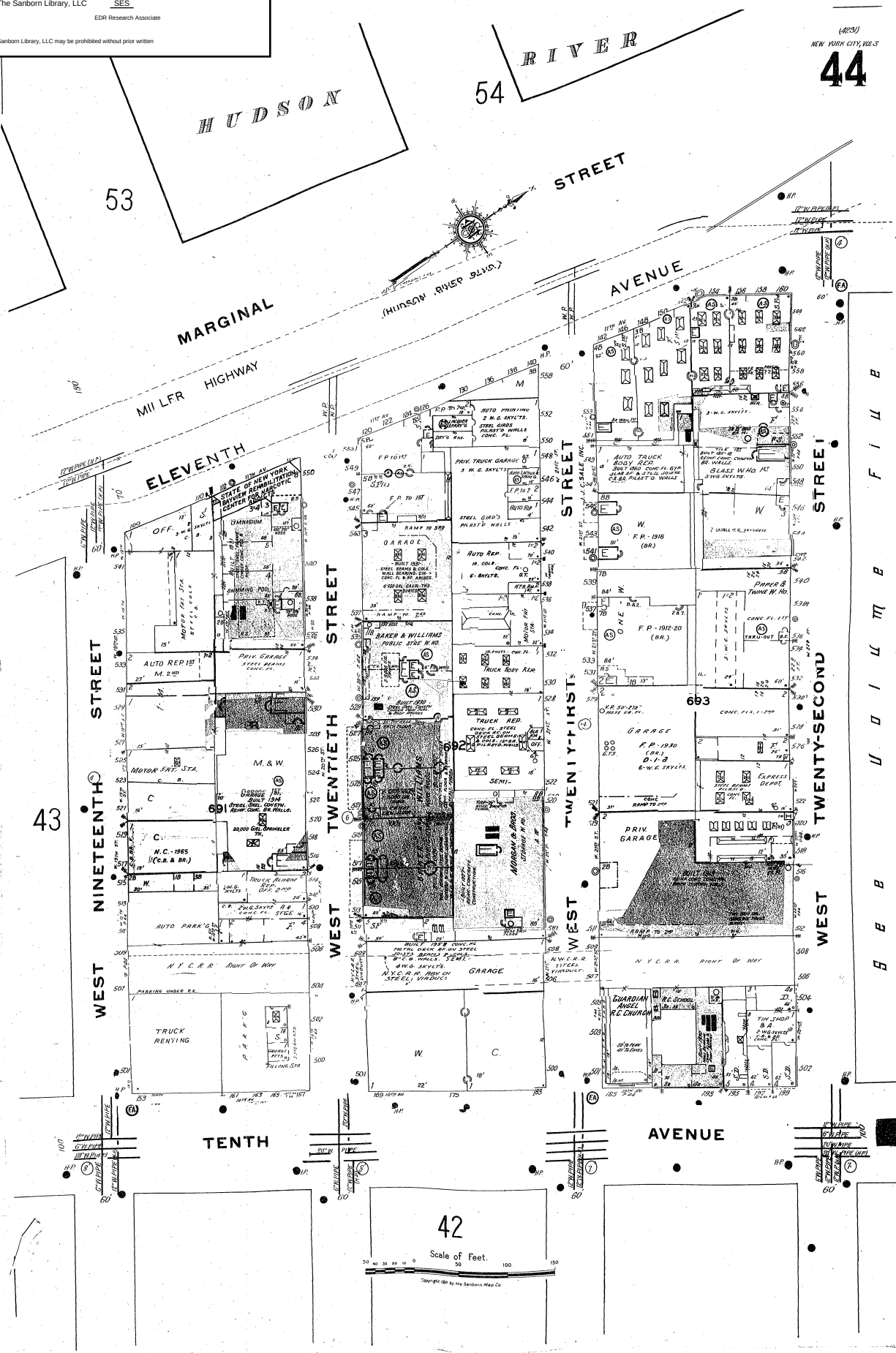
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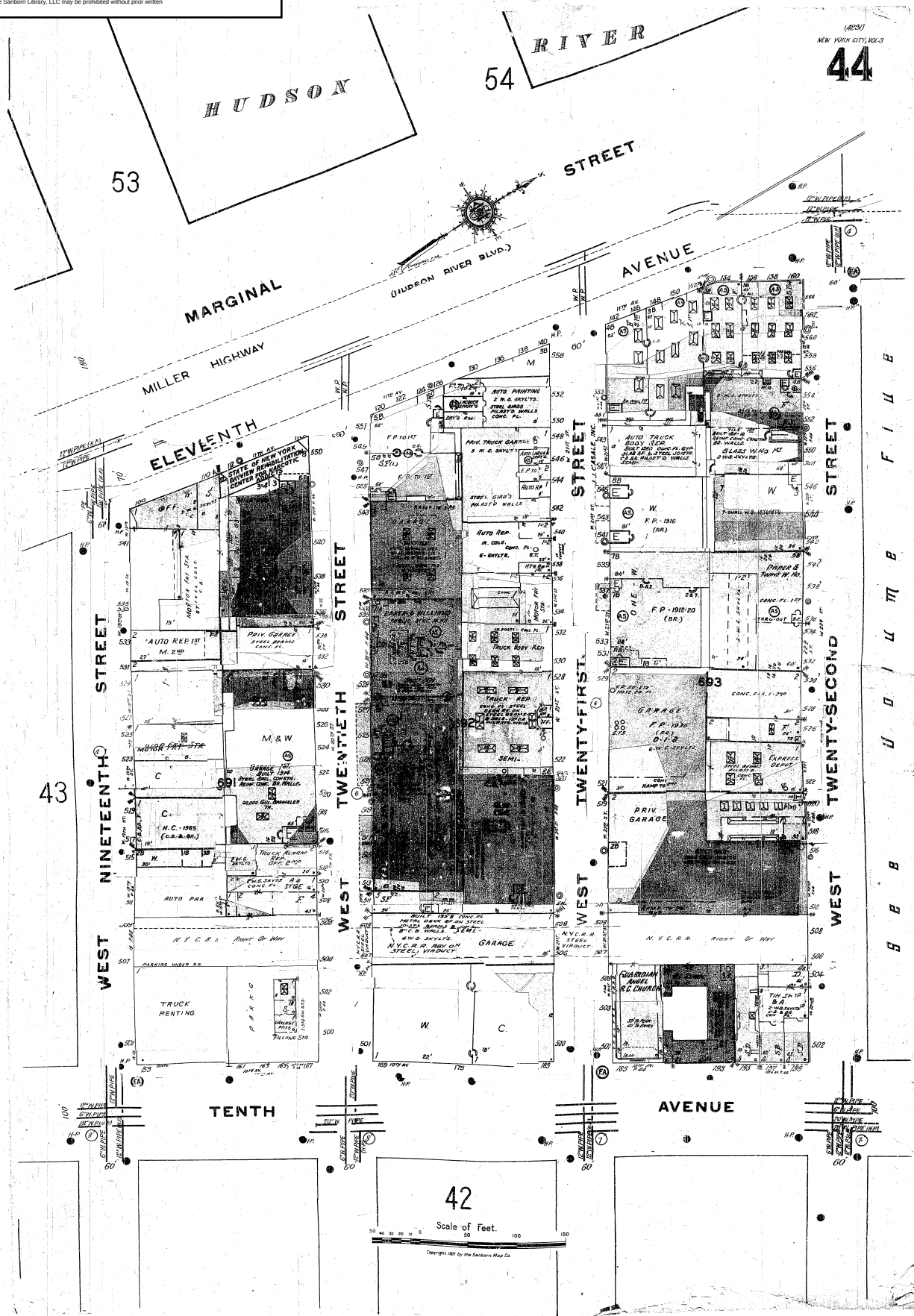


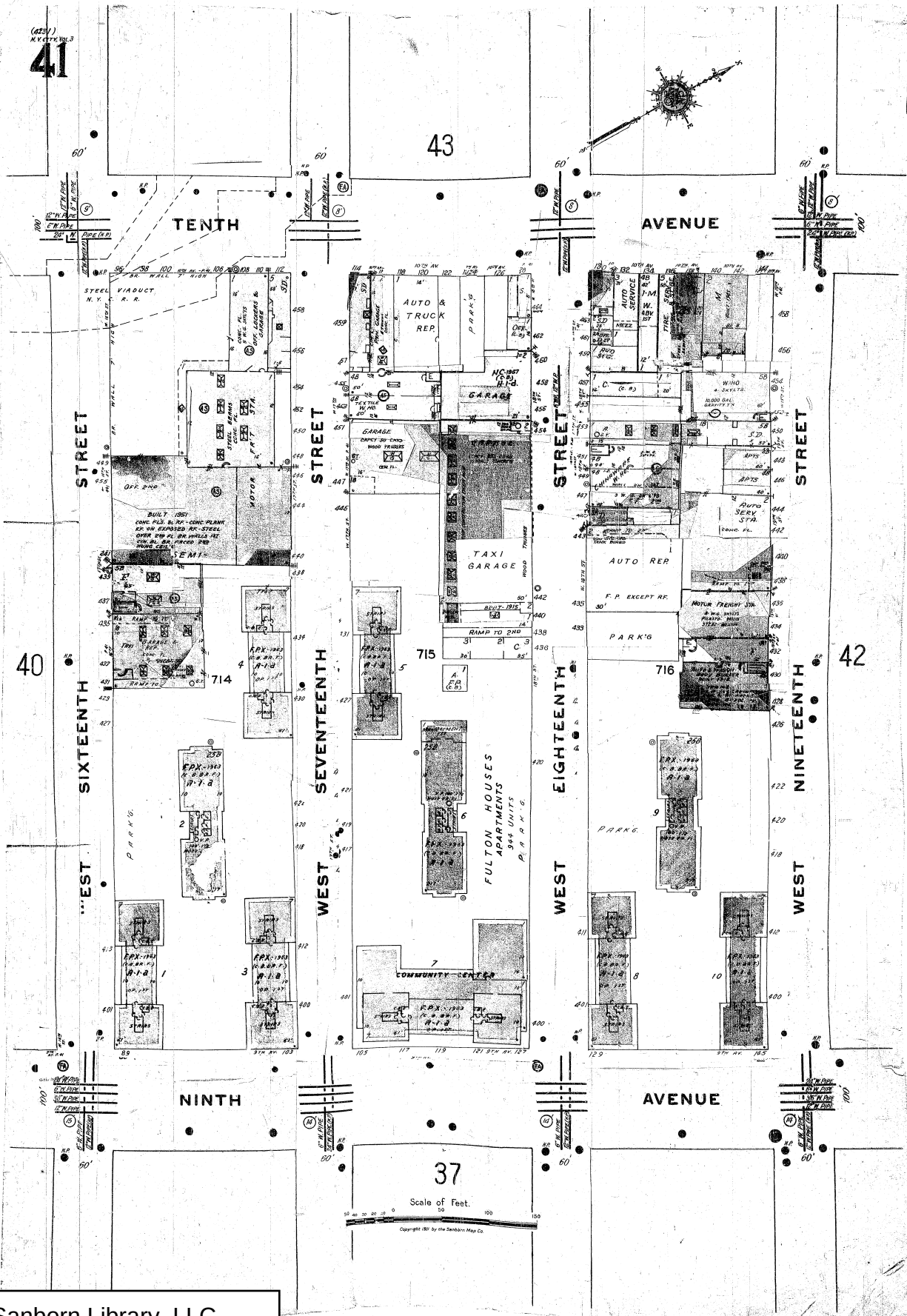


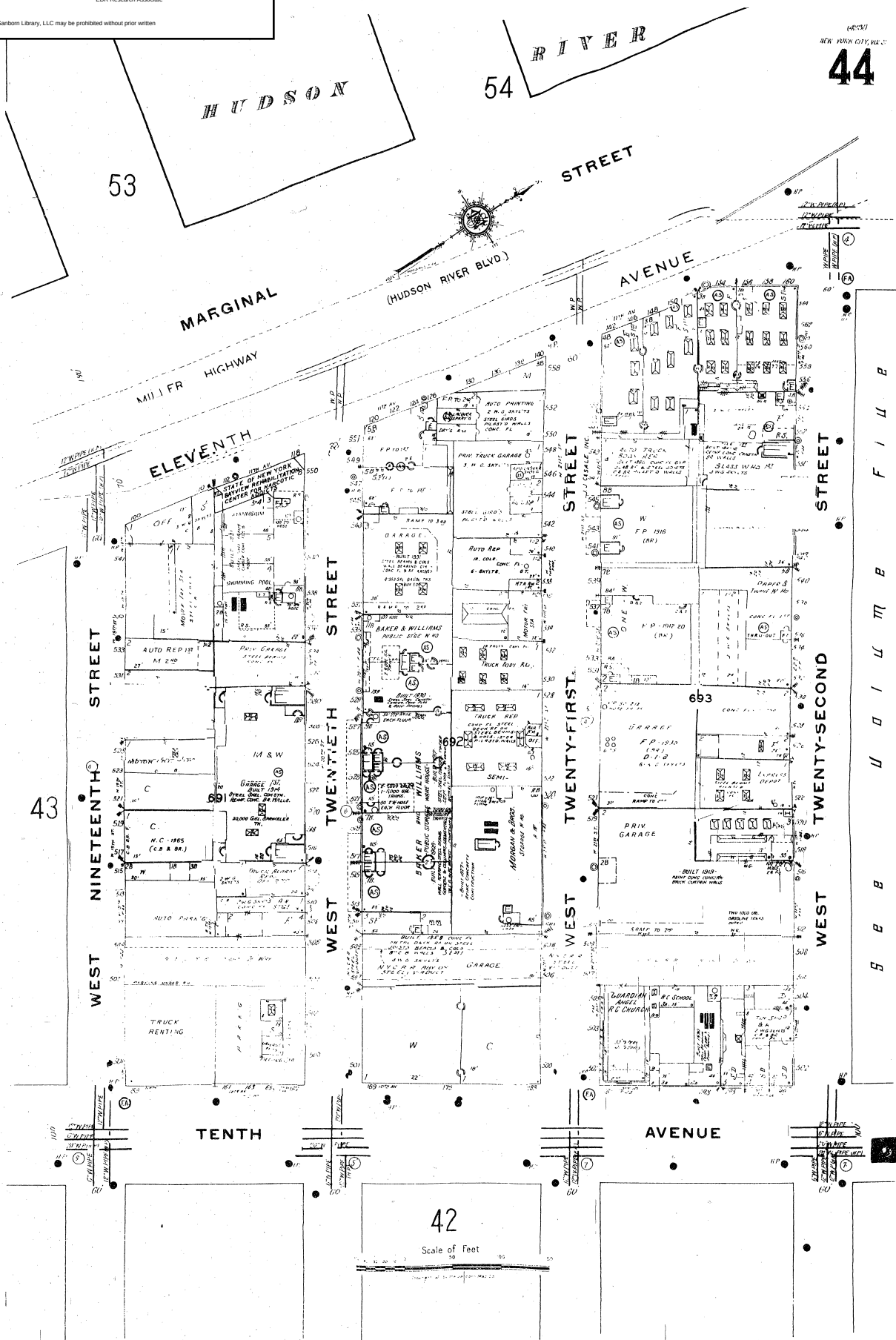
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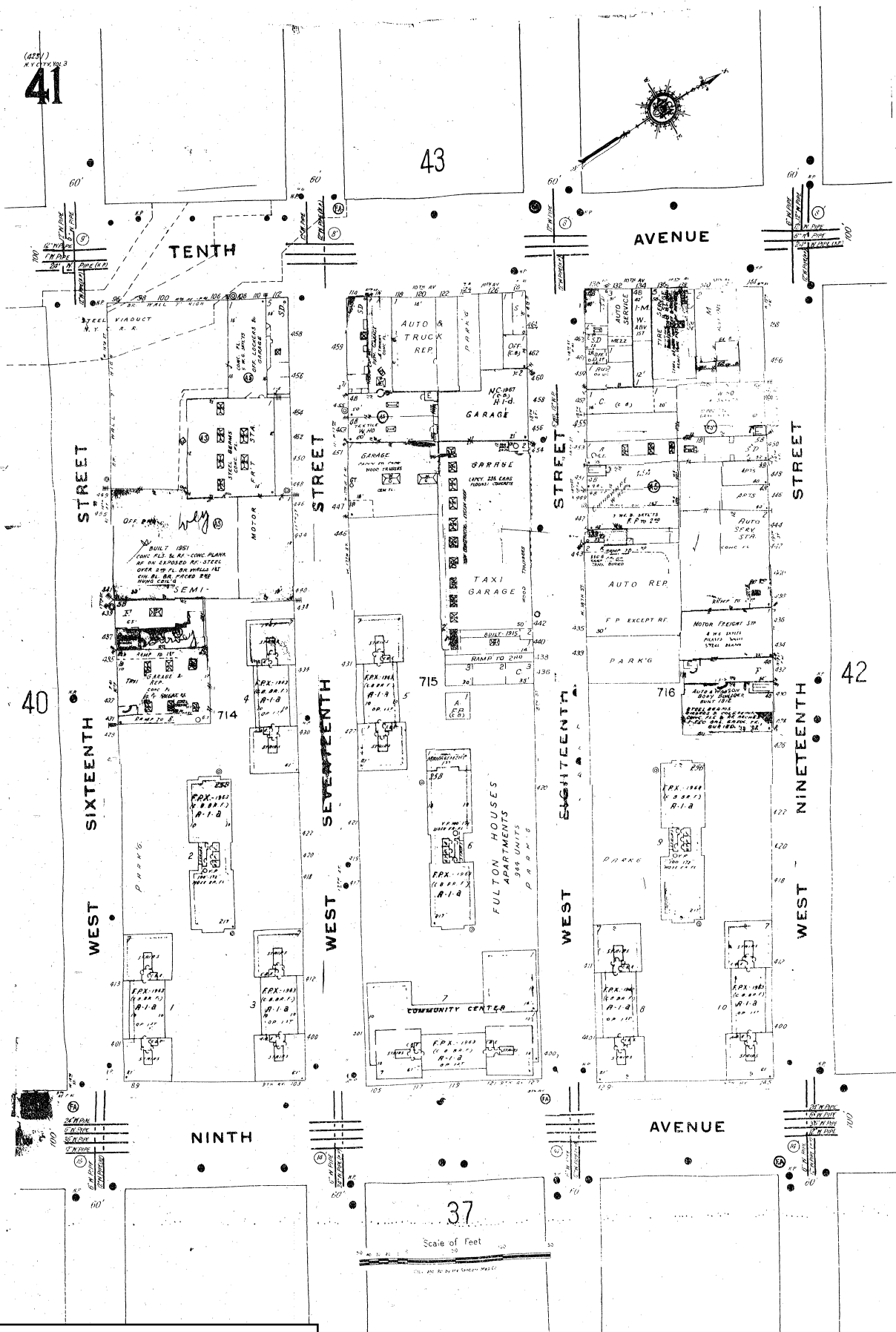
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RIVER

54

(423) NEW YORK CITY, VOL. 5

44

53

MARGINAL

HWY.

MILLER

ELEVENTH

WEST NINETEENTH STREET

43

WEST TWENTIETH STREET

WEST TWENTY-FIRST STREET

WEST TWENTY-SECOND STREET

F I U B

TENTH

AVENUE

42

Scale of Feet.

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41

43

AVENUE

TENTH

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STREET

STREET

40

WEST SIXTEENTH

WEST SEVENTEENTH

WEST EIGHTEENTH

WEST NINETEENTH

42

NINTH

AVENUE

37

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Appendix B

Well and Soil Boring Logs

Date Start/Finish: 9/5/08 Drilling Company: Boart Longyear Driller's Name: Matt White Drilling Method: Rotosonic Sampling Method: 4" X 2' corebarrel Rig Type: Mini-sonic	Northing: 696318.371 Easting: 629139.879 Casing Elevation: NA Borehole Depth: 32' bgs Surface Elevation: 13.12 Descriptions By: Craig Massaro	Well/Boring ID: SB-A Client: Consolidated Edison Company of New York, Inc. Location: Verizon Building Block 715, Lot 59 New York City, New York
--	--	--

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0								
		1	0-2	2	28			CONCRETE.	
					16			Brown fine to coarse SAND, some fine to coarse Gravel, trace Wood, Concrete and Schist, NVI, loose, dry, .	
		2	2-4	2	605	×		Brown fine to coarse SAND, some fine to coarse Gravel, trace Wood, Cobbles and Schist, moderate odor, loose, dry.	
					244				
-5	-5	3	4-6	2	64			Brown fine to coarse SAND, some Silt and fine to medium Gravel, trace Cobbles and Glass, faint odors, loose, moist.	
					9.3			Trace Wood, Cobbles and Schist from 3-4'.	
		4	6-8	1.4	41			Dark brown fine to medium SAND, little Silt, and fine to coarse Gravel, medium dense, faint odors, moist.	
					100				
		5	8-10	0.7	159	×		Dark brown fine to coarse SAND, little fine to coarse Gravel, trace Wood, moderate odors, loose, moist.	
-10	-10							Dark brown fine to coarse SAND, some fine to medium Gravel and Silt, trace Wood, faint odors, loose, moist.	
		6	10-12	0.6	72				
		7	12-14	NR	NA			No recovery.	
									
-15	-15	8	14-16	2	21			Olive gray fine to medium SAND, little fine to coarse Gravel and Silt, trace Wood, faint odors, medium dense, wet.	
					19				

Borehole backfilled with Bentonite to grade



Remarks: NVI = No Visual Impacts and no odor, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 2 to 2.5, 8 to 8.5, 21 to 21.5, and 31.5 to 32 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).

Site Location:

Borehole Depth: 32' bgs

Verizon Building
Block 715, Lot 59
New York City, New York

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
		9	16-18	NR	NA			No recovery.	
		10	18-20	NR	NA			No recovery. Material was very competent, slow drilling rate, <1" per second, possible holder bottom.	
20	-20	11	20-22	1.3	79 511	×		Olive gray fine to medium SAND, little Silt and Cobbles (Gneiss and Schist), trace Brick, some black staining from 20.8 - 21.2 only, strong odors, NVI from 21.2 - 21.3, medium dense, wet.	
		12	22-24	1.8	204 17.8			Olive gray fine to coarse SAND, some fine to medium Gravel and Silt, trace coarse Gravel, moderate odors, slightly cohesive, medium dense, wet.	
								Olive gray medium to coarse GRAVEL, trace coarse Gravel and Cobbles, faint odors, loose, wet.	
25	-25	13	24-26	NR	NA			No Recovery.	
		14	26-28	NR	NA			No Recovery, loose GRAVEL above, possible explanation for no recovery.	
		15	28-30	NR	NA			No Recovery, loose GRAVEL above, possible explanation for no recovery.	
30	-30	16	30-32	2	3.2 1.5	×		Gray brown fine to coarse GRAVEL, trace coarse Sand, NVI, very loose, wet.	
35	-35								

Borehole
backfilled with
Bentonite to
grade



Remarks: NVI = No Visual Impacts and no odor, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 2 to 2.5, 8 to 8.5, 21 to 21.5, and 31.5 to 32 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).

Date Start/Finish: 8/22/08 Drilling Company: Boart Longyear Driller's Name: John Graglia Drilling Method: Rotosonic Sampling Method: 4" X 2' corebarrel Rig Type: Mini-sonic	Northing: 696345.859 Easting: 629131.980 Casing Elevation: NA Borehole Depth: 20.5' bgs Surface Elevation: 13.26 Descriptions By: Craig Massaro	Well/Boring ID: SB-B Client: Consolidated Edison Company of New York, Inc. Location: Verizon Building Block 715, Lot 59 New York City, New York
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DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0	1	0-2	2	483	×		Brown medium to coarse SAND, some fine to coarse Gravel, trace fine Sand and Schist pieces, strong odors, slight staining, loose, dry.	Steel flushmount cover Locking J-Plug Concrete Pad (0-0.5' bgs) Sand Drain (0.5-1' bgs) Bentonite Seal (0-5' bgs) in SB-B1 2" Sch 40 PVC Riser (0.5-7' bgs) #1 Silica Sand Pack (5-11' bgs) in SB-B1 2" Sch 40 PVC 0.010" Slot Screen (7-11' bgs) in SB-B1 Bentonite Seal (0-13' bgs) in SB-B2 #1 Silica Sand Pack (13-16' bgs) in SB-B2 2" Sch 40 PVC 0.010" Slot Screen (14-16' bgs) in SB-B2
		2	2-4	2	8463	×			
					4875				
					9999				
-5	-5	3	4-6	2	4761				
					1523			Brown fine to medium SAND, some fine to coarse Gravel, trace Schist fragments, strong odors, moist.	
		4	6-8	NR	NA			No Recovery.	
		5	8-10	1	1981	×		Brown fine to coarse SAND, little fine to coarse Gravel, trace Silt, strong odors, loose, moist to wet.	
-10	-10	6	10-12	1.2	908			Brown fine to coarse SAND, some medium to coarse Gravel, trace Schist pieces, strong odors, medium dense, wet.	
					482				
		7	12-14	NR	NA			No Recovery.	
								Olive gray fine to medium SAND, little Silt and Mica flakes, NVI, medium dense, wet.	
-15	-15	8	14-16	1	0.0				

Infrastructure, environment, facilities	Remarks: NVI = No Visual Impacts and no odors, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery Sample collected at 1.5 to 2, 9.5 to 10 and 19.5 to 20 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total). Note that three separate wells were installed (SB-B1, SB-B2, and SB-B3) at different depths at SB-B to capture discreet groundwater zones.
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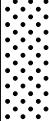
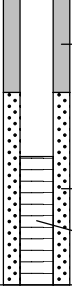
Client: Consolidated Edison Company of New York, Inc.

Well/Boring ID: SB-B

Site Location:

Verizon Building
Block 715, Lot 59
New York City, New York

Borehole Depth: 20.5' bgs

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
		9	16-18	1.8	0.0			Olive gray fine to coarse SAND, some fine to coarse Gravel and Mica flakes, NVI, loose, wet.	 Bentonite Seal (0-17' bgs) in SB-B3 #1 Silica Sand Pack (17-20.5' bgs) in SB-B3 2" Sch 40 PVC 0.010" Slot Screen (18.5-20.5' bgs) in SB-B3
		10	18-20	1.5	0.0			Olive gray fine to coarse GRAVEL, some medium to coarse Sand, trace Wood, NVI, loose, wet.	
20	-20					X		End of Boring at 20.5' bgs.	
25	-25								
30	-30								
35	-35								

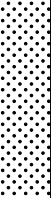
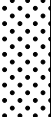
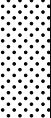


Remarks: NVI = No Visual Impacts and no odors, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 1.5 to 2, 9.5 to 10 and 19.5 to 20 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).

Note that three separate wells were installed (SB-B1, SB-B2, and SB-B3) at different depths at SB-B to capture discreet groundwater zones.

Date Start/Finish: 9/5/08 Drilling Company: Boart Longyear Driller's Name: Matt White Drilling Method: Rotosonic Sampling Method: 4" X 2' corebarrel Rig Type: Mini-sonic	Northing: 696374.327 Easting: 629126.729 Casing Elevation: NA Borehole Depth: 42' bgs Surface Elevation: 13.36 Descriptions By: Craig Massaro	Well/Boring ID: SB-C Client: Consolidated Edison Company of New York, Inc. Location: Verizon Building Block 715, Lot 59 New York City, New York
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DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0								
		1	0-2	NR	NA			CONCRETE.	Borehole backfilled with Bentonite to grade
		2	2-4	NR	NA			Brown fine to medium SAND, some fine to medium Gravel, trace Cobble at 3-5', NVI, loose, dry. 0.5 to 5.0' previously logged during hand clearance.	
-5	-5	3	4-6	2	4.6 8.8			Brown fine to coarse SAND, some fine to coarse Gravel, trace Brick and Glass, NVI, loose, dry.	
		4	6-8	2	12.6 4.3			Brown fine to coarse SAND, some fine to coarse Gravel, trace Brick and Glass, NVI, loose,dry.	
		5	8-10	2	749 861			Brown fine to coarse SAND, some medium to coarse Gravel, strong odors, trace staining from 9' - 10' bgs, medium dense, loose, moist.	
-10	-10	6	10-12	1.1	850 3580			Brown fine to coarse SAND, some fine to medium Gravel, trace coarse Gravel and Ceramic pieces, strong odors, trace staining throughout and sheen after shake test, moist.	
		7	12-14	1.5	2732 3747			Brown fine to coarse SAND, some fine to medium Gravel, trace coarse Gravel and Ceramic pieces, trace staining throughout, sheen after shake test, wet at 13.8' bgs.	
-15	-15	8	14-16	NR	N			No recovery.	

	Remarks: NVI = No Visual Impacts and no odors, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery Sample collected at 13.5 to 14, 21.5 to 22 and 35.5 to 36 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).
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Site Location:

Borehole Depth: 42' bgs

Verizon Building
Block 715, Lot 59
New York City, New York

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction					
20-20		9	16-18	2	2523	X		Brown medium to coarse SAND, fine to medium Gravel, trace Clay, strong odors, slight sheen after shake test, medium dense, wet.						
					NA			Brown fine to medium SAND, trace coarse Sand, strong odors, slight sheen after shake test, loose, wet.						
		10	18-20	1.3	2522			Brown fine SAND, and SILT, some Clay, strong odors, strong odors, slight sheen after shake test, very dense, wet.						
					2132			Brown fine to medium SAND, some coarse Sand, strong odors, loose, wet.						
					11			20-22		2	1900		Coarse Sand, lense from 21.8 - 22' bgs.	
											1980			
		25-25		12	22-24		1	30			Reddish brown fine to medium SAND, little Silt and fine Gravel, trace Clay, faint odors, medium dense, wet.			
								13			24-26	1	212	Reddish brown medium to coarse SAND, little fine to medium Gravel, trace fine Sand and Silt, moderate odors, loose, wet.
				14	26-28		1						238	Reddish brown medium to coarse SAND, trace fine Gravel, moderate odors, very loose, wet.
													15	28-30
16	30-32			1.5	7.8		Reddish brown fine to medium SAND, little Silt, trace fine Gravel, NVI, very loose, wet.							
					8.9									
30-30		17	32-34	NR	NA		No recovery. Measured to bottom of hole (33.5').							
					35-35			18	34-36	1.4	6.1		Reddish brown fine to coarse SAND, little fine to medium Gravel, trace Silt, faint odors, very loose, wet.	
2.3	X													



Remarks: NVI = No Visual Impacts and no odors, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 13.5 to 14, 21.5 to 22 and 35.5 to 36 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).

Client: Consolidated Edison Company of New York, Inc.

Well/Boring ID: SB-C

Site Location:

Borehole Depth: 42' bgs

Verizon Building
Block 715, Lot 59
New York City, New York

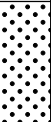
DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
		19	36-38	NR	NA			No recovery	Borehole backfilled with Bentonite to grade
		20	38-40	NR	NA			No recovery	
40	-40	21	40-42	NR	NA			No recovery, with the exception of a handful of fine to coarse Gravel, NVI, wet.	
45	-45								
50	-50								
55	-55								



Remarks: NVI = No Visual Impacts and no odors, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 13.5 to 14, 21.5 to 22 and 35.5 to 36 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).

Date Start/Finish: 9/4/08 Drilling Company: Boart Longyear Driller's Name: Matt White Drilling Method: Rotosonic Sampling Method: 4" X 2' corebarrel Rig Type: Mini-sonic	Northing: 696340.325 Easting: 629053.258 Casing Elevation: NA Borehole Depth: 26' bgs Surface Elevation: 13.59 Descriptions By: Craig Massaro	Well/Boring ID: SB-D Client: Consolidated Edison Company of New York, Inc. Location: Verizon Building Block 715, Lot 59 New York City, New York
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DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0								
		1	0-2		0.0			CONCRETE.	Borehole backfilled with Bentonite to grade
					0.0			Brown fine to coarse SAND, little fine to coarse Gravel, trace Concrete, NVI, loose, dry.	
			0-4	2	0.0				
		2	2-4		0.0				
					0.0				
-5	-5	3	4-6	1.5	4.6			Conglomerate rock.	
					12.2			Brown fine to coarse SAND, little fine to coarse Gravel, NVI, loose, dry.	
		4	6-8	2	0.9			Dark brown/olive gray fine to coarse SAND, some fine to coarse Gravel, trace Brick chunks, NVI, loose, moist at 7' bgs.	
					7.4				
		5	8-10	1.5	0.0			Dark brown/olive gray fine to coarse SAND, some fine to coarse Gravel, trace Brick chunks, NVI, loose, moist.	
-10	-10				0.0				
		6	10-12	1.3	0.0			Dark brown/olive gray fine to coarse SAND, little fine to coarse Gravel, trace Silt, NVI, moist.	
					0.0	×			
		7	12-14	NR	NA			No recovery.	
-15	-15	8	14-16	1.5	0.0			Olive gray medium to coarse SAND, little fine Gravel, NVI, loose, wet.	
					0.0				

	Remarks: NVI = No Visual Impacts, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery Sample collected at 11.5 to 12 and 23.5 to 24 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).
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Site Location:

Borehole Depth: 26' bgs

Verizon Building
Block 715, Lot 59
New York City, New York

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
20	-20	9	16-18	0.5	8.7			Olive gray fine to coarse SAND, some Quartz and Schist rock pieces > 2", NVI, wet.	Borehole backfilled with Bentonite to grade
		10	18-20	0.6	0.0			Black/gray SCHIST medium to coarse fractured pieces ranging in size from fine gravel size to 4", NVI, wet.	
		11	20-22	1.0	4.8			Olive gray fine to coarse SAND, some Gneiss and Schist rock pieces ranging in size from 2" to 4", trace Wood pieces, NVI, wet.	
		12	22-24	1.5	10.3			Olive gray fine to coarse SAND, some Gneiss and Schist rock pieces, NVI, loose, wet.	
					18.4			Brown fine to coarse GRAVEL, some fine to coarse Sand, trace Silt, NVI, loose, wet.	
					4.6			Brown medium to coarse SAND, trace fine Gravel, medium dense, NVI, wet.	
25	-25	13	24-26	NR	NA			No recovery, except for 4 pieces of Gravel ranging from fine to coarse in size, NVI, wet.	
30	-30								
35	-35								



Remarks: NVI = No Visual Impacts, bgs = Below Grade Surface,
NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 11.5 to 12 and 23.5 to 24 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).

Date Start/Finish: 8/20/08 - 8/21/08 Drilling Company: Boart Longyear Driller's Name: John Graglia Drilling Method: Rotosonic Sampling Method: 4" X 2' corebarrel Rig Type: Mini-sonic	Northing: 696382.049 Easting: 629088.454 Casing Elevation: 12.95 Borehole Depth: 21' bgs Surface Elevation: 13.2 Descriptions By: Craig Massaro	Well/Boring ID: Well Cluster A Client: Consolidated Edison Company of New York, Inc. Location: Verizon Building Block 715, Lot 59 New York City, New York
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DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
15									
0									Steel flushmount cover
									Locking J-Plug
								CONCRETE	Concrete Pad (0-0.5' bgs)
					1.2			Brown fine to coarse SAND, some medium to coarse Gravel and Brick.	Sand Drain (0.5-1' bgs)
					3.2			Hand cleared with air knife and vacuum.	
10		1	0-5	5	2.1				Bentonite Seal (0-5' bgs) in A1
					0.8				2" Sch 40 PVC Riser (0.5'-7' bgs)
					0.6				
5		2	5-6	1	1.1			Brown fine to coarse SAND, some medium to coarse Gravel and Brick, NVI.	
								Brown fine to coarse SAND, some medium to coarse Gravel, trace Clay and Wood, soils stained from 1' - 2', moist.	
5		3	6-12	2	248				#1 Silica Sand Pack (5-11' bgs) in SB-B1
10					2042				2" Sch 40 PVC 0.010" Slot Screen (7-11' bgs) in A1
						×			
0		4	12-15	NR	NA			NR	Bentonite Seal (0-12.5' bgs) in A2
									#1 Silica Sand Pack (12.5-15.5' bgs) in A2
15		5	15-17	1.5	638 338			Dark brown medium to coarse SAND, some fine to medium Gravel, trace coarse Gravel, loose, NVI, wet.	2" Sch 40 PVC 0.010" Slot Screen (13.5-15.5' bgs) in A2

	Remarks: NVI = No Visual Impacts, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery Sample collected at 11.5 to 12, 16.5 to 17 and 20 to 20.5 feet bgs and analyzed for VOCs, SVOCs, CN (amenable/total). Note that three separate wells were installed (Well Cluster A1, A2, and A3) at different depths at Well Cluster A to capture discreet groundwater zones.
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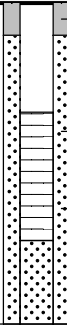
Client: Consolidated Edison Company of New York, Inc.

Well/Boring ID: Well Cluster A

Site Location:

Verizon Building
Block 715, Lot 59
New York City, New York

Borehole Depth: 21' bgs

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
		5	15-17	1.5	683	×		Dark brown medium to coarse SAND, some fine to medium Gravel, trace coarse Gravel, loose, NVI, wet.	 Bentonite Seal (0-16.5' bgs) in A3 #1 Silica Sand Pack (16.5-21' bgs) in A3 2" Sch 40 PVC 0.010" Slot Screen (17.7-19.7' bgs) in A3
-5		6	17-20	3	88 45			Olive gray fine to coarse GRAVEL, subrounded, some medium to coarse Sand and Wood, loose, wet.	
20		7	20-21	1	83 21	×		Brown subangular fine to medium Gravel with pulverized Concrete, NVI, dry.	
								END OF BORING AT 21' bgs	
-10									
25									
-15									
30									
-20									
35									



Remarks: NVI = No Visual Impacts, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 11.5 to 12, 16.5 to 17 and 20 to 20.5 feet bgs and analyzed for VOCs, SVOCs, CN (amenable/total).

Note that three separate wells were installed (Well Cluster A1, A2, and A3) at different depths at Well Cluster A to capture discreet groundwater zones.

Date Start/Finish: 8/22/08 Drilling Company: Boart Longyear Driller's Name: John Graglia Drilling Method: Rotosonic Sampling Method: 4" X 2' corebarrel Rig Type: Mini-sonic	Northing: 696345.859 Easting: 629131.980 Casing Elevation: 12.89 Borehole Depth: 20.5' bgs Surface Elevation: 13.26 Descriptions By: Craig Massaro	Well/Boring ID: Well Cluster B Client: Consolidated Edison Company of New York, Inc. Location: Verizon Building Block 715, Lot 59 New York City, New York
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DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
15									
0									Steel flushmount cover
									Locking J-Plug
		1	0-2	2	483	X		Brown medium to coarse SAND, some fine to coarse Gravel, trace fine Sand and Schist pieces, strong odors, slight staining, loose, dry.	Concrete Pad (0-0.5' bgs)
					8463				
									Sand Drain (0.5-1' bgs)
10		2	2-4	2	4875				Bentonite Seal (0-5' bgs) in SB-B1
					9999				
									2" Sch 40 PVC Riser (0.5'-7' bgs)
5		3	4-6	2	4761			Brown fine to medium SAND, some fine to coarse Gravel, trace Schist fragments, strong odors, moist.	
					1523				
								No Recovery.	
		4	6-8	NR	NA				
5		5	8-10	1	1981	X		Brown fine to coarse SAND, little fine to coarse Gravel, trace Silt, strong odors, loose, moist to wet.	#1 Silica Sand Pack (5-11' bgs) in SB-B1
									2" Sch 40 PVC 0.010" Slot Screen (7-11' bgs) in SB-B1
10		6	10-12	1.2	908			Brown fine to coarse SAND, some medium to coarse Gravel, trace Schist pieces, strong odors, medium dense, wet.	
					482				
								No Recovery.	Bentonite Seal (0-13' bgs) in SB-B2
0		7	12-14	NR	NA				#1 Silica Sand Pack (13-16' bgs) in SB-B2
15		8	14-16	1	0.0			Olive gray fine to medium SAND, little Silt and Mica flakes, NVI, medium dense, wet.	2" Sch 40 PVC 0.010" Slot Screen (14-16' bgs) in SB-B2

	Remarks: NVI = No Visual Impacts and no odors, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery Sample collected at 1.5 to 2, 9.5 to 10 and 19.5 to 20 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total). Note that three separate wells were installed (SB-B1, SB-B2, and SB-B3) at different depths at SB-B to capture discreet groundwater zones.
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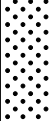
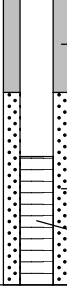
Client: Consolidated Edison Company of New York, Inc.

Well/Boring ID: Well Cluster B

Site Location:

Verizon Building
Block 715, Lot 59
New York City, New York

Borehole Depth: 20.5' bgs

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
		9	16-18	1.8	0.0			Olive gray fine to coarse SAND, some fine to coarse Gravel and Mica flakes, NVI, loose, wet.	 Bentonite Seal (0-17' bgs) in SB-B3 #1 Silica Sand Pack (17-20.5' bgs) in SB-B3 2" Sch 40 PVC 0.010" Slot Screen (18.5-20.5' bgs) in SB-B3
-5		10	18-20	1.5	0.0			Olive gray fine to coarse GRAVEL, some medium to coarse Sand, trace Wood, NVI, loose, wet.	
20						X		End of Boring at 20.5' bgs.	
-10									
25									
-15									
30									
-20									
35									



Remarks: NVI = No Visual Impacts and no odors, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 1.5 to 2, 9.5 to 10 and 19.5 to 20 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).

Note that three separate wells were installed (SB-B1, SB-B2, and SB-B3) at different depths at SB-B to capture discreet groundwater zones.

Date Start/Finish: 8/26/08 Drilling Company: Boart Longyear Driller's Name: Matt White Drilling Method: Rotosonic Sampling Method: 4" X 2' corebarrel Rig Type: Mini-sonic	Northing: 696343.789 Easting: 629098.528 Casing Elevation: 13.05 Borehole Depth: 25' bgs Surface Elevation: 13.34 Descriptions By: Craig Massaro	Well/Boring ID: Well Cluster C Client: Consolidated Edison Company of New York, Inc. Location: Verizon Building Block 715, Lot 59 New York City, New York
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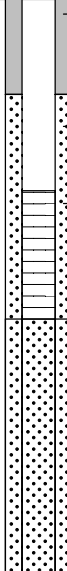
DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0								
		1	0-3	2.6	3.4 1.8 0.4			CONCRETE Brown medium to coarse SAND, some fine to coarse angular - subangular Gravel, trace Cobbles, NVI, loose, dry.	Steel flushmount cover Locking J-Plug Concrete Pad (0-0.5' bgs) Sand Drain (0.5-1' bgs)
		2	3-5	2	3.5 2.8			Brown medium to coarse SAND, some fine to medium Gravel, trace Cobbles, NVI, loose, moist.	Bentonite Seal (0-5' bgs) in C1 2" Sch 40 PVC Riser (0.5'-7' bgs)
-5	-5	3	5-7	1.3	10.8 15.7			Olive gray fine to coarse SAND, little fine to coarse Gravel, trace Schist pieces (<1"), NVI, medium dense, moist.	
		4	7-9	NR	NA			No recovery. Measured borehole after pulling core barrel. 9' measurement to bottom, suggesting material was pushed out of the way, (loose soil).	#1 Silica Sand Pack (5-11' bgs) in C1
-10	-10	5	9-11	0.8	24.8	×		Olive gray fine to coarse SAND, little fine to medium Gravel, trace Schist, NVI, moist.	2" Sch 40 PVC 0.010" Slot Screen (7-11' bgs) in C1
		6	11-13	2	11.8 17.2			Olive gray fine to coarse SAND, little fine to medium Gravel, trace coarse Gravel, NVI, medium dense, wet.	Bentonite Seal (0-12.5' bgs) in C2
		7	13-15	2	2.5 2.4			Olive gray fine to coarse SAND, some fine to coarse angular Gravel, trace Schist pieces throughout, NVI, medium dense, wet.	#1 Silica Sand Pack (12.5-15.5' bgs) in C2
-15	-15	8	15-17	0.9	NA			Olive gray medium to coarse SAND, some fine to medium Gravel, trace coarse angular Gravel, 1 piece of Sandstone <2", NVI, loose, wet.	2" Sch 40 PVC 0.010" Slot Screen (13.5-15.5' bgs) in C2

	Remarks: NVI = No Visual Impacts, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery Sample collected at 10.5 to 11 and 20.5 to 21 feet bgs and analyzed for VOCs, SVOCs, CN, (amenable/total). Note that three separate wells were installed (Well Cluster C1, C2, and C3) at different depths at Well Cluster C to capture discreet groundwater zones.
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Site Location:

Borehole Depth: 25' bgs

Verizon Building
Block 715, Lot 59
New York City, New York

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
20 -20		8	15-17	0.9	NA			Olive gray medium to coarse SAND, some fine to medium Gravel, trace coarse angular Gravel, 1 piece of Sandstone <2", NVI, loose, wet.	
		9	17-19	0.9	0.8			Weathered fractured SCHIST pieces, some fine to medium Sand and Silt, NVI, wet.	
					0.6				
		10	19-21	1.5	151		X	Olive gray fine to medium SAND, little angular fine to coarse Gravel, trace Silts, Clays, and Wood pieces, Brick (2" piece) at 21', soils stained.	
					787			Olive gray fine to medium SAND, trace Silt, Clay and Concrete pieces, NVI, loose, moist.	
		11		1.5	232			Resistance and evidence of concrete chunk suggests bottom of holder, however no pulverized layers of concrete observed.	
12		0.6	NA		Fractured cored rock, Granitic, NVI.				
							End of boring at 25 bgs.		
25 -25									
30 -30									
35 -35									



Remarks: NVI = No Visual Impacts, bgs = Below Grade Surface,
NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 10.5 to 11 and 20.5 to 21 feet bgs and analyzed for VOCs, SVOCs, CN, (amenable/total).

Note that three separate wells were installed (Well Cluster C1, C2, and C3) at different depths at Well Cluster C to capture discrete groundwater zones.

Well, Soil Boring and Test Pit Logs from the Site Characterization Study

Site Characterization Study Report for the Former West 18th Street Gas Works
Manhattan, New York

TRC Environmental Corporation, January 2006

BORING LOG

BORING No.: SB-1
SHEET 1 OF 1

JOB NAME/ CLIENT W18th St MGP SCS/Con Edison		PROJECT NO. 41318-0700-10000	AREA OF SITE SE of Former Gas Holder #1
ADDRESS Verizon Building on W 18th Street b/w 9th and 10th Ave		ELEVATION/DATUM 21.97/NAVD 88	
DRILLING CONTRACTOR Fenley and Nicol Environmental, Inc.		DRILLER Kevin Kegel	TRC INSPECTOR Jessica Elliott
DRILLING RIG Simco Earthprobe 200		TYPE/SIZE BIT N/A	START DATE 5/14/2005
SAMPLER TYPE 2' discrete sampler		HAMMER WEIGHT/DROP N/A	END DATE 5/14/2005
		TOTAL DEPTH (feet below ground surface (ft bgs)) 6.5'	WATER LEVEL (ft bgs) N/A

WELL	CONSTRUCTION	SAMPLES			DEPTH	WATER	DESCRIPTION OF SOILS	REMARKS
		NUMBER	RECOVERY	BLOWS				
			IN FEET	PER 6"			f - fine lt - light m - medium dk - dark c - coarse tr - trace l - little sl - slight	(PID, STAINING, ODORS, ETC.) N/S = No Staining N/O = No odors
					1		0'-0.3': CONCRETE and rebar.	0.3'-2': N/O, N/S PID (headspace) = 3.7 ppm max.
					3		0.3'-2.0': Fill-Brown f to m SAND, GRAVEL, rock fragments, slag and coal fragments.	
							2.0'-4.0': Fill-Lt brown very f SAND.	2'-3': N/O, N/S PID (headspace) = 2.5 ppm max.
					5		4.0'-5.0': Fill-Brown f to m SAND.	3'-4': N/O, N/S PID (headspace) = 3.5 ppm max.
							Sample collected: W18STMGP-SB2-57	4'-5': N/O, N/S PID (headspace) = 1.8 ppm max.
							5.0'-6.0': No recovery.	
					7		6.0'-6.5': Hard rock.	
							E.O.B. at 6.5' bgs (Refusal due to rock at 6.0' bgs)	
					9			
					11			
					13			
					15			
					17			

BORING LOG

BORING No.: SB-2
SHEET 1 OF 2

JOB NAME/ CLIENT W18th St MGP SCS/Con Edison	PROJECT NO. 41318-0700-10000	AREA OF SITE Inside Former Gas Holder #1	
ADDRESS Verizon Building on W 18th Street b/w 9th and 10th Ave		ELEVATION/DATUM 12.98/ NAVD 88	
DRILLING CONTRACTOR Fenley and Nicol Environmental, Inc.	DRILLER Kevin Kegel	TRC INSPECTOR Amy Klimek	
DRILLING RIG Simco Earthprobe 200	TYPE/SIZE BIT N/A	START DATE 5/6/2005	END DATE 5/6/2005
SAMPLER TYPE 2' discrete sampler	HAMMER WEIGHT/DROP N/A	TOTAL DEPTH (feet below ground surface (ft bgs)) 20.5'	WATER LEVEL (ft bgs) 13'

WELL	CONSTRUCTION	SAMPLES			DEPTH	WATER	DESCRIPTION OF SOILS f - fine m - medium c - coarse lt - light dk - dark tr - trace ltl - little sl - slight	REMARKS (PID, STAINING, ODORS, ETC.) N/S = No Staining N/O = No odors
		NUMBER	RECOVERY IN FEET	BLOWS PER 6"				
					1		0'-0.8': CONCRETE and rebar.	
							0.8'-2.0': Fill-Lt brown-gray f to c SAND, GRAVEL and rock (schist) fragments. Sample collected: W18STMGP-SB2-11.5	0.8'-2': Strong gasoline-like odor, N/S PID = 22.1 ppm max.
					3		2.0'-5.0': Fill-Brown f to c SAND, some gravel, rock (schist) fragments, cobbles, tr silt and brick fragments.	2'-3': N/O, N/S PID = 11.8 ppm max.
								3'-4': N/O, N/S PID = 8.0 ppm max.
					5			4'-5': N/O, N/S PID = 5.1 ppm max.
		1	0.4'				5.0'-5.4': Fill-Dk brown SILT, f SAND, CLAY and some gravel. Sample collected: W18STMGP-SB2-57	5'-7': N/O, N/S PID = 5.7 ppm max.
					7		7.0'-7.4': Fill-Dk brown m SAND, some silty, gravel, cobbles and tr clay.	
		2	0.4'					7'-9': N/O, N/S PID = 1.0 ppm max.
					9			
		3	0.7'				9.0'-9.7': Fill-Dk brown-black SILT, f SAND, some clay, asphalt and gravel.	9'-11': N/O, N/S PID = 1.0 ppm max.
					11			
		4	0.9'				11.0'-11.9': Fill-Dk brown-black SILT, f SAND, some cobbles and intermittent clay.	11'-13': N/O, N/S PID = 0.1 ppm max.
					13			
		5	1.0'				13.0'-13.5': Fill-Dk brown-black SILT, f SAND, some cobbles, gravel and asphalt. Sample collected: W18STMGP-SB2-1315	13'-15': Petroleum odor, N/S PID = 0.8 ppm max.
							13.5'-14.0': Fill-Dk brown SILT, f SAND, some clay and tr m sand.	
					15			
		6	0.7'				15.0'-15.7': Fill-Dk brown SILT, f SAND and some clay.	15'-17': MGP-related odor, N/S PID = 0.5 ppm max.
					17			
		7	0.5'				17.0'-17.5': Fill-Dk brown-black SILT, f SAND, some clay, cobbles, wood fibers and mica schist fragments.	17'-19': Strong MGP-related odor, N/S PID = 124 ppm max.

TRC

BORING LOG

JOB NAME/ CLIENT W18th St MGP SCS/Con Edison		PROJECT NO. 41318-0700-10000		AREA OF SITE Inside Former Gas Holder #1	
ADDRESS Verizon Building on W 18th Street b/w 9th and 10th Ave		ELEVATION/DATUM 12.98/NAVD 88			
DRILLING CONTRACTOR Fenley and Nicol Environmental, Inc.		DRILLER Kevin Kegel		TRC INSPECTOR Amy Klimek	
DRILLING RIG Simco Earthprobe 200		TYPE/SIZE BIT N/A		START DATE 5/6/2005	
SAMPLER TYPE 2' discrete sampler		HAMMER WEIGHT/DROP N/A		TOTAL DEPTH (feet below ground surface (ft bgs)) 20.5'	
				WATER LEVEL (ft bgs) 13'	

WELL	CONSTRUCTION	SAMPLES			DEPTH	WATER	DESCRIPTION OF SOILS	REMARKS (PID, STAINING, ODORS, ETC.) N/S = No Staining N/O = No odors
		NUMBER	RECOVERY IN FEET	BLOWS PER 6"				
		8	0.5'		19		19.0'-19.5': Fill-Black SILT, f SAND, some cobbles, tr clay, organic matter and wood fibers. Sample collected: W18STMGP-SB2-1920.5	19'-21': Strong MGP-related odor, N/S PID = 19.2 ppm max.
					21		E.O.B. at 20.5' bgs (Refusal due to rocks. Possible bottom of Former Gas Holder #2 at 20.5' bgs)	
					23			
					25			
					27			
					29			
					31			
					33			
					35			

TRC

BORING LOG

BORING No.: SB-3

SHEET 1 OF 2

JOB NAME/ CLIENT W18th St MGP SCS/Con Edison	PROJECT NO. 41318-0700-10000	AREA OF SITE SE of Former Gas Holder #2 and SW of Former Gas Holder #1	
ADDRESS Verizon Building on W 18th Street b/w 9th and 10th Ave		ELEVATION/DATUM 13.60/NAVD 88	
DRILLING CONTRACTOR Fenley and Nicol Environmental, Inc.	DRILLER Kevin Kegel	TRC INSPECTOR Amy Klimek	
DRILLING RIG Simco Earthprobe 200	TYPE/SIZE BIT N/A	START DATE 5/6/2005	END DATE 5/6/2005
SAMPLER TYPE	HAMMER WEIGHT/DROP	TOTAL DEPTH (feet below ground surface (ft bgs))	WATER LEVEL (ft bgs)
2' discrete sampler	N/A	20'	13'

WELL	CONSTRUCTION	SAMPLES			DEPTH	WATER	DESCRIPTION OF SOILS f - fine m - medium c - coarse lt - light dk - dark tr - trace ltl - little sl - slight	REMARKS (PID, STAINING, ODORS, ETC.) N/S = No Staining N/O = No odors
		NUMBER	RECOVERY IN FEET	BLOWS PER 6"				
					1		0'-0.8': CONCRETE and rebar.	1'-2': N/O, N/S PID = 0.4 ppm max.
							0.8'-1': Fill-Large (>3"x5' surface area) piece of former brick structure with mortar joints lying horizontal.	
							1.0'-5.0': Fill-Brown f to m SAND, ltl c sand, gravel and brick chunks.	
					3			2'-3': N/O, N/S PID = 1.0 ppm max.
							Sample collected: W18STMGP-SB3-33.5	3'-4': N/O, N/S PID = 2.0 ppm max.
					5			4'-5': N/O, N/S PID = 1.6 ppm max.
		1	0.7'				5.0'-7.8': Fill-Brown SILT, f to m SAND, c GRAVEL, some cobbles and rock rock fragments.	5'-7': N/O, N/S PID = 0.1 ppm max.
							Sample collected: W18STMGP-SB3-57	
					7			7'-9': N/O, N/S PID = 0.2 ppm max.
		2	0.8'					
					9			9'-11': N/O, N/S PID = 0.1 ppm max.
		3	1.0'				9.0'-9.25': Fill-Red-brown SILT, f SAND and some cobbles. 9.25'-10.0': Fill-Brown SILT and f SAND.	
					11			11'-13': N/O, N/S PID = 1.6 ppm max.
		4	2.0'				11.0'-13.0': Fill-Brown silty CLAY and ltl f sand.	
					13			
		5	0.8'				13.0'-13.8': Fill-Dk brown-gray SILT, f to m SAND and tr clay. Sample collected: W18STMGP-SB3-1315	13'-15': Strong gasoline-like odor, N/S PID = 63.0 ppm max.
					15			
		6	1.0'				15.0'-16.0': Fill-Brown GRAVEL, m SAND and tr silt.	15'-17': N/O, N/S PID = 1.5 ppm max.
					17			
		7	1.4'				17.0'-18.4': Fill-Brown GRAVEL, f to c SAND, tr silt and clay.	17'-19': N/O, N/S PID = 0.2 ppm max.

TRC

JOB NAME/ CLIENT W18th St MGP SCS/Con Edison		PROJECT NO. 41318-0700-10000		AREA OF SITE Inside Former Gas Holder #1				
ADDRESS Verizon Building on W 18th Street b/w 9th and 10th Ave		ELEVATION/DATUM 13.60/NAVD 88						
DRILLING CONTRACTOR Fenley and Nicol Environmental, Inc.		DRILLER Kevin Kegel		TRC INSPECTOR Amy Klimek				
DRILLING RIG Simco Earthprobe 200		TYPE/SIZE BIT N/A		START DATE 5/6/2005				
SAMPLER TYPE 2' discrete sampler		HAMMER WEIGHT/DROP N/A		TOTAL DEPTH (feet below ground surface (ft bgs)) 20.5'				
				END DATE 5/6/2005				
				WATER LEVEL (ft bgs) 13'				
WELL	CONSTRUCTION	SAMPLES			DEPTH	WATER	DESCRIPTION OF SOILS	REMARKS
		NUMBER	RECOVERY IN FEET	BLOWS PER 6"				
		8	1.0'		19		Sample collected: W18STMGP-SB3-1719 19.0'-20.0': Fill-Brown GRAVEL, f to c SAND, tr silt and clay.	19'-20': N/O, N/S PID = 2.1 ppm max.
					21		E.O.B. at 20' bgs	
					23			
					25			
					27			
					29			
					31			
					33			
					35			

SHEET 2 OF 2

TRC

BORING LOG

BORING No.: SB-4

SHEET 1 OF 2

JOB NAME/ CLIENT W18th St MGP SCS/Con Edison		PROJECT NO. 41318-0700-10000	AREA OF SITE Inside Former Gas Holder #2
ADDRESS Verizon Building on W 18th Street b/w 9th and 10th Ave		ELEVATION/DATUM 13.40/NAVD 88	
DRILLING CONTRACTOR Fenley and Nicol Environmental, Inc.		DRILLER Kevin Kegel	TRC INSPECTOR Jessica Elliott
DRILLING RIG Simco Earthprobe 200		TYPE/SIZE BIT N/A	START DATE 5/5/2005
SAMPLER TYPE 2' discrete sampler		HAMMER WEIGHT/DROP N/A	END DATE 5/5/2005
		TOTAL DEPTH (feet below ground surface (ft bgs)) 21'	WATER LEVEL (ft bgs) 8'

WELL	CONSTRUCTION	SAMPLES		DEPTH	WATER	DESCRIPTION OF SOILS	REMARKS (PID, STAINING, ODORS, ETC.) N/S = No Staining N/O = No odors
		NUMBER	RECOVERY IN FEET				
						f - fine m - medium c - coarse lt - light dk - dark tr - trace ltl - little sl - slight	
				1		0'-0.8': CONCRETE and rebar.	
						0.8'-2.0': Fill-Gray f SAND, some m sand, gravel, tr c sand and rock fragments.	0.8'-2': N/O, N/S PID = 3.6 ppm max.
				3		2.0'-3.0': Fill-Lt brown f to c SAND, some silt, gravel, brick and rock fragments.	2'-3': N/O, N/S PID = 1.4 ppm max.
						3.0'-5.0': Fill-M brown SILT, f SAND, some m sand, tr c sand, gravel, rock fragments and cobbles.	3'-4': N/O, N/S PID = 1.1 ppm max.
				5		Sample collected: W18STMGP-SB4-4.55.5	4'-5': N/O, N/S PID = 0.5 ppm max.
						5.0'-6.5': Fill-Brown f to c SAND, some silt, gravel, rock (schist) fragments and brick fragments.	5'-6.5': N/O, N/S
		1	2.5'	7		6.5'-7.5': Dk gray SILT, f SAND, some gravel, tr clay, pockets of c sand, and rock (schist) fragments.	6.5'-9': Strong gasoline-like odor, black staining, sheen PID = 5.7 ppm max.
						Sample collected: W18STMGP-SB4-79	
				9		9.0'-9.5': Fill-Dk gray f to m SAND, some c sand, tr gravel and pockets of silt.	9'-11': SI gasoline-like odor, N/S, tr sheen PID = 0.9 ppm max.
		2	0.5'			11.0'-11.4': Fill-Dk gray f to c SAND, some silt and gravel.	11'-13': SI petroleum odor, tr black staining, tr sheen PID = 4.4 ppm max.
		3	0.4'	13		13.0'-13.5': Fill-Dk gray c SAND, some m sand, gravel, rock (schist) fragments and tr silt.	13'-15': Petroleum odor, N/S, sheen PID = 30.5 ppm max.
		4	0.5'	15		15.0'-15.8': Fill-Gray-brown f SAND, some rock (schist) fragments, tr silt and m to c sand.	15'-17': SI MGP-related odor, N/S, sheen PID = 9.8 ppm max.
		5	0.8'	17		17.0'-17.7': Fill-Brown f to m SAND, SILT, some rock (schist) fragments, and tr c sand.	17'-19': MGP-related odor, N/S, sheen PID = 12.9 ppm max.
		7	0.7'				

TRC

BORING LOG

BORING No.: SB-4
SHEET 2 OF 2

JOB NAME/ CLIENT W18th St MGP SCS/Con Edison				PROJECT NO. 41318-0700-10000		AREA OF SITE Inside Former Gas Holder #2			
ADDRESS Verizon Building on W 18th Street b/w 9th and 10th Ave				ELEVATION/DATUM 13.40/NAVD 88					
DRILLING CONTRACTOR Fenley and Nicol Environmental, Inc.				DRILLER Kevin Kegel		TRC INSPECTOR Jessica Elliott			
DRILLING RIG Simco Earthprobe 200				TYPE/SIZE BIT N/A		START DATE 5/5/2005		END DATE 5/5/2005	
SAMPLER TYPE 2' discrete sampler				HAMMER WEIGHT/DROP N/A		TOTAL DEPTH (feet below ground surface (ft bgs)) 21'		WATER LEVEL (ft bgs) 8'	
WELL	CONSTRUCTION	SAMPLES			DEPTH	WATER	DESCRIPTION OF SOILS	REMARKS (PID, STAINING, ODORS, ETC.) N/S = No Staining N/O = No odors	
		NUMBER	RECOVERY IN FEET	BLOWS PER 6"					
		8	0.6'		19		19.0'-19.6': Fill-Black stained SILT, f to c SAND, GRAVEL, brick and rock chunks. Sample collected: W18STMGP-SB4-1921	19'-21': Very strong MGP-related odor, heavy black staining, visible OLM PID = 3,124 ppm max.	
					21		E.O.B. at 21' bgs (Refusal due to rocks and brick. Possible bottom of Former Gas Holder #2 at 21' bgs)		
					23				
					25				
					27				
					29				
					31				
					33				
					35				

TRC

BORING LOG

BORING No.: SB-5

SHEET 1 OF 2

JOB NAME/ CLIENT W18th St MGP SCS/Con Edison	PROJECT NO. 41318-0700-10000	AREA OF SITE SW of Former Gas Holder #2
ADDRESS Verizon Building on W 18th Street b/w 9th and 10th Ave	ELEVATION/DATUM 13.80/NAVD 88	
DRILLING CONTRACTOR Fenley and Nicol Environmental, Inc.	DRILLER Scott Yanuck/Kevin Kegel	TRC INSPECTOR Jessica Elliott
DRILLING RIG Geoprobe 6610DT	TYPE/SIZE BIT N/A	START DATE 5/2/2005
SAMPLER TYPE 5' & 3' macrocore sampler		END DATE 6/3/2005
HAMMER WEIGHT/DROP N/A	TOTAL DEPTH (feet below ground surface (ft bgs)) 31'	WATER LEVEL (ft bgs) 11.5'

WELL	CONSTRUCTION	SAMPLES			DEPTH	WATER	DESCRIPTION OF SOILS	REMARKS (PID, STAINING, ODORS, ETC.)
		NUMBER	RECOVERY IN FEET	BLOWS PER 6"				
							f - fine m - medium c - coarse lt - light dk - dark tr - trace ltl - little sl - slight	N/S = No Staining N/O = No odors
		1	0.3'		1		0'-0.2': CONCRETE and rebar.	0.2'-2': N/O, N/S
							0.8'-2.0': Fill-Brown f to m SAND, some c sand, gravel, ltl silt, brick fragments and tr wood fibers.	PID = 1.7 ppm max.
					3		2.0'-3.0': Fill-Brown f to c SAND, some gravel, pebbles, tr silt and brick fragments.	2'-3': N/O, N/S
							3.0'-4.5': Fill-Brown f to c SAND, GRAVEL and brick fragments.	PID = 1.3 ppm max.
							Sample collected: W18STMGP-SB5A-3.44	3'-4': N/O, N/S
					5		5.0'-15.0': Drilled to 15' bgs and began sampling at 15' bgs. Soil descriptions recorded during installation of MW-5B were used for SB-5.	PID = 1.7 ppm max.
							5.0'-5.3': Fill-Brown SILT, f to m SAND, some c sand, ltl gravel and clay.	4'-5': N/O, N/S
					7			PID = 3.9 ppm max.
								5'-6.5': N/O, N/S
								5'-10': N/O, N/S
								PID = 28.4 ppm max.
					9			
		2	1.4'		11		10.0'-10.9': Fill-Lt to dk brown SILT, f to c SAND, GRAVEL and brick fragments.	10'-11': Strong petroleum-like odor, sheen, N/S
							10.9'-11.4': Fill-Lt brown f to c SAND and GRAVEL.	PID = 387 ppm max.
					13			11'-15': Very strong petroleum-like odor, black staining, sheen
								PID = 4,085 ppm max.
					15		15.0'-17.5': Wood timbers.	
		3	5.0'		17		17.5'-19.0': Fill-Brown-gray m to c SAND, tr f sand and gravel.	15'-19': Strong petroleum-like odor, sheen black staining on wood, tr NAPL.
							Sample collected: W18STMGP-SB5A-1719	PID = 198 ppm max.

TRC

JOB NAME/ CLIENT W18th St MGP SCS/Con Edison		PROJECT NO. 41318-0700-10000		AREA OF SITE SW of Former Gas Holder #2				
ADDRESS Verizon Building on W 18th Street b/w 9th and 10th Ave		ELEVATION/DATUM 13.80/NAVD 88						
DRILLING CONTRACTOR Fenley and Nicol Environmental, Inc.		DRILLER Scott Yanuck/Kevin Kegel		TRC INSPECTOR Jessica Elliott				
DRILLING RIG Geoprobe 6610DT		TYPE/SIZE BIT N/A		START DATE 5/2/2005				
SAMPLER TYPE 5' & 3' macrocore sampler		HAMMER WEIGHT/DROP N/A		END DATE 6/3/2005				
				TOTAL DEPTH (feet below ground surface (ft bgs)) 31'				
				WATER LEVEL (ft bgs) 11.5'				
WELL	CONSTRUCTION	SAMPLES			DEPTH	WATER	DESCRIPTION OF SOILS	REMARKS (PID, STAINING, ODORS, ETC.)
		NUMBER	RECOVERY IN FEET	BLOWS PER 6"				
					19		19'-19.6': Fill-Black stained SILT, f to c SAND, GRAVEL, brick and rock chunks. Sample collected: W18STMGP-SB5A-1920	19'-20': Tr petroleum-like odor, N/S PID = 6.8 ppm max.
		4	5.0'		21		20.0'-25.0': ML-Gray silty CLAY and tr f sand.	20'-25': Very sl petroleum-like odor, N/S PID = 8.4 ppm max.
					23			
					25			
		5	1.5'		27		26.0'-26.5': SP-Brown c SAND, tr gravel and m sand. 26.5'-27.5': SM-Brown c SAND, SILT, CLAY, lil f to m sand and tr gravel. Sample collected: W18STMGP-SB5A-2628	26'-29': N/O, N/S PID = 8.0 ppm max.
					29			
		6	1.5'		31		29.0'-30.5': SP-Brown m SAND.	29'-31': N/O, N/S PID = 5.0 ppm max.
					33		E.O.B. at 31' bgs (Heaving sands in casing from 12'-31' bgs. Move location over 2' and attempt new SB-5/MW-5B location)	
					35			

SHEET 2 OF 2

TRC

BORING LOG

BORING No.: MW-5A
SHEET 1 OF 2

JOB NAME/ CLIENT	PROJECT NO.	AREA OF SITE	
W18th St MGP SCS/Con Edison	41318-0700-10000	SW of Former Gas Holder #2	
ADDRESS	ELEVATION/DATUM		
Verizon Building on W 18th Street b/w 9th and 10th Ave	13.84/NAVD 88		
DRILLING CONTRACTOR	DRILLER	TRC INSPECTOR	
Fenley and Nicol Environmental, Inc.	Scott Yanuck	Jessica Elliott	
DRILLING RIG	TYPE/SIZE BIT	START DATE	END DATE
Geoprobe 6610DT	N/A	5/2/2005	5/2/2005
SAMPLER TYPE	HAMMER WEIGHT/DROP	TOTAL DEPTH	WATER LEVEL (ft bgs)
5' macrocore sampler	N/A	(feet below ground surface (ft bgs)) 22'	11.5'

WELL	CONSTRUCTION	SAMPLES		DEPTH	WATER	DESCRIPTION OF SOILS	REMARKS (PID, STAINING, ODORS, ETC.)
		NUMBER	RECOVERY IN FEET				
						f - fine m - medium c - coarse lt - light dk - dark tr - trace ltl - little sl - slight	N/S = No Staining N/O = No odors
		1	0.3'	1		0'-0.8': CONCRETE and rebar.	0.8'-2': N/O, N/S PID = 1.7 ppm max.
				3		0.8'-2.0': Fill-Brown SILT, f SAND, some m sand, tr c sand, gravel and cobbles. 2.0'-4.0': Fill-Brown f to c SAND, some gravel, cobbles and tr silt. Sample collected: W18STMGP-SB5B-2.53	2'-3': N/O, N/S PID = 0.9 ppm max.
				5		4.0'-4.5': Fill-Brown f to c SAND, some gravel, cobbles, tr silt and brick fragments.	3'-4': N/O, N/S PID = 5.6 ppm max.
				7		5.0'-5.3': Fill-Brown SILT, f to m SAND, some c sand, ltl gravel and clay.	4'-5': N/O, N/S PID = 0.9 ppm max.
				9			5'-10': N/O, N/S PID = 28.4 ppm max.
		2	1.4'	11		10.0'-10.9': Fill-Lt to dk brown SILT, f to c SAND, GRAVEL and brick fragments. Sample collected: W18STMGP-SB5B-1011	10'-11': Strong petroleum-like odor, sheen, N/S PID = 387 ppm max.
				13		10.9'-11.4': Fill-Lt brown f to c SAND and GRAVEL. Sample collected: W18STMGP-SB5B-1112	11'-15': Very strong petroleum-like odor, black staining, sheen PID = 4,085 ppm max.
		3	0.1'	15		15.0'-15.1': Fill-Brown-gray SILT, f SAND and tr gravel.	15'-20': Very strong petroleum-like odor, N/S, sheen PID = 1,222 ppm max.
				17			 Sand  Bentonite Chips  Concrete  Well Screen

TRC

JOB NAME/ CLIENT W18th St MGP SCS/Con Edison		PROJECT NO. 41318-0700-10000		AREA OF SITE SW of Former Gas Holder #2	
ADDRESS Verizon Building on W 18th Street b/w 9th and 10th Ave				ELEVATION/DATUM 13.84/NAVD 88	
DRILLING CONTRACTOR Fenley and Nicol Environmental, Inc.		DRILLER Scott Yanuck		TRC INSPECTOR Jessica Elliott	
DRILLING RIG Geoprobe 6610DT		TYPE/SIZE BIT N/A		START DATE 5/2/2005	
SAMPLER TYPE 5' macrocore sampler		HAMMER WEIGHT/DROP N/A		TOTAL DEPTH (feet below ground surface (ft bgs)) 22'	
				WATER LEVEL (ft bgs) 11.5'	
WELL		CONSTRUCTION		SAMPLES	
				NUMBER RECOVERY IN FEET BLOWS PER 6"	
				DEPTH	
				WATER	
				DESCRIPTION OF SOILS f - fine m - medium c - coarse lt - light dk - dark tr - trace ltl - little sl - slight	
				REMARKS (PID, STAINING, ODORS, ETC.) N/S = No Staining N/O = No odors	
				18"-22": N/O, N/S PID = 1.9 ppm max.	
				20'-21.0': Fill-Brown m to c SAND, tr gravel, silt and brick and concrete fragments. PID = 55 ppm max.	
				21'-22": Sl petroleum-like odor, N/S, tr sheen PID = 12.4 ppm max.	
				Sample collected: W18STMGP-SB5B-2122	
				E.O.B. at 22' bgs (Refusal due to brick/concrete at 22' bgs)	
				23' 25' 27' 29' 31' 33' 35'	
				Well set at 19' bgs. Screen interval from 19.0' to 9.0' bgs.	
				Sand Bentonite Chips Concrete Well Screen	

TRC

BORING LOG

BORING No.: MW-5B
SHEET 1 OF 3

JOB NAME/ CLIENT W18th St MGP SCS/Con Edison	PROJECT NO. 41318-0700-10000	AREA OF SITE SW of Former Gas Holder #2	
ADDRESS Verizon Building on W 18th Street b/w 9th and 10th Ave	ELEVATION/DATUM 13.80/NAVD 88		
DRILLING CONTRACTOR Fenley and Nicol Environmental, Inc.	DRILLER Scott Yanuck	TRC INSPECTOR Jessica Elliott	
DRILLING RIG Geoprobe 6610DT	TYPE/SIZE BIT N/A	START DATE 6/1/2005	END DATE 6/8/2005
SAMPLER TYPE	HAMMER WEIGHT/DROP	TOTAL DEPTH (feet below ground surface (ft bgs))	WATER LEVEL (ft bgs)
5' macrocore & 2' & 4' discrete sampler	N/A	42'	11.5'

WELL	CONSTRUCTION	SAMPLES			DEPTH	WATER	DESCRIPTION OF SOILS f - fine m - medium c - coarse lt - light dk - dark tr - trace ltl - little sl - slight	REMARKS (PID, STAINING, ODORS, ETC.) N/S = No Staining N/O = No odors
		NUMBER	RECOVERY IN FEET	BLOWS PER 6"				
		1	0.3'		1		0'-0.8': CONCRETE and rebar.	0.8'-2': N/O, N/S PID = 1.7 ppm max.
					3		0.8'-2.0': Fill-Brown SILT, f SAND, some m sand, tr c sand, gravel and cobbles. 2.0'-4.0': Fill-Brown f to c SAND, some gravel, cobbles and tr silt. Sample collected: W18STMGP-SB5A-3.54	2'-3': N/O, N/S PID = 0.9 ppm max.
					5		4.0'-4.5': Fill-Brown f to c SAND, some gravel, cobbles, tr silt and brick fragments.	3'-4': N/O, N/S PID = 5.6 ppm max.
					7		5.0'-5.3': Fill-Brown SILT, f to m SAND, some c sand, ltl gravel and clay.	4'-5': N/O, N/S PID = 0.9 ppm max.
					9			5'-10': N/O, N/S PID = 28.4 ppm max.
		2	1.4'		11		10.0'-10.9': Fill-Lt to dk brown SILT, f to c SAND, GRAVEL and brick fragments.	10'-11': Strong petroleum-like odor, sheen, N/S PID = 387 ppm max.
					13		10.9'-11.4': Fill-Lt brown f to c SAND and GRAVEL.	11'-15': Very strong petroleum-like odor, black staining, sheen PID = 4,085 ppm max.
		3	0.1'		15		15.0'-15.1': Fill-Brown-gray SILT, f SAND and tr gravel.	15'-19': Very strong petroleum-like odor, N/S, sheen PID = 1,222 ppm max.
		4	2.0'		17		Begin sampling for MW-5B at 17' bgs (2' discrete sampler) in order to determine top of clay interval. Sample collected: W18STMGP-SB5A-1719	 No Backfill/Hole Collapse  Concrete  Well Screen

TRC

BORING LOG

BORING No.: MW-5B

SHEET 2 OF 3

JOB NAME/ CLIENT W18th St MGP SCS/Con Edison			PROJECT NO. 41318-0700-10000			AREA OF SITE SW of Former Gas Holder #2		
ADDRESS Verizon Building on W 18th Street b/w 9th and 10th Ave			ELEVATION/DATUM 13.80/NAVD 88					
DRILLING CONTRACTOR Fenley and Nicol Environmental, Inc.			DRILLER Scott Yanuck			TRC INSPECTOR Jessica Elliott		
DRILLING RIG Geoprobe 6610DT			TYPE/SIZE BIT N/A			START DATE 5/2/2005		
END DATE 5/2/2005			SAMPLER TYPE 5' macrocore & 2' & 4' discrete sampler			HAMMER WEIGHT/DROP N/A		
TOTAL DEPTH (feet below ground surface (ft bgs)) 42'			WATER LEVEL (ft bgs) 11.5'					
WELL	CONSTRUCTION	SAMPLES			DEPTH	WATER	DESCRIPTION OF SOILS	REMARKS (PID, STAINING, ODORS, ETC.) N/S = No Staining N/O = No odors
		NUMBER	RECOVERY IN FEET	BLOWS PER 6"				
		5	2.0'		19		18.5'-19.0': ML-Tan silty CLAY and tr f sand. 19.0'-21.0': SM-Brown f to m SAND, SILT, tr clay, gravel and c sand. Sample collected: W18STMGP-SB5A-1920	19'-21': Sheen
		6	2.0'		21		21.0'-23.0': GW-Brown f to c SAND, GRAVEL, some silt and intervals of silty clay interval (varying thickness from approximately 0.2'-0.3').	
		7	2.0'		23		23.0'-25.0': SW-Red-brown m to c SAND, lt gravel and 0.25' thick interval of silty CLAY in bottom of sample (24.75'-25.0').	
					25			
		8	2.0'		27		26.0'-28.0': SM-Lt brown SILT, f SAND, some clay and m to c sand and gravel. Sample collected: W18STMGP-SB5A-2628	
		9	4.0'		29		28.0'-31.0': SM-Brown f SAND, some silt, tr m sand and c sand.	28'-32': N/O, N/S PID = 0.0 ppm max.
					31			
		10	4.0'		33		31.0'-31.3': ML-Tan silty CLAY and tr f sand. 31.3'-36.0': SW-Brown m to c SAND and some f sand. Sample collected: W18STMGP-MW5B-3436	32'-36': Very sl non-MGP related odor, N/S PID = 0.0 ppm max.
					35			
							36.0'-42.0': Soils were not logged, but 3.25" steel casing was advanced to 42' bgs to set monitoring well MW-5B with the screen interval below any clay intervals.	



No Backfill/Hole Collapse



Concrete



Well Screen

TRC

BORING LOG

BORING No.: MW-5B

SHEET 3 OF 3

[illegible]

TRC

BORING LOG

BORING No.: SB-6

SHEET 1 OF 4

JOB NAME/ CLIENT W18th St MGP SCS/Con Edison	PROJECT NO. 41318-0700-10000	AREA OF SITE NW of Former Gas Holder #2	
ADDRESS Verizon Building on W 18th Street b/w 9th and 10th Ave	ELEVATION/DATUM 13.69/NAVD 88		
DRILLING CONTRACTOR Fenley and Nicol Environmental, Inc.	DRILLER Scott Yanuck	TRC INSPECTOR Jessica Elliott	
DRILLING RIG Geoprobe 6610DT	TYPE/SIZE BIT N/A	START DATE 5/12/2005	END DATE 5/13/2005
SAMPLER TYPE	HAMMER WEIGHT/DROP	TOTAL DEPTH (feet below ground surface (ft bgs))	WATER LEVEL (ft bgs)
3' & 5' macrocore sampler with 31/4" steel casi	N/A	72'	13'

WELL	CONSTRUCTION	SAMPLES			DEPTH	WATER	DESCRIPTION OF SOILS f - fine m - medium c - coarse lt - light dk - dark tr - trace ltl - little sl - slight	REMARKS (PID, STAINING, ODORS, ETC.) N/S = No Staining N/O = No odors
		NUMBER	RECOVERY IN FEET	BLOWS PER 6"				
					1		0'-0.3': CONCRETE and rebar.	0.3'-2': N/O, N/S PID = 4.0 ppm max.
							0.8'-2.0': Fill-Brown SILT, f SAND and tr gravel.	
					3		2.0'-5.0': Fill-Brown f SAND, some silt, gravel and brick fragments.	2'-3': N/O, N/S PID = 1.7 ppm max.
								3'-4': N/O, N/S PID = 1.4 ppm max.
					5			4'-5': N/O, N/S PID = 2.5 ppm max.
							5.0'-6.7': Fill-Brown SILT, f SAND, tr m to c sand and gravel.	5'-10': N/O, N/S PID = 0.3 ppm max.
		1	1.7'		7			
					9			
		2	1.7'		11		10.0'-11.7': Fill- Brown SILT, f SAND, some m to c sand and tr gravel. Sample collected: W18STMGP-SB6-1012	10'-13': SI petroleum-like odor (stronger at tip of sample), tr black staining PID (sample sleeve) = 265 ppm max. PID (sample tip) = 2,060 ppm max.
					13		12.9'-13.0' (tip of 10'-13' sample): Brown f to c SAND, SILT and some gravel.	
		3	1.4'				13.0'-14.4': Fill-Gray-brown SILT, f SAND and tr c sand. Sample collected: W18STMGP-SB6-1315	13'-16': Strong petroleum-like odor, some black staining, sheen, tr NAPL PID = 3,520 ppm max.
					15			
		4	0.4'		17		16.0'-16.4': Fill-Dk brown SILT, f SAND, tr m sand and rock fragments.	16'-19': SI petroleum-like odor, N/S PID = 134 ppm max.

TRC

BORING LOG

BORING No.: SB-6

SHEET 2 OF 4

JOB NAME/ CLIENT W18th St MGP SCS/Con Edison		PROJECT NO. 41318-0700-10000	AREA OF SITE NW of Former Gas Holder #2
ADDRESS Verizon Building on W 18th Street b/w 9th and 10th Ave		ELEVATION/DATUM 13.69/NAVD 88	
DRILLING CONTRACTOR Fenley and Nicol Environmental, Inc.		DRILLER Scott Yanuck	TRC INSPECTOR Jessica Elliott
DRILLING RIG Geoprobe 6610DT		TYPE/SIZE BIT N/A	START DATE 5/12/2005
SAMPLER TYPE 3' & 5' macrocore sampler with 31/4" steel ca		HAMMER WEIGHT/DROP N/A	END DATE 5/13/2005
		TOTAL DEPTH (feet below ground surface (ft bgs)) 72'	WATER LEVEL (ft bgs) 13'

WELL	CONSTRUCTION	SAMPLES			DEPTH	WATER	DESCRIPTION OF SOILS	REMARKS (PID, STAINING, ODORS, ETC.) N/S = No Staining N/O = No odors
		NUMBER	RECOVERY IN FEET	BLOWS PER 6"				
					19		0'-19.0': 3 1/4" steel casing installed to 19' bgs. Discrete sampling from 19'-72' bgs. 19.0'-20.9': Fill-Brown SILT, f SAND and tr m sand and gravel (2' discrete sampler). Sample collected: W18STMGP-SB6-1921	19'-20': N/O, N/S PID = 45 ppm max.
		5	0.8'					
		6	2.9'		21		20.9'-22.9': Fill-Lt brown f to c SAND, GRAVEL, rock fragments and tr brick fragments.	20'-23': N/O, N/S PID = 2.4 ppm max.
					23		23.0'-26.1': SM-Brown-dk brown SILT, f SAND, with pockets of m to c sand and tr gravel. Sample collected: W18STMGP-SB6-2426	23'-27': N/O, N/S PID = 0.9 ppm max.
		7	4.0'					
					25			
					27		26.1'-28.2': ML-Tan silty CLAY and tr f sand.	27'-32': N/O, N/S PID = 0.0 ppm max.
		8	5.0'					
					29		28.2'-36.0': SP-Brown f to m SAND and tr silt. Sample collected: W18STMGP-SB6-28.530.5	
					31			
					33			32'-37': N/O, N/S PID = 0.0 ppm max.
		9	5.0'					
					35			

TRC

BORING LOG

JOB NAME/ CLIENT W18th St MGP SCS/Con Edison		PROJECT NO. 41318-0700-10000	AREA OF SITE NW of Former Gas Holder #2
ADDRESS Verizon Building on W 18th Street b/w 9th and 10th Ave		ELEVATION/DATUM 13.69/NAVD 88	
DRILLING CONTRACTOR Fenley and Nicol Environmental, Inc.		DRILLER Scott Yanuck	TRC INSPECTOR Jessica Elliott
DRILLING RIG Geoprobe 6610DT		TYPE/SIZE BIT N/A	START DATE 5/12/2005
SAMPLER TYPE 3' & 5' macrocore sampler with 31/4" steel ca		HAMMER WEIGHT/DROP N/A	END DATE 5/13/2005
		TOTAL DEPTH (feet below ground surface (ft bgs)) 72'	WATER LEVEL (ft bgs) 13'

WELL	CONSTRUCTION	SAMPLES			DEPTH	WATER	DESCRIPTION OF SOILS	REMARKS (PID, STAINING, ODORS, ETC.) N/S = No Staining N/O = No odors
		NUMBER	RECOVERY IN FEET	BLOWS PER 6"				
		10	5.0'		37		36.0'-36.5': SP-Brown very c SAND. 36.5'-38.0': SP-Brown f to m SAND.	
					39		38.0'-40.0': ML-Tan silty CLAY and tr f sand.	
					41		40.0'-57.0': SP-Brown f to m SAND and tr c sand.	
		11	5.0'		43			37'-42': N/O, N/S PID = 0.0 ppm max.
					45			
					47			42'-47': N/O, N/S PID = 0.0 ppm max.
		12	5.0'		49			
					51			47'-52': N/O, N/S PID = 0.0 ppm max.
		13	5.0'		53			

TRC

BORING LOG

BORING No.: SB-6

SHEET 4 OF 4

JOB NAME/ CLIENT W18th St MGP SCS/Con Edison		PROJECT NO. 41318-0700-10000	AREA OF SITE NW of Former Gas Holder #2
ADDRESS Verizon Building on W 18th Street b/w 9th and 10th Ave		ELEVATION/DATUM 13.69/NAVD 88	
DRILLING CONTRACTOR Fenley and Nicol Environmental, Inc.		DRILLER Scott Yanuck	TRC INSPECTOR Jessica Elliott
DRILLING RIG Geoprobe 6610DT		TYPE/SIZE BIT N/A	START DATE 5/12/2005
SAMPLER TYPE 3' & 5' macrocore sampler with 31/4" steel ca		HAMMER WEIGHT/DROP N/A	END DATE 5/13/2005
		TOTAL DEPTH (feet below ground surface (ft bgs)) 72'	WATER LEVEL (ft bgs) 13'

WELL	CONSTRUCTION	SAMPLES			DEPTH	WATER	DESCRIPTION OF SOILS	REMARKS (PID, STAINING, ODORS, ETC.) N/S = No Staining N/O = No odors
		NUMBER	RECOVERY IN FEET	BLOWS PER 6"				
					55			
					57			
		14	5.0'				57.0'-66.7': SW-Brown f to m SAND and some c sand.	57'-62': N/O, N/S PID = 0.0 ppm max.
					59			
					61			
					63			
		15	5.0'					
					65			
					67			
					69			
					71			
		16	5.0'				66.7'-67.0': GC-Brown f to very c SAND and GRAVEL. 67.0'-71.75': GP-Brown m to very c SAND, GRAVEL and tr f sand.	62'-67': N/O, N/S PID = 0.0 ppm max. 67'-72': N/O, N/S PID = 0.0 ppm max.
							Sample collected: W18STMGP-SB6-7072	
							71.75'-72.0': Refusal-Schist fragments in spoon.	

E.O.B. at 72' bgs (Refusal due to hard rock).

TRC

TRC Environmental Corp.			
TEST PIT LOG		Sheet 1 Of 1	
Project No.	Client	Test Pit No.	
41318	Con Edison	TP-1	
Location		Elevation & Datum	
Verizon Building on W 18th Street		13.70 NAVD '88	
Contractor		TRC Inspector	
Fenley and Nicol Environmental		Jessica Elliott	
Excavator		Date Started/Completed	Completion Status
Manual Excavation		4/27/2005	4/27/2005-Backfilled
Sampler Type		Total Depth (ftbg)	Water Level (ftbg)
Grab		4.2'	Obs. Stab. N/A
DEPTH (FT BGS)	WATER	SAMPLE DESCRIPTION	REMARKS (PID/DID, ETC)
0.0'		CONCRETE and rebar (0.0'-0.3')	
1.0'		Intact red brick wall encountered along eastern wall of SB-6 and western wall of TP-1 (Western ring wall of Former Gas Holder #2). Brick wall running N-S and approximately 20" wide. excavated along eastern side of wall (interior).	N/O, N/S PID = 1.4 ppm max.
2.0'		1.0'-4.2': Brown-dark brown f to c SAND, GRAVEL, COBBLES, brick fragments and large rock (schist) fragments and chunks.	N/O, N/S PID = 1.1 ppm max.
3.0'			N/O, N/S PID = 1.1 ppm max.
4.0'			N/O, N/S PID=1.0 ppm max.
5.0'		E.O.T.P. at 4.2' bgs (2.0' x 2.0')	

TEST PIT LOG

Project No.		Client	Test Pit No.	
41318		Con Edison	TP-1B	
Location		Elevation & Datum		
Verizon Building on W 18th Street		13.24 NAVD '88		
Contractor		TRC Inspector		
Fenley and Nicol Environmental		Jessica Elliott		
Excavator		Date Started/Completed	Completion Status	
Manual Excavation		5/4/2005	5/4/2005-Backfilled	
Sampler Type		Total Depth (ftbg)	Water Level (ftbg)	
Grab		3'	Obs. Stab.	
			N/A	

DEPTH (FT BGS)	WATER	SAMPLE DESCRIPTION	REMARKS (PID/DID, ETC)
0.0'		CONCRETE and rebar (0.0'-0.7') 0.7'-2.0': Fill-Brown SILT, f to c SAND, GRAVEL, some cobbles, brick and rock fragments. Sample collected: W18STMGP-TP1B-1.01.5	Gasoline-like odor, N/S PID = 667 ppm max.
1.0'		1.0': Intact red brick wall (western ring wall of Former Gas Holder #1). Brick wall running N-S and approximately 18" wide. Excavated along eastern side of wall (holder interior). excavated along eastern side of wall (interior).	
2.0'		2.0'-3.0': Brown SILT, f SAND, ltl m to c sand, gravel, brick fragments, wood timbers and rock (schist) fragments.	Gasoline-like odor, black staining on wood timbers PID = 78.2 ppm max.
3.0'		3.0': Large boulders; unable to excavate deeper. E.O.T.P. at 3' bgs (7.5' x 2.0')	Gasoline-like odor, N/S PID = 46.0 ppm max.
4.0'			

Appendix C

Groundwater Sampling and
Development Logs

Low-Flow Groundwater Sampling Log

Project West 18th St MGP
 Project Number B0043011.1.3 Site Location Manhattan, NY Well ID MW-1
 Date 10-2-08 Sampled By C. Massaro / G. Williams
 Sampling Time 1125 Recorded By 11 11
 Weather 60° Coded Replicate No. _____

Instrument Identification

Water Quality Meter(s) YSI 600 XL Serial # _____
 Casing Material PVC Purge Method 2" Bladder Pump
 Casing Diameter 4" Screen Interval (ft bmp) _____ Top unknown Bottom unknown
 Sounded Depth (ft bmp) 15.10 Pump Intake Depth (ft bmp) 1400 1400
 Depth to Water (ft bmp) 11.42 Purge Time _____ Start 1100 Finish _____

Field Parameter Measurements During Purging

Time	Minutes Elapsed	Flow Rate (mL/min)	Volume Purged	Temp (°C)	pH (s.u.)	Conductivity (umhos or mS/cm) ¹⁾	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)
1105	5	300		20.10	7.15	2.68	-326.2	0.26	30	13.00
1110	10	11		20.15	7.17	2.68	-333.1	0.23	45	13.50
1115	15	11		20.19	7.18	2.68	-322.1	0.21	50	13.55
1120	20	11		20.21	7.18	2.69	-326.8	0.21	50	13.55

Collected Sample Condition _____ Color yellow/brown Odor mod. Appearance _____
 Parameter _____ Container _____ No. _____ Preservative _____
VOCs VOAs 2 HCL
SVOCs Ambers 2 None
CN Total Plastic 1 NaOH

PID Reading 0.3 CM

Comments _____

1) Circle one unit type

Low-Flow Groundwater Sampling Log

Project West 18th St MGP
 Project Number B0043011.1.3 Site Location Manhattan, NY Verizon Well ID MW-2
 Date 10-2-08 Sampled By CEM / GW
 Sampling Time _____ Recorded By ll ll
 Weather _____ Coded Replicate No. _____

Instrument Identification

Water Quality Meter(s) YSI 600XL Serial # _____
 Casing Material PVC Purge Method Peristaltic
 Casing Diameter 2" Screen Interval (ft bmp) Top Unknown Bottom unknown
 Sounded Depth (ft bmp) 13.20 Pump Intake Depth (ft bmp) 12.5-13.00 12.5-13.00
 Depth to Water (ft bmp) 11.60 Purge Time Start 1356 Finish _____

Field Parameter Measurements During Purging

Time	Minutes Elapsed	Flow Rate (mL/min)	Volume Purged	Temp (°C)	pH (s.u.)	Conductivity (umhos or mS/cm) ¹⁾	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)
<u>1401</u>	<u>5</u>	<u>225</u>		<u>20.81</u>	<u>6.83</u>	<u>2.65</u>	<u>-49.6</u>	<u>1.36</u>	<u>650</u>	<u>12.20</u>
<u>1406</u>	<u>10</u>	<u>225</u>		<u>20.67</u>	<u>6.80</u>	<u>2.54</u>	<u>-55.2</u>	<u>1.21</u>	<u>310</u>	<u>12.48</u>
<u>1411</u>	<u>15</u>	<u>225</u>		<u>20.57</u>	<u>6.78</u>	<u>2.50</u>	<u>-58.2</u>	<u>1.27</u>	<u>190</u>	<u>12.80</u>
<u>1416</u>	<u>20</u>	<u>225</u>		<u>20.57</u>	<u>6.76</u>	<u>2.51</u>	<u>-60.1</u>	<u>1.27</u>	<u>160</u>	<u>13.00</u>
<u>1417</u>	<u>Dry</u>	<u>- Allowing to recover.</u>								
<u>1554</u>										<u>11.74</u>

Collected Sample Condition

Color BrownOdor Moderate

Appearance _____

Parameter

Container

No.

Preservative

VOCs
SVOCs
CN Total

VOAS
Ambers
Plastic

2
2
1

HCL
None
NaOCl

PID Reading _____

Comments

Not enough H₂O to pump with bladder, so used
peristaltic.

1) Circle one unit type

Low-Flow Groundwater Sampling Log

Project West 18th Street MGP
 Project Number 80043011.1.3 Site Location Verizon Building Well ID MW-3
 Date 10-1-08 Sampled By CTM / GW
 Sampling Time 1420 Recorded By 11 11
 Weather 70° sunny Coded Replicate No. _____

Instrument Identification

Water Quality Meter(s) YSI 600XL Serial # _____
 Casing Material PVC Purge Method 2" Bladder
 Casing Diameter 4 Screen Interval (ft bmp) Top unknown Bottom unknown
 Sounded Depth (ft bmp) 14.70 Pump Intake Depth (ft bmp) 14.5
 Depth to Water (ft bmp) 13.02 Purge Time Start 1355 Finish _____

Field Parameter Measurements During Purging

Time	Minutes Elapsed	Flow Rate (mL/min)	Volume Purged	Temp (°C)	pH (s.u.)	Conductivity (umhos or mS/cm) ¹⁾	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)
1400	5	450		20.44	6.59	1.67	-121.5	1.90	110	13.02
1405	10	450		20.34	6.55	1.60	-126.2	1.61	18	13.02
1410	15	450		20.33	6.54	1.58	-126.5	1.58	12	13.02
1415	20	450		20.40	6.53	1.57	-126.9	1.55	9.8	13.02

Collected Sample Condition Color yellow/bm Odor Moderate Appearance _____
 Parameter Container No. Preservative
VOCs 2 VOAs 2 HCL
SVOCs 2 Ambers 2 None
CA Total 1 Plastic 1 NaOH

PID Reading 2.6

Comments _____

1) Circle one unit type

Low-Flow Groundwater Sampling Log

Project West 18th Street MGP
 Project Number B0043011.1.3 Site Location Verizon Building Manhattan Well ID MW-4
 Date 10-1-08 Sampled By CIM, GW
 Sampling Time 1300 Recorded By 11 11
 Weather 70° sunny Coded Replicate No. _____

Instrument Identification

Water Quality Meter(s) YSI 600XL Serial # _____
 Casing Material PVC Purge Method 2" Bladder
 Casing Diameter 4 Screen Interval (ft bmp) Top Unknown Bottom Unknown
 Sounded Depth (ft bmp) 14.35 Pump Intake Depth (ft bmp) 14
 Depth to Water (ft bmp) 12.42 Purge Time Start 1230 Finish _____

Field Parameter Measurements During Purging

Time	Minutes Elapsed	Flow Rate (mL/min)	Volume Purged	Temp (°C)	pH (s.u.)	Conductivity (umhos or mS/cm) ¹⁾	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)
1235	5	300		19.27	6.62	1.91	-113.4	2.01	400	12.42
1240	10	300		19.07	6.65	1.15	-124.2	2.38	110	12.42
1245	15	300		18.68	6.65	1.13	-128.7	1.76	60	12.42
1250	20	300		18.62	6.66	1.12	-132.7	1.74	36	12.42
1255	25	300		18.60	6.68	1.11	-131.8	1.69	27	12.42

Collected Sample Condition

 Color Yellowish/Brown Odor Moderate

Appearance _____

Parameter

Container

No.

Preservative

VOCs
SVOCs
CN Total

VOCs
Ambers
Plastic

2
2
2

HCL
None
NaOH

 PID Reading 0.4

Comments

1) Circle one unit type

Low-Flow Groundwater Sampling Log

Project West 18th St MGP
 Project Number 80043011.1.3 Site Location Venzon Building Well ID MW-5
 Date 10-2-08 Sampled By cm/gw
 Sampling Time _____ Recorded By " "
 Weather 70° sunny Coded Replicate No. _____

Instrument Identification

Water Quality Meter(s) YSI 600 XL Serial # _____
 Casing Material PVC Purge Method Peristaltic
 Casing Diameter 4" Screen Interval (ft bmp) Top Unknown Bottom Unknown
 Sounded Depth (ft bmp) 14.10 Pump Intake Depth (ft bmp) _____
 Depth to Water (ft bmp) 13.35 Purge Time Start 1435 Finish _____

Field Parameter Measurements During Purging

Time	Minutes Elapsed	Flow Rate (mL/min)	Volume Purged	Temp (°C)	pH (s.u.)	Conductivity (umhos or mS/cm) ¹⁾	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)
1440	5	225		20.56	6.73	2.19	-77.9	0.59	>999	13.88
1445	10	225		21.49	6.74	2.22	-91.9	0.88	>999	13.88
1450	15	225		21.60	6.74	2.22	-92.3	0.92	7999	13.88
1455	20	225		21.63	6.74	2.23	-92.0	0.99	800	13.88
1500	25	225		21.65	6.74	2.23	-91.4	1.04	550	13.88
1505	30	225		21.67	6.73	2.22	-88.7	1.10	160	13.88
1510	35	225		21.75	6.73	2.22	-88.3	1.12	45	13.88

Collected Sample Condition _____ Color Brown/blk Odor mod-strong Appearance sl sheen
 Parameter _____ Container _____ No. _____ Preservative _____
VOCS VOAS 2 HCL
SUDCS Ambers 1 None
CN Total Plastic 1 NaOH

PID Reading 0.7

Comments Not enough H₂O to pump with 2" Bladder.

1) Circle one unit type

Low-Flow Groundwater Sampling Log

Project B0043011.1.3
 Project Number West 18th St + MGP Site Location Manhattan, NY Verizon Well ID MW-5A
 Date 10-2-08 Sampled By C. Massaro / G. Williams
 Sampling Time 1310 Recorded By 11 11
 Weather SS? Coded Replicate No. _____

Instrument Identification

Water Quality Meter(s) YST 600XL Serial # _____
 Casing Material PVC Purge Method 2" Bladder
 Casing Diameter 2 Screen Interval (ft bmp) Top 9 Bottom 19
 Sounded Depth (ft bmp) 18.88 Pump Intake Depth (ft bmp) _____
 Depth to Water (ft bmp) 14.39 Purge Time Start 1230 Finish _____

Field Parameter Measurements During Purging

Time	Minutes Elapsed	Flow Rate (mL/min)	Volume Purged	Temp (°C)	pH (s.u.)	Conductivity (umhos or mS/cm) ¹⁾	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)
1235	5	150		19.98	7.10	1.79	-338.2	0.60	450	15.65
1240	10	150		20.01	7.07	1.77	-338.7	0.45	270	15.77
1245	15	150		19.95	7.08	1.76	-335.7	0.46	150	15.95
1250	20	150		19.93	7.10	1.75	-333.8	0.45	95	16.15
1255	25	150		19.91	7.12	1.75	-333.4	0.45	80	16.22
1300	30	150		19.95	7.15	1.74	-332.8	0.41	50	16.30
1305	35	150		19.95	7.18	1.73	-333.6	0.38	50	16.41

Collected Sample Condition

 Color brn / blk

 Odor Moderate

Appearance _____

Parameter

Container

No.

Preservative

VOCs
SVOCs
CAI Total

VOAs
Ambers
Plastic

2
12cm
1

HCL
None
NaOH

 PID Reading 0.3

Comments

1) Circle one unit type

Project	West 18th Street MGP		
Project Number	B0093011.1.3	Site Location	Verizon Building Manhattan Well ID MW-8
Date	10-1-08	Sampled By	cm/gw
Sampling Time	1550	Recorded By	" "
Weather	70° sunny	Coded Replicate No.	

Water Quality Meter(s)	<u>YSI 600XL</u>		Serial #	<u></u>	
Casing Material	<u>PVC</u>	Purge Method	<u>2" Bladder</u>		
Casing Diameter	<u>4"</u>	Screen Interval (ft bmp)	Top	<u>unknown</u>	Bottom
Sounded Depth (ft bmp)	<u>17.00</u>	Pump Intake Depth (ft bmp)	<u></u>		
Depth to Water (ft bmp)	<u>12.00</u>	Purge Time	Start	<u>1525</u>	Finish

[illegible]

Collected Sample Condition	Color	Odor	Appearance
Parameter	Container	No.	Preservative
VOCs	VOCs	2	HCL
Sivocs	Ambers	2	None
CN - Total	Plastic	1	NaOH

Comments _____

[http://team/sites/SEI/SiteInvest/Field Forms/lowflowsampforms.xls](http://team/sites/SEI/SiteInvest/Field%20Forms/lowflowsampforms.xls) - Sheet1

Low-Flow Groundwater Sampling Log

Project West 18th St MGP
 Project Number B004301.1-3 Site Location Manhattan, NY Verizon Well ID MW-10
 Date 10-2-08 Sampled By CSM / GW
 Sampling Time 1220 Recorded By " "
 Weather 70° Coded Replicate No. _____

Instrument Identification

Water Quality Meter(s) _____ Serial # _____
 Casing Material PVC Purge Method _____
 Casing Diameter 4" Screen Interval (ft bmp) Top unknown Bottom unknown
 Sounded Depth (ft bmp) 15.00 Pump Intake Depth (ft bmp) 14
 Depth to Water (ft bmp) 11.11 Purge Time Start 1150 Finish _____

Field Parameter Measurements During Purging

Time	Minutes Elapsed	Flow Rate (mL/min)	Volume Purged	Temp (°C)	pH (s.u.)	Conductivity (umhos or mS/cm) ¹⁾	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)
1155	5	CM		20.51	8.00	0.01	11.9	8.14	CM	11.37 CM
1155	5	CM		20.51	CM					11.37 CM
1155	5	260		20.06	6.54	5.41	-48.2	1.30	160	11.37
1200	10	200		20.04	6.56	5.49	-54.4	1.28	110	11.91
1205	15	200		20.15	6.57	5.54	-59.9	1.38	55	12.35
1210	20	200		20.25	6.58	5.55	-61.5	1.25	55	12.40
1215	25	200		20.25	6.58	5.56	-61.6	1.25	55	12.42

Collected Sample Condition _____ Color yellow/brown Odor moderate Appearance _____
 Parameter VOCs Container VOAS No. 2 Preservative HCL
SVOCs Ambers CMZ 1 None
CN Total Plastic 1 No H₂O

PID Reading 0.5

Comments _____

1) Circle one unit type

Low-Flow Groundwater Sampling Log

Project West 18th St Gas Works
 Project Number B0043011.3 Site Location Verizon Building, Manhattan Well ID MW-11
 Date 9-30-08 Sampled By C. Massaro
 Sampling Time 1645 Recorded By C. Massaro
 Weather 70° Coded Replicate No. _____

Instrument Identification

Water Quality Meter(s) _____ Serial # _____
 Casing Material PVC Purge Method Bladder 0.75" CM Peristaltic
 Casing Diameter 1.5" Screen Interval (ft bmp) Top unknown Bottom unknown
 Sounded Depth (ft bmp) 18.30 Pump Intake Depth (ft bmp) 16
 Depth to Water (ft bmp) 11.69 Purge Time Start 1615 Finish _____

Field Parameter Measurements During Purging

Time	Minutes Elapsed	Flow Rate (mL/min)	Volume Purged	Temp (°C)	pH (s.u.)	Conductivity (umhos or mS/cm) ¹⁾	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)
1620	5	500		19.58	6.51	5.79	-163.2	3.96	38	12.45
1625	10	"		19.44	6.49	5.76	-187.8	3.46	24	12.45
1630	15	500		19.41	6.49	5.70	-172.8	2.32	21	12.58
1635	20	500		19.43	6.48	5.69	-169.6	2.08	18	12.60
1640	25	500		19.38	6.48	5.64	-169.7	2.01	12	12.63

Collected Sample Condition _____ Color clear Odor strong Appearance _____
 Parameter VOCs Container VOAS No. 2 Preservative HCL
SVOCs Ambers 2 None
CN Total/Amenable Plastic 2 NaOH

PID Reading _____

Comments _____

1) Circle one unit type

Low-Flow Groundwater Sampling Log

Project West 18th St MGP
 Project Number B0043011.1.3 Site Location Verizon Building, Manhattan Well ID MW-12
 Date 9-30-08 Sampled By C. Massaro, G. Williams
 Sampling Time 1735 Recorded By 11
 Weather 70° Coded Replicate No. 11

Instrument Identification

Water Quality Meter(s) YSI 600XL Serial #
 Casing Material PVC Purge Method Peristaltic Pump
 Casing Diameter 2 Screen Interval (ft bmp) Top Unknown Bottom Unknown
 Sounded Depth (ft bmp) 18.85 Pump Intake Depth (ft bmp) 16
 Depth to Water (ft bmp) 13.02 Purge Time 1705 Finish

Field Parameter Measurements During Purging

Time	Minutes Elapsed	Flow Rate (mL/min)	Volume Purged	Temp (°C)	pH (s.u.)	Conductivity (umhos or mS/cm) ¹⁾	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)
5:10	5	500		19.74	6.67	2847	-23.3	4.63		
5:15	10	500		18.98	6.51	2.127	-145.5	2.20	17	13.65
5:20	15	500		18.96	6.50	2.13	-150.4	1.88	9.7	13.64
5:25	20	500		18.96	6.49	2.15	-153.6	1.78	7.7	13.64
5:30	25	500		18.92	6.48	2.17	-156.2	1.68	6.2	13.64
5:35										

Collected Sample Condition

Color Lt brn/blkOdor StrongAppearance Sheen

Parameter

Container

No.

Preservative

VOCs
SVOCs
CN Total / Amenable

VOAs
Ambers
Plastic

2
2
2

HCL
None
NaOH

PID Reading

Comments

1) Circle one unit type

Low-Flow Groundwater Sampling Log

Project West 18th Street Gas Works
 Project Number B0043011.1.3 Site Location Venizon Building Manhattan Well ID Well Cluster A2
 Date 9-30-08 Sampled By C. Massaro / G. Williams
 Sampling Time 1145 Recorded By C. Massaro
 Weather 70° partly cloudy Coded Replicate No. _____

Instrument Identification

Water Quality Meter(s) YSI 600XL Serial # _____
 Casing Material PVC Purge Method Bladder 2"
 Casing Diameter 2" Screen Interval (ft bmp) Top 13.50 Bottom 15.50
 Sounded Depth (ft bmp) 15.02 Pump Intake Depth (ft bmp) 14.50
 Depth to Water (ft bmp) 11.32 Purge Time _____ Start _____ Finish _____

Field Parameter Measurements During Purging

Time	Minutes Elapsed	Flow Rate (mL/min)	Volume Purged	Temp (°C)	pH (s.u.)	Conductivity (umhos or mS/cm) ¹⁾	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)
11:10		100		20.15	7.45	2.96	-22.2	2.90	888	13.18
11:15		11		20.24	7.47	2.97	-23.0	2.24	885	14.5
11:20		11		20.85	7.45	2.97	-120	1.94	900	14.5
11:25		11		21.03	7.47	3.02	-126	1.87	880	14.5
11:30		11		21.06	7.48	3.02	-128	1.78	950	14.5
11:35		11		21.17	7.48	3.01	-128	1.68	750	14.5
11:40		11		21.24	7.47	3.01	-124	1.86	680	14.5

Collected Sample Condition Color brown/gray Odor Moderate Appearance _____
 Parameter Container No. Preservative
VOCS Can 3 VOAS 2 HCL
SVOCs 2 Ambo Can 2 None
CN Total/Amenable 2 gl plastic Can 1 NaOH
 PID Reading 43.72
 Comments * purge rate = recovery rate

1) Circle one unit type

Low-Flow Groundwater Sampling Log

Project West 18th Street Gas Works
 Project Number B0043011.1.3 Site Location Verizon Building Manhattan Well ID Well Cluster A3
 Date 9-30-08 Sampled By C. Massaro, G. Williams
 Sampling Time 1130 Recorded By C. Massaro
 Weather 70° F Coded Replicate No. _____

Instrument Identification

Water Quality Meter(s) YSI 600XL Serial # _____
 Casing Material PVC Purge Method Bladder 2"
 Casing Diameter 2" Screen Interval (ft bmp) Top 17.70 Bottom 19.70
 Sounded Depth (ft bmp) 19.25 Pump Intake Depth (ft bmp) 18.5
 Depth to Water (ft bmp) 11.40 Purge Time Start 1105 Finish 1135

Field Parameter Measurements During Purging

Time	Minutes Elapsed	Flow Rate (mL/min)	Volume Purged	Temp (°C)	pH (s.u.)	Conductivity (umhos or mS/cm) ¹⁾	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)
1110	5	500	H ₂ O	19.00	6.66	3.208	-244.0	2.96	220	11.40
1115	10	500		18.80	6.66	3.290	-253.2	2.29	160	11.40
1120	15	500		18.81	6.67	3.288	-273.2	2.00	80	11.40
1125	20	500		18.78	6.68	3.290	-278.2	1.80	50	11.40
1130	25	500		18.75	6.69	3.285	-281.3	1.76	23	11.40

Collected Sample Condition Color cloudy Odor moderate Appearance Lt brown/gray
 Parameter Container No. Preservative
VOCs VOA's 32 HCL
SVOCs Ambers 2 None
CN, Total, Amenable plastic 2 NaOH
 PID Reading 23.8

Comments _____

1) Circle one unit type

Low-Flow Groundwater Sampling Log

Project West 18th St. MGP
 Project Number B0043011-1.3 Site Location Venzon Building Well ID SB-B2
 Date 10-1-08 Sampled By CJM, GW
 Sampling Time 1145 Recorded By 11 11
 Weather 70° sunny Coded Replicate No. _____

Instrument Identification

Water Quality Meter(s) YSI 600XL Serial # _____
 Casing Material PVC Purge Method _____
 Casing Diameter 2 Screen Interval (ft bmp) Top _____ Bottom _____
 Sounded Depth (ft bmp) 15.32 Pump Intake Depth (ft bmp) 14.5
 Depth to Water (ft bmp) 13.23 Purge Time Start 1100 Finish _____

Field Parameter Measurements During Purging

Time	Minutes Elapsed	Flow Rate (mL/min)	Volume Purged	Temp (°C)	pH (s.u.)	Conductivity (umhos or mS/cm) ¹⁾	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)
1105	5	100		19.78	6.91	2.12	-131.5	7.58	7999	14.5
1110	10	11		19.98	6.93	2.12	-121.8	7.03	11	11
1115	15	11		20.30	6.94	2.10	-103.5	6.29	11	14.5
1120	20	11		21.33	6.96	2.13	-90.0	5.26	11	14.5
1125	25	11		21.70	6.99	2.14	-81.5	5.19	11	14.5
1130	30	11		21.46	7.00	2.12	-95.8	4.77	11	11
1135	35	11		21.51	7.01	2.11	-90.2	4.75	11	11
1140	40	11		21.58	7.03	2.10	-89.9	4.75	11	11

Collected Sample Condition

Color _____ Odor _____ Appearance _____
 Parameter VOCs Container VOAs No. 2 Preservative HCL
SVOCs Ambers 2 None
CA Total Plastic 1 NaOH

PID Reading 44.8

Comments 100mL/min flow rate is = to recovery rate
* having trouble keeping bladder full because of slow
recovery, so air is present causing higher DO
values.

1) Circle one unit type

Project	50043011-1.3		
Project Number	West 18th St + M6P	Site Location	Verizon Building, Manhattan Well ID SB-B3
Date	10-1-08	Sampled By	C. Massaro / G. Williams
Sampling Time	1110	Recorded By	" "
Weather	70° sunny	Coded Replicate No.	Dup-02

Water Quality Meter(s)	YSI 600XL	Serial #
------------------------	-----------	----------

Casing Material	PVC	Purge Method	2" Bladder
-----------------	-----	--------------	------------

Casing Diameter	Screen Interval (ft bmp)	Top	Bottom
-----------------	--------------------------	-----	--------

Sounded Depth (ft bmp)	20.18	Pump Intake Depth (ft bmp)	19	19
------------------------	-------	----------------------------	----	----

Depth to Water (ft bmp)	13.48	Purge Time	Start	1038	Finish
-------------------------	-------	------------	-------	------	--------

[illegible]

Collected Sample Condition

Color Fawn ^{cm} Lt brn/yellow Odor moderate

Appearance

Parameter

Container

No.

Preservative

VOCs
SVOCs
Total CN

VOAs
Ambers
Plastic

2
2
1

Preservative

HCl
None
NaOH

PID Reading 24.5

Comments

Low-Flow Groundwater Sampling Log

Project West 18th Street Gas Works
 Project Number B004301.1.3 Site Location Vergara Building Well ID Well Cluster C2
 Date 9-30-08 Sampled By C. Massaro
 Sampling Time 1355 Recorded By C. Massaro
 Weather 70° sunny Coded Replicate No. _____

Instrument Identification

Water Quality Meter(s) YSI 600XL Serial # _____
 Casing Material PVC Purge Method _____
 Casing Diameter 2 Screen Interval (ft bmp) Top _____ Bottom _____
 Sounded Depth (ft bmp) _____ Pump Intake Depth (ft bmp) _____
 Depth to Water (ft bmp) 11.87 Purge Time Start 1325 Finish _____

Field Parameter Measurements During Purging

Time	Minutes Elapsed	Flow Rate (mL/min)	Volume Purged	Temp (°C)	pH (s.u.)	Conductivity (umhos or mS/cm) ¹⁾	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)
1330	5	~150		22.18	7.62	1.65	-94.7	2.46	290	11.89
1335	10	11		20.98	7.55	1.32	-101.7	2.41	180	14.50
1340	15	11		21.11	7.54	1.31	-101.0	2.13	210	14.50
1345	20	11		21.35	7.54	1.29	-99.1	2.00	190	14.50
1350	25	11		21.42	7.54	1.28	-96.8	2.18	160	14.50

Collected Sample Condition _____ Color _____ Odor _____ Appearance _____
 Parameter VOCs Container VOAS No. 2 Preservative HCL
SVOCs Ambers 1 None
CN Total/Amenable Plastic 1 NaOH

PID Reading 1.2

Comments * ~100 mL/min drew down H₂O level to pump intake.

1) Circle one unit type

Low-Flow Groundwater Sampling Log

Project WEST 18TH ST GAS WORKS
 Project Number B004-3011-0001-0003 Site Location Upper 2nd Bldg NYC Well ID WPU CLUSTER C-3
 Date 9-30-08 Sampled By G.W.C.M.
 Sampling Time 1330 Recorded By BW / CM
 Weather 70° Sunny Coded Replicate No. _____

Instrument Identification
 Water Quality Meter(s) YSI 600XL Serial # _____
 Casing Material PVC Purge Method Bladder 2"
 Casing Diameter 2" Screen Interval (ft bmp) Top _____ Bottom _____
 Sounded Depth (ft bmp) _____ Pump Intake Depth (ft bmp) _____
 Depth to Water (ft bmp) 12.45 Purge Time Start 1255 Finish _____

Field Parameter Measurements During Purging

Time	Minutes Elapsed	Flow Rate (mL/min)	Volume Purged	Temp (°C)	pH (s.u.)	Conductivity (umhos or mS/cm) ¹⁾	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)
1300	5	300		19.28	8.01	1.32	-136.5	4.69	330	15.10
1305	10	11		18.95	7.99	1.32	-143.2	3.30	320	15.10
1310	15	11		19.60	7.97	1.34	-143.0	3.26	190	15.10
1315	20	11		19.16	7.93	1.48	-144.1	3.12	120	15.30
1320	25	11		18.73	7.86	1.49	-147.2	2.53	70	15.55
1325	30	11		18.66	7.83	1.51	-149.1	2.30	40	15.59
1330	35	11		18.68	7.80	1.53	-149.8	2.28	50	15.69

Collected Sample Condition
 Color sl cloudy Odor moderate Appearance fast cloudy
 Parameter VOGs Container am No. 2 Preservative HCL
SVOGS 2 VOAS 2 None
CN Total, Amenable 2 Ambers 2 NaOH
2 Plastic 2

PID Reading 4.1 ppm

Comments _____

1) Circle one unit type

INSTRUMENT CALIBRATION FORM

Project CON ED W 18TH ST
 Project No. B0043011.0001.000003
 Site Location W-18TH ST MANHATTAN
 Date 9-30-08
 Time _____
 Prepared by G.W.

☐ Ph Cond Tempmeter
 Model Oakton 300 Services
 Serial 121686

☐ Turbidity Meter
 Model 2020 Lamotte
 Serial 3597-3502

☐ D.O. Meter
 Model #55/25 FT
 Serial 00H0611

☐ ORP Meter
 Model 00702-70
 Serial 55386

☐ Multiprobe
 Model YSI 600 XL
 Serial 02J0183A1

☐ Turbidity Meter
 Model 2020 Lamotte
 Serial _____

☐ D.O. Meter
 Model _____
 Serial _____

☐ ORP Meter
 Model _____
 Serial _____

☐ PID
 Model Photovac 2020
 Serial ED HF 358

☐ PID
 Model Photovac 2020
 Serial _____

☐ pH Cond Temp
 Model Oakton 300 Series
 Serial 197765

☒ Rental 600 XL
 Model PINE 7127
 Serial 600 XL
PINE 02651

Check appropriate box for equipment calibrated. If two similar items are calibrated, please note two checks under calibration successful

Parameter PID (ppmv)	Value	Calibration Successful
Zero	✓	✓
Span	100	✓

Parameter D.O.	Calibration Successful
100% Saturated Air	YES
Barometer Adjustment	YES
Elevation Adjustment	NO

ph (si Units)	Value	Calibration Successful
4.00	✓	YES
7.00	✓	YES
10.00		

* ORP (Mv)	Calibration Successful
Hydroquinone (240) (Black)	
Zobel Solution (237) (yellow)	YES
Temperature Based Chart Calibration	
* Adjusted	

Conductivity (umhos)	Value	Calibration Successful
84 umhos		
1413 umhos	✓	YES
Other		

* No adjustment on some meters just a probe check, others are adjustable

Turbidity (NTU)	Value	Calibration Successful
NO		
1.0 NTU		
10 NTU		
40 NTU		
Other		

INSTRUMENT CALIBRATION FORM

Project COW BD W 18TH ST
 Project No. B0043011.0001.00003
 Site Location W 18TH ST NYC
 Date 10-1-08
 Time _____
 Prepared by GKW

☐ Ph Cond Tempmeter
 Model Oakton 300 Services
 Serial 121686

☐ Turbidity Meter
 Model 2020 Lamotte
 Serial 3597-3502

☐ D.O. Meter
 Model #55/25 FT
 Serial 00H0611

☐ ORP Meter
 Model 00702-70
 Serial 55386

☐ Multiprobe
 Model YSI 600 XL
 Serial 02J0183A1

☐ Turbidity Meter
 Model 2020 Lamotte
 Serial _____

☐ D.O. Meter
 Model _____
 Serial _____

☐ ORP Meter
 Model _____
 Serial _____

☐ PID
 Model Photovac 2020
 Serial ED HF 358

☐ PID
 Model Photovac 2020
 Serial _____

☐ pH Cond Temp
 Model Oakton 300 Series
 Serial 197765

☒ Rental 600 KL
 Model Pose 7127
 Serial 600 KL
Pose 02651

Check appropriate box for equipment calibrated. If two similar items are calibrated, please note two checks under calibration successful

Parameter PID (ppmv)	Value	Calibration Successful
Zero	✓	YES
Span	✓	YES

Parameter D.O.	Calibration Successful
100% Saturated Air	✓ YES
Barometer Adjustment	YES
Elevation Adjustment	NO

ph (si Units)	Value	Calibration Successful
4.00	✓	YES
7.00	✓	YES
10.00		

* ORP (Mv)	Calibration Successful
Hydroquinone (240) (Black)	
Zobel Solution (237) (yellow)	YES
Temperature Based Chart Calibration	
* Adjusted	

Conductivity (umhos)	Value	Calibration Successful
84 umhos		
1413 umhos	✓	YES
Other		

* No adjustment on some meters just a probe check, others are adjustable

Turbidity (NTU)	Value	Calibration Successful
<u>NO</u> 1.0 NTU		
10 NTU		
40 NTU		
Other		

INSTRUMENT CALIBRATION FORM

Project Cow EP W 18TH ST
 Project No. B0043011.0001.00003
 Site Location W 18TH ST NYC
 Date 10-2-80
 Time _____
 Prepared by G.W.

☐ Ph Cond Tempmeter
 Model Oakton 300 Services
 Serial 121686

☐ Turbidity Meter
 Model 2020 Lamotte
 Serial 3597-3502

☐ D.O. Meter
 Model #55/25 FT
 Serial 00H0611

☐ ORP Meter
 Model 00702-70
 Serial 55386

☐ Multiprobe
 Model YSI 600 XL
 Serial 02J0183A1

☐ Turbidity Meter
 Model 2020 Lamotte
 Serial _____

☐ D.O. Meter
 Model _____
 Serial _____

☐ ORP Meter
 Model _____
 Serial _____

☐ PID
 Model Photovac 2020
 Serial ED HF 358

☐ PID
 Model Photovac 2020
 Serial _____

☐ pH Cond Temp
 Model Oakton 300 Series
 Serial 197765

☒ Rental B00002
 Model AW57127
 Serial 600X
PIWE02651

Check appropriate box for equipment calibrated. If two similar items are calibrated, please note two checks under calibration successful

Parameter PID (ppmv)	Value	Calibration Successful
Zero	✓	YES
Span	✓	YES

Parameter D.O.	Calibration Successful
100% Saturated Air	YES
Barometer Adjustment	YES
Elevation Adjustment	

ph (si Units)	Value	Calibration Successful
4.00	✓	YES
7.00	✓	
10.00		

* ORP (Mv)	Calibration Successful
Hydroquinone (240) (Black)	
Zobel Solution (237) (yellow)	YES
Temperature Based Chart Calibration	
* Adjusted	

Conductivity (umhos)	Value	Calibration Successful
84 umhos		
1413 umhos	✓	YES
Other		

* No adjustment on some meters just a probe check, others are adjustable

Turbidity (NTU)	Value	Calibration Successful
<u>ND</u> 1.0 NTU		
10 NTU		
40 NTU		
Other		

ARCADIS

Site Activities Tailgate Safety Briefing Sign-in Log

Project Number: B0043011.0001-00003 Project Name: COWEN W 18TH ST

Date: 9-3, 10-1-2-2008 Time: _____

Briefing Conducted by: GARY WILSON Signature: [Signature] Company: ARCADIS

This sign-in log documents the tailgate briefing conducted in accordance with the HASP. Personnel who perform work operations on Site are required to attend each briefing and to acknowledge receipt of each briefing, daily.

TOPICS COVERED (check all those covered):

- | | | |
|---|---|--|
| ☒ General PPE Usage | ☐ Confined Space | ☐ Excavation Safety |
| ☐ Hearing Conservation | ☒ Slips, Trips, Falls | ☐ Confined Space |
| ☐ Respiratory Protection | ☐ Heat Stress | ☒ Traffic Safety |
| ☐ Personal Hygiene | ☐ Thermal Stresses | ☐ Changes to the HASP |
| ☐ Exposure Guidelines | ☐ Site Control | ☐ Initial Review of Hazard Evaluation |
| ☒ Decon Procedures | ☐ Work Zones | ☐ Other (specify): |
| ☒ Emergency Procedures
(include route to hospital) | ☐ Lockout/Tagout | ☐ Other (specify): |

Personnel Sign-in List

Printed Name	Signature	Company Name
Craig Massaro	<u>[Signature]</u>	ARCADIS
GARY WILSON	<u>[Signature]</u>	ARCADIS
Craig Massaro	<u>[Signature]</u>	11
GARY H. WILSON	<u>[Signature]</u>	ARCADIS
Craig Massaro	<u>[Signature]</u>	11

10-1-08

10-2-08

Appendix D

Forensic Evaluation



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West Tower Suite 205
Cary
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MEMO

To:
File

Copies:
Craig Massaro
Terry Taylor

From:
Ted Sauer

Date:
January 14, 2009

ARCADIS Project No.:
B0043011

Subject:
Forensic Evaluation to Differentiate Petroleum Product Volatile Hydrocarbons (e.g., BTEX) From Those of Coal Tar in Soils and Groundwater at the ConEdison Former West 18th Street MGP Site (Verizon Property) in New York, New York

Introduction

In previous investigations of groundwater and soils at the Con Edison Former West 18th Street Manufactured Gas Plant (MGP) Site (i.e., Verizon property) in New York, New York, the volatile hydrocarbons benzene, toluene, ethyl benzene and xylenes (BTEX) and other hydrocarbons were determined to be present and in some samples exceed MCL criteria in soil and groundwater within the property boundaries. The source of the hydrocarbons has been unknown but allegedly associated with MGP wastes found in some soils at the Site even though there were historic and present uses of the Site that would suggest other sources that include petroleum.

As a result, to determine potential sources of the hydrocarbons in groundwater at the Site, groundwater and soil samples were collected in 2008 and analyzed for a suite of volatile hydrocarbons that would compositionally characterize types of hydrocarbon material (e.g., gasoline, coal tar) contributing to the presence of hydrocarbons and BTEX exceedances in Site soil and groundwater. This suite of volatile hydrocarbons is collectively called PIANOS compounds, and represent over 100 paraffin (P), isoparaffin (I), aromatic (A), naphthenic (N), olefin (O) and sulfur heterocyclic (S) hydrocarbons (Table 1). This suite of volatile hydrocarbons has been found to be essential in determining sources of hydrocarbons of concern such as BTEX in environmental samples (Stout et al. 2002; Sauer and Costa 2003).

Sampling and Analysis

In August 2008, seven (and 1 duplicate) soil samples were collected at four areas at the Site (Figure 1) to characterize potential sources of hydrocarbons in both soils and groundwater. Two soil samples [SB-C(14) and SB-C(22)] were collected at SB-C, near the doorway of the building facing 18th Street (between the two former gas holders); three samples [WC-A(12), WC-A(17) and WC-A(20)] at Well Cluster A, west of

SB-C (under the former west gas holder); one sample [SB-B(10)] at SB-B, south of SB-C, near the former 550-gallon gasoline USTs (under the former east gas holder); and one sample [WC-C(21)] at Well Cluster C, in the center of the property (between the two former gas holders). The samples were collected at different subsurface depths in each area from 10 to 22 ft bgs. The inventory of soil samples collected at the Site is provided in Table 1.

In September/October 2008, eight (and 1 duplicate) groundwater samples were collected in the same four areas sampled for soils and in another area near the former 4000-gallon UST. Two groundwater samples (MW-8 and MW-9) were collected near SB-C, two samples (MW-A2 and MW-A3) at the Well Cluster A area, two samples (MW-B2 and MW-B3) at SB-B, and two samples (MW-C2 and MW-C3) at Well Cluster C. Also, one groundwater sample (MW-4) was collected in the area of the former 4000-gallon gasoline UST south of SB-B near the east boundary (under the former east gas holder).

Both the soil and groundwater samples from the Site were analyzed for nearly 100 volatile hydrocarbon compounds in the gasoline range listed in Table 1. In addition, three gasoline standards that represent the 3 major types of gasolines available on the market, Regular (87 octane rating), Plus (89), and Super (91), were also analyzed for PIANOS compounds. The target compounds, collectively called PIANOS, included eight paraffin compounds (*n*-alkanes) from pentane through dodecane; 23 isoparaffin compounds (branched alkanes); 35 aromatic compounds that included BTEX, C₃-C₄-, and C₅-benzenes, and the 2-ring naphthalenes; 12 naphthene compounds (saturated cyclic compounds), 13 olefin compounds (alkenes), five thiophene compounds and benzothiophene (sulfur cyclic compounds), and gasoline additives that include tertiary butyl alcohol (TBA), methyl tertiary butyl ether (MTBE), and di-isopropyl ether (DIPE), and other compounds.

These target analytes were determined by EPA Method 8260 modified to include calibration solutions of this more robust list of volatile compounds, stricter quality control objectives, longer gas chromatographic column, and longer chromatography temperature program as presented in the published literature, Uhler et al. (2003) and Sauer and Costa (2003). These modifications to this purge and trap, gas chromatography/mass spectrometer (GC/MS) method were necessary to successfully separate and quantify these compounds. Also, Total Petroleum Hydrocarbon – Diesel Range Organics (TPH-DRO) analysis was performed by modified Method 8015 on the samples, and the gas chromatogram (i.e., GC fingerprint) from the analysis was used to help identify the type of petroleum in the samples. These GC fingerprints are provided in the appendix of this memo.

Selected diagnostic aromatic compounds and groups of compounds were used in double ratio plots. The concentration of a group of higher-molecular-weight mono-aromatic compounds (HMW aromatics) that included compounds listed after indan/indene in the aromatic fraction of the PIANO composition in Table 1 was calculated for each sample. This group of C₄- and C₅- aromatic compounds, eluting after the *n*-alkane decane in the analysis, represents the volatile hydrocarbons that would be most resistant to the effects of

weathering (e.g., evaporation, dissolution, biodegradation) of an organic product exposed to the environment.

Overall Hydrocarbon Compositional Characteristics of Site Samples

Compositional histograms of PIANOS compounds (Figures 2A and 2B) were generated for the soil and groundwater samples from the Site and for a representative gasoline standard and a coal tar NAPL (from another site). These compositional histograms show the relative contributions of the individual hydrocarbons and hydrocarbon groups (P, I, A, N, O and S) to the overall PIANOS composition in the samples. The relative percent of the major hydrocarbon groups in the soil and groundwater samples containing gasoline and/or coal tar are summarized in Table 2.

Evident from the PIANOS histograms of the gasoline standard and coal tar NAPL in Figures 2A and 2B, the compositional characteristics of the two products are quite contrasting. Coal tar contains almost exclusively aromatic compounds with relatively trace amounts of the thiophenes and high molecular weight *n*-alkanes, whereas the petroleum product is represented by all the PIANOS groups. Isoparaffin, naphthene, and olefin compounds are absent from coal tars. Also in coal tar, the volatile aromatic group has a much higher proportion of the 2-ring aromatic naphthalenes than that of petroleum. As evident in Figure, the distinguishing features of the two product types are also evident in the soil and groundwater samples that contain either one of the products.

These PIANOS compositional histograms which help to show the predominant product type in a sample are complemented by the GC fingerprints from the TPH (TPH-DRO type) analysis. In Table 2, the results of the evaluation of the GC fingerprints of the samples are provided. The volatile hydrocarbon portion of coal tar falls within the gasoline range of GC fingerprints and as a result determining the contribution of either product is difficult when there is a mixture of the two type products. One feature of a GC fingerprint that allows for determining the presence of gasoline only in the sample is the absence of significant peaks after the gasoline signature which is approximately 20 minutes (C14) on the GC fingerprint. If there are not many significantly large peaks after 20 minutes on the GC fingerprint, then the product is gasoline. Peaks after 20 minutes would represent other petroleum products, coal tar or some other organic material. A comparison of the GC fingerprints of soil sample WC-A(12), which contains gasoline only, and soil sample WC-A(20), which contains a mix of gasoline and coal tar, illustrates this feature (see appendix for the GC fingerprints).

Differentiation of Gasoline and Coal Tar Products Using Diagnostic Ratio Relationships

Identifying the source of particular hydrocarbons-of-concern, such as BTEX, in the environment where coal tar and petroleum products are candidate sources requires a number of considerations. One consideration is the overall composition of hydrocarbons. If there are negligible amounts of P, I, N, and O compounds in the environmental sample, the source of hydrocarbons would probably be coal tar products.

If, on the other hand, the environmental sample contained the full suite of PIANOS compounds, the source of the hydrocarbons would be, at a minimum, a petroleum product. However, since both petroleum products and coal tar contain aromatics, the presence of the non-aromatic compounds does not limit the hydrocarbon source to petroleum products since aromatics from the coal tar could be present with the aromatics from the petroleum product. Compounds such as indene and some of the thiophenes have been used to suggest the presence of coal tar in environmental samples, but the presence of these compounds does not indicate the relative amount of coal tar in environmental samples contaminated with a mix of coal tar and petroleum.

Another consideration in source identification is the effects of weathering (evaporation, dissolution and biodegradation) on the composition of the products. Depending on the relative influence of particular weathering processes, the change in composition of a product would be variable and identifying a particular source less predictable. The vapor pressures and solubilities of these PIANOS groups are different, and therefore, loss of particular hydrocarbons from weathering in the environment would vary depending on the type and extent of exposure (Stout et al., 2002). Overall product compositions (compositional fingerprints) would look different over time depending on the extent of weathering.

Still another consideration is the transport of product from one matrix to matrix (i.e., soil or NAPL to groundwater). Due to different solubilities of individual hydrocarbons in a product, the composition of the material will change when the product moves from the soil/NAPL matrix to the groundwater matrix. The more soluble compounds of the product will be relatively enhanced in groundwater compared to the NAPL or contaminated soil (Sauer and Costa, 2003). Aromatics would be relatively enhanced compared to the other hydrocarbon groups in groundwater when contaminated soil or NAPL are in contact with groundwater. The effects of solubilities would especially be an issue when comparing compositions of petroleum products with coal tar in groundwater. The composition of gasoline in groundwater compared to same gasoline in soil would be enhanced with aromatics relative to the other non-aromatics such that the hydrocarbon composition in the groundwater would look like there was a contribution of coal tar in the groundwater, and would lead to a misidentification of the product or products in the groundwater.

The effects of weathering and the differences in physical properties of individual hydrocarbons that influence changes in hydrocarbon compositions of an original hydrocarbon source material when moving from matrix to another require consideration when identifying useful diagnostic compounds for use in differentiating hydrocarbon sources. As a result, identification of sources of petroleum products exposed to the environment requires comparison of particular analytes or groups of analytes that have similar physical/biodegradation properties (Burris et al., 2006; Sauer and Costa, 2003; Stout et al., 2002). This is especially important when comparing compositions of petroleum and coal tars in groundwater to those in soils. In evaluating petroleum product and coal tar data in samples from the Site, diagnostic ratios of individual and groups of compounds were found to be useful in determining the relative contributions of petroleum product and coal tar in environmental samples.

One useful diagnostic ratio is the ratio of the PAH naphthalenes and the high molecular weight mono-aromatics (HMW Aromatics – defined above). The naphthalenes and HMW Aromatics are the most weathering-resistant compounds of the PIANOS compounds, and have distinguishing features for coal tar and petroleum products. In Figure 3, the ratio of naphthalenes and HMW Aromatics are graphed versus the percent ratio of the aromatics and total PIANOS for the soil samples. This figure shows the relationship of gasoline and coal tar where coal tar naphthalenes are five to 10 times higher in coal tar-containing than in petroleum-containing soils. Almost every soil sample has either the coal tar or gasoline compositional signature. One soil sample, WC-A(20) has a mix of coal tar and gasoline evident by its position in Figure 3.

Coal tar contains almost exclusively aromatics, and in Figure 3, the diagnostic ratio of percent aromatics versus total PIANOS shows coal tar NAPL and coal tar-containing soil samples positioned to the far right of the graph with values close to 100%. In contrast, the gasoline standards are positioned to the left of center reflecting the presence of the non-aromatic hydrocarbons in gasoline. This compositional feature for fresh gasolines (gasoline standards) becomes affected, however, by exposure to the environment and the processes of weathering. The effect of weathering is illustrated by the gasoline-containing soil samples in Figure 3 where the non-aromatic hydrocarbons are preferentially lost when compared to the aromatic hydrocarbons such that the relative aromatic content of the gasoline-containing soils increases. The non-aromatic compound classes (PINOS) are mostly represented by low-molecular-weight hydrocarbons with carbons less than the 10 which is different from the aromatics which are mostly represented by higher-molecular-weight aromatics with carbons greater than 10. The lower-molecular-weight, non-aromatic hydrocarbons are more susceptible to weathering than the higher-molecular-weight aromatics and therefore the relative amount of aromatics increases with weathering. As a result, the use of this percent aromatic to total PIANOS ratio is limited in determining the relative contribution of coal tar and gasoline in a mixture of the two products because of the effects of weathering on the non-aromatic fraction of gasolines.

In addition, the change in relative aromatic content in gasolines released to the environment also occurs when gasoline-containing soils or NAPL are in contact with groundwater. In Figure 4, the groundwater samples from the Site are included with the soil samples. At locations where gasoline is present in soils, the aromatic fraction (ratio of percent aromatics versus total PIANOS) in the groundwater samples is higher than that of the corresponding soil samples. This is evident in Table 2 when comparing the percent values of the PIANOS groups in the groundwater and soil at the same location. This enhancement of the aromatic fraction in the groundwater samples is due mostly to the generally higher solubilities of the aromatic hydrocarbons compared to those of the non-aromatic compounds. As pointed before, the higher aromatic percents in groundwater may be misinterpreted as groundwater containing coal tar when in fact that is not the case.

A diagnostic ratio that clearly shows the relative contribution of gasoline or coal tar in both soils and groundwater is the ratio of 1,2,3,4-tetramethyl benzene to 1,2,4,5-tetramethyl benzene. These two

compounds have very similar solubilities and because of their relatively higher molecular weight compared to the other aromatics they are less susceptible to weathering. So any significant change in the ratio would reflect a difference in composition due to source not from the effects of weathering. This ratio of the two C4-benzenes is paired with the percent naphthalenes and HMW Aromatics, and in Figure 5 shows the distinct difference in composition of samples containing gasoline from those containing coal tar. The diagnostic pair also shows the compositions of mixes of the two products. Soil and groundwater samples containing gasoline are grouped with the gasoline standards in the figure, in the same way that the soil and groundwater samples containing coal tar are grouped with the coal tar NAPL and coal tar in soil samples. In between the areas of the two source materials in the figure are the samples that contain a mix of gasoline and coal tar.

Another parameter that helps to differentiate gasoline hydrocarbons from coal tar hydrocarbons is the sulfur-containing compounds. Although sulfur-containing compounds vary in petroleum products depending on refining conditions and source oil, the relative amount of sulfur cyclic hydrocarbons in volatile hydrocarbon compositions (i.e., PIANOS) is relatively higher in coal tar than in gasoline. Gasolines rarely contain detectable thiophenes and relatively small amount of benzothiophene (see Table 1), whereas fresh coal tar will usually contain many of these sulfur compounds at relative amounts around 5 percent or greater depending on the extent of weathering of the coal tar. Benzothiophene is the most weathering resistant volatile sulfur cyclic compound and will often be present in samples containing either gasoline or coal tar. The relative amount of sulfur cyclic compounds is a potential distinguishing feature for coal tar and gasoline differentiation as illustrated in Figure 6.

Source Identification of Hydrocarbons in Site Soils and Groundwater

Although it would be desired to use the diagnostic ratios, especially the ratios used in the double ratio plot in Figure 5, to estimate the relative contribution of each product in samples that contain a mixture of the two source products, there is not sufficient data from either this study or the published literature to allow one at this time to make this estimate. However, the selected diagnostic ratios in addition to the other compositional information from the PIANO and TPH analyses provide multiple lines of evidence to differentiate hydrocarbons of gasoline from those of coal tar in both soil and groundwater. The results of the hydrocarbon compositional characterization in identifying sources of hydrocarbons in soil and groundwater samples from the Site are summarized in Figure 7 and discussed below:

- The soils and groundwater in the SB-C area including MW-8 have the compositional signature of gasoline. The PIANOS compositions of the soil samples SB-C(14) and SB-C(22) and groundwater samples MW-8 and MW-9 that represent this area are consistent with that of gasoline standards. There appears to be no evidence of coal tar in any of these samples.
- In the area of Well Cluster C, which is in the middle of the Site between the two gas historic holders of the former MGP facility, both soils and groundwater have the compositional signature of a coal tar

product. The PIANOS compositions of the Well Cluster C soil samples WC-C(21) and groundwater samples MW-C2 and MW-C3, with well screen intervals of 13.5 to 15.5 ft bgs and 19 to 21 ft bgs, respectively, are generally consistent with the represent coal tar NAPL and coal tar-containing soils collected at another former MGP site. The slight deviation of the MW-C2 groundwater composition compared to the other Well Cluster groundwater sample is probably due to low concentrations and non-detects of the PIANOS compounds.

- In the area of Well Cluster A, most soil and groundwater contain predominately gasoline but in some samples coal tar is also present. The shallow soil samples, WC-A(12) and WC-A(17), and the shallow groundwater sample, MW-A2 with a well screen interval of 13.5 to 15.5 ft bgs, have the gasoline signature with low or negligible evidence of coal tar. The deepest soil sample WC-A(20) has a mixture of gasoline and coal tar. The deep groundwater sample, MW-A3 with a well screen interval of 17.5 to 19.5 ft bgs, looks to contain mostly coal tar hydrocarbons, but the apparent absence of the non-aromatic (PINO) compounds, which would indicate coal tar, may be due to the high analyte detection limits due to diluting of the sample prior to analysis.
- In the SB-B area, the shallow soils and groundwater have a gasoline signature, whereas the deeper groundwater has a mix of gasoline and coal tar. This area is closest to the former 550 gallon USTs at the Site. The soils at SB-B are only represented by one shallow soil sample SB-B(10). A deeper soil sample was not analyzed for PIANOS. The shallow groundwater sample, MW-B2 with a well screen interval of 14 to 16 ft bgs, looks to have a similar hydrocarbon composition as that of MW-A2 (Well Cluster A area) which contained gasoline. The shallow groundwater samples of the two areas were collected at approximately the same well screen interval. The deeper groundwater sample MW-B3 of the SB-B area, which was collected in the well screen interval of 18.5 and 20.5 ft bgs, has a composition that indicates a mixture of gasoline and coal tar. The deep groundwater sample MW-A3 of the Well Cluster A area also has a mixture of gasoline and coal tar.
- In the area of the former 4000-gallon UST, one groundwater sample MW-4 was collected at well depth 14.35 ft (well screen interval unknown). The PIANOS concentrations in this sample are very low with all almost all the PIANOS made up of benzene and indan. The PIANO composition indicates gasoline with some coal tar but the low PIANOS concentration makes the assessment inconclusive.
- MTBE, a gasoline additive, is present at varying concentrations in all groundwater samples and in some soil samples. However, MTBE is not present in the soil samples at SB-C where gasoline only is present. The absence of MTBE may be due water-washing of the chemical from the gasoline hydrocarbons because its high solubility or may be due to that the spilled gasoline pre- or post-dates the use of the chemical in the gasoline. TBA, another gasoline additive, is also present in the shallow groundwater samples but not in the soil samples. The concentrations of this chemical are especially high in the SB-B groundwater samples for, at the moment, an unknown reason.

Summary

In this study, compositional characteristics of the PIANOS hydrocarbons in Site soil and groundwater samples are compared with each other and standard gasoline and coal tar NAPL samples to identify and differentiate the source of hydrocarbons in soils and groundwater at the Site. From multiple lines of evidence that include PIANOS compositional characterization, diagnostic ratio relationships of selected aromatic and heterocyclic compounds, and TPH GC fingerprint evaluation, the results of these interpretative analyses are summarized here and in Figure 7.

- There are areas of the Site where gasoline and coal tar are exclusively present. In the SB-C area that includes MW-8, shallow (14 ft bgs) and deep (22 ft bgs) soils and groundwater (unknown well screen intervals) contain only gasoline. In the area of Well Cluster C, only coal tar product is present in soils (only deep, 21 ft bgs representation) and shallow (13.5 to 15.5 ft bgs interval) and deep (19 to 21 ft bgs interval) groundwater.
- In other areas (Well Cluster A, SB-B), gasoline is the only or predominate product in shallow soils and groundwater (<16 ft bgs) with a mixture of gasoline and coal tar product present in the deeper (around 20 ft bgs) soils and groundwater.
- The gasoline additives, MTBE and TBA, are present in all shallow and most deep groundwater samples but only in a small number of shallow soil samples at the Site. The presence of these additives is indicative of gasoline contamination.

References

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Uhler, R.M., E.M. Healey, K.J. McCarthy, A.D. Uhler, and S.A. Stout. 2003. Molecular Fingerprinting of Gasoline by a Modified EPA 8260 Gas Chromatography-Mass Spectrometry Method. *Intern. J. Environ. Anal. Chem.* 83 (1): 1-20.

**Table 1. PIANO Results and GC Fingerprint Evaluation For Soil and Groundwater Samples Collected From ConEd W. 18th Street
Former MGP Site, New York**

Sample Name Lab Sample ID Date Collected Reporting Limit Result Units	y in Water mg/L	MW-A2 GW 0810015-01 9/30/2008 20 µg/L	MW-A3 GW 0810015-02 9/30/2008 100 µg/L	WC-A(12) Soil 0808111-01 8/20/2008 425 µg/Kg	WC-A (17) Soil 0808111-02 8/21/2008 93.8 µg/Kg	WC-A (20) soil 0808111-03 8/21/2008 94 µg/Kg	MW-C2 GW 0810015-03 9/30/2008 2 µg/L	MW-C3 GW 0810015-04 9/30/2008 40 µg/L	WC-C (21) Soil 0808162-01 0808162-01 6120 ug/kg	MW-B3 GW 0810015-06 10/1/2008 20 µg/L	DUP-02 GW (MW-B3) 0810015-09 9/30/2008 100 µg/L	MW-B2 GW 0810015-07 10/1/2008 20 µg/L	SB-B (10) Soil 0808111-04 8/21/2008 390 ug/kg
Aromatics													
Benzene	1790	4040	13300	872	1970	913	39.1	3520	222000	4380	4240	917	340
Toluene	535	27.9	12.5	191	654	25.8	2.91	1860	236000	28	33	123	4790
Ethylbenzene	161	1450	373	25100	12600	474	1.41	1060	178000	56.9	49.5	150	19300
p/m-Xylene	151	3420	498	45100	47400	1360	3.05	1340	257000	77	76	948	67400
Styrene		0	0	0	0.0	0.0	0	22	4340	0	0	0	0
o-Xylene	171	974	124	8910	14500	408	1.17	593	101000	21.5	22.5	427	16900
Isopropylbenzene	65	90.9	117	7860	2290	115	0.61	28	3460	68.7	64.5	23.8	3270
n-Propylbenzene	51	203	59	31100	8490	262	0	6.4	2690	50.3	35.5	24.2	14300
1-Methyl-3-ethylbenzene	83	479	67	23400	17800	580	0.26	54.8	21500	6.5	0	242	33600
1-Methyl-4-ethylbenzene	93	277	65.5	20800	9450	325	0	36.2	12000	6.7	0	97.5	21800
1,3,5-Trimethylbenzene	48	306	70.5	23800	10600	362	0.19	81.6	34000	6.4	0	134	25400
1-Methyl-2-ethylbenzene	74	228	53	9870	8070	214	0.29	23	6940	13.6	11	113	11400
tert-Butylbenzene		0	0	0	0.0	0.0	0	0	0	0	0	0	68.3
1,2,4-Trimethylbenzene	52	1290	193	110000	38100	1300	0.68	237	85700	19.4	19.5	513	84900
Isobutylbenzene	10	5.3	0	3040	743	23.4	0	0	0	1.3	0	0	1490
sec-Butylbenzene	18	6.8	0	2960	723	24.4	0	0	0	0	0	0	1500
1-Methyl-3-isopropylbenzene	43	9.9	0	2000	1060	27.2	0	0	948	0	0	4.8	2420
1-Methyl-4-isopropylbenzene	23	4.3	0	1520	437	13.6	0	0	673	0	0	1.6	1110
1,2,3-Trimethylbenzene	75	315	66	16300	7500	255	0.49	70.2	21000	10.9	11	153	21500
1-Methyl-2-isopropylbenzene	48	1.8	0	461	115	0.0	0	0	0	0	0	0	263
Indan		569	2590	22800	7040	1390	36.2	594	27600	1060	933	311	15100
Indene		23	38.9	1870	581	49	2	195	40100	46.5	36	15.9	1920
1,3-Diethylbenzene		27.7	16.5	11400	2860	101	0	0	1250	13.3	10	16.1	8500
1-Methyl-3-propylbenzene	9.1	32.7	10	9480	5150	151	0	0	1680	0	0	17.9	12700
1-Methyl-4-propylbenzene	10	20.7	8	12000	3120	96.1	0	0	1220	2.2	0	7.7	7750
n-Butylbenzene	12	13.6	6.5	8730	2120	71.7	0	0	1320	3.1	0	3.4	5460
1,2-Dimethyl-4-ethylbenzene	13	47.6	14	12800	5510	157	0	6.4	4980	1.4	0	29.4	16800
1,2-Diethylbenzene	23	6.6	0	1940	472	20.6	0	0	0	2.9	0	3.2	1380
1-Methyl-2-propylbenzene	13	17.2	6.5	5270	2010	58.1	0	0	703	1.7	0	8.2	5630
1,4-Dimethyl-2-ethylbenzene	15	43.3	11.5	15100	4230	114	0	3.2	2380	1.6	0	22.3	13000
1,3-Dimethyl-4-ethylbenzene		33.2	8	11400	3450	98.5	0	3	2420	0	0	17.7	10600
1,3-Dimethyl-5-ethylbenzene	12	77.9	39.5	32000	7440	277	0.29	7	4680	30.9	23.5	39.3	22200
1,3-Dimethyl-2-ethylbenzene	20	8.9	5	2190	532	21.1	0	0	550	4.2	0	4.4	1680
1,2-Dimethyl-3-ethylbenzene	17	16.5	0	2890	1330	38.9	0	0	1040	0	0	9.1	4490
1,2,4,5-Tetramethylbenzene	3.5	35.8	20	17000	3460	129	0.2	5.8	3760	13.9	12.5	16.8	10900
1,2,3,5-Tetramethylbenzene		57.3	21.5	22100	4930	166	0	8.2	6450	2.2	0	27.8	16300
Pentylbenzene	3.4	0	0	1220	226	15.0	0	0	673	0	0	0	1460
1,2,3,4-Tetramethylbenzene		26	17.5	6240	1340	78.8	0.23	8.2	4830	12.8	10.5	10.9	4980
1-t-Butyl-3,5-Dimethylbenzene		0	0	0	0.0	0.0	0	0	0	0	0	0	0
1,3,5-Triethylbenzene		0	0	0	0.0	0.0	0	0	0	0	0	0	0
Naphthalene		239	392	23400	4990	947	3.66	3340	1140000	127	106	68.4	18000
1,2,4-Triethylbenzene		0	0	0	0.0	0.0	0	0	0	0	0	0	0
Hexylbenzene		0	0	433	81.6	0.0	0	0	0	0	0	0	804
2-Methylnaphthalene		34.8	142	13200	2210	659	0.74	216	302000	32.5	31	16.4	18300
1-Methylnaphthalene		26.7	142	7090	1180	468	0.93	170	167000	41	36	13.7	8930

**Table 1. PIANO Results and GC Fingerprint Evaluation For Soil and Groundwater Samples Collected From ConEd W. 18th Street
Former MGP Site, New York**

Sample Name Lab Sample ID Date Collected Reporting Limit Result Units	y in Water mg/L	MW-A2 GW 0810015-01 9/30/2008 20 µg/L	MW-A3 GW 0810015-02 9/30/2008 100 µg/L	WC-A(12) Soil 0808111-01 8/20/2008 425 µg/Kg	WC-A (17) Soil 0808111-02 8/21/2008 93.8 µg/Kg	WC-A (20) soil 0808111-03 8/21/2008 94 µg/Kg	MW-C2 GW 0810015-03 9/30/2008 2 µg/L	MW-C3 GW 0810015-04 9/30/2008 40 µg/L	WC-C (21) Soil 0808162-01 0808162-01 6120 ug/kg	MW-B3 GW 0810015-06 10/1/2008 20 µg/L	DUP-02 GW (MW-B3) 0810015-09 9/30/2008 100 µg/L	MW-B2 GW 0810015-07 10/1/2008 20 µg/L	SB-B (10) Soil 0808111-04 8/21/2008 390 ug/kg
Paraffins													
Pentane	48	13.5	0	234	320	41.3	0	0	2200	14.9	0	0	0
Hexane	13	23.2	0	1900	2920	82.5	0	0	0	2.8	0	0	178
Heptane	3	14.9	0	14600	6150	206	0	0	0	0	0	0	4070
Octane	0.66	4.7	0	26000	8140	288	0	0	2290	0	0	0	9670
Nonane	0.17	0	0	14400	5160	176	0	0	4130	0	0	0	8320
Decane	0.052	0	0	6700	2810	97.1	0	0	7680	0	0	0	7960
Undecane	0.044	0	0	3280	1060	40.8	0	0	6760	0	0	0	7260
Dodecane	0.003	0	0	2320	565	36.1	0	0	6210	0	0	0	6260
Tridecane		0	0	868	183	11.2	0	0	3940	0	0	0	4380
Tetradecane		0	0	437	66.2	0.0	0	0	2750	0	0	0	2260
Pentadecane		0	0	236	39.9	0	0	0	2450	0	0	0	1280
Isoparaffins													
Isopentane	48	31.8	0	219	602	45.5	0	0	1010	37.6	43.5	6.2	0
2,2-Dimethylbutane		0	0	0	134	0.0	0	0	0	0	0	0	0
2,3-Dimethylbutane	21	8.2	0	293	598	0.0	0	0	0	0	0	0	0
2-Methylpentane	16	45.9	0	2010	3380	102	0	0	0	11.8	0	0	99.5
3-Methylpentane	18	38.2	0	1550	2750	74.6	0	0	0	11.3	0	0	87.8
2,2-Dimethylpentane		0	0	231	235	0.0	0	0	0	0	0	0	0
2,4-Dimethylpentane	5.5	0	0	1220	1130	33.8	0	0	0	0	0	0	295
2,2,3-Trimethylbutane		0	0	74.3	67.6	0.0	0	0	0	0	0	0	0
3,3-Dimethylpentane	5.9	0	0	439	307	0.0	0	0	0	0	0	0	68.3
2-Methylhexane	2.5	27.8	0	13100	7600	233	0	0	0	0	0	0	2770
2,3-Dimethylhexane	5.3	16.5	0	4820	2710	82.0	0	0	0	2.6	0	0	1820
3-Methylhexane	2.6	33.1	0	15200	7350	248	0	0	0	0	0	0	3390
3-Ethylpentane		3.4	0	1620	702	0.0	0	0	0	0	0	0	361
Isooctane		5.1	0	7400	2460	90.5	0	0	0	0	0	0	7560
2,2-Dimethylhexane		0	0	962	341	10.8	0	0	0	0	0	0	224
2,5-Dimethylhexane		0	0	7600	2520	82.5	0	0	0	0	0	0	2720
2,4-Dimethylhexane	1.3	4	0	9410	3300	117	0	0	0	0	0	0	3520
2,2,3-Trimethylpentane		0	0	1050	350	6.56	0	0	0	0	0	0	585
2,3,4-Trimethylpentane		4.2	0	9990	3180	105	0	0	0	0	0	0	8220
2,3,3-Trimethylpentane		7.4	0	11000	3530	117	0	0	0	0	0	0	7180
2,3-Dimethylhexane	0.94	0	0	8840	2810	96.6	0	0	0	0	0	0	3900
2-Methylheptane	0.86	8	0	32600	7990	354	0	0	0	0	0	0	10100
4-Methylheptane	0.84	0	0	13600	4190	157	0	0	0	0	0	0	3900
3-Methylheptane	0.79	18.8	0	35600	9270	466	0	0	0	0	0	0	10300
3-Ethylhexane		0	0	6240	1730	77.8	0	0	0	0	0	0	1800
2,5-Dimethylheptane		0	0	18300	4480	155	0	0	0	0	0	0	4720
3,5-Dimethylheptane		0	0	5370	1300	45.5	0	0	0	0	0	0	1300
3,3-Dimethylheptane		0	0	1550	400	8.44	0	0	0	0	0	0	306
2,3-Dimethylheptane	0.25	0	0	7930	1840	63.8	0	0	0	0	0	0	2390
3,4-Dimethylheptane		0	0	11100	2640	98.0	0	0	0	0	0	0	2640
4-Methyloctane		0	0	26100	6230	251	0	0	0	0	0	0	6640
2-Methyloctane	0.22	0	0	32400	7860	292	0	0	0	0	0	0	9480

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Sample Name Lab Sample ID Date Collected Reporting Limit Result Units	y in Water mg/L	MW-A2 GW 0810015-01 9/30/2008 20 µg/L	MW-A3 GW 0810015-02 9/30/2008 100 µg/L	WC-A(12) Soil 0808111-01 8/20/2008 425 µg/Kg	WC-A (17) Soil 0808111-02 8/21/2008 93.8 µg/Kg	WC-A (20) soil 0808111-03 8/21/2008 94 µg/Kg	MW-C2 GW 0810015-03 9/30/2008 2 µg/L	MW-C3 GW 0810015-04 9/30/2008 40 µg/L	WC-C (21) Soil 0808162-01 0808162-01 6120 ug/kg	MW-B3 GW 0810015-06 10/1/2008 20 µg/L	DUP-02 GW (MW-B3) 0810015-09 9/30/2008 100 µg/L	MW-B2 GW 0810015-07 10/1/2008 20 µg/L	SB-B (10) Soil 0808111-04 8/21/2008 390 ug/kg
Isoparaffins (Cont.)													
3-Methyloctane	0.21	0	0	33900	7980	315	0	0	0	0	0	0	9370
3,3-Diethylpentane		0	0	0	0.0	0.0	0	0	0	0	0	0	0
3,3-Dimethyloctane		0	0	879	200	0.0	0	0	0	0	0	0	0
2-Methylnonane		0	0	18900	4050	167	0	0	0	0	0	0	8110
3-Methylnonane		0	0	18700	3950	131	0	0	0	0	0	0	6090
Naphthenes													
Cyclopentane	161	4.1	0	0	69.4	0.0	0	0	0	39.1	22	8.4	0
Methylcyclopentane	42	70.5	25	1600	2130	51.1	0	0	0	55.4	50.5	6.8	271
Cyclohexane	67	17.6	0	469	449	0.0	0	0	0	22.1	0	0	113
1,1-Dimethylcyclopentane		0	0	0	0.0	0.0	0	0	0	0	0	0	0
1,3-Dimethylcyclopentane (cis)		12.2	0	2360	1270	36.6	0	0	0	0	0	0	704
Methylcyclohexane	14	32.8	0	6710	2900	86.7	0	0	0	13.2	0	0	2450
Ethylcyclopentane	9.6	8.8	0	3660	1490	44.5	0	0	0	0	0	0	1380
1,2,3-Trimethylcyclopentane (ctc)		0	0	2090	794	0.0	0	0	0	0	0	0	880
1,4-Dimethylcyclohexane (trans)		0	0	2060	552	17.8	0	0	0	0	0	0	689
1,2-Dimethylcyclohexane (trans)	6	0	0	1850	348	23.4	0	0	0	0	0	0	747
Isopropylcyclopentane		0	0	1250	377	0.0	0	0	0	0	0	0	597
1,2-Dimethylcyclohexane (cis)	6	0	0	3790	1070	32.4	0	0	0	0	0	0	1650
n-Propylcyclopentane		0	0	2380	678	0.0	0	0	0	0	0	0	1270
1,1,4-Trimethylcyclohexane		0	0	0	0.0	0.0	0	0	0	0	0	0	0
Isopropylcyclohexane		0	0	0	0.0	0.0	0	0	0	0	0	0	0
Isobutylcyclohexane		0	0	0	0.0	0.0	0	0	0	0	0	0	0
Olefins													
3-Methyl-1-butene	130	0	0	0	0.0	0.0	0	0	0	0	0	0	0
1-Pentene	150	0	0	0	0.0	0.0	0	0	0	0	0	0	0
2-Methyl-1-butene		0	0	0	30.0	0.0	0	0	0	0	0	0	0
2-Pentene (trans)	205	0	0	0	31.4	0.0	0	0	0	0	0	0	0
2-Methyl-1,3-butadiene		0	0	0	0.0	0.0	0	0	0	0	0	0	0
2-Pentene (cis)		0	0	0	0.0	0.0	0	0	0	0	0	0	0
4-Methyl-1-pentene		0	0	0	18.3	0.0	0	0	0	0	0	0	0
1-Hexene	50	0	0	0	29.6	0.0	0	0	0	0	0	0	0
2-Hexene (trans)	89	0	0	61.6	218	0.0	0	0	0	0	0	0	0
2-Methyl-2-pentene	79	5.8	0	225	401	0.0	0	0	0	7	0	0	50.7
2-Hexene (cis)		0	0	0	145	0.0	0	0	0	0	0	0	0
1,3-DMCP (trans)/2-Methyl-1-hexene		18.8	0	3890	2060	45.5	0	0	0	0	0	0	1220
1-Heptene/1,2-DMCP (trans)		10.7	0	2650	1640	26.7	0	0	0	0	0	0	757
3-Heptene (trans)	31	0	0	236	438	0.0	0	0	0	0	0	0	304
3-Heptene (cis)		0	0	0	0.0	0.0	0	0	0	0	0	0	0
2-Heptene (trans)		0	0	138	340	0.0	0	0	0	0	0	0	158
2-Heptene (cis)		0	0	178	327	0.0	0	0	0	0	0	0	0
1-Octene		0	0	0	0.0	0.0	0	0	0	0	0	0	0
1,2,3-TMCP(ccc)/2-Octene (trans)		0	0	1200	353	0	0	0	0	0	0	0	523
2-Octene (cis)		0	0	0	237	0.0	0	0	0	0	0	0	449

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Olefins (Cont.)													
1-Nonene		0	0	0	0	0	0	0	3030	0	0	0	0
3-Nonene (trans)		0	0	0	0.0	0.0	0	0	0	0	0	0	0
3-Nonene (cis)		0	0	0	0.0	0.0	0	0	0	0	0	0	0
2-Nonene		0	0	0	0.0	0.0	0	0	0	0	0	0	0
1-Decene		0	0	0	0.0	0.0	0	0	0	0	0	0	0
Sulfur Heterocyclics													
Thiophene		46.9	142	0	0.0	0.0	1.04	35.6	1650	37.1	33	8.1	0
2-Methylthiophene		0	0	0	0.0	0.0	0	12.2	1070	0	0	0	0
3-Methylthiophene		0	0	0	0.0	0.0	0	10.2	887	0	0	0	0
2-Ethylthiophene		0	0	0	0.0	0.0	0	6	795	0	0	0	0
Benzothiophene		10.4	48	546	128	48.8	0	200	46600	6.6	0	0	1180
Gasoline Additives													
Tertiary butanol		254	0	0	0	0	28.9	0	0	4270	4680	4270	0
MTBE	52100	106	110	0	17.4	0.0	24.1	32	0	72	65	27.8	0
Diisopropyl Ether (DIPE)		0	0	0	0.0	0.0	0.87	0	0	10.3	0	14	0
Ethyl Tertiary Butyl Ether (ETBE)		0	0	0	0.0	0.0	0	0	0	0	0	0	0
1,2-Dichloroethane		0	0	0	0.0	0.0	0	0	0	0	0	0	0
TAME		0	0	0	0.0	0.0	0	0	0	0	0	0	0
1,2-Dibromoethane		0	0	0	0.0	0.0	0	0	0	0	0	0	0
MMT		0	0	0	0.0	0.0	0	0	0	0	0	0	0
Analyte Ratios													
1,4-dimethyl-2-ethyl bz/1,2-dimethyl-4-ethyl bz		0.91	0.82	1.18	0.77	0.73	-	0.50	0.48	1.14	-	0.76	0.77
ethyl bz/ o-xylene		1.49	3.01	2.82	0.87	1.16	1.21	1.79	1.76	2.65	2.20	0.35	1.14
indan/1,3-Dimethyl-5-ethylbz		7.30	65.57	0.71	0.95	5.02	124.83	84.86	5.90	34.30	39.70	7.91	0.68
1,3-dimethyl-5-ethylbz/1-methyl-2-propylbz		4.53	6.08	6.07	3.70	4.77	-	-	6.66	18.18	-	4.79	3.94
1,2,3,4-tetramethylbz/1,2,4,5-tetramethylbx		0.73	0.88	0.37	0.39	0.61	1.15	1.41	1.28	0.92	0.84	0.65	0.46
Misc Parameters													
Sum Aromatics (No Naphthalenes)		14,186	17,812	528,277	237,804	9,666	89	9,763	1,292,887	5,944	5,588	4,433	493,405
sum PIANO minus Aromatics		490	25	467,970	155,976	5,370	0	0	42,450	218	116	21	185,797
Aromatics/Non-Aromatics		29.0	712.5	1.1	1.5	1.8	-	-	30.5	27.3	48.2	207.1	2.7
Total PIANO (no S or Ns)		14,676	17,837	996,247	393,780	15,036	89	9,763	1,335,337	6,162	5,704	4,454	679,203
Sum Aromatics (No Naphthalenes)/Total		97%	100%	53%	60%	64%	100%	100%	97%	96%	98%	100%	73%
Paraffins		0.38%	0.00%	7.12%	6.96%	6.49%	0.00%	0.00%	2.77%	0.29%	0.00%	0.00%	7.59%
Isoparaffins		1.71%	0.00%	36.14%	27.97%	26.69%	0.00%	0.00%	0.07%	1.02%	0.76%	0.14%	17.63%
Aromatics (no Ns)		96.29%	98.81%	53.00%	60.37%	64.08%	98.85%	97.37%	93.26%	95.79%	97.40%	99.34%	72.52%
Naphthalenes		0.99%	0.14%	2.83%	3.08%	1.94%	0.00%	0.00%	0.00%	2.09%	1.26%	0.34%	1.58%
Olefins		0.24%	0.00%	0.86%	1.59%	0.48%	0.00%	0.00%	0.22%	0.11%	0.00%	0.00%	0.51%
Sulfur		0.39%	1.05%	0.05%	0.03%	0.32%	1.15%	2.63%	3.68%	0.70%	0.58%	0.18%	0.17%
Percent Isoparaffins+Naphthalenes		2.70%	0.14%	38.97%	31.05%	28.63%	0.00%	0.00%	0.07%	3.11%	2.02%	0.48%	19.21%
Total PIANO +S (no Ns)		14,733	18,027	996,793	393,908	15,085	90	10,027	1,386,339	6,205	5,737	4,463	680,383
Naphthalenes		301	676	43,690	8,380	2,074	5	3,726	1,609,000	201	173	99	45,230
Percent Sulfur/(Aromatics+Sulfur)		0.4%	1.1%	0.1%	0.1%	0.5%	1.2%	2.6%	3.8%	0.7%	0.6%	0.2%	0.2%
Percent Ns/(Aromatics+Ns)		2%	4%	8%	3%	18%	6%	28%	55%	3%	3%	2%	8%

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		0810015-01	0810015-02	0808111-01	0808111-02	0808111-03	0810015-03	0810015-04	0808162-01	0810015-06	0810015-09	0810015-07	0808111-04
		9/30/2008	9/30/2008	8/20/2008	8/21/2008	8/21/2008	9/30/2008	9/30/2008	0808162-01	10/1/2008	9/30/2008	10/1/2008	8/21/2008
		20	100	425	93.8	94	2	40	6120	20	100	20	390
		µg/L	µg/L	µg/Kg	µg/Kg	µg/Kg	µg/L	µg/L	ug/kg	µg/L	µg/L	µg/L	ug/kg
Misc Parameters (Cont.)													
Percent P+I+N		3%	0%	46%	38%	35%	0%	0%	3%	3%	2%	0%	27%
Percent A+S		97%	100%	53%	60%	64%	100%	100%	97%	96%	98%	100%	73%
Percent Ns/Aromatics (no Ns)		2.1	3.8	8.3	3.5	21.5	6.0	38.2	124.5	3.4	3.1	2.2	9.2
Percent Ns/(Ns+HMW Aromatic above Indane)		39.3%	78.6%	20.4%	14.9%	57.3%	88.1%	98.9%	97.7%	69.0%	75.4%	29.6%	23.8%
C10-C28 DRO mg/L or mg/kg		5.0	8.2	613	202	96.5	1.4	10.9	15300	2.8	3.0	2.4	918
TPH GC Fingerprint Evaluation		Few well resolved peaks but with more peaks in C10 to C12 than coal tar. Negligible peaks after C13 (19 min). Weathered gasoline	Similar to Well Cluster C3	Gasoline	Gasoline	Mix, mostly gasoline	Few, small peaks in gasoline range (same size peaks as C13 to C20) and small peaks from C13 to C20. Weathered coal tar	Few, large, well resolved peaks with empty space (C10-C12) in gasoline range (<C13), and many, small peaks past C13 to C20 -- Coal Tar Fingerprint	Coal tar only fresh with relatively high BTEX	Few well resolved peaks with empty spacing in gasoline range (<C13), and many smaller peaks from C13 to C20	Duplicate of SB-B3	Similar to Well Cluster A2	Gasoline

**Table 1. PIANO Results and GC Fingerprint Evaluation For Soil and Groundwater Samples Collected From ConEd W. 18th Street
Former MGP Site, New York**

Sample Name Lab Sample ID Date Collected Reporting Limit Result Units	MW-8 GW 0810015-10 10/1/2008 100 µg/L	MW-9 GW 0810015-05 10/1/2008 Analysis	SB-C (14) Soil 0809049-01 09/08/2008 933 ug/kg	Dup-01 Soil [SB-C(14)] 0809049-03 09/08/2008 786 ug/kg	SB-C (22) Soil 0809049-02 09/08/2008 1050 ug/kg	MW-4 GW 0810015-08 10/1/2008 5 µg/L	Coal Tar NAPL 2008 10.6 mg/kg oil	Coal Tar in Soil 2008 425 ug/kg	Coal Tar in Soil 2008 743 ug/kg	Regular 0809077-03 09/09/2008 93.1 mg/kg oil	Plus 0809077-04 09/09/2008 92.2 mg/kg oil	Super 0809077-05 09/09/2008 98.1 mg/kg oil
Aromatics												
Benzene	3080		1120	1370	1880	688	23.0	1220	3970	6010	5610	5780
Toluene	4520		38600	43400	47100	2.75	2.85	440	1390	58500	68000	64200
Ethylbenzene	2480		69800	73400	252000	0	523	28700	44500	58500	12600	12600
p/m-Xylene	11000		296000	303000	980000	6.3	49.7	12600	20100	59600	59100	57400
Styrene	0		0	0	0	0	0.0	0	193	17.7	0.0	0.0
o-Xylene	4570		93900	99400	302000	1.25	31.2	11200	15200	21700	20600	19400
Isopropylbenzene	147		12500	12100	43500	20.3	93.0	3760	7450	849	666	550
n-Propylbenzene	337		43300	44200	153000	11.8	45.6	959	1600	3500	2920	2800
1-Methyl-3-ethylbenzene	1800		150000	151000	443000	0	4.38	8960	15300	14800	11400	12200
1-Methyl-4-ethylbenzene	776		70000	69500	218000	0	91.6	9290	15800	6420	5480	5100
1,3,5-Trimethylbenzene	1040		82000	81800	235000	0.8	178	4420	9820	7720	6700	6290
1-Methyl-2-ethylbenzene	852		52200	51200	154000	3.95	112	3370	4820	4620	3800	3400
tert-Butylbenzene	0		163	161	305	0	0.0	0	0	0.0	0.0	0.0
1,2,4-Trimethylbenzene	3820		301000	298000	783000	1	833	18700	29100	26900	21000	20400
Isobutylbenzene	17		4430	4480	18600	0	3.48	59.5	123	220	171	178
sec-Butylbenzene	19		4210	4040	16500	0	0.0	0	0	204	153	157
1-Methyl-3-isopropylbenzene	41		8040	7500	28000	0	44.4	1860	4530	418	288	256
1-Methyl-4-isopropylbenzene	11.5		2870	2600	7890	0	62.9	5890	2550	151	95.9	80.0
1,2,3-Trimethylbenzene	1130		61200	58700	158000	1.4	350	7510	13100	5020	3970	3320
1-Methyl-2-isopropylbenzene	0		653	613	1750	0	5.22	63.8	85.5	29.3	20.3	17.7
Indan	931		37400	36300	96600	283	2180	64500	128000	2040	1700	1970
Indene	112		1910	13900	5120	10.9						
1,3-Diethylbenzene	126		21000	19900	53600	3.35	64.8	3470	5270	824	660	728
1-Methyl-3-propylbenzene	190		39300	38200	126000	0	20.2	627	1210	2020	1540	1660
1-Methyl-4-propylbenzene	91		21100	20100	69000	0.5	30.7	946	1380	969	746	801
n-Butylbenzene	58		14600	14300	50200	0.8	20.2	572	799	618	494	537
1,2-Dimethyl-4-ethylbenzene	306		47200	44100	126000	0	71.5	2720	3610	2440	1890	1980
1,2-Diethylbenzene	26.5		3680	3370	10100	0.65	5.96	159	201	152	109	113
1-Methyl-2-propylbenzene	87		15200	14100	49000	0	17.2	380	613	664	475	490
1,4-Dimethyl-2-ethylbenzene	234		34300	31700	89400	0	33.5	1280	1740	1560	1180	1210
1,3-Dimethyl-4-ethylbenzene	188		28400	26300	77800	0	54.4	1500	1800	1290	988	1000
1,3-Dimethyl-5-ethylbenzene	384		55200	51900	137000	6.8	196	6540	9610	2310	1770	1820
1,3-Dimethyl-2-ethylbenzene	34		3620	4160	10200	1.1	14.4	353	509	165	118	116
1,2-Dimethyl-3-ethylbenzene	91		11700	10400	29000	0	37.1	825	1190	452	340	350
1,2,4,5-Tetramethylbenzene	200		27400	24500	63700	3.65	118	1620	2920	1180	902	918
1,2,3,5-Tetramethylbenzene	335		42400	38200	103000	0.55	248	4060	6480	1830	1400	1360
Pentylbenzene	13.5		3130	3010	7250	0	9.76	121	223	69.4	62.7	79.5
1,2,3,4-Tetramethylbenzene	108		11700	8900	26000	3	225	3800	5460	396	420	331
1-t-Butyl-3,5-Dimethylbenzene	0		0	0	0	0	0.0	0	0	0.0	0.0	0.0
1,3,5-Triethylbenzene	0		0	0	0	0	0.0	0	0	0.0	0.0	0.0
Naphthalene	772		39400	35700	87500	4.85	16300	476000	1160000	821	793	1090
1,2,4-Triethylbenzene	0		0	0	0	0	0.0	0	0	0.0	0.0	0.0
Hexylbenzene	0		1460	1420	2630	0	11.2	70.1	208	23.3	0.0	25.5
2-Methylnaphthalene	168		30600	26400	40800	8.25	6240	170000	467000	504	515	664
1-Methylnaphthalene	91		14200	12200	16600	10.6	5500	175000	522000	254	251	305

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Paraffins												
Pentane	512		956	484	93000	9.4	0.0	0	0	33800	24600	23900
Hexane	226		6100	7130	270000	1.75	0.0	0	0	26400	20600	13000
Heptane	120		31800	35500	422000	0	0.0	0	0	12900	11000	7910
Octane	38		36600	34600	242000	0	0.0	0	0	5960	4860	3440
Nonane	0		27800	30100	126000	0	4.06	0	156	2770	1840	1260
Decane	32		24200	25100	88600	0	9.81	130	349	1780	1280	1260
Undecane	47.5		16500	16400	47700	0	5.96	223	535	514	419	508
Dodecane	71.5		13100	12800	33900	0	0.0	0	197	128	124	151
Tridecane	0		6850	6120	14100	0	0.0	0	0	120	130	141
Tetradecane	0		2760	1830	2580	0	0.0	0	0	72.2	90.9	27.5
Pentadecane	0		1230	888	363	0	0.0	0	0	0	0	0
Isoparaffins												
Isopentane	914		928	417	171000	27.8	3.48	274	145	88300	78300	89600
2,2-Dimethylbutane	35.5		242	267	7900	0	0.0	0	0	1590	2670	3450
2,3-Dimethylbutane	97.5		709	947	45600	2.65	0.0	0	0	12300	14500	19000
2-Methylpentane	416		4950	5280	248000	6.75	0.0	0	0	40500	36800	31000
3-Methylpentane	283		4020	4550	176000	6.15	0.0	0	0	27000	24200	20800
2,2-Dimethylpentane	0		513	613	8970	0	0.0	0	0	1440	1180	700
2,4-Dimethylpentane	41.5		3940	4620	60800	0	0.0	0	0	18300	19400	20000
2,2,3-Trimethylbutane	0		168	208	3590	0	0.0	0	0	425	500	649
3,3-Dimethylpentane	0		784	904	9230	0	0.0	0	0	1340	1110	662
2-Methylhexane	139		23100	26500	256000	0	0.0	0	0	20000	17500	15500
2,3-Dimethylhexane	98		12900	15100	175000	0	0.0	0	0	24400	26100	28800
3-Methylhexane	153		26000	29800	274000	0	0.0	0	0	20200	17600	15000
3-Ethylpentane	13		2550	2900	22400	0	0.0	0	0	1800	1590	1200
Isooctane	81.5		29000	33500	263000	0	0.0	0	0	36100	57300	109000
2,2-Dimethylhexane	0		1570	1780	12900	0	0.0	0	0	93.1	92.2	98.1
2,5-Dimethylhexane	15		12200	13800	93700	0	0.0	0	0	5820	8010	12000
2,4-Dimethylhexane	19.5		14700	16800	97000	0	0.0	0	0	6310	7510	9400
2,2,3-Trimethylpentane	0		2100	2380	17200	0	0.0	0	0	1400	2470	4980
2,3,4-Trimethylpentane	47.5		25200	28300	180000	0	0.0	0	0	12100	22000	45900
2,3,3-Trimethylpentane	57		22300	25000	172000	0	0.0	0	0	11600	22500	49500
2,3-Dimethylhexane	19.5		13700	15100	82500	0	0.0	0	0	4770	6340	8970
2-Methylheptane	45.5		37300	42200	201000	0	0.0	0	0	7860	6880	5930
4-Methylheptane	0		14700	16600	78300	0	0.0	0	0	3060	2650	2220
3-Methylheptane	93		36800	41500	212000	0	0.0	0	0	7360	6740	5700
3-Ethylhexane	0		6150	7260	36400	0	0.0	0	0	1300	0.0	874
2,5-Dimethylheptane	0		14600	14600	66500	0	0.0	0	0	2250	1900	1710
3,5-Dimethylheptane	0		3890	3710	18200	0	0.0	0	0	614	474	399
3,3-Dimethylheptane	0		1320	1360	8850	0	0.0	0	0	254	153	94.2
2,3-Dimethylheptane	0		7340	8170	35700	0	0.0	0	0	1350	1080	801
3,4-Dimethylheptane	0		4390	4200	14600	0	0.0	0	0	645	992	830
4-Methyloctane	0		20200	22800	89600	0	0.0	0	0	2310	1910	1560
2-Methyloctane	0		28500	28600	105000	0	0.0	0	0	3090	2300	2160

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Sample Name Lab Sample ID Date Collected Reporting Limit Result Units	MW-8 GW 0810015-10 10/1/2008 100 µg/L	MW-9 GW 0810015-05 10/1/2008 Analysis	SB-C (14) Soil 0809049-01 09/08/2008 933 ug/kg	Dup-01 Soil [SB-C(14)] 0809049-03 09/08/2008 786 ug/kg	SB-C (22) Soil 0809049-02 09/08/2008 1050 ug/kg	MW-4 GW 0810015-08 10/1/2008 5 µg/L	Coal Tar NAPL 2008 10.6 mg/kg oil	Coal Tar in Soil 2008 425 ug/kg	Coal Tar in Soil 2008 743 ug/kg	Regular 0809077-03 09/09/2008 93.1 mg/kg oil	Plus 0809077-04 09/09/2008 92.2 mg/kg oil	Super 0809077-05 09/09/2008 98.1 mg/kg oil
Isoparaffins (Cont.)												
3-Methyloctane	28.5		27300	30100	107000	0	0.0	0	0	3230	2480	2140
3,3-Diethylpentane	0		0	0	0	0	0.0	0	0	0.0	0.0	0.0
3,3-Dimethyloctane	0		979	1030	4910	0	0.0	0	0	101	40.6	23.6
2-Methylnonane	0		23100	24500	82800	0	0.0	0	0	0.0	0.0	0.0
3-Methylnonane	13		17600	18700	55600	0	0.0	0	0	1090	760	743
Naphthenes												
Cyclopentane	225		0	78.6	14800	18.1	0.0	0	0	3920	3780	3120
Methylcyclopentane	556		5240	6140	155000	24.6	0.0	0	0	25800	21400	17900
Cyclohexane	174		1860	2210	46600	9.2	0.0	0	0	8810	7800	5990
1,1-Dimethylcyclopentane	0		0	0	0	0	0.0	0	0	644	559	390
1,3-Dimethylcyclopentane (cis)	68.5		5290	6310	50800	0	0.0	0	0	5340	4790	4340
Methylcyclohexane	178		16100	18300	185000	5.2	0.0	0	0	7120	5980	5660
Ethylcyclopentane	38.5		6800	8100	43900	0	0.0	0	0	2850	2570	2690
1,2,3-Trimethylcyclopentane (ctc)	0		3890	4560	24600	0	0.0	0	0	1680	1030	767
1,4-Dimethylcyclohexane (trans)	0		3150	3100	11800	0	0.0	0	0	758	738	677
1,2-Dimethylcyclohexane (trans)	0		3520	2180	15600	0	0.0	0	0	1050	681	558
Isopropylcyclopentane	0		1710	1610	5790	0	0.0	0	0	338	296	277
1,2-Dimethylcyclohexane (cis)	0		6450	5340	20600	0	0.0	0	0	678	501	509
n-Propylcyclopentane	0		3550	3640	13700	0	0.0	0	0	617	517	542
1,1,4-Trimethylcyclohexane	0		2060	1960	5880	0	0.0	0	0	294	238	0.0
Isopropylcyclohexane	0		0	0	0	0	0.0	0	0	0.0	0.0	0.0
Isobutylcyclohexane	0		0	0	0	0	0.0	0	0	0.0	0.0	0.0
Olefins												
3-Methyl-1-butene	0		0	0	926	0	0.0	0	0	570	587	571
1-Pentene	32.5		0	0	4110	0	0.0	0	0	1500	1570	1300
2-Methyl-1-butene	64.5		0	0	7700	0	0.0	0	0	4330	4140	3630
2-Pentene (trans)	249		0	0	15800	0	0.0	0	0	4210	4490	3770
2-Methyl-1,3-butadiene	0		0	0	0	0	0.0	0	0	159	126	81.4
2-Pentene (cis)	139		0	0	7420	0	0.0	0	0	2290	2370	2020
4-Methyl-1-pentene	0		0	0	3170	0	0.0	0	0	278	345	313
1-Hexene	0		0	0	7050	0	0.0	0	0	568	638	566
2-Hexene (trans)	84.5		933	1070	23600	0	0.0	0	0	1620	2850	3450
2-Methyl-2-pentene	123		1500	1770	40200	2.1	0.0	0	0	2100	6150	7340
2-Hexene (cis)	82		630	727	15900	0	0.0	0	0	1010	1420	1510
1,3-DMCP (trans)/2-Methyl-1-hexene	86		8890	11000	81700	0	0.0	0	0	7400	6160	5890
1-Heptene/1,2-DMCP (trans)	60.5		5290	6440	83800	0	0.0	0	0	6660	4850	3700
3-Heptene (trans)	0		2960	3240	15300	0	0.0	0	0	390	411	405
3-Heptene (cis)	0		0	0	0	0	0.0	0	0	0.0	0.0	0.0
2-Heptene (trans)	0		1910	2210	14000	0	0.0	0	0	362	356	348
2-Heptene (cis)	0		2280	2660	14800	0	0.0	0	0	272	273	0.0
1-Octene	0		0	0	0	0	0.0	0	0	0.0	0.0	0.0
1,2,3-TMCP(ccc)/2-Octene (trans)	0		1600	1580	4540	0	0.0	0	0	318	259	247
2-Octene (cis)	0		2100	2080	7010	0	0.0	0	0	60.5	135	164

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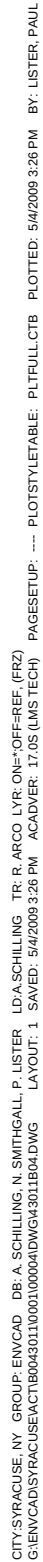
Sample Name Lab Sample ID Date Collected Reporting Limit Result Units	MW-8 GW 0810015-10 10/1/2008 100 µg/L	MW-9 GW 0810015-05 10/1/2008 Analysis	SB-C (14) Soil 0809049-01 09/08/2008 933 ug/kg	Dup-01 Soil [SB-C(14)] 0809049-03 09/08/2008 786 ug/kg	SB-C (22) Soil 0809049-02 09/08/2008 1050 ug/kg	MW-4 GW 0810015-08 10/1/2008 5 µg/L	Coal Tar NAPL 2008 10.6 mg/kg oil	Coal Tar in Soil 2008 425 ug/kg	Coal Tar in Soil 2008 743 ug/kg	Regular 0809077-03 09/09/2008 93.1 mg/kg oil	Plus 0809077-04 09/09/2008 92.2 mg/kg oil	Super 0809077-05 09/09/2008 98.1 mg/kg oil
Olefins (Cont.)												
1-Nonene	0		0	0	0	0	0.0	0	0	0	0	0
3-Nonene (trans)	0		0	0	0	0	0.0	0	0	0.0	0.0	0.0
3-Nonene (cis)	0		0	0	0	0	0.0	0	0	0.0	0.0	0.0
2-Nonene	0		0	0	0	0	0.0	0	0	0.0	0.0	0.0
1-Decene	0		5200	6780	15600	0	0.0	0	0	0.0	0.0	0.0
Sulfur Heterocyclics												
Thiophene	0		0	0	0	7.25	0.0	0	0			
2-Methylthiophene	0		0	0	0	0	0.0	0	0			
3-Methylthiophene	0		0	0	0	0	0.0	0	0			
2-Ethylthiophene	0		0	0	0	0	0.0	0	119			
Benzothiophene	74.5		2320	1990	5090	0	583	17000	44300			
Gasoline Additives												
Tertiary butanol	0		0	0	0	862	0.0	0	0			
MTBE	33		0	0	0	13.2	0.0	0	0			
Diisopropyl Ether (DIPE)	0		0	0	0	3.75	0.0	0	0			
Ethyl Tertiary Butyl Ether (ETBE)	0		0	0	0	0	0.0	0	0			
1,2-Dichloroethane	0		0	0	0	0	0.0	0	0			
TAME	0		0	0	0	0	0.0	0	0			
1,2-Dibromoethane	0		0	0	0	0	0.0	0	0			
MMT	0		0	0	0	0	0.0	0	0			
Analyte Ratios												
	mg/kg											
1,4-dimethyl-2-ethyl bz/1,2-dimethyl-4-ethyl bz	0.76		0.73	0.72	0.71	-	0.47	0.47	0.48	0.64	0.62	0.61
ethyl bz/ o-xylene	0.54		0.74	0.74	0.83	0.00	16.76	2.56	2.93	2.70	0.61	0.65
indan/1,3-Dimethyl-5-ethylbz	2.42		0.68	0.70	0.71	41.62	11.12	9.86	13.32	0.88	0.96	1.08
1,3-dimethyl-5-ethylbz/1-methyl-2-propylbz	4.41		3.63	3.68	2.80	-	11.40	17.21	15.68	3.48	3.73	3.71
1,2,3,4-tetramethylbz/1,2,4,5-tetramethylbx	0.54		0.43	0.36	0.41	0.82	1.91	2.35	1.87	0.34	0.47	0.36
Misc Parameters												
Sum Aromatics (No Naphthalenes)	39,156		1,712,686	1,711,224	4,975,125	1,052	5,811	212,545	360,855	294,182	237,369	229,618
sum PIANO minus Aromatics	5,819		706,552	768,134	5,790,189	114	23	627	1,382	548,743	548,986	641,717
Aromatics/Non-Aromatics	6.7		2.4	2.2	0.9	9.3	249.3	339.0	261.1	0.5	0.4	0.4
Total PIANO (no S or Ns)	44,974		2,419,238	2,479,358	10,765,314	1,166	5,835	213,172	362,237	842,925	786,355	871,335
Sum Aromatics (No Naphthalenes)/Total	87%		71%	69%	46%	90%	100%	100%	100%	35%	30%	26%
Paraffins	2.32%		6.93%	6.89%	12.44%	0.95%	0.31%	0.15%	0.30%	10.02%	8.26%	5.92%
Isoparaffins	5.79%		18.41%	19.91%	32.43%	3.70%	0.05%	0.12%	0.04%	43.93%	50.36%	58.69%
Aromatics (no Ns)	86.92%		70.73%	68.96%	46.19%	89.69%	90.55%	92.34%	88.74%	34.90%	30.19%	26.35%
Naphthalenes	2.75%		2.46%	2.56%	5.52%	4.87%	0.00%	0.00%	0.00%	7.11%	6.47%	4.98%
Olefins	2.04%		1.37%	1.59%	3.37%	0.18%	0.00%	0.00%	0.00%	4.05%	4.72%	4.05%
Sulfur	0.17%		0.10%	0.08%	0.05%	0.62%	9.08%	7.39%	10.92%			
Percent Isoparaffins+Naphthalenes	8.55%		20.87%	22.47%	37.95%	8.56%	0.05%	0.12%	0.04%	51.04%	56.83%	63.67%
Total PIANO +S (no Ns)	45,049		2,421,558	2,481,348	10,770,404	1,173	6,418	230,172	406,656	842,925	786,355	871,335
Naphthalenes	1,031		84,200	74,300	144,900	24	28,040	821,000	2,149,000	1,579	1,559	2,059
Percent Sulfur/(Aromatics+Sulfur)	0.2%		0.1%	0.1%	0.1%	0.7%	9.1%	7.4%	11.0%	0.0%	0.0%	0.0%
Percent Ns/(Aromatics+Ns)	3%		5%	4%	3%	2%	83%	79%	86%	1%	1%	1%

**Table 1. PIANO Results and GC Fingerprint Evaluation For Soil and Groundwater Samples Collected From ConEd W. 18th Street
Former MGP Site, New York**

Sample Name Lab Sample ID Date Collected Reporting Limit Result Units	MW-8 GW 0810015-10 10/1/2008 100 µg/L	MW-9 GW 0810015-05 10/1/2008 Analysis	SB-C (14) Soil 0809049-01 09/08/2008 933 ug/kg	Dup-01 Soil [SB-C(14)] 0809049-03 09/08/2008 786 ug/kg	SB-C (22) Soil 0809049-02 09/08/2008 1050 ug/kg	MW-4 GW 0810015-08 10/1/2008 5 µg/L	Coal Tar NAPL 2008 10.6 mg/kg oil	Coal Tar in Soil 2008 425 ug/kg	Coal Tar in Soil 2008 743 ug/kg	Regular 0809077-03 09/09/2008 93.1 mg/kg oil	Plus 0809077-04 09/09/2008 92.2 mg/kg oil	Super 0809077-05 09/09/2008 98.1 mg/kg oil
Misc Parameters (Cont.)												
Percent P+I+N	11%		28%	29%	50%	10%	0%	0%	0%	61.1%	65.1%	69.6%
Percent A+S	87%		71%	69%	46%	90%	100%	100%	100%	35%	30%	26%
Percent Ns/Aromatics (no Ns)	2.6		4.9	4.3	2.9	2.3	482.5	386.3	595.5	0.5	0.7	0.9
Percent Ns/(Ns+HMW Aromatic above Indane)	29.4%		18.1%	17.3%	12.3%	53.7%	96.0%	96.6%	98.0%	8.5%	10.6%	13.2%
C10-C28 DRO mg/L or mg/kg	141.0	132	1260	1780	3420	0.9	3420	3420	3420			
TPH GC Fingerprint Evaluation	Same as MW-9. Many large, not well resolved peaks end abruptly just after C13. Negligible peaks after C13 -- Gasoline Fingerprint	Same as MW-8	Gasoline only	Gasoline only	Gasoline only	Similar to SB-B3	Weathered tar	Fresh tar	Fresh tar	Gasoline Product	Gasoline Product	Gasoline Product

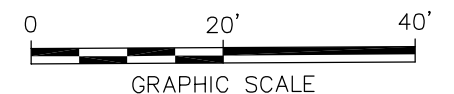
Table 2. PIANOS Results and TPH Fingerprint Interpretation of Soil and Groundwater Samples Collected at ConEd West 18th Street Former MGP Site, New York

Sample Location	Percent						TPH Fingerprint Interpretation
	Paraffins (P)	Isoparaffins (I)	Aromatics (A)	Naphthenes (N)	Olefins (O)	Sulfur (S)	
<u>SB-C Area</u>							
<i>Soil</i>							
SB-C (14)	6.9 (6.9)	18.4 (20.2)	70.7 (68.8)	2.5 (2.6)	1.4 (1.6)	0.1 (0.1)	Gasoline Only
SB-C (22)	12.5	32.5	46.2	5.5	3.4	0.05	Gasoline Only
<i>Groundwater</i>							
MW-8	2.3	5.8	86.9	2.8	2.1	0.17	Gasoline Only, negligible peaks after C13 Same as MW-8
MW-9	0	0	0	0	0	0	
<u>Well Cluster A Area</u>							
<i>Soil</i>							
WC-A (12)	7.1	36.1	53	2.8	0.9	0.05	Gasoline
WC-A (17)	7	28	60.4	3.1	1.6	0.03	Gasoline
WC-A (20)	6.5	26.7	64.1	1.9	0.5	0.32	Mix, mostly gasoline
<i>Groundwater</i>							
MW-A2	0.4	1.7	96.3	1	0.24	0.4	Weathered gasoline
MW-A3	0	0	98.8	0.14	0	1.1	Similar to MW-C3
<u>SB-B Area</u>							
<i>Soil</i>							
SB-B (10)	7.6	17.7	72.4	1.6	0.5	0.17	Gasoline
<i>Groundwater</i>							
MW-B2	0	0.14	99.3	0.34	0	0.18	Similar to MW-A2
MW-B3	0.3(0.0)	1.0 (0.8)	95.8 (97.4)	2.1 (1.3)	0.11 (0.0)	0.7 (0.6)	Mix
<u>Well Cluster C Area</u>							
<i>Soil</i>							
WC-C (21)	2.9	0.08	93.1	0	0.2	3.8	Fresh coal tar
<i>Groundwater</i>							
MW-C2 (low conc)	0	0	98.8	0	0	1.2	Weathered coal tar
MW-C3	0	0	97.3	0	0	2.7	Coal tar
<u>UST (4000 gal.) Area</u>							
<i>Groundwater</i>							
MW-4 (low conc)	1	3.7	89.6	4.9	0.2	0.6	Similar to MW-B3
<u>Gasoline Standards</u>							
Regular	10.0	43.9	34.9	7.1	4.1	Not Analyzed	-
Plus	8.3	50.4	30.2	6.5	4.7	Not Analyzed	-
Super	5.9	58.7	26.4	4.9	4.1	Not Analyzed	-
<u>Coal Tar in Soil (from another location)</u>							
NAPL	0.3	0.1	90.6	0.0	0.0	9.1	-



	PROPERTY LINE
	SOIL BORING (RETACO)
	MONITORING WELL (RETACO)
	TEST PIT (CON EDISON)
	MONITORING WELL/SOIL BORING LOCATION (CON EDISON)
	BUILDING COLUMN
	APPROXIMATE LOCATION OF FIVE FORMER 550-GALLON UNDERGROUND GASOLINE STORAGE TANKS
	APPROXIMATE LOCATION OF FORMER 4000-GALLON UNDERGROUND GASOLINE (DIESEL) TANK
	APPROXIMATE LOCATION OF FORMER GAS HOLDERS
	APPROXIMATE LOCATION OF BUILDING WALLS

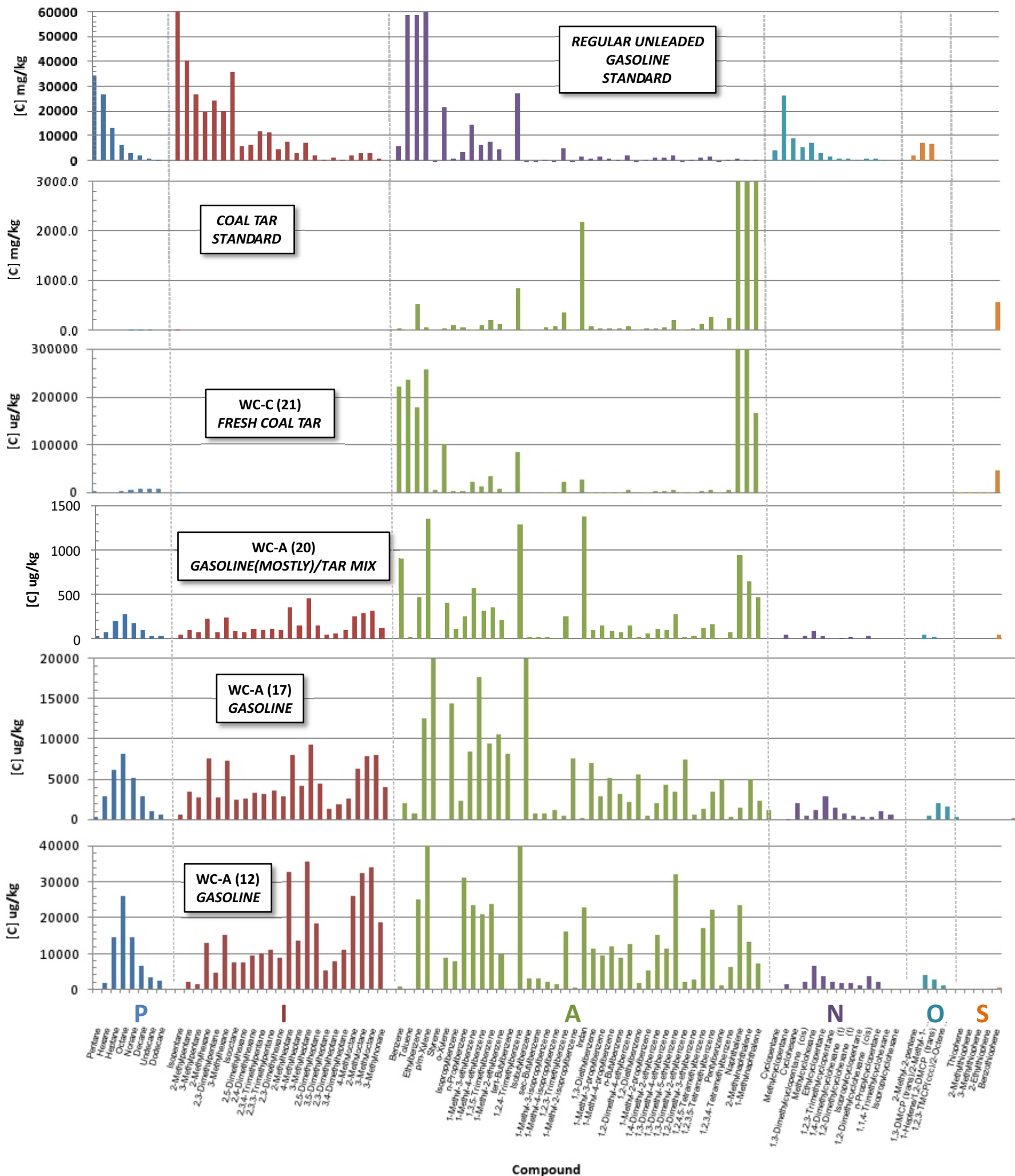
1. SURVEY CONTROL WAS TAKEN FROM SITE WIDE BASE SURVEY PREPARED BY MUNOZ ENGINEERING, P.C. DATED APRIL 2007.
2. ALL ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM AS DERIVED FROM GPS.
3. HORIZONTAL COORDINATES ARE IN NYS COORDINATE SYSTEM (EAST) NAD 83 AS DERIVED FROM GPS.
4. BENCH MARK EL=12.91 X-CUT IN METAL LIGHT POLE ROUND BASE BOLT IN FRONT OF VERIZON BUILDING ON WEST 18th STREET.
5. LOCATIONS OF FORMER GAS HOLDERS ARE BASED ON SANBORN FIRE INSURANCE MAPS, DATED 1904-1985.
6. RETACO BORING AND MONITORING WELL LOCATIONS ARE BASED ON REPORTS ISSUED BY ENVIROTRAC ON BEHALF OF RETACO BETWEEN 2001 AND 2008.
7. UST LOCATIONS ARE BASED ON A SITE SUMMARY REPORT, ISSUED BY ENVIROTRAC, DATED AUGUST 2003.
8. BUILDING INTERIOR LAYOUT BASED ON FIELD RECONNAISSANCE.



CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
BLOCK 715 LOT 59
FORENSIC EVALUATION

SAMPLE LOCATION MAP

FIGURE
1



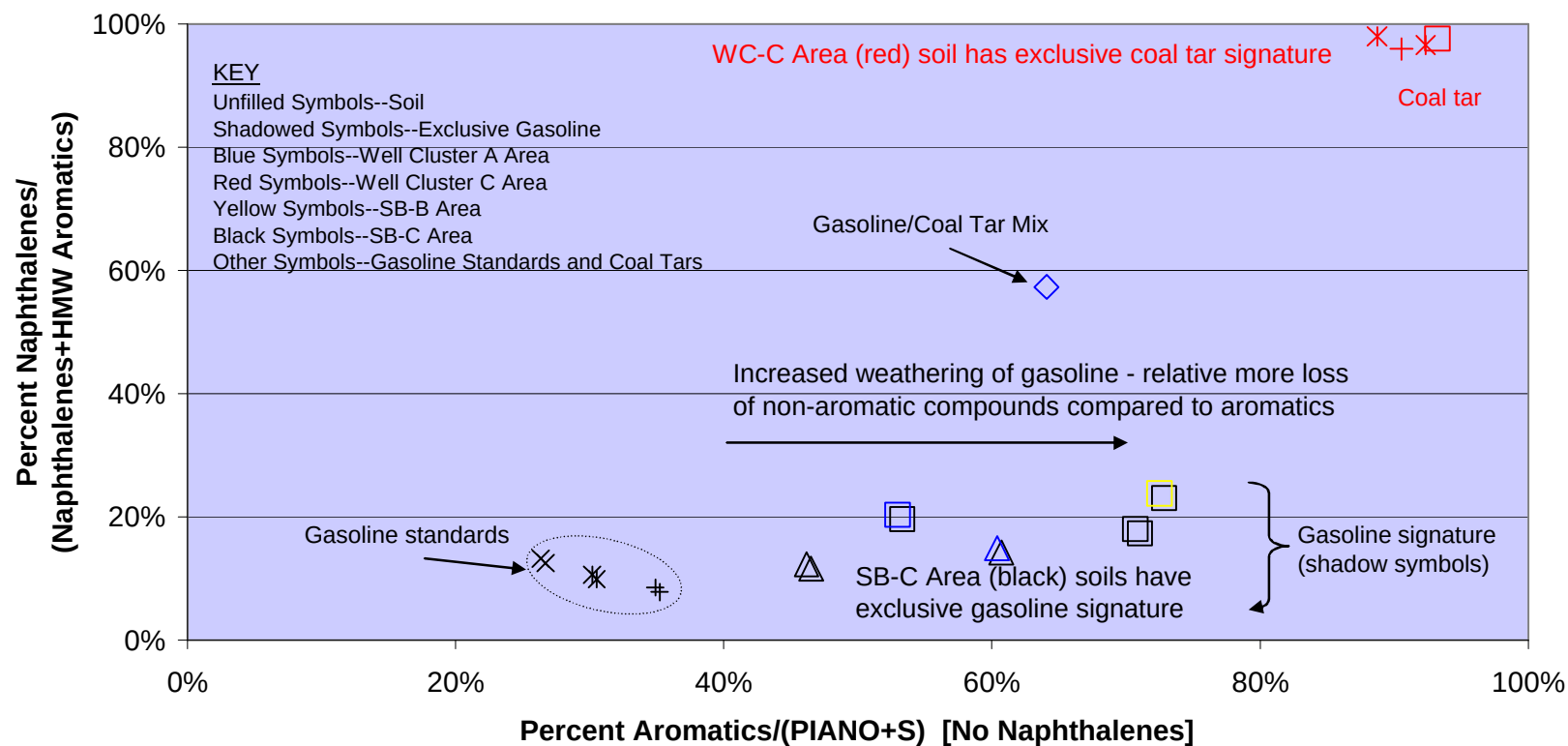
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
BLOCK 715 LOT 59
FORENSIC EVALUATION

**DISTRIBUTION OF PIANOS
COMPOUNDS IN SOIL**



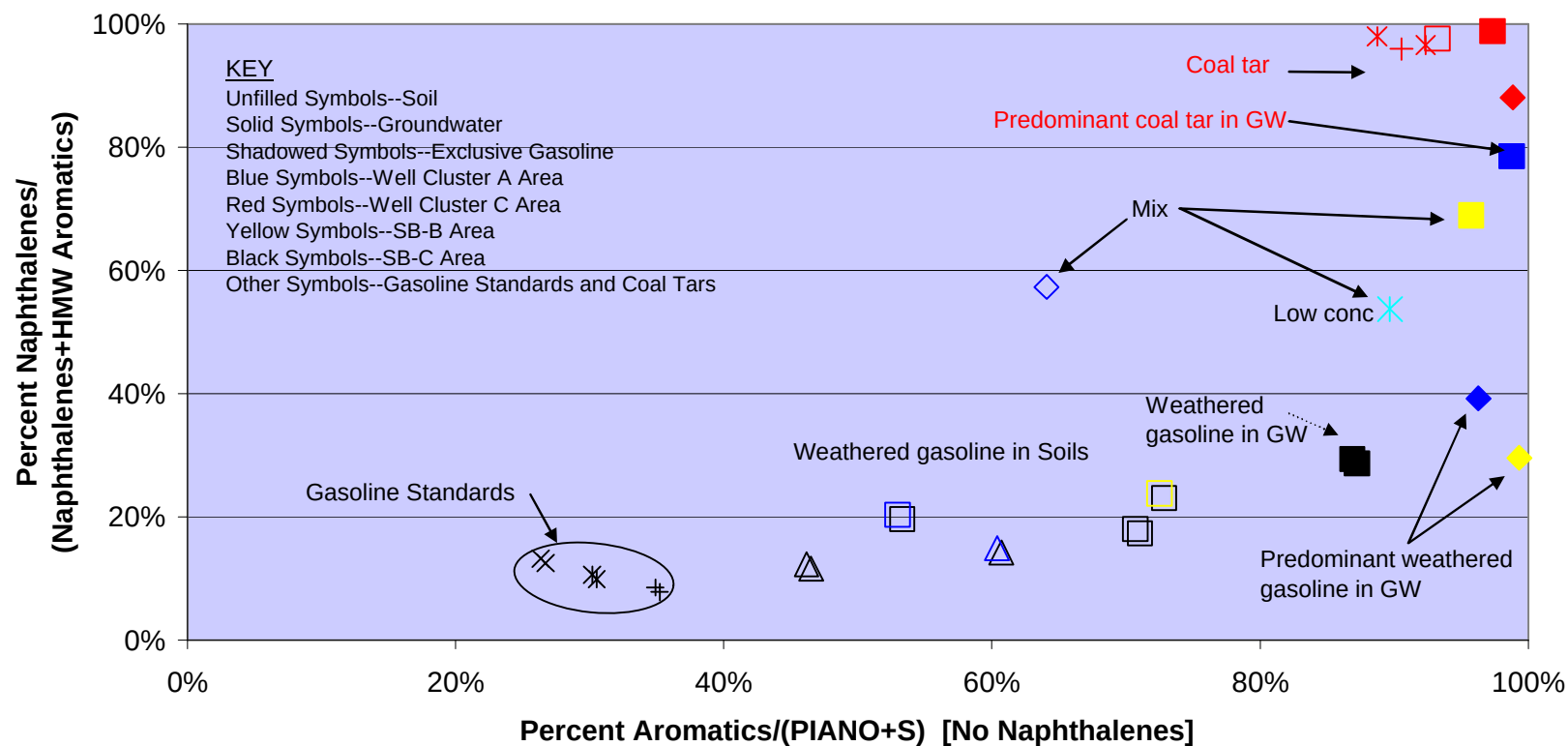
FIGURE
2A

**Figure 3. ConEd W. 18th Street Former MGP (Verizon) Facility
Soils PIANO Double Ratio Plots**



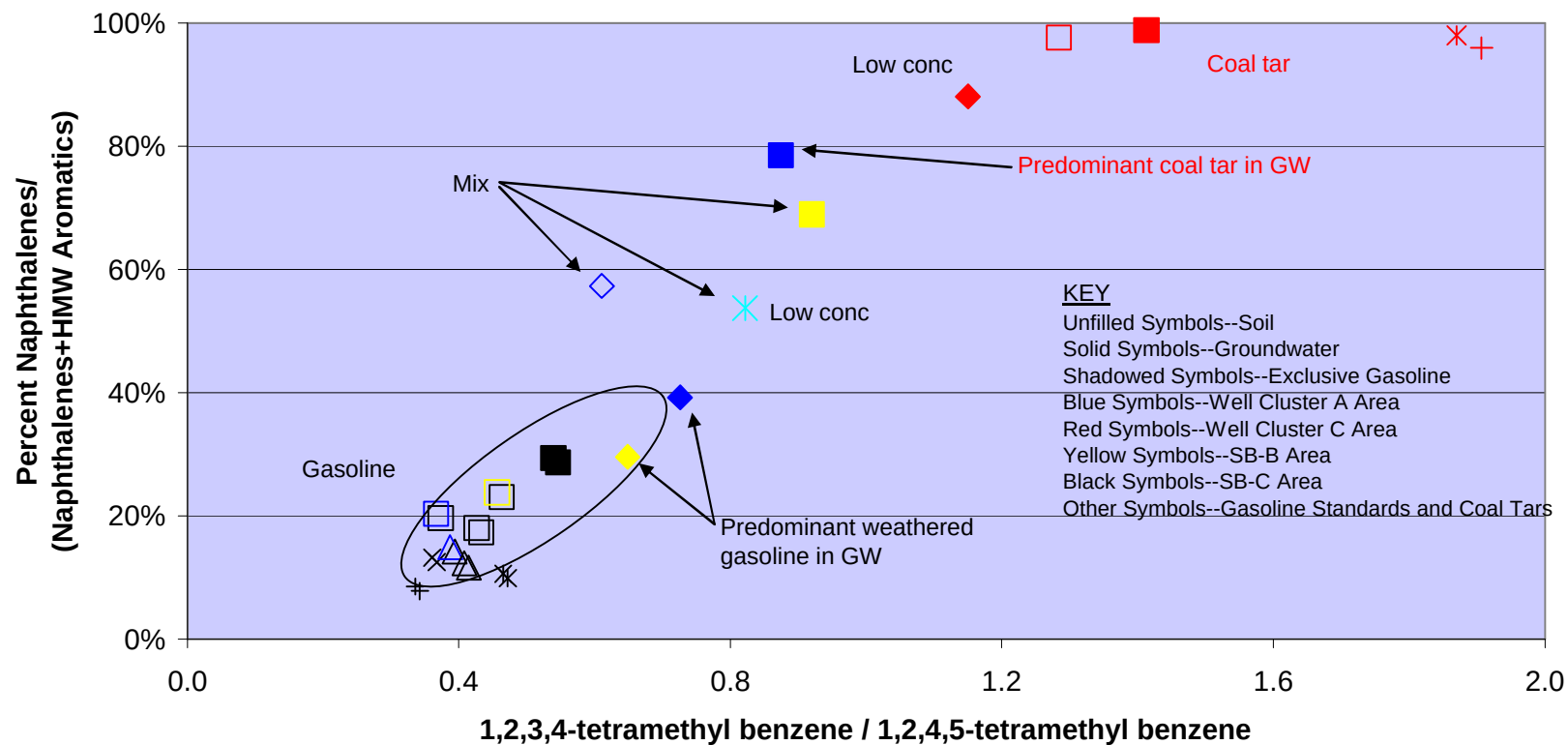
□ WC-A(12) Soil	△ WC-A (17) Soil	◇ WC-A (20) soil	□ WC-C (21) Soil	□ SB-B (10) Soil	□ SB-C (14) Soil
△ SB-C (22) Soil	+ Regular	✱ Plus	✕ Super	✱ Coal Tar Soil	+ W Coal Tar NAPL

**Figure 4. ConEd W. 18th Street Former MGP (Verizon) Facility
Soils and Groundwater PIANO Double Ratio Plots**



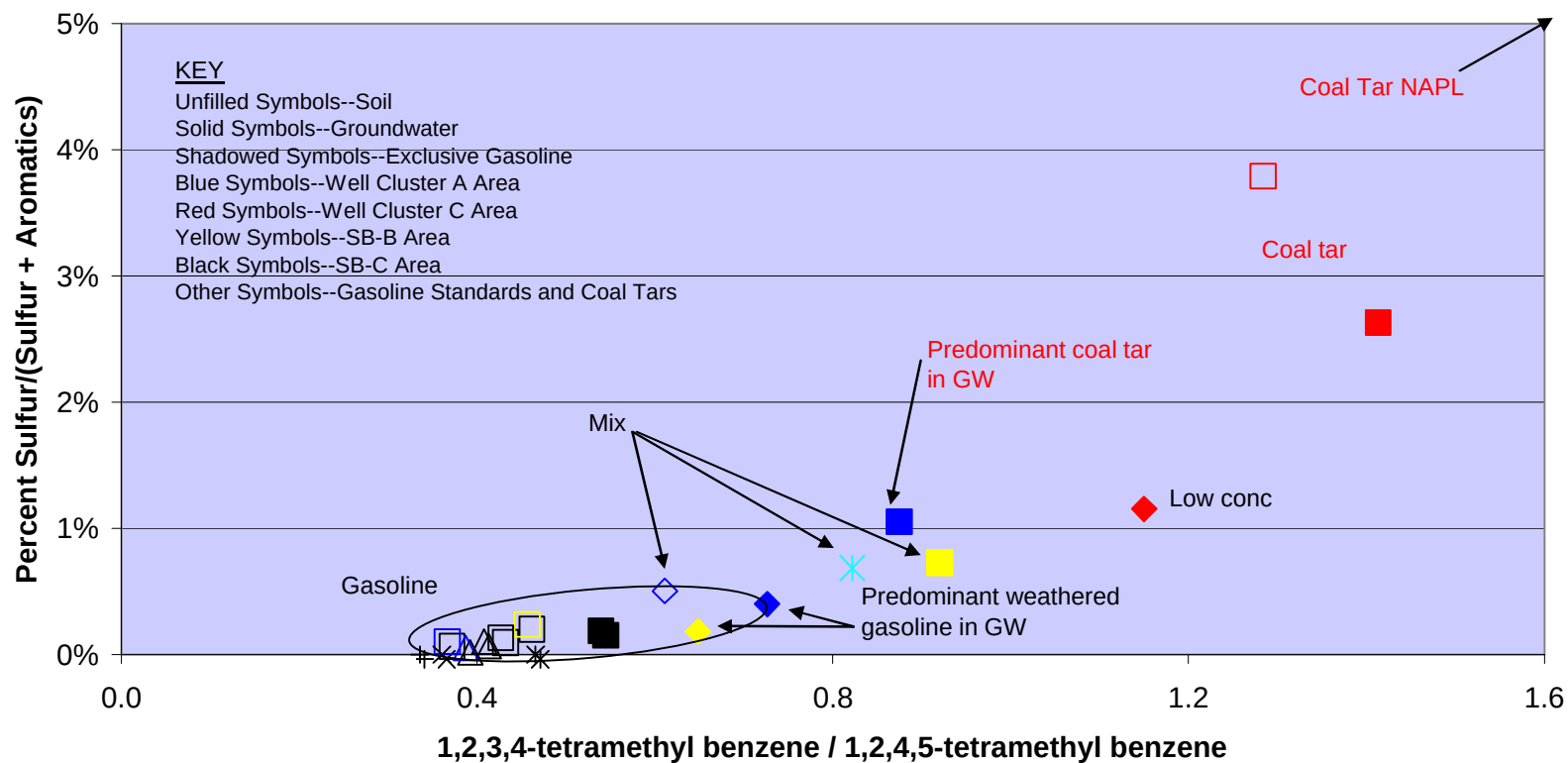
□ WC-A(12) Soil	△ WC-A (17) Soil	◇ WC-A (20) soil	◆ MW-A2 GW	■ MW-A3 GW
□ WC-C (21) Soil	◆ MW-C2 GW	■ MW-C3 GW	□ SB-B (10) Soil	◆ MW-B2 GW
■ MW-B3 GW	□ SB-C (14) Soil	△ SB-C (22) Soil	■ MW-8 GW	× MW-4 GW
+ Regular	* Plus	× Super	× Coal Tar in Soils	+ W Coal Tar NAPL

**Figure 5. ConEd W. 18th Street Former MGP (Verizon) Facility
Soils and Groundwater PIANO Double Ratio Plots**



□ WC-A(12) Soil	△ WC-A (17) Soil	◇ WC-A (20) soil	◆ MW-A2 GW	■ MW-A3 GW
□ WC-C (21) Soil	◆ MW-C2 GW	■ MW-C3 GW	□ SB-B (10) Soil	◆ MW-B2 GW
■ MW-B3 GW	□ SB-C (14) Soil	△ SB-C (22) Soil	■ MW-8 GW	× MW-4 GW
+ Regular	× Plus	× Super	× Coal Tar in Soils	+ W Coal Tar NAPL

**Figure 6. ConEd W. 18th Street Former MGP (Verizon) Facility
Soils and Groundwater PIANO Double Ratio Plots**



□ WC-A(12) Soil	△ WC-A (17) Soil	◇ WC-A (20) soil	◆ MW-A2 GW	■ MW-A3 GW
□ WC-C (21) Soil	◆ MW-C2 GW	■ MW-C3 GW	□ SB-B (10) Soil	◆ MW-B2 GW
■ MW-B3 GW	□ SB-C (14) Soil	△ SB-C (22) Soil	■ MW-8 GW	✧ MW-4 GW
+ Regular	✧ Plus	✧ Super	✧ Coal Tar in Soils	+ W Coal Tar NAPL

**ELECTRONIC ATTACHMENTS
(Provided on CD)**

1. EDR Radius Report
2. Site Characterization Report
3. Transducer Data Files
4. Laboratory Analytical Reports
5. Data Usability Summary
Reports