Outlet City
Voluntary Cleanup Program (VCP) No. V00081-2
Long Island City, NY

REMEDIAL INVESTIGATION REPORT

Outlet City Inc.
41-16 West Street
Long Island City, NY 11101
FLS Project Number: 10038-000

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 2
47-40 21st Street
Long Island City, NY 11101-5407

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and

March 2007

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Professional Engineer's Certification

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(RIR)
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It is a violation of New York State Law for any person, unless acting under the direction of a licensed professional engineer or land surveyor, to alter any item in any way. If an item bearing the seal of an engineer or land surveyor is altered, the altering engineer or land surveyor shall affix to the item his seal and notation "altered by" followed by his signature and the date of such alteration, and a specific description of the alteration.

I, Arnold Fleming, hereby certify that the information presented in the report was prepared under my direct supervision.

Date

Arnold F. Fleming, P.E.
NYS Professional Engineer
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1.0 INTRODUCTION

This Remedial Investigation Report (RIR) encompasses all the investigations completed for the entire site from 1988 to date by AKRF, ELM and Fleming Lee-Shue (FLS). The RIR also incorporates the most recent work completed by FLS as part of an additional remedial investigation focusing on Areas C, D, and E on the western part of the site where contamination is heaviest. An Additional Remedial Investigation Work Plan (ARIW) was prepared by FLS in November 2005 and approved by the New York State Department of Environmental Conservation (NYSDEC) on December 6, 2005. Section 2.3 discusses the results of all previous investigations. Section 3 presents the methodology for the additional remedial investigation and Section 4 presents the subsequent findings.

The Site encompasses the majority of an approximately three-acre parcel of land in Long Island City, Queens County, New York (herein after referred to as the "Site") bound by Jackson Avenue (north), Queens Boulevard (east), the Sunnyside Long Island Railroad (LIRR) Yard A (south), and Orchard Street (west). A New York City Transit Authority (NYCTA) substation and a vacant five-story residential building are located on the northwest corner of this bounded area; however, these structures are not part of the Site. The Site is partially bisected by West Street, which is no longer mapped as a city street within the confines of property. An abandoned New York City subway tunnel runs northeast-southwest through the northwest tip of the Site. Figure 1 presents a Site Location Map and Figure 2 presents a Site Plan.

The Site has been developed with the current buildings for at least 50 years. Figure 2 depicts the current Site development, including Buildings 1, 2A, 2B, 2C, 3A, 3B, 4, 5, 6, 6A, 9, and 10, asphalt parking lots A, B, C, D, and E, and two small unpaved areas adjacent to the railroad tracks, and Areas F and G (formerly used for a railroad siding).

On-site buildings are constructed of reinforced concrete frame and wood post-and-beam construction. All buildings have concrete floors on their lowest level at, or slightly below, surrounding sidewalk elevations. Building 4 is the only building with a basement mostly below sidewalk grade.

According to the New York City Zoning Map 9b, the Site was historically zoned as "M1-6/R10 Light Manufacturing," until the Jackson Avenue rezoning changed the classification to M1-5/R9 with dual manufacturing/residential zone that would allow light manufacturing, commercial, retail, and residential uses on the site. Currently, two of the Site buildings are used as office space, and the remaining buildings are used as warehouses. All soil on the Site has been capped with buildings and/or asphalt parking lots, with the exception of Areas F and G. These areas are not used as part of normal Site operations and enclosed with a fence to prevent public access.

Surrounding properties are primarily used for light manufacturing and/or commercial purposes, with sporadic residential use. Adjacent properties to the south are used as part of the LIRR Yard A (rail yard).

1.1 Objectives

The RIR was performed to satisfy the following objectives:

- Delineate the light non-aqueous phase liquid (LNAPL) plume by installing additional soil borings and monitoring wells.
- Characterize the LNAPL plume by short- and long-term fluid level monitoring.
- Investigate dense non-aqueous phase liquid (DNAPL) by installing soil borings and bedrock interface monitoring wells.
- Characterize soil and groundwater contamination by sampling and analysis for Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs).
- Characterize contaminant concentration in soil, groundwater, and soil gas.
- Identify other units requiring removal and/or remediation (e.g. underground storage tanks (USTs), vaults, or kettles)

2.0 SITE BACKGROUND

The Site was occupied by the West Chemical Company (West Chemical) from the early 1900s until 1977. During this time, West Chemical manufactured a variety of commercial and household disinfectants, soaps, floor waxes, insecticides, and paper product dispensing machines.

The manufacture of a disinfectant “Coronoleum” (CN+) prior to 1950 resulted in the storage of large quantities of creosote on Site. Previous Site investigations identified the following three historic instances of potential creosote contamination:

- Between 1938 and 1950, West Chemical discovered leaks in the bottoms of several aboveground storage tanks (ASTs) located in Area D. The leaks were fixed by installing false bottoms in the tanks. However, the amount of creosote released to the ground was not quantified.

- In 1950, the New York City Fire Department (FDNY) deliberately released the contents of a 5,000-gallon AST of creosote to the ground in Area E during a fire as an explosion prevention measure. The 5,000-gallon AST no longer exists, and was presumably removed prior to the property’s change of ownership.

- Former West Chemical personnel identified that creosote was historically delivered to the plant by means of a rail siding, which makes up Area F. The creosote was pumped into a fill line and delivered to storage tanks in Area D. It is probable that additional releases have occurred during filling periods due to unidentified overfills and unmonitored chemical transfer. These areas are depicted on Figure 2.

Because of these events, the active ingredient in the CN+ product changed to bromine and creosote use was discontinued on the site after 1950.

Reportedly, West Chemical stored a variety of other materials on-site during its tenure, including muriatic acid, alcohol, rosin, fats, and oils. These materials were used in the manufacture of hand creams, cleaning products (floor waxes and cleaners), and vending machine products.

The following summarizes the history of petroleum bulk storage on the Site:

- Two, 500-gallon, gasoline USTs were identified at the Site in Area C during ownership by West Chemical. The USTs were installed before 1938 and taken out of service when West Chemical ceased private shipping operations. The USTs were removed from the Site in 2003, as outlined in a separate work plan and closure report by AKRF.

- Four heating oil USTs were installed under Building 10 between 1947 and 1948. These tanks were originally used to store No. 6 fuel oil and later converted to No. 4 fuel oil. In 1990, the tanks were closed-in-place and a natural gas-fired heating system was installed.

- Twenty-two ASTs were located in Areas C, D, and E in the 1940s and 1950s. The ASTs ranged in capacity from 3,000 to 24,000 gallons, with a total tank volume of 260,575 gallons.

- Vaults and kettles filled with unknown liquid were encountered in Building 2B and 3A respectively. The composition of the liquid and quantity is unknown, but water mixed with disinfectant is suspected.

Additionally, wastewater from cleaning of product-mixing tanks and machinery was reported to be diverted to the soils at the railroad siding on the Site at times. Wastewater also collected in trenches along the perimeter of the Site buildings and was channeled to a holding basin prior to discharge into the City sewer system. The Site was transferred to Outlet City, Inc. in 1978 and has been used for retail and light manufacturing/commercial purposes since that time.

2.1 Geology

Regionally, the Site is located on a relatively flat plain, which extends from the Sunnyside Rail yards in an eastern direction to the East River on the west. Site elevation decreases from Jackson Avenue (approximately 20 feet above Mean Sea Level) to the rail yards (approximately 10 feet Mean Sea Level).

The generalized subsurface profile consists of fill overlying silty sand and glacial till, with bedrock at depths between 4.8 and 42 feet below grade (ft-bg). Descriptions of each soil stratum are given below. Detailed boring logs are presented in Appendix A.

Fill

Surface soils consist of a fill layer varying in thickness from approximately 6.5 to 25 feet. This fill is a mixture of fine to medium sand, with some silt and gravel and traces of brick, cinders, concrete, cobbles, and wood.

Native Soil

The fill material is underlain by silty sand and glacial deposits followed by a layer of fine sand with intermittent seams of silt and clay. Thicker layers of varied silt and clay are present within this sand unit in some locations on the Site. The sand layer varies in thickness from approximately 3 to 15 feet. Additionally, a till layer is present from approximately 22 to 39 ft-bg beneath the northwest portion of the Site.

Bedrock

Based on soil boring data from previous investigations, bedrock at the Site is gneiss. Depth to bedrock varies from 6.5 to 42 feet below grade. Bedrock beneath the Site rises to a conical peak beneath Building 10 at approximately 11 ft Queens Datum (QD). Bedrock plunges from the peak to the following elevations: -34 ft QD to the north, -16.5 ft to the south, -22 ft QD to the west, and -27 ft QD to the east. The plunge is steepest to the north, and relatively gentler in the other cardinal directions. Bedrock elevation contour map and depth to bedrock cross-sections are depicted in Figures 3 and 4.

2.2 Hydrology

Groundwater

Groundwater occurs within the unconsolidated geologic materials covering the Site. The upper surface of the groundwater reservoir is marked by the groundwater-table, which fluctuates seasonally in response to precipitation. Depth to the groundwater table ranges from 3 to 14 feet below grade but is typically 7 to 10 feet below grade over most of the site. Groundwater flow direction is predominantly to the south-southwest with local deflections to the south-southeast around the bedrock mound under Building 10.

Underground utilities such as sewer, water, subways, steam pipes and other subsurface manmade objects may locally impede and redirect natural groundwater flow, or if the water or sewer lines leak, leakage may cause localized mounding of the groundwater table. A detailed description of groundwater flow is in Section 4.2.1.

Surface Water

No surface water bodies exist on the Site. The closest surface water body is the Dutch Kill coming from the Newtown Creek, located approximately 1,600 feet south of the Site, and the East River, and located approximately 4,200 feet west of the Site.

2.3 Previous Investigations

A series of environmental investigations were conducted at the Site since 1988. The following is a concise discussion of their individual scopes of work and the cumulative findings of these investigations. Please refer to Figure 5: Site Plan for the locations of the soil borings and monitoring wells described below. Figures 6 and 7 present the total VOCs and total SVOCs found in soil on site during these site investigations.

2.3.1 1988 AKRF Site Investigations

In 1988, AKRF completed a Site investigation entitled, *Queens Plaza Site Investigation*. Based upon the history of the Site, AKRF identified nine locations on the Site to be investigated and advanced soil boring at these nine selected locations, including: Area A (W-U), B (S-2), C (WD-1 and S-3), D (S-5 and S-6), E (S-4), F (WD-2), and G (S-1).

Soil samples from eight of the borings were collected using split-spoon soil samplers from the surface and groundwater/soil interface and submitted for laboratory analyses. In the ninth boring (Area C – gasoline tanks), continuous soil samples were collected in two-foot increments to the depth of groundwater. In this boring the surface sample and the one subsurface soil sample which exhibited the highest (non-methane) organic vapor concentration (OVC) on the photoionization detector (PID) were submitted for laboratory analysis. Three of the soil borings were converted to monitoring wells - one at an upgradient location, Area A (W-U), and two downgradient locations, Area C (W-D1) and Area F (W-D2) and groundwater samples were collected and analyzed at NYSDEC certified laboratory.

Soils samples were analyzed for Target Compound List (TCL) VOCs and SVOCs (except boring S-2), priority pollutant metals (PP Metals), and Extraction Procedure (EP) Toxicity Characteristics. Additionally, soil samples from borings S-1, S-3, S-4, and W-U were analyzed for pesticides, as S-3 and S-4 had been identified with contamination during analysis. Soil borings S-2, S-3, and S-4 were analyzed for polychlorinated biphenyls (PCBs), S-1 and W-D2 were analyzed for cyanide, and borings S-3, S-6, and W-D1 were tested for the characteristic of ignitibility. Groundwater samples were tested for TCL VOCs, SVOCs, pesticides, PCBs, and PP Metals and cyanide. Results of these samples are presented and discussed in Sections 2.3.7 and 2.3.8.

2.3.2 1990 AKRF Site Investigation

In 1990, AKRF completed a Site investigation entitled, *Outlet City Soil and Groundwater Sampling Results*. In this study, a total of 38 soil borings were installed in open areas and beneath several on-site buildings. These borings were located in Areas A (A-1, A-2, A-3D, A-4, A-5, DW-1, and DW-2), B (B-1), C (C-1, C-2, C-3D, C-4, and D-2D), D (D-1 and D-3), E (E-1D and E-2), F (F-1), and G (G-1), under buildings 2A (2A-1), 3A (3A-1), 3B (3B-1), 5 (5-1), 6 (6-1), 6A (6A-1), 9 (9-1, 9-2, 9-3, and 9-4), and 10 (10-1, 10-2, and 10-3), along West Street (WS-1, WS-2, and WS-3), and along Orchard Street (OS-1D, OS-2, and OS-3). In Areas A, C, E, and along Orchard Street, borings A-3D, C-3D, D-2D, E-1D, and OS-1D, respectively, were advanced to bedrock (approximately 19 to 36 feet in depth below grade).

The monitoring wells OS-2 and OS-3 and soil boring OS-1D were installed west of the Site (along Orchard Street) in order to assess the possible off-Site migration of contamination.

Soil samples were analyzed for VOCs, SVOCs, pesticides, Target Analyte List (TAL) metals (with cyanide), Total Petroleum Hydrocarbons (TPHs), and EP Toxicity Characteristics. Groundwater samples were analyzed for VOCs, SVOCs, pesticides, TAL metals (with cyanide), and dissolved metals. Results of these samples are presented and discussed in Sections 2.3.7 and 2.3.8.

2.3.3 1998 AKRF Site Investigation

In 1998, AKRF completed a Site investigation entitled, *Outlet City Property, Supplemental Site Assessment/Remedial Investigation (SSA/RI)*. This study was completed to further assess Site conditions for the purpose of identifying an appropriate Site remediation plan. The sampling program included seven new locations and four locations identified with contamination in the 1990 AKRF sampling investigation. Groundwater was sampled at nine locations, including eight existing monitoring wells and one temporary well point installed in a soil boring.

Soil borings were advanced at five locations under Buildings 1 (B-1, B-2, and B-3) and 4 (B-4 and B-5) and advanced to depths of 0.5- to 3.5-feet below the floor grade and soil samples were collected in discreet two-foot intervals to the depth of groundwater. The soil samples from these locations were analyzed for TCL VOCs, SVOCs, pesticides, and PP Metals (including cyanide). One soil sample was collected from under each building (B-3 and B-4) and analyzed for Toxicity Characteristics Leaching Procedure (TCLP) metals and TCLP pesticides/herbicides.

Results of the 1990 sampling program revealed elevated levels of heavy metals in Area C, boring C-2 (0-2') and C-3D (0-2'), Area E, boring E-1D (0-4'), and Area F, boring F-1 (0-2'). Therefore, in 1998, AKRF collected samples from locations 0-3'-below grade at locations B-6 (or E-1D), B-7 (or C-2), and B-8 (or C-3D), and the sample from each location with the highest organic vapor concentration (OVC) was submitted for TCLP lead, cadmium, and arsenic analysis. Another sample was collected from the approximate location of boring F-1 at a depth of 0-2'-below grade and submitted for TCLP metals analysis.

AKRF advanced two soil borings in 1998 in Area E (B-9 and B-10), adjacent to the NYCTA substation (transformer area), and soil samples were collected from each boring. In both borings the soil sample obtained at the depth closest to groundwater was retained for analysis for PCBs.

Groundwater samples were collected from F-1and eight existing monitoring wells in Areas A, B, C, F, and G, under building 9, and along Orchard Street (A-4, W-U, B-1, W-D1, W-D2, G-1, 9-1, and OS-3, respectively). Analysis for TCL VOCs, SVOCs and TAL metals (filtered/unfiltered) were completed on samples from each of the wells. Results of these samples are summarized in Sections 2.3.7 and 2.3.8.

Other monitoring wells, D-2D, E-2, and 10-1, were not sampled as a floating layer of creosote was observed in the wells; however, the depth to the top of the product and the thickness of the product was measured. The only other well on-site was located along Orchard Street, well OS-2, which was not sampled as it did not contain sufficient water for the collection of a water sample.

2.3.4 2001 ELM Soil and Groundwater Sampling and Analysis (SGSA)

ELM conducted soil and groundwater sampling at the Site as part of a due diligence investigation for a potential developer of the site. ELM broadly based their sampling program on the Additional Investigation Work Plan that AKRF submitted to the NYSDEC in 2001. However, the sampling was completed with less stringent methodology for quality assurance/quality control (QA/QC) than outlined in the AKRF Work Plan.

ELM installed 26 soil borings depending upon sampling location accessibility. The soil borings, installed by mechanical techniques, were advanced to a depth of 35-feet below grade or to the point of refusal. Shallow refusal (less than 20-feet below grade) occurred in boring G-3 (southeastern Site corner) and all indoor boring locations. On the southwestern portion of the Site, in Areas F and G, and along Orchard Street (F-2, G-2, and OS-4, respectively) refusal occurred at depths of approximately 20- to 25-feet, which may be indicative of bedrock. Additionally, in Area C, at the northwestern corner of the Site, boring C-6 was advanced into weathered bedrock to a depth of 48 feet below grade (ft-bg) making it possible to investigate the conditions close to the bedrock surface.

With the exception of the soil boring under building 3A (3A-2), where refusal was encountered before reaching the desired depth, one to three soil samples were collected from each of the soil borings for laboratory analyses. Generally, soil samples were collected at approximately 10 to 15 ft-bg and at the bottom of each boring.

Although the sampling methodology used for the collection of groundwater samples was not reported, the field notes suggest that the groundwater samples were obtained without purging or developing the wells or well points prior to collecting the water samples. Generally, groundwater and deep groundwater samples were collected at approximately 10 to 15 ft-bg (the groundwater table) and 30 to 35 ft-bg (deep groundwater from above the bedrock), respectively.

Both groundwater and soil samples were submitted to Long Island Analytical Laboratories, Inc. for VOCs (EPA method 8260), SVOCs (EPA method 8270), pesticides (EPA method 608) and metals analyses. Results of these samples are summarized in Sections 2.3.7 and 2.3.8.

No QA/QC samples were taken and/or analyzed during ELM's subsurface investigation, and that, with the exception of acetone, methylene chloride and phthalates (common laboratory contaminants), no unexpected compounds or apparent quality problems were noted in ELM's investigation. The results indicated similar contaminant concentrations and distributions to those identified in the previous investigations. Additionally, it is important to note that since no development of the monitoring wells was noted as part of this assessment, reported analytical results may reflect contaminants sorbed onto the sediment in the groundwater samples and not necessarily reflect true groundwater conditions.

2.3.5 2002 AKRF Site Investigation

AKRF retained a New York State-licensed land surveyor, Montrose Surveying Company, LLP, to complete an elevation survey on the Site in order to calculate the elevations of the ground surface and the top of PVC casing (+/- 0.01-feet) at the wells previously installed by ELM. The elevations of the other wells had previously been surveyed by Montrose in August 1998.

Subsequently, AKRF measured the depth to water and/or product in the existing monitoring and recovery wells by means of an oil/water interface probe. The probe was lowered into the well and when the signal sounded indicating the detection of water and/or light non-aqueous phase liquid (LNAPL), the depth was noted. Additionally, the probe was used to measure dense non-aqueous phase liquid (DNAPL) at the bottom of each of the wells.

AKRF completed groundwater sampling on 22 of the Site's 28 existing monitoring wells in order to update groundwater data and address uncertainties regarding ELM's results. The reported parameters were recorded on groundwater sampling logs.

Sampled wells included 10 installed by AKRF and 12 installed by ELM. There were six monitoring wells excluded from the sampling program, in Areas C and E, under building 10, and along Orchard Street, including those with measured free product (10-1, 10-2, E-2, and D-2D), a well with an extremely slow recovery rate (10-4), and a well that was improperly installed (OS-3). Additionally, the recovery wells, RW-1, RW-2, and RW-3, were not sampled. A Lamotte 2020 turbidity meter was used to measure turbidity, and a Hydrolab multi-parameter probe with a flow-through cell was used to measure the turbidity, pH, temperature, and specific conductivity of the extracted water at approximate 5-minute intervals while purging the well.

Using NYSDEC Analytical Service Protocol (ASP), the groundwater was analyzed for Target Compound List (TCL) VOCs (EPA method 8260), TCL SVOCs (EPA method 8270), dissolved TAL metals, PCBs (EPA method 8082), and pesticides (EPA method 8081). Analysis and filtration for dissolved metals analysis was performed at the NYSDEC-ASP laboratory.

2.3.6 2006, FLS Sub-Slab Vapor and Indoor Air Findings

The findings of the sub-slab vapor and indoor air sampling were submitted to NYSDEC in a separate FLS report entitled *Sub-Slab and Indoor Air Sample Baseline Report*, dated April 11, 2006. This report is presented in Appendix C.

In summary, the VOCs detected in air and sub-slab soil vapor included acetone, benzene, 2-butanone, carbon tetrachloride, chloromethane, dichlorodifluoromethane, ethylbenzene, toluene, xylenes, tetrachloroethene, trichloroethene, and trichlorofluoromethane.

With exception of carbon tetrachloride, which was detected in only 1 out of 12 indoor air samples (AA-10) at a concentration of 1.4 ug/m^3, all VOCs in indoor air were detected at concentrations within the ranges published in the NYSDOH study of air in homes (1997-2003) and the USEPA study of air in offices (1994-1998). Comparison of indoor air results with VOC concentrations detected in outdoor air and sub-slab soil vapor suggests that indoor air is impacted by VOCs in sub-slab soil vapor in Buildings 2A, 3B, 5, 6, 10, and the southwest portion of Building 9. These VOCs include benzene, toluene, ethylbenzene, xylene, and 2-butanone (MEK).

2.3.7 Analytical Results of Previous Soil Analysis

During the five previous investigations, approximately 191 soil samples were collected, of which approximately 76 samples were collected from below the water table and approximately 115 samples were collected from above the water table. Fifty-three (53) of the 115 above-water samples were collected from surface soils (0 to 2 ft-bg). The samples were collected in Areas A through F, beneath buildings 1, 2A, 3A, 3B, 4, 5, 6, 9, 10, on the eastern and western sidewalks along West Street, and on the eastern sidewalk along Orchard Street. The areas beneath buildings 2B and 2C were not investigated because access to these buildings is limited.

Volatile Organic Compounds (VOCs)

A review of the cumulative soil analytical results identified that specific VOCs (listed below) are among the Site's primary contaminants. It appears that the concentration of total VOCs on the south and west portion of the Site, Areas E, D, F, and G and under Buildings 1, 3B, 4, 6, 6A, and 10, exceed the NYSDEC Technical Administrative Guidance Memorandum (TAGM) No. 4046 Recommended Soil Cleanup Objective (RSCO) of 10 parts per million (ppm). The compounds which exceed their respective TAGM RSCOs are included in the table below:

Volatile Organic Compounds Detected in Soil above TAGM RSCOs

VOC Sample	TAGM 4046 (ppb)	Sample Name	AKRF (1988) Concentration (ppb)	AKRF (1990) Concentration (ppb)	AKRF (1998) Concentration (ppb)	ELM Concentration (ppb)
Benzene	60	B-1			13,000 (0.5-2.5)	
		B-2			4,300 (0.5-3)	
		B-3			5,400 (0.5-3.5)	
		3B -1		4,000 (4-6)		
		B-4			1,900 (1-3)	
		B-5			2,200 (1-3)	
		6A-2-2				110 (17.5-18)
		D-1		330 (0-4)		
		E-1D		1,800 (0-4)		
		E-2		8,500 (12-14)		
		S-5	840 (0-2)			
		S-5	1,200 (L)			
Toluene	1,500	1-1				5,806 (2-4)
		3B-1		36,000 (4-6) 11,000J (8-10)		

Volatile Organic Compounds Detected in Soil above TAGM RSCOs

VOC Sample	TAGM 4046 (ppb)	Sample Name	AKRF (1988) Concentration (ppb)	AKRF (1990) Concentration (ppb)	AKRF (1998) Concentration (ppb)	ELM Concentration (ppb)
		3B-2				12,592 (14.5-15)
		B-1			47,000 (0.5-2.5)	
		B-2			27,000 (0.5-3)	
		B-3			55,000 (0.5-3.5)	
		B-4			17,000 (1-3)	
		B-5			16,000 (1-3)	
		E-1D		26,000 (0-4) 2,400 (6-10) 19,000 (14-16)		
		E-2		4,800 (8-10) 100,000 (12-14)		
		E-3				16,398 (19-19.5)
		3B-1		27,000 (4-6) 6,900 (8-10)		
		S-5	7,300 (0-2)			
		S-5	18,000 (L)			
		S-4	2,100 (0-2)			
		S-4	1,900 (L)			
Ethylbenzene	5,500	3B-2				7,444 (14.5-15)
		B-1			40,000 (0.5-2.5)	
		B-2			19,000 (0.5-3)	
		B-3			53,000 (0.5-3.5)	
		B-4			12,000 (1-3)	
		B-5			12,000 (1-3)	
		E-1D		21,000 (0-4) 1,700 (6-10) 18,000 (14-16)		
		E-2		1,300J (2-4) 13,000 (8-10) 63,000 (12-14)		
		E-3				10,656 (19-19.5)
		3B-1		128,000 (4-6) 36,000 (8-10)		
		S-5	8,200 (0-2)			
		S-5	12,000 (L)			
Xylenes	1,200	3B-2				26,377 (14.5-15)
		B-1			165,000 (0.5-2.5)	
		B-2			99,000 (0.5-3)	
		B-3			213,000 (0.5-3.5)	
		B-4			49,000 (1-3)	
		B-5			46,000 (1-3)	
		E-1D		64,000 (0-4) 9,000 (6-10) 116,000 (14-16)		
		E-2		9,100J (2-4) 74,000 (8-10) 220,000 (12-14)		
		E-3				37,432 (19-19.5)
		1-1				21,282 (2-4)
		S-5	50,000 (0-2)			
		S-5	62,000 (L)			
		S-6	35,000 (0-2)			

Volatile Organic Compounds Detected in Soil above TAGM RSCOs

VOC Sample	TAGM 4046 (ppb)	Sample Name	AKRF (1988) Concentration (ppb)	AKRF (1990) Concentration (ppb)	AKRF (1998) Concentration (ppb)	ELM Concentration (ppb)
		S-4	11,000 (0-2)			
		S-4	9,900 (L)			
p-isopropyltoluene	10,000	E-3				21,883 (19-19.5)
		E-3				4,498 (19-19.5)
isopropylbenzene	2,300	1-1				24,302 (2-4)
1,2,4-trimethylbenzene	10,000	3B-2				25,886 (14.5-15)
		E-3				35,773 (19-19.5)
		1-1				6,990 (2-4)
1,3,5-trimethylbenzene	3,300	3B-2				7,252 (14.5-15)
		E-3				11,365 (19-19.5)
		3B-1		3,200J (4-6)		
2-butanone	300	S-5	13,000			
		S-5	4,200 (L)			
		S-4	2,400 (0-2)			
		S-4	2,500 (L)			
		S-WD2	2,000 (0-2)			
PCE		S-5	27,000 (0-2)			
		S-5	1,500 (L)			
TCE		S-6	1,200 (0-2)			
1,2-dichlorobenzene	7,900	3B-1		3,200J (4-6)		

Benzene, toluene, ethylbenzene, xylenes, p-isopropyltoluene, isopropylbenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and 1,2-dichlorobenzene were detected at concentrations exceeding the respective, individual compound, TAGM RSCOs in soils in Area E and beneath Buildings 1 and 3B the storage and unloading areas for creosote, respectively. The aforementioned compounds as well as styrene and chloroform were identified at relatively lower concentrations in Areas A, C, F and G, and under Buildings 6, 9, and 10, and along Orchard Street.

The chlorinated hydrocarbon compound 1,2-dichloroethane was detected at a concentration of 1,803 ppb, exceeding the RSCO of 200 ppb for that compound, in Area A and under Building 6A. Low concentrations of other chlorinated compounds including: 1,2-dichloroethene, 1,1-dichloroethene, cis-1,2-dichloroethene, and 2-chlorotoluene were also identified in the soil samples collected from these areas. Soil samples from Areas C, D, and E also contained dichloroethane and dichloroethene, as well as tetrachlorethene, and trichloroethene. Additionally, methylene chloride and acetone were identified at elevated levels around the Site with concentrations of acetone identified in Area A, under Building 10, and along Orchard Street (OS-7D) all in excess of the compound's 200 ppb RSCO. These two VOCs are commonly identified as laboratory contaminants when found at low levels.

Total VOC concentrations detected in soil samples are depicted in Figure 6. The figure identifies VOC concentrations between 0 and 6 ft-bg to exceed the 10 ppm TAGM RSCO across much of the western and southern portions of the Site (Areas D and E, and under Buildings 1, 2C, 3B, 4, and 10). However, VOC contamination was not identified in the northwestern corner (Area C) or beyond the Site boundaries (along Orchard Street) at this depth. The elevated VOC concentrations were identified to extend vertically to a depth of approximately 20-feet below grade with the exception of Areas F and G, in which lateral contamination was not identified between 12 and 20 ft-bg. A small area near Areas C and D was identified with total VOCs > 10 ppm in deep soils from 20 to 50 ft-bg; however, no data were present at these depths for soil borings from under Buildings 1, 3B, 4 and 10 possibly due to shallow bedrock/shallow drilling refusal (< 20-feet below grade) at these locations.

Semi-Volatile Organic Compounds

Review of the cumulative soil analytical results identified that SVOCs are also among the primary Site contaminants. Concentrations of total SVOCs were identified as exceeding the TAGM 4046 RSCO of 500 ppm in Areas E, D, and G, and under Buildings 1, 4, 3B, 6A, and 10 on the Site. Total SVOC concentrations detected in soil samples are depicted in Figure 7. Additionally, concentrations of total SVOCs >10 ppm (but less than 500 ppm) were identified in Areas C (bedrock interface), F, and G, and along Orchard Street.

The SVOCs identified were phenolic compounds (2-methylphenol, 4-methylphenol, naphthalene, and phenol) and PAHs (acenaphthene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and phenanthrene). These compounds were identified at concentrations exceeding their respective RSCOs in samples collected in Areas C, E, F, G, beneath Buildings 1, 3B, 6A, 10, and along Orchard Street.

Other SVOCs, including, bis(2-ethylhexyl)phthalate, butylbenzylphthalate, dibenzofuran, and diethyl phthalate were also detected around the Site. However, of these contaminants, only dibenzofuran was identified at a concentration exceeding the 6,200 ppb RSCO (Area E and under Building 1, 3B, 6A, and 10). Phthalates have been known to be generated during the analytical process due to erosion of plastic equipment.

Generally, SVOC concentrations are lower on the eastern portion of the Site (Areas A and B), in the shallower soils of Area C, under Building 9, and along West Street. The relatively lower concentrations of contaminants on the eastern portion of the Site (primarily PAHs) were similar to those commonly found in urban areas. However, the elevated levels of PAHs and phenolic compounds identified on the western portion of the Site are probably a result of the former Site operations, including the storage and use of creosote.

It appears that VOC-contaminated soil usually coincides with SVOC-contaminated soil. Review of Figure 6 and 7 identify high levels of VOCs and SVOCs in Area E and under Buildings 1 and 4. Concentration levels indicate the possibility of LNAPL in these locations. However, VOC contamination was identified over a larger area, extending into Areas F and G, to the south of the area affected by VOCs and SVOCs.

In Figure 7, the highest concentrations of total SVOCs were identified in the western portion of the Site. However, isolated areas of elevated PAH concentrations were identified in the eastern portion in Area A and under Building 9. The western portion of the Site (phenols and PAHs) is most likely contaminated from the previous uses of the Site, including the use of creosote, whereas the lesser amount of contamination in the eastern portion of the Site (PAHs) most likely reflects the background urban fill used in the area.

Based on figures 6 and 7, the area of SVOC-contaminated soil generally coincides with the area of VOC-contaminated soil; however, the SVOC contamination does not extend as far south (into Areas F and G) as the VOC contamination. Deep soils (i.e., 20 to 50 feet below grade) did not exceed the TAGM 4046 500 ppm total SVOC limit. Particularly high levels of both VOCs and SVOCs are present in Area E and under Buildings 1 and 4, indicating the possible presence of free-phase product (LNAPL) at these locations.

Metals

The previous reports identified that the concentration of metals in Site soil was typical of urban areas and/or Eastern US Background Levels listed in the NYSDEC TAGM 4046. However, relatively higher levels of arsenic, cadmium, lead and mercury were identified in areas A, C, E, F, and G and beneath Buildings 1, 2A, 3B, 5, 6A, 8, and 10. Lead levels in Areas A (DW-1) and F (F-1) and beneath Building 9 (9-1) have been identified as exceeding the hazardous waste threshold for lead by Extraction Procedure (EP) Toxicity test. It should be noted that since the lead levels were evaluated, the EP Toxicity has since been replaced by the Toxicity Characteristic Leachate Procedure (TCLP) as the required method for determining toxicity. Soils testing as hazardous by EP Toxicity test may not be hazardous by the TCLP. Additionally, magnesium was present at concentrations that exceed the Eastern US background levels, which was identified in samples from Area A and under Buildings 6A and 9.

Pesticides

In general, previous studies identified relatively low levels (< 1-2 ppm) of pesticides across the Site, in Areas A, C, D, E, F, and G and under Buildings 3B, 6, 9, and 10. Relatively higher concentrations of these contaminants (0.5-10 ppm) were detected on the southwestern portion of the Site, under Building 1. Pesticides identified above their respective RSCOs on the south and west portions of the Site, include: alpha benzenehexachloride (BHC) (Area D and under building 1), gamma BHC (Areas C and D), endrin (Area E), heptachlor (Area E), heptachlor epoxide (Areas A, C, D, E, and F and under buildings 9, 6A, and 10), and adjacent to the NYCTA substation (boring S-2).

More recently, the 2001 ELM SGSA identified the pesticides 4,4'-DDD, 4,4-DDE and endosulfan II at < 1 ppm within 10 ft-bg under Building 1 (1-1 and 1-2) and behind Building 9 (G-3); however, the compounds were not identified at levels which exceeded their respective TAGM RSCOs. Additionally, the 2001 ELM

SGSA only identified the presence of on-site pesticides at Area G and under Building 1; therefore, it is possible that the pesticides identified in the previous studies may have degraded in the Site's subsurface.

Polychlorinated Biphenyls

Analysis of soil samples collected from the Site did not identify the presence of PCBs.

2.3.8 Analytical Results of Previous Groundwater Analyses

A total of 85 groundwater samples were collected from monitoring wells and temporary wellpoints installed in Areas A, B, C, E, F, and G, beneath Buildings 1, 6A, 3B, 9, and 10, and along West Street and Orchard Street. Groundwater samples were not collected in Area D due to LNAPL in the monitoring wells. Additionally, free product was observed in some wells in Area E and beneath Building 10. The extent of free product was largely delineated in Areas C, D, and E.

Volatile Organic Compounds (VOCs)

Groundwater sampling of monitoring wells throughout the Site identified elevated levels of VOCs (refer to Figure 8: Total VOC and SVOC Concentrations in Groundwater). In general, elevated concentrations of chlorinated VOCs, BTEX (benzene, toluene, ethylbenzene, and xylene), 1,2-dichloroethane, 1,2,4-trimethylbenzene, 2-butanone, styrene, isopropyltoluene, and, n-propylbenzene were identified.

Groundwater samples collected from monitoring wells at the western and southern portions of the Site, in Areas E and F, under Buildings 1 and 6A, and along Orchard Street (OS-7D), were identified with total concentrations of VOCs at levels equal or greater than 1,000 ppb. Please note that these areas were also identified with the highest levels of soil contamination and/or floating product.

Total BTEX concentrations in monitoring wells under Building 1 and along Orchard Street (OS-7D) were measured at 2,180 ppb and 10,130 ppb, respectively. Additionally, significant levels (>1,000 ppb) of 1,1,2-trichloroethane and/or 1,2-dichloroethane concentrations, acetone, and methylene chloride were detected in groundwater samples from monitoring wells in Areas E and F, under Building 1, and along Orchard Street (OS-7D).

However, only low (<100 ppb) concentrations of the VOCs trans- and cis-1,2-dichloroethene, 1,1- and 1,2-dichloroethane, trichloroethene, chloroethene (vinyl chloride), BTEX, and acetone or non-detected were identified in most of the groundwater samples from monitoring wells on the eastern portion of the Site. The exception was the groundwater sample from monitoring well 9-1 under Building 9 (southeastern corner of Site), which had a total VOC concentration of 671 ppb, which included chlorinated VOCs, methylene chloride, BTEX, and acetone.

Semi-Volatile Organic Compounds

Groundwater sampling from the monitoring wells throughout the Site identified the highest concentrations of SVOCs in the western and southwestern portion of the Site (refer to Figure 8: Total VOC and SVOC Concentrations in Groundwater). SVOCs exceeded 1 ppm in the Areas C, E, F, and G, under Buildings 1, 6A, and 10, and along Orchard Street. The detected SVOCs exceeding 1,000 ppb in these areas consisted primarily of phenolic compounds (phenol, 2-methylphenol, and phenanthrene) and low concentrations of PAHs (acenaphthene, anthracene, fluoranthene, fluorine, and pyrene). Chlorobenzenes, dibenzofuran, and phthalates were also identified in these areas at a much lower concentration. Other identified SVOCs include: carbozole, 2,6-dinitrotoluene, dibenzofuran, dichlorobenzene, diethylphthalate, 4-nitroaniline, and nitrobenzene.

Total SVOCs at concentrations between 100 ppb and 1 ppm were detected in Area A, under Buildings 3A and 9, and along Orchard Street. With the exception of monitoring wells 9-1 and W-U, the SVOCs from the groundwater samples on the eastern portion of the Site contained no SVOCs or had low (<100 ppb) concentrations.

It is important to note that high levels of SVOCs can be indicative of high sediment/particulate levels in water samples as SVOCs have very low solubilities. FLS could not confirm the composition of the previously collected water samples.

Metals

Groundwater throughout the Site was found to contain a variety of dissolved metals, most of which exceeded NYSDEC’s Division of Water Technical Operational Guidance Series (TOGS) 1.1.1 Class GA Ambient Water Quality Standards (AWQS), including: aluminum, arsenic, iron, lead, magnesium, manganese, nickel, and sodium. Additionally, barium, beryllium, cadmium, chromium, copper, selenium, and/or zinc were identified above their respective AWQS in Area E (E-2).

The source of metals in the groundwater cannot be accounted for by Site activities by West Chemical. The Site is located adjacent to the Sunnyside Rail Yard A. The presence of significant quantities of coal ash from historic rail operations may account for these metals. These yards had historically been the receiving point for most road de-icing salt used in NYC, which may account for the high sodium levels, more typical of the brackish groundwater found close to tidal waters.

Pesticides

Samples collected from Areas A, D, E, and F, under Building 10, and along Orchard Street (OS-2), were identified with pesticide levels exceeding TOGS GA AWQS; however, all concentrations were < 20 ppb with the exception of the groundwater sample from E-2 in Area E that was identified with a total pesticide concentration of 38 ppm.

In Areas A and C (W-D2 and C-5), endrin was found to exceed the GA AWQS of "non-detect". Other pesticides detected included alpha-chlordane, alpha-/delta-/gamma-BHC, endrin, and heptachlor, which were detected throughout the rest of the Site at concentrations < 1 ppb, and 4, 4-DDE, which was reported in the groundwater sample collected from under Building 1 (1-1).

Polychlorinated Biphenyls

No PCBs were detected in any of the groundwater samples collected from the on-site monitoring wells.

3.0 SAMPLING METHODOLOGY

This section details the methodology employed to conduct the additional investigation activities approved by NYSDEC in December 2005. The work included soil borings, installation of permanent monitoring wells, and sub-slab soil vapor and indoor air sampling. These resulted in the collection of soil, groundwater, soil vapor, and indoor and outdoor air samples for laboratory analyses. Additionally, subsurface fluid levels were monitored to assess free-phase product behavior and short- and long-term groundwater fluctuations.

3.1 Sub-Slab Vapor and Indoor Air Sampling

Sub-slab vapor and indoor air sampling was performed on March 1, 2006 to assess soil vapor beneath on-site buildings and the quality of indoor air. The findings of the sub-slab vapor and indoor air sampling were presented by FLS to NYSDEC in a separate report entitled *Sub-Slab and Indoor Air Sampling Baseline Report*, dated April 11, 2006 (Appendix C). (Since this testing was separate from the additional investigation, the results were summarized in Section 2.3.6.)

3.2 Soil Boring Installation

The additional investigation included 10 soil borings to further delineate the extent of subsurface contamination. As shown in Figure 9 seven (7) soil borings were advanced on the outdoor portion of the Site and three (3) soil borings were advanced inside the Site buildings.

Soil borings C-8, C-9, D-4, D-5, D-6, E-4, and F-3 were advanced outdoors in Areas C, D, E, and F; and soil borings 1-3, 10-6, and 10-7 were advanced in Buildings 1 and 10. The soil borings were located in areas where previous investigations identified contamination but did not adequately delineate its extent and in areas where soils were not previously investigated.

Soil borings were not installed in Building 2C during this and the previous investigations due to physical constraints within the building; however, since the indoor and outdoor areas surrounding Building 2C were adequately addressed, FLS concluded that sampling under Building 2C was not necessary to delineate on-site contamination.

The outdoor soil borings were installed using a truck-mounted Geoprobe unit; indoor soil borings were advanced using skid-mounted and a hand-held Geoprobe units.

3.3 Soil Sample Collection

Continuous soil sampling was performed with a Geoprobe unit using a discrete sampler, to avoid possible cross-contamination. The soil retrieved from each sampler was field screened with a photoionization detector (PID) for VOCs and described by FLS field personnel using the modified Burmister Classification System. Any evidence of contamination (e.g., non-aqueous phase liquid [NAPL], sheens, odors, staining, elevated PID readings) was documented by FLS field personnel. Soil boring logs are included in Appendix A.

Soil borings were advanced to refusal to determine depth to bedrock. Soil samples were collected from the soil/groundwater interface (approximately 5 to 8 ft-bg) in borings 1-3, 10-6, 10-7, and E-4 to evaluate petroleum impacts (LNAPL). Soil samples were collected at the top of bedrock (ranging from 6.5 to 42 ft-bg) to investigate potential DNAPL.

Soil samples selected for laboratory analysis were placed in laboratory supplied containers, sealed and labeled, and placed in a cooler and chilled to $4^{o}C$ for transport. The soil samples were submitted via courier for analysis to Severn Trent Laboratories (STL) of Shelton, Connecticut, a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory. The samples were analyzed for TCL VOCs and TCL SVOCs using Methods 8260 and 8270, respectively (Appendix C).

A 5-foot bedrock core was collected from borings C-8, C-9, E-4, 10-6, and F-3 by means of a NX diamond-bit core barrel, in order to obtain the rock quality description (RQD), depth to bedrock, and assess whether DNAPL migrated into rock fractures.

3.4 Monitoring Well Installation

Eleven monitoring wells (Figure 9) were installed using a hollow stem auger drill rig. Nine of the 10 soil borings advanced (C-8, C-9, D-4, D-5, E-4, F-3, 1-3, 10-6, and 10-7) were converted to deep monitoring wells. Two shallow wells were also installed next to deep wells C-8 and C-9. All deep monitoring wells were constructed of 2-inch-diameter Schedule 40 PVC piping with 10 feet of 0.020-inch, machine-slotted screen set across the water table. The deep wells were constructed as bedrock interface wells, with a 2-foot sump set in the bedrock to provide a reservoir for possible DNAPL accumulation. Monitoring well construction details are presented in Table 1 and Appendix B.

Groundwater quality was assessed at two discrete vertical intervals in the aquifer, in the top portion and in the interval immediately above the bedrock surface, by installing well couplets, one shallow and one deep, near each other. Two well couplets, MW-C8 (wells MW-C8D and MW-C8S) and MW-C9 (wells MW-C9D and MW-C9S), were installed in Area C. The screened portion of shallow wells extended from approximately 8 to 18 ft-bg, while that of deep wells from approximately 33 to 42 ft-bg.

The shallow wells terminated at 6 to 7 feet into the saturated zone. Gravel pack consisting of No. 2 Morie Sand was used to backfill the annular space around the well screen from the bottom of the well to approximately two feet above the top of the well screen. Soil borings were grouted with bentonite grout slurry from the top of the gravel pack to within one foot of the surface. For the deep wells, the bentonite slurry was pumped through a tremie pipe placed just above the gravel pack, and pulled back as the annular space filled with grout. Each well was finished with a locking flush-mounted road box set in a cement apron.

The monitoring wells were developed by pumping. Water-quality indicators (pH, temperature, specific conductivity, and turbidity) were monitored periodically while pumping. Development continued until either water quality indicators of the extracted water stabilized (± 10% for 3 successive readings) or the turbidity measured was < 50 nephelometric turbidity units (NTUs) on 3 successive readings. Well development water was containerized in 55-gallon steel drums.

3.5 Groundwater Sample Collection

Two weeks after installation all newly installed and existing wells (A-4, E-3, and OS-6) were gauged to measure the depth to water and NAPL by using an oil/water interface probe. The volume of water in each well was calculated using the length of the water column, well diameter, and depth to the bottom of the well.

Groundwater samples were not collected from wells containing NAPL. However, one sample of LNAPL was collected from monitoring well E-4 for forensic hydrocarbon fingerprint analyses (modified EPA method 8100) and physical properties. The LNAPL sample was submitted to META Environmental, Inc. of Watertown, Massachusetts for the analysis.

Low-flow purging techniques were used to purge the monitoring wells prior to obtaining groundwater samples. Non-dedicated sampling equipment (oil/water probe, peristaltic pumps, etc.) was decontaminated prior to sampling in each sampling location.

All groundwater samples were collected using dedicated polyethylene tubing attached to a peristaltic pump capable of low flow control. The groundwater samples were pumped directly into laboratory-supplied sample bottles. The samples were cooled, properly packaged to prevent breakage, and submitted for analyses via courier to Accutest Laboratories of Dayton, New Jersey, a NYSDOH-ELAP- certified laboratory. Groundwater samples in the newly installed wells were analyzed for TCL VOCs and TCL SVOCs by EPA Methods 8260 and 8270, respectively (Appendix C). Since metals and pesticides were sufficiently characterized in earlier investigations and PCBs were below detection limits, the current investigation focused on collecting samples for VOCs and SVOCs in order to further evaluate creosote DNAPL impacts.

Additional groundwater samples were collected from monitoring wells with signs of contamination and analyzed for biological oxygen demand (BOD) (EPA method 405.1), chemical oxygen demand (COD) (EPA method 410.4), iron (EPA method 6010b/200.7), total coliform (Method MUG), hardness (EPA method 310/1) and alkalinity (EPA method 2340B). The purpose of these analyses was to collect data necessary to evaluate different remedial measures. A-4, E-3, and OS-6 were sampled for BOD, COD, alkalinity, hardness, and iron and total coliform in order to assess whether breaks in sewage lines were reaching groundwater.

One groundwater sample, MW-10-6, was collected from an area of suspected municipal water or sewage infiltration, and analyzed for fluoride. Municipal water is treated with an average fluoride concentration of 1 milligram per liter (mg/l). The total coliform tests on groundwater samples collected in the vicinity of this area were collected to discern between the presence of potable water or sewage.

3.6 Fluid-Level Monitoring

Earlier investigations found the LNAPL thickness in monitoring wells varied with fluctuations in groundwater levels, and changes in LNAPL levels were observed in monitoring well D-2D and in the basement of Building 4 after rainfall.

In order to understand whether groundwater fluctuations influenced LNAPL plume migration, FLS made periodic groundwater fluid level measurements using an oil-water interface probe approximately every two weeks beginning in early July 2006 and ending on August 31, 2006. The monitoring period included three significant periods of rain fall where rainfall was one inch or greater in a single event. In addition, pressure transducers were placed in three wells, RW-2, W-D1, and F-1, in order to record fluctuations in groundwater during a rain event. A fourth transducer was placed in well RW-2 to collect atmospheric pressure readings, in order to correct water level measurements for any barometric changes. A free-phase product plume map depicting the limits of measurable LNAPL (the area of retention) and product thicknesses in the wells is presented in Section 4.

The fluid level monitoring further evaluated DNAPL and the need for additional remedial measures to address the DNAPL or dissolved-phase chlorinated hydrocarbons near the bedrock interface.

An oil/water interface probe was used to monitor fluid levels of depth to water and/or product in the newly installed and 18 existing wells on the western portion of the Site (C-5, D-2D, W-D1, W-D2, RW-1, RW-2, RW-3, E-2, E-3, 10-1, 10-2, 1-1, 1-2, OS-2, OS-4, OS-5, OS-6, and OS-7D). During each of the fluid level measurement episodes, FLS monitored the wells for DNAPL by lowering the oil/water probe to the bottom of each well and checking for product thickness.

3.7 Community Air Monitoring

During soil boring and monitoring well installation, community air monitoring was conducted by locating a PID along the work zone perimeter (upwind and downwind) and continuously measuring ambient VOC concentrations. The PID was equipped with an audible alarm and capable of calculating 15-minute running average concentrations, which were compared to programmed action levels. The PID was calibrated at least once daily. Upwind VOC concentrations were measured at the start of each work day and periodically thereafter to establish background conditions. VOC concentrations were measured from the downwind station at a minimum of once every two hours.

A project logbook was kept on-site for the purpose of recording background readings. This record was available on-site for review by the NYSDEC. Additionally, all investigation derived wastes were promptly containerized and covered in order to minimize nuisance odors during the investigation activities.

3.8 Investigation Derived Waste (IDW) Management

The waste generated during Site investigation was stored in Department of Transportation (DOT)-approved, 55-gallon drums which were kept covered during the field work, sealed at the end of each work day, and labeled with the date, well/boring number, waste type (water, free product), and FLS point of contact. An appropriate waste designation was determined from the results of the soil and water samples collected during well installation. Additionally, aquifer test groundwater discharge was generated and stored on-site in 55-gallon drums. At the time of preparation of this report, FLS is in the process of arranging proper disposal of all IDW in accordance with local, state, and federal regulations.

4.0 FINDINGS

Section 4 presents the results and findings for work completed as a part of the additional investigation. This includes soil and groundwater sampling, fluid level measurements, and forensic fingerprinting of LNAPL. Sufficient soil and groundwater data are now available to complete site characterization and delineate on-site contamination, and design the appropriate remedial actions. Summaries of the laboratory analytical data are provided in Tables 2 through 4.

4.1 Soil Findings

4.1.1 Field Observations during Soil Boring Installation

Creosote contamination was noted in on-site soils during the installation of the soil borings. Impacts were observed in each of the 10 soil borings, and LNAPL was noted in 7 out of 10 soil borings. Refer to Figure 9 for soil boring locations.

NAPL was noted in the following seven soil borings: 10-6, C-8, C-9, D-4, D-5, D-6, and E-4. Soil sample analytical results, discussed in detail in Section 4.1.2, confirm elevated concentrations of creosote constituents in these borings.

Soil borings attempted in Building 2B encountered liquid-filled voids immediately beneath the concrete floor slab. The voids are presumed to be concrete vaults used for the storage and manufacture of products. The dimensions of the vaults could not be obtained. The liquid in the vaults appeared to be water with odor of a disinfectant. Building 2B was formerly used to manufacture soap. Upon suspicion that the liquid contained soap, three samples of the liquid (T-1, T-2, and T-3) were submitted to STL for alkalinity, pH, and metals analyses, and results are discussed in Section 4.2.2. The quantity of liquid in the vaults beneath Building 2B has not been determined but the water contained traces of lye.

4.1.2 Soil Sample Analytical Results

The laboratory analytical results are provided in Appendix C. The analytical data are summarized in Tables 2 and 3. Soil samples were analyzed for VOCs and SVOCs. Figures 10 and 11 show the results of VOC and SVOC sampling results for soil.

<u>VOCs</u>

Detectable concentrations of VOCs are present in all analyzed soil samples and VOCs exceeded the TAGM RSCOs in 8 of the 10 soil samples. The concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX) are highest in soil samples D-5(24-26’), D-4(13.5-15.5’), C-8(36-37’), E-4(6-8’), and E-4(16-18.5’). The concentrations ranges of BTEX compounds exceeding TAGM include the following: benzene, 190 ppb to 9,500 ppb; toluene, 6,100 ppb to 100,000 ppb; ethylbenzene, 5,900 ppb to 48,000 ppb; and xylene, 1,300 ppb to 190,000 ppb.

SVOCs

SVOC compounds exceeded the TAGM RSCO in nine out of 10 soil samples. The concentrations of SVOCs, and the subset polycyclic aromatic hydrocarbons (PAHs), with the highest concentrations include naphthalene, 2-methylnaphthalene, acenaphthene, dibenzofuran, fluorene, and total SVOCs are highest in soil samples D-6(5-7'), D-5(24-26'), D-4(13.5-15.5'), C-8(36-37'), E-4(6-8'), and E-4(16-18.5'). The concentration ranges in these samples is as follows:

SVOCs	Concentration (ppb)	TAGM RSCO (ppb)
Naphthalene	470,000 - 2,500,000	13,000
2-methylnaphthalene	510,000 - 2,700,000	36,400
Acenaphthene	130,000 - 390,000	50,000
Dibenzofuran	120,000 - 380,000	6,200
Fluorene	67,000 - 210,000	50,000
Total SVOCs	922,500 - 6,214,000	500,000

These findings collaborate with the results of previous investigations on the presence and extent of creosote contamination beneath outdoor areas C, D, and E.

4.2 Groundwater Findings

4.2.1 Conceptual Groundwater Model

Bedrock beneath the Site rises to a conical peak beneath Building 10 at approximately 11 ft Queens Datum (QD). Bedrock plunges from the peak to the following elevations: -34 ft QD to the north, -16.5 ft QD to the south, -22 ft QD to the west, and -27 ft QD to the east. The plunge is steepest to the north, and relatively gentler in the other cardinal directions.

Groundwater contour maps were reconstructed from groundwater measurements collected during the fluid measurement task. Ground elevations were obtained from the Mueser Rutledge Geotechnical Report, December 16, 1988. Groundwater flow maps are presented in Figures 12 and 13.

Prior to development of the Site and the immediate areas, a stream known as Dutch Kills flowed through the area in a south-southwesterly direction into Newtown Creek, which emptied into the East River. Figures 12 and 13 present an inset of the 1868 Beers Historical Topographic Map showing the site bounded on the east and south by Dutch Kills and on the west by an unnamed stream. Both streams flow toward Newtown Creek. FLS infers from this information that the net groundwater flow on site is ultimately to the south-southwest.

The upper segment of Dutch Kills was filled in to facilitate development; the kill now terminates approximately 1,600 ft south of the Site, and still flows in a south-southwesterly direction into Newtown Creek. Groundwater from the Site would have flowed south-southeast into the Dutch Kills, the nearest surface water body, and then would have proceeded south-southwest with the flow direction of Dutch Kills. Additionally, a localized south-southwest component to groundwater flow is present on the western portion of the Site, flowing around the western side of the bedrock peak beneath Building 10. Despite the filling of the kill, the groundwater still follows the established flow pattern to the south-southeast into the kill, and then to the south-southwest with the direction of the kill.

Groundwater elevation is approximately 6.5 ft QD across the western portion of the Site, and approximately 7.25 ft QD across the eastern portion. Groundwater elevation rises to a peak (approximately 8.5 ft QD) at the location of the bedrock peak beneath Building 10. The rise is relatively abrupt and occurs within a radius of approximately 30 ft from the peak. FLS infers from this rise and the associated fluoride levels in groundwater from this locale that leaks from sewer and/or water mains are the cause of this abrupt rise. This localized mounding is the only exception to the relatively gentle decrease in groundwater elevation from north to south across the Site and represents a unique, localized condition arising from the building foundation and elevated bedrock at this location.

The largest known creosote release is reported to have occurred approximately 30 feet north of the bedrock peak, where the product was formerly stored. The creosote migrated down through the unsaturated zone to the aquifer, where lighter creosote remained at the top and denser creosote migrated down through the aquifer. The subtle difference in density of the creosote is responsible for the presence of both LNAPL and DNAPL. Some of the creosote dissolved into the groundwater.

DNAPL

The mechanics of DNAPL transport are that the historical creosote releases migrated from the source area(s) downward encountering lenses of varying permeability that caused DNAPL to move both laterally an vertically. Ultimately, DNAPL spread out and eventually reached the top of the bedrock where some portion pooled on the northern face of the bedrock mound, which directed DNAPL movement to the northwest and west along the bedrock slope.

With the source of DNAPL removed by migration, further DNAPL migration from the source area to points where the saturation level decreases below residual saturation levels. Groundwater displaced DNAPL in the smaller soil pores rendering the DNAPL discontinuous and immobile. DNAPL was not observed in any monitoring well during the fluid level monitoring period and this observation suggests immobility. DNAPL forms a smear zone near the former creosote storage area near Area E and as a thin layer along the top of the bedrock. Figure 14 shows the extent of the smear zone along cross-section A-A’.

LNAPL

The LNAPL spread out in an irregular shape from the location of the spill, with an inclination to the south-southeast. The LNAPL plume stabilized in a contiguous shape encompassing Area E, southeast corner of Area C, eastern half of Area D, northwest portion of Building 10, northern portion of Building 2C, northwest portion of Building 2B, and the southern portions of the two buildings located between Areas B and C. LNAPL was observed in wells at these locations during the remedial investigation. Figure 15 shows the horizontal extent of LNAPL. Figure 16 shows the LNAPL smear zone along cross-section B-B' near the source in Area E.

During historical release, groundwater and low permeability strata above the bedrock directed a portion of the NAPL to the south and south-southeast where it flowed along preferential pathways and/or building foundation walls to where it encountered the north foundation wall at Building 4 where it accumulated and pooled. It has remains at high enough saturation levels with sufficient head that enables it to flow onto the basement during high groundwater conditions. This condition appears localized to Building 4.

Dissolved Phase

Dissolved creosote constituents migrate beneath the Site with groundwater flow. Locally, in the northwest corner of the Site, the dissolved phase flows to the south-southeast. Groundwater then moves predominantly in a south-southwest direction. The dissolved plume may exhibit variations in flow direction due to fluctuating water levels, perched layers, building foundations, and shallow depth to bedrock. Ultimately, however, the net flow direction is predominantly to the south-southwest around the bedrock mound under Building 10..

The dissolved plume occurs in the lower and upper portions of the aquifer. In the lower portion, the dissolved plume mirrors the shape of the extent of DNAPL where the concentrations of VOC and SVOCs are greatest and are much higher than in the shallow wells. In the shallow wells, VOCs and SVOCs were not detected for most compounds, and two or more orders of magnitude lower than similar compounds detected in the deeper groundwater samples. The dissolved plume is most heavily impacted in the lower portion of the flow regime, where it is close to the DNAPL and below the low permeability till layer where groundwater flow is minimal.

4.2.2 Groundwater Sample Analytical Results

Groundwater samples collected on June 22 and June 23, 2006 were analyzed for VOCs, SVOCs, iron, fluoride, total coliform, biological oxygen demand (BOD), and inorganic parameters that include total alkalinity, chemical oxygen demand (COD), and total hardness. The laboratory analytical results are provided in Appendix C, and are summarized in Tables 4 through 6. Analytical results were compared to the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. Class GA Groundwater Standard. Additionally, one sample of LNAPL was collected from monitoring well E-4 on June 23, 2006, and analyzed for forensic carbon fingerprint by modified EPA method 8100. Figures 17 and 18 present the VOC and SVOC result of groundwater sampling.

VOCs

Analytical results of groundwater samples indicate petroleum-based and chlorinated VOCs in seven of eight samples. All seven samples with concentrations of VOCs (MW-10-6, MW-D4, MW-D5, MW-C8D, MW-C8S, MW-C9D, and MW-F4 [MW-F4 is actually MW F3, but the sample was miscoded by the laboratory. MW-F4 and MW-F3 are the same sample location]) contain at least one compound that exceeds TOGS. Compounds detected at concentrations that exceed TOGS GA AWQS are acetone, benzene, 2-butanone (MEK), chloroform, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, ethylbenzene, methylene chloride, tetrachloroethene (PCE) toluene, trichloroethene (TCE), vinyl chloride, and xylenes.

The highest impacts occur in groundwater samples MW-D5, MW-C8D, MW-C9D, and MW-D4, collected from monitoring wells installed in areas C and D. In these four samples the following VOC concentrations are present:

VOCs	**Concentration (ug/l)**	**TOGS GA AWQS (ug/l)**
Acetone	108 - 3,760	50
Benzene	219 - 4,100	1
2-butanone (MEK)	108 - 1,650	50
1,2-dichloroethane	178 - 4,320	5
Ethylbenzene	431 - 487	5
Toluene	987 - 4,420	5
Xylenes	1870 - 2,090	5

The types of detected compounds and their elevated concentrations suggest a mixture of possible creosote, petroleum fuels, and chlorinated compounds.

The analytical results show differences between shallow and deep groundwater samples. No VOCs are detected in shallow sample MW-C9S. Only two compounds marginally exceed TOGS GA AWQS in the shallow groundwater sample MW-C8S, acetone and vinyl chloride. These findings contrast with results for the deep groundwater samples collected at these locations, MW-C9D and MW-C8D.

Trichloroethene (TCE) is present in two of the eleven samples (MW-10-6 and MW-D4), and exceeds the TOGS value of 5 ug/l in both samples (39.5 and 18.5 ug/l, respectively). These compounds were not detected in soil samples collected from borings MW-D5, MW-10-6, and MW-D4. However, results of previous investigations (AKRF, 1988 and 1990) identify PCE and TCE in soils in Areas C, D, and E, in the vicinity of monitoring wells MW-D5, MW-10-6, and MW-D4. The prior detection of TCE and PCE in soil and the current groundwater results beneath Building 10 and Area D indicate chlorinated solvent impacts from former on-site activities.

In addition to the eight groundwater samples, one field blank and one trip blank were analyzed. They contained no detectable concentrations of VOCs.

SVOCs

Analytical results of groundwater samples indicate SVOCs in all eight analyzed samples. Of the eight samples with detected concentrations of SVOCs, seven samples (MW-10-6, MW-D4, MW-D5, MW-C8D, MW-C8S, MW-C9D, and MW-F4 [a.k.a MW-F3]) contain at least one compound that exceeds TOGS. Compounds detected at concentrations that exceed TOGS GA AWQS are 2-methylphenol, phenol, acenaphthene, anthracene, benzo(a)anthracene, chrysene, dibenzofuran, fluorene, 2-methylnaphthalene, naphthalene, and phenanthrene.

The highest SVOC impacts occur in the groundwater samples MW-D5, MW-C8D, MW-C9D, and MW-D4 (the same samples with the highest VOC concentrations) collected from monitoring wells installed in areas C and D. In these four samples the following SVOC concentrations are present:

	Concentration (ug/l)	**TOGS GA AWQS (ug/l)**
2-methylphenol	231 – 8,940	5
Phenol	950 – 2,660	1
Acenaphthene	114 - 402	20
Dibenzofuran	114 - 358	5
Fluorene	86.2 - 190	50
2-methylnaphthalene	870 – 3,450	50
Naphthalene	3,140 – 9,100	10

The SVOC analytical results show a sharp contrast between shallow and deep groundwater samples, similar to the VOC results. Total SVOC concentrations in shallow samples MW-C8S and MW-C9S are 115 ug/l and 11 ug/l, respectively. Total SVOC concentrations in deep samples MW-C8D and MW-C9D are 111,786 ug/l and 104,540 ug/l, respectively. The contrast between SVOC results in shallow samples and deep samples suggests that creosote contamination is present in the lower portion of the aquifer.

In addition to the eight groundwater samples, one field blank was analyzed. It contained no detectable concentrations of SVOCs.

Iron

Laboratory results for iron in groundwater samples from wells A-4, E-3 and OS-6 indicate that iron is present in groundwater at concentrations ranging from 1,070 to 10,900 ug/l, above the TOGS GA AWQS standard of 300 ug/l. According to the New York City Department of Environmental Protection (NYCDEP) Groundwater System 2005 Water Quality Data, groundwater beneath eastern parts of Queens contains concentrations of iron up to 760 ug/l. The elevated iron concentrations in groundwater beneath the Site are attributed to regional background conditions and anthropogenic fill, and not to conditions endemic to Site contamination.

Alkalinity, BOD, COD, and Hardness

Groundwater samples collected from monitoring wells A-4, E-3 and OS-6 were analyzed for total alkalinity as $CaCO_3$, biochemical oxygen demand (BOD), chemical oxygen demand (COD), and total hardness as $CaCO_3$. The ranges of detected parameters and the corresponding NYCDEP Groundwater System 2005 Water Quality Data ranges are presented below.

Parameter	Site Groundwater (mg/L)	NYCDEP 2005 Groundwater Quality Data
Alkalinity as $CaCO_3$	183 – 459	20.6 – 153
BOD	ND – 542	-
COD	22 – 1,820	-
Hardness as $CaCO_3$	141 – 301	80 – 294

ND – not detected

The NYCDEP data were collected from wells that are much deeper than wells installed at the Site, and therefore may not be directly comparable to on-site groundwater data.

Elevated alkalinity is likely the result of biodegradation of organic contaminants on Site, and may also be the result of on-site releases from soap manufacture. This is further supported by elevated BOD and COD levels.

Fluoride and Coliform Bacteria

Analytical results indicate that groundwater sample MW-10-6 contains a fluoride concentration of 0.38 mg/L. This finding suggests the infiltration of municipal water or sewage from a damaged/misconnected line beneath the western portion of Building 10.

Groundwater samples collected from monitoring wells A-4, E-3 and OS-6 were analyzed for fecal coliform bacteria. The groundwater sample from well A-4 contains coliform bacteria at concentrations of 400 and 5,000 col/100ml. Well A-4 is located in an open parking lot in the vicinity of a drywell. It is likely that surface runoff water containing fecal coliform bacteria collected in the drywell and dispersed to the groundwater in well A-4. No coliform bacteria were detected in the groundwater sample from well E-3; and coliform were detected above the reporting level in well OS-6. This suggests that water infiltrating from a damaged/misconnected water supply pipe beneath the western portion of Building 10 is not municipal sewage.

Forensic Hydrocarbon Fingerprint Analyses

One LNAPL sample was collected from monitoring well E-4 for forensic hydrocarbon fingerprint analyses. Analytical results for hydrocarbon fingerprint indicate that the LNAPL is coal tar creosote laced with kerosene, diesel, and other petroleum compounds. The LNAPL is moderately weathered, as indicated by the relatively low naphthalene concentrations.

Certain diagnostic source and weathering ratios are helpful in determining the type of material being diagnosed. In sample E-4, dibenzofuran/fluorene (D/F) and fluoranthene/pyrene (Fl/Py) ratios are consistent with ratios for creosotes, coal carbonization tars, and coke oven tars, observed in META's in-house library of source materials.

The bimodal n-alkane and alkylcyclohexane distribution suggests that two or more light-middle distillate products, such as kerosene or diesel, may be present. Additionally, the sample contains few high molecular weight PAHs, which are typically found in combustion-derived pyrogenic substances like creosote.

The measured LNAPL specific gravity is 0.9562, marginally below the range of 1.06 to 1.12 for various coal and wood tar creosote (META 2006). The measured interfacial tension (water/product) of 21.2 dynes/cm is within the 3 to 22 dynes/cm range for creosotes (Jackson 2004). Combined, and in conjunction with the petroleum compounds detected in the LNAPL, these data very strongly suggest that the creosote contains petrol impurities that reduce its specific gravity to slightly less than water. Consequently, the variable nature of these impurities and long term creosote use gives rise to the same NAPL that is both lighter and denser than water depending on the specific batch being used at the time. This gives rise to both LNAPL and DNAPL with very similar properties.

Liquid in Voids Beneath Building 2B

During attempted borings in Building 2B, voids filled with liquid were encountered immediately beneath the concrete floor slab. Based on its odor and the historic manufacture of soap in Building 2B, the liquid was suspected to be water with traces of disinfectant or soap. Three samples (T-1, T-2 and T-3) of this liquid were collected and sent to a NYSDOH-certified laboratory to be analyzed for alkalinity, pH and metals (aluminum, boron, calcium, magnesium, potassium and sodium). Results of these samples indicate high bicarbonate alkalinity, but no hydroxide alkalinity. The pH is slightly basic and ranges from 7.7 to 8.5. High bicarbonate alkalinity and basic pH of the samples strengthens the possibility of the liquid being water with traces of disinfectant or soap. Results of these samples are tabulated below.

Parameters	Sample T-1	Sample T-2	Sample T-3
pH	7.74	8.15	8.46
Bicarbonate Alkalinity, mg/L $CaCO_3$	311	2280	1210
Carbonate Alkalinity, mg/L $CaCO_3$	ND	ND	52.2
Hydroxide Alkalinity, mg/L $CaCO_3$	ND	ND	ND
Total Alkalinity, mg/L $CaCO_3$	311	2280	1270
Phenolphthalein Alkalinity, mg/L $CaCO_3$	ND	ND	26.1
Aluminum, mg/L	ND	ND	ND
Boron, mg/L	ND	ND	ND
Calcium, mg/L	206	6.50	1.68
Magnesium, mg/L	5.78	245	2.67
Potassium, mg/L	82.6	769	55.5
Sodium, mg/L	83.4	98.8	501

ND – Not Detected

4.3 Fluid Level Monitoring

FLS monitored fluid levels in 22 monitoring wells located on Areas C, D, E, and F, and on the eastern sidewalk of Orchard Street. The topography of the Site slopes gently to the south, from an elevation of approximately 17.3 ft QD near Jackson Avenue (adjacent to Area C) to approximately 7.3 ft QD near the Long Island Railroad (adjacent to Area F).

Well casing elevations were surveyed by Montrose Surveying Company, LLP of Richmond Hill, New York in August 1998. The survey was performed relative to QD, which is 2.725 feet above the U.S.C.G. Survey Datum (commonly referred to as the Mean Sea Level, Sandy Hook). Well casing elevation is known for wells W-D1, C-5, OS-5, F-1, OS-7D, D-2D, RW-3, RW-1, RW-2, E-2, E-3, OS-6, OS-2, and OS-4.

Fluid levels were measured on five separate occasions, July 5, August 7, 23, and 31, and September 15, 2006. The depth to groundwater was measured from the top of well casing in each well. DNAPL was not detected in any of the monitoring wells. If LNAPL was present in the well, the depth to product and the depth to water were measured. The table below presents a summary of water level and product thickness measured at the Site.

Fluid Level Measurements

Monitoring Well	Depth to Water Table Range[1] (ft)	Product Thickness (ft)	
		LNAPL	DNAPL
	Area C		
C-5	9.55 – 9.98	-	-
C-8D	9.1 – 9.98	-	-
C-8S	9.69 – 9.85	-	-
C-9D	10.72 – 11.16	-	-
C-9S	9.13 – 9.6	-	-
W-D1	9.41 – 9.87	-	-

Monitoring Well	Depth to Water Table Range[1] (ft)	Product Thickness (ft)	
		LNAPL	DNAPL
D-2D	9.8 – 10.3	0.00 – 0.22	-
Area D			
D-4	8.75 – 9.51	-	-
D-5	9.11 – 9.5	-	-
RW-3	7.67 – 8.78	0.14 – 0.28	-
Area E			
E-2	7.65 – 7.94	0.20 – 0.22	-
E-3	7.64 – 8.45	0.10	-
E-4	9.00 – 14.68	1.19 – 6.54	-
RW-1	9.01 – 10.1	1.87 – 2.22	-
RW-2	3.1 – 6.98	0.10 – 0.33	-
Area F			
F-1	2.55 – 3.23	-	-
F-3	2.54 – 3.04	-	-
Eastern Sidewalk of Orchard Street			
OS-2	7.55 – 7.89	-	-
OS-4	3.59 – 4.28	-	-
OS-5	8.2 – 8.68	-	-
OS-6	7.25 – 9.68	-	-
OS-7D	9.53 – 10.47	-	-

[1] Depth to water table was measured from top of individual well casings. The tops of well casing are located 2 to 4 inches below grade, and for discussion purposes considered to be almost at grade.

Across the Site, depth to groundwater fluctuated from approximately 2.5 to 14.7 ft-bg. Depth to groundwater in Area C ranged from 9.1 to 11.16 ft-bg; 7.67 to 9.51 ft-bg in Area D; 3.1 to 10.1 ft-bg in Area E; 2.54 to 3.23 ft-bg in Area F; and 3.59 to 10.47 along the eastern sidewalk of Orchard Street.

Out of 22 monitored wells, seven wells contained free product: D-2D, RW-1, RW-2, RW-3, E-2, E-3, and E-4. The wells are located over a contiguous area that spans the southern portion of Area C, the eastern portion of Area D, and the entire Area E. All other wells were free of product during this investigation. The thickness of product on top of the water column in these wells ranged from 0 to 6.54 ft, with the largest amount of free product noted in well E-4.

The fluctuations in depth to groundwater within individual wells ranged from 0.16 to 0.88 ft in Area C; from 0.39 to 1.11 ft in Area D; from 0.29 to 5.68 ft in Area E; from 0.5 to 0.68 ft in Area F; and from 0.34 to 2.04 ft along the eastern sidewalk of Orchard Street. The table below summarizes the median groundwater fluctuations and the median product fluctuations at the particular locations.

Fluid Level Fluctuations

Location	Median Groundwater Fluctuation (ft), [n=]	Median Product Fluctuation (ft), [n=]
Area C	0.46 [7]	0.3 [1]
Area D	0.76 [3]	1.19 [1]
Area E	1.09 [5]	0.79 [4]
Area F	0.59 [2]	-
Orchard Street	0.69 [5]	-

In all wells with exception of E-4, a decrease in the groundwater table elevation corresponds to a decrease in the LNAPL elevation, while the thickness of the LNAPL layer remains relatively unchanged. The fluctuations in groundwater elevation and product thickness were most pronounced in monitoring well E-4, where water elevation fluctuated from 9.00 to 14.68 ft and the thickness of product varied from 6.54 to 1.19 ft. In this well, it is noted that when the water table drops more LNAPL flows from the soils into the well resulting in a corresponding increase in the LNAPL layer. The fluid behavior observed in well E-4 suggests that there is more recoverable product immediately around monitoring well E-4, compared to the other wells, where product is nearly all residualized and unavailable for recovery.

In order to obtain information about the effects of rainfall on groundwater levels, FLS placed pressure transducers in wells RW-1 (Area E), W-D1 (Area C), and F-1 (Area F) prior to a rain event. Additionally, a barometric pressure transducer was placed in well RW-1, in order to compensate groundwater elevation readings for fluctuations in atmospheric pressure.

Regional hourly precipitation was monitored by the National Oceanic and Atmospheric Administration (NOAA) at LaGuardia International Airport in Queens, New York, located approximately 3 miles northeast of the Site. The rain event was made up of three phases and lasted for a total of approximately 28 hours, resulting in a total rainfall of 0.63 inches during this period.

During the rain event, well RW-1 and the surrounding area were flooded, as they were located at the bottom of a trough in a paved area. The readings of atmospheric pressure were thereby masked by the water in the well. This discussion does not focus on observations in well RW-1, since water in this well was due to surface water infiltration (flooding), and the pressure transducers therefore do not accurately represent fluctuations in groundwater elevation.

Well F-1 was located in an unpaved area on the southwest portion of the Site. In the 13-hour period prior to the rain event, the pressure in well F-1 decreased steadily for an equivalent of 0.3 feet of water. For the subsequent 18 hours, the rainfall was 0.01 inches and the pressure continued to decrease. During the following 10 hours, rainfall was 0.53 inches, and after a steady rise, the groundwater reached a maximum elevation. The time lag in the rise of groundwater elevation in the well is due to the time for the rainwater to percolate to the groundwater.

Well W-D1 was located in a paved area on the northwest portion of the Site. A much gentler rise in the groundwater elevation was observed. Rainwater does not enter the groundwater in the vicinity of the well; instead, rainwater enters the groundwater at points away from the monitoring well and then takes time to raise the groundwater level in the well.

The results of fluid level monitoring suggest that fluctuations in groundwater elevations result in corresponding fluctuations in the LNAPL elevations. The thickness of product on top of groundwater fluctuates widely on the northwest portion of Area E (well E-4), but is effectively static in all other areas. DNAPL was not encountered in any of the monitoring wells. The study shows that LNAPL conditions have long since reached steady state and changes in groundwater elevations have no effect on LNAPL movement. LNAPL recovery is limited to a very small volume, predominantly around monitoring well E-4. The extent of LNAPL is presented in Figure 16.

4.4 Non-Conformance with ARIW

Soil borings attempted in Building 2B (proposed borings 2B-1 and 2B-2) encountered liquid-filled voids immediately beneath the concrete floor slab. No soil was available for sampling in these locations.

Soil boring 4-1, proposed in the basement of Building 4, could not be completed due to flooding of the Building 4 basement. Soil samples were not collected from soil boring C-9 due to refusal in the till layer overlying bedrock.

Groundwater was not encountered at locations 10-7 and D-6 and monitoring wells were not installed at these locations.

5.0 CONCLUSIONS

The following conclusions are based on the findings of the previous investigations plus the recent additional remedial investigation, which focused on LNAPL and DNAPL and the smear zone in Area E and adjacent areas. Upon approval of this RIR by NYSDEC, a Remedial Action Work Plan (RAWP) detailing the remedial actions proposed for this Site will be prepared for submittal to the Department. The headings below follow the objectives on Page 6.

Delineation of LNAPL Plume and Smear Zone

An LNAPL plume occurs in the alleyway by Areas D and E as shown on Figure 15. The LNAPL plume is approximately 95 feet long by approximately 10 to 15 feet wide. A secondary LNAPL spur juts northwestward from the main body into Area D. The main LNAPL body has free product levels in monitoring wells that range from 0 to 0.33 feet thick and a median thickness of 0.2 feet. As shown on Figure 16, the smear zone ranges in thickness from approximately 1 to 4 feet over most of LNAPL area of retention. The smear zone extends above and below the water table. In a much smaller area in wells RW-1 and E-4, free product thickness in monitoring wells typically measures approximately 2+ feet and 5+ feet, respectively. The smear zone between these wells ranges from 3 feet in RW-1 to approximately 14 feet in well E-4, where the LNAPL smear zone appears to merge with the DNAPL smear zone. In the localized area around E-4, the smear zone extends from approximately 5 feet below grade to the top of bedrock at approximately 19 feet below grade. The LNAPL spur is approximately 45 feet long by approximately 5 to 12 feet wide. Free product levels in monitoring wells in the spur range from approximately 0 to 0.2 feet.

The recoverable LNAPL volume in Area D/E and the spur are estimated to be small because of the fine textured soils, the age of the plume, and the source having long since terminated. The LNAPL plume has stabilized and is immobile.

Characterize LNAPL Plume by Short- and Long-Term Fluid Level Monitoring

Fluid level measurements in the three wells near Area E fluctuated approximately 3 feet over the 2.3-month monitoring period and LNAPL product thickness levels in the same monitoring wells fluctuated by 0.25 feet in the same interval. The exception was in well E-4 where groundwater levels fluctuated by more than 5 feet as did the product thickness levels. Product thickness changes appear confined to the wells where free product was observed; fluctuating groundwater levels did not result in product appearing in wells where it was absent, meaning that fluctuating groundwater levels are not causing the LNAPL plume to migrate or to materially increase the volume of recoverable product.

Investigate DNAPL Extent and Occurrence

As shown on Figure 14, DNAPL was observed in soil borings at the northwest corner of the Site (Area C), in borings beneath Areas D and in borings beneath Area E. Most of the DNAPL occurs as thin, discreet lenses approximately 0.5 to 1 feet thick that coincide with low permeability strata and or the bedrock surface. Above the bedrock surface, DNAPL migration historically was controlled by low permeability strata, where it flowed to the northwest. At depth, DNAPL migration appears controlled predominately by the bedrock topography. All borings where DNAPL was observed have DNAPL at or just above the till/bedrock surface. In general, DNAPL tapers out with increasing distance from Area E.

With the source of DNAPL long since terminated, DNAPL is now the form of a residual that is effectively immobile. DNAPL was absent from all monitoring wells during the entire fluid level monitoring period, substantiating this conclusion.

Further Characterize Soil and Groundwater Contamination

Groundwater

Groundwater is heavily impacted by the contaminants found on site. The predominant VOCs are benzene, toluene, ethylbenzene, and xylenes (collectively BTEX). The predominant SVOCs are naphthalene, 2-methylnaphthalene, and phenol and its isomers, the methylphenol compounds. Benzene exceeded the TOGS GA AWQS in six of the eight wells sampled (six deep and two shallow) at concentrations ranging from 9 ug/l to 4,100 ug/L (standard 1 ug/L). Benzene remained undetected in two shallow wells. The same pattern holds for toluene, 63 ug/L to 4,420 ug/L (standard 5 ug/L); ethylbenzene, 46 ug/L to 448 ug/L (standard 5 ug/L); and xylenes, 115 ug/L to 2,090 ug/L (standard 5 ug/L). Naphthalene in the two shallow wells measured 4 ug/L and 25 ug/L (TOGS GA AWQS 10 ug/L). Naphthalene in the deeper wells ranged from 390 ug/L to 8,490 ug/L; phenolic compounds ranged from non-detect to 23,000 ug/L.

The concentrations of VOCs and SVOCs were from two to four orders of magnitude greater in the deeper wells than the shallow wells as a result of being associated with the creosote-related DNAPL found at depth.

Chlorinated solvents generally occurred sporadically in much lower concentrations, but elevated concentrations of methylene chloride occurred in the northern part of Area D and in Area C deep wells at concentrations ranging from 737 ug/L to 10,700 ug/L. Chlorinated compounds represent a sporadic, secondary source of contamination.

Soil

The most recent soil samples were collected either over tight silty clay layers or near the top of bedrock. As with groundwater, the predominant VOCs are benzene, toluene, ethylbenzene, xylenes, and also styrene in the case of soils. The principal SVOCs are naphthalene, 2-methylnaphthalene, phenol and its isomers, and PAHs. The combination of compounds indicates creosote as the principal source of contamination and the results for BTEX, naphthalene, 2-methylnaphthalene, and the other PAH compounds exceed the TAGM RSCOs in the area encompassed by Area C, Area D, Area E, and Building 10. Creosote contamination in the form of DNAPL appears most pronounced near the top of bedrock except in borings E-4 (Area E) and D-5 (Area D) where creosote impacts occurred in soils above the bedrock interface.

Creosote impacts were greatly reduced in borings 1-3 (Building 1) and F-3 (a.k.a. F-4, Area F) and BTEX compounds in samples from these borings were all below TAGM RSCOs.

SVOCs in the sample from boring F-3 (a.k.a. F-4) were all below TAGM RSCOs and in boring 1-3 most SVOC and PAH compounds were below the TAGM RSCOs.

Scattered locations throughout the Site, “Hot Spots,” have concentrations of VOCs, SVOCs, and metals exceeding the TAGM RSCO at various depth intervals. Figure 19 shows Hot Spot soil areas throughout the Site.

Soil Gas

A soil vapor study identified VOCs in the sub-slab air beneath all Site buildings and in indoor air within the buildings. Major VOCs detected were the BTEX and chlorinated compounds. All concentrations except one were within the NYSDOH air study ranges. Indoor air was most impacted by BTEX compounds and MEK in Buildings 2A, 3B, 5, 6 and 10. The compounds correspond to areas that are most impacted by creosote spills and with USTs, primarily in Areas C, D and E.

USTs

There are fuel oil USTs remaining on Site in Building 10. In addition, there remain concrete subsurface structures that contain an unknown quantity of fluid with soap and/or disinfectant residue in Building 2B, and subsurface kettles that contain unknown liquid in Building 3A.

6.0 REFERENCES

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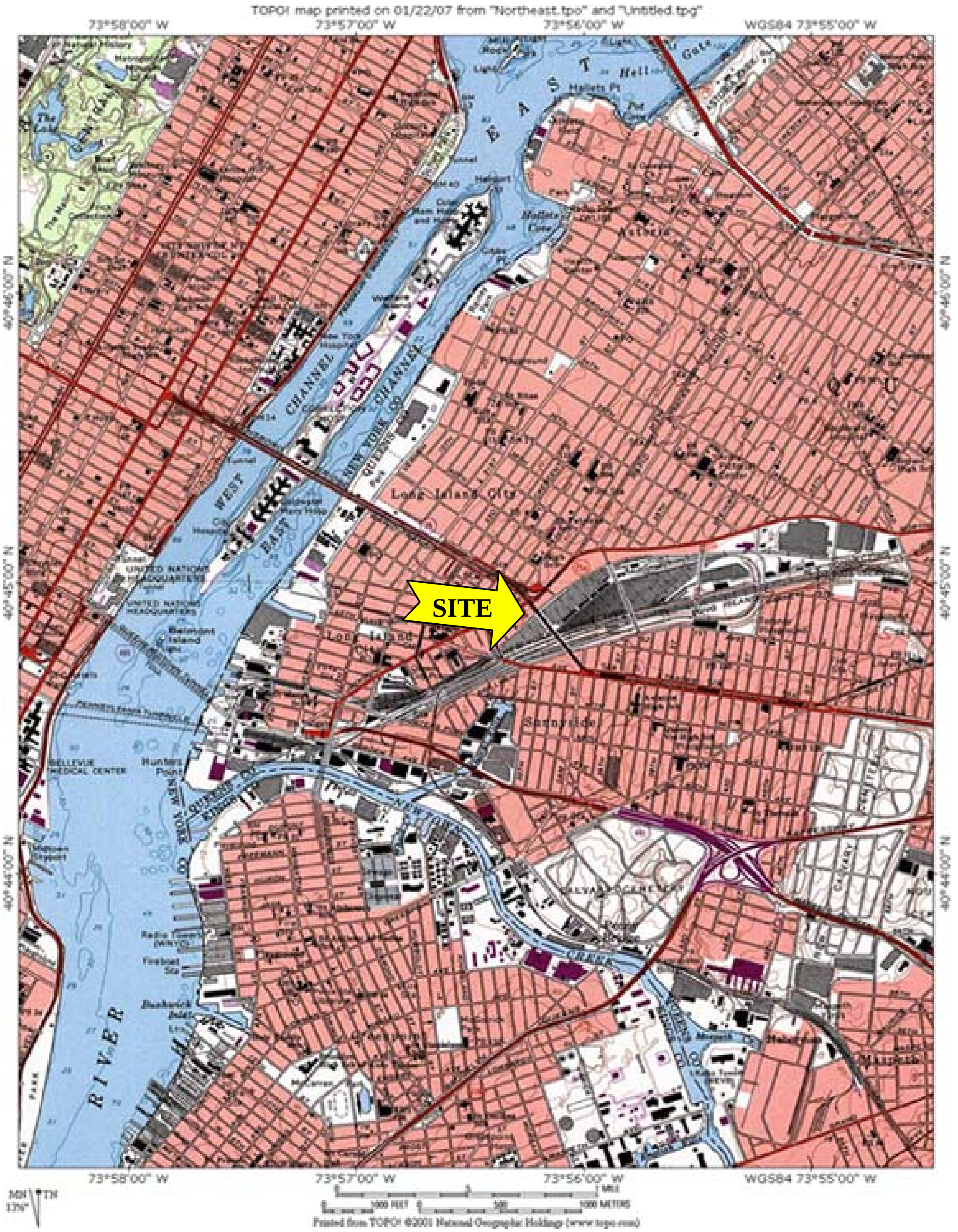
FIGURES



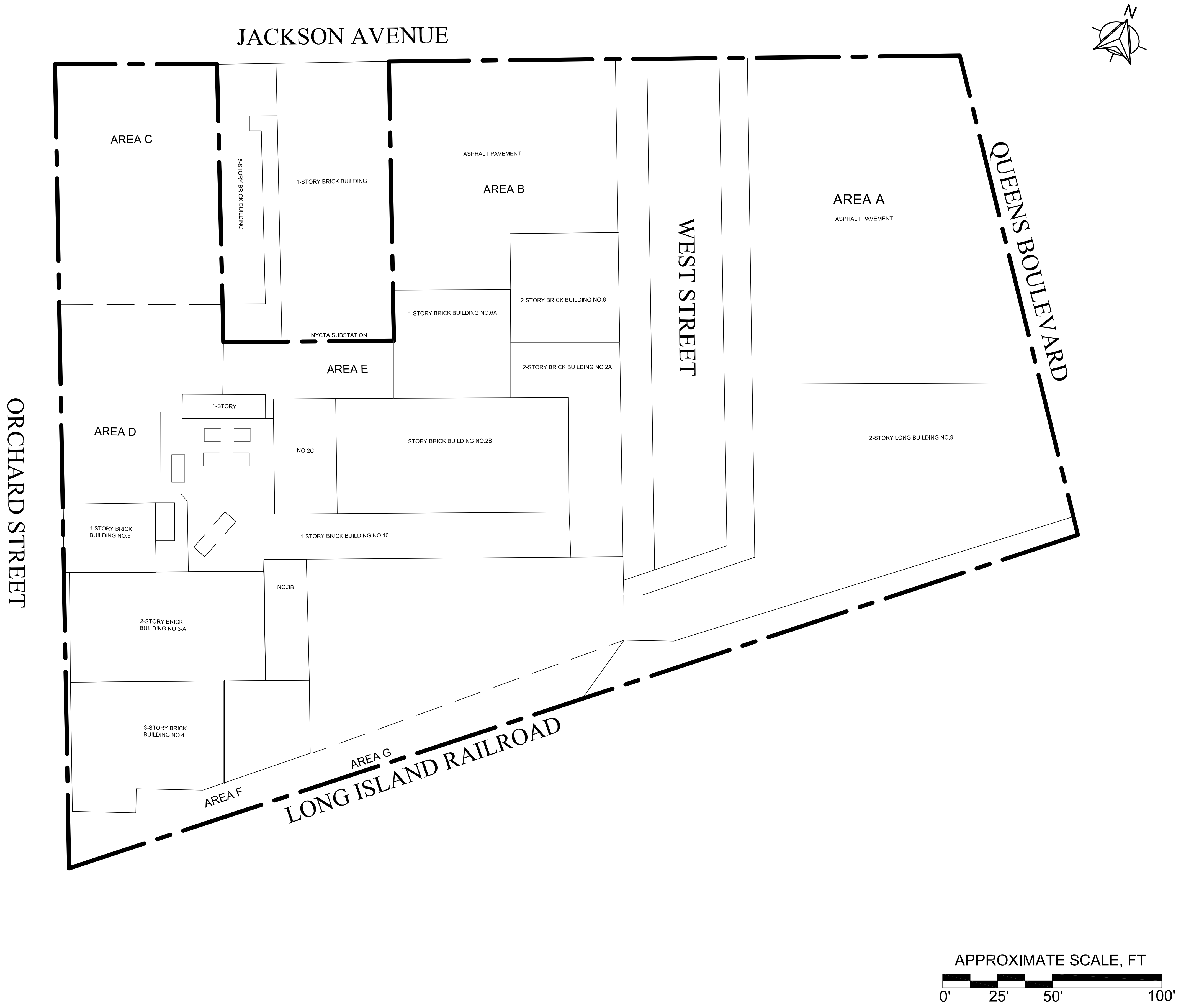
40074-G1 Weehawken, NJ NY Quadrant 7.5 Minute Topographic Map, published by the USGS, and obtained from TOPO! ©2001

Fleming Lee Shue

FIGURE 1: SITE LOCATION MAP

SITE: Outlet City, 41- 16 West St.
Long Island City, NY 11101
CLIENT: Outlet City, Inc.

Environmental Management & Consulting, 158 West 29th St., 9th Fl., New York, NY 10001



Fleming Lee Shue

Environmental Management & Consulting

158 West 29th Street, 9th Fl.
New York, NY 10001

OUTLET CITY
LONG ISLAND CITY, NY

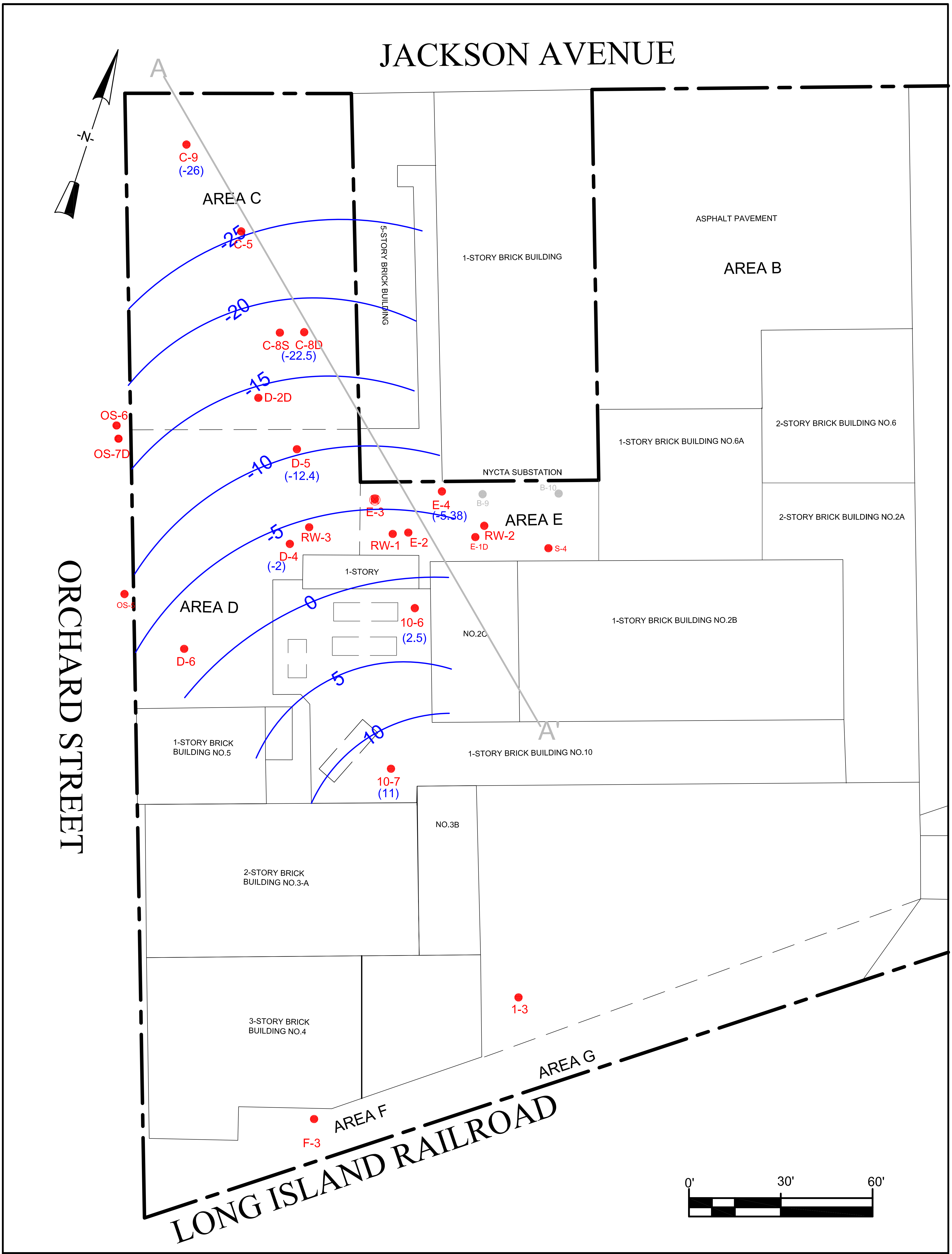
FIGURE 2

SITE PLAN

Date
March 2007

Project Number
10038-003

LEGEND



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Project Number
10038-003

OUTLET CITY
Long Island City, NY

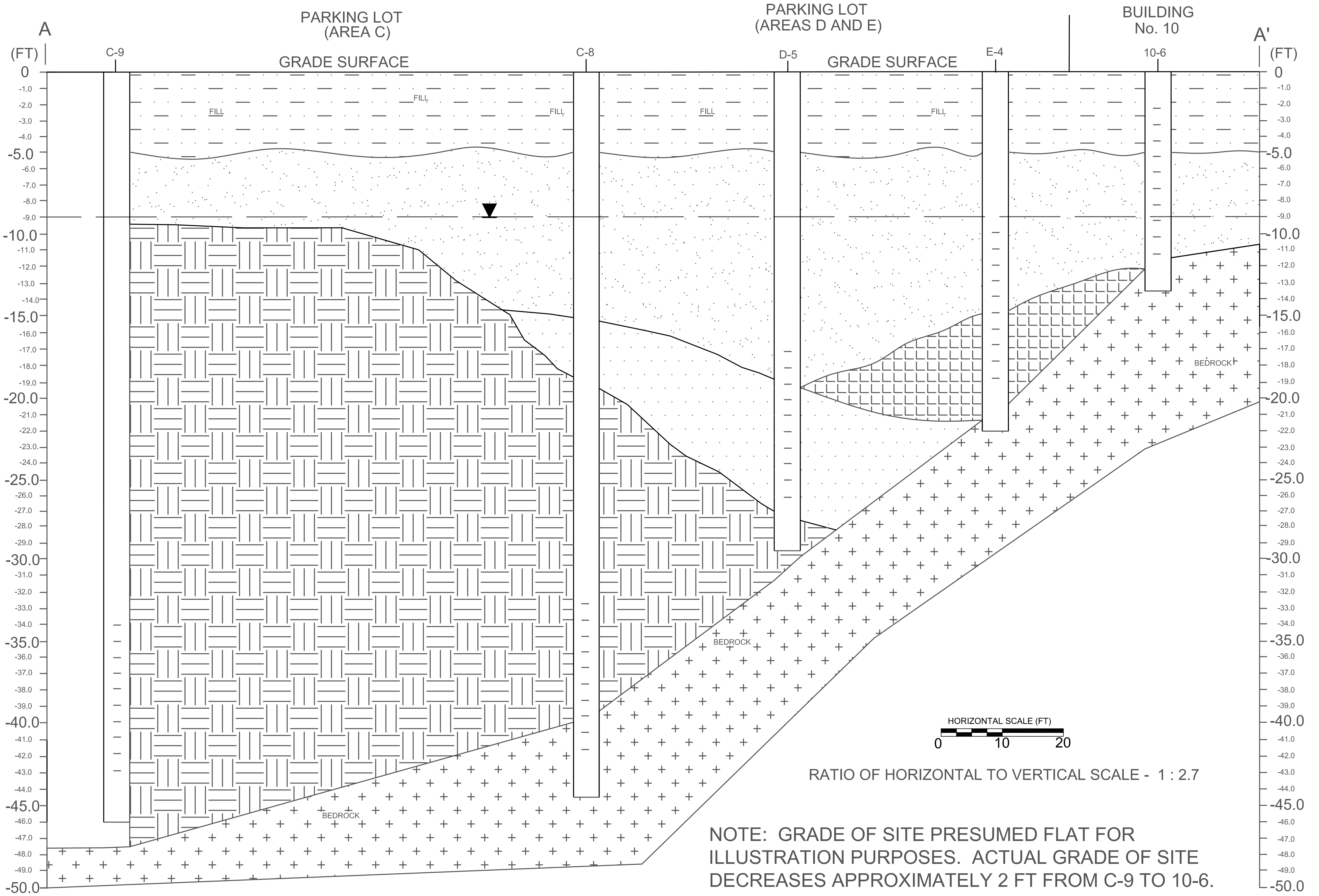
Date
March 2007

FIGURE 3

BEDROCK ELEVATION CONTOUR MAP

LEGEND

● 10-7	Soil Sampling and Monitoring well location
(11)	Bedrock elevation in feet (Queens Borough Datum)
—-10—	Bedrock elevation contour



RATIO OF HORIZONTAL TO VERTICAL SCALE - 1 : 2.7

NOTE: GRADE OF SITE PRESUMED FLAT FOR ILLUSTRATION PURPOSES. ACTUAL GRADE OF SITE DECREASES APPROXIMATELY 2 FT FROM C-9 TO 10-6.

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FIGURE 4

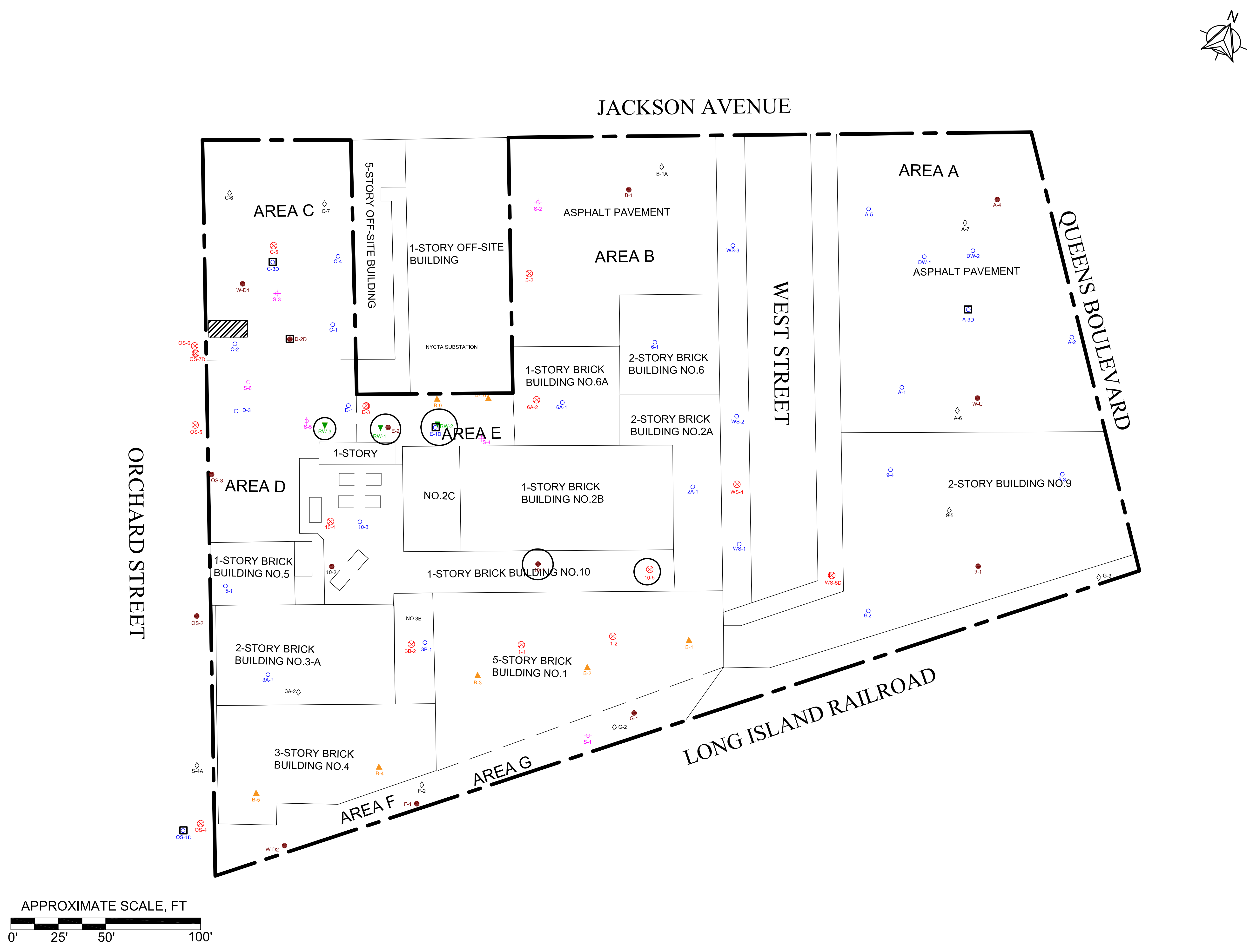
BEDROCK PROFILE CROSS-SECTION A-A'

Date
March 2007

Project Number
10038-003

LEGEND

▭	Fill, ash, cinders, wood, concrete fragments, fine to medium sand with some silt and gravel
⠿	Dense SAND, Silty Sand with trace clay
▭	Depth to groundwater
▦	Gray Silty CLAY with trace Sand
▥	Dense glacial TILL, fine to medium Sand with Gravel
+	Bedrock
⠿	Fine to medium SAND with some Gravel and trace silt



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Long Island City, New York

FIGURE 5

SOIL AND GROUNDWATER SAMPLING LOCATIONS (PREVIOUS INVESTIGATIONS)

Scale as Noted

Production Date
March 2007

Project Number
10038-000

LEGEND

▭	Site Boundary
▨	Gasoline USTs (Removed)
⊏ ⊐	Fuel Oil USTs
○	Floating Free Product
⊗	ELM SB/MW 2001 - Shallow
⊠	ELM SB/MW 2001 - Deep
◊	ELM SB 2001
□	Bedrock Borings
⌖	AKRF SB 1988
○	AKRF SB 1990
▲	AKRF SB 1998
▼	Recovery Well
●	Monitoring Well

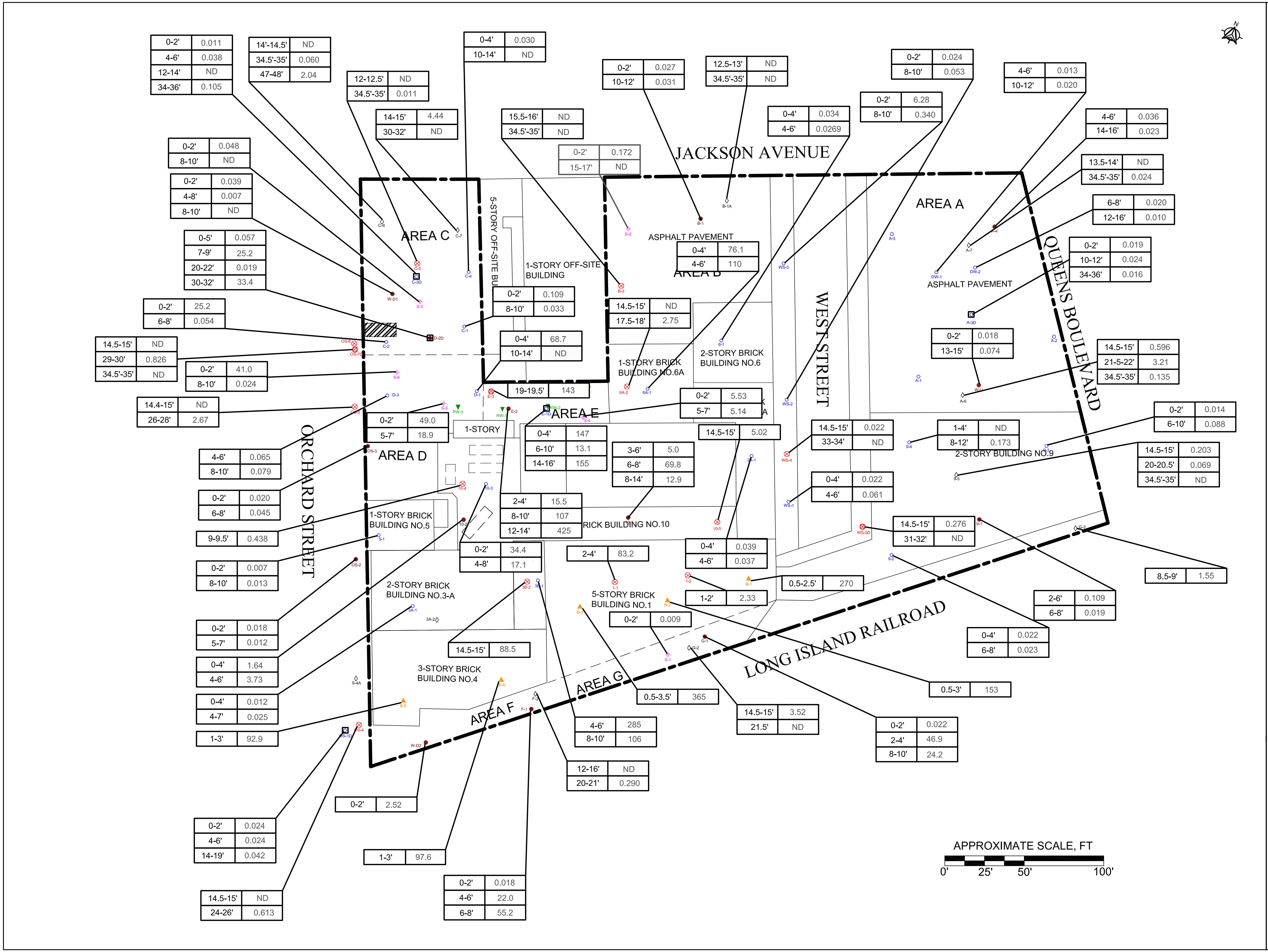

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FIGURE 6

Outlet City

Long Island City, New York

TOTAL VOCs IN SOIL (PREVOUS INVESTIGATIONS)

Scale as Noted

Production Date
March 2007

Project Number
10038-000

LEGEND

- ▭ Site Boundary
- ▨ Gasoline USTs (Removed)
- ⊏⊐ Fuel Oil USTs
- ⊗ ELM SB/MW 2001 - Shallow
- ⊗ ELM SB/MW 2001 - Deep
- ◊ ELM SB 2001
- □ Bedrock Borings
- ⌖ AKRF SB 1988
- ○ AKRF SB 1990
- ▲ AKRF SB 1998
- ▼ Recovery Well
- ● Monitoring Well
- 3.08 Total VOCs (ppm)

Sample Depth
0-2' 0.009 Total VOC concentration (ppm)

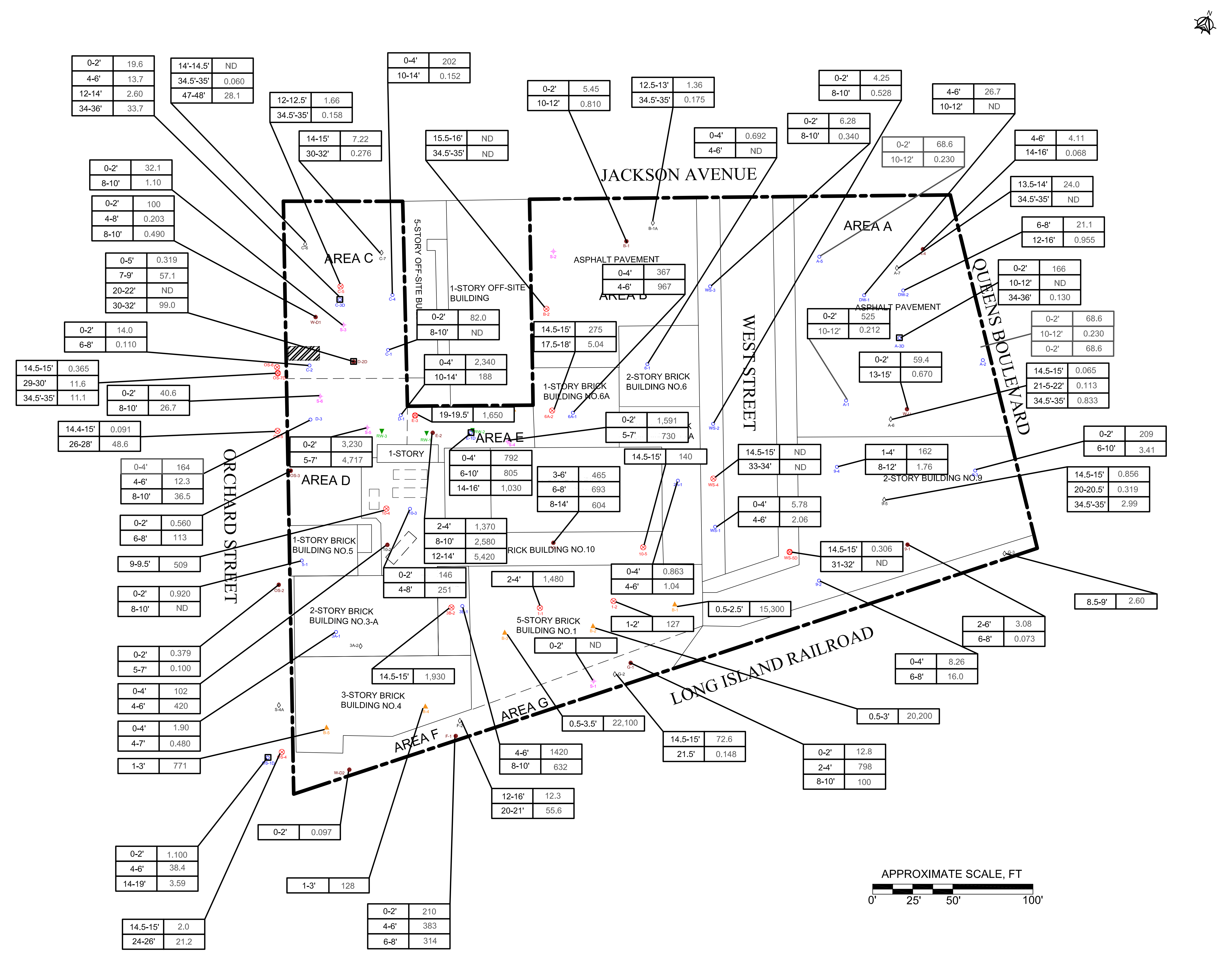

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FIGURE 7

Outlet City

Long Island City, New York

TOTAL SVOCs IN SOIL (PREVIOUS INVESTIGATIONS)

Scale as Noted

Production Date
March 2007

Project Number
10038-000

LEGEND

▭	Site Boundary
▨	Gasoline USTs (Removed)
⊏ ⊐	Fuel Oil USTs
⊗	ELM SB/MW 2001 - Shallow
⊗	ELM SB/MW 2001 - Deep
◇	ELM SB 2001
□	Bedrock Borings
✛	AKRF SB 1988
○	AKRF SB 1990
▲	AKRF SB 1998
▼	Recovery Well
●	Monitoring Well
3.08	Total SVOCs (ppm)

Sample Depth
0-2' 0.009
Total SVOC concentration (ppm)

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OUTLET CITY
Long Island City, New York

FIGURE 8

TOTAL VOC AND SVOC CONCENTRATIONS IN GROUNDWATER (PREVIOUS INVESTIGATIONS)

Scale as Noted

Production Date
March 2007

Project Number
10038-000

LEGEND

▭	Site Boundary
▨	Gasoline USTs (Removed)
▭	Fuel Oil USTs
○	Free Floating Product
⊗	ELM SB/MW 2001 - Shallow
⊠	ELM SB/MW 2001 - Deep
◇	ELM SB 2001
□	Bedrock Borings
⌖	AKRF SB 1988
○	AKRF SB 1990
▲	AKRF SB 1998
▼	Recovery Well
●	Monitoring Well

F-1
6.48 | 32.5

Monitoring Well Number
Total SVOC Concentration (mg/L)
Total VOC Concentration (mg/L)

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OUTLET CITY
LONG ISLAND CITY, NY

FIGURE 9

ADDITIONAL INVESTIGATION SOIL AND GROUNDWATER SAMPLING LOCATIONS

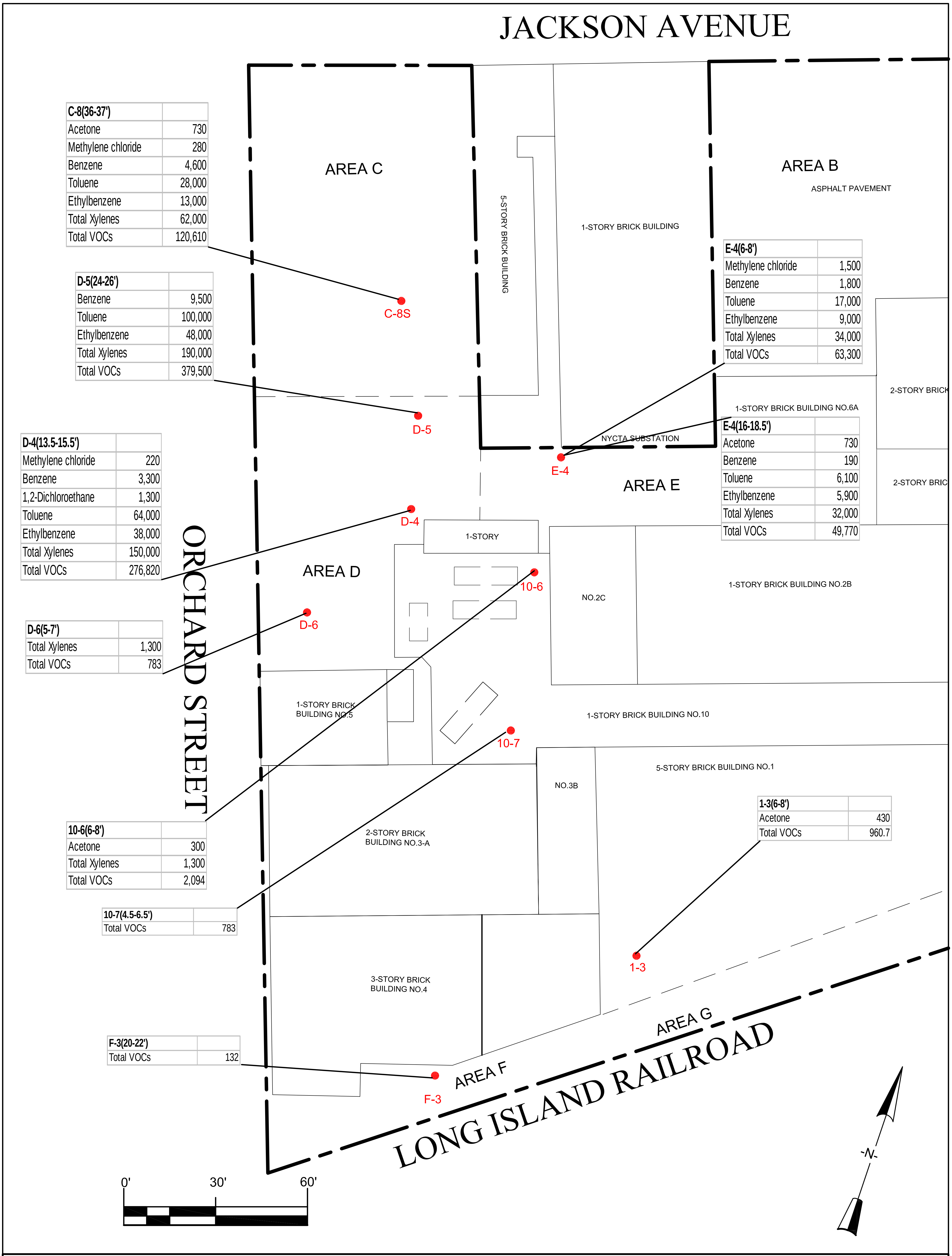
Date
March 2007

Project Number
10038-003

LEGEND

● Soil Sampling and Monitoring well location

Note: Only C-8S and C-9S are strictly for groundwater monitoring. All others are for soil sampling and groundwater monitoring.



C-8(36-37')	
Acetone	730
Methylene chloride	280
Benzene	4,600
Toluene	28,000
Ethylbenzene	13,000
Total Xylenes	62,000
Total VOCs	120,610

D-5(24-26')	
Benzene	9,500
Toluene	100,000
Ethylbenzene	48,000
Total Xylenes	190,000
Total VOCs	379,500

E-4(6-8')	
Methylene chloride	1,500
Benzene	1,800
Toluene	17,000
Ethylbenzene	9,000
Total Xylenes	34,000
Total VOCs	63,300

D-4(13.5-15.5')	
Methylene chloride	220
Benzene	3,300
1,2-Dichloroethane	1,300
Toluene	64,000
Ethylbenzene	38,000
Total Xylenes	150,000
Total VOCs	276,820

E-4(16-18.5')	
Acetone	730
Benzene	190
Toluene	6,100
Ethylbenzene	5,900
Total Xylenes	32,000
Total VOCs	49,770

D-6(5-7')	
Total Xylenes	1,300
Total VOCs	783

1-3(6-8')	
Acetone	430
Total VOCs	960.7

10-6(6-8')	
Acetone	300
Total Xylenes	1,300
Total VOCs	2,094

10-7(4.5-6.5')	
Total VOCs	783

F-3(20-22')	
Total VOCs	132

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FIGURE 10

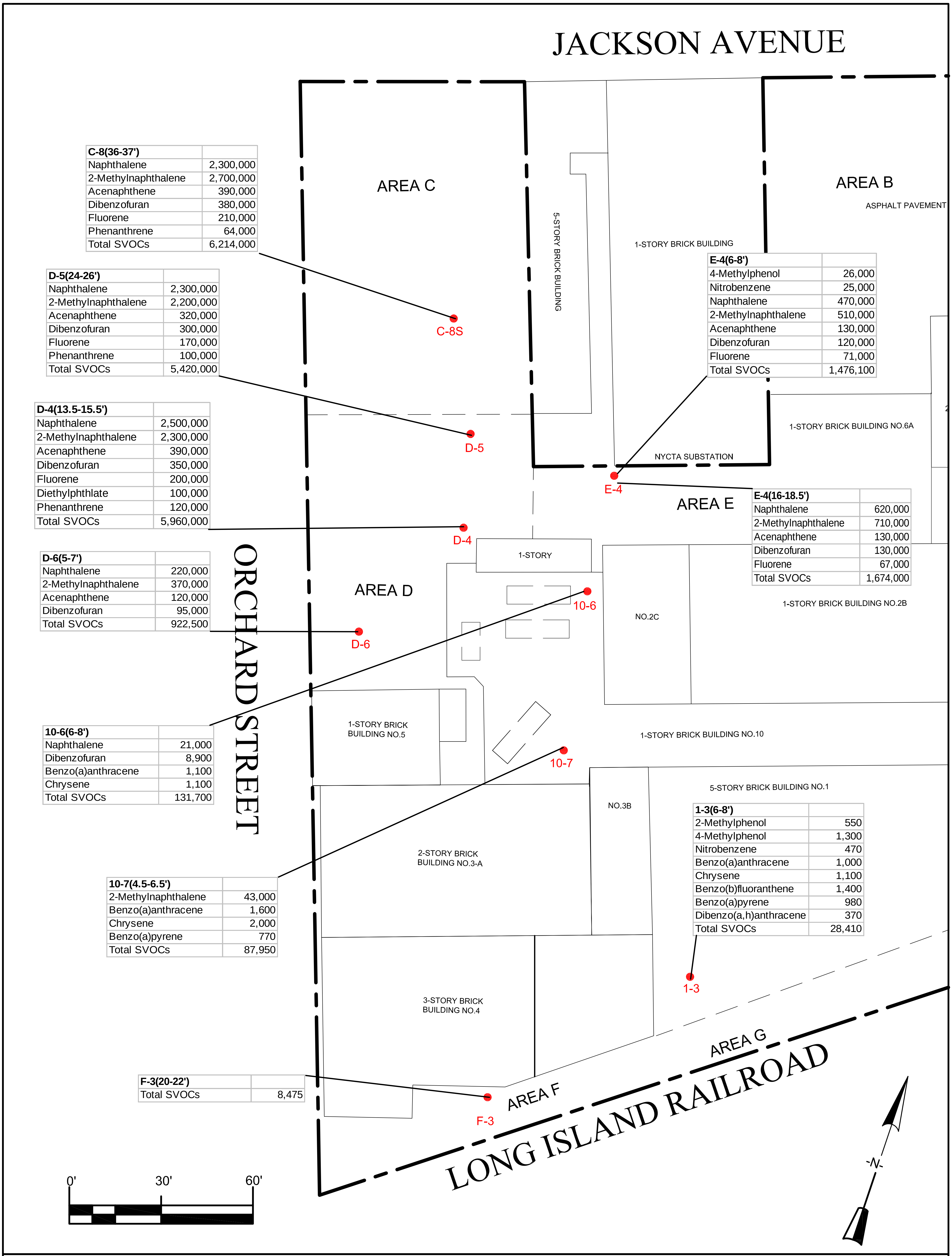
VOCS DETECTED IN SOIL, ug/kg

LEGEND

● Soil Sample and Monitoring Well Location

Samples collected on May 1, 2, and 11, 2006

Note: F-3 reported as F-4 in data tables



C-8(36-37')	
Naphthalene	2,300,000
2-Methylnaphthalene	2,700,000
Acenaphthene	390,000
Dibenzofuran	380,000
Fluorene	210,000
Phenanthrene	64,000
Total SVOCs	6,214,000

D-5(24-26')	
Naphthalene	2,300,000
2-Methylnaphthalene	2,200,000
Acenaphthene	320,000
Dibenzofuran	300,000
Fluorene	170,000
Phenanthrene	100,000
Total SVOCs	5,420,000

D-4(13.5-15.5')	
Naphthalene	2,500,000
2-Methylnaphthalene	2,300,000
Acenaphthene	390,000
Dibenzofuran	350,000
Fluorene	200,000
Diethylphthlate	100,000
Phenanthrene	120,000
Total SVOCs	5,960,000

D-6(5-7')	
Naphthalene	220,000
2-Methylnaphthalene	370,000
Acenaphthene	120,000
Dibenzofuran	95,000
Total SVOCs	922,500

10-6(6-8')	
Naphthalene	21,000
Dibenzofuran	8,900
Benzo(a)anthracene	1,100
Chrysene	1,100
Total SVOCs	131,700

10-7(4.5-6.5')	
2-Methylnaphthalene	43,000
Benzo(a)anthracene	1,600
Chrysene	2,000
Benzo(a)pyrene	770
Total SVOCs	87,950

F-3(20-22')	
Total SVOCs	8,475

E-4(6-8')	
4-Methylphenol	26,000
Nitrobenzene	25,000
Naphthalene	470,000
2-Methylnaphthalene	510,000
Acenaphthene	130,000
Dibenzofuran	120,000
Fluorene	71,000
Total SVOCs	1,476,100

E-4(16-18.5')	
Naphthalene	620,000
2-Methylnaphthalene	710,000
Acenaphthene	130,000
Dibenzofuran	130,000
Fluorene	67,000
Total SVOCs	1,674,000

1-3(6-8')	
2-Methylphenol	550
4-Methylphenol	1,300
Nitrobenzene	470
Benzo(a)anthracene	1,000
Chrysene	1,100
Benzo(b)fluoranthene	1,400
Benzo(a)pyrene	980
Dibenzo(a,h)anthracene	370
Total SVOCs	28,410

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Long Island City, NY

Date
March 2007

FIGURE 11

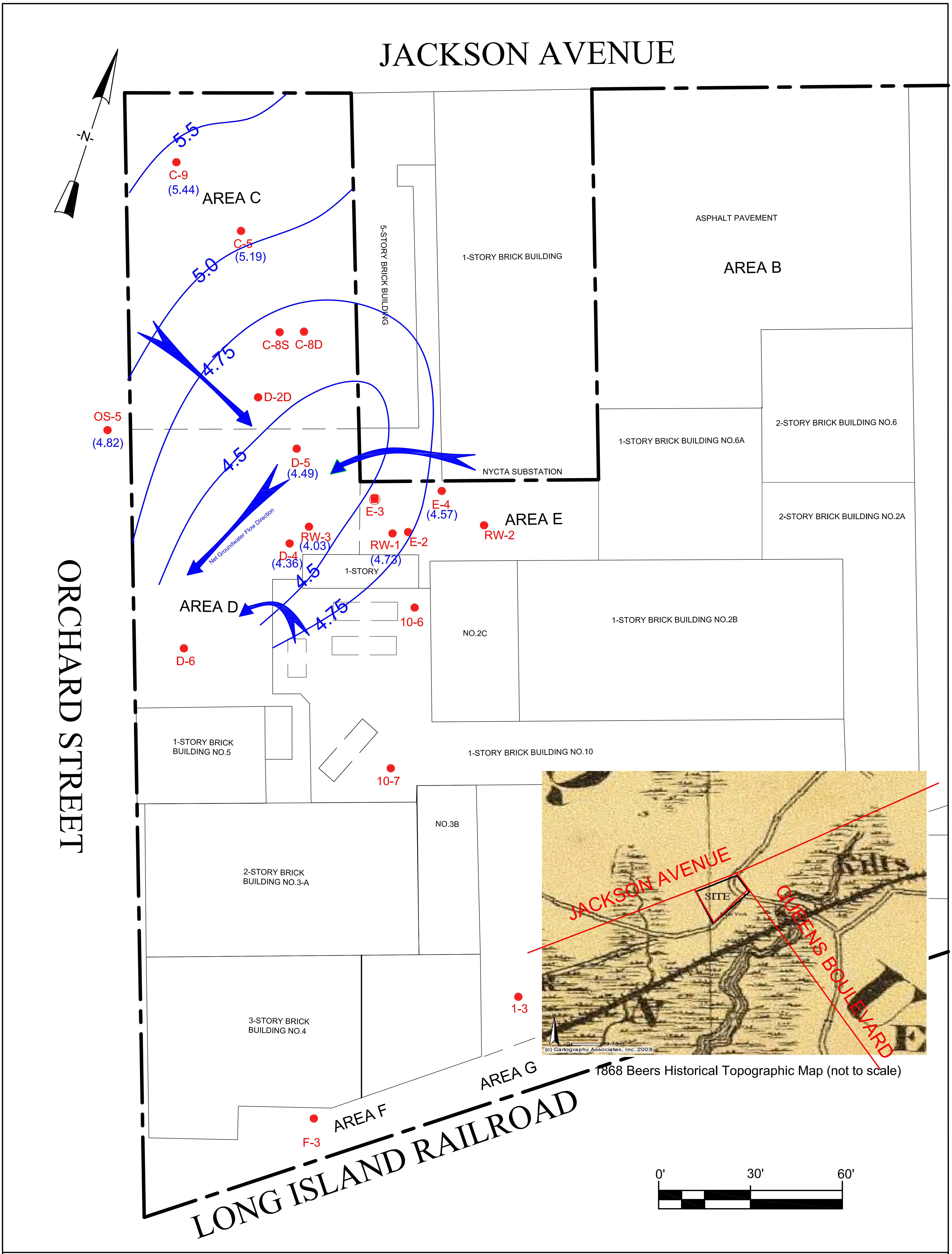
SVOCS DETECTED IN SOIL, ug/kg

LEGEND

● Soil Sample and Monitoring Well Location

Samples collected on May 1, 2, and 11, 2006

Note: F-3 reported as F-4 in data tables



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Date
March 2007

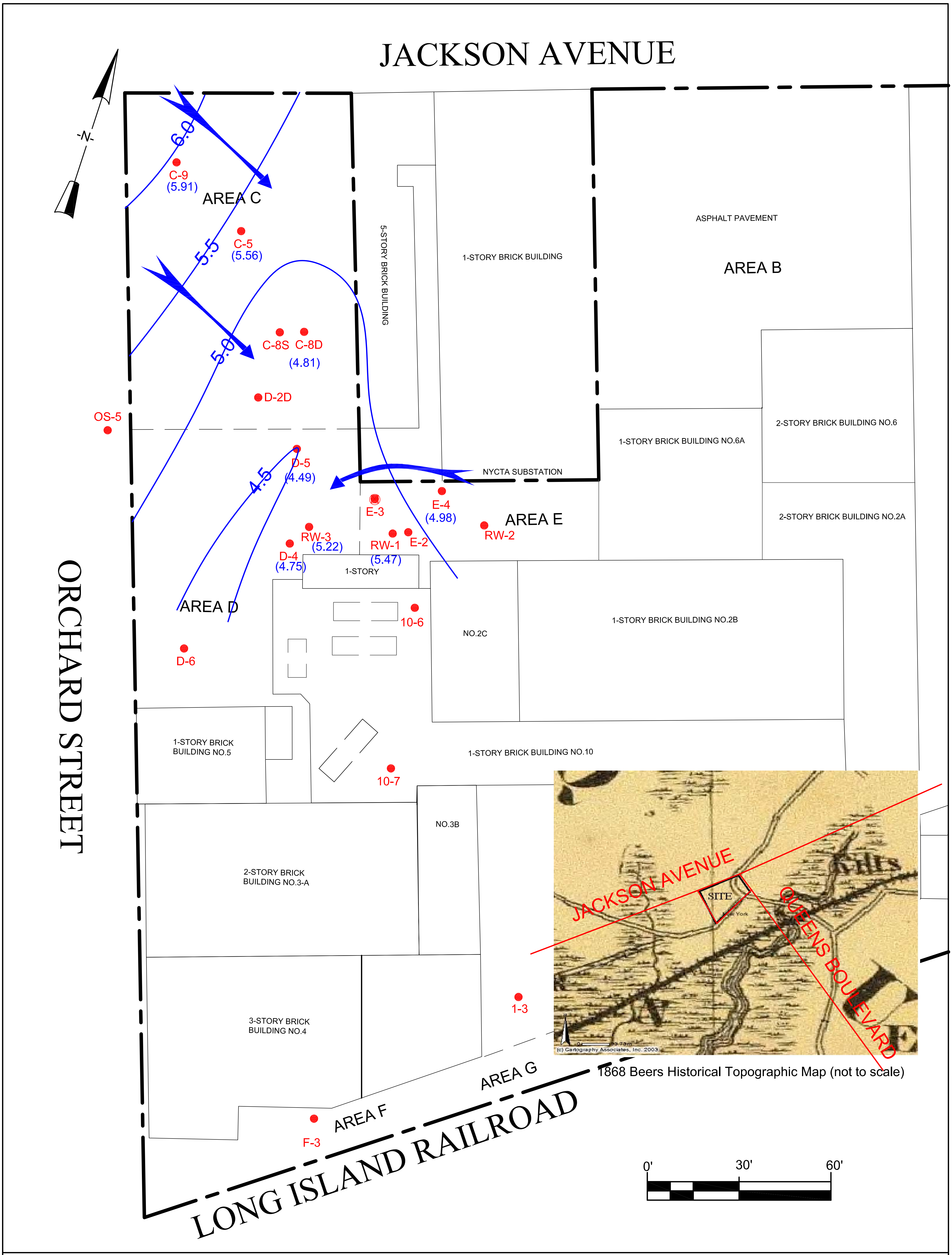
FIGURE 12

GROUNDWATER ELEVATION CONTOUR MAP

August 7, 2006 Measurements

LEGEND

● 10-7	Soil Sampling and Monitoring well location
(11)	Groundwater elevation in feet (Queens Borough Datum)
—-10—	Groundwater elevation contour
➔	Groundwater flow direction



1868 Beers Historical Topographic Map (not to scale)

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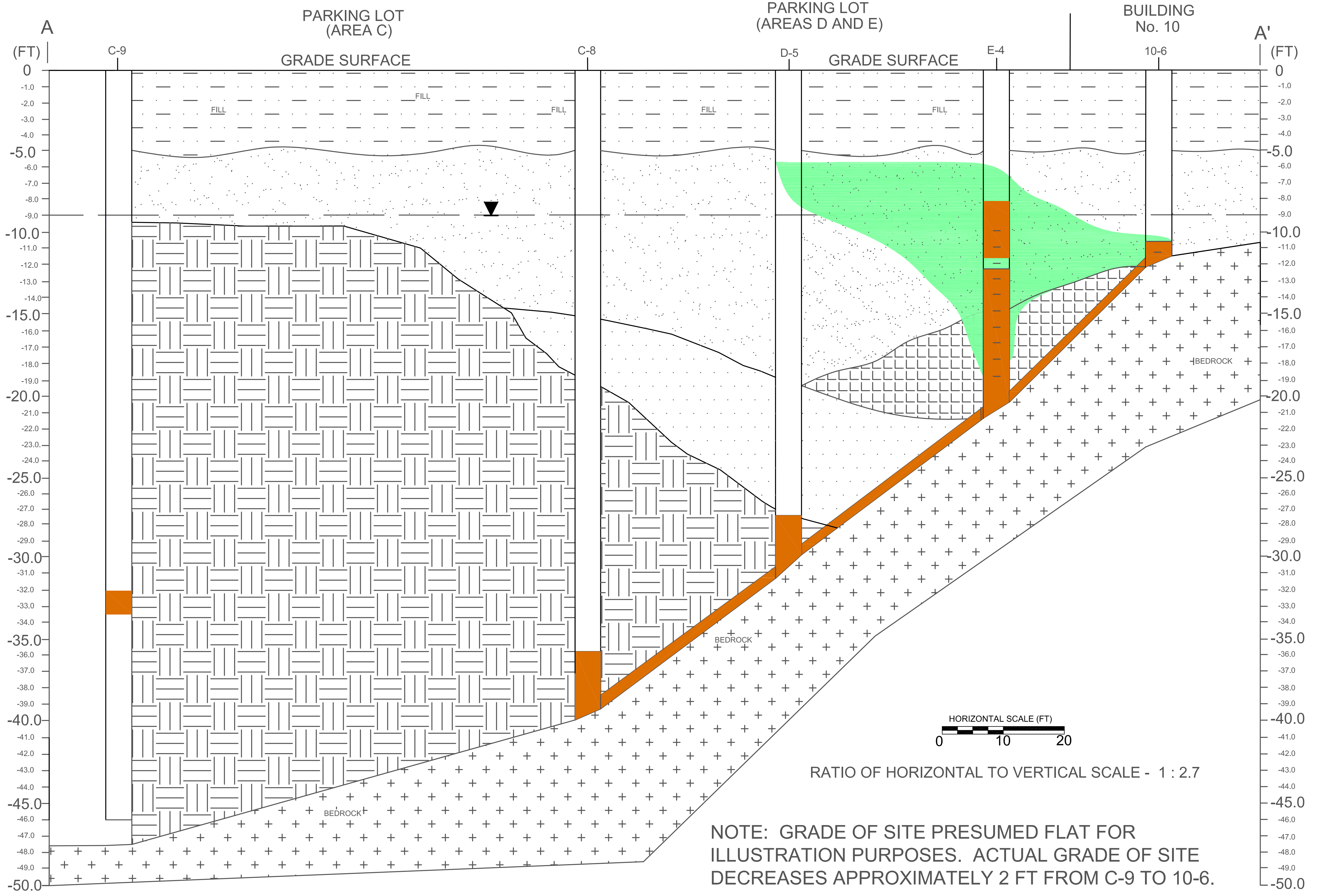
FIGURE 13

GROUNDWATER ELEVATION CONTOUR MAP

September 15,2006 Measurements

LEGEND

● 10-7	Soil Sampling and Monitoring well location
(11)	Groundwater elevation in feet (Queens Borough Datum)
—-10—	Groundwater elevation contour
➔	Groundwater flow direction



RATIO OF HORIZONTAL TO VERTICAL SCALE - 1 : 2.7

NOTE: GRADE OF SITE PRESUMED FLAT FOR ILLUSTRATION PURPOSES. ACTUAL GRADE OF SITE DECREASES APPROXIMATELY 2 FT FROM C-9 TO 10-6.

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FIGURE 14

EXTENT OF NAPL CROSS-SECTION A-A'

Date
March 2007

Project Number
10038-003

LEGEND

- ▭ Fill, ash, cinders, wood, concrete fragments, fine to medium sand with some silt and gravel
- ⬚ Dense SAND, Silty Sand with trace clay
- ▭ Depth to groundwater
- ▦ Gray Silty CLAY with trace Sand
- ▤ Dense glacial TILL, fine to medium Sand with Gravel
- + Bedrock
- ⬚ Fine to medium SAND with some Gravel and trace silt
- 🟧 DNAPL, Creosote
- 🟩 Smear Zone

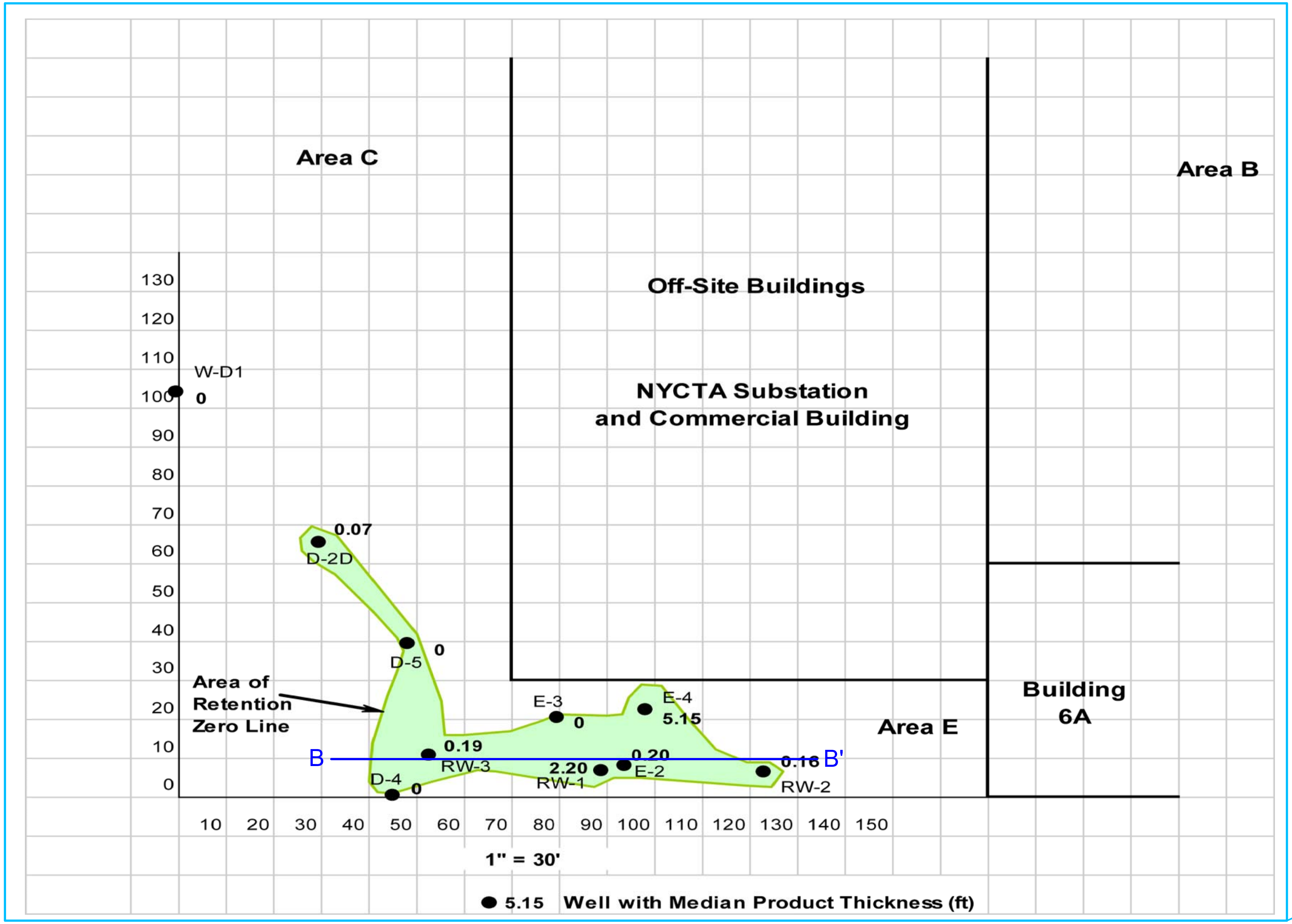

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FIGURE 15

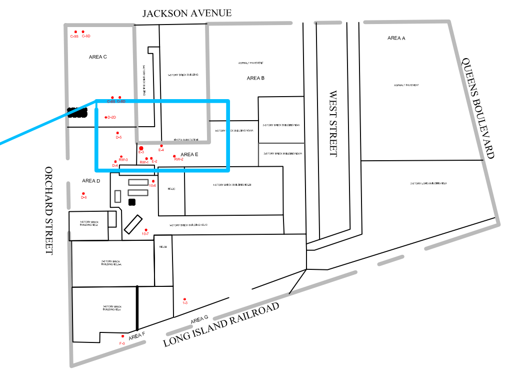
EXTENT OF MEASURABLE LNAPL IN WELLS

Date
March 2007

Project Number
10038-003

LEGEND

Area of Interest



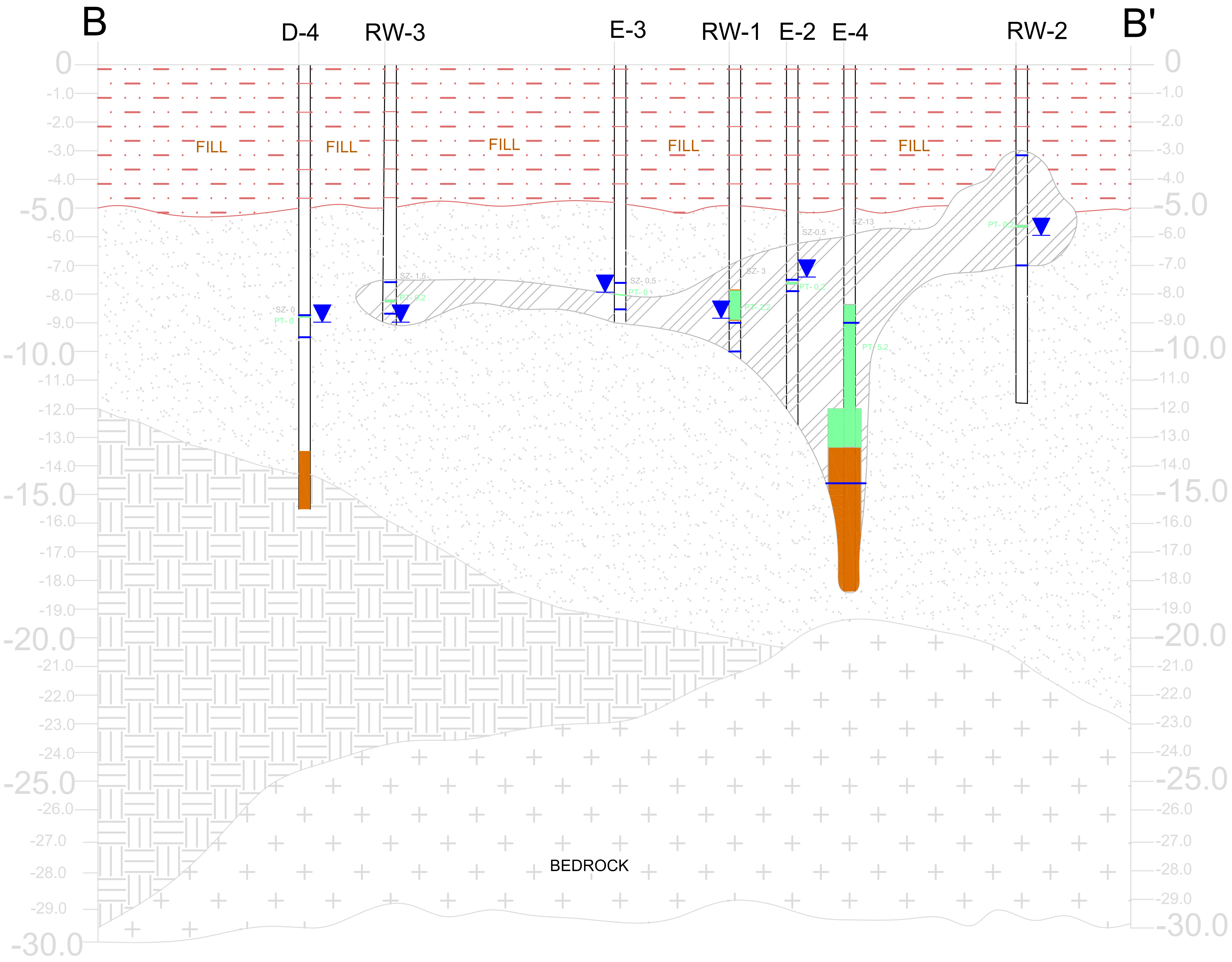


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FIGURE 16

EXTENT OF NAPL CROSS-SECTION B - B'

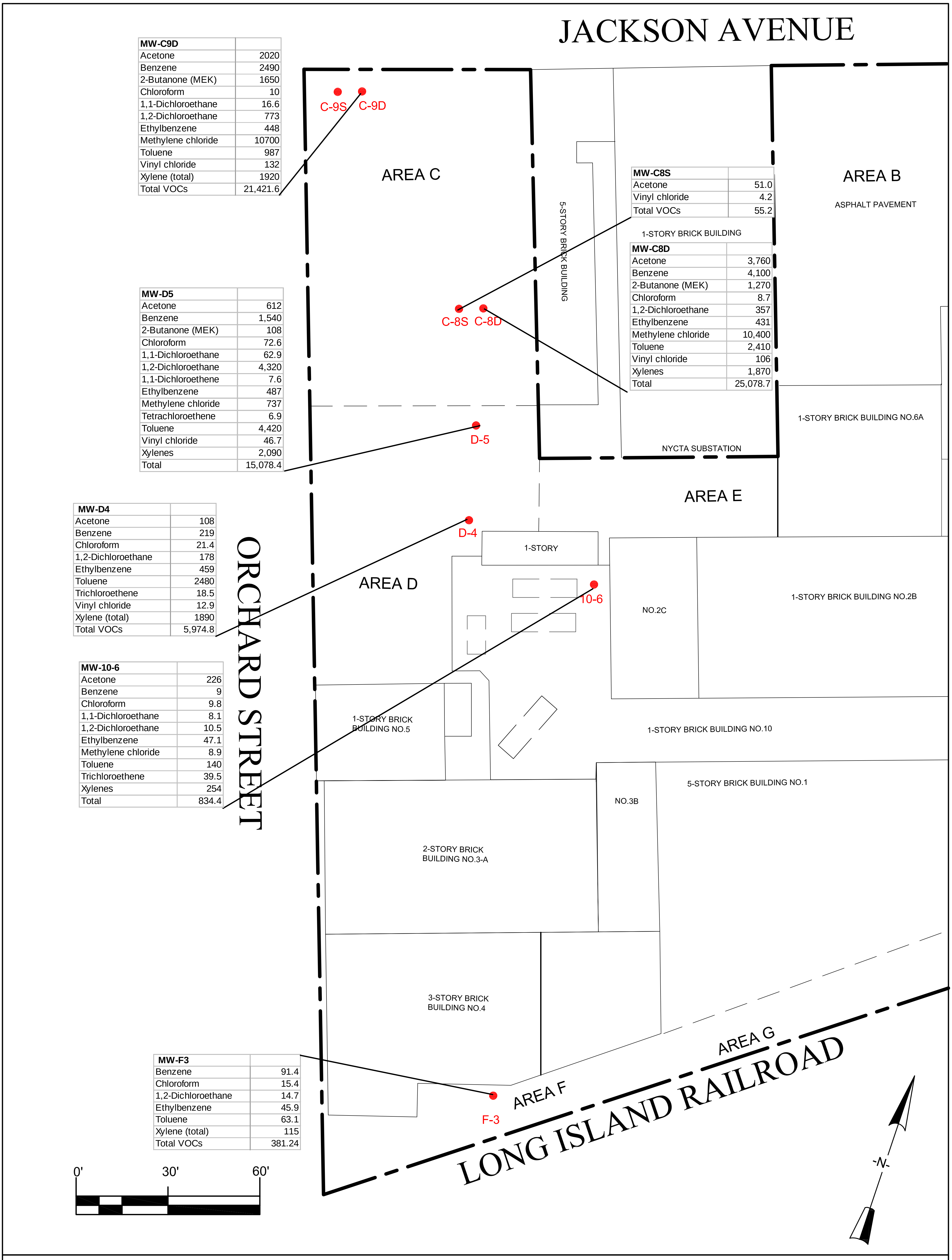
Date
March 2007

Project Number
10038-003

LEGEND

🟩	LNAPL
PT- 5.2	Product thickness , LNAPL Median Value
▨	Smear Zone, rounded up to nearest 0.5 ft.
SZ-0.5	Smear Zone Thickness , ft.
🟧	DNAPL (in soil)
▤	Fill, Ash, cinder wood, concrete fragments, fine to medium sand with some silt and gravel
▒	Dense SAND, Silty Sand with Trace Clay
▦	Dense glacial TILL, fine to medium Sand with Gravel
▩	Bedrock
▼	Depth to Water
—	Groundwater Table Elevation (range)

*Measurements between July 5,2006 & Sept 15,2006



MW-C9D	
Acetone	2020
Benzene	2490
2-Butanone (MEK)	1650
Chloroform	10
1,1-Dichloroethane	16.6
1,2-Dichloroethane	773
Ethylbenzene	448
Methylene chloride	10700
Toluene	987
Vinyl chloride	132
Xylene (total)	1920
Total VOCs	21,421.6

MW-C8S	
Acetone	51.0
Vinyl chloride	4.2
Total VOCs	55.2

MW-C8D	
Acetone	3,760
Benzene	4,100
2-Butanone (MEK)	1,270
Chloroform	8.7
1,2-Dichloroethane	357
Ethylbenzene	431
Methylene chloride	10,400
Toluene	2,410
Vinyl chloride	106
Xylenes	1,870
Total	25,078.7

MW-D5	
Acetone	612
Benzene	1,540
2-Butanone (MEK)	108
Chloroform	72.6
1,1-Dichloroethane	62.9
1,2-Dichloroethane	4,320
1,1-Dichloroethene	7.6
Ethylbenzene	487
Methylene chloride	737
Tetrachloroethene	6.9
Toluene	4,420
Vinyl chloride	46.7
Xylenes	2,090
Total	15,078.4

MW-D4	
Acetone	108
Benzene	219
Chloroform	21.4
1,2-Dichloroethane	178
Ethylbenzene	459
Toluene	2480
Trichloroethene	18.5
Vinyl chloride	12.9
Xylene (total)	1890
Total VOCs	5,974.8

MW-10-6	
Acetone	226
Benzene	9
Chloroform	9.8
1,1-Dichloroethane	8.1
1,2-Dichloroethane	10.5
Ethylbenzene	47.1
Methylene chloride	8.9
Toluene	140
Trichloroethene	39.5
Xylenes	254
Total	834.4

MW-F3	
Benzene	91.4
Chloroform	15.4
1,2-Dichloroethane	14.7
Ethylbenzene	45.9
Toluene	63.1
Xylene (total)	115
Total VOCs	381.24

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FIGURE 17

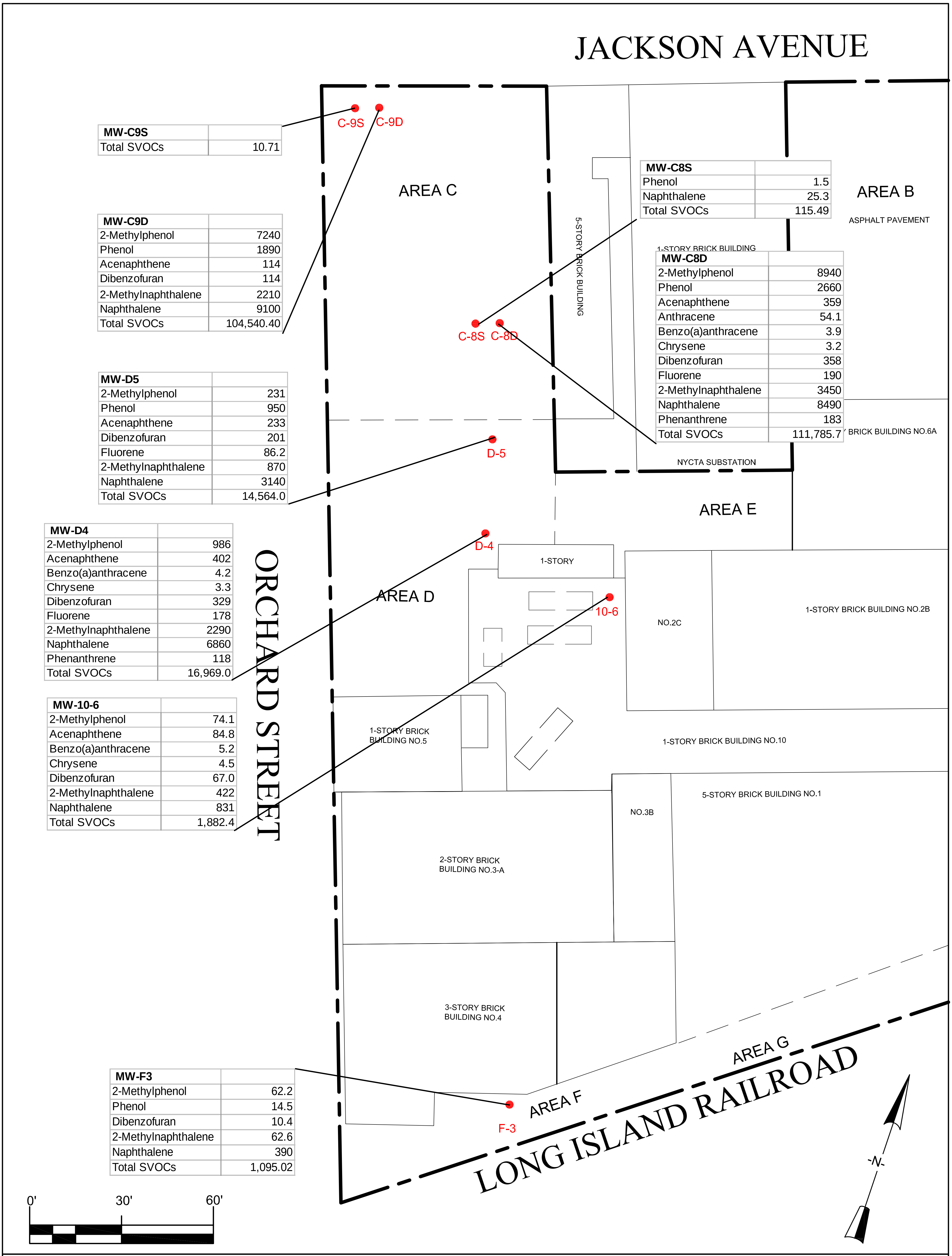
VOCS DETECTED IN GROUNDWATER, ug/l

LEGEND

● Soil Sample and Monitoring Well Location

Samples collected on June 22 and 23, 2006

Note: F-3 reported as F-4 in data tables



MW-C9S	
Total SVOCs	10.71

MW-C9D	
2-Methylphenol	7240
Phenol	1890
Acenaphthene	114
Dibenzofuran	114
2-Methylnaphthalene	2210
Naphthalene	9100
Total SVOCs	104,540.40

MW-C8S	
Phenol	1.5
Naphthalene	25.3
Total SVOCs	115.49

MW-C8D	
2-Methylphenol	8940
Phenol	2660
Acenaphthene	359
Anthracene	54.1
Benzo(a)anthracene	3.9
Chrysene	3.2
Dibenzofuran	358
Fluorene	190
2-Methylnaphthalene	3450
Naphthalene	8490
Phenanthrene	183
Total SVOCs	111,785.7

MW-D5	
2-Methylphenol	231
Phenol	950
Acenaphthene	233
Dibenzofuran	201
Fluorene	86.2
2-Methylnaphthalene	870
Naphthalene	3140
Total SVOCs	14,564.0

MW-D4	
2-Methylphenol	986
Acenaphthene	402
Benzo(a)anthracene	4.2
Chrysene	3.3
Dibenzofuran	329
Fluorene	178
2-Methylnaphthalene	2290
Naphthalene	6860
Phenanthrene	118
Total SVOCs	16,969.0

MW-10-6	
2-Methylphenol	74.1
Acenaphthene	84.8
Benzo(a)anthracene	5.2
Chrysene	4.5
Dibenzofuran	67.0
2-Methylnaphthalene	422
Naphthalene	831
Total SVOCs	1,882.4

MW-F3	
2-Methylphenol	62.2
Phenol	14.5
Dibenzofuran	10.4
2-Methylnaphthalene	62.6
Naphthalene	390
Total SVOCs	1,095.02

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Date
March 2007

FIGURE 18

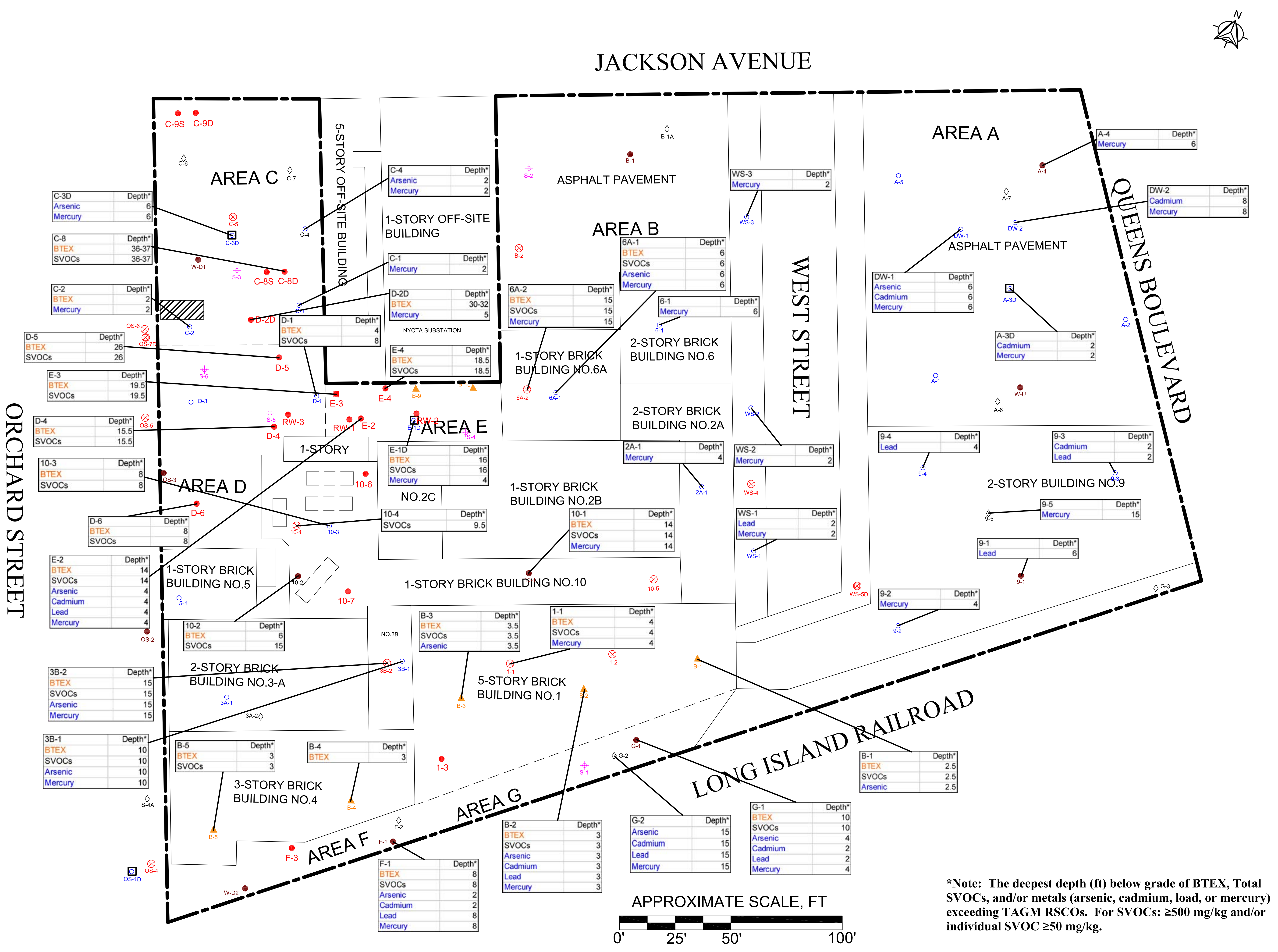
SVOCS DETECTED IN GROUNDWATER, ug/l

LEGEND

● Soil Sample and Monitoring Well Location

Samples collected on June 22 and 23, 2006

Note: F-3 reported as F-4 in data tables



C-3D	Depth*
Arsenic	6
Mercury	6

C-8	Depth*
BTEX	36-37
SVOCs	36-37

C-2	Depth*
BTEX	2
Mercury	2

D-5	Depth*
BTEX	26
SVOCs	26

E-3	Depth*
BTEX	19.5
SVOCs	19.5

D-4	Depth*
BTEX	15.5
SVOCs	15.5

10-3	Depth*
BTEX	8
SVOCs	8

D-6	Depth*
BTEX	8
SVOCs	8

E-2	Depth*
BTEX	14
SVOCs	14
Arsenic	4
Cadmium	4
Lead	4
Mercury	4

3B-2	Depth*
BTEX	15
SVOCs	15
Arsenic	15
Mercury	15

3B-1	Depth*
BTEX	10
SVOCs	10
Arsenic	10
Mercury	10

10-2	Depth*
BTEX	6
SVOCs	15

B-5	Depth*
BTEX	3
SVOCs	3

B-4	Depth*
BTEX	3

F-1	Depth*
BTEX	8
SVOCs	8
Arsenic	2
Cadmium	2
Lead	8
Mercury	8

C-4	Depth*
Arsenic	2
Mercury	2

C-1	Depth*
Mercury	2

D-2D	Depth*
BTEX	30-32
Mercury	5

D-1	Depth*
BTEX	4
SVOCs	8

E-4	Depth*
BTEX	18.5
SVOCs	18.5

E-1D	Depth*
BTEX	16
SVOCs	16
Mercury	4

10-4	Depth*
SVOCs	9.5

B-3	Depth*
BTEX	3.5
SVOCs	3.5
Arsenic	3.5

1-1	Depth*
BTEX	4
SVOCs	4
Mercury	4

B-2	Depth*
BTEX	3
SVOCs	3
Arsenic	3
Cadmium	3
Lead	3
Mercury	3

6A-2	Depth*
BTEX	15
SVOCs	15
Mercury	15

6A-1	Depth*
BTEX	6
SVOCs	6
Arsenic	6
Mercury	6

6-1	Depth*
Mercury	6

2A-1	Depth*
Mercury	4

10-1	Depth*
BTEX	14
SVOCs	14
Mercury	14

WS-3	Depth*
Mercury	2

WS-2	Depth*
Mercury	2

WS-1	Depth*
Lead	2
Mercury	2

G-2	Depth*
Arsenic	15
Cadmium	15
Lead	15
Mercury	15

G-1	Depth*
BTEX	10
SVOCs	10
Arsenic	4
Cadmium	2
Lead	2
Mercury	4

B-1	Depth*
BTEX	2.5
SVOCs	2.5
Arsenic	2.5

A-4	Depth*
Mercury	6

DW-2	Depth*
Cadmium	8
Mercury	8

DW-1	Depth*
Arsenic	6
Cadmium	6
Mercury	6

A-3D	Depth*
Cadmium	2
Mercury	2

9-4	Depth*
Lead	4

9-3	Depth*
Cadmium	2
Lead	2

9-5	Depth*
Mercury	15

9-1	Depth*
Lead	6

9-2	Depth*
Mercury	4

*Note: The deepest depth (ft) below grade of BTEX, Total SVOCs, and/or metals (arsenic, cadmium, load, or mercury) exceeding TAGM RSCOs. For SVOCs: ≥500 mg/kg and/or individual SVOC ≥50 mg/kg.

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Environmental Management & Consulting
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New York, NY 10001

FIGURE 19

Outlet City
Long Island City, New York

BTEX, SVOCs, AND METALS IN SOIL EXCEEDING TAGM RSCOs

Scale as Noted

Production Date
March 2007

Project Number
10038-000

LEGEND

▭	Site Boundary
▨	Gasoline USTs (Removed)
⊏ ⊐	Fuel Oil USTs
⊗	ELM SB/MW 2001 - Shallow
⊠	ELM SB/MW 2001 - Deep
◊	ELM SB 2001
□	Bedrock Borings
⌖	AKRF SB 1988
○	AKRF SB 1990
▲	AKRF SB 1998
▼	Recovery Well
●	Monitoring Well
●	FLS SB/MW 2006

TABLES

Table 1
Monitoring Well Construction Detail
Outlet City
42-16 West Street
Long Island City, NY
VCP No. V00081-2

Well	Installation Date	Installed by	Total Depth (ftbg)	Well Material	Diameter (in)	Bottom Sump Interval (ftbg)	Screen Interval (ftbg)	Solid Riser Interval (ftbg)	Bentonite Seal Interval (ftbg)	Grout Interval (ftbg)	Type
MW-C8D	6/12/2006	FLS	44.5	PVC	2	42-44	32-42	0-32	28-30	0.5-28	FM
MW-C8S	6/13/2006	FLS	20	PVC	2	17.5-19.5	7.5-17.5	0-7.5	3.5-5.5	0.5-3.5	FM
MW-C9D	6/13/2006	FLS	46	PVC	2	43.5-45.5	33.5-43.5	0-33.5	29.5-31.5	0.5-29.5	FM
MW-C9S	6/14/2006	FLS	20	PVC	2	17.5-19.5	7.5-17.5	0-7.5	3.5-5.5	0.5-3.5	FM
MW-D5	6/15/2006	FLS	29.5	PVC	2	27-29	17-27	0-17	13-15	0.5-13	FM
MW-E4	6/15/2006	FLS	22	PVC	2	19.5-21.5	9.5-19.5	0-9.5	5.5-7.5	0.5-5.5	FM
MW-D4	6/16/2006	FLS	25	PVC	2	22.5-24.5	12.5-22.5	0-12.5	8.5-10.5	0.5-8.5	FM
MW-F3	6/16/2006	FLS	24	PVC	2	21.5-23.5	11.5-21.5	0-11.5	7.5-9.5	0.5-7.5	FM
MW-10-6	6/19/2006	FLS	13.5	PVC	2	11-13	1-11	0-1	0.75-1	0.5-0.75	FM

ftbg - feet below grade
FM - Flush-mount Casing

Table 2
VOCs in Soil
Outlet City
42-16 West Street
Long Island City, NY
VCP No. V00081-2
Results in ug/kg

Sample ID	**TAGM 4046**	**1-3(6-8')**	**10-6(6-8')**	**10-7(4.5-6.5')**	**D-6(5-7')**	**D-5(24-26')**	**D-4(13.5-15.5')**	**C-8(36-37')**	**E-4(6-8')**	**E-4(16-18.5')**	**F-3(20-22')**
Laboratory ID	**Recommended**	**212787-001**	**212787-006**	**212787-003**	**212787-002**	**212871-002**	**212787-005**	**212871-001**	**212871-003**	**212871-004**	**212787-004**
Sample Collection Date	**Soil Cleanup**	**5/2/2006**	**5/1/2006**	**5/1/2006**	**5/1/2006**	**5/11/2006**	**5/2/2006**	**5/11/2006**	**5/11/2006**	**5/11/2006**	**5/2/2006**
Sample Depth (ftbg)	**Objective (RSCO)**	**6-8**	**6-8**	**4.5-6.5**	**5-7**	**24-26**	**13.5-15.5**	**36-37**	**6-8**	**16-18.5**	**20-22**
Chloromethane	-	7.9 U	59 U	56 U	61 U	570 U	250 U	220 U	590 U	220 U	5.1 U
Vinyl chloride	200	7.6 U	95 U	89 U	98 U	910 U	400 U	350 U	940 U	350 U	4.9 U
Bromomethane	-	7.2 U	140 U	130 U	150 U	1,400 U	590 U	530 U	1,400 U	530 U	4.6 U
Chloroethane	1,900	16.0 U	95 U	89 U	98 U	910 U	400 U	350 U	940 U	350 U	11 U
1,1-Dichloroethene	400	9.5 U	83 U	78 U	85 U	790 U	350 U	310 U	820 U	310 U	6.2 U
Carbon disulfide	2,700	7.7 J	110 U	100 U	110 U	1,000 U	450 U	390 U	1,100 U	400 U	3.4 U
Acetone	200	**430.0**	**300** J	160 U	170 U	1,600 UB	690 U	**730** JB	1,600 UB	**730** JB	73 J
Methylene chloride	100	77.0 JB	94 J	63 J	78 J	450 UB	**220** J	**280** JB	**1,500** JB	180 UB	32 JB
trans-1,2-Dichloroethene	300	5.1 U	59 U	56 U	61 U	570 U	250 U	220 U	590 U	220 U	3.3 U
1,1-Dichloroethane	200	7.1 U	71 U	67 U	73 U	680 U	300 U	260 U	700 U	270 U	4.6 U
cis-1,2-Dichloroethene	-	9.1 U	71 U	67 U	73 U	680 U	300 U	260 U	700 U	270 U	5.9 U
2-Butanone (MEK)	300	16.0 U	140 U	130 U	150 U	1,400 U	590 U	530 U	1,400 U	530 U	10 U
Chloroform	300	4.6 U	83 U	78 U	85 U	790 U	350 U	310 U	820 U	310 U	3 U
1,1,1-Trichloroethane	800	7.3 U	47 U	45 U	49 U	450 U	200 U	180 U	470 U	180 U	4.7 U
Carbon tetrachloride	600	6.8 U	120 U	110 U	120 U	1,100 U	500 U	440 U	1,200 U	440 U	4.4 U
Benzene	60	54.0	47 U	45 U	49 U	**9,500**	**3,300**	**4,600**	**1,800** J	**190** J	4.9 U
1,2-Dichloroethane	100	8.6 U	71 U	67 U	73 U	680 U	**1,300** J	260 U	700 U	270 U	5.6 U
Trichloroethene	700	5.9 U	83 U	78 U	85 U	790 U	350 U	310 U	820 U	350 J	3.8 U
1,2-Dichloropropane	-	9.2 U	110 U	100 U	110 U	1,000 U	450 U	390 U	1,100 U	400 U	6 U
Bromodichloromethane	-	7.3 U	47 U	45 U	49 U	450 U	200 U	180 U	470 U	180 U	4.7 U
cis-1,3-Dichloropropene	-	6.8 U	59 U	56 U	61 U	570 U	250 U	220 U	590 U	220 U	4.4 U
4-Methyl-2-Pentanone (MIBK)	1,000	10.0 U	83 U	78 U	85 U	790 U	350 U	310 U	820 U	310 U	6.7 U
Toluene	1,500	10.0 J	36 U	33 U	130 J	**100,000**	**64,000**	**28,000**	**17,000**	**6,100**	4.7 U
trans-1,3-Dichloropropene	-	8.0 U	36 U	33 U	37 U	340 U	150 U	130 U	350 U	130 U	5.2 U
1,1,2-Trichloroethane	-	9.1 U	71 U	67 U	73 U	680 U	300 U	260 U	700 U	270 U	5.9 U
Tetrachloroethene	1,400	6.1 U	59 U	56 U	61 U	570 U	250 U	220 U	590 U	220 U	4 U
2-Hexanone	-	22.0 U	95 U	89 U	98 U	910 U	400 U	350 U	940 U	350 U	14 U
Dibromochloromethane	N/A	3.6 U	59 U	56 U	61 U	570 U	250 U	220 U	590 U	220 U	2.3 U
Chlorobenzene	1,700	6.9 U	47 U	45 U	49 U	450 U	200 U	180 U	470 U	180 U	4.5 U
Ethylbenzene	5,500	32.0 J	400 J	150 J	300 J	**48,000**	**38,000**	**13,000**	**9,000**	**5,900**	6.1 J
Styrene	-	9.2 U	59 U	56 U	61 U	32,000	20,000	12,000	590 U	4,500	6 U
Bromoform	-	8.6 U	95 U	89 U	98 U	910 U	400 U	350 U	940 U	350 U	5.6 U
1,1,2,2-Tetrachloroethane	600	11.0 U	47 U	45 U	49 U	450 U	200 U	180 U	470 U	180 U	6.8 U
Total Xylenes	1,200	350.0	**1,300**	570	**1,300**	**190,000**	**150,000**	**62,000**	**34,000**	**32,000**	21 J
Total VOCs	10,000	960.7	2,094	783	1,808	**379,500**	**276,820**	**120,610**	**63,300**	**49,770**	132.1

Notes:
ug/Kg - micrograms per kilogram
ftbg - feet below grade
B - Analyte detected in associated method blank
U - Analyte not detected at or above reporting limit
J - Value is estimated (greater than detection limit but below reporting limit)
Bold - Concentration exceeds TAGM RSCO

Table 3
SVOCs in Soil
Outlet City
42-16 West Street
Long Island City, NY
VCP No. V00081-2
Results in ug/kg

Sample ID **Laboratory ID** **Sample Collection Date** **Sample Depth (ftbg)**	**TAGM 4046** **Recommended** **Soil Cleanup** **Objective (RSCO)**	**1-3(6-8')** **212787-001** **5/2/2006** **6-8**	**10-6(6-8')** **212787-006** **5/1/2006** **6-8**	**10-7(4.5-6.5')** **212787-003** **5/1/2006** **4.5-6.5**	**D-6(5-7')** **212787-002** **5/1/2006** **5-7**	**D-5(24-26')** **212871-002** **5/11/2006** **24-26**	**D-4(13.5-15.5')** **212787-005** **5/2/2006** **13.5-15.5**	**C-8(36-37')** **212871-001** **5/11/2006** **36-37**	**E-4(6-8')** **212871-003** **5/11/2006** **6-8**	**E-4(16-18.5')** **212871-004** **5/11/2006** **16-18.5**	**F-3(20-22')** **212787-004** **5/2/2006** **20-22**
4-Nitrophenol	100 OR MDL	240 U	1,600 U	1,500 U	17,000 U	62,000 U	86,000 U	74,000 U	16,000 U	30,000 U	150 U
Fluorene	50,000	200 J	9,700	3,200 J	45,000	**170,000**	**200,000** J	**210,000**	**71,000**	**67,000** J	440
4-Nitroaniline	50,000*	81 U	550 U	510 U	5,800 U	21,000 U	29,000 U	25,000 U	5,300 U	10,000 U	51 U
4-Bromophenyl-phenylether	50,000*	86 U	590 U	550 U	6,100 U	22,000 U	31,000 U	27,000 U	5,700 U	11,000 U	55 U
Hexachlorobenzene	41,000	82 U	570 U	520 U	5,900 U	21,000 U	30,000 U	25,000 U	5,400 U	10,000 U	53 U
Diethylphthlate	7,100	82 U	570 U	520 U	5,900 U	21,000 U	**100,000** J	25,000 U	5,400 U	10,000 U	53 U
4-Chlorophenyl-phenylether	50,000*	77 U	530 U	490 U	5,500 U	20,000 U	28,000 U	24,000 U	5,100 U	9,800 U	49 U
Pentachlorophenol	1,000 OR MDL	480 U	3,300 U	3,100 U	35,000 U	130,000 U	170,000 U	150,000 U	32,000 U	62,000 U	310 U
n-Nitrosodiphenylamine	50,000*	84 U	580 U	540 U	6,000 U	22,000 U	30,000 U	26,000 U	5,600 U	11,000 U	54 U
4,6-Dinitro-2-methylphenol	50,000*	400 U	2,800 U	2,600 U	29,000 U	100,000 U	150,000 U	120,000 U	27,000 U	51,000 U	260 U
Phenanthrene	50,000	2,300	21,000	9,000	40,000	**100,000** J	**120,000** J	**64,000** J	48,000	17,000 J	320 J
Anthracene	50,000	2,800	5,500	1,500 J	12,000 JH	30,000 J	33,000 U	29,000 U	9,100 J	12,000 U	59 U
Carbazole	-	470 J	570 U	550 J	5,900 U	21,000 U	30,000 U	25,000 U	5,400 U	10,000 U	55 J
Di-n-butyl phthalate	8,100	74 U	510 U	470 U	5,300 U	19,000 U	27,000 U	23,000 U	4,900 U	9,400 U	47 U
Fluoranthene	50,000	2,500	5,400	1,100 J	11,000 J	18,000 U	26,000 U	22,000 U	14,000 J	9,000 U	45 U
Pyrene	50,000	3,600	4,400	3,100 J	9,500 J	20,000 U	28,000 U	24,000 U	11,000 J	9,800 U	49 U
Butylbenzylphthalate	50,000	72 U	500 U	460 U	5,200 U	19,000 U	26,000 U	22,000 U	4,800 U	9,200 U	46 U
Benzo(a)anthracene	224 or MDL	**1,000**	**1,100** J	**1,600** J	5,400 U	20,000 U	27,000 U	23,000 U	5,000 U	9,600 U	48 U
Chrysene	400	**1,100**	**1,100** J	**2,000** J	5,100 U	18,000 U	26,000 U	22,000 U	4,700 U	9,000 U	45 U
3,3-Dichlorobenzidine	-	150 U	1,000 U	950 U	11,000 U	39,000 U	54,000 U	46,000 U	9,900 U	19,000 U	95 U
bis(2-Ethylhexyl)phthalate	50,000	170 J	510 U	470 U	5,300 U	19,000 U	27,000 U	23,000 U	4,900 U	9,400 U	140 J
Di-n-octyl phthalate	50,000*	59 U	400 U	370 U	4,200 U	15,000 U	21,000 U	18,000 U	3,900 U	7,500 U	38 U
Benzo(b)fluoranthene	1,100	**1,400** M	1,100 U	1,000 U	11,000 U	41,000 U	56,000 U	48,000 U	10,000 U	20,000 U	100 U
Benzo(k)fluoranthene	1,100	440 JM	430 U	400 U	4,500 U	16,000 U	22,000 U	19,000 U	4,100 U	7,900 U	40 U
Benzo(a)pyrene	61 or MDL	**980**	470 U	**770** J	4,900 U	18,000 U	25,000 U	21,000 U	4,600 U	8,800 U	44 U
Indeno(1,2,3-c,d)pyrene	3,200	1,300	390 U	360 U	4,100 U	15,000 U	21,000 U	18,000 U	3,800 U	7,300 U	36 U
Dibenzo(a,h)anthracene	14 or MDL	**370** J	430 U	400 U	4,500 U	16,000 U	22,000 U	19,000 U	4,100 U	7,900 U	40 U
Benzo(g,h,i)perylene	50,000	62 U	430 U	930 JM	4,500 U	16,000 U	22,000 U	19,000 U	4,100 U	7,900 U	40 U
Total SVOCs	500,000	28,410	131,700	87,950	**922,500**	**5,420,000**	**5,960,000**	**6,214,000**	**1,476,100**	**1,674,000**	8,475

Notes:
ug/kg - micrograms per kilogram
ftbg - feet below grade
B - Analyte detected in associated method blank
U - Analyte not detected at or above reporting limit
J - Value is estimated (greater than detection limit but below reporting limit
H - Alternate peak selection upon analytical review
M - Manually integrated compound
MDL - Method Detection Limit
Bold - Concentration exceeds TAGM RSCO
* Individual SVOCs < 50,000 ppb

Table 3

SVOCs in Soil
Outlet City
42-16 West Street
Long Island City, NY
VCP No. V00081-2
Results in ug/kg

Sample ID	**TAGM 4046**	**1-3(6-8')**		**10-6(6-8')**		**10-7(4.5-6.5')**		**D-6(5-7')**		**D-5(24-26')**		**D-4(13.5-15.5')**		**C-8(36-37')**		**E-4(6-8')**		**E-4(16-18.5')**		**F-3(20-22')**	
Laboratory ID	**Recommended**	**212787-001**		**212787-006**		**212787-003**		**212787-002**		**212871-002**		**212787-005**		**212871-001**		**212871-003**		**212871-004**		**212787-004**	
Sample Collection Date	**Soil Cleanup**	**5/2/2006**		**5/1/2006**		**5/1/2006**		**5/1/2006**		**5/11/2006**		**5/2/2006**		**5/11/2006**		**5/11/2006**		**5/11/2006**		**5/2/2006**	
Sample Depth (ftbg)	**Objective (RSCO)**	**6-8**		**6-8**		**4.5-6.5**		**5-7**		**24-26**		**13.5-15.5**		**36-37**		**6-8**		**16-18.5**		**20-22**	
Phenol	30 or MDL	160	U	1,100	U	1,000	U	12,000	U	43,000	U	59,000	U	50,000	U	11,000	U	21,000	U	100	U
bis(2-Chloroethyl)ether	50,000*	76	U	520	U	480	U	5,400	U	20,000	U	27,000	U	23,000	U	5,000	U	9,600	U	48	U
1,3-Dichlorobenzene	1,600	86	U	590	U	550	U	6,100	U	22,000	U	31,000	U	27,000	U	5,700	U	11,000	U	55	U
1,4-Dichlorobenzene	8,500	89	U	2,600	JH	570	U	6,400	U	23,000	U	32,000	U	28,000	U	5,900	U	11,000	U	57	U
1,2-Dichlorobenzene	7,900	94	U	650	U	600	U	6,700	U	25,000	U	34,000	U	29,000	U	6,200	U	12,000	U	60	U
Benzyl alcohol	50,000*	110	U	730	U	670	U	7,600	U	28,000	U	38,000	U	33,000	U	7,000	U	13,000	U	68	U
2-Methylphenol	100 or MDL	**550**	J	1,000	U	950	U	11,000	U	39,000	U	54,000	U	46,000	U	9,900	U	19,000	U	95	U
2, 2-oxybis (1-chloropropane)	-	79	U	540	U	500	U	5,700	U	21,000	U	29,000	U	24,000	U	5,200	U	10,000	U	50	U
n-Nitroso-di-n-propylamine	50,000*	76	U	520	U	480	U	5,400	U	20,000	U	27,000	U	23,000	U	5,000	U	9,600	U	48	U
Hexachloroethane	50,000*	99	U	680	U	630	U	7,100	U	26,000	U	36,000	U	31,000	U	6,600	U	13,000	U	63	U
4-Methylphenol	900	**1,300**		2,100	U	1,900	U	22,000	U	78,000	U	110,000	U	93,000	U	**26,000**	J	38,000	U	190	U
2-Chlorophenol	800	140	U	990	U	920	U	10,000	U	38,000	U	52,000	U	45,000	U	9,600	U	18,000	U	92	U
Nitrobenzene	200 or MDL	**470**	J	460	U	430	U	4,800	U	18,000	U	24,000	U	21,000	U	**25,000**	J	8,600	U	43	U
bis(2-Chloroethoxy)methane	-	96	U	660	U	610	U	6,900	U	25,000	U	35,000	U	30,000	U	6,300	U	12,000	U	61	U
1,2,4-Trichlorobenzene	-	94	U	650	U	600	U	6,700	U	25,000	U	34,000	U	29,000	U	6,200	U	12,000	U	60	U
Isophorone	4,400	100	U	690	U	640	U	7,200	U	26,000	U	36,000	U	31,000	U	6,700	U	13,000	U	64	U
2,4-Dimethylphenol	-	1,300	M	2,000	U	1,800	U	21,000	U	75,000	U	100,000	U	170,000	J	42,000		37,000	U	310	JM
Hexachlorobutadiene	50,000*	110	U	780	U	730	U	8,200	U	30,000	U	41,000	U	35,000	U	7,600	U	15,000	U	73	U
Naphthalene	13,000	2,800		**21,000**		13,000		**220,000**		**2,300,000**		**2,500,000**		**2,300,000**		**470,000**		**620,000**		2,700	
2,4-Dichlorophenol	400	180	U	1,300	U	1,200	U	13,000	U	48,000	U	66,000	U	57,000	U	12,000	U	23,000	U	120	U
4-Chloroaniline	220 or MDL	180	U	1,200	U	1,100	U	13,000	U	47,000	U	65,000	U	56,000	U	12,000	U	23,000	U	110	U
2,4,6-Trichlorophenol	50,000*	140	U	980	U	910	U	10,000	U	37,000	U	52,000	U	44,000	U	9,400	U	18,000	U	91	U
2,4,5-Trichlorophenol	100	200	U	1,400	U	1,300	U	15,000	U	53,000	U	73,000	U	63,000	U	13,000	U	26,000	U	130	U
Hexachlorocyclopentadiene	50,000*	420	U	2,900	U	2,700	U	30,000	U	110,000	U	150,000	U	130,000	U	28,000	U	53,000	U	270	U
2-Methylnaphthalene	36,400	1,400		35,000		**43,000**		**370,000**		**2,200,000**		**2,300,000**		**2,700,000**		**510,000**		**710,000**		2,800	
2-Nitroaniline	430 OR MDL	71	U	480	U	450	U	5,100	U	18,000	U	26,000	U	22,000	U	4,700	U	9,000	U	45	U
2-Chloronaphthalene	50,000*	82	U	570	U	520	U	5,900	U	21,000	U	30,000	U	25,000	U	5,400	U	10,000	U	53	U
4-Chloro-3-methylphenol	240 or MDL	190	U	1,300	U	1,200	U	14,000	U	50,000	U	69,000	U	59,000	U	13,000	U	24,000	U	120	U
2,6-Dinitrotoluene	1,000	100	U	700	U	650	U	7,300	U	27,000	U	37,000	U	32,000	U	6,800	U	13,000	U	65	U
2-Nitrophenol	330 or MDL	190	U	1,300	U	1,200	U	14,000	U	51,000	U	70,000	U	60,000	U	13,000	U	25,000	U	120	U
3-Nitroaniline	500 or MDL	120	U	800	U	740	U	8,300	U	30,000	U	42,000	U	36,000	U	7,700	U	15,000	U	74	U
Dimethylphthalate	2,000	86	U	590	U	550	U	6,100	U	22,000	U	31,000	U	27,000	U	5,700	U	11,000	U	55	U
2,4-Dinitrophenol	200 OR MDL	190	U	1,300	U	1,200	U	14,000	U	50,000	U	70,000	U	60,000	U	13,000	U	25,000	U	120	U
Acenapthylene	41,000	520	J	470	U	440	U	4,900	U	18,000	U	25,000	U	21,000	U	4,600	U	8,800	U	44	U
2,4-Dinitrotoluene	50,000*	100	U	690	U	640	U	7,200	U	26,000	U	36,000	U	31,000	U	6,700	U	13,000	U	64	U
Acenaphthene	50,000	480	J	16,000		5,100		**120,000**		**320,000**		**390,000**		**390,000**		**130,000**		**130,000**		830	
Dibenzofuran	6,200	960		**8,900**		3,100	J	**95,000**		**300,000**		**350,000**		**380,000**		**120,000**		**130,000**		880	

Notes:
ug/kg - micrograms per kilogram
ftbg - feet below grade
B - Analyte detected in associated method blank
U - Analyte not detected at or above reporting limit
J - Value is estimated (greater than detection limit but below reporting limit)
H - Alternate peak selection upon analytical review
M - Manually integrated compound
MDL - Method Detection Limit
Bold - Concentration exceeds TAGM RSCO
* Individual SVOCs < 50,000 ppb

Table 4
VOCs in Groundwater
Outlet City
42-16 West Street
Long Island City, NY
VCP No. V00081-2
Results in ug/l

Sample ID Laboratory ID Sample Collection Date	NYSDEC TOGS (1.1.1) Ambient Water Quality Standards and Guidance Values	MW-D5 J33939-4 6/22/2006	MW-10-6 J34107-5 6/23/2006	MW-C8D J34107-2 6/23/2006	MW-C8S J34107-3 6/23/2006	MW-C9D J34107-6 6/23/2006	MW-C9S J34107-4 6/23/2006	MW-D4 J34107-1 6/22/2006	MW-F4 J34107-7 6/23/2006	FB J34107-8 6/23/2006	TB J34107-9 6/23/2006
Acetone	50	**612**	**226**	**3760**	**51.0**	**2020**	10 U	**108 J**	34.9	10 U	10 U
Benzene	1	**1540**	**8.6**	**4100**	5.0 U	**2490**	1.0 U	**219**	**91.4**	1.0 U	1.0 U
Bromodichloromethane	NS	10 U	2.0 U	20 U	5.0 U	20 U	1.0 U	20 U	2.0 U	1.0 U	1.0 U
Bromoform	NS	40 U	8.0 U	80 U	20 U	80 U	4.0 U	80 U	8.0 U	4.0 U	4.0 U
Bromomethane	NS	20 U	4.0 U	40 U	10 U	40 U	2.0 U	40 U	4.0 U	2.0 U	2.0 U
2-Butanone (MEK)	50	**108**	20 U	**1270**	50 U	**1650**	10 U	200 U	20 U	10 U	10 U
Carbon disulfide	50	29.0	4.0 U	40 U	10 U	40 U	2.0 U	40 U	4.0 U	2.0 U	2.0 U
Carbon tetrachloride	5	10 U	2.0 U	20 U	5.0 U	20 U	1.0 U	20 U	2.0 U	1.0 U	1.0 U
Chlorobenzene	5	10 U	3.6	20 U	2.4 J	20 U	1.0 U	20 U	2.0 U	1.0 U	1.0 U
Chloroethane	50	24.3	2.0 U	20 U	5.0 U	20 U	1.0 U	20 U	2.0 U	1.0 U	1.0 U
Chloroform	7	**72.6**	**9.8**	**8.7 J**	5.0 U	**10 J**	1.0 U	**21.4**	**15.4**	1.0 U	1.0 U
Chloromethane	NS	10 U	4.1	20 U	5.0 U	20 U	1.0 U	20 U	2.0 U	1.0 U	1.0 U
Dibromochloromethane	50	10 U	2.0 U	20 U	5.0 U	20 U	1.0 U	20 U	2.0 U	1.0 U	1.0 U
1,1-Dichloroethane	5	**62.9**	**8.1**	20 U	2.8 J	**16.6 J**	1.0 U	20 U	2.0 U	1.0 U	1.0 U
1,2-Dichloroethane	5	**4320**	**10.5**	**357**	5.0 U	**773**	1.0 U	**178**	**14.7**	1.0 U	1.0 U
1,1-Dichloroethene	5	**7.6 J**	2.0 U	20 U	5.0 U	20 U	1.0 U	20 U	2.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	NS	47.4	53.9	20 U	12.3	20 U	1.0 U	250	2.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	5	10 U	2.0 U	20 U	5.0 U	20 U	1.0 U	20 U	2.0 U	1.0 U	1.0 U
1,2-Dichloropropane	NS	10 U	2.0 U	20 U	5.0 U	20 U	1.0 U	20 U	2.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	NS	10 U	2.0 U	20 U	5.0 U	20 U	1.0 U	20 U	2.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	NS	10 U	2.0 U	20 U	5.0 U	20 U	1.0 U	20 U	2.0 U	1.0 U	1.0 U
Ethylbenzene	5	**487**	**47.1**	**431**	5.0 U	**448**	1.0 U	**459**	**45.9**	1.0 U	1.0 U
2-Hexanone	NS	50 U	10 U	100 U	25 U	100 U	5.0 U	100 U	10 U	5.0 U	5.0 U
4-Methyl-2-pentanone(MIBK)	50	50 U	10 U	100 U	25 U	100 U	5.0 U	100 U	10 U	5.0 U	5.0 U
Methylene chloride	5	**737**	**8.9**	**10400**	10 U	**10700**	2.0 U	40 U	0.84 J	2.0 U	2.0 U
Styrene	NS	**467**	15.8	366	25 U	275	5.0 U	338	10 U	5.0 U	5.0 U
1,1,2,2-Tetrachloroethane	5	10 U	2.0 U	20 U	5.0 U	20 U	1.0 U	20 U	2.0 U	1.0 U	1.0 U
Tetrachloroethene	5	**6.9 J**	2.0	20 U	5.0 U	20 U	1.0 U	20 U	2.0 U	1.0 U	1.0 U
Toluene	5	**4420**	**140**	**2410**	5.0 U	**987**	1.0 U	**2480**	**63.1**	1.0 U	1.0 U
1,1,1-Trichloroethane	5	10 U	2.5	20 U	5.0 U	20 U	1.0 U	20 U	2.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	NS	10 U	2.0 U	20 U	5.0 U	20 U	1.0 U	20 U	2.0 U	1.0 U	1.0 U
Trichloroethene	5	10 U	**39.5**	20 U	5.0 U	20 U	1.0 U	**18.5 J**	2.0 U	1.0 U	1.0 U
Vinyl chloride	2	**46.7**	2.0 U	**106**	**4.2 J**	**132**	1.0 U	**12.9 J**	2.0 U	1.0 U	1.0 U
Xylene (total)	5	**2090**	**254**	**1870**	5.0 U	**1920**	1.0 U	**1890**	**115**	1.0 U	1.0 U
Total VOCs	NS	15,078.4	834.4	25078.7	72.7	21421.6	0	5974.8	381.24	0	0

Notes:
ug/l - micrograms per liter
NS - No Standard
B - Analyte detected in associated method blank
U - Analyte not detected at or above reporting limit
J - Value is estimated (greater than detection limit but below reporting limit)
H - Alternate peak selection upon analytical review
M - Manually integrated compound
MDL - Method Detection Limit
Bold - Concentration exceeds TAGM RSCO
* Individual VOCs < 50,000 ug/l

Table 5
SVOCs in Groundwater
Outlet City
42-16 West Street
Long Island City, NY
VCP No. V00081-2
Results in ug/l

Sample ID **Laboratory ID** **Sample Collection Date**	**NYSDEC TOGS (1.1.1) Ambient Water Quality Standards and Guidance Values**	**MW-D5** **J33939-4** **6/22/2006**	**MW-10-6** **J34107-5** **6/23/2006**	**MW-C8D** **J34107-2** **6/23/2006**	**MW-C8S** **J34107-3** **6/23/2006**	**MW-C9D** **J34107-6** **6/23/2006**	**MW-C9S** **J34107-4** **6/23/2006**	**MW-D4** **J34107-1** **6/22/2006**	**MW-F4** **J34107-7** **6/23/2006**	**FB** **J34107-8** **6/23/2006**
2-Chlorophenol	50	50 U	66 U	25 U	5.0 U	25 U	5.0 U	50 U	6.3 U	5.0 U
4-Chloro-3-methyl phenol	5	50 U	66 U	25 U	5.0 U	25 U	5.0 U	50 U	6.3 U	5.0 U
2,4-Dichlorophenol	1	50 U	66 U	25 U	5.0 U	25 U	5.0 U	50 U	6.3 U	5.0 U
2,4-Dimethylphenol	NS	8790	66 U	64000	32.8	65300	5.0 U	6020	411	5.0 U
2,4-Dinitrophenol	5	200 U	260 U	100 U	20 U	100 U	20 U	200 U	25 U	20 U
4,6-Dinitro-o-cresol	NS	200 U	260 U	100 U	20 U	100 U	20 U	200 U	25 U	20 U
2-Methylphenol	5	**231**	**74.1**	**8940**	3.1 J	**7240**	5.0 U	**986**	**62.2**	5.0 U
3&4-Methylphenol	NS	50 U	244	23000	7.1	18500	5.0 U	NA	115	5.0 U
2-Nitrophenol	5	50 U	66 U	25 U	5.0 U	25 U	5.0 U	50 U	6.3 U	5.0 U
4-Nitrophenol	5	200 U	260 U	100 U	20 U	100 U	20 U	200 U	25 U	20 U
Pentachlorophenol	1	200 U	260 U	100 U	20 U	100 U	20 U	200 U	25 U	20 U
Phenol	1	**950**	66 U	**2660**	**1.5** J	**1890**	5.0 U	50 U	**14.5**	5.0 U
2,4,5-Trichlorophenol	1	50 U	66 U	25 U	5.0 U	25 U	5.0 U	50 U	6.3 U	5.0 U
2,4,6-Trichlorophenol	NS	50 U	66 U	25 U	5.0 U	25 U	5.0 U	50 U	6.3 U	5.0 U
Acenaphthene	20	**233**	**84.8**	**359**	4.9	**114**	1.7 J	**402**	18.3	2.0 U
Acenaphthylene	20	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
Anthracene	50	11.7 J	10.5 J	**54.1**	0.83 J	2.6 J	0.68 J	34.5	0.65 J	2.0 U
Benzo(a)anthracene	0.002	20 U	**5.2** J	**3.9** J	2.0 U	10 U	2.0 U	**4.2** J	2.5 U	2.0 U
Benzo(a)pyrene	0.002	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
Benzo(b)fluoranthene	0.002	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
Benzo(g,h,i)perylene	5	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
Benzo(k)fluoranthene	0.002	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
4-Bromophenyl phenyl ether	NS	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
Butyl benzyl phthalate	50	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
2-Chloronaphthalene	NS	50 U	66 U	25 U	5.0 U	25 U	5.0 U	50 U	6.3 U	5.0 U
4-Chloroaniline	5	50 U	66 U	25 U	5.0 U	25 U	5.0 U	50 U	6.3 U	5.0 U
Carbazole	NS	20 U	9.6 J	40.5	2.4	24.9	2.0 U	36.8	4.3	2.0 U
Chrysene	0.002	20 U	**4.5** J	**3.2** J	2.0 U	10 U	2.0 U	**3.3** J	2.5 U	2.0 U
bis(2-Chloroethoxy)methane	NS	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
bis(2-Chloroethyl)ether	NS	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
bis(2-Chloroisopropyl)ether	NS	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
4-Chlorophenyl phenyl ether	NS	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
1,2-Dichlorobenzene	4.7	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
1,3-Dichlorobenzene	5	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
1,4-Dichlorobenzene	5	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
2,4-Dinitrotoluene	NS	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
2,6-Dinitrotoluene	5	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
3,3'-Dichlorobenzidine	NS	50 U	66 U	25 U	5.0 U	25 U	5.0 U	50 U	6.3 U	5.0 U
Dibenzo(a,h)anthracene	50	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
Dibenzofuran	5	**201**	**67.0**	**358**	3.1 J	**114**	5.0 U	**329**	**10.4**	5.0 U
Di-n-butyl phthalate	50	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
Di-n-octyl phthalate	50	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
Diethyl phthalate	50	20 U	35.8	10 U	5.4	10 U	2.0 U	20 U	2.5 U	2.0 U
Dimethyl phthalate	50	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
bis(2-Ethylhexyl)phthalate	50	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
Fluoranthene	50	5.7 J	12.0 J	29.6	0.74 J	10 U	0.57 J	20.0	0.57 J	2.0 U
Fluorene	50	**86.2**	41.4	**190**	3.6	35.2	0.94 J	**178**	5.4	2.0 U
Hexachlorobenzene	0.35	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
Hexachlorobutadiene	NS	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
Hexachlorocyclopentadiene	NS	200 U	260 U	100 U	20 U	100 U	20 U	200 U	25 U	20 U
Hexachloroethane	NS	50 U	66 U	25 U	5.0 U	25 U	5.0 U	50 U	6.3 U	5.0 U
Indeno(1,2,3-cd)pyrene	0.002	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
Isophorone	50	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
2-Methylnaphthalene	50	**870**	**422**	**3450**	24.1	**2210**	1.3 J	**2290**	**62.6**	2.0 U
2-Nitroaniline	5	50 U	66 U	25 U	5.0 U	25 U	5.0 U	50 U	6.3 U	5.0 U
3-Nitroaniline	5	50 U	66 U	25 U	5.0 U	25 U	5.0 U	50 U	6.3 U	5.0 U
4-Nitroaniline	NS	50 U	66 U	25 U	5.0 U	25 U	5.0 U	50 U	6.3 U	5.0 U
Naphthalene	10	**3140**	**831**	**8490**	**25.3**	**9100**	3.6	**6860**	**390**	2.0 U
Nitrobenzene	5	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
N-Nitroso-di-n-propylamine	NS	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
N-Nitrosodiphenylamine	NS	50 U	66 U	25 U	5.0 U	25 U	5.0 U	50 U	6.3 U	5.0 U
Phenanthrene	50	40.2	39.3	**183**	2.9	9.7 J	1.2 J	**118**	4.4	2.0 U
Pyrene	50	5.2 J	11.7 J	24.4	0.82 J	10 U	0.72 J	16.2 J	2.5 U	2.0 U
1,2,4-Trichlorobenzene	5	20 U	26 U	10 U	2.0 U	10 U	2.0 U	20 U	2.5 U	2.0 U
Total SVOCs	NS	14,564.00	1,882.40	111,785.70	115.49	104,540.40	10.71	16,969.00	1,095.02	0

Notes:
ug/l - micrograms per liter
NS - No Standard
U - Analyte not detected at or above reporting limit
J - Value is estimated (greater than detection limit
but below reporting limit)
Bold - Concentration exceeds TAGM RSCO

Table 6
General Chemistry of Groundwater
Outlet City
42-16 West Street
Long Island City, NY
VCP No. V00081-2
Results in ppm unless otherwise noted.

Sample ID **Laboratory ID** **Sample Collection Date**	**MW-A4** **J33939-3** **6/22/2006**	**A-4 (1)** **J34784-3** **7/5/2006**	**MW-E3** **J33939-2** **6/22/2006**	**E-3 (1)** **J34784-1** **7/5/2006**	**MW-OS6** **J33939-1** **6/22/2006**	**OS-6 (1)** **J34784-2** **7/5/2006**	**MW-10-6** **J34107-5** **6/23/2006**
Alkalinity, Total as $CaCO_3$	183	NA	459	NA	282	NA	NA
BOD, 5 Day	9.3	NA	542	NA	3.4 U	NA	NA
Chemical Oxygen Demand	43.9	NA	1,820	NA	22.0	NA	NA
Hardness, Total as $CaCO_3$	301	NA	259	NA	141	NA	NA
Coliform, Total (col/100ml)	400	5,000	NA	2 U	NA	7	NA
Fluoride	NA	NA	NA	NA	NA	NA	0.38
Iron	300	NA	1,070	NA	2,660	NA	NA

Notes:
ppm - parts per million
ml - milliliter
U - Analyte not detected at or above reporting limit
NA - Not Analyzed
Two groundwater samples from monitoring wells MW-A4, MW-E3, and MW-OS6 were collected.
Samples collected on 7/5/2006 were analyzed only for total coliform. Sample A-4(1) was collected from well MW-A4, sample E-3(1) from well MW-E3, and sample OS-6(1) from well MW-OS6.

APPENDIX A

Soil Boring Logs

SOIL BORING #: 1-3

PROJECT ID:	Outlet City	FLS PROJECT NO.:	10038-001
LOT / BLOCK:		GEOLOGIST:	MA, CD
SITE LOCATION:	Long Island City, New York		
DRILLER:	Hydrotech Environmental		
DRILLING METHOD:	Truck Mounted Geo Probe		
SOIL SAMPLING METHOD:			
DATE BORING INSTALLED:	05/02/06		
TOTAL DEPTH:		DEPTH TO WATER:	

DEPTH (FT) BELOW SURFACE	PID READING (PPM)	DENSITY/ MOISTURE	REC. (ft)	LITHOLOGIC DESCRIPTION	SAMPLE DESIGNATION
0				concrete	
2	ND		0.5		
			1	Fill/ cinder / ash/ sand/ red brick / gravel	
4	ND		2		
6	ND		2	Creosote like odor	Soil sample 1-3(6-8') collected from 6 to 8 ftbg
8			4	gray sand silt wet with creosote like odor	
10	ND				
				End of Boring 11 ftbg Bedrock	
12					
14					
16					
18					
20					
22					

SOIL BORING LOG

DATE: 5/12/2006 DRAWN BY: CA, BM
SCALE: REV. BY: DB

Fleming-Lee Shue, Inc.
158 West 29th Street, 9th Floor
New York, New York 10001
(212) 675-3225

SOIL BORING #: 10-6

PROJECT ID:	Outlet City	FLS PROJECT NO.:	10038-001
LOT / BLOCK:		GEOLOGIST:	MA, CD
SITE LOCATION:	Long Island City, New York		
DRILLER:	Hydrotech Environmental		
DRILLING METHOD:	Truck Mounted Geo Probe		
SOIL SAMPLING METHOD:			
DATE BORING INSTALLED:	5/1/2006		
TOTAL DEPTH:		DEPTH TO WATER:	

DEPTH (FT) BELOW SURFACE	PID READING (PPM)	BLOWS PER 6" OF SAMPLE	REC. (ft)	LITHOLOGIC DESCRIPTION	SAMPLE DESIGNATION
0	ND				
2	ND		6"	Concrete	
4	ND		8"	FILL-black SILT and SAND	
6	250		1.5"	Gray dense clay and Silt	Soil sample 10-6(6-8') collected from 6 to 8 ftbg
8	400		1.3"		
10	144		3.5"		
12	307		0.5"	Dark, Black coarse sand with free product End of Boring 11.5 ftbg Bedrock 	
14					
16					
18					
20					
22					

SOIL BORING LOG

DATE: 5/12/2006 DRAWN BY: BM
SCALE: REV. BY: DB

Fleming Lee Shue

Fleming-Lee Shue, Inc.
158 West 29th Street, 9th Floor
New York, New York 10001
(212) 675-3225

SOIL BORING #: 10-7

PROJECT ID:	Outlet City	FLS PROJECT NO.:	10038-001
LOT / BLOCK:		GEOLOGIST:	MA, CD
SITE LOCATION:	Long Island City, New York		
DRILLER:	Hydrotech Environmental		
DRILLING METHOD:	Truck Mounted Geo Probe		
SOIL SAMPLING METHOD:			
DATE BORING INSTALLED:	05/01/06		
TOTAL DEPTH:		DEPTH TO WATER:	NA

DEPTH (FT) BELOW SURFACE	PID READING (PPM)	BLOWS PER 6" OF SAMPLE	REC. (ft)	LITHOLOGIC DESCRIPTION	SAMPLE DESIGNATION
0	ND		6"	Concrete	
2	ND		9"	fill (sand, pebbles, red brick)	
4	18.4		2.5"	fill (sand, pebbles, red brick) coarse sand with shattered rock @ tip dry with strong odor	Soil sample 10-7(4.5-6.5') collected from 4.5 to 6.5 ftbg
6	18.4			Refusal	
				End of Boring 6.5 ftbg Bedrock	
8					
10					
12					
14					
16					
18					
20					
22					

SOIL BORING LOG

DATE: 5/12/2006
SCALE:

DRAWN BY: CA, BM
REV. BY: DB

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PAGE 1 OF 1

SOIL BORING #: D-4

PROJECT ID: Outlet City
FLS PROJECT NO.: 10038-001
GEOLOGIST: MA, CD
LOT / BLOCK:
SITE LOCATION: Long Island City, New York
DRILLER: Hydrotech Environmental
DRILLING METHOD: Truck Mounted Geo Probe
SOIL SAMPLING METHOD:
DATE BORING INSTALLED: 05/01/06
DEPTH TO WATER:
TOTAL DEPTH:

DEPTH (FT) BELOW SURFACE	PID READING (PPM)	DENSITY/ MOISTURE	REC. (ft)	LITHOLOGIC DESCRIPTION	SAMPLE DESIGNATION
0					
	263		1	concrete	
2			2	FILL - cinder and ash, red brick , small pebbles	
	157.8				
4					
	237		1	Silt with fine sand (green)	
6			2		
	157.8		1	Brown silt with fine fine sand	
8			1		
	152.2				
10			2		
			1		
	0				
12			1		
	301		1	Brown mottled silty clay	Soil sample D-4(13.5-15.5') collected from 13.5 to 15.5 ftbg
14			2	brown coarse sandy with gravel and free product heavy creosote odor	
	219.5				
16				End of Boring 15.5 ft-bg Bedrock	
18					
20					
22					

SOIL BORING LOG

DATE: 5/12/2006
SCALE:
DRAWN BY: CA, BM
REV. BY: DB

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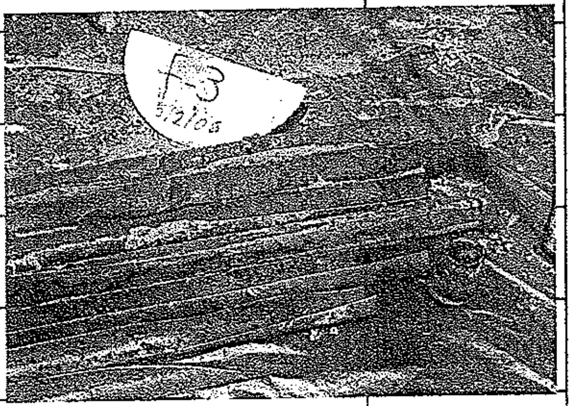
SOIL BORING #: F-3

PROJECT ID:	Outlet City	FLS PROJECT NO.:	10038-001
LOT / BLOCK:		GEOLOGIST:	MA, CD
SITE LOCATION:	Long Island City, New York		
DRILLER:	Hydrotech Environmental		
DRILLING METHOD:	Truck Mounted Geo Probe		
SOIL SAMPLING METHOD:			
DATE BORING INSTALLED:	05/02/06	DEPTH TO WATER:	
TOTAL DEPTH:			

DEPTH (FT) BELOW SURFACE	PID READING (PPM)	DENSITY/ MOISTURE	REC. (ft)	LITHOLOGIC DESCRIPTION	SAMPLE DESIGNATION
0					
2	ND		4	Fill cinders, ash, coal fragments	
4	ND			S/A	
6	ND			Dark black to gray clayey silt wet at 8'	
8				Greenish gray clay	
10	ND			gray silt with trace of sand	
12	ND			dense clay	
14	ND			Dark Gray clayey silt	
16	ND			Dark Gray clayey silt	
18	ND			Dense clay	
20	ND			weathered bedrock light	Soil sample F-3(20-22') collected from 20 to 22 ftbg
22				End of Boring 22 ftbg Bedrock	



SOIL BORING LOG

DATE:	5/12/2006	DRAWN BY:	CA, BM
SCALE:		REV. BY:	DB

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SOIL BORING #: D-5

PROJECT ID:	Outlet City	FLS PROJECT NO.:	10038-001
LOT / BLOCK:		GEOLOGIST:	MA
SITE LOCATION:	Long Island City, New York		
DRILLER:	Hydrotech Environmental		
DRILLING METHOD:	Truck Mounted Geo Probe		
SOIL SAMPLING METHOD:			
DATE BORING INSTALLED:	05/09/06		
TOTAL DEPTH:		DEPTH TO WATER:	

DEPTH (FT) BELOW SURFACE	PID READING (PPM)	DENSITY/ MOISTURE	REC. (ft)	LITHOLOGIC DESCRIPTION	SAMPLE DESIGNATION
0	688 285		3	Dark Black Fill, wood ash , cinders and coal fragments	
4	22 439		1 3	S/A Clayey silt with free product with strong odor	
8	355 321		1 3	Greenish gray silt strong odor Clayey silt with free product with strong odor	
12	344 57		1 3	Greenish gray silt strong odor Clayey silt with free product with strong odor	
16	468 502		2 2	S/a with free product Silty sand with pebbles and cobbles with strong odor	
20	20 50		4	Gray medium to coarse sand with pebbles and cobbles	
24	414		2	S/a with free product	Soil sample D-5(24-26') collected from 24 to 26 ftbg
				End of Boring 26 ftbg Bedrock	
28					
30					
32					
34					

SOIL BORING LOG

DATE:	5/12/2006	DRAWN BY:	CA, BM
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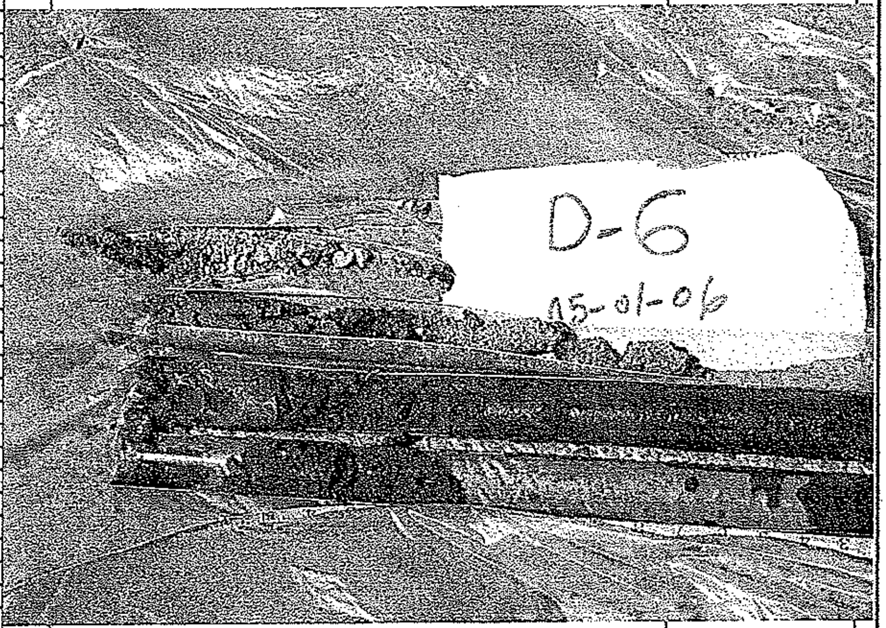
SOIL BORING #: D-6

PROJECT ID:	Outlet City	FLS PROJECT NO.:	10038-001
LOT / BLOCK:		GEOLOGIST:	MA, CD
SITE LOCATION:	Long Island City, New York		
DRILLER:	Hydrotech Environmental		
DRILLING METHOD:	Truck Mounted Geo Probe		
SOIL SAMPLING METHOD:			
DATE BORING INSTALLED:	05/02/06		
TOTAL DEPTH:		DEPTH TO WATER:	

DEPTH (FT) BELOW SURFACE	PID READING (PPM)	DENSITY/ MOISTURE	REC. (ft)	LITHOLOGIC DESCRIPTION	SAMPLE DESIGNATION
0					
	108.3		1.5	FILL- Brown silty sand with pebbles	
2					
4	18		1.9		
6	74.8		0.9	Greenish brown clayey silt with free product	Soil sample D-6(5-7') collected from 5 to 7 ftbg
8				End of Boring 8 ft-bg Bedrock	
10					
12					
14					
16					
18					
20					
22					



SOIL BORING LOG

DATE: 5/12/2006 DRAWN BY: CA, BM
SCALE: REV. BY: DB

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SOIL BORING #: E-4

PROJECT ID:	Outlet City	FLS PROJECT NO.:	10038-001
LOT / BLOCK:		GEOLOGIST:	MA
SITE LOCATION:	Long Island City, New York		
DRILLER:	Hydrotech Environmental		
DRILLING METHOD:	Truck Mounted Geo Probe		
SOIL SAMPLING METHOD:			
DATE BORING INSTALLED:	05/09/06		
TOTAL DEPTH:		DEPTH TO WATER:	

DEPTH (FT) BELOW SURFACE	PID READING (PPM)	DENSITY/ MOISTURE	REC. (ft)	LITHOLOGIC DESCRIPTION	SAMPLE DESIGNATION
0	593				
			3	Dark Black Fill, wood ash , cinders and coal fragments	
2	293				
4	198				
			1	S/A	
6	69		3	Clayey silt with free product with strong odor	Soil sample E-4(6-8') collected from 6 to 8 ftbg
8					
	3.6		1	Greenish gray silt strong odor	
10			3	Clayey silt with free product with strong odor	
	300				
12					
	498		2	S/a with free product	
14					
			2	Silty sand with pebbles and cobbles with strong odor	
16				S/a free product	Soil sample E-4(16-18.5') collected from 16 to 18.5 ftbg
18				End of Boring 18.5 ftbg Bedrock	
20					
22					

SOIL BORING LOG

DATE:	5/12/2006	DRAWN BY:	CA, BM
SCALE:		REV. BY:	DB

Fleming Lee Shue

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158 West 29th Street, 9th Floor
New York, New York 10001
(212) 675-3225

SOIL BORING #: E-4

PROJECT ID:	Outlet City	FLS PROJECT NO.:	10038-001
LOT / BLOCK:		GEOLOGIST:	MA
SITE LOCATION:	Long Island City, New York		
DRILLER:	Hydrotech Environmental		
DRILLING METHOD:	Truck Mounted Geo Probe		
SOIL SAMPLING METHOD:			
DATE BORING INSTALLED:	05/09/06		
TOTAL DEPTH:		DEPTH TO WATER:	

DEPTH (FT) BELOW SURFACE	PID READING (PPM)	DENSITY/ MOISTURE	REC. (ft)	LITHOLOGIC DESCRIPTION	SAMPLE DESIGNATION
0	593		3	Dark Black Fill, wood ash , cinders and coal fragments	
2	293				
4	198		1	S/A	
6	69		3	Clayey silt with free product with strong odor	Soil sample E-4(6-8') collected from 6 to 8 ftbg
8	3.6		1	Greenish gray silt strong odor	
10	300		3	Clayey silt with free product with strong odor	
12	498		2	S/a with free product	
14			2	Silty sand with pebbles and cobbles with strong odor	
16				S/a free product	Soil sample E-4(16-18.5') collected from 16 to 18.5 ftbg
18				End of Boring 18.5 ftbg Bedrock	
20					
22					

SOIL BORING LOG

DATE: 5/12/2006 DRAWN BY: CA, BM
SCALE: REV. BY: DB

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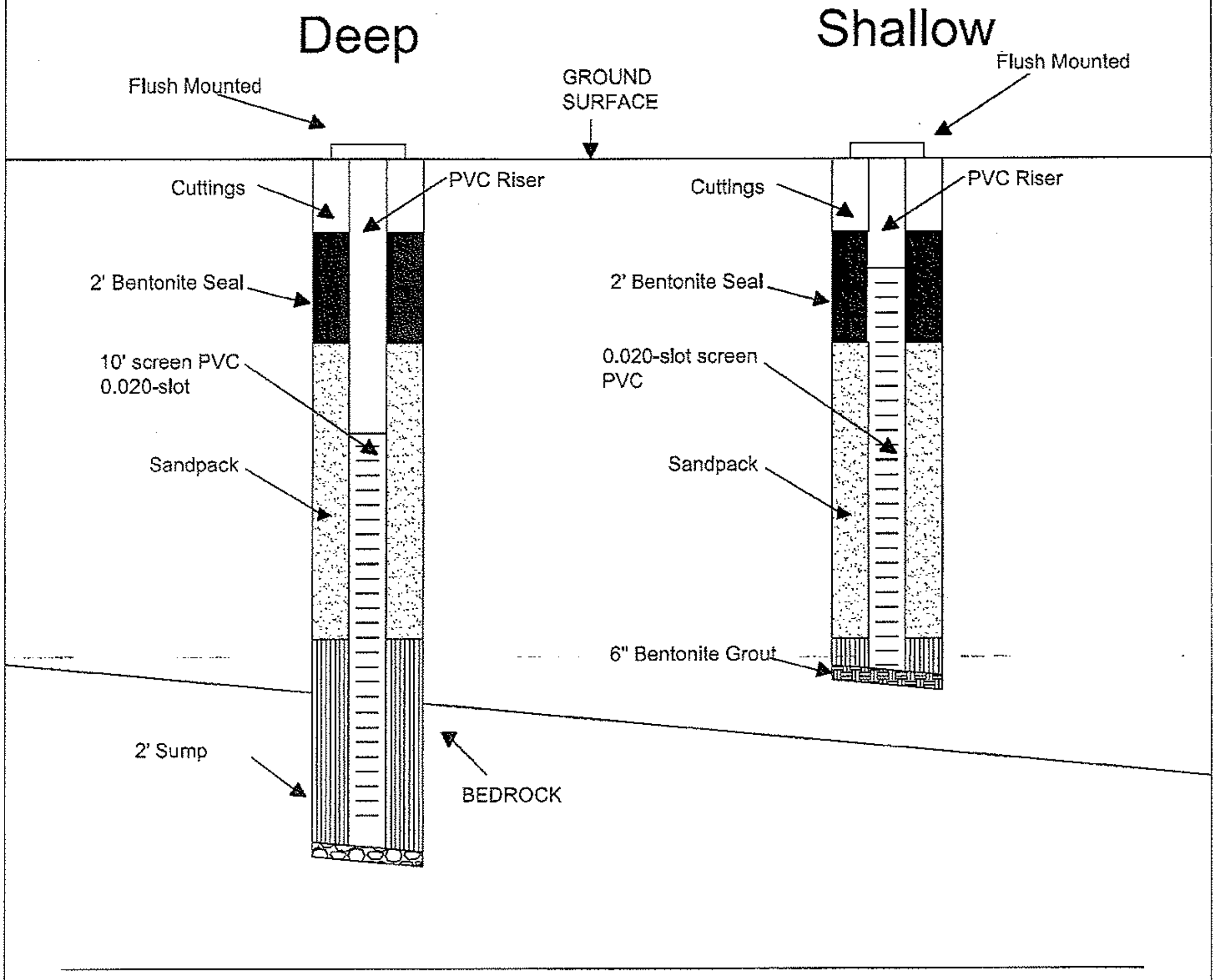
New York, New York 10001
(212) 675-3225

APPENDIX B

Monitoring Well Construction Details



NOT TO SCALE

Fleming Lee Shue
Environmental Management & Consulting

158 West 29th Street, 9th Fl.
New York, NY 10001

Outlet City
Long Island City, NY

Date
January 2007

Project Number
10038-003

TYPICAL MONITORING WELL CONSTRUCTION

LEGEND

APPENDIX C

Sub-Slab and Indoor Air Sample Baseline Report

SUB-SLAB AND INDOOR AIR SAMPLING BASELINE REPORT
OUTLET CITY SITE
LONG ISLAND CITY, NEW YORK

Prepared For:
New York State Department of Environmental Conservation

Fleming-Lee Shue Project Number:
10038-001

Prepared by:

Fleming
Lee Shue

Environmental Management & Consulting

Fleming-Lee Shue, Inc.
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http://www.flemingleeshue.com

April 11, 2006

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1.0 INTRODUCTION

1.1 Site Description

The Site encompasses the majority of an approximately three-acre parcel of land bound by Jackson Avenue (north), Queens Boulevard (east), the Long Island Railroad (LIRR) Yard A (south), and Orchard Street (west), in Long Island City, Queens County, New York. A New York City Transit Authority (NYCTA) Substation and a vacant, five-story residential building are located on the northwest corner of this geographic area; however, these structures are part of the Site. The Site is partially bisected by West Street, which is no longer mapped as a city street in the Site area. Please refer to Figure 1: Site Location Map and Figure 2: Site Plan.

The Site has been developed with the current buildings for at least 50-years. Figure 2: Site Plan depicts the current Site developments, including: Buildings 1, 2A, 2B, 2C, 3A, 3B, 4, 5, 6, 6A, 9, and 10, asphaltic parking lots A, B, C, D, and E, and two small unpaved areas adjacent to the railroad tracks, Areas F and G (formerly used for a railroad siding).

On-site buildings are constructed of reinforced concrete frame and wood post and beam construction. All buildings have been identified with concrete floors on their lowest level at, or slightly below, surrounding sidewalk elevations. Building 4 is the only development on the Site with a basement located mostly below sidewalk grade.

1.2 Site History

The Site was occupied by West Chemical Company (West Chemical) from the early 1900's through its closure in 1977. During this time, West manufactured a variety of commercial and household disinfectants, soaps, floor waxes, and insecticides, as well as paper product dispensing machines.

The manufacture of a disinfectant "Coronoleum" (a.k.a. CN+) during this time period resulted in the storage of large quantities of a light-fraction wood creosote on-Site through approximately 1950. After 1950, the active ingredients are changed to bromine and creosote was no longer stored or used on the site. Previous Site investigations identified three historic occurrences with this chemical, which may have resulted in Site contamination:

- Between 1938 and 1950, West Chemical discovered leaks in the bottoms of several aboveground storage tanks (ASTs) that were located in Area D of the Site. The leaks were fixed by installing false bottoms in the tanks. However, the amount of creosote released to the ground was not identified.

- In 1950, the New York City Fire Department (FDNY) deliberately released the contents of a 5,000-gallon AST of creosote to the ground during a fire as an explosion prevention measure. The 5,000-gallon AST is no longer located at the Site, and presumably, it was removed prior to the property's change of ownership.

- Former West Chemical personnel identified that creosote was historically delivered to the plant by means of a rail siding (Area F). The creosote was pumped into a fill line and delivered to storage tanks in Area D. It is possible that additional releases may have occurred during filling periods due to unidentified overfills and unmonitored chemical transfer. Figure 2: Site Plan depicts these areas on the Site.

Reportedly, West Chemical stored a variety of other materials on-Site during its tenancy, including: muriatic acid, alcohol, rosin, fats, and oils. These materials were used in the manufacture of hand creams, cleaning products (floor waxes and cleaners), and vending machine products.

1.3 Historical Investigations

In June 1996, AKRF submitted a *Voluntary Cleanup Site Assessment Report* and *Interim Remedial Measure (IRM) Workplan* to the New York State Department of Environmental Conservation (NYSDEC) for the Outlet City Site. These reports provided a description of the Site, its history, and a summary of prior reports completed on the property. Additionally, the IRM proposed the removal of free floating creosote from the water table (previously identified in Area E of the Site) through the installation of three recovery wells. The recovery wells were installed in May 1997 and the product recovery systems was operated until December 2003.

In 1998, upon the request of the NYSDEC, AKRF conducted additional soil and ground water sampling at the Site. The additional sampling was completed to gather more information for the development of additional remedial measures. Based on the information gathered, AKRF submitted a Supplemental Site Assessment/Remedial Investigation (SSA/RI) report to the NYSDEC in October 1998. Upon review of the SSA/RI, the NYSDEC and AKRF agreed that more information was needed before modifying the existing IRM system and/or installation of additional IRMs.

In March 2001, AKRF submitted a draft Additional Investigation Workplan to the NYSDEC. However, between April and May 2001, Environmental Liability Management (ELM) completed most of the scope of work proposed in the AKRF workplan during due diligence activities for a potential Site developer. AKRF was able to obtain the analytical results from the ELM study to respond to NYSDEC's comments on the draft Additional Investigation Workplan. The amended report was resubmitted in August 2001. Despite the amendments, the Additional Investigation Workplan was never finalized or implemented due to postponement of the Site redevelopment plans. Around this time the regulatory oversight of the Site was transferred from Local Region 2 to the headquarters of the NYSDEC in Albany, New York.

In May 2003, the NYSDEC, AKRF, and Site personnel agreed that the workplan must be designed to assess i) the possibility of dense non-aqueous phase liquid (DNAPL) at the bedrock interface and ii) evaluate appropriate remedial measures for soil and ground water through the collection of additional data. In June 2003, AKRF presented an *Additional Environmental Investigation Workplan*. The plan included conceptual upgrades to the existing IRM free-product recovery system to be discussed in detail in a subsequent Remedy Selection Report, after the collection of additional Site subsurface data. Despite the preparation and submission of this report to the NYSDEC, the *Additional Environmental Investigation Workplan* was not finalized or implemented.

Fleming-Lee Shue, Inc. (FLS) was retained to prepare an Additional Remedial Investigation (ARI) Workplan. The ARI Workplan outlines the proposed subsurface investigation that will be required to fully delineate Site contamination and baseline sub-slab vapor, indoor, and background air sampling. The workplan was approved by the NYSDEC on December 6th, 2005. Sub-slab, indoor, and background air sampling were collected on March 1st, 2006

1.4 Purpose

The purpose of this sub-slab vapor and indoor air sampling report is to present the results of the baseline sub-slab vapor, indoor (ambient), and outdoor (background) volatile organic compound (VOC) air sampling performed inside the Outlet City buildings to establish baseline conditions prior to the start of Dual-Phase Vapor Extraction (DPE) pilot testing or any additional remedial activities of the site.

2.0 SAMPLING LOCATIONS

Sub-slab vapor and indoor air sampling were originally proposed to be collected in thirteen locations inside Outlet City's buildings (SS-1 thru SS-13 for sub-slab vapor samples and AA-1 thru AA-13 for indoor air samples) and two background locations outside the buildings (AA-UW for the upwind location and AA-DW for the downwind location). Two sub-slab vapor and indoor air sampling locations (SS-5, AA-5 and SS-7, AA-7) were eliminated because groundwater was encountered directly below the sub-slab at location SS-5 and underground storage tanks (USTs) were discovered directly under the sub-slab at location SS-7 in Building 2B. These USTs were previously unknown and were found partially or fully filled with liquid. The liquid was sampled and analyzed for sodium hydroxide and pH to determine if the USTs contain lye. Analytical results indicated that the USTs contain water with trace of lye. Analytical results are presented in Appendix A.

The sub-slab vapor and indoor air sampling locations were selected to reflect those where the soil and groundwater contamination detected in previous investigations and areas where workers perform daily activities. The buildings heating, ventilation and air conditioning (HVAC) system was operational prior to and during the sampling event. The indoor temperature during the air sampling ranged between approximately 52° to 72° Fahrenheit. Sample locations are depicted on Figure 3.

3.0 SAMPLING METHODOLOGY

Sub-slab vapor samples were collected from permanent soil vapor sample points installed two inches below the building slab. Sub-slab vapor sample points were installed as described in the ARI work plan approved by the NYSDEC on December 6, 2005.

Prior to sub-slab vapor sample collection, air was purged from the sub-slab vapor points using ¼ -inch polyethylene tube and an air valve connected to a vacuum pump. The vacuum pump was run for at least 10 minutes to evacuate a minimum of three sample probe volumes. The flow rate for purging did not exceed 0.2 liter per minute. The purged air was discharged into a Tedlar bag and screened for organic vapors using an organic vapor meter (OVM) and the results are presented in Table 1.

Indoor air samples were collected within the Outlet City's buildings. Indoor air samples were collected at locations directly adjacent (co-located) to the sub-slab vapor sample point at breathing zone elevation (five feet above grade).

Background samples of the ambient air outside the buildings along West Street at upwind and downwind locations were collected at the same time as the sampling program.

Eleven (11) co-located sub-slab vapor and indoor air samples as well as two (2) background (outdoor) samples were collected in six-liter SUMMA passivated canisters in accordance with US EPA Method TO-15. A duplicate sample was collected at indoor air sampling location AA-1D. Each SUMMA canister was equipped with a dedicated flow regulator that was set to collect an air sample over an 8-hour period. The sample flow rates did not exceed the recommended maximum flow of 0.2 liter per minute provided in the New York State Department of Health (NYSDOH) sub-slab vapor sampling guidance document (NYSDOH, 2005a). For each sample, the start time, end time, maximum and minimum temperature, and beginning and final ambient temperature was recorded (Table 1). An identification tag was attached to each canister for shipment to the New York State ELAP-approved laboratory. The analysis was performed in accordance to USEPA Method TO-15.

4.0 AIR SAMPLING RESULTS

Baseline VOC air sampling analytical results were compared to values from both the NYSDOH Study of Volatile Organic Chemicals in Air of Fuel Oil Heated Homes 1997-2003 (NYSDOH, 2005b) and the United States Environmental Protection Agency (USEPA) 1994-1998 Office Indoor Air Evaluation (USEPA, 2001). Table 2 presents VOC detections. The detected concentrations are generally above the aforementioned referenced. This data set will be used to establish baseline concentrations prior to DPE pilot testing and subsequent remediation. The complete laboratory analytical data deliverable is presented in Appendix B.

Volatile Organic Compounds (VOCs) were detected in all 25 samples collected at the site. The VOCs can be divided into three classes for the purpose of this report:

⇒ Chlorinated VOCs

⇒ Petroleum Related VOCs

⇒ Other (Including manufacturing chemicals most likely used onsite and other miscellaneous compounds)

4.1 Results

4.1.1 Chlorinated VOCs

1,1,1-Trichloroethane (TCA) and Trichloroethene (TCE) and their degradable compounds such as 1,1-Dichloroethene, 1,2-Dichloroethane, cis-1,2-Dichloroethene, 1, 1 –Dichloroethene and vinyl chloride were detected in most of the eleven sub-slab vapor samples. The highest levels of chlorinated VOCs were detected in sub-slab vapor samples SS-3 and SS-8 at a total concentration of 4,485 and 31,490 $\mu g/m^3$, respectively.

No TCA or TCE or their degradable compounds were detected in any of the eleven indoor air samples or in the background air samples.

4.1.2 Petroleum Related VOCs

Petroleum related compounds such as benzene, 1,2,4-trimethylbenzene, 2,2,4-trimethylbenzene, toluene, ethylbenzene, xylenes, methyl tert-butyl ether, n-heptane, and n-hexane were detected in eight sub-slab vapor samples. The highest concentrations of petroleum related compounds were detected in the sub-slab vapor sample SS-8.

Low concentrations of petroleum related compounds were detected in the indoor air samples. These compounds are most likely related to the petroleum products used on site such as gasoline and to their elevated levels in the soil vapors under the buildings slab.

4.1.3 Other Compounds

Other volatile organic compounds (VOCs) such as acetone, MEK, chloroform, chloromethane, dichlorodifluoromethane, trichlorofluoromethane, and methylene chloride were detected in various sub-slab and indoor air samples. These compounds are likely related to the past usage of the on-site buildings by the West Chemical Company to manufacture a variety of commercial and household disinfectants, soaps, floor waxes, and insecticides.

4.1.4 Outdoor Background Samples

Upwind and Downwind samples were collected at the site to establish outdoor background levels. The results, for the upwind (AA-UW) and downwind sample (AA-DW) are presented in Table 2.

5.0 REFERNCES

NYSDOH, 2005a, *Draft Indoor Air Sampling and Analysis Guidance*, New York State Department of Health, February 1, 2005. http://www.health.state.ny.us/nysdoh/gas/svi_guidance/docs/svi_main.pdf

NYSDOH, 2005b, *Study of Volatile Organic Chemicals in Air of Fuel Oil Heated Homes*, New York State Department of Health, Revised November 14, 2005. http://www.health.state.ny.us/nysdoh/indoor/fuel_oil.htm

USEPA, 2001, *Draft: A standard EPA protocol for characterizing indoor air quality in large buildings*, Washington, DC: Office of Air and Radiation, 2001.

Sample ID	AA-1	AA-1D	AA-2	AA-3	AA-4	AA-6	AA-8	AA-9	AA-10	AA-11	AA-12	AA-13	AA-UW	AA-DW
Date Collected	03/01/06	03/01/06	03/01/06	03/01/06	03/01/06	03/01/06	03/01/06	03/01/06	03/01/06	03/01/06	03/01/06	03/01/06	03/01/06	03/01/06
Analysis Date	03/06/06	03/06/06	03/06/06	03/06/06	03/06/06	03/06/06	03/06/06	03/06/06	03/06/06	03/07/06	03/06/06	03/06/06	03/06/06	03/06/06
Dilution Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Units	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3
Parameter														
Acetone	ND	ND	17	13	ND	16	17	ND	15	ND	14	12	ND	ND
Benzene	1.1	1.3	1.8	1.2	1.2	1.3	1.2	1	1.2	1.7	1.2	1.2	0.84	ND
2-Butanone (MEK)	ND	3.3	3.2	2.9	ND	3	ND	ND	3.4	ND	ND	ND	ND	ND
Carbon tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	1.4	ND	ND	ND	ND	ND
Chloromethane	1.2	1.3	1.4	1.2	1.1	1.4	1.2	1.2	1.2	1.4	1.2	1.3	1.2	1.3
Dichlorodifluoromethane	2.3	2.4	2.2	2.2	2.1	2.6	2.3	2.3	2.5	2.4	2.4	2.4	2.3	2.4
Ethylbenzene	ND	0.95	1.3	ND	1.1	1	1	ND	1.5	1.2	ND	0.84	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND	18	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	ND	ND	ND	ND	ND	2	ND	ND	ND	2.2	ND	ND	ND	ND
Methyl tert-butyl ether	ND	ND	ND	ND	5.1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	0.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	5.4	ND	ND	ND	ND	ND
Toluene	5.2	15	14	5.1	15	14	11	3.7	10	18	6.2	9.1	ND	1.7
Trichloroethene	3.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	ND
1,2,4-Trimethylbenzene	ND	ND	1	ND	ND	ND	0.97	ND	ND	ND	ND	1.1	ND	ND
m-Xylene & p-Xylene	ND	2.9	3.5	ND	3	2.9	2.9	ND	3.5	3.5	1.7	2.3	ND	ND
o-Xylene	ND	0.93	1.2	ND	1	0.95	1	ND	1.4	1.2	ND	0.83	ND	ND

Sample ID	SS-1	SS-2	SS-3	SS-4	SS-6	SS-8	SS-9	SS-10	SS-11	SS-12	SS-13
Date Collected	03/01/06	03/01/06	03/01/06	03/01/06	03/01/06	03/01/06	03/01/06	03/01/06	03/01/06	03/01/06	03/01/06
Analysis Date	03/06/06	03/06/06	03/06/06	03/06/06	03/07/06	03/06/06	03/07/06	03/07/06	03/07/06	03/07/06	03/07/06
Dilution Factor	0.93	29.83	0.93	0.93	13.14	614.36	0.93	0.93	0.93	0.93	6.04
Units	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3
Parameter											
Acetone	30	ND	16	20	940	ND	110	25	26	27	ND
Benzene	1.2	ND	3.4	ND	120	34000	83	1	1.8	1.1	ND
2-Butanone (MEK)	3.7	ND	4.7	3.1	46	ND	15	6.2	5.4	6.2	ND
Carbon disulfide	8.3	ND	ND	ND	63	ND	19	ND	ND	ND	ND
Carbon tetrachloride	ND	ND	1.3	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	1.5	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	0.8	ND	ND	ND	5.3
Chloroform	ND	98	10	4.1	ND	ND	ND	1.9	13	50	15
Cyclohexane	ND	ND	ND	ND	ND	ND	46	ND	ND	ND	ND
Dichlorodifluoromethane	2.7	ND	3.3	3.2	ND	ND	2.1	3.1	2.8	3.2	ND
1,1-Dichloroethane	ND	3400	43	ND	19	1800	1.3	ND	ND	22	750
1,2-Dichloroethane	1.2	50	0.82	ND	ND	4400	0.94	ND	ND	ND	32
cis-1,2-Dichloroethene	ND	ND	ND	ND	ND	2400	0.99	ND	ND	1.3	430
trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	42
1,1-Dichloroethene	ND	70	ND	ND	ND	490	ND	ND	ND	ND	22
Ethylbenzene	ND	ND	ND	ND	ND	1400	0.89	1.1	0.85	ND	ND
n-Heptane	ND	ND	ND	ND	ND	ND	19	ND	ND	ND	ND
n-Hexane	ND	ND	ND	ND	ND	ND	14	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	8100	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	ND	ND	ND	ND	ND	ND	24	ND	ND	ND	ND
Methyl tert-butyl ether	ND	ND	ND	ND	ND	ND	11	ND	ND	ND	ND
Tetrachloroethene	ND	ND	1.3	ND	ND	ND	ND	ND	ND	4.3	9.2
Toluene	7.9	ND	1.1	ND	330	25000	9.5	8.6	15	6.4	6.8
1,1,1-Trichloroethane	ND	880	49	1.9	39	ND	ND	ND	1.6	11	57
Trichloroethene	ND	ND	ND	ND	ND	2400	ND	ND	ND	62	65
Trichlorofluoromethane	1.2	ND	1.5	1.6	ND	ND	ND	ND	1.5	1.8	ND
1,2,4-Trimethylbenzene	ND	ND	ND	ND	ND	ND	1.5	1.1	ND	1.1	ND
2,2,4-Trimethylpentane	ND	ND	ND	ND	ND	ND	52	ND	ND	ND	ND
Vinyl chloride	ND	85	ND	ND	ND	20000	28	ND	ND	ND	ND
m-Xylene & p-Xylene	2	ND	1.8	ND	17	2600	2.8	3.7	2.5	2.1	ND
o-Xylene	ND	ND	ND	ND	ND	690	1	1.2	0.81	ND	ND

APPENDIX D

Laboratory Analytical Results