Results you can rely on

SITE INVESTIGATION REPORT

198 Douglass Street, Brooklyn, New York

PREPARED BY

TRC ENVIRONMENTAL CORPORATION
WINDSOR, CONNECTICUT

JUNE 2012

TABLE OF CONTENTS

SECTION PAGE

TABLE OF CONTENTS (continued)

SECTION PAGE

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

1.1 Overview

TRC Environmental Corporation (TRC) was retained by current and former owners of the property located at 198 Douglass Street in Brooklyn, New York (the site) to conduct an environmental investigation in response to a request by the New York State Department of Environmental Conservation (NYSDEC) in a letter dated October 25, 2011.

1.2 Organization

This report is organized as follows. This section of the report presents the introductory information, including the project background and objectives. Section 2 presents background information on the site and previous site investigations. Section 3 describes the activities that were included in the site investigation. Section 4 presents the results of the site investigations. An interpretation of the data and conclusions based on current and historical analytical data, site-specific observations and environmental data for other environmental investigations in the surrounding area are presented in Section 5 of the report, followed by a list of references in Section 6.

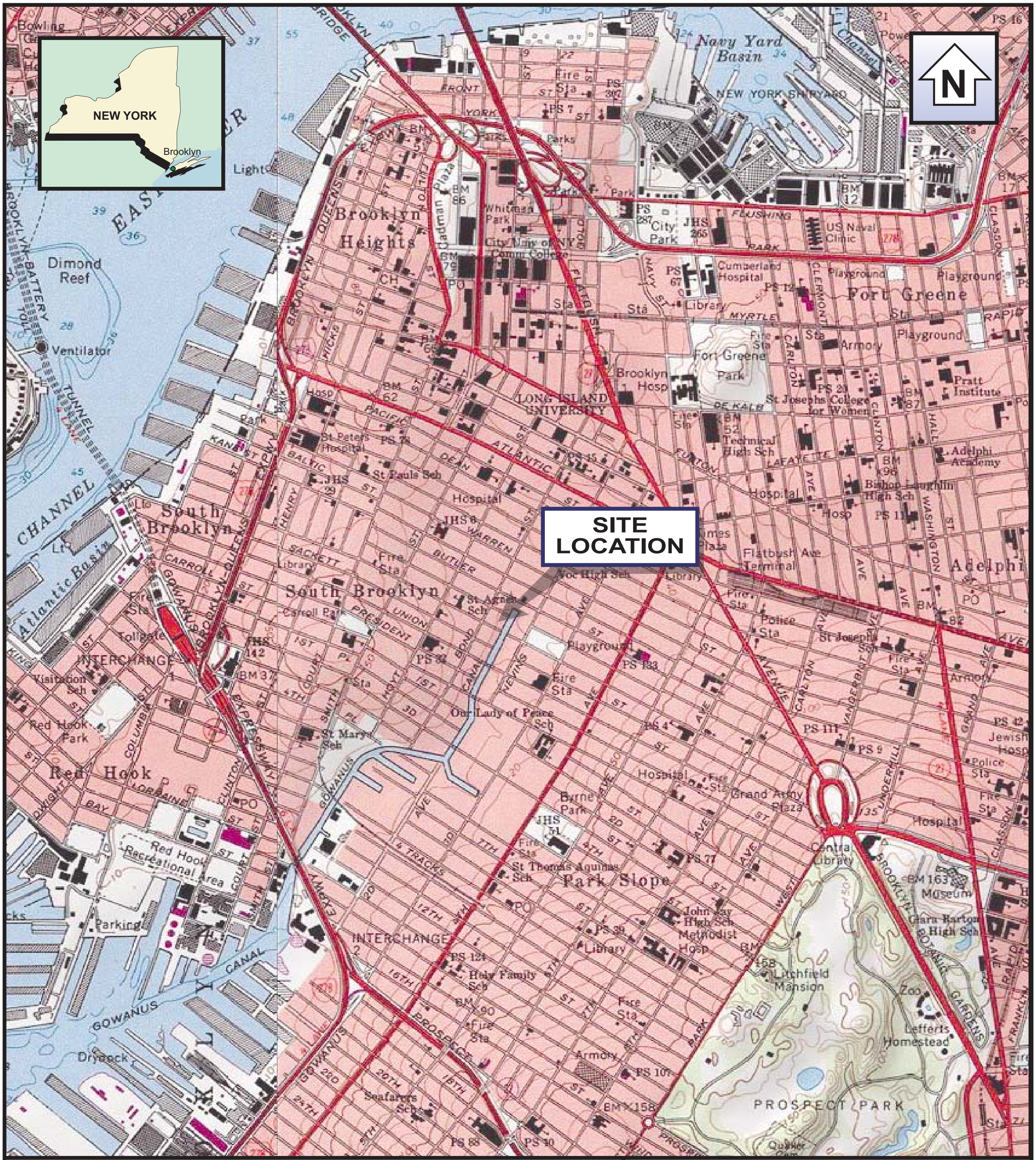
2.0 SITE BACKGROUND

2.1 Site Location and Description

The subject site at 198 Douglass Street in Brooklyn, New York consists of a 0.18-acre lot, with 78 feet of frontage on Douglass Street and a depth of 100 feet. The lot is entirely occupied by a one-story warehouse building currently used for the storage of art and antique goods and furniture. The building is not occupied on a daily basis; it is typically accessed by the property managers as needed for routine maintenance and the management of stored items. Surrounding land use is mixed, including commercial, industrial and residential properties. The site is located just northwest of the Gowanus Canal, near the canal's northern terminus, as shown in Figure 2-1.

2.2 History of Site and Surrounding Area

In preparing the following historical summary of the site and surrounding area, TRC relied on the 1998 AA Services LLC Environmental Assessment (AA Services, 1998) and the



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BASE CREATED WITH TOPO™ © 1996 WILDFLOWERS PRODUCTIONS, www.topo.com
7.5' USGS TOPOGRAPHIC MAP

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198 DOUGLASS STREET
BROOKLYN, NEW YORK

FIGURE 2-1
SITE LOCATION MAP

Date: 02/12 **Project No.** 191185.0001.0000

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2009 AMEC Earth & Environmental, Inc. (AMEC) Historical Review Report (AMEC, 2009a). Both of these documents included public records searches. Therefore, a combined description of the findings of the two reports relative to site history is presented here.

Prior use of the site was identified based on a review of Sanborn Fire Insurance (Sanborn) maps. The site was historically occupied by the following:

- P.G. Hughes, a lime, brick and lath storage yard, in 1896.
- Castle Brothers Cement in 1904.
- Knickerbocker Ice Company and an automobile garage in 1938 and 1950 (a gasoline UST is noted on the 1950 Sanborn map under the northeast corner of the building, as indicated in Figure 2-2).
- O.Z. Electrical Manufacturing Co. in 1969 and on maps from 1977 through 1986 (the gasoline UST is no longer noted on the 1969 Sanborn map).
- While not indicated on the Sanborn maps, at the time of the 1998 AA Services report, the site was occupied by Paramount Plumbing.

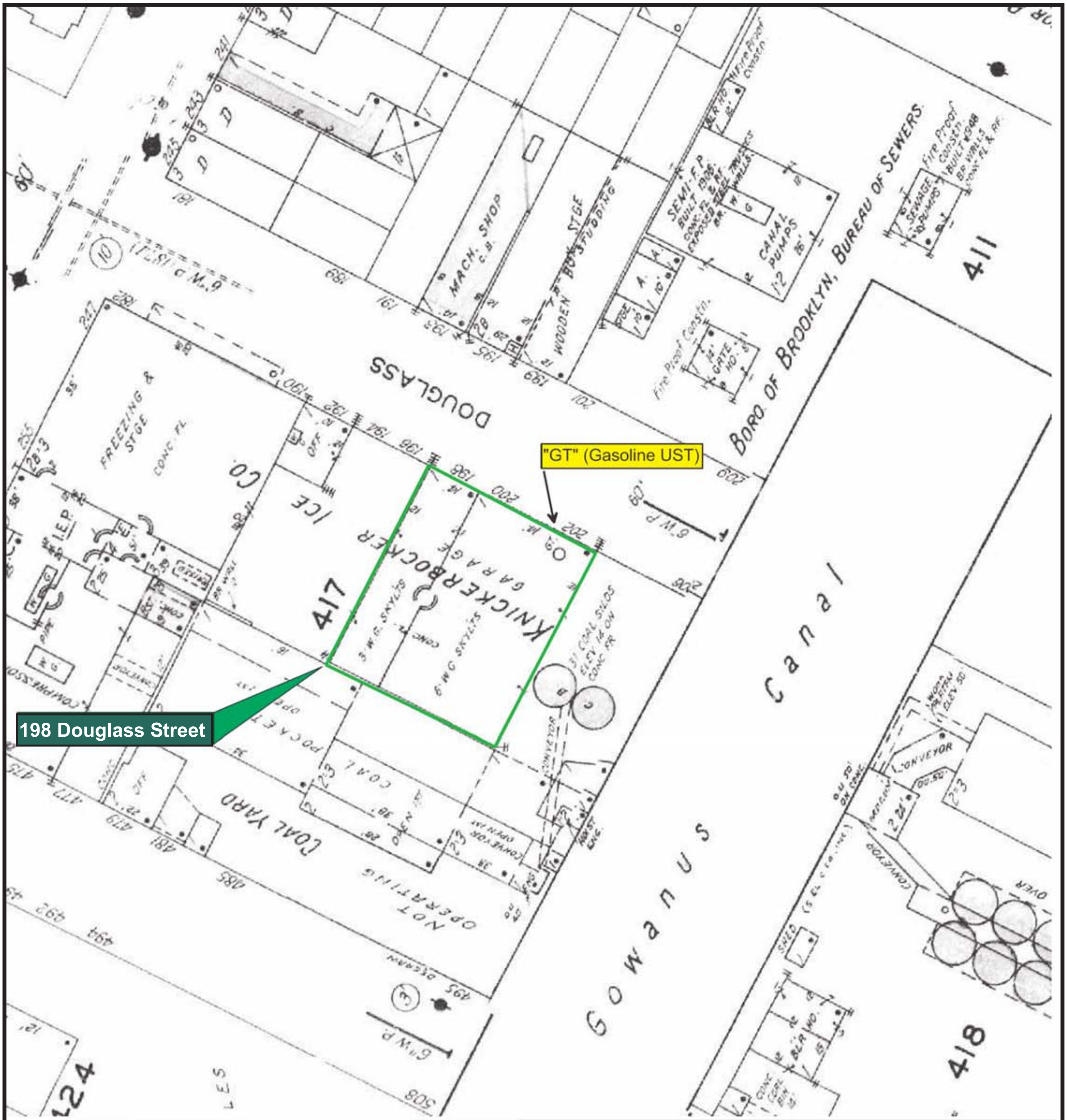
New York City Department of Water records indicate that O.Z. Electrical Manufacturing conducted bakelite moulding and machine shop operations at the site, with no known degreaser operations.

Surrounding land uses, historic and current, identified on the basis of the Sanborn maps include lumber and coal yards, a manufactured gas plant (on the east side of the canal), the Gowanus Pump Station (adjacent to the site to the northeast), electrical manufacturing, machine shops, woodworking shops, printing businesses, plastics manufacturing, warehouse and trucking operations, and a sanitation truck repair facility. A metal working operation was located within the building at 193 Douglass Street, located north of the site, in 1969. The locations of the closest sites are indicated on a 1969 Sanborn map in Figure 2-3.

The site is located approximately 50 feet from the Gowanus Canal, a 1.5-mile waterway that connects to the Upper New York Bay to the southeast. The resultant industrial nature of the surrounding land use has resulted in poor water and quality along the length of the canal.

The public information searches (AA Services, 1998 and AMEC, 2009a) identified the presence of numerous sites in the vicinity of the subject site that have records recorded in various environmental databases. Databases that included sites located near the subject site include:

- CERCLIS;
- RCRA corrective action;



0 60 120
Approximate Scale (feet)

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SOURCE:
Environmental Data Resources, Inc.
Certified Sanborn Map Report
1950 Sanborn Fire Insurance Map
Report # 2425640.3
February 23, 2009

Base map derrived from AMEC Historical Review and Assessment Figure 1

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FIGURE 2-2

GASOLINE UST LOCATION

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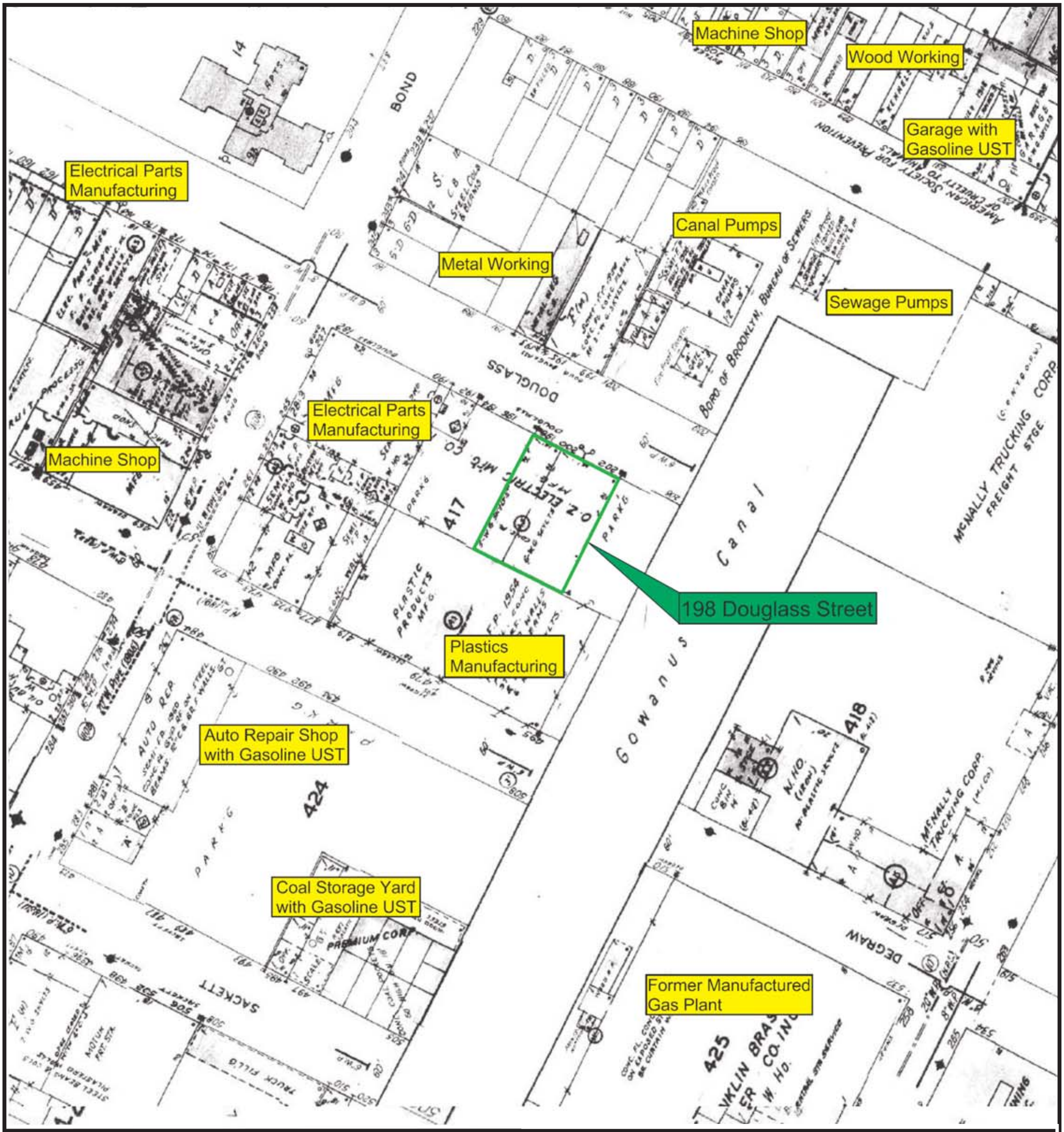

0 100 200
Approximate Scale (feet)

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SOURCE:
Environmental Data Resources, Inc.
Certified Sanborn Map Report
1969 Sanborn Fire Insurance Map
Report # 2425640.3
February 23, 2009

Base map derrived from AMEC Historical Review and Assessment Figure 2

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FIGURE 2-3

HISTORICAL LAND USE AREA

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- Large and small quantity RCRA generators;
- State hazardous waste sites;
- Solid waste facilities;
- Leaking storage tank (both aboveground and belowground) (LTANK) sites;
- Leaking storage tanks (both aboveground and below ground) (HIST LTANK) sites (based on NYSDEC's old tank database);
- Registered underground storage tank (UST) sites;
- Major oil storage facility (MOSF) and MOSF UST sites;
- Petroleum aboveground storage tank (AST) sites;
- Chemical bulk storage AST sites;
- Brownfields sites;
- Recycling facility sites;
- Inactive state hazardous waste sites;
- Historic UST sites;
- Reported emergency release/spill sites;
- Historic spill sites;
- Historic waste generators;
- Sites that used manifests for tracking waste shipments; and
- Manufactured gas plant locations.

One public record pertaining to the subject site itself was identified: a 2006 spill report that was made subsequent to a subsurface investigation that is described in Section 2.3.1.

Included on the list of emergency release/spill sites are multiple reports of off-site spills/releases, including at the New York City Department of Environmental Protection (NYCDEP) Gowanus Pump Station at 201 Douglass Street, located to the northeast, immediately across the street from the subject site. The reported off-site spills at the pump station site were typically associated with releases of raw sewage due to equipment failures; however, one spill was reported in May 1996 that involved diesel fuel. Polycyclic aromatic hydrocarbons (PAHs) were detected in soil in investigations that followed the 1996 spill but were attributed to the subsurface historic fill material. Available information indicates that four monitoring wells were installed at the NYCDEP pump station site and methyl tertiary-butyl ether (MTBE) was detected in the groundwater, with remediation through natural attenuation. A monitoring report submitted in late September 2005 reported MTBE levels in one well that ranged from 9 to 44 ppb, with the spill case closed and a No Further Action (NFA) letter issued by NYSDEC in November 2005.

In addition to past industrial operations at adjacent properties and in the immediate vicinity of the site, the 2009 AMEC report identified the following other off-site area of environmental concern:

- An open spill case approximately 333 feet northwest (assumed upgradient) of the site, at the Gowanus Housing Complex property at 238 Bond Street. Testing of a UST indicated tank failure. Corrective actions were implemented and the tank was retested. No further actions were implemented. NYSDEC recommended further investigation of soil and groundwater conditions. As of the 2009 AMEC report, it was not known whether further investigations had been conducted.

Two other sites of interest not discussed in the 2009 AMEC report are worth noting. The USEPA has also listed the entire length of the Gowanus Canal as a Superfund site in 2010. An RI Report (HDR, et al., 2011) and Draft Feasibility Study (CH2M Hill, 2011) have been prepared for the Gowanus Canal site. Monitoring wells have been installed along both sides of the length of the canal, as shown in Figure 2-4. The RI studies have indicated that the most densely contaminated upland parcels along the canal are those associated with former coal gasification operations at three manufactured gas plants (MGPs) located approximately 400 feet southeast of the site, 2,700 feet southwest of the site and 4,200 feet south-southwest of the site.

The Fulton Municipal MGP site is the closest MPG, located between Douglass Street and Sackett Street, to the southeast of the site and on the eastern side of the canal. RI field work at the former Fulton Municipal MGP site is being conducted by National Grid under a NYSDEC-approved Remedial Investigation Work Plan (RIWP). According to a website maintained by National Grid (http://www.fultonmgpsite.com/ index.html), the field activities associated with the RIWP and RIWP Addendum scopes of work were completed as of late May 2011 and an RI report was being prepared. Soil borings and monitoring wells have been installed on the western side of the canal, as shown on Figure 2-5. While no specific analytical data is available on the website, the Interim Remedial Measure Pre-Design Investigation Work Plan (GEI, 2012) generally states that shallow monitoring wells located west of the Gowanus Canal exhibited benzene/toluene/ethylbenzene/xylene (BTEX) compounds and concentrations of MTBE, tricihloroethene (TCE) and tetrachloroethene (PCE) above NYS ambient water quality criteria. Wells screened at an intermediate depth exhibited BTEX compounds and concentrations of other VOCs above ambient water quality standards. Tar was encountered in one intermediate well (FS-MW-22I) located along Degraw Street 100 feet southeast of 198 Douglass Street. As noted on Figure 2-5, additional borings are proposed for the property that is located between 198 Douglass Street and the canal.

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FIGURE 2-4
GOWANUS CANAL REMEDIAL INVESTIGATION GROUNDWATER MONITORING WELL LOCATIONS

Base map derrived from CH2MHILL Figure 2-11 Gowanus Canal Remedial Investigation Groundwater Monitoring Well Locations

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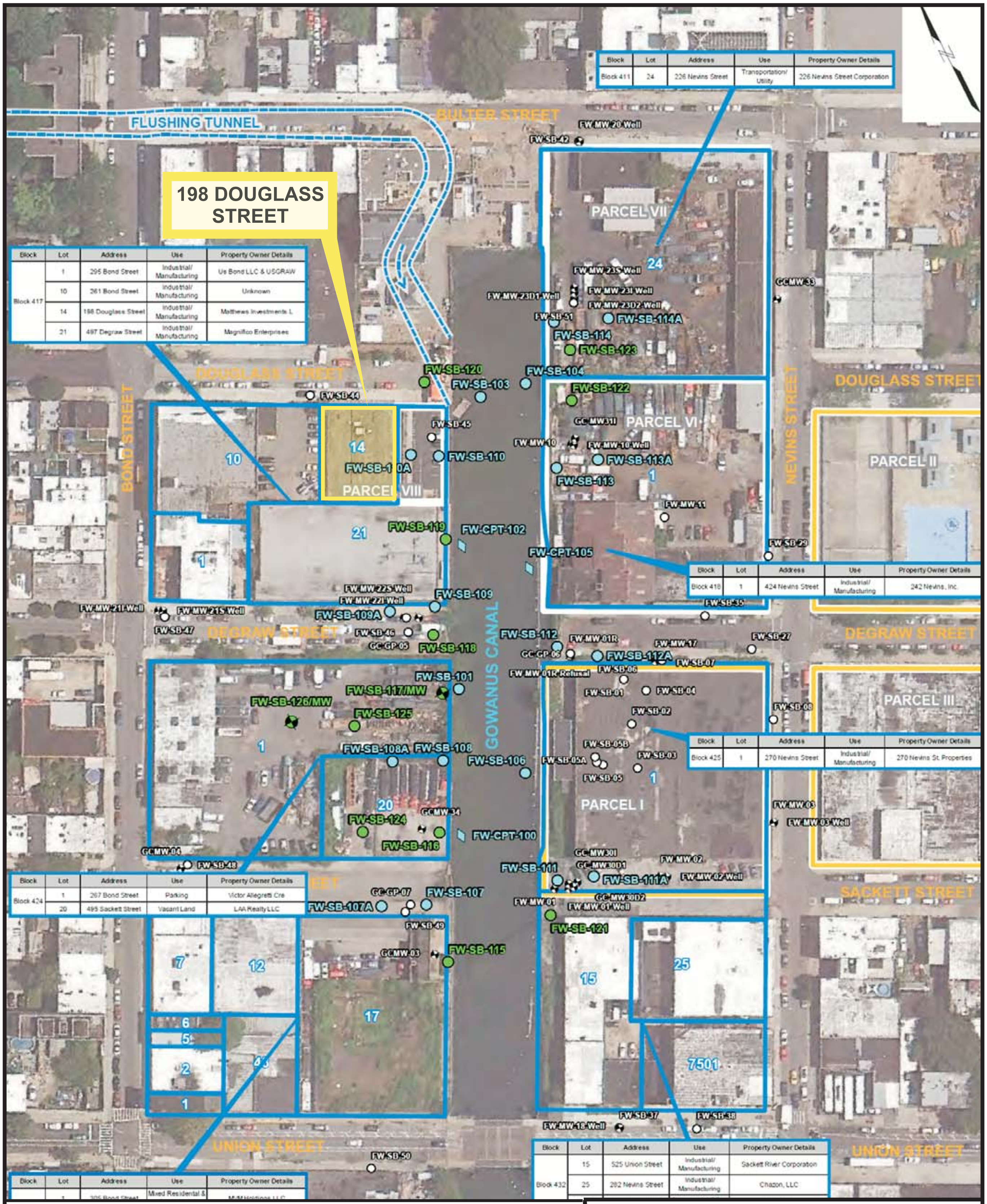

Block	Lot	Address	Use	Property Owner Details
Block 411	24	226 Nevins Street	Transportation/ Utility	226 Nevins Street Corporation

Block	Lot	Address	Use	Property Owner Details
Block 417	1	295 Bond Street	Industrial/ Manufacturing	Us Bond LLC & USGRAW
	10	261 Bond Street	Industrial/ Manufacturing	Unknown
	14	198 Douglass Street	Industrial/ Manufacturing	Matthews Investments L
	21	497 Degraw Street	Industrial/ Manufacturing	Magnifico Enterprises

Block	Lot	Address	Use	Property Owner Details
Block 418	1	424 Nevins Street	Industrial/ Manufacturing	242 Nevins, Inc.

Block	Lot	Address	Use	Property Owner Details
Block 425	1	270 Nevins Street	Industrial/ Manufacturing	270 Nevins St. Properties

Block	Lot	Address	Use	Property Owner Details
Block 424	1	267 Bond Street	Parking	Victor Allegretti Cre
	20	495 Sackett Street	Vacant Land	LAA Realty LLC

Block	Lot	Address	Use	Property Owner Details
Block 432	15	525 Union Street	Industrial/ Manufacturing	Sackett River Corporation
	25	282 Nevins Street	Industrial/ Manufacturing	Chazon, LLC

Block	Lot	Address	Use	Property Owner Details

LEGEND

●	CHARACTERIZATION BORING
⊕	MONITORING WELL
●	GEOTECHNICAL BORING
◊	CONE PENETRATION TEST
○	EXISTING BORING
⊕	EXISTING MONITORING WELL
▭	PROPERTY BOUNDARIES
▭	REMEDIAL INVESTIGATION PARCELS
▬	FORMER SITE BOUNDARY

Source: Final IRM Pre-Design Investigation Work Plan Fulton Municipal Works Former MGP, GEI Consultants, March 2012.

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FIGURE 2-5
FULTON MGP SITE STUDY LOCATIONS

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2.3 Previous Site-Related Environmental Investigations

Previous site-related environmental investigations include sampling conducted at the site in 2006 by AMEC and subsequent off-site sampling conducted by AMEC in 2009. These studies are further described below.

2.3.1 2006 AMEC Subsurface Environmental Investigation

In 2006, mini-piles were installed within the warehouse at the site to support a vertical expansion of the building structure. Following the observation of odors during this effort, AMEC collected a soil and groundwater sample from beneath the warehouse. A Geoprobe® hydraulic direct-push soil sampling device was used to collect a soil sample at a depth of 36 to 37 feet below grade (ftbg), based on the highest portable organic vapor photo-ionization detector (PID) soil field screening readings at that depth interval. A groundwater sample was to be collected from the same interval but, due to clogging of the sampling screen with material collapsed from the sides of the boring, the groundwater sample was instead collected from the 24- to 28-foot depth interval. The approximate sample location (SB-1) is shown on Figure 2-6. The soil and groundwater samples were analyzed for Priority Pollutants + 40 additional peaks (PP+40) and total petroleum hydrocarbons (TPH) by Severn Trent Laboratories (STL) Edison. A sheen suggestive of the presence of petroleum was noted in the groundwater sample. Air sampling was also conducted, consisting of the collection of a grab "indoor air sample… within the warehouse using a 6-liter, stainless steel SUMA canister within the boreholes (sic)", as well as air quality measurements taken using a PID and flame ionization detector (FID) within the work area. The air sample was analyzed by an STL Edison affiliate (Burlington, Vermont).

The soil sample, which was collected below the water table, exhibited traces of volatile organic compounds (VOCs), including PCE, ethylbenzene and xylene, but at levels below the applicable guidelines at the time (NYSDEC Technical and Administrative Guidance Memorandum (TAGM) guidelines) and current Soil Cleanup Objectives (SCOs) established at 6 NYCRR 375-6.8 based on unrestricted use, and a TPH level of 219 mg/kg. No pesticides or PCBs were detected. A summary of detected compounds is presented in Table 2-1[1].

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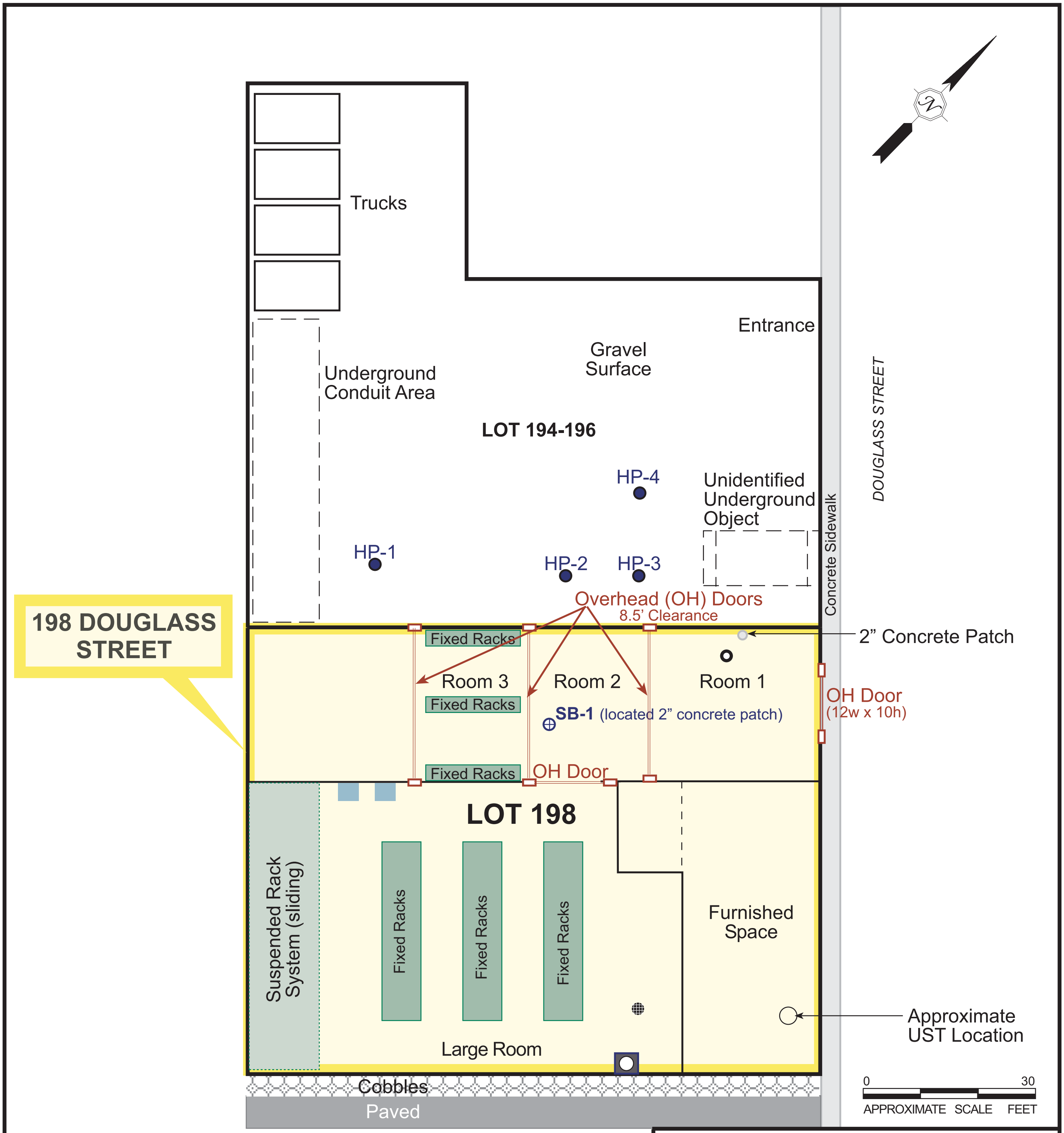
[1] Due to the poor quality of the original document, approximate interpretations of some of the concentrations are presented.



KEY

⊕ (SB-1) 2006 Soil and Groundwater Investigation

● (HP-1 – HP-4) 2009 Off-Site Soil and Groundwater Investigation

🟨 198 Douglass Street Site

NOTE: Ceiling height is 10.5ft

Base map derived from AMEC Figure 5 Soil Boring and Groundwater Sampling Locations and TRC site visit on 3-12-12. Previous sample locations are approximate

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FIGURE 2-6

HISTORICAL SAMPLING LOCATIONS

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Table 2-1
Historical Soil Sample Results
198 Douglass Street
Brooklyn, New York

	2006 On-Site Boring	2009 Off-Site Borings										
Client Sample ID:	**SB-1-36-37**	**HP-1_8-10**	**HP-1_33-35**	**HP-2_8-10**	**HP-2_30-32**	**HP-2_38-40**	**HP-3_9-11**	**HP-3_40-41**	**HP-4_9-11**	**HP-4_30-32**	**HP-4_40-41**	**HP-3_30-32**
Date Sampled:	**6/2/2006**	**2/10/2009**	**2/10/2009**	**2/10/2009**	**2/10/2009**	**2/10/2009**	**2/11/2009**	**2/11/2009**	**2/11/2009**	**2/11/2009**	**2/11/2009**	**2/11/2009**
	mg/kg	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
VOLATILE ORGANIC COMPOUNDS (VOCs)												
EPA Method 8260												
Benzene					0.03							0.0016 J
cis-1,2-Dichloroethene						0.0017 J					0.001 J	
Ethylbenzene	0.048											
Tetrachloroethene	0.0047											
Vinyl chloride						0.0029 J					0.003 J	
Total Xylenes	0.018											
Total Estimated VOC TIC Concentration	4.41				0.088 [1]		375.2	0.3259				0.166 [1]
SEMIVOLATILE ORGANIC COMPOUNDS (SVOCs)	NA											
EPA Method 8270												
Acenaphthene		0.012 J		0.075 J			0.39 J		0.032 J			0.068 J[1]
Acenaphthylene				0.052 J			0.2 J		0.026 J			
Anthracene		0.034 J		0.28 J[1]			0.79 J[1]		0.063 J			
Benzo(a)anthracene		0.093 [1]		0.74			2.4		0.17			
Benzo(a)pyrene		0.076		0.54 [1]			1.6		0.12			
Benzo(b)fluoranthene		0.054		0.46			1.4		0.15			
Benzo(g,h,i)perylene				0.17 J			0.53 J		0.072 J			
Benzo(k)fluoranthene		0.09		0.51			1.4		0.2			
Bis(2-ethyl hexyl)phthalate		0.14 J						0.42	0.18 J[1]	0.12 J	0.12 J	0.1 J
Chrysene		0.098 J[1]		0.65			1.9 [1]		0.2 J			
Dibenzo(a,h)anthracene				0.078 [1]			0.22					
Fluoranthene		0.11 J		1.2			4		0.24 J			
Fluorene		0.022 J		0.12 J			0.51 J					
Indeno(1,2,3-cd)pyrene				0.18			0.58 [1]		0.062 [1]			
Naphthalene		0.051 J		0.082 J								0.31 J
Phenanthrene		0.096 J[1]		1.1			2.8 [1]		0.19 J[1]			
Pyrene		0.13 J		1.4		0.02 J	3.8 [1]		0.27 J			
Total Estimated SVOC TIC Concentration		9.11 [1]		6.2			80.92		9.7	1.59		

Notes:

Data Source: Hard copy tables from AMEC, 2009b. Some values are not legible in the hard copy tables. A best effort has been made to provide representative values. Unclear data are noted in the table with a footnote.

Only detected compounds are listed. A blank cell indicates the analyte was not detected (unless designated at not analyzed - NA).

NA - Not Analyzed

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than zero.

TIC - Tentatively Identified Compound

[1] - Value in original data table is difficult to read. Value presented is a best estimate of the original data value.

The groundwater sample exhibited benzene, PCE, semi-volatile organic compounds (SVOCs) and metals at concentrations above New York State Groundwater Water Quality Standards and Guidance Values (Class GA Values) in the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1, Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. The SVOCs were attributed to petroleum hydrocarbons and the metals were attributed to suspended solids. No pesticides, PCBs, cyanide or phenols were detected. A summary of detected compounds is presented in Table 2-2[2].

The indoor air field screening identified up to 15 ppm VOCs, although no specific description of where the samples were collected was provided in the available information. The grab air sample, which was reported to be collected "from the boreholes", exhibited benzene, PCE, chloroethane, 1,3-butadiene, and methylene chloride concentrations above U.S. Environmental Protection Agency (USEPA) Region 3 ambient air exposure levels based on residential exposure.[3] The levels were reportedly below the Occupational Safety and Health Act (OSHA) permissible exposure limits (PELs) based on 8-hour threshold limit value (TLV) exposure. While this distinction was not made by AMEC in the report, since it appears the grab sample was collected from "within the boreholes", it would not be representative of air quality in the breathing zone.

The AMEC 2006 report concluded that, given the low contaminant concentrations in the soil beneath the groundwater table, the depth of groundwater contamination, and the inferred direction of shallow groundwater flow (to the east, towards the canal), that the groundwater contaminants were likely attributable to an upgradient source.

Information recorded on the NYSDEC spill report form indicates that the contamination detected by the 2006 investigation was reported to NYSDEC on June 26, 2006. In 2008, based on the 2006 AMEC report NYSDEC sought additional investigation due to the soil and groundwater samples not being collected at the groundwater interface, the concentrations observed where the samples were collected, and the air sample results. A work plan for an off-site investigation was submitted by AMEC in May 2008 and NYSDEC responded with additional requirements. Following resolution of off-site access issues for conducting an

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[2] Due to the poor quality of the original document, approximate interpretations of some of the concentrations are presented.

[3] The available copy of the 2006 AMEC report includes text only, the substance of which is repeated here. Tables or lab reports of the actual air sample data were not available for review.

Table 2-2
Historical Groundwater Sample Results
198 Douglass Street
Brooklyn, New York

	2006 On-Site	2009 Off-Site										
Client Sample ID:	**SB-1-GW**	**HP-1_8-10-GW**	**HP-1_31-35-GW**	**HP-2_8-10-GW**	**HP-2_30-32-GW**	**HP-3_9-11-GW**	**HP-3_30-32-GW**	**HP-4_9-13-GW**	**HP-4_30-32-GW**	**FB-02-10-09**	**FB-02-11-09**	**TB-02-09-09**
Date Sampled:	**6/2/2006**	**2/10/2009**	**2/10/2009**	**2/10/2009**	**2/10/2009**	**2/11/2009**	**2/11/2009**	**2/11/2009**	**2/11/2009**	**2/10/2009**	**2/11/2009**	**2/11/2009**
	ug/L	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
VOLATILE ORGANIC COMPOUNDS (VOCs)												
EPA Method 8260												
Benzene	18 [1]				1.6 [1]		1.3 [1]					
Tetrachloroethene	1,600 [1]											
Total Estimated VOC TIC Concentration		17	23		11	483	417 [1]		17	0.6 [1]	7.8 [1]	
SEMIVOLATILE ORGANIC COMPOUNDS (SVOCs)												NA
EPA Method 8270												
Acenaphthene	83 [1]		0.3 J	0.9 J		7.2 J	5.7 J	0.3 J	0.5 J			
Acenaphthylene	21								0.3 J[1]			
Anthracene	52			0.4 J		2.9 J	2.5 J	0.4 J				
Benzo(a)anthracene	75					3.3 J	4.4	0.9 J	0.8 J[1]			
Benzo(a)pyrene	74					1.7 J	2.8 [1]	0.7 J	0.6 J			
Benzo(b)fluoranthene	47					1.3 J	1.9 J	0.5 J[1]	0.5 J			
Benzo(g,h,i)perylene	43						1 J		0.4 J			
Benzo(k)fluoranthene	58 [1]					2.1 J	2.4	0.7 J	0.6 J[1]			
Bis(2-ethyl hexyl)phthalate	13		7.1 J									
Chrysene	76 [1]					2.7 J	3.4 J	0.9 J	0.7 J			
Dibenzo(a,h)anthracene	12											
Diethyl phthalate									7 J			
Fluoranthene	160 [1]		0.3 J	0.7 J		10 J	10 J	1.8 J	1.4 J			
Fluorene	28 [1]			0.5 J		11 J	6.2 J		0.4 J			
Indeno(1,2,3-cd)pyrene	38 [1]						0.4 J					
Naphthalene	120		0.3 J	1.5 J[1]	0.4 J				0.3 J			
Phenanthrene	180 [1]		0.8 J[1]	1.6 J[1]		13 J	10 J	1.8 J[1]	1.6 J[1]			
Pyrene	160 [1]		0.3 J	0.6 J		8.2 J	8.2 J	1.6 J[1]	1.2 J			
Total Estimated SVOC TIC Concentration	2,629		200	11	79	4,050 [1]	2,983 [1]	10	381.6 [1]			

Notes:

Data Source: Hard copy tables from AMEC, 2009b. Some values are not legible in the hard copy tables. A best effort has been made to provide representative values. Unclear data are noted in the table with a footnote.

Only detected compounds are listed. A blank cell indicates the analyte was not detected (unless designated at not analyzed - NA).

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TIC - Tentatively Identified Compound

[1] - Value in original data table is difficult to read. Value presented is a best estimate of the original data value.

investigation of upgradient conditions, an off-site investigation was conducted by AMEC in 2009, as described below.

2.3.2 2009 AMEC Limited Off-Site Investigation

The 2009 investigation focused on the assumed upgradient property at 194-196 Douglass Street, directly adjacent to and northwest of the site. A geophysical survey and limited soil and groundwater investigation were conducted on the adjacent property to determine if an upgradient source could be responsible for the groundwater contaminants detected in the one 2006 on-site groundwater sample collected at a depth of 24 to 28 ftbg. The geophysical survey of lot 194-196 identified several underground utilities and pipes and an unknown buried metal item approximately two feet by six feet in area near Douglass Street at a depth of approximately one ftbg, as shown on Figure 2-4.

Using a Geoprobe, four borings (HP-1 through HP-4) were advanced on the adjacent off-site property to a depth of 41 ftbg at the approximate locations shown in Figure 2-6. Two to three soil samples (typically at the groundwater table, at the point of highest PID readings and at the maximum depth) were collected from each boring for PP VOC and PP SVOC analysis. A visible sheen was noted in one of the borings (HP-3) at 9 to 10 ftbg. An odor of weathered petroleum hydrocarbons was noted in some of the soil samples. The soil samples exhibited trace concentrations of VOCs below TAGM screening levels and SVOCs (five PAHs) above TAGM screening levels in the shallow 8- to 11-foot-deep samples within or immediately below the fill layer. A summary of detected compounds is presented in Table 2-1.

Two groundwater samples were collected at each boring location using a Hydropunch sampler. The samples were collected at depths of 8 to 11 ftbg and at the highest PID reading depth, which ranged from 30 to 34 ftbg. The groundwater samples were submitted for PP VOC and PP SVOC analysis. Dissolved benzene was detected slightly above groundwater standards at HP-2 (30 to 32 ftbg) and HP-3 (30 to 32 ftbg). A variety of SVOCs were also detected above groundwater standards. No chlorinated solvents were detected. The concentrations of constituents detected in the off-site groundwater investigation were generally one to two orders of magnitude less than the 2006 AMEC site investigation results from the single on-site groundwater sample. A summary of detected compounds is presented in Table 2-2.

2.4 Geologic and Hydrogeologic Setting

2.4.1 Site Geology

Site-specific geologic information is provided by the results of the 2006 and 2009 investigations (AMEC, 2006 and AMEC, 2009b). The soil boring advanced during the 2006 site investigation provided information on site-specific geology that is generally consistent with documented regional geology presented in Section 2.4.2. Fill consisting of sand, silt, clay, gravel, and construction/demolition debris (concrete, brick, rock fragments, and wood) was encountered to a depth of 10 ftbg. Beneath the fill material, alluvium deposits consisting of a sequence of interbedded silty clay, sand, and peat layers was encountered to a depth of 36 ftbg. Below this interval, glacial deposits consisting of a sequence of brown fine- to coarse-grained sand was noted to a depth of 48 feet, at which point refusal was encountered. The geology of the subsurface materials encountered in the 2009 off-site investigation was similar to that observed in the 2006 investigation, with fill material encountered to a depth of 10 ftbg, interbedded silty clay, sand and peat layers encountered from 10 to 36 ftbg, brown fine- to coarse-grained sand from 36 to 38 ftbg, and red fine- to coarse-grained sand from 38 to 41 ftbg.

2.4.2 Regional Geology

Regional information on the geologic and hydrogeologic setting of the site is provided by the Draft Gowanus Canal Remedial Investigation (RI) Report (HDR, et al., 2011), which describes regional geology and hydrogeology based on numerous monitoring wells installed during the RI along both sides of the length of the canal.

The following geologic units (in order of increasing depth and age) are present in the local area:

- Fill
- Alluvial/marsh deposits
- Glacial sands and silts
- Bedrock

The thicknesses of the various units vary with location.

The area was originally marshland, with fill materials brought in during construction of the Gowanus Canal and for subsequent area development. The fill layer generally is 5 to 15 feet thick and consists of silts, sands, and gravels mixed with fragments of brick, metal, glass, concrete, wood, and other debris. Alluvial/marsh deposits lie below the fill and are composed of sands (alluvial deposits from flowing water bodies), peat, organic silts, and clays (marsh deposits). These alluvial/marsh deposits are associated with the original wetlands that were present when the area was first settled. The alluvial deposits are typically 10 to 45 feet thick.

A thick sequence of glacial deposits occurs below the alluvial/marsh deposits. The full thickness of the glacial deposits, which were composed mostly of coarser-grained sediments (sands and gravel) with occasional beds of silt, was not determined during the Gowanus Canal RI. These glacial sands, silts, and gravel were deposited as glacial ice melted during the retreat of the last ice age. At the base of the glacial sequence lies a layer of dense clay.

Weathered and competent bedrock underlies the glacial deposits. The bedrock consists of a medium- to coarse-grained metamorphic rock known as the Fordham Gneiss.

2.4.3 Site Hydrogeology

During the 2006 AMEC site investigation, groundwater was encountered near the bottom of the fill material, at a depth of approximately 9 ftbg. In the 2009 AMEC investigation, groundwater was encountered at 8 to 11 ftbg. These water table depth variations at the site are likely the result of documented nearby Gowanus Canal temporal tidal impacts and seasonal precipitation fluctuations. Because groundwater monitoring wells were not previously installed on the site, no information on groundwater flow direction or other hydrogeological data were obtained from the 2006 and 2009 investigations.

2.4.4 Regional Hydrogeology

The Gowanus Canal RI included characterization of shallow (15 ftbg) and intermediate (35 to 45 ftbg) groundwater via monitoring wells located along both sides of the Gowanus Canal, including wells located to the northeast (MW-1 and MW-2) and southwest (MW-3, MW-4 and MW-34) of the subject 198 Douglass Street site (see Figure 2-4). Based on the reported groundwater elevations, shallow groundwater flows towards the canal both at low and at high tide. Intermediate groundwater generally flows upward toward the canal. Vertical gradients were observed to be upwards immediately adjacent to (within 150 feet of) the canal. Variations of three to four feet in groundwater elevation attributable to tidal oscillations were measured in both shallow and intermediate wells. Based on water chemistry measurements in surface water and groundwater, it was concluded that infiltration from the canal controls water quality in shallow wells adjacent to the canal, with decreasing influence with distance from the canal. The study concluded that Gowanus Canal water influences water quality in the shallow fill/alluvium to a greater degree than water in the intermediate glacial deposits does. Overall, the combined results of tidal and groundwater-surface water chemistry studies indicate that shallow groundwater (within the fill/alluvium) and intermediate groundwater (in the deeper glacial deposits) flow generally towards the Gowanus Canal, although the flow pattern appears to reverse locally and with temporal regularity.

Groundwater in the vicinity of the site is classified by NYSDEC as GA. The GA classification indicates waters that could be used as a source of potable water supply.

2.4.5 Site-Specific Hydrology

Given that the entire site is covered by the existing building, site-specific hydrology is limited to the management of rainfall from the building roof. Stormwater drainage in the area is to a combined sewer system.

2.4.6 Regional Hydrology

The site is located approximately 50 feet from and northwest of the Gowanus Canal. The canal is a tidal waterbody and is assigned an SD surface water classification (6 NYCRR 890.6 Table 1). Class SD surface waters are most suitable for fishing. They are not suitable for primary or secondary contact recreation. While the surface water classification indicates a suitability for fishing, the USEPA recommends that no one should eat any fish or crabs from the Gowanus Canal[4].

The Gowanus Canal is the receiving body for a six-square mile watershed area. The Gowanus Canal flushing tunnel conveys aerated water from Buttermilk Channel to the head of the canal, discharging just to the northeast of the subject site, as shown on Figure 2-4.

3.0 APRIL-MAY 2012 SITE INVESTIGATION

Investigations of the 198 Douglass Street site were conducted in late April and early May 2012, as described below.

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[4] http://www.epa.gov/Region2/superfund/npl/gowanus/pdf/gowanus_colorcoding-041212.pdf

3.1 Approach

This investigation was designed to address concerns relative to the quality of the historic site-specific groundwater and air data and to obtain current air, soil and groundwater quality data. Specifically, the 2006 groundwater sample was collected from a collapsed borehole and apparently was silty based on the attribution of elevated metals levels to suspended solids in the sample. Therefore, based both on how the 2006 groundwater sample was collected, and the fact that there was only one sample collected, use of the 2006 groundwater data as representative of groundwater conditions at the site is questionable. With respect to the air data, the air grab sample was described as being collected within the borehole, which would not make it representative of indoor air. The PID and FID organic vapor field readings that accompanied the grab air sample did not provide quantitative data relative to indoor air quality, and attachments to the 2006 AMEC site investigation report were not available.

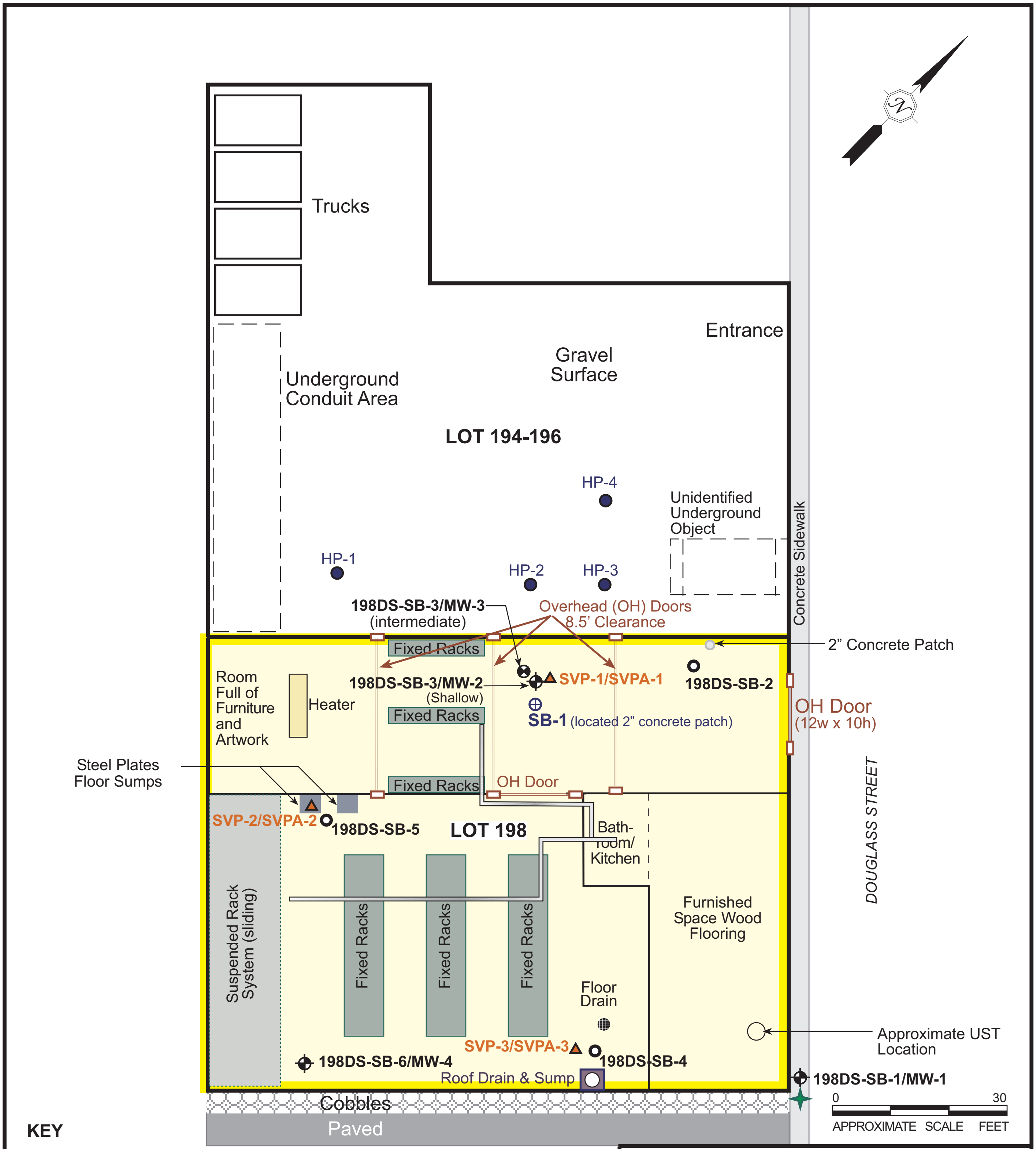
To address these concerns, TRC collected soil quality, groundwater quality and soil vapor data to assess the presence of site-related contamination, if any. The investigation focused on VOCs, as other constituents detected in the 2006 study were attributed to the silty nature of the groundwater sample (e.g., metals) or regional groundwater impacts (e.g., PAHs). The TRC investigation also focused on the 2006 sample location, SB-1, as well as the historic on-site gasoline UST location and other site features considered to be potential sources of, or conduits for, the migration of environmental contaminants. Specifically, TRC collected additional VOC groundwater data at an intermediate depth at 2006 sample location SB-1 to further assess the original 2006 groundwater sample results. TRC also characterized shallow soil and groundwater quality with respect to VOCs at the 2006 SB-1 location, in the vicinity of the historic gasoline UST, and at a third assumed downgradient location within the building. Monitoring wells were installed for the collection of groundwater samples to provide reliable groundwater elevation and water quality data. In addition, TRC collected shallow soil samples at three other locations identified on the basis of visual observations and PID readings. The intent of the shallow soil sampling effort was to characterize vadose zone soils and identify any contaminants that could be attributed to the site rather than to the potential impacts of regionally degraded groundwater. TRC also collected sub-slab soil vapor, indoor air and ambient air samples for quantitative analysis.

Based on a site reconnaissance conducted by TRC on March 12, 2012, preliminary investigation locations were evaluated with respect to access issues. The area in which the UST was noted in the 1950 Sanborn map is now a finished interior space with wooden floors. Therefore, an adjacent exterior location was selected for the subsurface investigation of the historic UST. The presumed location of the 2006 soil boring SB-1 was identified based on a figure of the boring location provided in a previous report (AMEC, 2009b) and an observed concrete patch in the floor at that location. A roof drain sump and floor drain were identified in the southeastern portion of the interior space. Two steel plates were also identified in the floor in the western portion of the interior. These two areas were targeted for the collection of soil samples. The subsurface soil vapor locations were selected to coincide with the 2006 SB-1 location, and to characterize the floor drain and steel plate areas. The specific steps conducted to accomplish these investigations are described below.

3.2 Utility Clearance

On April 30, 2012, under contract to TRC, Nova Geophysical Services (Nova) performed a utility survey of the interior portions of the building and the exterior portion along Douglass Street. The survey primarily focused on the proposed investigation areas, but also included the general footprint of the building. Nova utilized a ground penetrating radar (MALA's GPR with 350 MHz antenna) and electromagnetic conductance (Ditch Witch multi-channel EM TW-6 Pipe and Cable Locator) in the execution of the utility clearance.

The results of the utility clearance impacted a few proposed investigation locations, namely the exterior boring/monitoring well near the reported historic UST location and the shallow and intermediate boring and monitoring well locations and sub-slab soil vapor location that were to be located in the approximate vicinity of the 2006 SB-1 boring. The exterior boring location near the northeastern corner of 198 Douglass Street was off-set to the northwest by approximately five feet (closer to the general location shown on the 1950 Sanborn map) to clear a sewer line that was identified in the area. The shallow and intermediate borings and sub-slab soil vapor location in the vicinity of the 2006 SB-1 boring were adjusted to the west by several feet to clear an extensive concrete structure that was identified by the GPR. The survey found no other obstructions at the proposed sampling locations. The adjusted final sampling and monitoring well locations are shown on Figure 3-1.



KEY

- ⊕ (SB-1) 2006 Soil and Groundwater Investigation
- ● (HP-1 – HP-4) 2009 Off-Site Soil and Groundwater Investigation
- ⊕ Shallow Monitoring Well and Soil Sample Location
- ⊗ Intermediate Monitoring Well Location
- ○ Vadose Zone Soil Sample Location
- ▲ Sub-Slab and Indoor Air Monitoring Location
- ▭ Venting
- ✦ Exterior Ambient Air Sample Location
- 🟨 198 Douglass Street Site

NOTE: Ceiling height is 10.5ft

Base map derived from AMEC Figure 5 Soil Boring and Groundwater Sampling Locations and TRC site visit on 3-12-12. Previous sample locations are approximate

TRC
21 Griffin Road North
Windsor, CT 06095
(860) 298-9692

198 DOUGLASS STREET
BROOKLYN, NEW YORK

FIGURE 3-1
SOIL VAPOR, SOIL SAMPLE AND MONITORING WELL LOCATIONS

Date: 05/12 | **Project No.** 191185.0000.000000

PERS/JWALESZCZYK/HAZ/191185 Brooklyn NY REVISED 5-15-2012.FH10

Nova also noted that a sub-slab pipe runs parallel to the southeastern wall and connects with the sump where the floor drain and roof drain connect. Additionally, the two steel floor plates located in the southwestern corner of the larger warehouse room were inspected and found to be shallow sumps (approximately 12 inches deep) with concrete sides and bottom. There were no drainage pipes visible into or out of the sumps.

3.3 Sub-slab Soil Vapor Sampling/Indoor Air/Exterior Air Sampling

On April 30, 2012, TRC performed soil vapor sampling/indoor air sampling/exterior (ambient) air sampling based on the New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion (NYSDOH Guidance) (NYSDOH, 2006). The sampling included the following:

- Building inspection and chemical inventory;
- Collection and analysis of three sub-slab soil vapor samples located in areas of potential concern identified during TRC's March 12, 2012 site visit. These areas included the vicinity of the original soil boring SB-1 in the section of the building referred as Room No. 2 (see Figure 2-6 for room designations), the area of the two steel floor plates covering floor sumps in the section of the building referred to as the Large Room and the vicinity of the floor drain and roof drain sump in the northeastern corner of the Large Room;
- Collection and analysis of three indoor air samples from the interior of the building adjacent to and simultaneously with the sub-slab vapor samples; and
- The collection and analysis of one ambient air sample along the sidewalk of 198 Douglass Street.

3.3.1 Pre-Sampling Chemical Inventory and Inspection.

On April 30, 2012, in accordance with the NYSDOH Guidance, sample locations and adjacent spaces were inspected and screened with a ppbRAE [part per billion (ppb)-ranged] PID to determine if interfering conditions (e.g., cleaning supplies or petroleum products) were present. The "Indoor Air Quality Questionnaire and Building Inventory" form contained within the NYSDOH Guidance was completed by TRC to document existing building conditions, including any chemicals or petroleum products, and is included in Appendix A.

An initial screening of the building interior with the PID was performed immediately upon entering the building. PID screening was conducted in the various compartmentalized rooms (closed off by overhead doors) of the storage facility. Upon opening an overhead door, the door remained open throughout the screening of the entire building. The first room entered (referred to as Room No. 1, as indicated in Figure 2-6) and directly adjacent to the overhead door leading to the exterior of the building, had an initial screening result of 0.0 ppb prior to opening the overhead door to the next adjoining room (Room No. 2). Positive PID readings ranged from 300 to 400 ppb in Room No. 2 and peaked at 1,000 ppb upon opening the overhead door leading into Room No. 3. Subsequently, the overhead door to the larger storage room (Large Room) was opened and PID readings of 300 to 400 ppb were observed in that room. Figure 3-1 shows the room layout and the screening results are summarized in Table 3-1.

During the initial building inventory and inspection, the storage of chemicals or petroleum products was not identified as a potential source of the measured PID readings in the rooms. In Room No. 1, the air immediately adjacent to a five-gallon pail that contained a household/industrial cleaner spray bottle, a bottle of latex paint additive, and a partially used gallon of antifreeze (all with lids) exhibited a PID reading of 15 ppb. Greater detail of the composition of these items is provided on the Indoor Air Quality Questionnaire included in Appendix A. It is unknown if the off-gassing of products associated with the paintings and furniture pieces stored within the warehouse could be a source of the elevated PID readings, as the warehouse's primary use is for the storage of artwork and antiques and it was not practical to remove all the contents of the warehouse prior to conducting the screening. The floor slabs in general appeared to be without cracks and the joints between slabs were filled with a dark cork-type expansion joint filler.

3.3.2 Collection of 8-Hour Duration Sub-slab Soil Vapor Samples

The sub-slab and indoor air sampling program was performed on April 30, 2012 following the building inspection and chemical inventory. The sampling program was performed using procedures described in the NYSDOH Guidance (NYSDOH, 2006). Three sub-slab soil vapor samples, three adjacent indoor air quality samples, and one exterior ambient air quality sample were collected (a total of seven samples). Samples 198DS-SVP-1 (sub-slab sample) and 198DS-SVPA-1 (adjacent indoor air sample) were located in the vicinity of the 2006 sample location SB-1. Samples 198DS-SVP-2 (sub-slab sample) and 198DS-SVPA-2 (adjacent indoor air sample) were located in the vicinity of the two steel floor plates (floor

Table 3-1
Building Screening for Indoor Air Quality
198 Douglass Street
Brooklyn, New York
April 30, 2012

Location	Time Initial 09:15 (ppb)	11:05 (ppb)	12:10 (ppb)	14:50 (ppb)	19:40 (ppb)	Notes
Exterior	0.0	4.0	0.0	NR	0.0	
Room No. 1	0.0	47.0	19.0	NR	17.0	
Room No. 2	300 - 400	108.0	42.0	34.0	36.0	
Room No. 3	850.0	Closed	Closed	Closed	Closed	Room No. 2 readings spiked at 1,000 ppb upon opening room No. 3
Large Room - Vicinity of SVP-2	300 - 400	151.0	90.0	108.0	130.0	Initial reading results are for the whole room.
Large Room - Vicinity of SVP-3	300 - 400	132.0	73.0	94.0	80.0	
SVP-1		500 - 800	-	-	1,571	Observed a spike of 5,860 ppb during purging.
SVP-2		100 - 200	-	-	115	
SVP-3		708 - 810	-	-	38,600	Observed a spike of 12,100 ppb during purging.
Bucket of Cleaning Materials in Room No. 1					15	

Notes:

Screening conducted with a ppbRae - parts per billion (ppb) photoionization detector (PID)

Room No.1 located in the first bay between the overhead doors entering from Douglass Street along the northwestern potion of the building (see Figure 2-4).

Room No. 2 located between the overhead doors along the northwestern side of the building (adjoining Room No.1) (see Figure 2-4).

Room No.3 located between overhead doors to the southwest of Room No.2 (see Figure 2-4).

Large Room located in the southeast portion of the building (see Figure 2-4).

NR - Not Recorded

sumps) in the Large Room. Sample 198DS-SVP-3 (sub-slab sample) and 198DS-SVPA-3 (adjacent indoor air sample) were located in the vicinity of the floor drain and sump for the floor drain and roof drain in the Large Room. The exterior ambient air sample was located along the sidewalk near the southeastern exterior corner of the building, upwind of the site. The sample locations are provided on Figure 3-1.

Because overhead doors provided the only means of access between the rooms and the only actively-used access to the exterior of the building, all the overhead doors (including the exterior door) remained open during sample collection, with the exception of the overhead door between Room No. 2 and Room No. 3, which was kept closed as no additional investigative activities were planned for that section of the building. As a result, the ambient indoor air PID VOC concentrations were considerably less than the initial screening values by the time the sub-slab soil vapor and concurrent indoor air sampling was initiated. Upon initiation of sub-slab vapor/indoor air sample collection, Room No. 2, where soil vapor point 198DS-SVP-1 (and its associated ambient air grab sample 198DS-SVPA-1) were located, exhibited a background PID reading of 42 ppb and the Large Room, where soil vapor points 198DS-SVP-2 and 198DS-SVP-3 (including the associated ambient air grab samples 198DS-SVPA-2 and 198DS-SVPA-3) were located, exhibited background PID readings of 90 and 73 ppb, as indicated in Table 3-1.

The seven samples were collected utilizing individually-certified clean 6-liter Summa® canisters. Prior to sample collection, each sub-slab soil vapor point was purged utilizing the ppbRAE PID. The measured PID readings in the sub-slab vapor ranged from 100 to 12,100 ppb. The sub-slab vapor point purge PID screening results are included on Table 3-1, along with the building ambient air PID screening results.

Upon opening the valves on the Summa® canisters, the initial vacuum (inches of mercury) reading was recorded. In addition, the final vacuum reading was recorded following the completion of the eight hour sample. The vacuum readings are summarized on Table 3-2. Since the building is not continuously occupied, samples were collected for approximately eight hours.

At the completion of the sampling, the Summa canisters were properly labeled and delivered directly by TRC to Con-Test Analytical Laboratory (Con-Test) of East Longmeadow, Massachusetts for analysis. Con-Test is a NYSDOH Environmental Laboratory Approval Program (ELAP) certified analytical laboratory for air quality sample analyses. The air samples

Table 3-2
Summa Canister Vacuum Registry
198 Douglass Street
Brooklyn, New York
April 30, 2012

Sample ID	Canister Vacuum at Start (Inches Hg)	Canister Vacuum at Finish (Inches Hg)	Canister and 8-Hour Regulator ID Nos.
Exterior	-29	-8.8	BC1080/3209
SVP-1	-29	-10.3	BC1258/3243
SVPA-1	-30	-8.4	BC1619/3292
SVP-2	-29	-7.5	BC1346/3244
SVPA-2	-32	-9.8	BC1738/3199
SVP-3	-34	-10.2	BC1054/3089
SVPA-3	-30	-11.2	BC1463/3079

were analyzed for the following VOCs utilizing USEPA Method TO-15: benzene, carbon tetrachloride, chlorobenzene, chloroethane, chloromethane, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, 1,2-dichloroporopane, ethylbenzene, MTBE, methylene chloride, naphthalene, PCE, toluene, 1,1,1-trichloroethane (TCA), TCE, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, vinyl chloride, m&p-xylenes and o-xylene. These VOCs were selected to broadly assess air quality at the site.

Post vapor sample collection sub-slab PID screening was also performed at each of the sample locations, with measured results ranging from 115 to 38,600 ppb (see Table 3-1).

3.4 Soil Boring/Monitoring Well Installation and Soil and Groundwater Sampling

A total of seven soil borings were advanced on the site, with four completed as monitoring wells. The locations of the completed soil borings and monitoring wells are provided on Figure 3-1.

TRC retained Aquifer Drilling and Testing, Inc. (ADT) of Mineola, New York to provide soil boring and monitoring well installation services. The soil boring/monitoring well installation was conducted on May 3 and 4, 2012 under the supervision of TRC personnel. All soil borings were completed utilizing direct-push technologies with a track-mounted GeoProbe® Model 6620DT drill rig.

3.4.1 Soil Sampling and Analysis

Soil cores were collected continuously with five-foot-long, 2-inch diameter Macro-Core® samplers from grade to completed depth, which ranged from six feet below grade (ftbg) to thirty ftbg (with the exception of the boring completed for the installation of the intermediate-depth well, discussed further below). The samplers were fitted with dedicated acetate liners.

Each five-foot soil core was logged with respect to soil characteristics (i.e., grain size, moisture content and any other physical characteristics) and indicators of potential environmental impacts (e.g., stains and odors). In addition, each core was field-screened with a MiniRAE Lite PID equipped with a 10.6 eV lamp. The instrument was calibrated with a known concentration (100 ppm) of isobutylene prior to field screening.

One sample per boring location was collected from the vadose zone soils for laboratory analysis. The samples were selected on the basis of visual impacts and/or field screening results. A representative vadose zone fill material sample was collected where no evidence of contamination was observed. Discrete soil samples were collected with EnCore® sample kits for laboratory analysis for Target Compound List (TCL) VOCs and tentatively identified compounds (TICs) by USEPA Method 8260B.

Upon collection, the EnCore® sample was returned to its individual sealable bag, placed on ice and logged on the chain-of-custody to be submitted to the analytical laboratory. Soil samples were delivered via courier to Accutest Laboratories (Accutest) in Dayton, New Jersey, a NYSDOH ELAP-certified analytical laboratory, under proper chain-of-custody protocol.

A total of nine soil samples were collected, including quality assurance/quality control (QA/QC) samples (blind duplicate and laboratory matrix spike/matrix spike duplicate (MS/MSD samples). Additional QA/QC samples consisting of equipment rinsate blanks (FB050312 and FB050412) were collected each day of soil sampling and were included with the submitted samples. The equipment blanks were collected utilizing laboratory-supplied deionized water and unused Macro-Core® liners.

3.4.2 Soil Sampling Observations and Field Screening

In general, historic fill material consisting of varying amounts of silt, sand and gravel with evidence of coal fragments, ash-like material, slag, and construction and demolition debris (consisting of concrete and/or brick fragments) was observed in the soils recovered from each of the boring locations from grade to depths ranging from 5 to 12 ftbg. The fill material was underlain by soils consisting generally of dense silt with varying amounts of clay, sand and gravel with lenses of peat to depths of approximately 19 to 20 ftbg. A layer of gray fine- to medium-grained sand was encountered beneath the silt layers in the borings that were advanced to depths of approximately 20 feet or greater. The geology was generally comparable to that observed in previous investigations, as described in Section 2.4.1.

Groundwater was encountered at each of the boring locations ranging from 1.5 ftbg (198DS-SB-4) to 7 ftbg (198DS-SB-1). In general, the observed water table in the remaining borings was observed at approximately 3 ftbg. The depth to groundwater, PID readings, and signs of potential contamination (e.g., odors, staining) were used to select sample depths for laboratory testing. Observations associated with each boring are summarized below and presented in more detail in the boring logs in Appendix B.

Degraded petroleum odors were observed in the soils recovered from borings 198DS-SB-1 through 198DS-SB-4 (including both the shallow- and intermediate-depth borings of 198DS-SB-3). In the soils recovered from boring 198DS-SB-1 (the exterior boring located near the reported UST location), petroleum odors were observed from a depth of approximately 3 to 16 ftbg. Soil sample 198DS-SB-1 and a duplicate (198DS-SB-7) were collected from a depth of approximately 5 to 6 ftbg, where a PID reading of 180 ppm was observed. Based on previously documented depth to groundwater and the observed groundwater depth at the time of sample collection, it was thought that the sample was collected from the vadose zone above groundwater.

In the soils recovered from boring 198DS-SB-2 (located in the northern corner of the building, within Room 1), petroleum odors were observed in the soils recovered from 3 to 12 ftbg. Soil sample 198DS-SB-2 was collected from approximately 2 to 3 ftbg (groundwater was observed at 3 ftbg).

In the soils recovered from shallow boring 198DS-SB-3 (located adjacent to 2006 soil boring SB-1), petroleum odors were observed in the soils recovered from 17 to 20 ftbg. A decomposition-like organic odor was observed in the soils recovered from approximately 6 to 17 ftbg. At the intermediate depth boring, 198DS-SB-3, soils were only recovered from 1 to 6 ftbg, 11 to 16 ftbg and 20 to 30 ftbg. A degraded petroleum odor was observed in the soils recovered from 25 to 30 ftbg. Based on initial groundwater observations, a soil sample was collected from the 198DS-SB-3 shallow boring at a depth of approximately 5 to 6 ftbg. As the boring was advanced, however, it became evident that the groundwater was actually shallower, at a depth of approximately 3 ftbg, so the original sample was discarded. A replacement sample 198DS-SB-3 was then collected from the intermediate boring at a depth of approximately 2 to 3 ftbg.

The boring at location 198DS-SB-4, located near the floor drain and roof drain sump, was advanced to 6 ftbg to assess any potential impacts associated with the drain and sump. The soils recovered from this boring exhibited a slight petroleum odor and PID readings of 23 ppm to 63 ppm. Based on field measurements, groundwater in this boring was observed at a depth of 1.5 ftbg. Therefore, soil sample 198DS-SB-4 was collected from approximately 1 foot below grade (just beneath the concrete slab) to 1.5 ftbg. A slight petroleum odor was observed in the soil from which the sample was collected.

Boring 198DS-SB-5, located near the steel plates and associated floor sumps, was also advanced to 6 ftbg to assess any potential impacts associated with the shallow floor sumps. No petroleum odors and minimal PID readings were observed in the recovered soils. Sample 198DS-SB-5 was collected from approximately 1 to 3 ftbg, with the sample collected in triplicate for laboratory QA/QC MS/MSD samples.

Boring 198DS-SB-6, located in the southern corner of the building, was advanced to 16 ftbg. While no petroleum odors and minimal PID readings were observed in the recovered soil, an organic type of odor was observed. Wet soils were observed at a depth of approximately 3 ftbg. Soil sample 198DS-SB-6 was collected from approximately 1 to 3 ftbg.

Excess soils from the soil borings and monitoring well installation were containerized in a 55-gallon drum and secured on-site.

3.4.3 Groundwater Monitoring Well Installation

The four groundwater monitoring wells were installed utilizing the GeoProbe® drill rig equipped with a 3-inch diameter drive point to over-bore the original 2-inch soil boring and allow the installation of a 1.5-inch diameter polyvinyl chloride (PVC) pre-sand-packed well screen and riser casing.

Monitoring wells 198DS-MW-1, 198DS-MW-2, and 198DS-MW-4 were each constructed with 10 feet of 0.01 slot well screen pre-packed with No. 1 sand while well 198DS-MW-3 was constructed with a 5-foot section of pre-packed 0.01 slot screen to coincide with the original 2006 groundwater sample depth at this location. Each of the wells was completed to grade with a solid (threaded) PVC riser. The annular space was filled with clean No. 1 sand to approximately 1-foot above the screen. A bentonite seal consisting of approximately 1 foot of dehydrated bentonite chips was placed above the sand interval and hydrated prior to completing the remainder of the well with additional sand (if needed) and a concrete color and curb box. Each well was fitted with a lockable expansion plug and a 4- or 8-inch flush-mount curb box, with the exception of monitoring well 198DS-MW-4. A 2-inch flush-mount curb box with an expandable cap was utilized for monitoring well 198DS-MW-4 to minimize the disturbance of the concrete slab and limit the generation of concrete dust, given the prevalence of paintings and artwork in the vicinity of the well. Specific well construction details are included on the soil boring/well completion logs included as Appendix B.

The newly installed groundwater monitoring wells were subsequently developed by TRC on May 4, 2012 to remove any fine-grained material that had accumulated at the bottom of the wells and to improve the hydraulic connection between the wells and the surrounding formation. Monitoring wells 198DS-MW-1, 198DS-MW-2 and 198DS-MW-3 were developed utilizing a decontaminated foot-valve and hand pump and were subsequently evacuated with a peristaltic pump with dedicated tubing in order to monitor water quality parameters. As a result of the surge block/foot valve becoming unserviceable during the development of well 198DS-MW-3 (as discussed in Section 3.4.4 below), monitoring well 198DS-MW-4 was developed solely with the peristaltic pump and dedicated tubing.

Purge water was monitored for odor and sheen as well as the water quality parameters of turbidity, pH, conductivity, dissolved oxygen and oxidation/reduction potential (ORP). Development continued at each well until the monitored water quality parameters stabilized. All purge water was transferred to 55-gallon drums and secured on-site.

3.4.4 Monitoring Well Installation and Development Observations

The screen for monitoring well 198DS-MW-1 was set from 5 to 15 ftbg based upon water-saturated soil observations in the soil boring. Upon returning to the well on the following day, however, the groundwater surface was observed at approximately 3.5 ftbg. The water level in the adjacent Gowanus Canal was observed to be higher than on the previous day, indicating that the well is likely influenced by tidal fluctuations. The groundwater surface in the remaining wells was below the top of the screen, as the observed depths of saturated soils at the time of installation were considerably higher in the other borings.

The monitoring wells were all developed as described above. The purge water from all of the wells exhibited some degree of a petroleum-like odor. During the development of well 198DS-MW-3 (the intermediate well located adjacent to the 2006 boring SB-1), the surge block/foot valve was repeatedly fouled with sediment, requiring removal and cleaning. As the development of this well continued, a thick oil-like coating collected on the foot valve and the lower porting of the tubing. This petroleum product ended up rendering the valve useless, as decontamination procedures were unable to remove the residue. Although a petroleum product was observed on the well development equipment, no non-aqueous phase liquid (NAPL) or sheen was observed on the surface of the purge water.

3.4.5 Groundwater Sampling Procedures

Groundwater sampling was performed on May 11, 2012. The headspace inside each curb box was screened with a MiniRAE Lite PID upon opening the cover, followed by screening of the headspace within the well upon removal of the expandable cap. The screening results were recorded in the field log book as well as on Groundwater Sampling Logs, which are provided in Appendix C. Following the headspace readings, the wells were gauged for the presence of NAPL and to determine depth to water utilizing an oil/water interface probe. Additionally, the elevations of the top of the well casing were surveyed by TRC using an available elevation datum for a nearby construction project.

Table 3-3 summarizes the well gauging results from May 11, 2012 and the ground water elevations are included on Figure 3-2. Based on the three data points, the ground water gradient appears to be from the southwest to the northeast. However, as indicated on Figure 3-2, the elevations vary widely across the site (in particular, the ground water elevation differences between 198DS-MW-2 and 198DS-MW-3). These differences are likely the result of tidal influences and local mounding of the water table related to the geological conditions, building foundations, subsurface utilities, and the variations in the screened intervals of these wells.

Collection of groundwater samples from each of the monitoring wells was accomplished in accordance with “Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells” (USEPA, 1996). In particular, low-flow sampling was accomplished utilizing bladder pumps with dedicated polyethylene bladders and tubing, a water level indicator, and a Horiba U-22 multi-parameter water quality meter. Low-flow sampling procedures for each well were as follows:

- The bladder pump was set at the midpoint of the screened interval and the water level indicator was set to monitor the depth of the water column to adjust the pump discharge rate in order to avoid exceeding the maximum of 0.3 feet of drawdown.

- The purge water from the well was directed to a flow-through cell. The flow through cell was constantly monitored for field parameters, including pH, conductivity, turbidity, dissolved oxygen, temperature, salinity and ORP.

Table 3-3
Groundwater Elevations
198 Douglass Street
Brooklyn, New York
May 11, 2012

Well Identification	DTW (ftb TOC)	DTP (ftb TOC)	Elevation (fta MSL*)
198DS-MW-1	3.82	-	0.52
198DS-MW-2	3.38	-	1.23
198DS-MW-3	3.98	-	0.55
198DS-MW-4	3.35	-	1.41

Notes:

DTW - Depth to Water

DTP - Depth to Product

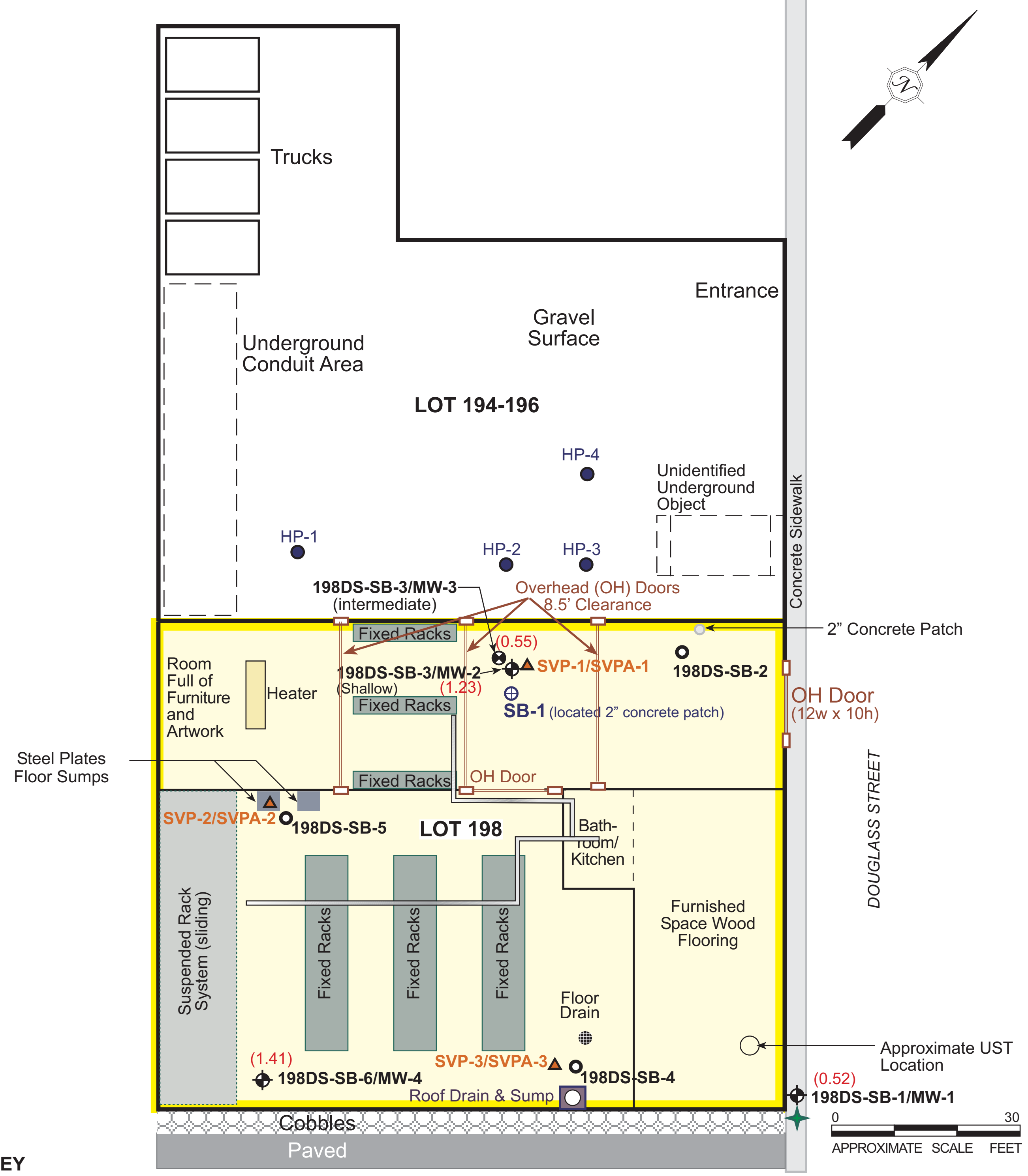
ftb/fta - Feet Below/Feet Above

TOC - Top of Casing

MSL* - Mean Sea Level elevation based on surveyed bench march etched into the sidewalk for the ongoing Gowanus Canal Project in the vicinity of 198 Douglass St.

Groundwater elevations were collected between 08:30 - 08:35 am on Monday May 11, 2012.

Low tide at Gowanus Bay was at 07:21 am on May 11, 2012 (www.saltwatertides.com)



KEY

(0.55) Groundwater Elevations in feet above mean sea level (MSL)..

⊕ (SB-1) 2006 Soil and Groundwater Investigation

● (HP-1 – HP-4) 2009 Off-Site Soil and Groundwater Investigation

⊕ Shallow Monitoring Well and Soil Sample Location

⊗ Intermediate Monitoring Well Location

○ Vadose Zone Soil Sample Location

▲ Sub-Slab and Indoor Air Monitoring Location

NOTE: Ceiling height is 10.5ft

═ Venting

✦ Exterior Ambient Air Sample Location

🟨 198 Douglass Street Site

Base map derived from AMEC Figure 5 Soil Boring and Groundwater Sampling Locations and TRC site visit on 3-12-12. Previous sample locations are approximate

TRC

21 Griffin Road North
Windsor, CT 06095
(860) 298-9692

198 DOUGLASS STREET
BROOKLYN, NEW YORK

FIGURE 3-2

GROUNDWATER ELEVATIONS

Date: 05/12

Project No. 191185.0000.000000

PERS/JWALESZCZYK/HAZ/191185 Brooklyn NY REVISED 5-15-2012.FH10

- Once all parameters had stabilized to within acceptable ranges (based on readings monitored at three- to five-minute intervals), groundwater samples were collected.

All purge water was transferred to 55-gallon drums and secured on-site.

The monitored groundwater parameters were recorded on the Groundwater Sampling Logs included in Appendix C. It should be noted that high levels of salinity were observed during the purging in monitoring wells 198DS-MW-1, 198DS-MW-2 and 198DS-MW-4. In particular, salinity concentrations of 4% were observed in wells 198DS-MW-1 and 198DS-MW-MW-4. The salinity in well 198DS-MW-1 continuously dropped during purging and stabilized at a concentration of 0.20%; however, the salinity in 198DS-MW-4 remained at 4%. Salinity was also observed during purging of well 198-MW-3 at a maximum concentration of 0.43%, but stabilized at 0.05%.

Upon achieving stabilization of monitored parameters, a groundwater sample was collected from each well directly from the pump into the appropriate laboratory-supplied container and stored on ice in a cooler. The samples were transported via courier under proper chain-of-custody protocols to Accutest for analysis of TCL VOCs plus TICs by USEPA Method 8260B.

A total of seven groundwater samples were collected, including QA/QC samples. A blind duplicate sample of 198DS-MW-3 was collected and labeled 198DS-MW-5, and sample 198DS-MW-4 was collected in triplicate for the laboratory MS/MSD samples. In addition, a laboratory-supplied trip blank (TB051112) and an equipment blank (FB051112), collected with laboratory-supplied deionized water and the field-decontaminated sampling equipment, accompanied the samples submitted to Accutest.

Field decontamination of the bladder pumps consisted of the following process:

- Liquinox wash
- Tap rinse
- Deionized water rinse
- 10% Nitric acid rinse
- Deionized water rinse
- Isopropyl alcohol (IPA) rinse
- Deionized water rinse
- Air dry

3.5 Investigation-Derived Waste Management

All excess soils from the soil borings and the installation of the monitoring wells and excess water generated during the development and purging of the monitoring wells was contained in drums and sampled for waste disposal purposes. On May 31, 2012, the drums were shipped by Brookside Environmental to Clean Water of New York under a non-hazardous waste manifest for subsequent treatment/disposal.

4.0 SITE INVESTIGATION RESULTS

4.1 Data Usability Analysis

TRC conducted a data usability analysis in accordance with the requirements of NYSDEC DER-10, Technical Guidance for Site Investigation and Remediation. The resultant Data Usability Summary Report (DUSR) is presented in Appendix D. Analytical results, as discussed below, reflect any data qualifiers assigned as a result of the usability analysis.

4.2 Soil Vapor/Indoor Air and Ambient Air Quality Results

Three sub-slab soil vapor, three adjacent indoor air and one exterior ambient air sample were collected and analyzed for VOCs using Method TO+15. The results of the sampling effort are summarized in Table 4-1. The NYSDEC Analytical Services Protocol (ASP) Category B data deliverable package is provided in Appendix D. The DUSR concluded that all air data were usable for project objectives with no qualification required.

4.2.1 Sub-slab, Indoor Air and Ambient Air Guidelines

The regulatory standards and guidelines used to evaluate the air sample analytical results are described below. Further interpretation of the data relative to the NYSDOH Guidance is provided in Section 5.

> Sub-slab Soil Vapor Sample Guidelines: New York State currently does not have any standards or regulatory criteria for concentrations of compounds in sub-slab soil vapor. Additionally, there are currently no databases available of background levels of volatile chemicals in sub-slab soil vapor.
>
> Indoor Air Sampling Guidelines: The indoor air sample results were compared to the NYSDOH Air Guideline Values (AGVs) and to the following background levels of VOCs in indoor air presented in the NYSDOH Guidance: 90th percentile indoor air values

Table 4-1
Sub-Slab Vapor, Indoor Air and Outdoor Air Sample Results
198 Douglass Street
Brooklyn, New York

LAB ID		12E0006-01	12E0006-02	12E0006-03	12E0006-04	12E0006-05	12E0006-06	12E0006-07	NYSDOH* Guidance for Evaluation Soil Vapor Intrusion**	Background Values				
CLIENT ID		198DS-SVP-1	198DS-SVPA-1	198DS-SVP-2	198DS-SVPA-2	198DS-SVP-3	198DS-SVPA-3	Exterior		ASTM E 2600 Concentration in Existing Residences - 95th Percentile(1)	USEPA BASE Data 90th Percentile Value(2)		HEI RIOPA 2005 95th Percentile Value (2)	
DATE SAMPLED		30-Apr-12	30-Apr-12	30-Apr-12	30-Apr-12	30-Apr-12	30-Apr-12	30-Apr-12	Indoor Air Guideline Values					
MATRIX		Air	Air	Air	Air	Air	Air	Air						
SAMPLE LOCATION	Units	Sub-Slab	Indoor	Sub-Slab	Indoor	Sub-Slab	Indoor	Ambient (Ext.)		Indoor	Outdoor	Indoor	Outdoor	Indoor
Benzene	ug/m^3	3.2	0.79	0.17	0.75	12	0.68	0.36		13	6.6	9.4	5.16	10
Carbon Tetrachloride	ug/m^3	<0.63	0.42	<0.22	0.27	<3.1	0.41	0.42		--	0.7	<1.3	1.0	1.1
Chlorobenzene	ug/m^3	<0.46	<0.16	<0.16	<0.16	<2.3	<0.16	<0.16		--	<0.8	<0.9	--	--
Chloroethane	ug/m^3	<0.26	0.17	<0.093	0.19	<1.3	<0.093	<0.093		--	<1.2	<1.1	--	--
Chloromethane	ug/m^3	<0.21	<0.072	<0.072	1.4	<1.0	1.2	1.2		--	3.7	3.7	--	--
1,2-Dichlorobenzene	ug/m^3	<0.60	<0.21	<0.21	<0.21	<3.0	<0.21	<0.21		--	<1.2	<1.2	--	--
1,3-Dichlorobenzene	ug/m^3	<0.60	<0.21	<0.21	<0.21	<3.0	<0.21	<0.21		--	<2.2	<2.4	--	--
1,1-Dichloroethane	ug/m^3	<0.40	<0.14	<0.14	<0.14	<2.0	<0.14	<0.14		--	<0.6	<0.7	--	--
1,2-Dichloroethane	ug/m^3	<0.40	<0.14	<0.14	<0.14	<2.0	<0.14	<0.14		--	<0.8	<0.9	--	--
1,1-Dichloroethylene	ug/m^3	<0.40	<0.14	<0.14	<0.14	<2.0	<0.14	<0.14		--	<1.4	<1.4	--	--
cis-1,2-Dichloroethylene	ug/m^3	<0.40	<0.14	<0.14	<0.14	<2.0	<0.14	<0.14		--	<1.8	<1.9	--	--
trans-1,2-Dichloroethylene	ug/m^3	<0.40	<0.14	<0.14	<0.14	<2.0	<0.14	<0.14		--	--	--	--	--
1,2-Dichloropropane	ug/m^3	<0.46	<0.16	<0.16	<0.16	<2.3	<0.16	<0.16		--	<1.6	<1.6	--	--
Ethylbenzene	ug/m^3	160	2.4	0.32	1.8	28	1.6	0.29		13	3.5	5.7	3.04	7.62
Methyl tert-Butyl Ether (MTBE)	ug/m^3	<0.36	<0.13	<0.13	<0.13	<1.8	<0.13	<0.13		--	6.2	11.5	22.1	36
Methylene Chloride	ug/m^3	3.7	13	2.2	15	<17	16	15	60	--	6.1	10	2.46	7.5
Naphthalene	ug/m^3	<0.52	1.8	0.82	1.4	<2.6	2.5	0.43		2.1	4.9	5.1	--	--
Tetrachloroethylene	ug/m^3	3.4	3.3	9.7	3.2	19	3.2	2.1	100	4.9 - 6.8	6.5	15.9	3.17	6.01
Toluene	ug/m^3	100	11	1.5	10	38	8.8	1.7		29-49	33.7	43.0	19.6	39.8
1,1,1-Trichloroethane	ug/m^3	0.8	<0.19	0.6	<0.19	<2.7	<0.19	<0.19		7.6 - 17	2.6	20.6	--	--
Trichloroethene	ug/m^3	46	0.2	100	<0.19	200	<0.19	<0.19	5	0.70 - 1.4	1.3	4.2	0.79	1.36
1,2,4-Trimethylbenzene	ug/m^3	6.8	7.6	2.4	7.0	<2.5	7.0	0.73		--	5.8	9.5	--	--
1,3,5-Trimethylbenzene	ug/m^3	3.9	2.4	0.72	2.2	260	2.2	0.26		--	2.7	3.7	--	--
Vinyl Chloride	ug/m^3	<0.26	<0.090	<0.090	<0.090	<1.3	<0.090	<0.090		0.1	<1.8	<1.9	--	--
m&p-Xylene	ug/m^3	570	9.3	0.96	7.3	120	6.3	0.82		22	12.8	22.2	10	22.2
o-Xylene	ug/m^3	300	4.2	0.56	3.2	65	2.8	0.32		6.9	4.6	7.9	3.23	7.24

Notes:
* NYSDOH - New York State Department of Public Health
** - NYSDOH Guidence for Evaluating Soil Vapor Intrusion in the State of New York, October 2006
Bold - Indicates detection of analyte above the laboratory reporting limits.
µg/m^3 = micrograms per cubic meter
< - Less than reporting limit
-- = Not Available

ASTM - American Society for Testing and Materials
BASE - Building Assessment and Survey Evaluation
HEI RIOPA - Health Effect Institute: Relationship of Indoor, Outdoor and Personal Air
(1) - From ASTM E 2600-08 "Standard Practice for Assessment of Vapor Intrusion into Structures on Property Involved in Re
Estate Transactions"
(2) - Per Appendix C of the Final NYSDOH Guidance.

from “Table C2. USEPA 2001: Building Assessment and Survey Evaluation (BASE) Database, SUMMA canister method”; and the 95th Percentile indoor air values from “Table C5, HEI 2005: Relationship of Indoor, Outdoor and Personal Air.” Upper Fence Limit indoor air values from “Table C1. NYSDOH 2003: Study of Volatile Organic Chemicals in Air of Fuel Oil Heated Homes” of the NYSDOH Guidance were not considered, as fuel oil is not used as a source of heat at this site. The indoor air results were also compared to the 95th percentile typical background VOC concentrations provided in ASTM E 2600-08 Appendix X7, Table X7.1, “Select VOCs in Existing Residences.”

Ambient (Outdoor) Air Sampling Guidelines The analytical results of the ambient air sample were compared to the NYSDOH AGVs and to the following background levels of VOCs in outdoor air presented in the NYSDOH Guidance: 90th Percentile outdoor air values from “Table C2. USEPA 2001: Building Assessment and Survey Evaluation (BASE) Database, SUMMA canister method”; and the 95th Percentile Outdoor Air Values from “Table C5, HEI 2005: Relationship of Indoor, Outdoor and Personal Air.”

4.2.2 Sub-Slab Soil Vapor Results

Chlorinated VOCs, BTEX compounds and other petroleum-related compounds were detected in the sub-slab soil vapor samples, as presented in Table 4-1. There are no standards or regulatory criteria that can be directly applied to sub-slab soil vapor results.

4.2.3 Indoor Air Sample Results

A summary of the analytical results for the indoor air samples is presented in Table 4-1. As with the sub-slab soil vapor samples, chlorinated VOCs, BTEX compounds and other petroleum-related compounds were detected in the indoor air samples. Carbon tetrachloride, chloroethane, and chloromethane were detected in indoor air samples but not in sub-slab samples, while methylene chloride, naphthalene, and 1,2,4-trimethylbenzene were detected at higher concentrations in indoor air samples than they were in the sub-slab soil vapor samples. The concentrations of detected VOCs are within the range of indoor air background levels, as presented in Table 4-1.

4.2.4 Ambient Air Sample Results

A summary of the analytical results for the ambient air sample is presented in Table 4-1. All of the VOCs detected in the exterior ambient air sample were also detected in the indoor air samples. Carbon tetrachloride, chloroethane, and chloromethane were detected in both the ambient and indoor air samples but not in sub-slab vapor samples, while methylene chloride was detected at higher concentrations in the ambient air sample and indoor air samples than in the sub-slab soil vapor samples. The level of carbon tetrachloride detected in the ambient air sample was equal to or above the indoor air levels. The levels of chloromethane and methylene chloride detected in the ambient air sample were also very comparable to or greater than the indoor air levels. Methylene chloride was the only compound detected in the exterior ambient air sample at a level that exceeds the outdoor air background levels presented in Table 4-1. Methylene chloride is a common laboratory contaminant.

4.3 Soil Investigation Results

Subsurface soils were characterized through the collection of six soil samples and one duplicate sample, with the samples analyzed for VOCs. The constituents detected in the soil samples are summarized in Table 4-2. A summary table listing all analytes and detection levels, the complete laboratory data report and the DUSR are presented in Appendix D. The DUSR concluded that all soil data were usable for project objectives, with the exception of the following: 2-butanone data in all soil samples and acetone data in all soil samples except 198DS-SB-2 (2-butanone and acetone were originally reported as non-detected in the samples where the data were rejected). A qualifier was assigned to the detected level of acetone in sample 198DS-SB-2 (as reflected in Table 4-2).

Soil results were compared to Soil Cleanup Objectives (SCOs) established at 6 NYCRR 375-6.8. SCOs established for Unrestricted Use (which represent the lowest of the values established for protection of groundwater, ecological resources and public health) were used to conduct an initial screening of the data. NYSDEC has also established SCOs for Restricted Use based on land use and allows for site-specific modifications to SCOs and site-specific SCOs; however, the initial data screening was conservatively limited to Unrestricted Use SCOs. For those compounds for which SCOs have not been promulgated, Supplemental SCOs (SSCOs) defined in NYSDEC Policy CP-51, Soil Cleanup Guidance (NYSDEC, 2010) were considered.

Several VOCs were detected in the subsurface soil samples, typically consisting of petroleum-related compounds. TCE was the only chlorinated VOC detected in the soil samples. Tentatively identified compounds (TICs) detected in the soil samples typically consisted of cycloalkanes, alkenes, alkanes or alcohols. Chloroform and VOC TICs were detected in the quality control field rinsate blank samples. The TICs detected in the field blank were not detected in the associated soil samples.

Table 4-2
May 2012 Soil Sample Results
198 Douglass Street
Brooklyn, New York

Client Sample ID:	6 NYCRR 375-6.8	CP-51 Soil Cleanup Guidance		198DS-SB-1	198DS-SB-7 (Duplicate of SB-1)	198DS-SB-2	198DS-SB-3	198DS-SB-4	198DS-SB-5	198DS-SB-6	Field Blank	Field Blank
Date Sampled:	**Unrestricted Use Soil Cleanup Objective**	**Supplemental Soil Cleanup Objective**		**5/3/2012**	**5/3/2012**	**5/3/2012**	**5/3/2012**	**5/4/2012**	**5/4/2012**	**5/4/2012**	**5/3/2012**	**5/4/2012**
Matrix:		**Residential**	**GW Protection**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Aqueous**	**Aqueous**
Sample Depth (ft):				**5-6**	**5-6**	**2-3**	**2-3**	**1-1.5**	**1-3**	**1-3**		
	mg/kg	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**ug/L**	**ug/L**
Volatile Organic Compounds (VOCs)												
Acetone	0.05	NA	NA	R	R	0.0108 J	R	R	R	R	R	R
2-Butanone (MEK)				R	R	R	R	R	R	R		
Carbon disulfide	NA	100	2.7	0.106 J	0.0413 J			0.00055 J				
Chloroform	0.37	NA	NA									0.44 J
Cyclohexane	NA	NA	NA	1.05								
Ethylbenzene	1.00	NA	NA	0.292	0.221							
Isopropylbenzene	NA	100	2.3	3.91	2.93			0.00049 J				
Methylcyclohexane	NA	NA	NA	11.9	9.13							
Toluene	0.70	NA	NA	0.3	0.216					0.00047 J		
Trichloroethene	0.47	NA	NA					0.0012 J	0.00081 J			
m,p-Xylene	0.26	NA	NA	0.0281 J	0.0276 J							
o-Xylene	0.26	NA	NA	0.0130 J								
Xylene (total)	0.26	NA	NA	0.0411 J	0.0276 J							
Total Estimated VOC TIC Concentration				188.9 J	154.8 J	ND	ND	0.1983 J	ND	ND	255.1 J	ND

Notes:

Supplemental Soil Cleanup Objectives are from CP-51 Soil Cleanup Guidance dated October 21, 2010

NA - No standard currently established

Only detected compounds are noted

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than zero.

R - Data rejected due to low response factors.

TIC - Tentatively Identified Compound

VOC concentrations determined by EPA Method 8260B

Shading indicates an exceedance of the CP-51 Soil Cleanup Guidance, Supplemental Soil Cleanup Objective, GW Protection

No VOCs were detected in the soil samples at levels exceeding the Unrestricted Use SCOs. Only one constituent, isopropylbenzene, was detected in a soil sample (and in a duplicate sample) at a level exceeding respective the Protection of Groundwater SSCO. Isopropylbenzene was detected at concentrations of 3.91 mg/kg and 2.93 mg/kg in the sample (198DS-SB-1) and duplicate sample (198DS-SB-7), levels which slightly exceed the Protection of Groundwater SSCO of 2.3 mg/kg. The boring from which these samples were collected was the exterior boring located near the historic UST location. The sample was collected from a depth of 5 to 6 feet below grade, below the groundwater table.

4.4 Groundwater Investigation Results

Groundwater quality was characterized through the collection of four groundwater samples and one duplicate sample, with the samples analyzed for VOCs. The constituents detected in the groundwater samples are summarized in Table 4-3. A summary table listing all analytes and detection levels, the complete laboratory data report and the DUSR are presented in Appendix D. The DUSR concluded that all groundwater data were usable for project objectives, with the exception of the acetone data in all groundwater samples (acetone was originally reported as non-detect where the data were rejected). No other qualifiers were assigned to VOCs that were detected in the groundwater samples.

Groundwater results were compared to New York State Ambient Water Quality Standards and Guidance Values as presented in the Division of Water TOGS 1.1.1, dated June 1998. TOGS 1.1.1 includes water quality standards established at 6 NYCRR 703 as well as guidance values. The groundwater classification for the 198 Douglass Street site is GA, so analytical results were compared to the GA standards and guidance values. The GA classification indicates waters that could be used as a source of potable water supply. It should be noted however, that based on elevated salinity measurements made during monitoring well purging (see Section 3.4.5), groundwater beneath the site would be unsuitable for use as drinking water without treatment.

One well, 198DS-MW-4 in the southern corner of the building, did not exhibit any VOCs. Eight VOCs were detected in the remaining groundwater samples combined, typically consisting of petroleum-related compounds. TCE and vinyl chloride were the only chlorinated VOCs detected in the samples. TICs were detected in two of the four monitoring wells and in

Table 4-3
May 2012 Groundwater Sample Results
198 Douglass Street
Brooklyn, New York

Client Sample ID:	TOGS 1.1.1[1]	198 DS-MW-1	198 DS-MW-2	198 DS-MW-3	198 DS-MW-5 (Duplicate of MW-3)	198 DS-MW-4	Field Blank	Trip Blank
Date Sampled:		**5/11/2012**	**5/11/2012**	**5/11/2012**	**5/11/2012**	**5/11/2012**	**5/11/2012**	**5/11/2012**
	ug/L	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
Volatile Organic Compounds (VOCs)								
Acetone		R	R	R	R	R	R	R
Cyclohexane	NS	1.6 J						
Ethylbenzene	5			0.48 J	0.47 J			
Isopropylbenzene	5	5.1		1.2 J	1.2 J			
Methylcyclohexane	NS	12.2						
Methyl Tert Butyl Ether	10	1.5	1.2	10.7	10.7			
Trichloroethene	5	0.43 J						
Vinyl chloride	2			0.75 J	0.75 J			
Xylene (total)	5	0.27 J						
Total Estimated VOC TIC Concentration		221.2 J	ND	166.4 J	178.7 J	ND	10 J	ND

Notes:

[1] Standards are taken from the New York State Ambient Water Quality Standards and Guidance Values for Water Class GA (June 1998, updated January 1999, April 2000, and June 2004)

Only detected compounds are noted

NS - No standard currently established

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than zero.

R - Data rejected due to low response factors.

TIC - Tentatively Identified Compound

VOC Concentrations determined by EPA Method 8260B

Shading indicates an exceedance of the GA Water Quality Standard or Guidance Value the field blank and generally consisted of cycloalkanes, alkenes, alkyl benzenes, 1H-indene-dihydro-methyl, 1,2,4-trimethylbenzene, and naphthalene. No VOCs were detected in the quality control trip blank that accompanied the samples.

Two VOCs were detected in the groundwater samples at levels slightly exceeding the standards or guidance values listed in TOGS 1.1.1. Isopropylbenzene was detected in the groundwater sample collected from monitoring well 198DS-MW-1 (located near the historic UST location) at a concentration of 5.1 ug/l, slightly exceeding the principal organic contaminant standard for groundwater of 5 ug/l. MTBE was detected in a groundwater sample collected from well 198DS-MW-3 (the intermediate depth well located adjacent to SB-1) and a duplicate sample, each at concentrations of 10.7 ug/l, which slightly exceed the MTBE guidance value of 10 ug/l.

5.0 DATA INTERPRETATION, SUMMARY AND CONCLUSIONS

This section provides a summary and interpretation of the data collected at the site and conclusions that can be made based on the data.

The interpretation of the site data takes into consideration NYSDEC guidance on the application of the screening criteria that were used to evaluate the data. For example, as described in CP-51 (NYSDEC, 2010), "The exceedance of one or more applicable SCOs or SSCOs… alone does not trigger the need for remedial action, define "unacceptable" levels of contaminants in soil, or indicate that a site qualifies for any DEC remedial program (e.g., BCP, SSF). As noted in the definition of SCO above, SCOs and SSCOs are applicable statewide and do not account for many site-specific considerations which could potentially result in higher levels. Therefore, soil concentrations that are higher than the applicable SCOs or SSCOs are not necessarily health or environmental concerns." Therefore, the evaluation of soil results against the SCOs and SSCOs takes into consideration other site-specific factors. Similar considerations are also made in the evaluation of sub-slab vapor, indoor air and groundwater results.

5.1 Interpretation of Soil and Groundwater Data

The soil results indicate that the 198 Douglass Street site was not a source of significant subsurface soil contamination and the groundwater results provide evidence that the site was not a source of chlorinated VOCs.

The individual areas of potential environmental concern at the site are evaluated relative to the information provided by the soil and groundwater data below.

5.1.1 SB-1 Investigation Location

The groundwater sample collected in 2006 at a depth of 24 to 28 ftbg at location SB-1 exhibited benzene and PCE at levels above TOGS 1.1.1 standards and guidance levels. When a groundwater sample (198DS-MW-3) was collected in 2012 from a well screened at a comparable depth (25 to 30 ftbg) and near the original SB-1 sample location, the sample did not exhibit either benzene or PCE. MTBE was the only constituent detected in the 198DS-MW-3 (intermediate depth) sample at a level (10.7 ug/l) slightly exceeding the associated TOGS 1.1.1 guidance level (10 ug/l). MTBE was not detected in the soil sample collected from the same boring and was present at a lower concentration (1.2 ug/l) in the shallow well (198DS-MW2) located adjacent to 198DS-MW3. The on-site historic gasoline UST is not considered a potential source of the MTBE because the UST was not identified on site maps after 1950, MTBE has only been used as a gasoline additive since 1979, and MTBE was detected at a lower concentration (1.5 ug/l) in the well located adjacent to the historic UST location. As described in Section 2.2, MTBE was present in monitoring wells installed during the investigation of a diesel fuel spill at the Gowanus Pump Station, located immediately across Douglass Street from the site to the northeast and was allowed to naturally attenuate. The Gowanus Canal RI also confirms the presence of MTBE in shallow and intermediate depth groundwater samples collected near the Gowanus Pump Station at levels ranging from 5.9 to 14.1 ug/l (HDR, et al., 2011). Also, the Final IRM Pre-Design Investigation Work Plan for the Fulton Municipal Works Former Manufactured Gas Plant (MGP) Site (GEI, 2012) indicates that MTBE was detected in shallow wells installed on the west side of the Gowanus Canal at levels exceeding ambient water quality standards. This information from other site investigations conducted in surrounding areas confirms that MTBE is a local groundwater contaminant and is not attributable to the 198 Douglass Street site.

5.1.2 Historic UST Location

Potential impacts associated with the historic gasoline UST identified in the 1950 Sanborn map were investigated through the drilling of a soil boring and installation of a monitoring well on the exterior of the 198 Douglass Street building as near as possible to the historic UST location, as finished interior building areas prevented an interior investigation point. A single VOC was detected above both soil and groundwater screening criteria at this location. Soil sample 198DS-SB-1 (and its duplicate sample) collected at a depth of 5 to 6 ftbg exhibited isopropylbenzene at concentrations of 3.91 mg/kg and 2.93 mg/kg, respectively. The SSCO for isopropylbenzene based on groundwater protection is 2.3 mg/kg. The groundwater sample collected from the monitoring well installed at the same location (screened from 5 to 15 ftbg) also exhibited isopropylbenzene, at a concentration of 5.1 ug/l, which barely exceeds the principal organic contaminant standard for groundwater of 5 ug/l. As discussed in Section 3.4.3 and 3.4.4, the soil sample collected from 5 to 6 ftbg at this boring location was collected from the presumed vadose zone above groundwater, based on observations made during the soil boring and well installation. However, the water level in the monitoring well was subsequently measured at 3.5 fbgs. Therefore, the isopropylbenzene detected in the soil sample may be attributable to groundwater contamination, rather than site-related soil contamination.

Isopropylbenzene, also known as cumene, is the principal chemical used in the production of phenol and its coproduct, acetone, via the chemical intermediate cumene hydroperoxide. It is also used as a starting material in the production of acetophenone, a-methylstyrene, diisopropylbenzene, and dicumylperoxide. Minor uses of isopropylbenzene include as a thinner for paints, enamels, and lacquers; as a constituent of some petroleum-based solvents, such as naptha; in gasoline blending diesel fuel, and high-octane aviation fuel; and as a raw material for peroxides and oxidation catalysts such as polymerization catalysts for acrylic and polyester-type resins. It is also a good solvent for fats and resins [NTP, 1996]. Isopropylbenzene has also been found in groundwater near coal gasification facilities (WHO, 1999).

Isopropylbenzene was detected at only one other soil sample location (198DS-SB-4) and one other groundwater sample location (198DS-MW-3), both at levels below screening criteria. While the historic gasoline UST could potentially be a source of the isopropylbenzene, there are other USTs and industrial activities in the area that could be the source of the contamination. The Gowanus Pump Station at 201 Douglass Street has two diesel USTs and one unleaded gasoline UST (AMEC, 2009a) and reported a diesel fuel spill in 1996 with documented groundwater impacts. The Gowanus Housing Project located 333 feet northwest of the site at 238 Bond Street is the site of a fuel oil UST that failed tightness testing.

There is also further evidence that the isopropylbenzene is a local groundwater contaminant not directly attributable to the site. The Gowanus Canal RI report documents the detection of isopropylbenzene in soil samples collected at monitoring well locations MW-1, MW-2, MW-3 and MW-34 (located northeast and southwest of the 198 Douglass Street site, as shown in Figure 2-4) at concentrations as high as 10 mg/kg. Isopropylbenzene was also detected in groundwater samples collected from nearby Gowanus Canal RI monitoring wells MW-1, MW-3 and MW-34 at concentrations as high as 4.5 ug/l (HDR, et al., 2011). As previously presented in Sections 2.4.3 and 2.4.4, area groundwater flow gradients are influenced by temporal tidal impacts of the canal and, therefore, the detected isopropylbenzene levels may be the result of off-site sources. Since analytical data from the Fulton MGP site investigation was not available for review, it is unknown whether that site also exhibits isopropylbenzene in the groundwater.

5.1.3 Water Table Considerations

Supporting the above interpretation of the soil and groundwater data is the variation in water table elevations between the 2006 and 2009 studies (when the depth to groundwater averaged 8 to 11 ftbg) and the 2012 study (when the depth to groundwater varied from approximately 3 to 4 ftbg). This indicates that water table elevations vary significantly and that the rise and fall of the water table and changes in gradients due to nearby Gowanus Canal tidal impacts could distribute contamination throughout the subsurface beneath the site building. Given the presence of historic fill beneath the building to a depth of approximately 10 to 12 ftbg and the documented presence of groundwater contamination in the general area of the site, the variable groundwater table and historic fill material would explain the presence of constituents in the soil and groundwater samples not associated with the current or historic use of the building at 198 Douglass Street.

5.1.4 Floor Drain, Sumps and Other Investigation Locations

The investigation of other observed site features considered as potential sources of soil and/or groundwater contamination, namely the floor sumps under the steel plates and the floor drain/roof drain and sump area in the Large Room, did not identify any soil or groundwater contamination that would be indicative of a site-related contaminant source.

5.2 Interpretation of Sub-Slab Vapor, Indoor Air and Ambient Air Data

The NYSDOH Guidance (NYSDOH, 2006) outlines a number of considerations used in the interpretation of sub-slab vapor, indoor air and ambient air data. These include the following:

- Site-specific sampling results;
- Reported background concentrations of volatile chemicals;
- The AGVs developed by NYSDOH;
- Potential human health risks associated with exposure to the volatile chemicals;
- Attenuation factors;
- Decision matrices established by NYSDOH as risk management tools when soil vapor may be entering buildings (the matrices have been developed for use in evaluating four VOCs: carbon tetrachloride, PCE, TCA, and TCE);
- The nature and extent of contamination in environmental media;
- Site-specific environmental and building factors that affect soil vapor migration and intrusion;
- Sources of volatile chemicals; and
- Past, current and future land uses.

In Section 4, the site-specific data were compared to AGVs, where appropriate, and to reported background levels. This section evaluates site-specific data relative to these values as well as other less quantitative factors listed above.

An investigation of sub-slab vapor, indoor air, and ambient air quality was conducted as a result of reported observation of odors during the installation of mini-piles within the warehouse in 2006 and the results of subsequent 2006 air and groundwater sample analyses. A grab air sample, apparently collected from the boreholes rather than from the indoor air, exhibited benzene, PCE, chloroethane, 1,3-butadiene, and methylene chloride above residential exposure levels identified at the time of the 2006 study. The 2012 air sampling data identified the presence of similar compounds in both the sub-slab soil vapor samples and indoor air samples. However, no compounds were detected above established AGVs in any of the 2012 indoor air samples.

The four compounds for which NYSDOH decision matrices have been established are evaluated below, considering the matrix recommendations as well as other factors considered in the interpretation of such data:

- TCA was not detected in 2012 soil, groundwater or indoor air samples, although it was detected in two sub-slab vapor samples. For the detected TCA sub-slab concentrations, the decision matrix indicates no further action is appropriate.

- Carbon tetrachloride was not detected in 2012 soil or groundwater samples. It was not detected in the sub-slab vapor samples but was detected in indoor air at concentrations equal to or less than the concentration detected in the ambient air sample. While the decision matrix indicates that actions to identify sources and reduce exposures may be appropriate, no sources have been identified on site and the indoor air concentrations are equal to or less than exterior ambient air concentrations, indicating a local rather than site-specific source.

- PCE was not detected in 2012 soil or groundwater samples. The indoor air concentrations are similar to the ambient air concentrations (3.2 to 3.3 ug/m^3 for indoor air versus 2.1 ug/m^3 for ambient air), with only slightly elevated levels detected in sub-slab vapor samples (at 3.4 to 19 ug/m^3). While the decision matrix indicates that actions to identify sources and reduce exposures may be appropriate, the indoor air concentrations (3.2 to 3.3 ug/m^3) barely exceed the threshold (3 ug/m^3) below which no further action would be recommended. While not detected in the site-specific monitoring wells, PCE has been detected in nearby wells sampled as part of the Gowanus Canal RI (namely in shallow-depth wells MW-1, MW-2 and MW-34 and intermediate-depth wells MW-03 and MW-04, as shown on Figure 2-4) at concentrations ranging from 0.095 to 0.33 ug/L, indicating a local off site rather than site-specific source.

- TCE was detected in two 2012 soil samples and one 2012 groundwater sample (all at levels below unrestricted use soil/GA groundwater criteria). TCE was detected in two of the three sub-slab vapor samples. It was not detected, however, in the associated indoor air samples or in the exterior ambient air sample. For two of the three indoor air/sub-slab vapor data pairs, the decision matrix indicates that monitoring is appropriate, while for the third data pair, the decision matrix indicates no further action is needed. To further evaluate the potential risks associated with the presence of the TCE in the sub-slab vapor, published worker air exposure limits (namely Time Weighted Averages (TWAs) (8 hours) and Short Term Exposure Limits (STELs)) developed for TCE by the American Conference of Governmental Industrial Hygienists (ACGIH), the Occupational Safety and Health Administration (OSHA) and/or the National Institute for Occupations Safety and Health (NIOSH) were considered. Even if one hundred percent of the highest sub-slab TCE concentration infiltrated the concrete slab, entered the building, and filled the much larger building interior air space at the same highest measured sub-slab concentration of TCE (200 µg/m^3) (i.e., a 1:1 sub-slab to indoor air attenuation factor), the resulting TCE concentration would still be two orders of magnitude less than the most conservative published 8-hour worker exposure limit (ACGIH's TWA of 53,700 µg/m^3). While not detected in the site-specific monitoring wells, TCE has been detected in nearby wells sampled as part of the Gowanus Canal RI (namely in shallow-depth wells MW-2 and MW-34 and intermediate-depth wells MW-03 and

MW-04, as shown on Figure 2-4) at concentrations ranging from 0.059 to 13 ug/L, indicating a local off site rather than site-specific source of TCE.

5.3 Summary and Conclusions

In summary, while benzene and PCE were detected in the 2006 groundwater sample, these constituents were not detected in the 2012 soil or groundwater samples and therefore were not confirmed to be associated with the subject site. The few analytes detected in soil and groundwater samples above soil and groundwater screening criteria have been detected in other off-site area investigations and appear to be attributable to local groundwater flow conditions and area-wide contamination. An active leaking UST site (the Gowanus Housing Complex site) is located to the northwest of the site in the presumed upgradient direction and could also be contributing to constituents detected above screening criteria at the site, as could historic contamination allowed to naturally attenuate at the adjacent Gowanus Pump Station. Variable water table elevations and gradients and the presence of historic fill material at the 298 Douglass Street site could explain the detection of constituents in soil and groundwater that are not associated with current or historic uses of the on-site building. Furthermore, a comparison of groundwater quality data to GA groundwater criteria does not consider the groundwater salinity measured in the field that indicates that the water beneath the site is brackish and not suitable for use as drinking water without treatment; therefore, the direct application of GA criteria to groundwater at this site is conservative. Based on this evaluation, no further investigation of the soil or groundwater contaminants detected in the 2006 study or other potential site-related sources of soil or groundwater contamination is considered necessary.

The 2012 indoor air and ambient air monitoring did not identify the presence of any VOCs above AGVs. Several constituents detected in indoor air samples are likely attributable in all or in part to ambient air quality or to regional groundwater quality. While TCE was detected at the highest concentrations of the VOCs analyzed in the sub-slab vapor samples, it was not detected in indoor air samples and was present in soil and groundwater samples at levels below applicable unrestricted use soil/GA groundwater criteria. The sub-slab soil vapor, indoor air and ambient air data, combined with the recent on-site soil and groundwater data, do not indicate that site uses or associated site-specific subsurface contamination is responsible for the sub-slab detections.

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