One and Three Gotham Center
Remedial Investigation Report

28-07 Jackson Avenue

Long Island City, New York

Block 420, Lot 1

OER Project # 16EH-N319Q

E-Designation #E-104

CEQR #00DCP055Q

Prepared for:

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TABLE OF CONTENTS

CERTIFICATION **4**

REMEDIAL INVESTIGATION REPORT **10**

1.0 SITE BACKGROUND **10**
1.1 Site Location and Current Usage **10**
1.2 Proposed Redevelopment Plan **11**
1.3 Description of Surrounding Property **11**

2.0 SITE HISTORY **13**
2.1 Past Uses and Ownership **13**
2.2 Previous Investigations **13**
2.3 Site Inspection **16**
2.4 Areas of Concern **16**

3.0 PROJECT MANAGEMENT **17**
3.1 Project Organization **17**
3.2 Health and Safety **17**
3.3 Materials Management **17**

4.0 REMEDIAL INVESTIGATION ACTIVITIES **18**

5.0 ENVIRONMENTAL EVALUATION **28**
5.1 Geological and Hydrogeological Conditions **28**
5.2 Soil Chemistry **29**
5.3 Groundwater Chemistry **30**
5.4 Soil Vapor Chemistry **31**
5.5 Prior Activity **32**
5.6 Impediments to Remedial Action **33**

FIGURES

Figure 1 – Site Location Map
Figure 2 – Site Layout Map
Figure 3 – Sample Locations
Figure 4 – Volatile Organic Compounds (VOCs) in Soil
Figure 5 – Pesticides/Polychlorinated Biphenyls (PCBs) in Soil
Figure 6 – Metals in Soil
Figure 7 – Volatile Organic Compounds (VOCs) in Groundwater
Figure 8 – Semi-Volatile Organic Compounds (SVOCs) in Groundwater
Figure 9 – Pesticides/Polychlorinated Biphenyls (PCBs) in Groundwater
Figure 10 – Metals in Groundwater
Figure 11 – Volatile Organic Compounds (VOCs) in Soil Vapor
Figure 12 – Groundwater Flow Map

TABLES

Table 1 – Volatile Organic Compounds (VOCs) in Soil
Table 2 – Semivolatile Organic Compounds (SVOCs) in Soil
Table 3 – Pesticides and Polychlorinated Biphenyls (PCBs) in Soil
Table 4 – Metals in Soil
Table 5 – Volatile Organic Compounds (VOCs) in Groundwater
Table 6 – Semivolatile Organic Compounds (SVOCs) in Groundwater
Table 7 – Pesticides and Polychlorinated Biphenyls (PCBs) in Groundwater
Table 8 – Metals (Total and Dissolved) in Groundwater
Table 9 – Volatile Organic Compounds (VOCs) in Soil Vapor
Table 10- Laboratory Qualifiers

APPENDICES

Appendix A – Lithologic Logs
Appendix B – Groundwater Purge Logs
Appendix C – Previous Studies
Appendix D – Proposed Project Plans
Appendix E – Laboratory Deliverables

CERTIFICATION

I, Mohamed Ahmed, am a Qualified Environmental Professional, as defined in RCNY § 43-1402(ar). I have primary direct responsibility for implementation of the Remedial Investigation for the One and Three Gotham Center (28-07 Jackson Avenue) Site, (NYC OER Site No. 16EH-N319Q). I am responsible for the content of this Remedial Investigation Report (RIR), have reviewed its contents and certify that this RIR is accurate to the best of my knowledge and contains all available environmental information and data regarding the property.

Mohamed Ahmed	8/30/16	
Qualified Environmental Professional	Date	Signature

EXECUTIVE SUMMARY

The Remedial Investigation Report (RIR) provides sufficient information for establishment of remedial action objectives, evaluation of remedial action alternatives, and selection of a remedy pursuant to RCNY§ 43-1407(f). The remedial investigation (RI) described in this document is consistent with applicable guidance.

Site Location and Current Usage

The Site is located in the Long Island City section of Queens and is identified as Block 420 and Lot 1. Figure 1 shows the Site location. The Site is an irregularly shaped parcel and is currently a vacant lot. The Site lot is approximately 71,692-square and is approximately 400 feet deep. The Site lot encompasses part of Block 420, which is bordered to the north by Bridge Plaza South, to the south by 42nd Road, to the east by Jackson Avenue, and to the west by 28th Street. Lot 101 comprises nearly half of Block 420, and borders the Site to the north/ northwest. Lot 101 is currently occupied by a 22-story office building, constructed in 2010. The Site is bordered by mixed-use commercial and residential spaces, a New York City Transit Authority (NYCTA) Substation and properties undergoing construction. A map of the site boundary is shown on Figure 2.

Summary of Proposed Redevelopment Plan

The proposed project is a 1.14 million gross square feet (GSF) out-of-the-ground mixed-use office development augmented with retail and parking. The proposed project consists of two new mixed-use office buildings, One and Three Gotham Center, respectively, whose usable square footage will total 929,818 SF. The towers will be 26 stories resting on a single four-floor above-grade podium. The podium will house a 388-space public parking garage on the second through fourth floors, ground-floor retail, a loading dock on 42nd Road, and office spaces on floors two through four. The cellar level will house mechanical rooms and back-of-house spaces. Each building will contain a lobby fronting Jackson Avenue. The bottom of bulk excavation will be approximately 20 feet below sidewalk grade. A set of eleven elevators will be installed at One Gotham Center, and a

set of 16 elevators will be installed at Three Gotham Center. A loading dock with five berths will also be constructed along 42nd Road.

Summary of Past Uses of Site and Areas of Concern

The earliest Sanborn map (1836) shows the property developed with stores and dwellings until approximately 1936. Prior to 1970, the Site was shown as developed with a filling station with ten gasoline tanks on the northeast corner of the property, two auto repair facilities and an auto painting facility on the southwest portion. In 1950, a candy manufacturer, a canvas sewing facility, a food shopping facility, and Gem Heat Treating Co. were present along the northwest portion of the site. In 1970, the Site was developed with a parking lot in the northeast corner, vacant lots, Gem Heat Treating Co. offices and commercial facilities and stores. The site was developed with a parking garage from approximately 1977 to 2008. Lot 1 has been vacant since the demolition of the former garage in 2008.

Previous investigations in 2010 identified residual soil and groundwater contamination from the former filling station. Soils were removed and ORC was applied. Groundwater quality was monitored and improved over time.

Summary of the Work Performed under the Remedial Investigation

Tenen performed the following scope of work:

1. Installed nine soil borings across the entire project Site, and collected 17 soil samples for chemical analysis from the soil borings to evaluate soil quality;
2. Installed seven groundwater monitoring wells throughout the Site to establish groundwater flow and collected groundwater samples for chemical analysis to evaluate groundwater quality at all wells;
3. Collected groundwater samples from two existing monitoring wells for chemical analysis;
4. Installed nine soil vapor probes around the Site perimeter and collected nine samples for chemical analysis; and

5. Collected one ambient air sample to establish baseline vapor conditions at the Site.

Summary of Environmental Findings

1. Depth to groundwater is ranges from 8.85 on the southwestern end of the site and 15.12 ft-bg (at OW-2) on the northeastern end of the former filling station.

2. Groundwater flow is assumed to be in a west- northwesterly direction beneath the Site.

3. Depth to bedrock is approximately 90 feet below grade.

4. The stratigraphy of the Site was determined to be fill underlain by native material. A portion of the Site was historically occupied by a five-story building with an associated basement. Construction debris and recycled concrete material from the garage demolition was used to fill the existing basement to street grade. The subgrade slab was encountered between 12 and 16.5 ft-bg. Fill material including concrete chips, brick fragments, recycled concrete aggregate, metal pieces and silt made up the material above the slab. Below the slab, silt, fine sands and clay was encountered.

5. Soil samples results were compared to New York State Department of Environmental Conservation (NYSDEC) Unrestricted Use Soil Cleanup Objectives, Restricted Commercial Use Soil Cleanup Objectives (SCOs) as presented in 6NYCRR Part 375-6.8 and the NYSDEC DEC Policy CP-51. During field activities, a spill (Spill #1603635) was called in due to staining and odor at MW-5 (15-17). VOCs detected at MW-5 (15-17 ft-bg) below regulatory levels include the petroleum-related compounds n-butylbenzene, sec-butylbenzene, isopropylbenzene, n-propylbenzene, p-diethylbenzene and 1,2,4,5-tetramethylbenzene. Xylenes (total, o-xylene and p/m xylene) were detected at one sample location (max: 2.0 mg/kg) above the CP-51 standard. Acetone (max. 0.12 mg/kg) and 1,4-dioxane (max. 1.7 mg/kg) were detected

above their respective Unrestricted Use SCOs in one location. No VOCs were detected above the Restricted Commercial Use SCOs. One pesticide, 4,4'-DDT was detected at one sample location (max: 0.00807 mg/kg) above the Unrestricted Use SCO, but below the Restricted Commercial Use SCOs. Several metals, including copper (max: 62 mg/kg), lead (max: 67 mg/kg) and zinc (max: 340 mg/kg) were detected above the Unrestricted Use SCOs. One PCB, aroclor 1260 (max: 0.405 mg/kg), was detected at one sample location above the Unrestricted Use SCO, but below the Restricted Commercial Use SCO. No SVOCs were detected above regulatory standards in any sample location.

6. Groundwater sample results were compared to NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (AWQS). Several petroleum-related VOCs and SVOCs were detected in groundwater samples above the AWQS, including: benzene (max: 3.3 µg/l), toluene (26 µg/l), ethylbenzene (max: 180 µg/l), p/m-xylene (max: 220 µg/l), o-xylene (max: 5.6 µg/l), naphthalene (max: 110 µg/l), n-butylbenzene (max: 6.5 µg/l), sec-butylbenzene (max: 6.2 µg/l); isopropylbenzene (max: 48 µg/l), p-isopropyltoluene (max: 8.7 µg/l), naphthalene (max. 110 µg/L), n-propylbenzene (max: 45 µg/l), 1,3,5-trimethylbenzene (max: 38 µg/l), 1,2,4-trimethylbenzene (max: 68 µg/l), and 1,2,4,5-tetramethylbenzene (max: 24 µg/l). Other VOC compounds detected above the AWQS included chloroform (max: 17 µg/l) and acetone (max: 140 µg/l). Two SVOCs, phenol (max: 53 µg/l) and naphthalene (max. 93 µg/l), were detected above the AWQS. Several earth metals (dissolved), including magnesium, manganese and sodium, were detected in groundwater samples above regulatory thresholds. One PCB, Aroclor 1254 (max: 0.113 µg/l), was detected above the AWQS. No pesticides were detected above the AWQS.

7. Soil vapor samples collected during the RI were compared to against ambient air concentrations in accordance with NYSDOH Final Guidance on Soil

Vapor Intrusion and US Environmental Protection Agency (EPA) Vapor Intrusion Screening Levels (VISL) for Commercial and Residential Settings per the EPA OSWER VISL Calculator Version 3.4, November 2015 and EPA OSWER Publication 9200.2-154, Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air (November 2015). Petroleum-related BTEX compounds were detected in all nine samples above background air concentrations. Highest concentrations of total BTEX compounds were detected in sample SV-1 at 134.87 $\mu g/m^3$. Several chlorinated solvents were detected above background concentrations including: 1,1,1-trichloroethane (1,1,1-TCA) (max: 10.4 $\mu g/m^3$) and vinyl chloride (max: 1,050 $\mu g/m^3$). Tetrachloroethylene (PCE) and trichloroethylene (TCE) were not detected in any of the nine soil vapor samples. High concentrations of acetone (max: 1,890 $\mu g/m^3$) and ethanol (max: 4,560 $\mu g/m^3$) were noted. According to the NYSDOH matrix associated with 1,1,1-TCA (Matrix 2), reasonable and practical action should be taken to identify the source and reduce exposure of this compound at the soil vapor sample location. Future use of the Site and proposed building includes commercial land use. In an effort to identify regulatory guidance for commercial use, the soil vapor results were compared to the EPA VISL. Three VOCs were detected above EPA VISL Commercial levels including vinyl chloride, chloroform and benzene.

REMEDIAL INVESTIGATION REPORT

1.0 SITE BACKGROUND

LIC Site B-1 Owner, LLC, c/o Tishman Speyer Properties, Inc. has enrolled in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a 71,692-square foot (SF) property located at 28-07 Jackson Avenue, Long Island City, New York (the Site). Mixed-use office space is proposed for the Site's future use. A previous subsurface investigation was performed from November to December 2010 to define the onsite extent of contamination caused by the Site's previous use as a filling station. A Phase I Environmental Site Assessment report prepared by Hillmann Consulting in July 2015, identified a number of Recognized Environmental Conditions (RECs) discussed below. The Remedial Investigation (RI) field activities described in this were performed between July 12 and July 28, 2016. This Remedial Investigation Report (RIR) summarizes the nature and extent of contamination and provides sufficient information for establishment of remedial action objectives, evaluation of remedial action alternatives, and selection of a remedy that is protective of human health and the environment consistent with the use of the property pursuant to RCNY§ 43-1407(f).

1.1 Site Location and Current Usage

The Site is located at 28-07 Jackson Avenue in the Long Island City area of New York and is identified as Block 420 and Lot 1 on the New York City Tax Map. The property, known as Block 420 Lot 101, was converted in 2011 into a condominium ownership. As a result of this conversion, condominium Lot Numbers 1001 and 1002 were created. On August 05, 2016, the "reverter" a/k/a Lot 100 was severed from the condominium building and made its own separate tax lot. On August 16, 2016, a merger application was filed to the New York City Department of Finance (DOF) to merge Lot 100 into Lot 1 on Block 420. The DOF granted a new Tentative New Lot 1 that includes old Lot 1 and Lot 100. Department of Finance applications for Tentative Tax Lot Numbers are presented in Attachment 1. Figure 1 shows the Site location.

The Site is an irregularly shaped parcel and is currently a vacant lot. Two electrical sheds exist on the east and west sides of the Site, and area associated with the former structure at the Site. The electrical rooms are not currently operational. The Site lot is approximately 71,692-square feet (SF) and approximately 400 feet deep. The Site lot encompasses part of Block 420, which is bordered to the north by Bridge Plaza South, to the south by 42nd Road, to the east by Jackson Avenue, and to the west by 28th Street. Lot 101 comprises nearly half of Block 420, and borders the Site to the north/ northwest. Lot 101 is currently occupied by a 22-story office building, constructed in 2010. The Site is bordered by mixed-use commercial and residential spaces, a New York City Transit Authority (NYCTA) Substation and properties undergoing construction. A map of the site boundary is shown on Figure 2.

1.2 Proposed Redevelopment Plan

The proposed project is a 1.14 million gross square feet (GSF) out-of-the-ground mixed-use office development augmented with retail and parking. The proposed project consists of two new mixed-use office buildings, One and Three Gotham Center, respectively, whose usable square footage will total 929,818 SF. The towers will be 26 stories resting on a single four-floor above-grade podium. The podium will house a 388-space public parking garage on the second through fourth floors, ground-floor retail, a loading dock on 42nd Road, and office spaces on floors two through four. The cellar level will house mechanical rooms and back-of-house spaces. Each building will contain a lobby fronting Jackson Avenue. The bottom of bulk excavation will be approximately 20 feet below sidewalk grade. A set of eleven elevators will be installed at One Gotham Center, and a set of 16 elevators will be installed at Three Gotham Center. A loading dock with five berths will also be constructed along 42nd Road.

1.3 Description of Surrounding Property

Figure 1 details the surrounding land use. The northwest adjoining property is occupied by commercial and office buildings (Lot 101), and northwest of Block 420, the surrounding buildings are primarily vacant or used for commercial and office space. West

of the site are mixed residential and commercial buildings, vacant lots, commercial and office buildings, and industrial and manufacturing sites. Properties southeast of the Site are largely vacant, with a transportation and utility building and a parking facility present. Surrounding property immediately to the east is occupied by the entrance to the Ed Koch Queensboro Bridge, and a large traffic intersection along Queens Plaza South. The majority of the surrounding properties are zoned as commercial, manufacturing and residential.

2.0 SITE HISTORY

2.1 Past Uses and Ownership

The earliest Sanborn map (1836) shows the property developed with stores and dwellings until approximately 1936. Prior to 1970, the Site was shown as developed with a filling station with ten gasoline tanks on the northeast corner of the property, two auto repair facilities and an auto painting facility on the southwest portion. The gasoline filling station is shown as occupying the Site between 1936 and 1957. In 1950 a candy manufacturer, a canvas sewing facility a food shopping facility and Gem Heat Treating Co. were present along the northwest portion of the site. In 1970, the Site was developed with a parking lot in the northeast corner. The 1970 map also depicts vacant lots, Gem Heat Treating Co. offices and commercial facilities and stores. In 1974, the City of New York constructed a five-story garage building covering most of Lots 1 and 101 (Block 420). The Site was developed with a municipal parking garage from approximately 1977 to 2009. Soil under the former filling station had been excavated to a depth of approximately 13 feet below grade (ft-bg) to construct the basement of the five-story municipal garage building. The gasoline tanks most likely were removed during the soil excavation under the former filling station prior to the construction of the former municipal garage. However, no records were found to indicate a specific date for the tanks removal. In late 2008, this building was demolished to construct a new 22-story office building on Lot 101. Construction debris and recycled concrete material from the garage demolition was used to fill the existing basement to street grade on Lot 1. Lot 1 has been vacant since the demolition of the former garage in 2008.

2.2 Previous Investigations

Reports pertaining to prior environmental studies and investigations performed at the Site are discussed below:

Phase I Environmental Site Assessment (Phase I ESA) - Hillman Consulting, LLC (Hillman) July 2015

The Phase I ESA identified the following Recognized Environmental Conditions (RECs):

- The property is listed on the EDR E-Designation regulatory database describing "Underground Gasoline Storage Tanks Testing Protocol." This designation requires the property to undergo environmental investigation and remediation to the satisfaction of the NYC Office of Environmental Remediation (OER) before a change in site use/zoning can be approved and permits issued.
- A filling station with gasoline underground storage tanks (USTs) previously existed on the northeast side of the Site from at least 1936 to 1950. The filling station was demolished and a three-level municipal garage was built over the area by 1977. No documentation of UST closure or site investigation reports showing an absence of gasoline USTs was available.
- The documented presence of historic urban fill material to a minimum of 20 ft-bg.
- Historical presence of industrial adjacent properties including: a brass foundry, multiple auto repair facilities, a manufacturing facility and a sheet metal facility. Several adjacent properties were also listed on the E-Designation database.

The Phase I ESA identified the following Controlled REC:

- A NY Spills listing was identified at the Site in reference to the former filling station. DEC issued a memo indicating that Site investigation work was conducted in late 2010 to delineate contamination found in the proximity of the filling station and to determine if the contamination had impacted groundwater beneath the Site. Corrective action was completed and the case was closed on September 7, 2011 with residual subsurface contamination left in place.

The Phase I ESA identified the following Historical REC:

- A listing for the Site on the UST database references a 20,000 gallon No. 2 fuel oil UST removed from the property on January 14, 2009. The tank closure report states that several polycyclic aromatic hydrocarbons (PAHs) were detected above Soil Cleanup Objectives (SCOs) in three samples. Hillman notes that PAHs are generally associated with urban fill material.

Remedial Investigation Work Plan and subsequent revisions - Fleming Lee Shue, August 19, 2009

During a June 2009 sewer replacement project on Block 420, subsurface petroleum-contaminated soil was observed on Lot 1. A petroleum spill was reported to the New York State Department of Environmental Conservation (NYSDEC) petroleum Spill Hotline and a Spill Number 0902823 assigned.

A development agreement between the New York City Economic Development Corporation (NYCEDC) and LIC Site B2 Owner, LLC (current owner of the existing office building) required that an existing sewer that crosses Block 420 be replaced in a location immediately adjacent to the old sewer. The sewer line extends from 42nd Road to Bridge Plaza South crossing new Lot 1 and Lot 101. During excavation on Lot 1 to install the replacement sewer in proximity to Bridge Plaza South, petroleum-contamination soil was identified in native soil below the basement floor of the former garage (at approximately 10 to 17.5 ft-bg). The vertical and horizontal extent of the petroleum contamination could not be delineated due to ongoing construction of the office building on Lot 101.

Environmental controls and oversight were implemented to allow the sewer work to be completed. These measures included excavating soil to a depth of 17.5 feet below grade in the areas of the sewer replacement, approximately two feet below the static water table, in order to remove contaminated soil in the smear zone below the sewer line and application of Oxygen Release Compound (ORC) slurry at a depth of 17.5 ft-bg. The slurry was covered with plastic sheeting and gravel to raise the grade to the level needed for the construction of the sewer line. Before placing the ORC slurry, plastic sheeting, and gravel layer, the soil on the bottom of the excavation was screened for petroleum contamination and a soil sample collected and analyzed for volatile organic compounds (VOCs) and semivolatile organic compounds in accordance with the NYSDEC Spills and Technology (STARS) Protocol, Memorandum #1.

A subsurface investigation was performed in November and December 2010 to delineate the contamination identified near the former filling station, and to determine if the contamination had impacted the groundwater beneath the Site. Seventeen soil borings were advanced to depths ranging from 20 to 26 ft-bg and three groundwater monitoring wells were installed and sampled, one upgradient and two downgradient of the open spill. Several VOCs in soil and groundwater were detected slightly above the NYSDEC DEC Policy CP-51 guidance values. The petroleum spill case was closed on September 7, 2011 with residual subsurface contamination left in place. A copy of the Spill Closure Letter is included in Attachment 3.

2.3 Site Inspection

A Site inspection was performed as part of the RI at the Site to determine the site access for drilling equipment. The property is vacant with two electrical sheds on the eastern and western ends of the Site. The electrical rooms are not operational. The northern portion of the Site consists of a gated and paved parking lot associated with the 22-story building on Lot 101. No staining or visual impacts were observed during the Site inspection.

2.4 Areas of Concern

The AOCs identified for this Site include:

1. Presence of historic urban fill across the area outside the former basement Site to an approximate depth of 17 ft-bg.
2. Previous Site uses including a gasoline filling station.
3. Residual subsurface contamination in the area near the former gasoline filling station as a subsequent to the spill closure of Spill Number 0902823.

Copies of prior environmental reports are presented in Appendix C.

3.0 PROJECT MANAGEMENT

3.1 Project Organization

The Qualified Environmental Profession (QEP) responsible for oversight of the RI and preparation of this RIR is Mohamed Ahmed.

3.2 Health and Safety

All work described in this RIR was performed in full compliance with applicable laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements.

3.3 Materials Management

All material encountered during the RI was managed in accordance with applicable laws and regulations.

4.0 REMEDIAL INVESTIGATION ACTIVITIES

The RI was conducted between July 12th and July 28th 2016. Tenen performed the following scope of work:

1. Completed a Site Inspection;
2. Installed nine soil borings on the Site, and collected 17 soil samples for chemical analysis from the soil borings to evaluate soil quality;
3. Installed seven groundwater monitoring wells throughout the Site to establish groundwater flow and collected groundwater samples for chemical analysis to evaluate groundwater quality at all wells;
4. Collected groundwater samples from two existing monitoring wells for chemical analysis;
5. Installed nine soil vapor probes around the Site perimeter and collected nine samples for chemical analysis; and
6. Collected one ambient air sample to establish baseline vapor conditions at the Site.

4.1 Borings and Monitoring Wells

Soil Boring Installation and Sampling

Nine soil borings were advanced at the Site. Five of the nine (MW-3 through MW-7) borings were advanced using a Sonic Rig in conjunction with the geotechnical investigation performed by Mueser Rutledge Consulting Engineers (MRCE). These borings were advanced by MRCE to bedrock. The following soil borings were advanced below the basement slab using a Sonic Rig: SB-1, MW-3, MW-5, MW-6 and MW-7. These five borings were advanced through the sub-cellar slab and below the depth of excavation (17 ft-bg). Samples were collected below the sub-cellar slab, encountered between 12 and 16.5 ft-bg, and below the depth of excavation at 17-20 ft-bg. If evidence of contamination was encountered at this depth, the first apparent clean zone of native

soil was also sampled. Boring MW-4, was originally located within former basement basement footprint; however, subsurface soils were encountered at shallow intervals and no slab was encountered during drilling. This boring was advanced outside the former basement as discussed below.

Four remaining soil borings (SB-2, SB-3, SB-4 and MW-4) were advanced in the area outside of the former basement footprint, to below the depth of excavation (17-20 ft-bg). Samples were collected at the surface (0-2 ft-bg) interval and at 17-19 ft-bg). If evidence of contamination (elevated PID readings, staining and/or odors) was encountered, the first apparent clean interval of native soil was sampled.

A Sonic drilling rig operated by Aquifer Drilling and Testing (ADT) was used to advance soil borings MW-3 through MW-7 and SB-1. Borings MW-3 through MW-7 were extended to bedrock as part of the geotechnical investigation. Soil samples were collected using the five-foot Sonic sampler and split spoon sampler.

A Geoprobe® direct push unit operated by ADT was used to advance soil borings MW-1, MW-2 and SB-2, outside of the former basement footprint. Soil samples were obtained by driving a two-inch diameter by five-foot long steel macro core sampler with a dedicated acetate liner through the subsurface soil.

Discrete (grab) samples were taken from the aforementioned sampling intervals. Sufficient sample volume was collected for each analysis, with additional sample volume collected for reanalysis, if necessary. Soil samples were collected in glass containers.

Boring locations are shown on Figure 2. A table detailing the boring locations and sample designations is included below.

Soil Sample Borings, Sample Designations and Descriptions of Location

Sample Location	Sample Name (Depth in ft-bg)	Description of Location

MW-3	MW-3 (17-19)	West of former gasoline filling station; inside former basement footprint.
	MW-3 (20-22)	
MW-4	MW-4 (0-2)	West of former gasoline filling station; outside former basement footprint.
	MW-4 (17-19)	
MW-5	MW-5 (15-17)	Southeast corner of Site, adjacent to Jackson Avenue; inside former basement footprint.
	MW-5 (23-25)	
MW-6	MW-6 (20-22)	Southwest corner of Site, adjacent to Jackson Avenue; inside former basement footprint.
	MW-6 (26-28)	
MW-7	MW-7 (26-28)	Southwest end of Site, adjacent to 42nd Road; inside former basement footprint.
SB-1	SB-1 (18-19)	South, center of Site; inside former basement footprint.
	SB-1 (20-22)	
SB-2	SB-2 (0-2)	Center of Site; outside former basement footprint.
	SB-2 (7-9)	
SB-3	SB-3 (0-2)	North end of Site located within parking area of adjacent existing 22-story building. Outside former basement footprint.
	SB-3 (17-19)	
SB-4	SB-4 (0-2)	West end of Site, adjacent to 42nd Road; outside former basement footprint.
	SB-4 (17-19)	

The soil was field screened using a photoionization detector (PID). Elevated PID levels were recorded at MW-4 and MW-5. The highest PID reading [42.4 parts per million (ppm)], was detected at approximately 18 ft-bg at MW-4 and a sample was collected at the 17-19 ft-bg interal. A petroleum-like odor was noted during sampling at this location, which is downgradient and within close proximity to the former gasoline filling station. As previously mentioned, residual subsurface contamination remained subsequent to the spill closure in the eastern portion of the Site.

At MW-5, a maximum PID reading of 106 ppm was measured directly below the concrete slab at approximately 16 ft-bg and a sample was collected at 15 to 17 ft-bg. Petroleum-like odor and minor staining was noted within this interval. PID readings continued at elevated levels, (0.6 to 14.7 ppm) to a depth of 23 ft-bg. A sample was collected at 23 to 25 ft-bg, the first apparent interval of native soil. Due to the elevated PID readings, staining and petroleum-like odor, a spill was called into the NYS Spill

Hotline. Spill #1603635 was assigned to the Site and a NYSDEC representative was assigned to the project. The open spill is currently under review. A waterproofing material was observed on the subcellar slab at this location.

Fill material, including recycled concrete and construction debris, was observed above the subcellar slab within the building footprint. At two locations, MW-7 and SB-1, thick metal sheeting and rebar was encountered above the slab at a depth ranging from 14 to 26 ft-bg. Previous investigations, completed in 2009 by FLS, identified metal sheeting at 20 to 25 ft-bg on the eastern side of the side within the area of the former filling station.

All grossly contaminated soil cuttings encountered during this investigation were drummed. Following the completion of the soil sampling, boreholes were backfilled with clean cuttings/sand.

Investigation boring logs are provided in Appendix A. Soil boring and monitoring well locations are shown in Figure 2.

Groundwater Monitoring Well Installation

As discussed previously, soil borings MW-3 through MW-7 were extended to bedrock as part of the geotechnical investigation. These five borings were relocated approximately three feet to the north of their original location and were re-installed using a Sonic drilling rig, to approximately 15 feet below the groundwater table. Two-inch diameter groundwater monitoring wells were installed at these locations. Soil boring location SB-3 and SB-4 were converted to two-inch diameter groundwater monitoring wells MW-1 and MW-2, respectively.

All seven installed groundwater monitoring wells were developed by purging three well volumes. Two previously installed permanent groundwater wells (OW-1 and OW-2) within the area of the former filling station were developed by purging three volumes and subsequently sampled. A petroleum-like odor was observed at OW-1. The contents of the purged water were drummed for further disposal.

Groundwater was encountered between 8.85 ft-bg (at MW-7) in the southwestern end of the site and 15.12 ft-bg (at OW-2) on the northeastern end of the former filling station. Details regarding groundwater sampling are provided below. Depth to groundwater was calculated from the top of casing.

Groundwater Monitoring Wells and Descriptions of Location

Sample Location	Description of Location
MW-1	North end of Site located within parking area of adjacent existing 22-story building. Outside former basement footprint.
MW-2	West end of Site, adjacent to 42nd Road; outside former basement footprint.
MW-3	West of former gasoline filling station; inside former basement footprint.
MW-4	West of former gasoline filling station; outside former basement footprint.
MW-5	Southeast corner of Site, adjacent to Jackson Avenue; inside former basement footprint.
MW-6	Southwest corner of Site, adjacent to Jackson Avenue; inside former basement footprint.
MW-7	Southwest end of Site, adjacent to 42nd Road; inside former basement footprint.
OW-1	Northeast side of former gasoline filling station
OW-2	West side of former gasoline filling station

Groundwater sampling took place approximately 48 hours after well development. At each well, water temperature, pH and turbidity were measured using a Horiba U-52 in order to stabilize parameters before sample collection. Samples were collected using a low-flow peristaltic pump.

Headspace readings were recorded in the field using a PID. The highest detections occurred within the area of the former filling station, with a maximum reading of 206 ppm at OW-1. Elevated PID readings, with the highest at MW-3 (42.5 ppm) were noted at monitoring wells located downgradient and within a 150-foot radius of the former gasoline filling station. Two groundwater wells in the southern end of the Site showed elevated PID levels ranging from 11 ppm (MW-7) to 18.4 ppm (MW-6).

Monitoring well locations are shown in Figure 2.

4.2 Sample Collection and Chemical Analysis

Sampling performed during the RI was focused on the previously-identified Areas of Concern, prior Site and adjacent/surrounding historical information, and field measurements and observations and included sampling and evaluation of soil, groundwater and soil vapor. The sampling objectives are delineation of the nature and extent of contamination in order to determine the impact of contaminants on public health and the environment. The sampling described in this RIR provides sufficient basis for evaluation of remedial action alternatives, establishment of a qualitative human health exposure assessment, and selection of a final remedy.

Soil Sampling

Soil samples were containerized in accordance with EPA analytical protocols. Each sample was labeled, sealed, and placed in a chilled cooler for shipment to the laboratory. A record of each sample, including notation of any odors, color, and sample matrix, was kept in the sampler's field log book. A chain of custody was maintained throughout the field sampling, transport of samples to the laboratory, and lab analysis. Field and trip blanks were collected for quality assurance/quality control (QA/QC) purposes. The soil samples collected by Tenen were analyzed for Target Compound List (TCL) VOCs by EPA Method 8260, TCL semivolatile organic compounds (SVOCs) by EPA Method 8270, pesticides/polychlorinated biphenyls (PCBs) by EPA Methods 8081/8082 and Target Analyte List (TAL) metals by EPA Method 6010.

Seventeen soil samples were collected for chemical analysis during this RI. Analytical results, dates of collection and sample depths, are reported in Tables 1 through 4 and sample locations are shown in Figure 2.

Analytical methodologies are described below.

Groundwater Sampling

Chain of custody documentation was completed before shipment. The groundwater sample was placed in ice and secured in a cooler during shipment to the laboratory and analyzed by Alpha for TCL VOCs by EPA Method 8260, TCL SVOCs by EPA Method 8270, pesticides/ PCBs by EPA Methods 8081/8082 and total and dissolved TAL metals by EPA Method 6010.

Nine groundwater samples were collected on June 27-28, 2016. Groundwater sample collection data is reported in Tables 5 through 8. Sampling logs with information on purging and sampling of groundwater monitor wells are included in Appendix B. Figure 2 shows the location of groundwater sampling wells. Laboratory and analytical methods are shown below.

Soil Vapor and Ambient Air Sampling

Nine soil vapor probes were installed and nine soil vapor samples were collected for chemical analysis during this RI. Soil vapor sampling locations are shown in Figure 2 and sample collection data is reported in Table 9. One ambient air sample was also collected at an upgradient location. Methodologies used for soil vapor assessment conform to the *New York State Department of Health (NYSDOH) Final Guidance on Soil Vapor Intrusion, October 2006.*

Three soil vapor points were advanced within the former basement footprint, to a depth of approximately two feet above the basement sub-slab. Six soil vapor points were advanced outside of the basement footprint, to a depth of approximately five feet above the groundwater table. Several soil vapor points are co-located with soil boring locations. Soil vapor points were located around the perimeter within proposed building footprint.

The following table details the locations and sample designations for each soil vapor point:

Soil Vapor Sampling Points, Sample Designations and Locations

Sample Location	Description of Location
SV-1	Southwest end of Site; inside former basement footprint
SV-2	Co-located with SB-1; south, center of Site, inside former basement footprint.
SV-3	Co-located with MW-3; west of former gasoline filling station; inside former basement footprint.
SV-4	Co-located with MW-4; west of former gasoline filling station, outside former basement footprint.
SV-5	Co-located with MW-1; north end of Site located within parking area of adjacent existing 22-story building. Outside former basement footprint.
SV-6	Center, north end of Site located within parking area of adjacent existing 22-story building.
SV-7	West side of Site, adjacent to 42nd Road. Outside former basement footprint.
SV-8	Downgradient and west of former gasoline station area, outside former basement footprint.
SV-9	Co-located with MW-2; west end of Site, adjacent to 42nd Road. Outside of former basement footprint.
AMBIENT	Upwind of Site

A Geoprobe® direct push unit operated by ADT was used to install soil vapor sampling probes at locations SV-1 through SV-9. At each soil vapor sampling location, a ½ inch diameter, 6-inch long perforated soil vapor sampling probe was placed at the bottom of the boring. The soil vapor sampling probe was connected to ¼-inch diameter polyethylene tubing that was extended to grade. Fine #00 sand was placed in the annular space around the probe and tubing to grade. The borehole above the sampling probe to grade was sealed using an inert sealant (bentonite, wetted at the surface) to prevent ambient air mixing with the soil vapor. In accordance with the New York State Department of Health (NYSDOH) October 2006 Final Guidance for Evaluating Soil

Vapor Intrusion in the State of New York (Soil Vapor Guidance) protocols, a tracer gas (helium) was used to verify the integrity of the soil vapor probe and sampling tube seals. A plastic chamber was sealed above the borehole. The sampling tube was pushed through the top of the sealed chamber. The atmosphere inside the chamber was enriched with the tracer gas (helium). A portable helium monitor was attached to the sampling tube to measure a vapor sample from the probe for the presence of high concentrations (>10%) of the tracer gas.

Soil vapor was purged from the boring hole by attaching the surface end of the polyethylene tube to an air valve and then to a vacuum pump. The vacuum pump removed one to three volumes of air (volume of the sample probe and tube) prior to sample collection. The flow rate for both purging and sample collection did not exceed 0.2 liter per minute.

The soil vapor samples were first screened for organic vapors using a photoionization detector (PID). Pre-soil vapor sample PID reading ranged from non-detect readings (0.0 ppm) at SV1 and SV-9 to a maximum of 31.0 ppm at SV-5. Soil vapor and ambient air samples were collected in 2.75-liter Summa canisters using eight-hour regulators and analyzed for volatile organic compounds (VOCs) using EPA Method TO-15.

Field notes were maintained summarizing sample identification, date and time of sample collection, sampling depth, identity of samplers, sampling methods and devices, soil vapor purge volumes, volume of the soil vapor extracted, vacuum of canisters before and after the samples were collected and chain of custody protocols.

Chemical Analysis

Chemical analytical work presented in this RIR has been performed in the following manner:

Factor	**Description**
Quality Assurance Officer	The chemical analytical quality assurance is directed by Matthew

	Carroll
Chemical Analytical Laboratory	The chemical analytical laboratory for the RI is Alpha Analytical Laboratories, a New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP)-certified analytical laboratory.
Chemical Analytical Methods	Soil analytical methods: • TAL Metals by EPA Method 6010C (rev. 2007); • VOCs by EPA Method 8260C (rev. 2006); • SVOCs by EPA Method 8270D (rev. 2007); • Pesticides by EPA Method 8081B (rev. 2000); • PCBs by EPA Method 8082A (rev. 2000); Groundwater analytical methods: • TAL Metals by EPA Method 6010C (rev. 2007); • VOCs by EPA Method 8260C (rev. 2006); • SVOCs by EPA Method 8270D (rev. 2007); • Pesticides by EPA Method 8081B (rev. 2000); • PCBs by EPA Method 8082A (rev. 2000); Soil vapor analytical methods: • VOCs by TO-15 VOC parameters.

Results of Chemical Analyses

Laboratory data for soil, groundwater, soil vapor and ambient air are summarized in Tables 1 through 9. Laboratory data deliverables for all samples evaluated in this RIR are provided in digital form in Appendix E.

5.0 ENVIRONMENTAL EVALUATION

5.1 Geological and Hydrogeological Conditions

Stratigraphy

The Site is mapped on the Central Park Quadrangle 7.5 Minute Topographic Map, published by the United States Geological Survey (USGS) (Figure 1). Review of the topographic map indicates that that the Site is located at approximately 20 feet above the National Geodetic Vertical Datum of 1929 (an approximation of mean sea level) (USGS). The surface topography at the Site and surrounding area is relatively flat.

During environmental sampling, the subsurface lithology was determined to be fill underlain by native material. A portion of the Site was historically occupied by a five-story building with an associated basement. Construction debris and recycled concrete material from the garage demolition was used to fill the existing basement to street grade. The subgrade slab was encountered between 12 and 16.5 ft-bg. Fill material including concrete chips, brick fragments, recycled concrete aggregate, metal pieces and silt made up the material above the slab. Below the slab, silt, fine sands and clay were encountered.

Fill material at the Site outside the former basement footprint consisted of concrete chips, brick fragments, silt and wood extending to an approximate depth of 15 ft-bg. Native material consists of sand, silt and cobbles. Lithologic logs are presented in Appendix A.

Hydrogeology

Groundwater was encountered between 8.85 to 15.12 ft-bg with an assumed westerly flow direction. The groundwater flow is consistent with that estimated in the 2009 United States Geologic Survey (USGS) publication, *Water-Table and Potentiometric-Surface Altitudes in Upper Glacial, Magothy and Lloyd Aquifers Beneath Long Island, New York, March-April 2006*. Groundwater is not used as a source of potable water in this area of Queens. The nearest surface water body is Newtown Creek, located roughly 2,000 feet to the south of the Site. Groundwater is assumed to be flowing to the west with a southern component towards the East River, located approximately 4,000 feet to the west of the Site.

5.2 Soil Chemistry

Soil analytical results are summarized in Tables 1 through 4; laboratory qualifiers are summarized in Table 10. The laboratory analytical report is included in Appendix E. The maximum PID reading in soil was 106 ppm. Soil results were compared to the New York State Department of Environmental Conservation (NYSDEC) Unrestricted Use SCOs as listed in 6 NYCRR Part 375-6.8(a) and the Restricted Commercial Use SCOs as listed in 6 NYCRR Part 375-6.8(b) and the NYSDEC DEC Policy CP-51.

Xylenes (total, o-xylene and p/m xylene) were detected above CP-51 values at SB-1 in the interval of 18-19 ft-bg. Total xylenes were detected at 2.0 mg/kg above CP-51 value of 0.26 mg/kg. At location SB-1, a PID reading of 10.1 ppm was noted; however, no odor was observed. A sample was collected at the first apparent clean native zone (20-22 ft-bg), and no xylenes were detected above regulatory levels at this interval. Acetone was also detected above the Unrestricted Use SCOs. No other VOCs were detected above CP-51 regulatory levels at any of the locations. No VOCs were detected above Restricted Commercial Use SCOs. During field activities, a spill (Spill #1603635) was called in due to staining and odor at MW-5 (15-17). VOCs detected at MW-5 (15-17 ft-bg) below regulatory levels include the petroleum-related compounds n-butylbenzene, sec-butylbenzene, isopropylbenzene, n-propylbenzene, p-diethylbenzene and 1,2,4,5-tetramethylbenzene.

One pesticide, 4,4'-DDT, was detected at location SB-4 (0-2) at a concentration of 0.00807 mg/kg, above the Unrestricted Use SCO of 0.0033 mg/kg, but well below Restricted-Commercial Use SCOs. No exceedences were noted in the deeper intervals at this location.

The following metals were identified above Unrestricted Use SCOs: copper, lead and zinc, with no metals detected above Restricted-Commercial Use SCOs. Copper and zinc were detected at one location, SB-2, within the shallow interval at a concentration of 62 mg/kg and 340 mg/kg, above the Unrestricted Use SCO of 50 mg/kg and 109 mg/kg. Lead was detected at one location, SB-3, at a concentration of 67 mg/kg, above the Unrestricted Use SCO of 63 mg/kg.

One polychlorinated biphenyl (PCB), Aroclor 1260, was detected at 0.405 mg/kg at MW-5 (15-17), above the Unrestricted Use SCO of 0.1 mg/kg, but below the Commercial Use SCO.

No SVOCs were detected above standards at any of the locations. Data collected during the RI is sufficient to delineate the vertical and horizontal distribution of contaminants in soil/fill at the Site.

5.3 Groundwater Chemistry

Groundwater results were compared to the NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (AWQS).

Several petroleum-related VOCs and SVOCs were detected in groundwater samples above the AWQS, with the highest concentrations generally detected in sample MW-4. Benzene was detected in sample OW-1 at a concentration of 3.3 micrograms per liter (ug/l) above the AWQS of 1 ug/l. In MW-4, toluene was detected at a maximum concentration of 26 ug/l; ethylbenzene was detected at a concentration of 180 ug/l; p/m-xylene was detected at a concentration of 220 ug/l; and o-xylene was detected at a concentration of 5.6 ug/l, all above the AWQS of 5 ug/l. Naphthalene was detected in the VOC and SVOC scans, at a maximum concentration of 110 ug/l, above the AWQS of 10 ug/l. Other petroleum-related compounds detected above the AWQS of 5 ug/l at MW-4 included n-butylbenzene (max: 6.5 µg/l), sec-butylbenzene (max: 6.2 µg/l); isopropylbenzene (max: 48 µg/l), p-isopropyltoluene (max: 8.7 µg/l), naphthalene (max. 110 µg/L), n-propylbenzene (max: 45 µg/l), 1,3,5-trimethylbenzene (max: 38 µg/l), 1,2,4-trimethylbenzene (max: 68 µg/l), and 1,2,4,5-tetramethylbenzene (max: 24 µg/l).

Other VOC compounds detected above the AWQS include chloroform, detected in MW-2 at 17 ug/l, above the AWQS of 7 ug/l, and acetone, detected at a maximum concentration of 140 ug/l in MW-7, above the AWQS of 50 ug/l. The SVOC phenol was identified in four monitoring wells, with a maximum concentration of 53 ug/l in sample MW-7, above the AWQS of 1 ug/l.

Several metals (dissolved and total) were detected in groundwater samples above the regulatory thresholds. Most exceedances were common earth metals, including iron,

magnesium, manganese, and sodium. Chromium (total) was identified ranging from 52.89 ug/l (MW-1) to 69 ug/l (MW-2), above the AWQS of 50 ug/l. Lead (total) was detected between 36.51 ug/l (OW-1) and 48.73 (MW-2), above the AWQS of 25 ug/l. One PCB, Aroclor 1254, was detected in groundwater sample MW-7 at a concentration of 0.113 ug/l, above the AWQS of 0.09 ug/l.

As described above, no SVOCs, with the exception of naphthalene and phenol, were detected above the AWQS. No pesticides were detected above the AWQS. Data collected during the RI is sufficient to delineate the distribution of contaminants in groundwater at the Site.

Groundwater analytical results are summarized in Tables 5 through 8 and laboratory qualifiers are summarized in Table 10. The laboratory analytical report is included in Appendix E.

5.4 Soil Vapor Chemistry

Soil vapor analytical results are included as Table 9 and the laboratory analytical report is included in Appendix E. Laboratory qualifiers are summarized in Table 10.

Nine soil-vapor points (SV-1 through SV-9) and one ambient air sample were collected on July 27, 2016. Soil vapor results were assessed in accordance with the NYSDOH Final Guidance on Soil Vapor Intrusion, October 2016, and compared against background (ambient air) concentrations and US Environmental Protection Agency (EPA) Vapor Intrusion Screening Levels (VISL) for Commercial and Residential Settings per the EPA OSWER VISL Calculator Version 3.4, November 2015 and EPA OSWER Publication 9200.2-154, Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air (November 2015).

Petroleum-related BTEX compounds were detected in all nine samples above background air concentrations. Maximum detections include the following: benzene was detected at 15.3 ug/m3 (SV-6); toluene was detected at 45.6 ug/m3 (SV-2); ethylbenzene was detected at 13.6 ug/m3 (SV-1); and p/m-xylene and o-xylene were detectected 47.3 ug/m3 and 20.3 ug/m2, respectively (SV-1). Additional petroleum-related compounds

were detected above background concentrations: 1,3,5-trimethylbenzene and 1,3-dichlorobenzene were detected at SV-1 (5.8 ug/m3 and 22.8 ug/m3, respectively); the max concentration of 1,2,4-trimethylbenzene was also detected at SV-1 (21.8 ug/m3) while the minimum concentration was detected at SV-9 (2.43 ug/m3).

Several chlorinated solvents were detected above background concentrations. Vinyl chloride was detected ranging from 18.5 ug/m3 at SV-5 to 1,050 ug/m3 at SV-6; 1,1,1-trichloroethane (1,1,1-TCA) was detected only at SV-3 at a concentration of 10.4 ug/m3. TCE and PCE were not detected in any of the nine soil vapor samples.

High concentrations of acetone and ethanol were noted. The max detections for both compounds were at SV-6, with acetone detected at 1,890 ug/m3 and ethanol at 4,560 ug/m3.

According to the NYSDOH matrix associated with 1,1,1-TCA (Matrix 2), reasonable and practical action should be taken to identify the source and reduce exposure of this compound at soil vapor sample location SV-3.

As previously mentioned, soil vapor samples were compared against ambient air concentrations in accordance with NYSDOH Final Guidance on Soil Vapor Intrusion. Future use of the Site and proposed building includes commercial land use. In an effort to identify regulatory standards for commercial use, the soil vapor results were compared to the EPA VISL. Three VOCs were detected above EPA VISL standards including vinyl chloride, chloroform and benzene.

Data collected during the RI is sufficient to delineate the distribution of contaminants in soil vapor at the Site.

5.5 Prior Activity

Based on an evaluation of the data and information from the RIR, disposal of significant amounts of hazardous waste is not suspected at this site.

5.6 Impediments to Remedial Action

There are no known impediments to remedial action at this property.

FIGURES

TABLES

APPENDIX A

BORING LOGS

APPENDIX B

GROUNDWATER SAMPLING LOGS

APPENDIX C

PREVIOUS STUDIES

APPENDIX D

PROPOSED PROJECT PLANS

APPENDIX E

LABORATORY DELIVERABLES