1500 Astor Avenue
Remedial Investigation Report

1500 Astor Avenue - Bronx, NY
Block 4393, Lot 1
BCP Site # C203105

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
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CERTIFICATION

I, Alana M. Carroll, certify that I am currently a Qualified Environmental Professional as defined in 6NYCRR Part 375 and that this Remedial Investigation Report was prepared in accordance with all applicable statues and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.

Alana Carroll

Alana Carroll, PG

01/31/2019

Date

1.0 INTRODUCTION

On behalf of Eastchester-Astor, LLC (the "Volunteer"), Tenen Environmental, LLC (Tenen) has prepared this Remedial Investigation Report (RIR) for the property located at 1500 Astor Avenue and 2300-2314 Eastchester Road (Block 4393, Lot 1) in the Borough of the Bronx, New York City, New York (the Site). The Site location and layout are identified on Figures 1 and 2. This RIR presents the methodology and findings of the remedial investigation (RI) conducted in accordance with the May 2018 Remedial Investigation Work Plan (RIWP), which was approved by the New York State Department of Environmental Conservation (NYSDEC). The RIWP is included as Appendix A.

The objective of the RI was to further investigate and characterize the nature and extent of contamination on Site and confirm prior investigation results. The scope of work included investigation of soil in areas not previously sampled, further assessment of groundwater conditions and assessment soil vapor conditions on and bordering the Site.

RI activities were conducted in March and May 2018. The results of this investigation were used to prepare the qualitative human health exposure assessment (EA) included in Section 6.0 of this RIR. This RIR has been prepared in accordance with the NYSDEC Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10, May 3, 2010) and the Brownfield Cleanup Agreement (BCA) between the Volunteer and NYSDEC effective February 21, 2018.

Prior Site investigations, detailed in Section 3, have confirmed the presence of onsite contamination. Specifically, Site investigations have identified chlorinated solvents at concentrations above regulatory levels in environmental media. The soil, soil vapor and groundwater are impacted with PCE, consistent with the historic use of the Site as a dry cleaner for a period of at least 32 years. Based upon the location and distribution of elevated PCE concentrations, these impacts are attributable to the historic dry cleaning operations. Based upon comparison with the New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York (Soil Vapor Guidance), the levels of PCE identified at the Site require mitigation.

Based on the above, it was concluded that further investigation would be required to characterize the nature and extent of soil, groundwater, and soil vapor contamination on the Site to determine if contaminant levels related to historic Site operations threaten public health or the environment. To accomplish these objectives, the following RI tasks were completed between March and June 2018:

- Soil borings were advanced at fifteen locations.
- Twenty-two soil samples [including QA/QC samples] were collected at depths ranging from 0 to 10 feet below grade (ft-bg).
- Two permanent groundwater-monitoring wells were installed. Groundwater samples were collected from one newly installed well [MW-12 was dry] and from five previously installed wells.

- Soil vapor samples were collected from two locations in the parking lot and two sub-slab locations within the onsite building. Two indoor air samples were collected, and two ambient air samples were collected.

The analytical results of the RI sampling confirmed the presence of an onsite soil source of chlorinated solvent impacts associated with former Site operations as a dry cleaner. Elevated concentrations of PCE above applicable regulatory standards were found in soil within the source area and groundwater within and downgradient of the source area. Chlorinated solvents were found in soil vapor above ambient concentrations across the Site, with comparison of sub-slab and indoor air concentrations of PCE to NYSDOH Matrix B indicating that monitoring is necessary. One SVOC [benzo(a)pyrene] was detected in one shallow (0-1 ft-bg) soil sample at a concentration slightly exceeding the applicable regulatory standard.

1.1 Report Organization

This RIR details the findings of the RI tasks completed by Tenen between March and June 2018, including soil, groundwater and soil vapor sampling. The RI data was used to characterize the current environmental conditions at the Site. Data from prior investigations has also been summarized. This RIR is organized as follows:

- Section 1 – Introduction
- Section 2 – Background and Setting
- Section 3 – Previous Environmental Investigations
- Section 4 – Remedial Investigation Scope of Work
- Section 5 – Investigation Results
- Section 6 – Qualitative Exposure Assessment
- Section 7 – Summary
- Section 8 – References

Supporting tables, figures and appendices referenced throughout are included at the end of this report. As required by NYSDEC Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10) Section 3.13(c), the electronic data summary (EDS), including results of all analyses associated with the RI was submitted to NYSDEC in October 2018 and accepted by NYSDEC as complete on November 7, 2018. Data usability summary reports (DUSRs) and laboratory deliverables for all samples collected during the RI are included in Appendix B.

2.0 BACKGROUND AND SETTING

This section includes a description of the Site and adjacent and surrounding area uses, and summaries of Site characteristics, historic operations and regulatory interactions.

2.1 Site Description and Surrounding Uses

The Site is located at the northwest corner of the intersection of Astor Avenue and Eastchester Road in the Pelham Gardens section of the Bronx, New York.

The Site is comprised of two adjoined buildings, one of which fronts on Astor Avenue (1500 Astor Avenue) and the second on Eastchester Road (2300-2314 Eastchester Road). The property lot is an L-shaped 0.66-acre parcel located in the Bronx Community Board 11 and is identified as Block 4393, Lot 1 on New York City Tax Maps.

The Astor Avenue building is two stories and is currently occupied by medical offices. The Eastchester Road building is one story and is currently divided into five commercial units. The Eastchester Road building has a full basement, which is used for storage only. On the ground floor, two of the units are vacant (2308 & 2314). Units 2310 and 2312 are combined into one leased unit, occupied by a doctor's office. Units 2300 and 2302 are also combined and occupied by a realtor's office (current property owner). Unit 2304 is occupied by an urgent-care medical office.

The adjacent properties include residential with some commercial uses. The north adjacent property is occupied by a commercial building utilized as a medical center. Residential buildings occupy the adjacent properties to the south, west and east of the Site. The Jacobi Medical Center is located south of site, across Pelham Parkway.

2.2 Site Characteristics

Site Topography
The surface topography slopes down to the southeast. Based on the U.S. Geological Survey (Flushing, New York Quadrangle) topographic map, the property lies at an elevation of approximately 60 feet above mean sea level (ft-msl).

Site Geology and Hydrogeology
Bedrock is estimated to be present at approximately 45 feet above mean sea level. This is consistent with site-specific boring logs, which noted bedrock at eleven to 14.5 feet below grade (ft-bg). Bedrock dips down to the south.

The overburden is composed predominantly of silt with some sand. Perched groundwater was encountered at depths ranging from approximately six to ten ft-bg. Groundwater in a bedrock well was encountered at approximately 26 ft-bg. The shallow groundwater flow has been measured to be toward the south, consistent with the bedrock dip, as shown in Figure 3.

Previous investigations at the Site, including the 2018 RI, have documented groundwater

concentrations of contaminants above the NYSDEC TOGS 1.1.1 Class GA Ambient Water Quality Standards and Guidance Values (Class GA Standards) in perched groundwater and groundwater encountered in the bedrock well. There are no known wellhead protection areas or specifically designated groundwater recharge areas in the vicinity of the Site. Groundwater in this area is not used as a source of potable water.

2.3 Site History and Historic Operations

In February 2016, a Phase I Environmental Site Assessment (Phase I ESA) for the Site, was performed by Property Solutions Incorporated (Property Solutions) in accordance with ASTM E-1527-13, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process.

Based on a review of historic information sources, the historic use of the Site as a dry cleaner was identified as a Recognized Environmental Condition (REC). Based on the information included in the Phase I ESA, the duration of the dry cleaning activities on the Site had been approximately 32 years.

2.4 Regulatory Interaction

Eastchester-Astor, LLC entered into the Brownfield Cleanup Program as a Volunteer on February 21, 2018 via the execution of a BCA with NYSDEC. A RIWP, including a Citizen Participation Plan (CPP) and Health and Safety Plan was submitted to NYSDEC in November 2017. In accordance with the CPP, a Fact Sheet was distributed announcing the availability of the RIWP for public comment. The public comment period ended on January 12, 2018 and the RIWP was subsequently approved by NYSDEC.

3.0 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

In 2016 and 2017, several environmental investigations were conducted at the Site, and are summarized below:

- *Phase I Environmental Site Assessment Report, 1500 Astor Avenue and 2302-2314 Eastchester Road, Bronx, New York,* Property Solutions, February 4, 2016.
- *Limited Phase II Subsurface Investigation, 1500 Astor Avenue and 2302-2314 Eastchester Road, Bronx, New York,* Property Solutions, July 22, 2016.
- *Limited Phase II Subsurface Investigation Addendum, 1500 Astor Avenue and 2302-2314 Eastchester Road, Bronx, New York,* Property Solutions, August 8, 2016.
- *Summary of Investigation Activities – March 2017, 1500 Astor Avenue and 2302-2314 Eastchester Road, Bronx, New York,* Property Solutions, May 5, 2017.

The findings of the above investigations are summarized below. Previous groundwater, soil, and soil vapor/indoor air results are shown on RIWP Figures 4 through 6, respectively (Appendix A). The referenced reports are included in RIWP Appendix C. Not all reports originally contained laboratory deliverables; in these cases, the laboratory deliverables are provided as addenda. The previous groundwater data has been provided in Category B deliverables and a data usability summary report (DUSR) will be provided.

***Phase I Environmental Site Assessment, 1500 Astor Avenue and 2302-2314 Eastchester Road, Bronx, New York,* Property Solutions, February 4, 2016.**

The February 2016 Phase I ESA identified the historic use of the Site as a dry cleaner as a REC based upon information provided during the Site reconnaissance and records, including in a database report and city directories. Based on the information included in the Phase I ESA, the duration of the dry cleaning activities was approximately 32 years.

***Limited Phase II Subsurface Investigation, 1500 Astor Avenue and 2302-2314 Eastchester Road, Bronx, New York,* Property Solutions, July 22, 2016**

The 2016 Phase II Subsurface Investigation was performed to further investigate the potential presence of hazardous materials at the Site. The investigation included the following:

- Advancement of seven soil borings (SB-01 through SB-04 and 2118-SB8 though 2118-SB10).
- Collection of two grab samples from varying intervals from the seven soil borings for a total of 14 soil samples and analysis for volatile organic compounds (VOCs).
- Installation and sampling of two soil vapor points in the basement; all soil vapor and ambient air samples were analyzed for VOCs using EPA Method TO-15.
- Installation and sampling of two temporary well points (TW-03 and TW-04) in the rear (east) yard of the building and the front (west) sidewalk of the building.

- Installation and sampling of six shallow permanent monitoring wells (MW-1S and MW-2 through MW-5) and one bedrock permanent monitoring well (MW-1D). All groundwater samples were analyzed for VOCs.

PCE was detected in six soil samples at concentrations ranging from 0.001 milligrams per kilogram (mg/kg) to 380 mg/kg, above the NYSDEC Part 375 Commercial Use soil cleanup objective (SCO) of 150 mg/kg. All remaining VOCs were below the applicable SCOs.

Groundwater results were compared to the Class GA Standards. PCE was detected in six groundwater samples at concentrations ranging from 8.3 micrograms per liter (ug/L) in the sample 2118-MW1D(26.5) to 2,100 ug/L in the sample 2118-TW-03(7.6). Both concentrations are above the Class GA Standard of 5 ug/L. Trichloroethene (TCE), a PCE degradation compound, was detected in two samples at concentrations ranging from 5.1 ug/L in sample 2118-TW-03(7.6) to 30 ug/L in sample 211-MW5(8.4), above the Class GA Standard of 5 ug/L. Cis-1,2-dichloroethene (cis-1,2-DCE) was detected in sample 2118-MW5(8.4) at a concentration of 59 ug/L, above the Class GA Standard of 5 ug/L.

PCE was detected in sub-slab soil vapor samples ranging in concentrations from 1,950 micrograms per cubic meter (ug/m^3) in sample 2118-SV-01(0.5) to 5,210 ug/m^3 in sample 2118-SV-02.

Limited Phase II Subsurface Investigation, 1500 Astor Avenue and 2302-2314 Eastchester Road, Bronx, New York, **Property Solutions, August 8, 2016**

The 2016 Phase II Subsurface Investigation was performed to further investigate the potential presence of hazardous materials at the Site. The investigation included the following:

- Collection and analysis of groundwater samples from permanent monitoring wells MW-1D and MW-5.

Groundwater results were compared to the Class GA Standards. PCE was detected in samples at concentrations ranging from 4.6 ug/l, in sample MW-1D(28.2), to 11.0 ug/l, in sample MW-5(8.3) above the Class GA Standard of 5.0 ug/l. Cis-1,2-dichloroethene and TCE were detected in sample MW-5(8.3) at concentrations of 11 ug/l and 12 ug/l, above their Class GA Standards of 5 ug/l.

Summary of Investigation Activities – March 2017, 1500 Astor Avenue and 2302-2314 Eastchester Road, Bronx, New York**, Property Solutions, May 5, 2017.**

The March 2017 Investigation was performed to further investigate the potential presence of hazardous materials at the Site. The investigation included the following:

- Installation of five shallow permanent groundwater monitoring wells (MW-6 through MW-10);

- Collection and analysis of two indoor air samples and one ambient air sample;
- Collection and analysis of three sub-slab soil vapor samples and four soil vapor samples from exterior borings;
- Collection and analysis of groundwater samples from each of the eleven monitoring wells for analysis of VOCs, semivolatile organic compounds (SVOCs) and total and dissolved metals; and,
- Resampling one indoor air sample location (IA-03) due to laboratory QA/QC determination of prior sample being contaminated by a tainted regulator.

Groundwater samples were compared to the Class GA Standards. PCE was detected in five samples at concentrations ranging from 11 ug/l in sample 1494-GW-06 ug/l to 110 ug/l in sample 1494-GW-1S, above the Class GA Standard of 5 ug/l. TCE was detected in two samples at concentrations ranging from 31 ug/l in sample 1494-GW-05 to a concentration of 34 ug/l in sample 1494-GW-09, above the Class GA Standard of 5 ug/L. Cis-1,2-DCE was detected in three samples ranging in concentration from 11 ug/l in sample 1494-GW-06 to a concentration of 80 ug/l in sample 1494-GW-09, above the Class GA Standard of 5 ug/l.

All soil vapor and indoor air results were analyzed using the NYSDOH Soil Vapor Guidance. PCE was detected in two samples ranging in concentration from 317 ug/m^3 in sample 1494-SV-09 to a concentration of 6,630 ug/m3 in sample 1494-SV-04. TCE was detected in four samples, ranging in concentration from 5.15 ug/m^3 in sample 1492-SV-09 to a concentration of 288 ug/m^3 in sample 1494-SV-04.

4.0 REMEDIAL INVESTIGATION SCOPE OF WORK

The RI, as described in the approved RIWP, included the installation and sampling of soil borings, soil vapor sampling points and monitoring wells. The NYSDOH General Community Air Monitoring Program (CAMP) was instituted during all ground-intrusive activities. CAMP results are included in Appendix C.

The field activities were conducted between March 29, 2018 and June 21, 2018.

Analytical results for soil, groundwater, sub-slab soil vapor, and soil vapor were compared to the following:

- Soil – NYSDEC Unrestricted Use, Protection of Groundwater and Commercial Use Soil Cleanup Objectives (SCOs).
- Groundwater – NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Class GA Water Quality Standards and Guidance Values (Class GA Standards) and USEPA Drinking Water Health Advisories for Perfluorooctanoic acid (PFOA) and Perfluorooctanesulfonic acid (PFOS).
- Sub-slab soil vapor and co-located indoor air – New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion, with revisions (SVI Guidance)
- Indoor air – Air Guidance Values (AGVs) and USEPA Building assessment and survey evaluation (BASE) database.

All sampling locations are depicted on Figure 2.

4.1 Soil Sampling

4.1.1 Soil Sampling Scope of Work

The soil investigation described in the RIWP included the advancement of eleven soil borings to further investigate previously detected contamination in the soil, and vertically delineate its extent across the Site.

A subsurface soil investigation was performed on June 12, 2018; the scope of work consisted of the following:

- Advance four interior soil borings (TSB-1, TSB-2, TSB-10 and TSB-11), seven exterior soil borings (TSB-3 through TSB-9) and four delineation soil borings (TBS-8A through TSB-8D);
- Collect soil samples in the area of the highest previously-detected contamination and in areas of the Site that were not previously investigated;
- Collect soil samples from each boring to characterize and delineate potential impacts;
- Analyze soil samples for Part 375 SCOs.

4.1.2 Soil Sampling Methodology

A core drill and hand auger were used to advance interior soil borings TSB-1, TSB-2, TSB-10 and TSB-11. A direct-push Geoprobe® was used to advance exterior soil borings TSB-3 through TSB-9 and delineation borings TSB-8A through TSB-8D. The sampling methodology is detailed below.

In general, selected soil intervals were screened between grade and the groundwater interface, ranging from approximately seven to nine ft-bg. At all soil boring locations, the collected soil volumes were screened with a PID and visual (e.g., source areas – sumps, floor drains, stains, sheens, blebs, presence of NAPL, etc.) and olfactory observations were recorded in boring logs [Appendix D]. If evidence of VOC impacts were detected and drilling conditions allowed, the borehole was extended vertically until no impacts were detected. The full extent of each boring was screened, and samples were collected based upon field observations and readings. If VOC contamination was detected, a sample was collected, at a minimum, at the interval of highest suspected contamination and at the first interval apparently not impacted by VOCs. If VOC contamination was not detected, soil samples were collected, at a minimum, from the two-foot interval directly above the groundwater interface.

Samples were collected in laboratory-supplied glass jars and were sealed, labeled, and placed in a cooler containing ice (to maintain a temperature of approximately 4 degrees Celsius) for delivery to Alpha Analytical Laboratories, a New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP)-certified analytical laboratory. Soil samples were analyzed for TCL VOCs, TCL SVOCs, pesticides, polychlorinated biphenyls (PCBs) and TAL Metals.

The table below summarizes the sample designations, locations and depths.

Sample Designation (depth in ft-bg.)	Sample Location
TSB-1(0-1)	Boring TSB-1
TSB-2(0-2)	Boring TSB-2
TSB-3(5-7)	Boring TSB-3
TSB-3(8-10)	Boring TSB-3
TSB-4(0-2)	Boring TSB-4
TSB-4(7-9)	Boring TSB-4
TSB-5(0-3.5)	Boring TSB-5
TSB-5(6-8)	Boring TSB-5
TSB-6(0-2)	Boring TSB-6
TSB-6(5-7.5)	Boring TSB-6
TSB-7(0-2)	Boring TSB-7
TSB-8(0-2)	Boring TSB-8
TSB-8(2-4)	Boring TSB-8
TSB-8(2-4) DUP[1]	Boring TSB-8
TSB-8(5-6)	Boring TSB-8

Sample Designation (depth in ft-bg.)	Sample Location
TSB-8A(0-0.5)	Boring TSB-8A
TSB-8B(2-3)	Boring TSB-8B
TSB-8C(0-0.5)	Boring TSB-8C
TSB-8D(0-0.5)	Boring TSB-8D
TSB-9(0-1)	Boring TSB-9
TSB-10(4-6)	Boring TSB-10
TSB-11(0-2)	Boring TSB-11

[1] Duplicate sample.

A record of each sample, including PID readings, notation of any odors, color, and other observations of the sample matrix, was kept in the sampler's field logbook. A chain of custody was maintained throughout the field sampling, transport of samples to the laboratory, and during lab analysis. All soil borings were backfilled with drill cuttings that were determined to not be grossly contaminated and/or clean sand.

4.2 Soil Vapor Sampling

4.2.1 Soil Vapor Sampling Scope of Work

The following scope of work was proposed to investigate potential soil vapor impacts in areas that were not previously investigated, to confirm previous sampling results and to develop information needed for the qualitative exposure assessment.

Soil vapor sampling occurred during two separate events: interior soil vapor and indoor air sampling was conducted on March 29, 2018 before the end of the heating season; exterior soil vapor sampling was conducted on June 21, 2018. The scope of work for both events consisted of the following:

- Installation of two interior sub-slab soil vapor points (TSV-1 and TSV-2) to a depth of two inches below the slab;
- Installation of two exterior soil vapor points (TSV-3 and TSV-4) to a depth of three ft-bg;
- Purging and collection of soil vapor samples at each location;
- Collection of two ambient air samples (one per event);
- Collection of two indoor air samples; and,
- Analysis of soil vapor, indoor air, and ambient air samples for TO-15 VOCs.

Exterior soil vapor sampling points were installed along the northern and eastern Site boundaries. One interior sub-slab soil vapor point was installed beneath the foundation slab of each onsite building. One indoor air sample was collected in the vicinity of each sub-slab soil vapor sample vapor over an eight-hour duration. One ambient air sample (TAA) was collected over an eight-hour duration at the upwind border of the Site during sampling

on March 29, 2018. One ambient air sample (Ambient) was also collected over an eight-hour duration at the upwind border of the Site during sampling on June 21, 2018.

4.2.2 Soil Vapor Sampling Methodology

All samples were collected in general accordance with the *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH, October 2006).

Interior sub-slab soil vapor points were installed using a hand held rotary hammer. Access to the sub-slab soil was gained by drilling through the top surface material (concrete and flooring material) using a drill bit. Upon penetration through the surface material, a disposable Vapor Pin® was set no more than two inches below the slab.

A direct-push track-mounted Geoprobe® was used to install the exterior soil vapor sampling probes. Access to the subsurface soil was gained by drilling through the soil surface using the truck-mounted Geoprobe. Upon penetration through the surface material, a disposable sampling probe, consisting of a 1.5-inch long hardened point and a six-inch long perforated vapor intake, was installed at the target depth. The screen was surrounded by #1-size quartzite sand to approximately one foot above the top of the screen. The screen and sand pack were isolated from ambient air by placing wetted bentonite pellets to grade.

The soil vapor sampling probe was connected to 3/8-inch diameter tubing to the surface. The borehole above the sampling probe to grade was sealed using a sand pack and an inert sealant to prevent ambient air mixing with the soil vapor. Ambient air was purged from the boring hole by attaching the surface end of the 3/8-inch diameter tubing 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 all soil vapor sample collection.

All soil vapor samples were screened for organic vapors using a PID. Samples were collected in 2.7-liter Summa canisters using an eight-hour regulator. The flow rate of both purging and sampling did not exceed 0.2 liters per minute (L/min). A sample log sheet was 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, apparent moisture content of the sampling zone, and chain of custody protocols.

Helium tracer gas was used as a quality assurance/quality control (QA/QC) measure to verify the integrity of the soil vapor probe seal. A portable monitoring device was used to analyze a sample of soil vapor for the tracer gas prior to sampling. If this analysis showed a significant presence of the tracer, the probe seals were adjusted to prevent infiltration. At the conclusion of the sampling, tracer monitoring was performed a second time to confirm the integrity of the probe seals.

The indoor air and ambient air samples were collected from four to six feet above the slab. The sampling flow rate did exceed 0.2 liters per minute (L/min).

The summa canisters were transported to Alpha Analytical Laboratories, a New York State ELAP-certified laboratory, under chain of custody procedures and the samples analyzed for VOCs using EPA method TO-15.

4.3 Groundwater Sampling

The following scope of work was proposed to further characterize the groundwater at the Site and develop information for use in the qualitative exposure assessment:

- Groundwater samples were collected from five previously installed permanent monitoring wells: MW1S, MW1D, MW-4, MW-5, MW-10 and one newly installed permanent monitoring well: MW-11;
- Soil boring TSB-11 was converted into a two-inch diameter permanent monitoring well [MW-11];
- Soil boring TSB-9 was converted into a two-inch diameter permanent monitoring well [MW-12];
- Groundwater samples analyzed for Part 375 list compounds; 1,4-dioxane and perfluoroalkyl acids (PFAAs);
- Newly installed wells were surveyed.

4.3.1 Monitoring Well Locations and Rationale for Placement

Monitoring well MW-11 was installed within the basement of the onsite building. Monitoring well MW-12 was installed along the southeastern Site boundary. Both wells were installed to further assess groundwater conditions and flow direction beneath the Site.

4.3.2 Groundwater Well Installation and Sampling

As previously described, two soil borings were converted into permanent groundwater wells. Two permanent monitoring wells (MW-11 and MW-12) were constructed using 2" diameter slotted PVC well screen. The annular space around the well was backfilled with No. 2 Morie quartz sand to a depth of 1' above the top of the well screen or to the top of the slab. MW-11, installed in the cellar of the onsite building, was constructed of two feet of 0.02 slot screen and MW-12, installed along the southeast perimeter of the Site, was constructed of approximately five feet of 0.02 slot screen and finished with one foot of PVC riser. MW-11 was installed using a hand auger and MW-12 was installed using a direct-push track-mounted Geoprobe®.

All wells were developed following installation by pumping using dedicated high density polyethylene (HDPE) tubing. Newly installed [MW-11] and previously installed wells [MW1S, MW1D, MW-4, MW-5, MW-10] were sampled approximately one week after development. MW-12 was not sampled due to the absence of water in the well column. All sampling equipment was decontaminated prior to use. Prior to sampling, water levels were measured using an electronic product-water level indicator and recorded in the field logbook.

Water quality measurements, including temperature, pH, oxidation-reduction potential (ORP), turbidity, dissolved oxygen (DO) and total dissolved solids (TDS) were collected and recorded at approximate 15-minute intervals. Samples were collected only after temperature, pH and DO stabilized to within 10 percent of the previous reading and turbidity was below 50 Nephelometric Turbidity Units (NTUs). Sufficient sample volume was collected for each analysis. All samples were collected in glass containers and preserved in accordance with the Quality Assurance Project Plan (QAPP). Water quality measurements are provided in Appendix E.

Samples were collected using low-flow techniques in accordance with EPA Region 1 Low-Stress (Low-Flow) "Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells", (EQASOP-GW 001, Revision 3, dated July 30, 1996; Revised: January 19, 2010). All groundwater samples were analyzed for TCL VOCs, TCL SVOCs, pesticides, PCBs, TAL Metals (total and dissolved), 1,4-dioxane and PFAAs.

Development and purge water was containerized for disposal.

4.4 Quality Assurance / Quality Control (QA/QC)

All samples were collected in accordance with the QAPP included as Appendix A of the RIWP. A Data Usability Summary Report (DUSR) was also prepared and is included in Appendix B of this RIR.

4.5 Deviations from the RIWP

The RIWP included sampling two newly installed monitoring wells [MW-11 and MW-12]. As indicated in Section 4.3.2 of this RIR, groundwater was not encountered in MW-12 and a sample was not collected at this location.

5.0 INVESTIGATION RESULTS

This section provides a discussion of the results of the March – June 2018 RI soil, groundwater and soil vapor investigations. Sample results are included in Tables 1 through 3. All results are summarized in Figures 4 through 7 and laboratory deliverables are included in Appendix B.

As previously discussed, sample results were compared to the following:

- Soil – NYSDEC Unrestricted Use SCOs, Restricted Commercial Use SCOs, and Restricted Protection of Groundwater SCOs.
- Groundwater – NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Class GA Water Quality Standards and Guidance Values (Class GA Standards).
- Sub-slab soil vapor and co-located indoor air – New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion, with revisions (SVI Guidance)
- Indoor air – Air Guidance Values (AGVs) and USEPA Building assessment and survey evaluation (BASE) database.

5.1 Field Observations

Soil

Shallow soil samples collected throughout the Site generally consisted of some fill material containing brick fragments, asphalt fragments, and concrete fragments with dark brown silt and fine grain sand. Below the fill material, layers of brown silt with weathered bedrock were encountered. No petroleum odors or staining were noted in any soil borings. Soil boring logs from the remedial investigation are included in Appendix D.

Groundwater

The depth to groundwater was measured from top of casing in monitoring wells MW-1S, MW-1D, MW-04, MW-05, MW-10, and MW-11. The measured depth to groundwater ranged from 1.34 ft-bgs in MW-11 (cellar) to 7.8 ft-bgs in MW-05. No sheen was observed during groundwater sampling. Depth to water and water quality measurements are summarized in Appendix E. Based on the results of the well survey, groundwater flow is generally to the southwest. A groundwater contour map is included as Figure 3. A well survey is included in Appendix E.

Soil Vapor

PID readings were all below 5.5 parts per million (ppm) [TSV-3] in the four locations sampled.

5.2 Analytical Results

5.2.1 Soil

A total of 21 soil samples and one duplicate were collected from varying intervals at the 15 boring locations shown on Figure 2, and analyzed for TCL VOCs, TCL SVOCs, pesticides, polychlorinated biphenyls (PCBs) and metals.

Sample results were compared with the New York State Part 375 Unrestricted Use Soil Cleanup Objectives (SCOs), the Restricted Commercial Use SCOs, and the Protection of Groundwater SCOs. The soil analytical results are discussed below. Soil analytical results in excess of SCOs are depicted on Figure 4.

VOCs

Chlorinated VOC tetrachloroethene was detected in samples TSB-8A(0-0.5), TSB-8B(2-3), TSB-8(5-6), and TSB-8(0-2) above Unrestricted Use SCOs. For this analyte, the Protection of Groundwater SCO is the same as the Unrestricted Use SCO and each of these concentrations also exceed the Protection of Groundwater SCO. Tetrachloroethene detected in sample TSB-8(0-2) was also above the Restricted Commercial Use SCO. Tetrachloroethene was detected above Unrestricted Use SCOs at levels ranging from 7.8 mg/kg to 240 mg/kg. No other VOCs were detected above the Unrestricted Use SCOs.

SVOCs

SVOCs benzo(b)fluoranthene and indeno(1,2,3-cd)pyrene were detected in samples TSB-3(5-7), TSB-8(0-2), and TSB-9(0-1) above their respective Unrestricted Use SCO. Benzo(a)anthracene, benzo(a)pyrene, and chrysene were also detected above the Unrestricted Use SCOs in TSB-9(0-1) only.

The following compounds are listed as follows: analyte (maximum concentration, SCO). Benzo(a)anthracene (1.5 mg/kg, 1.0 mg/kg), benzo(a)pyrene (1.1 mg/kg, 1.0 mg/kg), benzo(b)fluoranthene (1.7 mg/kg, 1.0 mg/kg), chrysene (1.5 mg/kg, 1.0 mg/kg), indeno(1,2,3-cd)pyrene (1.1 mg/kg, 0.5 mg/kg). No other SVOCs were detected above the Unrestricted Use SCOs. For benzo(a)anthracene and chrysene, the Restricted Protection of Groundwater SCOs are the same as the Unrestricted Use SCOs and each of these concentrations also exceed the Protection of Groundwater SCOs. For benzo(a)pyrene, the Restricted Commercial Use SCO is the same as the Unrestricted Use SCO and this concentration also exceeded the Restricted Commercial Use SCO.

Pesticides and PCBs

The pesticide 4-4'-DDD was detected in samples TSB-1(0-1), TSB-2(0-2), TSB-5(0-3.5), TSB-6 (0-2), TSB-6(5-7.5), TSB-7(0-2), TSB-8(0-2), and TSB-8(5-6) above the Unrestricted Use SCO (0.0033 mg/kg) at concentrations ranging from 0.0072 mg/kg to 0.208 mg/kg. The pesticide 4,4'-DDE was detected in samples TSB-1(0-1), TSB-2(0-2), TSB-5(0-3.5), TSB-6(0-2), TSB-7(0-2), TSB-8(0-2), TSB-8(5-6), and TSB-9(0-1) above the Unrestricted Use SCO (0.033 mg/kg) at concentrations ranging from 0.00685 mg/kg to 0.0697 mg/kg. The pesticide 4,4'-DDT was detected in samples TSB-2(0-2), TSB-5(0-3.5), TSB-6(0-2), TSB-8(0-2), TSB-8(5-6), and TSB-9(0-1) above the Unrestricted Use SCO (0.0033 mg/kg) at concentrations ranging from 0.0274 mg/kg to 0.189 mg/kg. The pesticide dieldrin was detected in samples TSB-5(0-3.5), TSB-6(0-2), TSB-8(0-2), and TSB-8(5-6) above the Unrestricted Use SCO (0.005 mg/kg) at concentrations ranging from 0.00741 mg/kg to 0.0295 mg/kg. No other pesticides were detected above the Unrestricted Use SCOs. No pesticides were detected above the Protection of Groundwater SCOs or the Restricted Commercial Use SCOs.

The PCB Aroclor 1254 was detected in sample TSB-8(0-2) above the Unrestricted Use SCO (0.1 mg/kg) at a concentration of 0.202 mg/kg. No other PCBs were detected above the Unrestricted Use SCOs. No PCBs were detected above the Protection of Groundwater SCOs or the Restricted Commercial Use SCOs.

Metals
Lead was detected in TSB-2(0-2) and TSB-5(0-3.5) above the Unrestricted Use SCO (63 mg/kg) at a concentration of 66.7 mg/kg and 66.3 mg/kg, respectively. Trivalent chromium was detected in TSB-4(0-2), TSB-5(0-3.5), TSB-5(6-8), TSB-8(0-2), TSB-9(0-1), and TSB-11(0-2) above the Unrestricted Use SCO (30 mg/kg) at concentrations ranging from 31 mg/kg to 40 mg/kg. Hexavalent chromium was detected in TSB-4(0-2) above the Unrestricted Use SCO (1 mg/kg) at a concentration of 1.2 mg/kg. No metals were detected above the Protection of Groundwater SCOs or the Restricted Commercial Use SCOs.

Summary of Soil Analytical Results

- One chlorinated VOC, tetrachloroethene, was detected in four samples [TSB-8A(0-0.5), TSB-8B(2-3), TSB-8(0-2), and TSB-8(5-6)] at concentrations above Unrestricted Use SCOs and the Protection of Groundwater SCOs. One sample [TSB-8(0-2)] contained a concentration of tetrachloroethene above the Restricted Commercial Use SCO.
- SVOCs were detected in two samples [TSB-3(5-7) and TSB-8(0-2)] at concentrations above Unrestricted Use SCOs, but below the Protection of Groundwater SCOs and Restricted Commercial Use SCOs. Benzo(a)pyrene was detected in one sample [TSB-9(0-1)] at a concentration slightly above Restricted Commercial Use SCOs, but below Protection of Groundwater SCOs.
- Pesticides were detected in nine of 21 samples above the Unrestricted Use SCOs, but below the Protection of Groundwater SCOs and Restricted Commercial Use SCOs.
- One PCB, Aroclor 1254, was detected in one sample, TSB-8(0-2) at concentrations above the Unrestricted Use SCOs, but below the Protection of Groundwater SCOs and Restricted Commercial Use SCOs.
- One metal, lead, was detected in two samples [TSB-2(0-2) and TSB-5(0-3.5)] above the Unrestricted Use SCOs, but below the Protection of Groundwater SCOs and Restricted Commercial Use SCOs. Hexavalent and/or trivalent chromium were detected in six of 21 samples above the Unrestricted Use SCOs but below the Protection of Groundwater SCOs and Restricted Commercial Use SCOs.

5.2.2 Groundwater
Groundwater samples were collected from monitoring wells MW-1D, MW-1S, MW-04, MW-05, MW-10, and MW-11. Groundwater samples were collected using low-flow techniques. Analytical results were compared to the Class GA Standards and are discussed below. Emerging contaminants were compared to the USEPA Drinking Water Health Advisories for PFOA and PFOS. Groundwater analytical results above Class GA Standards or the EPA Drinking Water Health Advisories are depicted on Figure 5.

VOCs
Tetrachloroethene (PCE) was detected in groundwater samples MW-1D, MW-1S, MW-05, and MW-11 above the Class GA Standard of 5 ug/L at concentrations ranging from 24 ug/L to 160 ug/L. Trichloroethene (TCE) was detected in groundwater sample MW-05 above the Class GA Standard of 5 ug/L at a concentration of 10 ug/L. Cis-1,2-Dichloroethene was detected in groundwater samples MW-05 and MW-11 above the Class GA Standard of 5 ug/L at concentrations of 41 ug/L and 5.5 ug/L, respectively.

VOCs detected in MW-04 and MW-10 (as well as the MW-10 duplicate), were detected at concentrations below the Class GA Standards.

SVOCs
No SVOCs were detected in any groundwater sample.

Pesticides and PCBs
No pesticides or PCBs were detected above the Class GA Standards in any groundwater sample.

Metals, Total and Dissolved
Several naturally-occurring earth metals were detected in groundwater samples, with iron and sodium detected above Class GA Standards as follows: total iron was detected in MW-1D and MW-1S at concentrations of 8,960 ug/L and 744 ug/L, respectively, above the Class GA Standard of 300 ug/L; total sodium was detected above its Class GA Standard of 20,000 ug/L in five of six groundwater samples ranging in concentration from 131,000 ug/L in MW-10 duplicate to 190,000 ug/L in MW-5.

Emerging Contaminants (1,4-Dioxane and PFAAs)
As of January 1, 2018, NYSDEC, required that emerging contaminant sampling be performed during the RI or site characterization phase on sites participating in state remedial programs. This sampling protocol includes sampling groundwater for 1,4-dioxane, perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA) and other associated perfluorinated chemicals (PFCs) (collectively PFAAs).

PFOS and PFOA were compared to the USEPA Drinking Water Health Advisories of 0.7 ug/L. In addition, six PFAAs and 1,4-dioxane were included on the USEPA's third drinking water contaminant candidate list, which is a list of unregulated contaminants that are known to, or anticipated to, occur in public water systems and may require regulation under the Safe Drinking Water Act. Given the potential for the establishment of a drinking water standard for these contaminants, it is appropriate to understand where these contaminants exist in groundwater and at what concentration.

All six monitoring wells were sampled for emerging contaminants. Low concentrations of PFAAs were detected in all six monitoring wells across Site. PFOS (0.103 ug/L) and PFOA (0.0867 ug/L) were detected in downgradient monitoring well MW-05 above the USEPA Drinking Water Health Advisory levels. The concentrations may be related to the historic

use of part of the Site as a dry cleaner. Dry cleaners use cleaning chemicals, including chemicals that are stain- and water-repellent, which are known to contain PFAAs. 1,4-Dioxane was not detected in any groundwater samples. However, 1,4-Dioxane had reporting limits above the NYSDEC Groundwater Sampling for Emerging Contaminants guidance, and therefore may not be representative of current Site conditions.

Groundwater is not nor will be used as a potable source for the Site or surrounding community. Potable water is provided from reservoirs in upstate New York by the New York City Department of Environmental Protection (NYCDEP).

Summary of Groundwater Analytical Results

- PCE was detected in four groundwater samples (MW-1S, MW-1D, MW-05, and MW-11) at concentrations exceeding the Class GA Standard. TCE was detected in one groundwater sample (MW-05) at a concentration exceeding the Class GA Standard. Cis-1,2-Dichloroethene was detected in two groundwater samples (MW-05 and MW-11) at concentrations exceeding the Class GA Standard.
- No SVOCs, PCBs or pesticides were detected above Class GA Standards.
- Sodium was detected above its Class GA Standard in five of six groundwater samples. Iron was detected above its Class GA Standard in two of six groundwater samples.
- PFAAs were detected in groundwater samples across Site. 1,4-Dioxane was not detected in any groundwater samples. PFOS and PFOA were detected in one groundwater sample (MW-05) above the USEPA Drinking Water Health Advisory levels.

5.2.3 Soil Vapor

Sub-slab soil vapor samples were collected at two locations (TSV-1 and TSV-2), co-located indoor air samples were collected at two locations (TIA-1 and TIA-2) and exterior soil vapor samples were collected at two locations (TSV-3 and TSV-4). One ambient air sample was collected during each event (TAA and AMBIENT). Indoor air concentrations were compared to the SVI Guidance AGVs and the EPA BASE indoor air mean values. Sub-slab soil vapor concentrations and associated co-located indoor air concentrations were compared to the SVI Guidance Matrices. All samples were analyzed for VOCs using USEPA method TO-15.

PCE was detected in both sub-slab and both exterior soil vapor locations (TSV-1 to TSV-4) and both indoor air locations (TIA-1 and TIA-2) at concentrations ranging from 2.15 ug/m^3 to 154 ug/m^3. Comparison of PCE concentrations in sub-slab soil vapor sample TSV-1 and co-located indoor air sample TIA-1 to the Decision Matrix B of the NYSDOH SVI Guidance, indicates that monitoring is necessary. All other Matrix actions for sub-slab and co-located indoor air samples indicated no further action necessary.

VOC concentrations detected in both co-located indoor air samples were compared to SVI Guidance AGVs. There were no concentrations detected in either indoor air sample in exceedance of SVI Guidance AGVs. Analytes that do not have a SVI Guidance AGV were

compared to EPA BASE indoor air mean values. Concentrations of ethyl alcohol (max: 1750 ug/m^3) and acetone (max: 171 ug/m^3) were detected in both indoor air samples in exceedance of their respective EPA BASE indoor air mean values. Concentrations of carbon tetrachloride (max: 0.598 ug/m^3), ethylbenzene (max: 17.9 ug/m^3), p/m-xylene (max: 65.2 ug/m^3), and o-xylene (max: 23.2 ug/m^3) were also detected in exceedance of their respective EPA BASE indoor air mean values in sample TIA-1.

Concentrations of chlorinated solvents and petroleum-related compounds were detected in sub-slab soil vapor. Detected chlorinated solvents include PCE [max: 154 micrograms per cubic meter (ug/m^3)], TCE (max: 14.7 ug/m^3) and cis-1,2-dichloroethene (max: 2.43 ug/m^3). Petroleum-related compounds include: benzene (max: 2.97 ug/m^3), xylenes (max: 3.21 ug/m^3), 1,2,4-trimethylbenzene (max: 4.91 ug/m^3), n-hexane (max: 4.79 ug/m^3), ethylbenzene (max: 0.999 ug/m^3), toluene (max: 7.61 ug/m^3) and 2-butanone (max: 1.55 ug/m^3). The highest concentrations of chlorinated VOCs were detected in sample TSV-1 and the highest concentrations of petroleum-related compounds were detected in TSV-2.

Concentrations of chlorinated solvents and petroleum-related compounds were detected in exterior soil vapor samples. Detected chlorinated solvents include PCE (max: 42.7 ug/m^3) and TCE (max: 4.19 ug/m^3). Petroleum-related compounds include: benzene (max: 19.4 ug/m^3), xylenes (max: 13.7 ug/m^3), 1,2,4-trimethylbenzene (max: 1.09 ug/m^3), n-hexane (max: 6.13 ug/m^3), ethylbenzene (max: 4.39 ug/m^3), toluene (max: 14.9 ug/m^3) and 2-butanone (max: 53.4 ug/m^3). The highest concentrations of chlorinated VOCs were detected in sample TSV-4 and the highest concentrations of petroleum-related compounds were detected in TSV-3 (north of the PCE hot spot in soil).

Similar concentrations of PCE and TCE were detected in both exterior soil vapor samples and sub-slab sample TSV-2. Sub-slab sample TSV-1 contained significantly higher concentrations of both PCE and TCE than either exterior soil vapor sample. The maximum concentration of PCE in exterior soil vapor samples was detected in TSV-4 at 42.7 ug/m^3, while the maximum concentration of PCE in sub-slab soil vapor samples was detected in TSV-1 at 154 ug/m^3. The maximum concentration of TCE in exterior soil vapor samples was detected in TSV-3 at 4.19 ug/m^3, while the maximum concentration of TCE in sub-slab soil vapor samples was detected in TSV-1 at 14.7 ug/m^3. Co-located indoor air samples both contained concentrations of PCE and TCE significantly lower than exterior and sub-slab soil vapor samples.

Summary of Soil Vapor Analytical Results

- Concentrations of PCE in soil vapor were detected at all four soil vapor locations and both indoor air locations. PCE concentrations were detected at a max of 154 ug/m^3 in sub-slab soil vapor, 5.74 ug/m^3 in indoor air, and 42.7 ug/m^3 in exterior soil vapor. Concentrations of TCE in soil vapor were also detected.
- Comparison of PCE concentrations in one set of corresponding indoor air and sub-slab soil vapor samples indicates that monitoring is necessary at one location and no further action at the second location. All other matrix actions for sub-slab and co-located indoor air samples require no further action.

- Several petroleum-related compounds, including benzene, xylenes, and trimethylbenzene, were detected in soil vapor and indoor air.
- Concentrations of ethyl alcohol, acetone, carbon tetrachloride, ethylbenzene, and xylenes were detected in indoor air in exceedance of EPA BASE indoor air mean values. No VOCs in indoor air were detected in exceedance of SVI Guidance AGVs.

6.0 QUALITATIVE EXPOSURE ASSESSMENT

A qualitative exposure assessment (EA) has been completed in accordance with Section 3.3(c)4 of DER-10 and the NYSDOH guidance for performing a qualitative EA (NYSDEC DER-10; Technical Guidance for Site Investigation and Remediation; Appendix 3 B).

The objectives of the qualitative exposure assessment are to evaluate and document how humans might be exposed to Site-related contaminants and to assess whether there are any complete or potentially complete exposure pathways now and under the reasonably anticipated future land use of the Site.

An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a site. An exposure pathway has five elements: (1) a contaminant source; (2) contaminant release and transport mechanisms to an exposed population; (3) a receptor population; (4) a route of exposure; and (5) a point of exposure to a receptor population. The following sections discuss the potential exposure pathways to chlorinated solvents at the Site. A table describing the environmental media, potential exposure routes and a human exposure assessment is included at the end of this section.

6.1 Contaminant Sources

Based on the results of previous sampling and the RI, the contaminants of concern at the Site include chlorinated solvents and SVOCs.

The soil, soil vapor and groundwater are impacted with PCE, consistent with the historic use of the Site as a dry cleaner for a period of at least 32 years. Chlorinated solvent VOCs (CVOCs) have been detected in soil, soil vapor and groundwater at concentrations above applicable regulatory and/or ambient levels. SVOCs, particularly benzo(a)pyrene, was detected in soil above regulatory levels and is likely attributable to the presence of historic fill.

6.2 Contaminant Release and Transport Mechanisms

The shallow fill material is impacted with CVOCs and SVOCs. These impacts are likely related to the quality of the historic fill material imported to the Site as well as the historic dry cleaning operations.

A CVOC source area has been identified onsite and is present behind the former dry cleaner (Eastchester Road building). Analytical results from soil samples collected as part of this RI indicate that PCE in soil is limited to this area. The distribution of groundwater impacts supports a relationship between the soil source area and chlorinated solvent concentrations in groundwater downgradient of the source area. CVOCs were found in soil vapor across the Site and below the onsite buildings.

Concentrations of benzo(a)pyrene exceeded its Restricted Commercial Use SCOs in one soil sample at a depth of 0-1 ft-bg.

6.3 Potential Receptor Populations

The potential onsite receptors include Site workers (workers who currently occupy the various commercial spaces in the two onsite buildings) construction workers, visitors or trespassers. The potential off-site receptors include off-site workers and off-site residents.

6.4 Potential Routes and Points of Exposure

The findings of prior investigations and the RI indicate CVOCs and fill-related SVOCs above regulatory levels in soils at depths extending from grade to an approximate maximum depth of 6 ft-bg. Earlier investigations documented shallow soil contamination at the Site with potential for exposure via dermal adsorption, inhalation and incidental ingestion if proper protective measures are not implemented. There is potential for exposure via these pathways during ground-intrusive sampling and Site remediation, however due to the presence of building foundations and paved parking, on Site exposures unrelated to remedial activities are not likely. Exposure of environmental professionals during sampling will be mitigated by adherence to a HASP. During remediation activities, the potential for exposure of Site construction workers and nearby residents to contaminated soil via onsite handling and off-site transportation of disturbed soil will be avoided by implementation of a CAMP and HASP.

Concentrations of VOCs and metals were detected above the Class GA Standards, which were developed to be protective of public health based upon groundwater as a potential drinking water source. While concentrations of these constituents exceed Class GA Standards and there is the potential for these constituents to migrate off Site, exposure to contaminants via drinking water is not applicable to the Site given the fact that the Site and surrounding community are supplied by an upstate New York municipal system.

Dermal and inhalation exposure to VOCs in groundwater, based on the depth to groundwater, should be limited to construction workers involved in dewatering and excavation below the groundwater table, and Site workers collecting groundwater samples for environmental analysis. These exposures would be mitigated by adherence to a HASP during sampling activities and a CAMP and HASP during construction.

Exposure to contaminants in soil and groundwater is currently, and will continue to be, mitigated by the Site buildings, a parking lot and a soil cap (landscaping), which will cover the entire Site footprint.

There is potential for volatilization of chlorinated solvents or petroleum-related compounds into ambient air and indoor air on and off Site. Exposure to site workers and nearby residents during remediation will be mitigated by adherence to a HASP during sampling activities and to a HASP and CAMP during remediation.

6.5 Summary of Qualitative Exposure Assessment

The table below summarizes the potential exposure routes and receptors and presents a human exposure assessment for each.

Potential Exposure Route	Potential Receptors	Human Exposure Assessment
Dermal contact with surface soils and incidental ingestion	• Site workers during sampling activities and construction workers during site remediation.	• The potential for on- and off-site exposure during ground-intrusive activities will be avoided by implementation of a HASP and CAMP during sampling events and Site redevelopment. Current exposure will be prevented by the Site buildings and paved parking lot and a soil cap (landscaping), which cover the entire Site.
Ingestion of groundwater	• Area residents through ingestion of groundwater.	• Groundwater is not nor will be used as a potable source for the Site or surrounding community. Potable water is provided from reservoirs in upstate New York by the New York City Department of Environmental Protection (NYCDEP).
Dermal contact with groundwater/ Inhalation of volatile groundwater constituents	• Site workers during sampling activities and construction workers during site remediation.	• Exposure will be avoided by having environmental professionals sampling groundwater and workers engaged in construction dewatering adhering to a HASP. Current exposure will be prevented by the Site buildings and paved parking lot, which cover the entire Site.

Potential Exposure Route	Potential Receptors	Human Exposure Assessment
Inhalation of vapors	• Current building occupants and construction workers and nearby residents.	• Elevated ambient levels are not currently present. • Exposures during Site remediation will be mitigated through implementation of a HASP and CAMP • Remediation will include excavation of the CVOC source area and remediation of the groundwater below the Site, all of which will eliminate this pathway.

7.0 SUMMARY

Based on the results of the RI and previous investigations, the following summary has been prepared:

Site History

- A portion of the Site was operated by a dry cleaning facility for approximately 32 years.
- Previous reports identified PCE impacts in soil, groundwater and soil vapor.

Geology/Hydrogeology

- The Site is covered by six inches to five feet of surface fill material, underlain by layers of reddish-brown medium to coarse grain sand with some silt and degraded bedrock.
- Groundwater was encountered at approximately 1.34 ft-bgs (building cellar) to 7.8 ft-bgs (below sidewalk grade) and flows in a southwest direction.

Soil

- The results of the RI indicate that there is a PCE source area in soil located behind the onsite building fronting Eastchester Road. PCE was vertically and horizontally delineated in soil as part of this RI and is estimated to be limited to a 160 square foot area having a depth of seven feet.
- Petroleum-related VOCs were not detected in soil at concentrations exceeding applicable standards.
- One SVOC [benzo(a)pyrene] was detected in one shallow (0-1 ft-bg) soil sample (TSB-9) at a concentration slightly exceeding the Restricted Commercial SCO. TSB-9 was located in the landscaped area south of the Astor Place Site building. SVOCs are common constituents of historic fill material.

Groundwater

- Chlorinated solvents were detected above Class GA Standards in groundwater collected from the PCE source area (shallow and deep wells) and areas downgradient of the source area. Chlorinated solvents were either not detected or detected and very low concentrations below Class GA Standards in upgradient and crossgradient wells.

Soil Vapor

- Chlorinated solvents were detected in indoor air samples at concentrations exceeding EPA BASE indoor air mean values. No chlorinated solvents were detected in indoor air at concentrations exceeding SVI Guidance AGVs. PCE was detected in both sub-slab and both exterior soil vapor samples and both indoor air samples collected. Comparison of the highest PCE concentration in soil vapor collected from the basement of the onsite building to the PCE concentration in the corresponding indoor air sample with NYSDOH Matrix B indicates that monitoring is necessary.

Petroleum Impacts

- Petroleum-related VOCs were detected in indoor air samples at concentrations exceeding EPA BASE indoor air mean values. Petroleum-related VOCs were also detected in both sub-slab and both exterior soil vapor samples collected.

Qualitative Environmental Assessment

- The following potential exposure routes were identified: direct contact with surface soils, inhalation (and incidental ingestion), ingestion of groundwater, direct contact with groundwater and inhalation of vapors.
- Potential impacts from these exposure routes can be mitigated through the implementation of HASP and CAMP during ground-intrusive activities, current Site caps (building foundations, asphalt parking lot and landscaping soil cap) and through Site remediation performed under an approved remedial action work plan.

8.0 REFERENCES

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Figures

Tables

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May 2018 Remedial Investigation Work Plan

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Laboratory Data Packages
Data Usability Summary Reports

Appendix C
Community Air Monitoring Plan (CAMP) Results

Appendix D
Boring Logs and Well Construction Diagrams

Appendix E
Monitoring Well Purging and Sampling Logs
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