REMDIAL INVESTIGATION REPORT

for

QUEENS HEALTH CENTER

43-06 AND 43-30 38TH STREET
LONG ISLAND CITY, QUEENS, NEW YORK
Block 220, Lots 25 and 40
OER Project Number 19TMP2177Q

Prepared for:

New York Hotel Trades Council &
Hotel Association of New York City, Inc., Health Center, Inc.
305 West 44th Street
New York, New York 10036

Prepared By:

Langan Engineering, Environmental, Surveying,
Landscape Architecture and Geology, D.P.C.
21 Penn Plaza
360 West 31st Street, 8th Floor
New York, New York 10001

August 2019
Langan Project No. 170554301

LANGAN

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

LIST OF ACRONYMS

Acronym	Definition
AOC	Area of Concern
AWQS	Ambient Water Quality Standards and Guidance Values
Bgs	Below grade surface
CEQR	City Environmental Quality Review
DO	Dissolved Oxygen
DOB	Department of Buildings
DOT	Department of Transportation
ELAP	Environmental Laboratory Accreditation Program
EM	Electromagnetic
ESA	Environmental Site Assessment
eV	Electron Volt
GPR	Ground-Penetrating Radar
NTU	Nephelometric Turbidity Unit
NYCRR	New York Codes, Rules, and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
ORP	Oxidation-Reduction Potential
PAH	Polyaromatic Hydrocarbon
PCE	Tetrachloroethylene
pH	Hydrogen ion concentration
PID	Photoionization Detector
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
QEP	Qualified Environmental Professional
RAP	Remedial Action Plan
RI	Remedial Investigation
RIR	Remedial Investigation Report
SCO	Soil Cleanup Objective
TCE	Trichloroethylene
TOGS	Technical and Operational Guidance Series
TOVs	Total Organic Vapors
UN	United Nations
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank

CERTIFICATION

I, Jason Hayes, am a Qualified Environmental Professional (QEP), as defined in RCNY § 43-1402(tt). I have primary direct responsibility for implementation of the Remedial Investigation for the Queens Health Center site (OER Project Number: 19TMP2177Q). 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.

Qualified Environmental Professional

9-10-2019
Date

Signature

EXECUTIVE SUMMARY

This Remedial Investigation Report (RIR) for Queens Health Center in Queens, New York (the site) 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 at 43-06 and 43-30 38th Street in Long Island City, Queens, New York, and is identified as Queens Borough Tax Block 220, Lots 25 and 40. The site is located on the city block bound by 43rd Avenue to the north, 38th Street to the east, Queens Boulevard to the south, and 37th Street to the west. The approximately 20,000-square-foot site is improved with an asphalt-paved parking area on Lot 25 and a 1-story, slab-on-grade commercial building on Lot 40. The building on Lot 40 is used to store medical supplies for the southern adjoining health center. A site location map is included as Figure 1. Site elevation (el) is about 66 to 68, which is also about sidewalk grade (relative to North American Vertical Datum 1988 [NAVD88]). A Site Plan is provided as Figure 2. According to the list of City Environmental Quality Review (CEQR) Environmental Designations available on the New York City Department of City Planning website, the site does not have an assigned an E-Designation number. Although not E-Designated, the site has been enrolled in the New York City Voluntary Cleanup Program (VCP) administered by the Office of Environmental Remediation as Site No. 19TMP2177Q. As part of the VCP, OER review and approval of a RIR and Remedial Action Work Plan (RAWP) are required.

Summary of Proposed Redevelopment Plan

Anticipated redevelopment includes demolition of the existing structure on Lot 40 and construction of a new 6-story health center building spanning the whole site. The new building will include a partial cellar level set back about 20 feet from the east and west site boundaries. The ground level will include a drive aisle on the east side of the building. The proposed top of basement slab depth is 15 feet below grade surface (bgs) with a mat slab extending to depths of 16 – 19 feet bgs (el 51 – el 48). Deeper excavations will be required for elevator and mechanical pits. Excavation is not expected to require dewatering as groundwater is about 49 – 50 feet bgs.

According to the New York City Department of City Planning (NYCDCP) Zoning Map 9b, the Subject Property is located in a M1-4 manufacturing district. M1-4 indicates a "Light Manufacturing Zoning District" having manufacturing, commercial, and community facility uses. The proposed use is consistent with existing zoning for the property. The proposed site development plan is presented as Figure 3. Preliminary architectural and structural plans are included in Appendix A.

Summary of Past Uses of Site and Areas of Concern

The current owner of the site is Hotel Association of NYC Health Center Inc, who has owned Lot 25 since 1999 and Lot 40 since 2008. There is no documentation of another owner of Lot 25. Owners of Lot 40 between 1968 and 2008 included Irvinware, 43-30 Thirty Eighth Street Realty Corp., Dosanko Foods Inc., and the City of New York. Historical use of the site included an auto wrecking operation with an associated auto wreck storage yard (1936-1970), a battery service facility (1936), unspecified manufacturing (1977-2006), and a noodle factory (unknown-2002). Lot 40 has been developed since 1936, but buildings were not evident on Lot 25 since 2005.

Based on a Phase I Environmental Site Assessment (ESA), dated November 28, 2018, the following Recognized Environmental Conditions were identified, which were also considered potential Areas of Concerns (AOC):

- Historical Use of the Site – Historical use of the site as an auto wrecking operation with an associated auto wreck storage yard (1936-1970), a battery service facility (1936), unspecified manufacturing (1977-2006), and a noodle factory (unknown-2002)
- Historic Fill Material – Historic fill material is located beneath the building slab. This material is commonly impacted with metals and semivolatile organic compounds (SVOCs).
- Historical Use of Surrounding Properties – Former uses of adjoining and surrounding properties included auto/truck service stations (1936-2005); a gasoline filling station (1936-2005); metal manufacturing, plating, and works (1934 – 2001); cosmetics manufacturing (1947-1950); die casting (1936); machine repair (1936); a Sanitation Department garage (1947-1950); a lubricant factory (1934); a boiler manufacturer (1923-1939); a plastics manufacturer (1962); textile manufacturing (1970-1977); unspecified manufacturing (1962-2005); and a dry cleaner (1991-2004). The adjacent property located 43-19 37th Street was listed as a large quantity generator of hazardous waste in 1980 and the property at 38-01 Queens Boulevard is in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) and is undergoing remediation for chlorinated solvent contamination among other contaminants.

Summary of the Work Performed under the Remedial Investigation

Results of sampling completed as part of a January 2019 Phase II Environmental Site Investigation (ESI) and July 19, 2019 Waste Characterization Report are presented as the RI for this site. The scope of work completed during the Phase II ESI and Waste Characterization included the following:

Phase II ESI

1. Conducted a site inspection to observe conditions and assess access considerations (i.e., structures, buildings, etc.)

2. Completed a geophysical survey to identify anomalies indicative of underground storage tanks (USTs) and associated piping and to clear boring locations from physical and/or subsurface utilities and structures
3. Advanced five soil borings (EB-01 through EB-05) to varying depths down to about 50 feet below grade surface (bgs) and collected 11 soil samples, including one duplicate sample, for chemical analysis to evaluate soil quality
4. Collected four groundwater samples, including one duplicate sample, from existing geotechnical groundwater monitoring wells for chemical analysis to evaluate groundwater quality
5. Installed six soil vapor probes (SV01 through SV05 plus a duplicate location) and collected six sub-surface soil vapor samples (including a duplicate)for chemical analysis to evaluate soil vapor quality

Waste Characterization

1. Advanced 12 soil borings (SB01 through SB12) to depths down to about 19 feet bgs and collected 13 soil sample sets (composite and grab samples), including one duplicate sample set, for chemical analysis to evaluate soil quality
2. Advanced an additional 24 soil borings to about 12 feet bgs around Phase II ESI soil borings EB-02, EB-04 and EB-05 to delineate the extent of hazardous and/or high total lead

Summary of Environmental Findings

Results of this remedial investigation are summarized below:

1. Elevation of the property ranges from about el 66 to 68, which is also about sidewalk grade.
2. Groundwater was observed during the RI at depths from about 49 to 50 feet bgs. Based on local topography, groundwater is presumed to flow west or southwest.
3. Stratigraphy below slabs and pavement consists of historic fill material primarily comprised of fine- to medium-grained sand with varying amounts of silt, gravel, mica fragments, and construction debris (i.e., brick, concrete, ash, and glass). Historic fill material was observed to depths ranging from about 11 to 19 feet bgs and was generally underlain by dense sand and gravel, with varying amounts of silt.
4. Petroleum-like odor and photoionization detector (PID) readings of up to 7.9 parts per million (ppm) were observed at about 8 to 9 feet bgs in boring EB-05 unsaturated historic fill material; however, petroleum-related volatile organic compounds (VOCs) were not detected in the soil sample from this interval. Petroleum-like odors were observed at the groundwater table (but not in dry soil above) in geotechnical boring LB-10 (completed on December 5, 2018) in the sidewalk east of the building on Lot 40 (up-gradient).

5. Soil/fill samples results collected during the Phase II ESI were compared to NYSDEC Part 375 Table 375-6.8 Unrestricted Use SCOs (UU SCOs) and Restricted Use Commercial SCOs (RUC SCOs). Soil samples exhibited no VOCs or polychlorinated biphenyls (PCB) above the Unrestricted Use SCOs. SVOCs, pesticides and metals were detected above UU SCOs. Concentrations above SCOs were generally consistent with historic fill material in New York City, except for total lead at anomalously high concentrations (1,530 milligrams per kilogram [mg/kg] to 3,020 mg/kg) in shallow samples (0 to 2 feet bgs) at three locations, and atypically high SVOC concentrations (above 100 mg/kg for individual compounds) in one 0 to 2-foot sample collected at the center of the western site border.

6. Soil/fill samples results collected during the Waste Characterization were compared to NYSDEC Part 375 Restricted Use – Residential (RUR) SCOs and Protection of Groundwater (PG) SCOs, and to the Resource Conservation and Recovery Act (RCRA) Maximum Concentration of Contaminants for the Toxicity Characteristic. Soil samples exhibited no VOCs, pesticides, herbicides, or PCBs at concentrations exceeding RUR or PU SCOs in composite samples. One or more total metals were reported at concentrations exceeding RUR and/or PG SCOs in various samples.

   Hazardous lead was detected in shallow historic fill material (0-4 feet bgs) throughout the site and from 0 – 10 feet bgs beneath the Lot 40 building. High SVOC concentrations within hazardous lead soil in the central western part of the site will represent an underlying hazardous constituent (UHC) upon excavation, requiring special disposal considerations.

7. Groundwater sample results were compared to NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Class GA Ambient Water Quality Standards and Guidance Values (SGVs).

   A. Groundwater contained chlorinated solvents at concentrations that exceed TOGS SGVs, including trichloroethene (TCE) up to 54 µg/L, tetrachloroethene (PCE) up to 25 µg/L, and cis-1,2-dichloroethene up to 6.6 µg/L. Chlorinated solvents in the soil samples did not exceed New NYSDEC UU SCOs. It is likely that these compounds in groundwater are related to the eastern adjoining BCP site undergoing remediation for chlorinated solvents and/or another off-site source.

      The VOCs acrolein, methyl tert-butyl ether (MTBE), 1,2,4-trimethyl benzene, and n-butyl benzene in groundwater also exceeded TOGS AWQS. These compounds were not identified in site soil and may be related to off-site sources.

   B. SVOCs were reported at concentrations above the SGVs in well LB7; however, this may be related to entrained sediment in the sample as turbidity was 222 Nephelometric Turbidity Units (NTU) at the time of sampling.

   C. Dissolved metals reported at concentrations above SGVs are attributed to regional conditions.

8. Concentrations of the chlorinated VOCs TCE (up to 11 micrograms per cubic meter [µg/m^3]), carbon tetrachloride (up to 7.6 µg/m^3), and 1,1,1-trichloroethane (TCA) (up to 780 µg/m^3) were reported at concentrations that trigger a recommendation of monitor or mitigate based on the New York State Department of Health (NYSDOH) Decision Matrices in the 2006 Guidance on Evaluating Soil Vapor Intrusion (and subsequent updates), updated in 2017. Total VOC concentrations in soil vapor samples ranged from 195 µg/m^3 in SV04 to 1,354 µg/m^3 in SV05.

REMEDIAL INVESTIGATION REPORT

1.0 SITE BACKGROUND

New York Hotel Trades Council & Hotel Association of New York City, Inc., Health Center, Inc. has enrolled in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a 20,000-square-foot site located at 43-06 and 43-30 38th Street (the site) in the Long Island City neighborhood of Queens, New York. Commercial use is proposed for the property. Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. (Langan) was retained by New York Hotel Trades Council & Hotel Association of New York City, Inc., Health Center, Inc. to complete a Remedial Investigation Report (RIR) for the site.

Langan attended a Pre-Application Meeting with OER and Hotel Trades Council & Hotel Association of New York City, Inc., Health Center, Inc. on June 27, 2019 to discuss the preliminary design and the results of previous environmental investigations. This RIR summarizes the nature and extent of contamination identified during investigations and 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 was performed in two phases, including December 18 - 21, 2018 (Phase II ESI) and March 20 - 27, 2019 (Waste Characterization), and is consistent with applicable guidance.

1.1 Site Location and Current Usage

The site is located at 43-06 and 43-30 38th Street in Long Island City, Queens, New York, and is identified as Queens Borough Tax Block 220, Lots 25 and 40. The site is located on the city block bound by 43rd Avenue to the north, 38th Street to the east, Queens Boulevard to the south, and 37th Street to the west. The approximately 20,000-square-foot site is improved with an asphalt-paved parking area on Lot 25 and a 1-story, slab-on-grade commercial building on Lot 40. The building on Lot 40 is used to store medical supplies for the southern adjoining health center. A site location map is included as Figure 1. A Site Plan is included as Figure 2.

1.2 Proposed Redevelopment Plan

Anticipated redevelopment includes demolition of the existing structure on Lot 40 and construction of a new s6-story health center building spanning the whole site. The new building will include a partial cellar level set back about 20 feet from the east and west site boundaries. The ground level will include a drive aisle on the east side of the building. The proposed top of basement slab depth is 15 feet below grade surface (bgs) with a mat slab extending to depths of 16 – 19 feet bgs (el 51 – el 48). Deeper excavations will be required for elevator and mechanical pits. Excavation is not expected to not require dewatering as groundwater is about 49 – 50 feet bgs.

According to the New York City Department of City Planning (NYCDCP) Zoning Map 9b, the Subject Property is located in a M1-4 manufacturing district. M1-4 indicates a "Light

Manufacturing Zoning District" having manufacturing, commercial, and community facility uses. The proposed use is consistent with existing zoning for the property. The proposed site development plan is presented as Figure 3. Preliminary architectural and structural plans are included in Appendix A.

1.3 Description of Surrounding Properties

The site is located in an area generally characterized by commercial buildings and light industrial buildings. The adjoining and surrounding property uses are summarized in the table below:

Direction	Adjoining Properties			Surrounding Properties
	Block No.	Lot No.	Description	
East	219	18	One-story warehouse	One-story parking garage
		9	Eight-story commercial building under construction (BCP Site No. C241178)	
West	220	18	One-story commercial building	Multiple one to three-story commercial, industrial, and parking lot buildings
		21	One-story industrial building with a partial cellar	
North	220	23	Two-story warehouse	Two-story warehouse and a two-story factory for industrial uses
South	220	9	Two-story (out-patient) health center building	Two four-story retail and commercial buildings

A Surrounding Land Use Map is provided as Figure 4.

2.0 SITE HISTORY

2.1 Past Uses and Ownership

The current owner of the site is Hotel Association of NYC Health Center Inc., who has owned Lot 25 since 1999 and Lot 40 since 2008. There is no documentation of another owner of Lot 25. Owners of Lot 40 between 1968 and 2008 included Irvinware, 43-30 Thirty Eighth Street Realty Corp., Dosanko Foods Inc., and the City of New York. Sanborn Maps indicate that the site was developed around 1936 and was occupied by an Auto Service and Storage Yard. Buildings were not shown on Lot 25 since 2005, and Lot 40 has been developed since 1936.

2.2 Previous Investigations

The previous environmental report summarized below is included in Appendix B.

November 28, 2018 Phase I ESA, prepared by Langan

This Phase I identified Recognized Environmental Conditions (RECs) related to the following:

- Historical use of the site for auto wrecking operations with an associated auto wreck storage yard (1936-1970), a battery service facility (1936), unspecified manufacturing (1977-2006), and a noodle factory (unknown-2002).
- Historical and current use of adjoining and/or surrounding property use as auto/truck service stations (1936-2005); gasoline filling station (1936-2005); metal manufacturing, plating, and works (1934 – 2001); cosmetics manufacturing (1947-1950); die casting (1936); machine repair (1936); Sanitation Department garage (1947-1950); lubricant factory (1934); boiler manufacturer (1923-1939); plastics manufacturer (1962); textile manufacturing (1970-1977); unspecified manufacturing (1962-2005); and a dry cleaner (1991-2004). The adjacent property located 43-19 37th Street was listed as a large quantity generator of hazardous waste in 1980 and the property at 38-01 Queens Boulevard is in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) and is undergoing remediation for chlorinated solvent contamination.

Potential dry wells and historic fill material were identified as business environmental risk (BERs).

2.3 Site Inspection

Supplementation site inspections were not complete after the Phase I and Phase II ESI.

2.4 Areas of Concern

Based on the Phase I RECs, areas of concern (AOCs) identified for this site, which may have impacted site soil, groundwater and soil vapor, include:

- Historical Use of the Site – Historical use of the site for an auto wrecking operation with an associated auto wreck storage yard (1936-1970), a battery service facility (1936), unspecified manufacturing (1977-2006), and a noodle factory (unknown-2002)
- Historic Fill Material – Historic fill material is located beneath the building slab. This material is commonly impacted with metals and semivolatile organic compounds (SVOCs).
- Historical Use of Surrounding Properties – Former uses of adjoining and surrounding properties included auto/truck service stations (1936-2005); a gasoline filling station (1936-2005); metal manufacturing, plating, and works (1934 – 2001); cosmetics manufacturing (1947-1950); die casting (1936); machine repair (1936); a Sanitation Department garage (1947-1950); a lubricant factory (1934); a boiler manufacturer (1923-1939); a plastics manufacturer (1962); textile manufacturing (1970-1977); unspecified manufacturing (1962-2005); and a dry cleaner (1991-2004). The adjacent property located 43-19 37th Street was listed as a large quantity generator of hazardous waste in 1980 and the property at 38-01 Queens Boulevard is in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) and is undergoing remediation for chlorinated solvent contamination among other contaminants.

3.0 PROJECT MANAGEMENT

3.1 Project Organization

The Qualified Environmental Profession (QEP) responsible for preparation of this RIR is Jason Hayes, P.E., of Langan.

3.2 Health and Safety

Work described in this RIR was performed in compliance with applicable laws and regulations, including Occupational Safety and Health Administration (OSHA) worker safety requirements and Hazardous Waste Operations and Emergency Response (HAZWOPER) requirements.

3.3 Materials Management

Material encountered during the RI was managed in accordance with applicable laws and regulations. Excess non-impacted soil cuttings were used to backfill boring locations. Purged groundwater was containerized in steel, Department of Transportation (DOT)-approved, 55-gallon drums. The drums were transported off-site by Eastern Environmental Solutions, Inc. (Eastern Environmental) of Manorville, New York for disposal at Clean Water of New York in Staten Island on August 30, 2019.

4.0 REMEDIAL INVESTIGATION ACTIVITIES

Langan completed the following Phase II ESI and Waste Characterization scope to provide the RI data presented herein:

Phase II ESI

1. Conducted a site inspection to observe conditions and assess access considerations (i.e., structures, buildings, etc.)
2. Completed a geophysical survey to identify anomalies indicative of underground storage tanks (USTs) and associated piping and to clear boring locations from physical and/or subsurface utilities and structures
3. Advanced five soil borings (EB-01 through EB-05) to varying depths down to about 50 feet below grade surface (bgs) and collected 11 soil samples, including one duplicate sample, for chemical analysis to evaluate soil quality
4. Collected four groundwater samples, including one duplicate sample, from existing geotechnical groundwater monitoring wells for chemical analysis to evaluate groundwater quality
5. Installed six soil vapor probes (SV01 through SV05 plus duplicate location) and collected six sub-surface soil vapor samples for chemical analysis to evaluate soil vapor quality

Waste Characterization

1. Advanced 12 soil borings (SB01 through SB12) to depths down to about 19 feet bgs and collected 13 soil sample sets (composite and grab samples), including one duplicate sample set, for chemical analysis to evaluate soil quality
2. Advanced an additional 24 soil borings to about 12 feet bgs around Phase II ESI soil borings EB-02, EB-04 and EB-05 to delineate the extent of hazardous and/or high total lead

4.1 Investigation Methodology

4.1.1 Geophysical Investigation

Prior to intrusive geotechnical sampling, NOVA Geophysical & Environmental, Inc. (NOVA), of Douglaston, New York, conducted a geophysical survey on November 17, 2018. NOVA used ground-penetrating radar (GPR) and electromagnetic detection equipment to identify subsurface anomalies, including those indicative of potential USTs and utilities across accessible portions of the site. Borings were relocated as necessary to avoid subsurface utilities and minor anomalies.

4.1.2 Drilling and Soil Logging

Phase II ESI

Phase II ESI soil borings were advanced by Eastern Environmental between December 18 and 21, 2018. A Langan field engineer was on-site to document field observations and collect soil

samples. Soil borings were advanced to depths ranging from about 10 to 50 feet bgs using either a Geoprobe® 420M limited-access, direct-push drill rig, or a Geoprobe® 6610DT track-mounted, direct-push drill rig, depending on the accessibility of each boring location. Phase II boring locations are shown on Figure 5A.

Waste Characterization

Langan performed in-situ waste characterization soil sampling between March 20 and 27, 2019. Eastern Environmental advanced 12 borings (SB01 through SB12) using either a Geoprobe® 420M limited-access, direct-push drill rig, or a Geoprobe® 7822DT track-mounted, direct-push drill rig, depending on the accessibility of each boring location. Waste characterization boring locations are depicted on Figure 5B.

Supplemental delineation borings were advanced during the waste characterization field mobilization effort to delineate lead and/or SVOCs identified during the December 2018 Phase II investigation as listed below:

- 10 borings at or around Phase II boring EB2
- 7 borings at or around Phase II boring EB4
- 7 boring at or around Phase II boring EB5

Delineation boring locations are shown on Figure 5B. During both field efforts, soil was continuously collected into dedicated 3, 4, or 5-foot acetate sleeves to boring completion depths, which ranged from about 10 to 50 feet bgs. Soil samples retrieved from borings were visually classified for soil type, grain size, texture, and moisture content. Each sample was screened for visual, olfactory, and instrumental evidence of a chemical or petroleum release. Instrumental screening for the presence of organic vapors was performed using a photoionization detector (PID) equipped with a 10.6 electron volt (eV) lamp. Boring logs are included in Appendix C.

Following sample collection, borings were backfilled with soil cuttings or clean sand, and patched with concrete or asphalt to match surrounding surfaces.

4.1.3 Groundwater Investigation

Monitoring wells were not installed during the Phase II ESI or waste characterization. During an attempt to install a new well at boring EB-03, refusal was encountered at about 25 feet bgs utilizing hollow-stem augers at the initial and several off-set locations. Previously installed geotechnical observation wells in the parking lot (LB1, LB5, and LB7) were gauged and sampled for laboratory analysis. All of the sampled wells were constructed using 20-foot sections of 0.01-inch-slot, 2-inch-diameter, schedule 40 polyvinyl chloride (PVC) well screen with attached riser. A summary of respective well depths and screened intervals is described in the following table:

Well ID	Total Well Depth	Well Screen Interval
LB1	80	60 to 80
LB5	60	40 to 60
LB7	90	70 to 90

The annulus was generally backfilled with No. 1 filter sand to about 5 feet above the top of the slotted well screen followed by an approximately 2-foot-thick bentonite-pellet seal. The remainder of the annulus was backfilled to grade with soil cuttings. Monitoring well construction logs are included as Appendix D. Eastern Environmental developed the monitoring wells by pumping groundwater and sediment with a submersible pump until evacuated water was visibly clear. Monitoring well locations are shown on Figure 6.

4.1.4 Soil Vapor Investigation

Six soil vapor probes (SV01, SV02, SV03 (and duplicate SVDUP01 in 1-foot offset sample), SV04, and SV05 were installed by Eastern Environmental with either the limited-access or track-mounted Geoprobe® drill rig. Soil vapor probes were installed in accordance with the October 2006, updated in 2017 New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York to depths of about 3 feet bgs. Dedicated polyethylene tubing was threaded to disposable 1-7/8-inch polyethylene implants to construct the temporary points. The annular space around the probes was backfilled with filter sand to about 2.5 feet bgs followed by a bentonite seal to grade. The soil vapor sample locations and results are shown on Figure 7. Soil vapor construction and sampling logs are included in Appendix E.

4.2 Sample Collection and Chemical Analysis

Soil, groundwater, and soil vapor samples were collected to determine the nature and extent of environmental impacts and the potential impact of contaminants on public health and the environment. Discrete (grab) and composite samples have been used for final delineation of the nature and extent of contamination and to determine the impact of contaminants on public health and the environment. The sampling performed and presented in this RIR provides sufficient basis for evaluation of remedial action alternatives and selection of a final remedy. Soil, groundwater, and soil vapor samples were collected into laboratory-supplied containers and transported to York Analytical Laboratories, Inc. (York), a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory in Stratford, CT (NY Lab ID No. 10854). Sample collection summaries are provided in Tables 1A, 1B, and 1C.

4.2.1 Soil Sampling

Phase II ESI

Between 18 and 21 December 2018, a total of 11 soil samples (two from each of the five boring locations plus a duplicate sample) were collected for laboratory analysis. A field blank sample was also collected for additional quality assurance/quality control (QAQC). A minimum of two samples was collected from each boring, including one from 0-2 feet bgs and one from deeper historic fill material (between 4 and 19 feet bgs) or the groundwater interface (47-49 feet bgs). In borings where field evidence of impacts was observed, samples were collected from the interval exhibiting the greatest degree of impacts.

Samples submitted for volatile organic compound (VOC) analysis were collected directly from the acetate liner into laboratory-supplied TerraCore® soil samplers. The remaining sample volume was placed in laboratory-supplied containers for additional analyses. The sample containers were labeled, placed in a laboratory-supplied cooler, and packed on ice (to maintain a temperature of 4±2°C). The samples were picked up and delivered via courier service to York.

Phase II soil samples were analyzed for NYSDEC Title 6 of the Official Compilation of New York Codes, Rules, and Regulations (NYCRR) Part 375 and Target Compound List (TCL) VOCs by United States Environmental Protection Agency (USEPA) method 8260C, SVOCs by USEPA method 8270D, pesticides by USEPA method 8081B, polychlorinated biphenyls (PCBs) by USEPA method 8082A, and Target Analyte List (TAL) metals by USEPA methods 6010D and 7470A.

Following sample collection, boreholes were backfilled with soil cuttings to grade and restored in kind at the surface as necessary.

Waste Characterization

Between 20 and 27 March 2019, 13 waste characterization sample sets, each consisting of one grab sample and one composite sample, were collected for laboratory analysis. Grab VOC soil samples were collected using a TerraCore® sampling kit. Composite samples were created by homogenizing five constituent grab samples from multiple borings. Waste characterization samples were collected from varying depths between 0 and 19 feet bgs to be representative of the proposed development cut.

Analysis of waste characterization samples was selected to comply with requirements for disposal facilities often used on projects in New York City and included the following parameters:

Grab Soil Samples

- Thirteen grab soil samples were submitted for NYSDEC Part 375 and New Jersey Department of Environmental Protection (NJDEP)-listed VOCs and NJDEP Extractable Petroleum Hydrocarbons (NJ EPH)
- One grab soil sample was also submitted for VOCs by the Toxicity Characteristic Leaching Procedure (TCLP)

Composite Soil Samples:

- Thirteen composite soil samples were submitted for NYSDEC Part 375/NJDEP-listed SVOCs, pesticides, herbicides, PCBs, and metals (including cyanide and hexavalent and trivalent chromium), and TCLP metals
- One composite sample was also submitted for Resource Conservation Recovery Act (RCRA) characteristics including pH, flashpoint, and cyanide, sulfide reactivity; Full TCLP; and paint filter

Additionally, a lead/SVOC delineation was implemented simultaneously with the Waste Characterization to supplement the findings of the Phase II ESI. The sampling methodology for the lead/SVOC delineation is summarized below:

EB2 – Lead and SVOC Delineation

A boring was installed immediately adjacent to Phase II boring EB2 (EB2-A) to vertically delineate lead and SVOC impacts around the 0 to 2-foot interval of concern. Nine borings were advanced to the north, east, and south of EB2 in about 10-foot offset intervals. Soil samples were collected from each offset boring in 0 to 2, 2 to 4, 4 to 6, 6 to 8, 8 to 10, and 10 to12-foot depth intervals. The lab was initially authorized to only analyze samples from first ring of offset borings (closest to EB2) from the 0 to 2-foot interval and from the 2 to 4-foot interval in boring EB2-A for total lead, TCLP lead, and SVOCs. Remaining samples were held by the laboratory and then analyzed as requested based on the initial sample results.

EB4 – Lead Delineation

A boring was installed immediately adjacent to Phase II boring EB4 (EB4-A) to vertically delineate lead impacts around the 0 to 2-foot interval of concern. Six borings were advanced to the north and east of EB4 in about 10-foot offset intervals (total of 7 borings). Soil samples were collected from each offset boring in 0 to 2, 2 to 4, 4 to 6, 6 to 8, and 10 to 12-foot depth intervals, but only samples from the first offset well (closest to EB4) from 0 to 2 feet and boring EB4-A from 2 to 4 feet were initially analyzed by the laboratory for total lead and TCLP lead. Remaining samples were held at the laboratory pending results of initial samples.

EB5 – Lead Delineation

A boring was installed immediately adjacent to Phase II boring EB5 (EB5-A) to vertically delineate lead impacts around the 0 to 2-foot interval of concern. Six borings were advanced to the

southeast and southwest of EB4 in about 10-foot offset intervals (total of 7 borings). Soil samples were collected from each offset boring in 0 to 2, 2 to 4, 4 to 6, 6 to 8, and 10 to 12-foot depth intervals, but only samples from first offset well (closest to EB5) from 0 to 2 feet and boring EB5-A from 2 to 4 feet were initially analyzed by the laboratory for total lead and TCLP lead. Remaining samples were held at the laboratory pending results of initial samples.

4.2.2 Groundwater Sampling

Following development, observation wells were sampled by a Langan field engineer in accordance with the USEPA's low-flow groundwater sampling procedure to allow for collection of a representative sample ("Low Stress [low flow] Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells", EQASOP-GW 001, 19 January 2010). Before sample collection, the static water level was measured to the nearest 0.01 foot using a Solinst water level meter, a minimum of three well volumes were purged using a submersible pump, and well effluent was pumped through a Horiba U-52 flow-through cell to monitor for hydrogen ion concentration (pH), conductivity, turbidity, dissolved oxygen (DO), temperature, and oxidation-reduction potential (ORP). Because of malfunctioning pumping equipment, field parameters did not stabilize prior to sample collection and sample turbidity levels in LB7 and LB1 were 222 nephelometric turbidity units (NTU) and 132 NTU, respectively. Groundwater sampling logs are included in Appendix F.

Four groundwater samples, including one duplicate sample, were collected. A field blank sample was collected for additional QA/QC. Groundwater samples were collected into labeled, laboratory-supplied containers, placed in a laboratory-supplied cooler, and packed on ice (to maintain a temperature of 4±2°C). The samples were picked up and delivered via courier service to York under standard chain-of-custody protocol. Groundwater samples were analyzed for TCL VOCs by USEPA method 8260C, TCL SVOCs by USEPA method 8270D, and TAL total and dissolved metals by USEPA methods 6020B and 7470A. Samples collected for dissolved metal analysis were filtered in the field with 0.45-micron filters.

4.2.3 Soil Vapor Sampling

Six soil vapor samples (including a duplicate sample) were collected in accordance with the October 2006 NYSDOH Final Guidance on Soil Vapor Intrusion updated in 2017. As a QA/QC measure, an inert tracer gas (helium) was introduced into an above-grade sampling chamber before and after sampling to ensure that the soil vapor probes were properly sealed above the target sampling depth, thereby preventing infiltration of ambient air to the subsurface. Direct readings of helium of less than 10 percent prior to sampling were considered sufficient to verify a tight seal. Each soil vapor probe was purged using a MultiRAE multi-gas meter at rate of 0.2 liters per minute (L/min) to evacuate a minimum of three sample tubing volumes prior to sample collection. Soil vapor samples were collected into laboratory-supplied, batch-certified, 6-Liter Summa® canisters calibrated for 120 minutes of sampling. Summa® canisters were labeled and transported via courier to York under standard chain-of-custody protocol for analysis of VOCs by USEPA method TO-15.

Following sample collection, soil vapor probes were removed and boreholes were backfilled with soil cuttings to grade and the surface was restored in kind. Soil vapor probe construction and sampling logs are included in Appendix E.

4.2.4 QA/QC Sampling

As a part of the RI, four trip blank samples, one duplicate soil sample, one duplicate groundwater sample, two field blank samples, and one duplicate soil vapor sample were collected and submitted to York for QA/QC purposes. The trip blanks, which consist of about 80 milliliters (mL) of acidic water prepared by the laboratory and sent with the sample containers, were analyzed for Part 375/TCL VOCs.

4.2.5 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 Emily Strake.
Chemical Analytical Laboratory	Chemical analytical laboratory used is NYS ELAP certified York Analytical Laboratory: NY Lab ID No. 10854.
Chemical Analytical Methods	Phase II ESI Soil analytical methods: • TAL Metals by USEPA Method 6010C • VOCs by USEPA Method 8260C • SVOCs by USEPA Method 8270D • Pesticides by USEPA Method 8081B • PCBs by USEPA Method 8082A Waste Characterization and Delineation Soil analytical methods: • NYSDEC Part 375 and New Jersey Department of Environmental Protection (NJDEP)-listed VOCs and NJDEP Extractable Petroleum Hydrocarbons (NJ EPH) • One waste characterization grab sample was submitted for VOCs by TCLP • NYSDEC Part 375/NJDEP-listed SVOCs, pesticides, herbicides, PCBs, and metals (including cyanide and hexavalent and trivalent chromium, and TCLP metals • One waste characterization sample composite sample was submitted for Resource Conservation Recovery Act (RCRA) Characteristics including pH, flashpoint, cyanide, sulfide reactivity, a full TCLP analysis, and paint filter Groundwater analytical methods: • TAL total and dissolved Metals by USEPA Method 6020B and 7470A • VOCs by USEPA Method 8260C • SVOCs by USEPA Method 8270D Soil vapor analytical methods: • VOCs by TO-15 VOC parameters

4.2.6 Results of Chemical Analyses

Laboratory results for soil, groundwater, and soil vapor are summarized in Tables 2A through 4 and sampling locations illustrating soil, groundwater, and soil vapor sampling data are depicted on Figures 5A through 7. Laboratory analytical reports for samples evaluated in this RIR are provided in Appendix G.

5.0 ENVIRONMENTAL EVALUATION

5.1 Geological and Hydrogeological Conditions

Regional Geology

According to the USGS, "Bedrock and Engineering Geologic Maps of New York County and Parts of Kings and Queens Counties, New York, and Parts of Bergen and Hudson Counties, New Jersey", dated 1994 and prepared by Charles A. Baskerville (Baskerville Map), the site is underlain by the Ravenswood Granodiorite of the Middle Ordovician to Middle Cambrian. The Ravenswood Granodiorite is characterized as a medium- to dark-gray, sillimanite-garnet-pink microcline-plagioclase-biotite-muscovite-quartz and biotite-hornblende-orthoclase layered gneiss. Bedrock was not encountered during environmental or geotechnical investigations; however, based on the Baskerville Map, bedrock is estimated at about 170 feet bgs at the site.

Stratigraphy

A geotechnical evaluation was conducted by Langan concurrently with this Phase II ESA. During the geotechnical evaluation, historic fill material, primarily comprised of fine- to medium-grained sand with varying amounts of silt, gravel, mica fragments, and construction debris (i.e., brick, concrete, ash, and glass) was observed to depths ranging from about 11 to 19 feet bgs. Historic fill material was generally underlain by dense sand and gravel, with varying amounts of silt.

Hydrogeology

Groundwater flow is typically topographically influenced, as shallow groundwater tends to originate in areas of topographic highs and flows toward areas of topographic lows, such as rivers, stream valleys, ponds, and wetlands. A broader, interconnected hydrogeologic network often governs groundwater flow at depth or in the bedrock aquifer. Groundwater depth and flow direction are also subject to hydrogeologic and anthropogenic variables such as precipitation, evaporation, extent of vegetation cover, and coverage by impervious surfaces. Other factors influencing groundwater include depth to bedrock, the presence of artificial fill, and variability in local geology and groundwater sources or sinks.

Groundwater was observed at depths ranging from about 49 to 50 feet bgs during the December 20, 2018 monitoring well gauging event conducted by Langan. Based on local topography, groundwater is presumed to flow west, southwest.

5.2 Soil Chemistry

Data collected during the Phase II ESI and Waste Characterization are sufficient to delineate the vertical and horizontal distribution of contaminants in soil/fill at the site. The results of these investigations are summarized below:

Phase II ESI

Soil sample analytical results were compared to NYSDEC Title 6 of the New York Codes, Rules and Regulations (NYCRR) Part 375 Unrestricted Use (UU) and Restricted Use – Commercial

(RUC) Soil Cleanup Objectives (SCOs). Soil sample analytical results for 11 soil samples, including a duplicate, collected are summarized in Table 2A and shown on Figure 5A. A summary of collected Phase II samples and analysis is presented in Table 1A. Analytical laboratory reports are included in Appendix G. Analytes detected at concentrations above UU and RUC SCOs are listed below; samples with corresponding analytes detected above RUC SCOs are shown in **bold**.

VOCs – Concentrations of VOCs did not exceed UU or RUC SCOs.

SVOCs – Concentrations of the below 15 SVOCs exceeded either UU or RUC SCOs in the noted samples (maximum reported concentration is noted in parentheses):

- 3 & 4 Methylphenol (m&p Cresol): EB-02_0-2 (0.527 mg/kg)
- Acenaphthene: EB-02_0-2 (30.3 mg/kg)
- Benzo(a)Anthracene: **EB-02_0-2 (145 mg/kg),** EB-05_0-2, EB-05_8-9
- Benzo(a)Pyrene: **EB-02_0-2 (129 mg/kg), EB-05_0-2, EB-05_8-9**
- Benzo(b)Fluoranthene: EB-01_0-2, **EB-02_0-2 (116 mg/kg),** EB-05_0-2, EB-05_8-9
- Benzo(k)Fluoranthene: **EB-02_0-2 (100 mg/kg),** EB-05_0-2, EB-05_8-9
- Chrysene: EB-01_0-2, **EB-02_0-2 (131 mg/kg),** EB-05_0-2, EB-05_8-9
- Dibenzo(a,h)Anthracene: **EB-02_0-2 (28.2 mg/kg),** EB-05_0-2, EB-05_8-9
- Dibenzofuran: EB-02_0-2 (18 mg/kg)
- Fluoranthene: EB-02_0-2 (258 mg/kg)
- Fluorene: EB-02_0-2 (33.4 mg/kg)
- Indeno(1,2,3-c,d)Pyrene: EB-01_0-2, **EB-02_0-2 (64.4 mg/kg),** EB-05_0-2, EB-05_8-9
- Naphthalene: EB-02_0-2 (19.2 mg/kg)
- Phenanthrene: EB-02_0-2 (194 mg/kg)
- Pyrene: EB-02_0-2 (180 mg/kg)

Pesticides – The concentration of one pesticide exceeded UU SCOs (but not RUC SCOs) in one boring:

- 4,4'-DDT: EB-04_0-2 (0.0259 mg/kg)

PCBs – Concentrations of PCBs did not exceed UU or RUC SCOs.

Metals – Concentrations of nine metals listed below exceeded UU or RUC SCOs in the noted samples (maximum reported concentration is noted in parentheses):

- Arsenic: **EB-02_0-2 (40 mg/kg)**
- Barium: **EB-02_0-2. EB-04_0-2, EB-05_0-2, EB-05_8-9 (1,910 mg/kg)**
- Cadmium: EB-02_0-2, **EB-04_0-2 (10.5 mg/kg),** EP-05_0-2
- Copper: **EB-02_0-2**, EB-02_17-19**, EB-04_0-2, EB-05_0-2, EB-05_8-9 (952 mg/kg)**
- Lead: **EB-02_0-2 (3,020 mg/kg),** EB-02_17-19, **EB-04_0-2, EB-05_0-2,** EB-05_8-9

- Mercury: EB-01_0-2, EB-02_0-2, EB-04_0-2, EB-05_0-2, EB-05_8-9 (2.15 mg/kg)
- Nickel: EB-02_0-2, EB-04_0-2, EP-05_0-2 (35.3 mg/kg)
- Selenium: EB-01_0-2 (17.9 mg/kg)
- Zinc: EB-02_0-2, EB-02_17-19, EB-04_0-2 (2,730 mg/kg), EB-05_0-2, EB-05_8-9

Waste Characterization

Soil analytical results were tabulated and compared to NYSDEC Part 375 Restricted Use – Residential (RUR) SCOs and Protection of Groundwater (PG) SCOs, and to the RCRA Maximum Concentration of Contaminants for the Toxicity Characteristic. Waste characterization analytical results are summarized in Tables 2B through 2H, waste characterization boring locations are shown on Figure 5B, and a description of composite sample points is provided in Table 1B. The following is a summary of results.

- No VOCs were reported at concentrations exceeding RUR or PG SCOs in grab soil samples.
- A total of seven SVOCs were reported at concentrations exceeding RUR and/or PG SCOs in composite soil samples WC02_COMP_0-4 and WC02_COMP_10-16. SVOC concentrations in WC02_COMP_0-4 were higher than those observed in typical historic fill material and the individual 5 points that comprised the composite sample were analyzed for SVOCs. Results of this supplemental analysis indicated that the four composite points from borings SB05 and SB06, collected from within 0-3 feet bgs, contained SVOC concentrations typical of historic fill material in New York City and below NJDEP Non-Residential Soil Remediation Standards (SRS). Composite point SB04_GRAB_1-2 (from boring SB04) contained atypically high concentrations of SVOCs (above NJDEP Non-Residential SRS); therefore, this sample point appears to be contributing to the high SVOC concentrations in composite sample WC02_COMP_0-4.
- No pesticides, herbicides, or PCBs were reported at concentrations exceeding RUR or PG SCOs in composite soil samples.
- EPH concentrations ranged from not detected to 2,670 mg/kg (highest in SB01_GRAB_2-3).
- One or more total metals were reported at concentrations exceeding RUR and/or PG SCOs in composite soil samples WC01_COMP_0-4, WC02_COMP_0-4, WC02_COMP_10-16, WC03_COMP_0-4, WC03_COMP_4-10, and WC04_COMP_0-4.
- TCLP lead was reported at values exceeding the RCRA Maximum Concentration of Contaminants for the Toxicity Characteristic of 5 milligrams per liter (mg/L) in the following three composite samples: WC01_COMP_0-4 (6.4 mg/L), WC02_COMP_0-4 (26.3 mg/L), and WC03_COMP_0-4 (6.16 mg/L).

  The five points comprising each of these composites were then analyzed for total and TCLP lead. This supplemental analysis resulted in the following:

- WC01_COMP_0-4: Hazardous concentrations were identified in individual sample points SB01_GRAB_0-1 (13.9 mg/L), SB02_GRAB_0-1 (35.4 mg/L), and SB03_GRAB_2-3 (13.3). Total lead ranged from 7,830 mg/kg to 19,500 mg/kg in these three samples. Total lead concentrations in the remaining two grabs were 27.6 mg/kg (SB01_GRAB_1-2) and 197 mg/kg (SB03_GRAB_1-2).
- WC02_COMP_0-4: Hazardous results were not reported for the five points in this composite and total lead concentrations ranged from 15 to 1,050 mg/kg (the highest concentration in SB06_GRAB_0-1).
- WC03_COMP_0-4: Hazardous concentrations were identified in individual sample points SB07_GRAB_0-2 (78.1 mg/L) and SB08_GRAB_2-3 (5.34 mg/L). Total lead concentrations were below 400 mg/kg in each of the five points, except for SB07_GRAB_0-2 where 43,200 mg/kg was reported.

Lead/SVOC Delineation Soil Analytical Results (Part of Waste Characterization)

Delineation analysis (listed on Table 1C) was completed between March and June 2019 and results were compared to the following regulatory criteria:

- Total lead - NJDEP Non-Residential SRS
- TCLP Lead - RCRA Maximum Concentration of Contaminants for the Toxicity Characteristic
- SVOCs - NJDEP Non-Residential SRS

Delineation analytical results are presented in Tables 2F through 2H, summarized below, and shown on Figure 5C.

EB2 – Lead and SVOC Delineation

The 0 to 2-foot-deep samples from the first ring offsets did not contain SVOCs that exceeded NJDEP non-residential SRS, with the exception of benzo(a)pyrene in sample EB2_N1_0-2. Otherwise, SVOC concentrations in the offset ring were typical of historic fill in New York City. SVOCs in the 2 to 4-foot-deep sample at EB2A did not exceed NJDEP non-residential SRS. Additional SVOC analysis was not requested.

Lead analytical results exceeded RCRA limits and/or NJDEP non-residential SRS within the 2 to 4-foot-deep interval at EB2A and in multiple offset borings to the north and south at depths between 0 and 4 feet bgs. Hazardous lead concentrations ranged from 5.48 to 76.4 mg/L in this delineation area.

SVOC concentrations in both the original EB2 0-2 foot bgs sample in December 2018 and the 0 to 4-foot composite from EB2A exceeded the USEPA Universal Treatment Standards (UTSs) for hazardous waste. SVOC concentrations above the UTSs at this location represent an underlying hazardous constituent (UHC), which is considered a different waste stream from typical hazardous lead soil. UHCs were not identified in the offset borings around EB2 and EB2A.

EB4 – Lead Delineation

Hazardous lead concentrations were reported for the following samples: EB4-E1_0-2 (5.73 mg/L), EB4-E2_0-2 (23.4 mg/L), EB4-E3_0-2 (21.5 mg/L), EB4-N1_0-2 (10.2 mg/L), EB4-N2_0-2 (6.06 mg/L), each within the 0 to 2-foot depth interval. Total lead concentrations exceeded the NJ Non-residential SRS of 800 mg/kg at various locations at depths down to 8 feet bgs in this delineation area.

EB5 – Lead Delineation

Hazardous lead concentrations were reported at various locations and depths up to 8 feet bgs for the following samples: EB5-SE1_4-6 (18.6 mg/L), EB5-SE3_6-8 (33.4 mg/L), EB5-SW_0-2 (29.2 mg/L), EB5-SW2_2-4 (23.4 mg/L), EB5_SW3_0-2 (51.5 mg/L), and EB5_SW3_6-8 (9.64 mg/L). Total lead concentrations exceeded the NJDEP non-residential SRS of 800 mg/kg at several locations throughout this delineation area at depths down to 10 feet bgs.

Results of several grab samples from each delineation area also exceeded the NYSDEC RUC SCO of 1,000 mg/kg for total lead.

5.3 Groundwater Chemistry

Groundwater sample analytical results were compared to the NYSDEC 6 NYCRR Part 703.5 and the NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values for Class GA water (NYSDEC SGVs). Groundwater sample analytical results for the three samples collected are summarized in Table 3 and shown on Figure 6. Analytical laboratory reports are included in Appendix G. Analytes detected at concentrations exceeding NYSDEC SGVs are listed below:

VOCs – Concentrations of the following eight VOCs exceeded NYSDEC SGVs in one or more groundwater samples (maximum concentration is noted in parentheses):

- 1,2,4-Trimethylbenzene: LB5 (34 micrograms per liter [µg/L])
- Acrolein: LB1 (9.9 µg/L)
- Chloroform: LB7(9.1 µg/L)
- Cis-1,2-Dichloroethene: LB1(6.6 µg/L)
- Methyl Tert-Butyl Ether (MTBE): LB7 (16 µg/L)
- n-Propylbenzene: LB5 (8.3 µg/L)
- Tetrachloroethene (PCE): LB1 (25 µg/L)
- Trichloroethene (TCE): LB1 (54 µg/L), LB5

SVOCs – Concentrations of five SVOCS exceeded NYSDEC SGVs in the sample from well LB7:

- Benzo(a)Anthracene: LB7 (0.0462 µg/L)
- Benzo(a)Pyrene: LB7 (0.0385 µg/L)
- Benzo(b)Fluoranthene: LB7 (0.0385 µg/L)

- Benzo(k)Fluoranthene: LB7 (0.0385 µg/L)
- Chrysene: LB7 (0.0615 µg/L)

Metals (Dissolved) – Concentrations of four metals exceeded NYSDEC SGVs in three groundwater samples:

- Iron: LB1, LB5, LB7 (3,480 µg/L)
- Magnesium: LB1 (48,600 µg/L), LB5
- Manganese: LB1 (4,200 µg/L), LB5
- Sodium: LB1, LB5 (443,000 µg/L), LB7

Several total metals exceeded the comparison criteria, but those results are attributed to entrained sediment in the unfiltered samples.

5.4 Soil Vapor Chemistry

Five soil vapor samples and one duplicate were collected during the Phase II ESI. No direct-comparison standards for soil vapor samples currently exist in New York State. Soil vapor sample analytical results were conservatively compared to the minimum soil vapor concentrations recommending monitoring or mitigation as set forth in the NYSDOH October 2006 Guidance for Evaluating Soil Vapor Intrusion in the State of New York Decision Matrices for Sub-Slab Vapor and Indoor Air and subsequent updates (2017). The matrices address the following compounds: 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethene, cis-1,2-dichloroethene, carbon tetrachloride, methylene chloride, TCE, PCE, and vinyl chloride.

Concentrations of the chlorinated VOCs TCE (up to 11 micrograms per cubic meter [µg/m^3]), carbon tetrachloride (up to 7.6 µg/m^3), and 1,1,1-TCA (up to 780 µg/m^3) were reported at concentrations that trigger a recommendation of monitor or mitigate based on the NYSDOH Decision Matrices. Total VOC concentrations in soil vapor samples ranged from 195 µg/m^3 in SV04 to 1,354 µg/m^3 in SV05.

Soil vapor sample analytical results are summarized in Table 4 and shown on Figure 7. Analytical laboratory reports are included in Appendix G.

5.5 Impediments to Remedial Action

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