CLAY PROPERTIES, LLC

19-27 AND 29 CLAY STREET AND 60-62 COMMERCIAL STREET

KINGS COUNTY

BROOKLYN, NEW YORK

Remedial Action Work Plan

NYSDEC BCP Number: C224390

Prepared for:

New York State Department of Environmental Conservation
Division of Environmental Remediation
47-40 21st Street
Long Island City, NY 11101
&
Clay Properties, LLC
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DECEMBER 2024

CERTIFICATION STATEMENT

I, Stephen M. Kline, P.E., certify that I am currently a NYS registered professional engineer and that this Remedial Action Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and Green Remediation (DER-31).

Stephen M. Kline, P.E. _____ _____

NYS Professional Engineer # 080431 Date Signature

I, Victoria D. Whelan. P.G., certify that I am currently a Qualified Environmental Professional as defined in 6 New York Codes, Rules, and Regulations (NYCRR) Part 375 and that this Remedial Action Work Plan was prepared in accordance with all applicable statutes and regulations and substantial conformance with New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation.

Victoria D. Whelan, P.G. _____ _____

NYS Professional Geologist # 0318 Date Signature

Remedial Action Work Plan

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LIST OF ACRONYMS

ACRONYM	DEFINITION
AOC	Area of Concern
AGV	Air Guidance Values
ASTM	American Society for Testing and Materials
AWQS	Ambient Water Quality Standards
BCA	Brownfield Clean-up Agreement
BGS	Below Ground Surface
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
CHASP	Construction Health and Safety Plan
Cr6+	Hexavalent Chromium
CSOP	Contractors Site Operation Plan
COPCs	Chemicals Of Potential Concern
CVOCs	Chlorinated Volatile Organic Compounds
DCR	Declaration of Covenants and Restrictions
DER	Department of Environmental Remediation
DNAPL	Dense Non-Aqueous Phase Liquid
DUSR	Data Usability Summary Report
ECs/ICs	Engineering and Institutional Controls
EPA	Environmental Protection Agency
ESA	Environmental Site Assessment
FER	Final Engineering Report
ft	Feet
ft2	Square Feet
GC	General Contractor
GPS	Global Positioning System
GZA	GZA GeoEnvironmental of New York
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
LNAPL	Light Non-Aqueous Phase Liquid
MCG/M3	Micrograms per Cubic Meter
NOC	Notice of Completion
NYC VCP	New York City Voluntary Clean-up Program
NYC DEP	New York City Department of Environmental Protection
NYC DOB	New York City Department of Buildings
NYC DOF	New York City Department of Finance
NYC OER	New York City Office of Environmental Remediation
NYCRR	New York Codes Rules and Regulations
NYS DEC	New York State Department of Environmental Conservation
NYS DOH	New York State Department of Health
NYS DOT	New York State Department of Transportation
NYS ELAP	Environmental Laboratory Accreditation Program
ORP	Oxygen Release Compound

ACRONYM	DEFINITION
OSHA	United States Occupational Health and Safety Administration
PBS	Petroleum Bulk Storage
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethene
PE	Professional Engineer
PID	Photo Ionization Detector
PPE	Personal Protective Equipment
PPM	Parts Per Million
QA/QC	Quality Assurance/ Quality Control
QEP	Qualified Environmental Professional
QHHEA	Qualitative Human Health Exposure Assessment
RAOs	Remedial Action Objectives
RAWP	Remedial Action Work Plan
RECs	Recognized Environmental Condition
RI	Remedial Investigation
RIR	Remedial Investigation Report
RMZ	Residual Management Zone
Sanborn	Sanborn Fire Insurance Map
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SHWS	Solid Hazardous Waste Site
SMMP	Soils/ Materials Management Plan
SQ FT	Square Feet
SVI	Soil Vapor Intrusion (Guideline)
SVOC	Semi-Volatile Organic Compound
TCE	Trichloroethene
TOGS	Technical and Operational Guidance Series
UST	Underground Storage Tank
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

This Remedial Action Work Plan (RAWP) was prepared on behalf of Clay Properties LLC (the volunteer) for the property located at 19-29 Clay Street and 60-62 Commercial Street, Block 2482, Lots 9, 10, and 53, Brooklyn, New York (the Site). The Site was accepted into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP). Two Brownfield Cleanup Agreements (BCAs) were executed on July 16, 2024, for two adjoining sites – C224390 and C224408. The two applications were amended merged under one BCA now referred to as C224390, memorialized in a revised BCA on November 14, 2024.

This RAWP summarizes the nature and extent of contamination as determined from data gathered during a Remedial Investigation (RI) completed by Goldberg-Zoino Associates of New York P.C. d/b/a GZA GeoEnvironmental of New York (GZA) in 2024. The RI is documented in a Remedial Investigation Report (RIR) dated November 2024.

The selected remedy is consistent with the procedures defined in the NYSDEC Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation (DER-10) and complies with applicable environmental standards, criteria, and guidance, and conforms to applicable laws and regulations.

SITE DESCRIPTION

The Site is located in the Greenpoint neighborhood of Brooklyn, New York. A topographic map showing the location of the Site is provided as **Figure 1**. The Site is comprised of three contiguous parcels as described below:

Address	Block and Lot	Land Use	Parcel Size	Current Use
19-27 Clay Street	Block 2482 Lot 9	Industrial / Manufacturing / Dense Residential (M1-2/R6)	0.15 acres	2-story warehouse building
60-62 Commercial Street	Block 2482 Lot 10		0.087 acres	Storage yard, parking
29 Clay Street	Block 2482 Lot 53		0.22 acres	Vacant Lot

A Site Plan with an aerial of the Site is included in **Figure 2**.

The surrounding properties were assessed during previous Phase I Environmental Site Assessments and during subsequent investigation events. At the present time, the surrounding properties remain a mix of residential and industrial/manufacturing land uses. The Site is bound to the north (across Commercial Street) by an asphalt-paved storage yard for equipment and vehicles by the New York City Transit Authority (NYCTA); to the east by a 1-story warehouse and a new 7-story residential building (NYSDEC BCP Site No. C224153); to the south (across Clay Street) by the Former NuHart Plastics Site (NYSDEC BCP Site No. C224287); and to the west by a mixed-use development currently under construction (NYSDEC BCP Site No. C244278). A figure showing the vicinity property land use with a 500-ft buffer around the Site is included as **Figure 3**.

SITE HISTORY

The following sections outline the Site History, including previous environmental assessments of the Site and surrounding area.

Past Uses and Ownership

Throughout its history, the Site was utilized for various industrial and manufacturing operations including iron works, tin can storage facility, cotton batting company, paper storage warehouse, and non-specific manufacturing use.

Records from 1887 through the mid-1900s, show the Site as being a part of a larger iron works facility, which included a boiler shop, machine shop, and blacksmith. By mid-1910s, the Site structures remained unchanged, however, it is now identified as a tin can storage facility. By the early 1940s, the Site has been redeveloped with commercial/industrial buildings fronting Clay Street, which include a 2-story structure (at the western portion of the parcel) occupied by a cotton batting manufacturer and a 1- and partial 2-story structure (at the eastern portion of the parcel) identified as a paper storage warehouse and a candy manufacturing company. Northern portions of the property were undeveloped. By the mid-1960s, the Site structures were identified for non-specific manufacturing uses while the northern portion of the property was identified as a lumber storage yard.

According to New York City Department of Finance (DOF) Records, the property was sold to multiple entities in 1968 to Wolbrom Family and IBCO Trading Co. Inc.; in 1982 to Mildred Hostyk; and 1997 to Nicole Associates LLC. Historical city directory records show that throughout this time, Site was occupied by a cosmetic and writing instruments manufacturing company (Angela Varona Cosmetics, Inc. Chromex Chemical Corp., and Liqui Mark Corp.). Historical records show that in 1966, Irving Wolbrom started Interflo Technologies, a company that pioneered the development and manufacturing of special porous structures for use in medical devices and filtration. From at least July 1994 to January 1997, historical environmental records obtained by GZA identified the property as being occupied by Interflo Technologies, a Resource Conservation and Recovery Act (RCRA) small quantity hazardous waste generator. Interflo Technologies generated ignitable, halogenated, non-halogenated solvents and mercury waste under USEPA ID No. NY0000374314. Multiple RCRA violations were identified for the Site which were reportedly addressed to the satisfaction of USEPA, and the company was sold in 1997.

By early 2000s until mid-2010s, historical city directory records showed that the Site was occupied by metal manufacturers (Jerome Aluminum Products Corp. and Liberty Custom Contractors, Inc.) and medical props warehouse company (Alpha Medical Resources, Inc.). By 2021, the property was sold to multiple entities; Michelet LLC, Lisal LLC, and Adsaga LLC. Throughout this time the property was identified for non-specific industrial manufacturing uses. On July 6, 2022, Clay Properties LLC purchased the property.

Summary of the Remedial Investigation

The findings summarized herein are based on field observations, instrumental readings and laboratory analytical results of soil, groundwater, and soil vapor samples collected during the 2024 NYSDEC BCP RI and 2023 NYCOER RI. The finding and conclusions are summarized below:

- Conducted a geophysical survey to scan for subsurface anomalies that may be indicative of unidentified underground storage tanks (USTs) and utilities in the vicinity of the proposed boring locations;
- 2023 RI - Advanced of 10 soil borings to depths ranging from 5 to 10 feet below ground surface (ft bgs) across the Site for the collection of 20 soil samples;
- 2024 RI - Advanced of 31 soil borings to depths ranging from 5 to 45 feet below ground surface (ft bgs) across the Site for the collection of Collected 100 discrete samples, 42 composite samples and additional Quality Assurance/Quality Control (QA/QC) samples for laboratory analyses;
- Excavated one shallow test pit using hand tools to investigate the existing trench on 29 Clay Street;

- 2024 RI - Installed 11 permanent monitoring well clusters. Each cluster is comprised of two or three, 1- or 2-inch diameter monitoring wells to varying depths: shallow, intermediate, and deep;
- 2024 RI - Conducted an elevation survey of the permanent monitoring wells to develop a groundwater contour map.
- 2024 RI - Collected 19 groundwater samples from the shallow and intermediate wells, 11 groundwater samples from the deep wells, and additional QA/QC samples for laboratory analyses;
- 2023 RI – Installation and sample collection from 9 soil vapor points;
- 2024 RI - Installation of 12 soil vapor points down to four (4) ft bgs;
- 2024 RI - Collected 12 soil vapor samples and additional QA/QC samples for laboratory analyses;
- 2024 RI - Collected four ambient air samples (indoor and outdoor);
- Managed investigation derived waste (IDW) during RI activities.
- Performed community air monitoring during RI activities in accordance with CAMP and added additional CAMP as needed and requested by NYSDEC.

RI Sample locations are shown on **Figure 4**.

Chemical Analytical Work Performed

Soil Laboratory Analyses

Soil samples were containerized and analyzed at a New York State Department of Health ELAP-certified laboratory, York Analytical Laboratories of Richmond Hill, NY (York).
The soil samples were analyzed for the following:

- Target compound list (TCL) Volatile Organic Compounds (VOCs) (includes 1,4 Dioxane) by EPA Method 8260C (rev. 2006);
- TCL Semi-Volatile Organic Compounds (SVOCs) by EPA Method 8270D (rev. 2007);
- Target Analyte List (TAL) Metals by EPA Method 6010C (rev. 2007) including Hexavalent Chromium and Total Cyanide;
- Polychlorinated biphenyls (PCBs) by EPA Method 8082A (rev. 2007);
- Pesticides by EPA Method 8081B (rev. 2000);
- Herbicides by EPA Method 8151A (rev. 2000); and
- Per- and Polyfluoroalkyl substances (PFAS) by EPA Method 1633 (2023).

In total, 100 discrete soil samples were analyzed for VOCs and 42 composite soil samples were collected for full suite analysis. Additional duplicate and QA/QC samples were also collected, as required by the site-specific QAPP. Completed sample labels were affixed to the side of the laboratory provided sample bottles. Once the sample bottles were filled, they were immediately placed in the cooler with ice to maintain the samples at below 4ºC and transported, via courier to York, under proper chain-of-custody procedures for analysis.

Groundwater Laboratory Analyses

Sampling equipment and procedures for PFAS sample collection generally followed EPA Method 1633 PFAS Field Sampling Guidelines. Groundwater samples were stored at or below 4°C and transported under proper chain of custody procedures to York to be analyzed for the following:

- TCL VOCs by EPA Method 8260C (rev. 2006);
- TCL SVOCs by EPA Method 8270D (rev. 2007);
- Total and dissolved TAL Metals by EPA Method 6010C/6020/7470 (rev. 2007);
- Cyanide by EPA Method 9010/9012B (rev. 2004);
- Mercury by EPA Method 7471B (rev. 2007);
- Pesticides by EPA Method 8081B (rev. 2000);
- PCBs by EPA Method 8082A (rev. 2000);
- 1,4-Dioxane by EPA Method SW 846 8260 (isotope dilution for 1-4 Dioxane); and
- PFAS by EPA Method 1633 (2023).

In total, 11 groundwater samples from the deep screened wells were analyzed for VOCs only and 19 samples from the shallow and intermediate wells were collected for full-suite analysis. Purge water was containerized in 55-gallon drums and stored on-Site prior to disposal off-Site. Other investigative derived waste was containerized and temporarily stored in a centralized location for off-site disposal.

Soil Vapor, Indoor and Outdoor Air Laboratory Analyses

The soil vapor samples were collected with a laboratory-supplied 6-liter Summa canister equipped with an 8-hour flow regulator calibrated for less than 0.2 liters per minute. Following completion of the purging and the helium tracer test, dedicated polyethylene/HDPE tubing was used to connect the probe to a laboratory-supplied 6-liter Summa canister for sampling. Summa canisters were transported via courier to York and the samples were analyzed for the following:

- TCL VOCs by EPA Method TO-15

The indoor air/ambient air samples were collected with a laboratory-supplied 6-liter Summa canister equipped with an 8-hour flow regulator calibrated for less than 0.2 liters per minute. After approximately eight hours, the summa canister flow regulator was closed and detached. Summa canisters were transported via courier to York and analyzed for the following:

- TCL VOCs by EPA Method TO-15

Geological and Hydrogeological Conditions

Based on our review of the 1776-7 Original High and Low Grounds, Salt Marsh and Shorelines in the City of Brooklyn Map, the Site lies within the border line of the original shoreline of Newtown Creek. With development, the shoreline was extended west and north by backfilling and raising grades to develop the street grid. Fill used to raise grades is underlain by clayey silts and silty sands.

In September 2024, DPK Land Surveying (DPK) conducted a survey of the Site which showed that the ground elevation ranges (proximate to monitoring wells) from elevations (EL) 14.52 feet above mean sea level (amsl) relative to the North American Vertical Datum 1988 (NAVD88) at the western portion of the Site, to EL 15.51 feet amsl at the eastern portion of the Site. The topographic gradient at the Site slopes generally down from east to west (See **Figure 1**). The nearest water bodies are Newtown Creek located approximately 600 feet to the north, and the East River located approximately 800 feet to the west, of the Site.

Based on Bedrock 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 1990, the bedrock near the Subject Property

consists of interbedded units of gray thinly laminated muscovite-biotite-quartz schist, and white to pinkish with light green weathering gneiss. During this RI, bedrock was encountered at approximately EL -25 feet amsl, which is approximately 40 ft bgs.

Soil and Rock Conditions

Based on the results of our subsurface exploration program during the 2024 NYSDEC RI, the subsurface conditions at the Site generally consist of the following observed soil profile.

- SURFACE COVER: Surface cover consisting of concrete was encountered at each soil boring location. The concrete was approximately 4 to 10-inches in thickness.
- FILL: Fill, consisting of dark brown/black/gray/tan fine to coarse sand containing construction debris, such as bricks, concrete, cinders/asphalt millings, was encountered below the Surface Cover in the borings extending to depths of up to approximately 4 ft bgs.
- SAND: Sand stratum was encountered below the fill in most locations, extending to approximately 20 ft bgs. The Sand stratum generally consisted of brown fine to coarse sand, with varying levels of silt and gravel.
- SILTY SAND: A silty sand stratum was also encountered below the fill in some borings and below the sand layer in some of the borings. In some borings, the silty sand stratum extended to termination depths of approximately 39 ft bgs. The stratum consists of light brown/brown silty sand with varying levels of gravel.
- SILTY CLAY / CLAYEY SILT: A silt/clay stratum was encountered interbedded between the sand and silty sand stratum and extended to depths ranging from approximately 15 to 22 ft bgs (approximately 0.5 feet to 4 feet thick) in some of the shallow borings, and between 26 to 32 ft bgs in some of the deep borings (approximately between 2 and 5 feet thick). The stratum consists of brown/dark gray silty clay and clayey silt, and trace fine sand. The thicker shallow layers of silty clay were primarily encountered in the southern portion of the site.
- DECOMPOSED ROCK: Decomposed rock stratum was encountered underlying the sand and silty sand stratum to depths ranging from 37 ft bgs to boring termination depth of 45 ft bgs. Decomposed rock is identified as material that has retained the parent bedrock features.

The subsurface condition at the Site is typical of a subsurface tidal waterbody. The Site was historically part of the shoreline of Newtown Creek, which received intermittent inflow and outflow of discharges. The subsurface profiles are shown included as **Figures 5A to 5D**.

Groundwater Conditions

GZA performed a synoptic groundwater well gauging event at the shallow wells on September 5, 2024. The groundwater elevation data from specific shallow wells (i.e., MW-01S to MW-8S and MW-10S) were used to prepare a groundwater contour map with measurements presented in EL amsl relative to the NAVD88. During this groundwater gauging event, depth to groundwater (i.e., from the top of casing [TOC]) ranged from 8.20 ft bgs to 11.72 ft bgs (EL 4.77 ft to 6.85 ft amsl), excluding MW-09S and MW-11S. At the time of the gauging event, MW-09S and MW-11S were observed to have not fully recharged after well development, and therefore; were not included in the groundwater contours.

The groundwater elevation data shows that groundwater flows generally from east to west across the Site, towards the East River. The groundwater contour map from the shallow wells is included as **Figure 6**.

Remedial Investigation Findings

The following sections detail the contamination conditions that exist at the Site in soil, groundwater, and soil vapor based on RI findings. The RI Sampling Summary is presented in **Table 1**. Soil analytical results were compared to 6 NYCRR Part 375 Unrestricted Use SCOs (UUSCOs), Restricted-Residential Use SCOs (RRUSCOs), and Protection of Groundwater Resources SCOs (PGSCOs). Perfluoroalkyl substances in soil were compared to 6 NYCRR Part 375-6 Perfluorooctanoic acid (PFOA) and Perfluorooctanesulfonic acid (PFOS) Guidance values. Groundwater analytical results were compared to the NYSDEC Technical Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (AWQS) & Guidance Values and Groundwater Effluent Limitations. Elevated concentrations of analytes in soil vapor and ambient are presented.

2023 NYCOER RI Soil Sampling Results

Volatile Organic Compounds

- The chlorinated solvent, Trichloroethylene (TCE), was detected in one shallow sample above the UUSCO and PGSCOs and one sample above the UUSCO, RRUSCO, and PGSCOs.

Semi-Volatile Organic Compounds

- Polycyclic aromatic hydrocarbons (PAHs) (i.e., benzo(a)anthracene [max of 15 mg/kg], benzo(a)pyrene [max of 13.1 mg/kg], benzo(b)fluoranthene [max of 12 mg/kg], benzo(k)fluoranthene [max of 10.9 mg/kg], chrysene [max of 13.9 mg/kg], dibenzo(a,h)anthracene [max of 1.59 mg/kg], indeno(1,2,3-cd)pyrene [max of 8.73 mg/kg] were detected in three (2) shallow samples either above UUSCOs, PGSCOs, and/or RUSCOs. Phenol was detected in one shallow sample above the PGSCO.

Metals

- Metals specifically arsenic (max of 15.3 mg/kg), copper (max of 311 mg/kg), lead, nickel (max of 36.8 mg/kg), mercury (max of 0.193 mg/kg), zinc (max of 1,400 mg/kg), were detected in one to nine (9) soil samples above UUSCOs, but below RRUSCOs or PGSCOs. Barium (max of 513 mg/kg) and cadmium (max of 6.14 mg/kg) were detected above UUSCOs and RRUSCOs in one sample. Lead (max of 6,870 mg/kg) were detected in four samples and manganese (max of 3,260 mg/kg) in one sample above the UUSCOs, RRUSCOs, and PGSCOs.

Polychlorinated biphenyls

- PCBs were detected in one sample above the UUSCO and one sample above the UUSCO, RRUSCO, and PGSCO.

Pesticides

- The pesticides 4,4'-DDT was detected in three samples above the UUSCO, 4,4'-DDE in two samples above the UUSCO, and Dieldrin was detected in one sample above the UUSCO, RRUSCO, and PGSCO in one sample.

Per and Polyfluoroalkyl Substances

- PFAS were either below detection limits of were detected below their respective UUSCOs, RRUSCOs, or PGSCOs. Note that only two shallow soils samples were targeted for analysis during the 2023 Remedial Investigation.

The soil analytical results for the 2023 Remedial Investigation are summarized in **Tables 2A, 3A, 4A, 5A and 6A**. **Figure 7** shows the soil sample locations and spider diagrams summarizing exceedances of UUSCOs, RRUSCOs, and PGSCOs.

2024 NYSDEC RI Soil Sampling Results

Volatile Organic Compounds

- Acetone (max of 0.067 mg/kg), 1,1,1-Trichloroethane (max of 36 mg/kg), cis-1,2-Dichloroethylene (max of 3.8 mg/kg), ethyl benzene, methylene chloride (max of 3.1 mg/kg), n-butylbenzene (max of 21 mg/kg), n-propylbenzene (max of 30 mg/kg), naphthalene (max of 21 mg/kg), sec-butylbenzene (max of 17 mg/kg), toluene, vinyl chloride (max of 0.0810 mg/kg), xylene were detected above UUSCOs and PGSCOs, but below RRUSCOs in some samples.
- Several Chlorinated VOCs, including TCE (max of 57,000 mg/kg) and PCE (max of 120 mg/kg) were detected above UUSCOs, RRUSCOs, and PGSCOs in some samples.
- Petroleum hydrocarbons, specifically xylene (max of 2,700 mg/kg), 1,2,4-trimethylbenzene (max of 410 mg/kg), 1,3,5-Trimethylbenzene (max of 120 mg/kg), ethyl benzene (max of 410 mg/kg), and toluene (max of 1,100 mg/kg), were detected above UUSCOs PGSCOs, and RRUSCOs in some samples.

Semi-Volatile Organic Compounds

- Polycyclic aromatic hydrocarbons (PAHs), specifically benzo(a)anthracene (max of 6.63 mg/kg), benzo(a)pyrene (max of 7.36 mg/kg), benzo(b)fluoranthene (max of 5.7 mg/kg), benzo(k)fluoranthene (max of 6.29 mg/kg), chrysene (max of 6.83 mg/kg), dibenzo(a,h)anthracene (max of 0.88 mg/kg), and indeno(1,2,3-cd)pyrene (max of 4.18 mg/kg), were detected above UUSCOs, PGSCOs, and/or RRUSCOs in the shallow samples.

Metals

- Zinc (max of 1,060 mg/kg) was detected above UUSCOs, but below RRUSCOs and PGSCOs in some samples. Selenium was detected above UUSCOs and PGSCOs, but below RRUSCOs in one sample. Cadmium (max of 5.31 mg/kg) were detected above UUSCOs and RRUSCOs, but below PGSCOs in one sample.
- Arsenic (max of 43.6 mg/kg), barium (max of 1,010 mg/kg), copper (max of 2,620 mg/kg), lead (max of 3,560 mg/kg), and nickel (max of 443 mg/kg) were detected above the UUSCOs, RRUSCOs, and PGSCOs in some samples.

Pesticides and polychlorinated biphenyls

- Pesticides and PCBs were either below their detection limits or detected below their respective UUSCOs, RRUSCOs and PGSCOs

Per- and Polyfluoroalkyl Substances

- PFOS (max of 4.96 micrograms per kilogram [ug/kg]) was detected above UUSCOs in seven soil samples and detected above UUSCOs and PGSCOs in three soil samples.
- PFOA (max of 0.804 ug/kg) was detected in two soil samples above UUSCOs.

DNAPL

- DNAPL was observed in two wells in the central portion of Lot 53. DNAPL was first observed in SB-35 at a depth of 16-18 feet bgs. In consultation with the NYSDEC, several step out borings were advanced to assess the nature and extent of the plume. DNAPL was subsequently observed in SB-35_E (15 -17 feet bgs), SB-35_S (15-18 feet bgs) and SB-35_10W (18-22 feet bgs). The DNAPL seems to be isolated to an interval located approximately 7-9 feet above a clay layer identified in the central and southern portions of Lot 9 and Lot 53.

Additionally, groundwater is impacted by the Chlorinated VOC contaminated soil identified within Lot 9 and Lot 53 and from the suspected source area in the area of SB-35 on Lot 53. The highest concentration of TCE in groundwater was detected in MW-01S (208,000 ug/L), approximately 100 feet downgradient from the suspected source area in the area of SB-35. Petroleum related VOCs were also identified in groundwater samples collected from several wells on Lot 9 and Lot 53 mainly in the intermediate and deep wells.

The soil analytical results for the 2024 NYSDEC RI are summarized in **Tables 2B, 3B, 4B, 5B and 6B**. **Figures 8A to 8D** show the soil sample locations and spider diagrams summarizing exceedances of UUSCOs, RRUSCOs, and PGSCOs.

2023 NYCOER RI Groundwater Sampling Results

Volatile Organic Compounds

- Concentrations of chlorinated VOCs, 1,1,2-Trichloroethane, 1,1-Dichloroethylene, chloroform, cis-1,2-dichloroethylene, PCE, trans-1,2-dichloroethylene, TCE, and vinyl chloride exceeded TOGS 1.1.1 AWQS in groundwater samples. Note, not all chlorinated VOCs exceeded the TOGS 1.1.1 AWQS for each groundwater sample.
- No petroleum-related VOCs exceeded the TOGS 1.1.1 AWQS during this sampling event.

Semi-Volatile Organic Compounds

- Polycyclic aromatic hydrocarbons (PAHs) (i.e., benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene) were detected above TOGS 1.1.1 AWQS in one groundwater samples. Hexachlorobutadiene was also detected above TOGS 1.1.1 AWQS in one groundwater sample.

Metals

- Total metals including copper, lead, magnesium, manganese, mercury, and sodium were detected above the NYSDEC TOGS 1.1.1 AWQS. Dissolved metals including lead, manganese, and sodium were detected above the TOGS 1.1.1 AWQS.

Pesticides

- No pesticides were detected above the TOGS 1.1.1 AWQS from the monitoring wells sampled in the 2023 NYCOER RI.

Polychlorinated Biphenyls

- No PCBs were detected above the TOGS 1.1.1 AWQS from the monitoring wells sampled in the 2023 NYCOER RI.

Per- and Polyfluoroalkyl Substances

- PFAS were not detected above the NYSDEC guidance values from the monitoring wells sampled in the 2023 NYCOER RI.

The groundwater analytical results for the 2023 Remedial Investigation are summarized in **Tables 7A, 8A, 9A, 10A,** and **11A**. **Figure 9** shows the groundwater sample locations and spider diagram summarizing exceedances of NYSDEC TOGS 1.1.1 AWQS.

2024 NYCOER RI Groundwater Sampling Results

Volatile Organic Compounds

- Petroleum-related VOCs including 1,2,4-Trimethylbenzene, benzene, ethylbenzene, isopropylbenzene, methyl tert-butyl ether (MTBE), naphthalene, n-propylbenzene, o-xylene, p-isopropyltoluene, styrene, toluene, and total xylenes were detected in four shallow groundwater wells, three intermediate groundwater wells, and six deep groundwater monitoring wells above the NYSDEC TOGS 1.1.1 AWQS. Note, not all petroleum-related VOCs were detected in every sample above the TOGS 1.1.1 AWQS. The maximum concentrations are as follows: 1,2,4-Trimethylbenzene at 526 micrograms per liter (µg/L) in MW-10S, benzene at 2.92 µg/L in MW-01M, ethylbenzene at 2,260 µg/L in MW-10S, isopropylbenzene at 29.5 µg/L in MW-10S, MTBE at 27.3 µg/L in MW-09S, naphthalene at 92.5 µg/L in MW-10S, n-propylbenzene at 48 µg/L in MW-10S, , o-xylene at 2,850 µg/L in MW-10S, p-isopropyltoluene at 5.6 µg/L in MW-10D, styrene at 90.5 µg/L in MW-10S, toluene at 5,570 in MW-10S, and total xylenes at 9,660 µg/L in MW-10S.

- Chlorinated-related VOCs including 1,1,1-Trichloroethane, 1,1,2,2-trichloroethane, 1,1,2-trichloroethane, 1,1-dichloroethane, 1,1-dichloroethylene, 1,2,3-trichlorpropane, 1,2-dichloroethane, chloroform, cis-1,2-dichloroethylene, methylene chloride, PCE, trans-1,2-dichloroethylene, TCE, and vinyl chloride were detected in all collected groundwater samples above the NYSDEC TOGS 1.1.1 AWQS. Note, not all chlorinated-related VOCs were detected in every sample above the TOGS 1.1.1 AWQS. The maximum concentrations are as follows: 1,1,1-Trichloroethane at 134 µg/L in MW-10S, 1,1,2,2-trichloroethane at 9.01 in MW-11S, 1,1,2-trichloroethane at 60.5 µg/L in MW-07M, 1,1-dichloroethane at 16.5 µg/L MW-06D, 1,1-dichloroethylene at 106 µg/L in MW-06D, 1,2,3-trichlorpropane at 2.9 µg/L in MW-07M, 1,2-dichloroethane at 8.3 in MW-01M, chloroform at 36.5 µg/L, cis-1,2-dichloroethylene at 48,000 in MW-06D, methylene chloride at 37 µg/L in MW-10S, PCE at 532 µg/L in MW-10S, trans-1,2-dichloroethylene at 179 µg/L in MW-06D, TCE at 208,000 µg/L in MW-01D, and vinyl chloride at 385 µg/L in MW-06D.

Semi-Volatile Organic Compounds

- The PAHs, Benzo(b)fluoranthene and chrysene, were detected in one shallow groundwater monitoring well above the TOGS 1.1.1 AWQS
- 1,4-Dioxane was detected in six shallow groundwater monitoring wells (max of 4.69 µg/L) and five intermediate groundwater monitoring wells (max of 39.5 µg/L) above the TOGS 1.1.1 AWQS.
- Phenol was detected in one shallow groundwater monitoring well above the TOGS 1.1.1 AWQS.
- Naphthalene was detected in one shallow groundwater monitoring well above the TOGS 1.1.1 AWQS.

Metals

- Total Chromium was detected in one shallow and one intermediate groundwater monitoring well, and dissolved Chromium was detected in one shallow groundwater monitoring well above the TOGS 1.1.1 AWQS.
- Total copper was detected in one intermediate groundwater monitoring well above the TOGS 1.1.1 AWQS.

- Total Lead was detected in seven shallow groundwater monitoring wells (max of 5,310 µg/L) and one intermediate groundwater monitoring well above the TOGS 1.1.1 AQWS.
- Total Magnesium was detected in two shallow (max of 86,700 µg/L) and five intermediate (max of 165,000 µg/L) groundwater monitoring wells, and dissolved Magnesium was detected in one shallow and five intermediate (max of 128,000 µg/L) groundwater monitoring wells above the TOGS 1.1.1 AWQS.
- Total Manganese was detected in all shallow (max of 6,210 µg/L) and all intermediate (max of 11,400 µg/L) groundwater monitoring wells, and dissolved Manganese was detected in seven shallow (max of 3,150 µg/L) and all intermediate (max of 11,500 µg/L) groundwater monitoring wells above the TOGS 1.1.1 AWQS.
- Total Nickel was detected in two shallow (max of 282 µg/L) and one intermediate groundwater monitoring well above the TOGS 1.1.1 AWQS.
- Total Sodium was detected in nine shallow (max of 179,000 µg/L) and all intermediate (max of 160,000 µg/L) groundwater monitoring wells, and dissolved Sodium was detected in nine shallow (max of 220,000 µg/L) and all intermediate (max of 178,000 µg/L) groundwater monitoring wells above the TOGS 1.1.1 AWQS.
- Total and dissolved Zinc was detected in one shallow and one intermediate groundwater monitoring well above the TOGS 1.1.1 AWQS
- Total Cadmium was detected in one shallow and two intermediate (max of 19 µg/L) groundwater monitoring wells, and dissolved Cadmium was detected in one shallow and one intermediate groundwater monitoring well above the TOGS 1.1.1 AWQS.
- Total Selenium was detected in three shallow (max of 98.3 µg/L) and one intermediate groundwater monitoring well, and dissolved selenium was detected in three shallow (max of 111 µg/L) and three intermediate (max of 34 µg/L) groundwater monitoring wells above the TOGS 1.1.1 AWQS.
- Total Mercury was detected in one shallow and one intermediate groundwater monitoring well above the TOGS 1.1.1 AWQS

Pesticides

- No pesticides were detected above the TOGS 1.1.1 AWQS from the monitoring wells sampled in the 2024 RI.

Herbicides

- No herbicides were detected above the TOGS 1.1.1 AWQS from the monitoring wells sampled in the 2024 RI.

Polychlorinated Biphenyls

- No PCBs were detected above the TOGS 1.1.1 AWQS from the monitoring wells sampled in the 2024 RI.

Perfluoroalkyl Substances

- PFOS was detected in seven shallow groundwater monitoring wells (max of 124 nanograms per liter (ng/L)) and six intermediate groundwater monitoring wells (max of 447 ng/L) in concentrations greater than the NYSDEC Part 375 Remedial Program for PFAS.
- PFOA was detected in eight shallow groundwater monitoring wells (max of 624 ng/L) and eight intermediate groundwater monitoring wells (max of 543 ng/L) in concentrations greater than the NYSDEC Part 375 Remedial Program for PFAS.
- Perfluoroheptanoic acid (PFHpA) was detected in one intermediate groundwater monitoring well in a concentration greater than the NYSDEC Part 375 Remedial Program for PFAS.

- Perfluorohexanesulfonic acid (PFHxs) was detected in one shallow and one intermediate monitoring well in concentrations greater than the NYSDEC Part 375 Remedial Program for PFAS.

The groundwater analytical results for the 2024 Remedial Investigation are summarized in **Tables 7B, 8B, 9B, 10B, and 11B**. **Figures 10A and 10B** show the groundwater sample locations and spider diagrams summarizing exceedances of NYSDEC TOGS 1.1.1 AWQS.

2023 NYCOER RI Soil Vapor and Ambient Air Analytical Results

Soil Vapor – Volatile Organic Compounds

- PCE (max of 430 µg/m^3) was detected at elevated concentrations in five soil vapor samples.
- TCE (max of 740,000 µg/m^3) was detected at elevated concentrations in each of the nine soil vapor samples.
- 1,1,1 TCA (max of 200 µg/m^3) was detected at elevated concentrations in one soil vapor samples.
- Carbon tetrachloride (max of 9,200 µg/m^3) was detected at elevated concentrations in two soil vapor samples.

Outdoor / Ambient Air – Volatile Organic Compounds

- VOCs were either not detected or detected at low level concentrations in the two outdoor air samples.

See **Table 12A** and **Figure 11** for the 2023 NYCOER RI vapor and outdoor air concentrations.

2024 NYSDEC RI Soil Vapor and Ambient Air Analytical Results

Soil Vapor – Volatile Organic Compounds

- PCE (max of 55,000 µg/m^3) was detected at elevated concentrations in six soil vapor samples.
- TCE (max of 3,900,000 µg/m^3) was detected at elevated concentrations in each of the 14 soil vapor samples.
- 1,1,1 TCA (max of 3,600 µg/m^3) was detected at elevated concentrations in 10 soil vapor samples.
- 1,1-DCE (max of 45 µg/m^3), was detected at elevated concentration in one soil vapor sample.
- Cis-1,1-DCE (max of 1,300 µg/m^3) was detected at elevated concentrations in seven soil vapor samples.
- Carbon tetrachloride (max of 900 µg/m^3) was detected at elevated concentrations in seven soil vapor samples.
- Benzene (max of 230 µg/m^3), cyclohexane (max of 160 µg/m^3), n-heptane (max of 810 µg/m^3), and n-hexane (max of 1,600 µg/m^3) were detected at elevated concentration in one soil vapor sample.

Indoor Air and Ambient Air – Volatile Organic Compounds

- 1,2,4-Trimethylbenzene (max of 2.0 µg/m^3), cyclohexane (max of 3.30 µg/m^3), naphthalene (max of 6.0 µg/m^3), n-heptane (max of 13.0 µg/m^3), o-xylene (max of 2.2 µg/m^3), PCE (max of 3.1 µg/m^3), and toluene (max of 10 µg/m^3), were detected at an elevated concentrations in one outdoor air sample. Benzene (max of 2.5 µg/m^3) was detected at an elevated concentrations in one indoor air sample.
- Carbon tetrachloride was detected at elevated concentrations in all the indoor air samples (max of 0.54 µg/m^3) and all the outdoor air samples (max of 1.1 µg/m^3).
- TCE was detected at elevated concentrations at all the indoor air samples (max of 3.10 µg/m^3) and all outdoor air samples (max of 4.20 µg/m^3).

The 2024 NYSDEC RI soil vapor results are summarized in **Table 12B**. The indoor air, and ambient air analytical results are summarized in **Table 13**. **Figure 12** shows the sample locations and spider diagrams summarizing the results.

QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT

Based on the conceptual site model and the review of the environmental data, complete on-site exposure pathways appear to be present in current, construction phase, and future conditions. The QHHEA identified soil, groundwater and soil vapor as the primary impacted media and Constituents of Potential Concern (COPCs).

The complete exposure pathways indicate there is a risk of exposure to humans from site Contaminants via exposure to soil, groundwater, and soil vapor if appropriate measures, including institutional and engineering controls as necessary, are not implemented. A qualitative human health exposure assessment was performed to evaluate the exposure pathways, and the following conclusions were developed.

1. Under current conditions human exposure to contaminants is limited due to the surface cover, and access is limited to workers and authorized guests. The primary exposure pathways are dermal contact, ingestion, and inhalation of soil. The exposure risks can be avoided or minimized by following the appropriate Construction Health and Safety Plan (CHASP) and vapor and dust suppression measures, and by implementing a Community Air Monitoring Plan (CAMP) during activities.

2. A complete exposure pathway is possible for the migration of Site contaminants to offsite human receptors during the remedial construction phase. During this phase, Site access will be limited to authorized visitors and workers and protective measures will be used during construction to prevent completion of this pathway, including following Site-specific HASP and implementation of a CAMP and SMMP. A perimeter SVE system will be installed during the remedial construction phase to prevent off-Site migration of contamination in soil vapor.

3. The existence of a complete exposure pathway for site contaminants to human receptors under future conditions is unlikely, as contaminant sources will be removed during implementation of an Interim Remedial Measure (IRM) and residual soil will be underneath a composite cover. Regional groundwater is not used as a potable water source in New York City, exposure to groundwater contaminants is also unlikely by human receptors. The potential pathway for soil vapor intrusion into the buildings will be addressed through the construction of an engineered composite cover and the use of soil vapor mitigation measures (e.g., soil vapor extraction (SVE), sub-slab depressurization system (SSDS)), thereby minimizing the risk of exposure to soil vapor.

4. It is unlikely that a complete exposure pathway exists for the migration of site contaminants to off-site human receptors for current or future conditions. Under future conditions, the site will be remediated to prevent completion of this pathway.

FISH AND WILDLIFE ASSESSMENT (FWIA)

The Fish and Wildlife Impact Analysis (FWIA) is unnecessary for the Site. A search of the United States Fish and Wildlife Service Information for Planning and Consultation indicates that there are no critical habitats within the Site boundary. The Site is located in an area predominantly composed of residential, commercial, and industrial buildings, with minimal ecological habitat. Additionally, the majority of soils on the Site will be covered, thereby

reducing the potential for ecological impact. Therefore, the potential for Site-related COC to mitigate to fish and wildlife resources, if present, is considered minimal.

SUMMARY OF REMEDY

The Selected Track 4 Restricted Residential remedy will include the following elements:

1. Green remediation components are as follows:

   - Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
   - Reducing direct and indirect greenhouse gas and other emissions;
   - Increasing energy efficiency and minimizing use of non-renewable energy;
   - Conserving and efficiently managing resources and materials;
   - Reducing waste, increasing recycling, and increasing reuse of materials that would otherwise be considered a waste;
   - Fostering green and healthy communities and working landscapes that balance ecological, economic, and social goals; and
   - Integrating the remedy with the end-use where possible and encouraging green and sustainable re-development.
   - Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this site, any future on-site buildings shall be constructed, at a minimum, to meet the 2020 Energy Conservation Construction Code of New York (or most recent edition) to improve energy efficiency as an element of construction.

   As part of the remedial program, to evaluate the remedial alternatives with respect to green and sustainable remediation principles, a *SiteWise™* environmental footprint analysis has been completed. Water consumption, greenhouse gas emissions, renewable and non-renewable energy use, waste reduction and material use for the proposed remedy have been estimated, and goals for the project related to these green and sustainable remediation metrics, as well as for minimizing community impacts, protecting habitats and natural and cultural resources, and promoting environmental justice, will be incorporated into the remedial program, as appropriate. The project will include detailed requirements to achieve the green and sustainable remediation goals. Further, progress with respect to green and sustainable remediation metrics that have been established by the *SiteWise™* model will be tracked during implementation of the remedial action and reported in the FER, including a comparison to the goals established during the remedial program.

   Additionally, the remedial program will include a climate change vulnerability assessment, to evaluate the impact of climate change on the project site and the proposed remedy. Potential vulnerabilities associated with extreme weather events (e.g., hurricanes, lightning, heat stress and drought), flooding, and sea level rise will be identified, and the remedial program will incorporate measures to minimize the impact of climate change on potential identified vulnerabilities.

2. Development and implementation of a Construction Health and Safety Plan (CHASP) and Community Air Monitoring Plan (CAMP) for the protection of on-site workers, community/residents, and the environmental during remediation and construction activities.

3. Implementation of soil erosion, pollution, and sediment control measures in compliance with applicable laws and regulations.

4. Excavation, stockpiling, off-site transport, and disposal of the following:

a. 0-4 feet bgs minimum across the entire Site (approximately 2,962 cubic yards)
b. Excavation of DNAPL source area to the extent practicable and floor drain system to groundwater at approximately 8 feet bgs. (approximately 120 cubic yards).
c. Removal of additional soil that exceeds Track 4 SCOs (RRUSCOs and PGSCOs) as needed to shallow groundwater via hot spot excavation to groundwater (approximately 8 cubic yards additional excavation at 19 Clay Street). The Track 4 SCOs are included in **Appendix P**.
d. Excavation for the elevator pit to approximately 8 ft bgs.

5. Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work.

6. Collection and analysis of documentation and confirmation soil samples to document soil quality remaining after the remedial excavation is complete. Confirmation samples will be collected to confirm contaminants of concern exceeding the Protection of Groundwater SCOs have been excavated. If concentrations of contaminants of concern exceed the Protection of Groundwater SCOs, additional excavation or remediation may be required.

7. Continue the groundwater monitoring program for up to one year after the Interim Remedial Measures (IRM) to evaluate the remedy and the need for supplemental injections at the Site. The determination for additional injections will be made in conjunction with the NYSDEC and prior to building occupancy.

8. Removal and decommissioning of any encountered USTs and/or associated appurtenances (e.g., fill lines, vent line, and electrical conduit) and disposal off-site, in accordance with DER-10, 6 New York Codes, Rules, and Regulations (NYCRR) Part 613.9, NYSDEC Commissioner Policy 51 (CP-51), and other applicable NYSDEC UST closure requirements.

9. Appropriate off-Site disposal of all material removed from the Site in accordance with all Federal, State, and local rules and regulations for handling, transport, and disposal.

10. Import of materials to be used for backfill and cover in compliance with: (1) chemical limits and other specifications included in **Table 16**, (2) all Federal, State, and local rules and regulations for handling and transport of material.

11. Installation of an engineered composite cover system, consisting of the following to prevent human exposure to residual contaminated soil/fill remaining under the Site:
    a. A permanent composite cover system consisting of a 33-inch concrete building slab
    b. It is anticipated the Site will be covered completely by concrete, no impervious surfaces.

12. Installation of a vapor barrier beneath the slab.

13. Conversion of the temporary Soil Vapor Extraction (SVE) system installed as part of the IRM to a permanent structure housed within the building. Details of the IRM are included in Section 2.7.

14. Construction of an active SSDS below the building slab to maintain vacuum under the building slab, including a 12-inch ventilation layer.

15. Completion of a survey to document the extents of the permanent and temporary components of the Site cover system.

16. Recording of an Environmental Easement, including Institutional Controls, to prevent future exposure to any residual contamination remaining at the Site.

17. Publication of a Site Management Plan for long term management of residual contamination as required by the Environmental Easement, including plans for: (1) Institutional and Engineering Controls, (2) monitoring, (3) operation and maintenance and (4) reporting.

18. All responsibilities associated with the Remedial Action, including permitting requirements and pretreatment requirements, will be addressed in accordance with all applicable Federal, State, and local rules and regulations.

REMEDIAL ACTION WORK PLAN

1.0 INTRODUCTION

This Remedial Action Work Plan (RAWP) was prepared on behalf of Clay Properties LLC (the volunteer) for the property located at 19-29 Clay Street and 60-62 Commercial Street, Block 2482, Lots 9, 10, and 53, Brooklyn, New York (the Site). The Site was accepted into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP). Two Brownfield Cleanup Agreements (BCAs) were executed on July 16, 2024, for two adjoining sites – C224390 and C224408. The two applications were amended and merged under one BCA now referred to as C224390, memorialized in a revised BCA on November 14, 2024.

This RAWP summarizes the nature and extent of contamination as determined from data gathered during a Remedial Investigation (RI) completed by Goldberg-Zoino Associates of New York P.C. d/b/a GZA GeoEnvironmental of New York (GZA) in 2024. The RI is documented in a Remedial Investigation Report (RIR) dated November 2024.

The selected remedy is consistent with the procedures defined in the NYSDEC Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation (DER-10) and complies with applicable environmental standards, criteria, and guidance, and conforms to applicable laws and regulations.

1.1 SITE LOCATION AND DESCRIPTION

The Site is located at 19-27 and 29 Clay Street and 60-62 Commercial Street in Kings County, Brooklyn New York and is identified as Block 2482, Lots 9, 10 and 53 on the New York City Tax Map. A United States Geological Survey (USGS) topographical quadrangle Map is attached as **Figure 1**. A Site location with the Property boundary is attached as **Figure 2**.

The surrounding properties were assessed during previous Phase I Environmental Site Assessments and during subsequent investigation events. At the present time, the surrounding properties remain a mix of residential and industrial/manufacturing land uses. The Site is bound to the north (across Commercial Street) by an asphalt-paved storage yard for equipment and vehicles by the New York City Transit Authority (NYCTA); to the east by a 1-story warehouse and a new 7-story residential building (NYSDEC BCP Site No. C224153); to the south (across Clay Street) by the Former NuHart Plastics Site (NYSDEC BCP Site No. C224287); and to the west by a mixed-use development currently under construction (NYSDEC BCP Site No. C244278). A figure showing the vicinity property land use with a 500-ft buffer around the Site is included as **Figure 3**.

A boundary map is attached to the BCA as required by Environmental Conservation Law (ECL) Title 14 Section 27-1419. The .45-acre property is fully described in **Appendix A – Metes and Bounds**. A global positioning system coordinate for the starting point is included.

1.2 CONTEMPLATED REDEVELOPMENT PLAN

The Remedial Action to be performed under the RAWP is intended to make the Site protective of human health and the environment consistent with the contemplated end use. The proposed redevelopment plan and end use is described here to provide the basis for this assessment. However, the Remedial Action contemplated under this RAWP may be implemented independent of the proposed redevelopment plan.

The project is a mixed-use development with a single 7-story new building. The project will have ground floor commercial use and residential lobby with residential above. The ground floor commercial use will have entrances on both Clay Street and Commercial Street. The residential lobby will be on Clay Street only. The development will include residential dwelling units from the 2nd to 7th floors, and terraces on the 2nd and 6th floor. The development plan does not include a cellar or a basement. The buildings utility rooms will be located on the ground floor facing Clay Street.

The development plans are included in **Appendix B**.

1.3 DESCRIPTION OF SURROUNDING PROPERTY

The area surrounding the Site consists of a mix of residential and commercial properties, parkland, and asphalt parking lots. An evaluation of the United States Geological Survey (USGS) 7-½ Minute Topographic Map containing the property indicated there are three sensitive receptors present within a 0.125-mile radius of the Subject Property. The three sensitive receptors are:

1. Greenpoint Playground,
2. Newtown Barge Playground,
3. Greenpoint Landing Esplanade.

The site to the west, 50 Commercial St is currently in the BCP C224278 and undergoing remediation. The NuHart Superfund/BCP site is located across the street on the Clay Street side of the Site and is also undergoing remediation under C224287.

2.0 DESCRIPTION OF REMEDIAL INVESTIGATION FINDINGS

The Site was investigated in accordance with the scope of work presented in the NYSDEC-approved Remedial Investigation (RI) Work Plan dated July 2024. The investigation was conducted between August 5, 2024 and September 10, 2024. The RI was submitted to NYSDEC on October 4, 2024. GZA received comments on the RI and will install additional soil borings prior to its finalization.

2.1 SUMMARY REMEDIAL INVESTIGATIONS PERFORMED

The 2024 NYSDEC BCP RI and 2023 NYCOER RI are summarized in the following sections and included the following activities:

- Conducted a geophysical survey to scan for subsurface anomalies that may be indicative of unidentified underground storage tanks (USTs) and utilities in the vicinity of the proposed boring locations;
- 2023 RI - Advanced 10 soil borings to depths ranging from 5 to 10 feet below ground surface (ft bgs) across the Site for the collection of 20 soil samples;
- 2024 RI - Advanced 31 soil borings to depths ranging from 5 to 45 feet below ground surface (ft bgs) across the Site for the collection of Collected 100 discrete samples, 42 composite samples and additional Quality Assurance/Quality Control (QA/QC) samples for laboratory analyses;
- Excavated one shallow test pit using hand tools to investigate the existing trench on 29 Clay Street;
- 2024 RI - Installed 11 permanent monitoring well clusters. Each cluster is comprised of two or three, 1- or 2-inch diameter monitoring wells to varying depths: shallow, intermediate, and deep;

- 2024 RI - Conducted an elevation survey of the permanent monitoring wells to develop a groundwater contour map.
- 2024 RI - Collected 19 groundwater samples from the shallow and intermediate wells, 11 groundwater samples from the deep wells, and additional QA/QC samples for laboratory analyses;
- 2023 RI – Installation and sample collection from 9 soil vapor points;
- 2024 RI - Installation of 12 soil vapor points down to four (4) ft bgs;
- 2024 RI - Collected 12 soil vapor samples and additional QA/QC samples for laboratory analyses;
- 2024 RI - Collected four ambient air samples (indoor and outdoor);
- Managed investigation derived waste (IDW) during RI activities.
- Performed community air monitoring during RI activities in accordance with CAMP and added additional CAMP as needed and requested by NYSDEC.
-

2.1.1 Borings and Wells

To characterize site soils during the 2024 RI, thirty-one (31) soil borings were drilled across the Site. Depths of soil borings varied between 5 and 45 feet below ground surface. Soil borings were drilled prior to installation of monitoring wells to develop a conceptual site model of subsurface lithology, in order to determine depths of well screens.

In total, monitoring wells were drilled in 11 locations (denoted as MW-01 to MW-11) and various depth intervals. Depth intervals are denoted with an ‘S’ (shallow), ‘M’ (intermediate), or ‘D’ (Deep). All well locations contained a shallow, intermediate, and deep well except for MW-06 which only contained a shallow and deep well.

If elevated PID readings, heavy odors, or staining were encountered above the upper clay layer, then borings and wells drilled deeper than the clay layer were installed through permanent steel casing as to not create a preferential pathway for contamination to move to the deeper strata.

2.1.2 Samples Collected

During the 2024 investigation the following samples were collected:

1. 100 discrete soil samples were analyzed for VOCs and 42 composite soil samples were collected for full suite analysis;
2. 19 groundwater samples from the shallow and intermediate wells, 11 groundwater samples from the deep wells, and additional QA/QC samples for laboratory analyses;
3. 12 soil vapor samples and additional QA/QC samples for laboratory analyses; four ambient air samples (indoor and outdoor);

During the 2023 investigation the following samples were collected:

1. Twenty (20) soil samples were analyzed for full suite analysis;
2. Five (5) groundwater samples;
3. Nine (9) vapor samples.

The evaluation from the sample collection is summarized below.

2.1.3 Chemical Analytical Work Performed

Soil Laboratory Analyses

Soil samples were containerized and analyzed at a New York State Department of Health ELAP-certified laboratory, York Analytical Laboratories of Richmond Hill, NY (York). The soil samples were analyzed for the following:

- Target compound list (TCL) VOCs (includes 1,4 Dioxane) by EPA Method 8260C (rev. 2006);
- TCL Semi-Volatile Organic Compounds (SVOCs) by EPA Method 8270D (rev. 2007);
- Target Analyte List (TAL) Metals by EPA Method 6010C (rev. 2007) including Hexavalent Chromium and Total Cyanide;
- Polychlorinated biphenyls (PCBs) by EPA Method 8082A (rev. 2007);
- Pesticides by EPA Method 8081B (rev. 2000);
- Herbicides by EPA Method 8151A (rev. 2000); and
- Per- and Polyfluoroalkyl substances (PFAS) by EPA Method 1633 (2023).

Completed sample labels were affixed to the side of the laboratory provided sample bottles. Once the sample bottles were filled, they were immediately placed in the cooler with ice to maintain the samples at or below 4ºC and transported, via courier to York, under proper chain-of-custody procedures for analysis.

Groundwater Laboratory Analyses

Sampling equipment and procedures for PFAS sample collection generally followed EPA Method 1633 PFAS Field Sampling Guidelines. Groundwater samples were stored at or below 4°C and transported under proper chain of custody procedures to York to be analyzed for the following:

- TCL VOCs by EPA Method 8260C (rev. 2006);
- TCL SVOCs by EPA Method 8270D (rev. 2007);
- Total and dissolved TAL Metals by EPA Method 6010C/6020/7470 (rev. 2007);
- Cyanide by EPA Method 9010/9012B (rev. 2004);
- Mercury by EPA Method 7471B (rev. 2007);
- Pesticides by EPA Method 8081B (rev. 2000);
- PCBs by EPA Method 8082A (rev. 2000);
- 1,4-Dioxane by EPA Method SW 846 8260 (isotope dilution for 1-4 Dioxane); and
- PFAS by EPA Method 1633 (2023).

Soil Vapor, Indoor and Outdoor Air Laboratory Analyses

The air samples were collected with a laboratory-supplied 6-liter Summa canister equipped with an 8-hour flow regulator calibrated for less than 0.2 liters per minute. Following completion of the purging and the helium tracer test, dedicated polyethylene/HDPE tubing was used to connect the probe to a laboratory-supplied 6-liter Summa canister for sampling. Summa canisters were transported via courier to York and the samples were analyzed for TCL VOCs by EPA Method TO-15.

2.1.4 Geophysical Work, trench exploration

On August 6, 2024, GZA subcontracted with Coastal Environmental Solutions Inc. of Holbrook, NY (Coastal), and mobilized to the Site to perform a geophysical survey of the boring locations detailed in the 2024 RIWP, and utilized an Impulse Radar PinPointR Ultra-Wide Band (UWB) Ground Penetrating Radar (GPR) system mounted to a stroller frame that rolls over surface, a Proceq GP8000 portable concrete scanner, Vivax – Metrotech vLoc3 -Pro Receiver/Transmitter electromagnetic (EM) utility locator, and TW-6 Pipe and Cable locator. The geophysical survey showed a series of former floor drains and sanitary lines that were marked near the investigation boring locations, as well as remnants of former electrical utilities. The RI boring locations were adjusted to avoid the detected anomalies. The geophysical survey report is included in the RIR.

GZA excavated one shallow test pit using hand tools at an existing trench within Lot 53. One soil sample was collected from the trench (29 CLAY-TRENCH 1). This shallow test pit was excavated to investigate the trench that transects Lot 53 in the area of identified subsurface contamination (DNAPL and heavy odors).

2.1.5 Best Management Practices

Best Management Practices (BMPs) were implemented at the Site to reduce the environmental footprint of the RI. Methods includes:

- Reducing total energy use;
- Reduce air pollutants and greenhouse gas emissions;
- Reduce water use, preserve water quality;
- Conserve material resources;
- Reduce waste; and
- Protect land and ecosystem services.

Real-time data collecting technologies utilized during the RI were minimally invasive, protecting the local ecosystem and ecosystem services. The BMP implemented under that principle is part of the Site's Community Air Monitoring Plan (CAMP). The Site had portable Photo-Ionization Detectors (PIDs) and portable dust-monitors that protected the workers on-site and the surrounding community, while remaining minimally invasive on-site.

Reducing the amount of time and distance for transporting materials to and from the Site will reduce fuel consumption and associated air emissions. The BMPs implemented under this principle are:

- Ensuring any heavy diesel trucks transporting materials had a Clean Idle Certification Label;
- Ensuring proper scheduling so that trucks did not need to idle longer than necessary to load or unload the material and minimize multiple mobilization/demobilizations from the Site;
- Reuse of clean, recyclable materials reduces consumption of non-renewable virgin resources and can provide energy savings and greenhouse gas reduction since these materials can be locally-derived, thus reducing transportation and processing emissions; and
- Whenever possible, meetings were held using remote communication technologies, such as videoconferencing and teleconferencing to reduce energy consumption and traffic congestion associated with personal transportation.

2.1.6 Documentation

The following sections detail the contamination conditions that exist at the Site in soil, groundwater, and soil vapor based on RI findings. The RI Sampling Summary is presented in **Table 1**. Summaries below combine the RI completed for 2023 NYCOER RI and the 2024 NYSDEC RI.

Soil

Soil results were compared to the NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives (SCOs), Restricted Residential Use SCOs, and Protection of Groundwater SCOs (PGSCOs). Emerging contaminant results were compared to the guidance values established in the NYSDEC Guidance Document for Part 375 Remedial Programs. Tables comparing the soil sampling results to the applicable NYSDEC Part 375 Soil Cleanup Objectives are presented in **Tables 2 through 6**.

Volatile Organic Compounds

2023 NYCOER RI VOC Soil Sampling Results

- The chlorinated solvent, Trichloroethylene (TCE), was detected in one shallow sample above the UUSCO and PGSCOs and one sample above the UUSCO, RRUSCO, and PGSCOs.

2024 NYSDEC RI VOC Soil Sampling Results

- Acetone (max of 0.067 mg/kg), 1,1,1-Trichloroethane (max of 36 mg/kg), cis-1,2-Dichloroethylene (max of 3.8 mg/kg), ethyl benzene, methylene chloride (max of 3.1 mg/kg), n-butylbenzene (max of 21 mg/kg), n-propylbenzene (max of 30 mg/kg), naphthalene (max of 21 mg/kg), sec-butylbenzene (max of 17 mg/kg), toluene, vinyl chloride (max of 0.0810 mg/kg), xylene were detected above UUSCOs and PGSCOs, but below RRUSCOs in some samples.
- Several Chlorinated VOCs, including TCE (max of 57,000 mg/kg) and PCE (max of 120 mg/kg) were detected above UUSCOs, RRUSCOs, and PGSCOs in some samples.
- Petroleum hydrocarbons, specifically xylene (max of 2,700 mg/kg), 1,2,4-trimethylbenzene (max of 410 mg/kg), 1,3,5-Trimethylbenzene (max of 120 mg/kg), ethyl benzene (max of 410 mg/kg), and toluene (max of 1,100 mg/kg), were detected above UUSCOs PGSCOs, and RRUSCOs in some samples.

Semi-Volatile Organic Compounds

2023 NYCOER RI SVOC Soil Sampling Results

- Polycyclic aromatic hydrocarbons (PAHs) (i.e., benzo(a)anthracene [max of 15 mg/kg], benzo(a)pyrene [max of 13.1 mg/kg], benzo(b)fluoranthene [max of 12 mg/kg], benzo(k)fluoranthene [max of 10.9 mg/kg], chrysene [max of 13.9 mg/kg], dibenzo(a,h)anthracene [max of 1.59 mg/kg], indeno(1,2,3-cd)pyrene [max of 8.73 mg/kg] were detected in three (2) shallow samples either above UUSCOs, PGSCOs, and/or RUSCOs. Phenol was detected in one shallow sample above the PGSCO.

2024 NYSDEC RI SVOC Soil Sampling Results

- Polycyclic aromatic hydrocarbons (PAHs), specifically benzo(a)anthracene (max of 6.63 mg/kg), benzo(a)pyrene (max of 7.36 mg/kg), benzo(b)fluoranthene (max of 5.7 mg/kg), benzo(k)fluoranthene (max of 6.29 mg/kg), chrysene (max of 6.83 mg/kg), dibenzo(a,h)anthracene (max of 0.88 mg/kg), and indeno(1,2,3-cd)pyrene (max of 4.18 mg/kg), were detected above UUSCOs, PGSCOs, and/or RRUSCOs in the shallow samples.

Pesticides

2023 NYCOER RI Pesticide Soil Sampling Results

- The pesticides 4,4'-DDT was detected in three samples above the UUSCO, 4,4'-DDE in two samples above the UUSCO, and Dieldrin was detected in one sample above the UUSCO, RRUSCO, and PGSCO in one sample.

2024 NYSDEC RI Soil Sampling Results

- Pesticides were below their detection limit and their respective SCOS.

Polychlorinated Biphenyls

2023 NYCOER RI Soil Sampling Results

- PCBs were detected in one sample above the UUSCO and one sample above the UUSCO, RRUSCO, and PGSCO

2024 NYSDEC RI Soil Sampling Results

- Pesticides were below their detection limit and their respective SCOS.

Metals

2023 NYCOER RI Soil Sampling Results

- Metals specifically arsenic (max of 15.3 mg/kg), copper (max of 311 mg/kg), lead, nickel (max of 36.8 mg/kg), mercury (max of 0.193 mg/kg), zinc (max of 1,400 mg/kg), were detected in one to nine (9) soil samples above UUSCOs, but below RRUSCOs or PGSCOs. Barium (max of 513 mg/kg) and cadmium (max of 6.14 mg/kg) were detected above UUSCOs and RRUSCOs in one sample. Lead (max of 6,870 mg/kg) were detected in four samples and manganese (max of 3,260 mg/kg) in one sample above the UUSCOs, RRUSCOs, and PGSCOs.

2024 NYSDEC RI Soil Sampling Results

- Zinc (max of 1,060 mg/kg) was detected above UUSCOs, but below RRUSCOs and PGSCOs in some samples. Selenium was detected above UUSCOs and PGSCOs, but below RRUSCOs in one sample. Cadmium (max of 5.31 mg/kg) were detected above UUSCOs and RRUSCOs, but below PGSCOs in one sample.
- Arsenic (max of 43.6 mg/kg), barium (max of 1,010 mg/kg), copper (max of 2,620 mg/kg), lead (max of 3,560 mg/kg), and nickel (max of 443 mg/kg) were detected above the UUSCOs, RRUSCOs, and PGSCOs in some samples.

Per- and Polyfluoroalkyl Substance

2023 NYCOER RI Soil Sampling Results

- PFAS were either below detection limits of were detected below their respective UUSCOs, RRUSCOs, or PGSCOs. Note that only two shallow soils samples were targeted for analysis during the 2023 Remedial Investigation.

2024 NYSDEC RI Soil Sampling Results

- PFOS (max of 4.96 micrograms per kilogram [ug/kg]) was detected above UUSCOs in seven soil samples and detected above UUSCOs and PGSCOs in three soil samples.
- PFOA (max of 0.804 ug/kg) was detected in two soil samples above UUSCOs.

Chlorinated Solvent Delineation

- DNAPL was observed in two wells in the central portion of Lot 53. DNAPL was first observed in SB-35 at a depth of 16-18 feet bgs. In consultation with the NYSDEC, several step out borings were advanced to assess the nature and extent of the plume. DNAPL was subsequently observed in SB-35_E (15 -17 feet bgs), SB-35_S (15-18 feet bgs) and SB-35_10W (18-22 feet bgs). The DNAPL seems to be isolated to an interval located approximately 7-9 feet above a clay layer identified in the central and southern portions of Lot 9 and Lot 53.
- Additionally, groundwater is impacted by the Chlorinated VOC contaminated soil identified within Lot 9 and Lot 53 and from the suspected source area in the area of SB-35 on Lot 53. The highest concentration of TCE in groundwater was detected in MW-01S (208,000 ug/L), approximately 100 feet downgradient from the suspected source area in the area of SB-35. Petroleum related VOCs were also identified in groundwater samples collected from several wells on Lot 9 and Lot 53 mainly in the intermediate and deep wells.

Groundwater

Groundwater results were compared to the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS 1.1.1) Ambient Water Quality Standards (AWQS) and the Guidance Values published in "Sampling, Analysis and Assessment of PFAS under NYSDEC's Part 375 Remedial Programs".

Volatile Organic Compounds

2023 NYCOER Remedial Investigation

- Concentrations of chlorinated VOCs, 1,1,2-Trichloroethane, 1,1-Dichloroethylene, chloroform, cis-1,2-dichloroethylene, PCE, trans-1,2-dichloroethylene, TCE, and vinyl chloride exceeded TOGS 1.1.1 AWQS in groundwater samples. Note, not all chlorinated VOCs exceeded the TOGS 1.1.1 AWQS for each groundwater sample.
- No petroleum related VOCs exceeded the TOGS 1.1.1 AWQS during this sampling event.

2024 NYSDEC Remedial Investigation

- Petroleum-related VOCs including 1,2,4-Trimethylbenzene, benzene, ethylbenzene, isopropylbenzene, methyl tert-butyl ether (MTBE), naphthalene, n-propylbenzene, o-xylene, p-isopropyltoluene, styrene, toluene, and total xylenes were detected in four shallow groundwater wells, three intermediate groundwater wells, and six deep groundwater monitoring wells above the NYSDEC TOGS 1.1.1 AWQS. Note, not all petroleum-related VOCs were detected in every sample above the TOGS 1.1.1 AWQS. The maximum concentrations are as follows: 1,2,4-Trimethylbenzene at 526 micrograms per liter (µg/L) in MW-10S, benzene at 2.92 µg/L in MW-01M, ethylbenzene at 2,260 µg/L in MW-10S, isopropylbenzene at 29.5 µg/L

in MW-10S, MTBE at 27.3 µg/L in MW-09S, naphthalene at 92.5 µg/L in MW-10S, n-propylbenzene at 48 µg/L in MW-10S, , o-xylene at 2,850 µg/L in MW-10S, p-isopropyltoluene at 5.6 µg/L in MW-10D, styrene at 90.5 µg/L in MW-10S, toluene at 5,570 in MW-10S, and total xylenes at 9,660 µg/L in MW-10S.

- Chlorinated-related VOCs including 1,1,1-Trichloroethane, 1,1,2,2-trichloroethane, 1,1,2-trichloroethane, 1,1-dichloroethane, 1,1-dichloroethylene, 1,2,3-trichlorpropane, 1,2-dichloroethane, chloroform, cis-1,2-dichloroethylene, methylene chloride, PCE, trans-1,2-dichloroethylene, TCE, and vinyl chloride were detected in all collected groundwater samples above the NYSDEC TOGS 1.1.1 AWQS. Note, not all chlorinated-related VOCs were detected in every sample above the TOGS 1.1.1 AWQS. The maximum concentrations are as follows: 1,1,1-Trichloroethane at 134 µg/L in MW-10S, 1,1,2,2-trichloroethane at 9.01 in MW-11S, 1,1,2-trichloroethane at 60.5 µg/L in MW-07M, 1,1-dichloroethane at 16.5 µg/L MW-06D, 1,1-dichloroethylene at 106 µg/L in MW-06D, 1,2,3-trichlorpropane at 2.9 µg/L in MW-07M, 1,2-dichloroethane at 8.3 in MW-01M, chloroform at 36.5 µg/L, cis-1,2-dichloroethylene at 48,000 in MW-06D, methylene chloride at 37 µg/L in MW-10S, PCE at 532 µg/L in MW-10S, trans-1,2-dichloroethylene at 179 µg/L in MW-06D, TCE at 208,000 in MW-01D, and vinyl chloride at 385 µg/L in MW-06D.

Semi-Volatile Organic Compounds

2023 NYCOER Remedial Investigation and 2024 NYSDEC Remedial Investigation

- Polycyclic aromatic hydrocarbons (PAHs) (i.e., benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene) were detected above TOGS 1.1.1 AWQS in one groundwater samples in 2023 and one groundwater sample in 2024.
- 1,4-Dioxane was detected in six shallow groundwater monitoring wells (max of 4.69 µg/L) and five intermediate groundwater monitoring wells (max of 39.5 µg/L) above the TOGS 1.1.1 AWQS.
- Phenol was detected in one shallow groundwater monitoring well above the TOGS 1.1.1 AWQS.
- Naphthalene was detected in one shallow groundwater monitoring well above the TOGS 1.1.1 AWQS.

Pesticides

- No Pesticides were detected above the TOGS 1.1.1 AWGS.

Polychlorinated Biphenyls

- No PCBs were detected in the groundwater samples.

Metals

2023 NYCOER Remedial Investigation

- The 2023 RI report that Dissolved metals including lead, manganese, and sodium were detected above the TOGS 1.1.1 AWQS. Dissolved Chromium was detected above the AWQS in MW-01S at 110 µg/L.

2024 NYSDEC Remedial Investigation

- Dissolved Magnesium was detected above the AWQS in MW-01M, MW-05M, MW-07M, MW-08M, and MW-09S/M, with a maximum concentration of 128,000 µg/L.
- Dissolved Manganese was detected above the AWGS in in seven shallow wells (MW-02S, MW-04S, MW-05S, MW-07S, MW-09S, MW-10S, MW-11S) with a maximum concentration of 3,150 µg/L, as well as in all intermediate wells, with a maximum concentration of 11,500 µg/L.

- Dissolved Sodium was detected above the AWGS in nine shallow wells (MW-01S, MW-02S, MW-05S, MW-06S, MW-07S, MW-08S, MW-09S, MW-10S, MW-11S) with a maximum concentration of 220,000 µg/L, as well as in all intermediate wells, with a maximum concentration of 178,000 µg/L.
- Dissolved Zinc was detected above the AWQS in MW-04M at 2,410 µg/L.
- Dissolved Cadmium was detected above the AWQS in MW-04M and MW-05S at a maximum concentration of 12.3 µg/L.
- Dissolved Selenium was detected in above the AWGS in three shallow wells (MW-07S, MW-09S, MW-11S) at a maximum concentration of 111 µg/L and three intermediate wells (MW-07M, MW-08M, MW-09S) at a maximum concentration of 34 µg/L.

Per- and Polyfluoroalkyl Substances

2023 NYCOER Remedial Investigation

- No PFAS compounds, Perfluorooctanesulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA), were detected during the 2023 Investigation.

2024 NYSDEC Remedial Investigation

- Perfluorooctanesulfonic acid (PFOS) was detected in seven shallow groundwater monitoring wells (max of 124 nanograms per liter (ng/L)) and six intermediate groundwater monitoring wells (max of 447 ng/L) in concentrations greater than the NYSDEC Part 375 Remedial Program for PFAS.
- Perfluorooctanoic acid (PFAS) was detected in eight shallow groundwater monitoring wells (max of 624 ng/L) and eight intermediate groundwater monitoring wells (max of 543 ng/L) in concentrations greater than the NYSDEC Part 375 Remedial Program for PFAS.
- Perfluoroheptanoic acid (PFHpA) was detected in one intermediate groundwater monitoring well in a concentration greater than the NYSDEC Part 375 Remedial Program for PFAS.
- Perfluorohexanesulfonic acid (PFHxs) was detected in one shallow and one intermediate monitoring well in concentrations greater than the NYSDEC Part 375 Remedial Program for PFAS.

Soil Vapor

Volatile Organic Compounds

2023 NYCOER Remedial Investigation and 2024 NYSDEC Remedial Investigation

- PCE (max of 55,000 µg/m^3) was detected at elevated concentrations in eleven soil vapor samples.
- TCE (max of 3,900,000 µg/m^3) was detected at elevated concentrations in each of the 23 soil vapor samples.
- 1,1,1 TCA (max of 3,600 µg/m^3) was detected at elevated concentrations in 11 soil vapor samples.
- Carbon tetrachloride (max of 9,200 µg/m^3) was detected at elevated concentrations in nine soil vapor samples.
- Cis-1,1-DCE (max of 1,300 µg/m^3) was detected at elevated concentrations in eight soil vapor samples.
- Benzene (max of 230 µg/m^3), cyclohexane (max of 160 µg/m^3), n-heptane (max of 810 µg/m^3), and n-hexane (max of 1,600 µg/m^3) were detected at elevated concentration in one soil vapor sample.

Indoor and Ambient Air Samples

Volatile Organic Compounds

2023 NYCOER Remedial Investigation and 2024 NYSDEC Remedial Investigation

- 1,2,4-Trimethylbenzene (max of 2.0 µg/m^3), cyclohexane (max of 3.30 µg/m^3), naphthalene (max of 6.0 µg/m^3), n-heptane (max of 13.0 µg/m^3), o-xylene (max of 2.2 µg/m^3), PCE (max of 3.1 µg/m^3), and toluene (max of 10 µg/m^3), were detected at an elevated concentrations in one outdoor air sample. Benzene (max of 2.5 µg/m^3) was detected at an elevated concentrations in one indoor air sample.
- Carbon tetrachloride was detected at elevated concentrations in all the indoor air samples (max of 0.54 µg/m^3) and all the outdoor air samples (max of 1.1 µg/m^3).
- TCE was detected at elevated concentrations at all the indoor air samples (max of 3.10 µg/m^3) and all outdoor air samples (max of 4.20 µg/m^3).

The RI results are summarized on **Tables 1 through 13.** Spider diagrams have been prepared and are presented in **Figures 7 through 12**.

2.2 SIGNIFICANT THREAT

The NYSDEC and NYSDOH have determined that this Site poses a significant threat to human health and the environment. Notice of that determination has been provided for public review. A copy of the notice is included in **Appendix C**.

2.3 SITE HISTORY

2.3.1 Past Uses and Ownership

The site was utilized for various industrial and manufacturing operations including iron works, tin can storage facility, cotton batting company, paper storage warehouse, and "non-specific manufacturing use." Interflo Technologies operated at 19-27 Clay Street as a Resource Conservation and Recovery Act (RCRA) small quantity hazardous waste generator from at least July 1994 to January 1997. Interflo Technologies generated ignitable, halogenated, non-halogenated solvents and mercury waste under USEPA ID No. NY0000374314. Multiple RCRA violations were identified for the Site; however, all were addressed to the satisfaction of USEPA.

Fire insurance maps for the years 1887 through 1905 indicate that the site was developed with multiple structures under the name Logan Iron Works, including blacksmith shop, a flange shop, and a boiler shop. To the north were Commercial Street and additional iron works, followed by sugar refinery. By 1916, the site had developed to match the 1905 map's depictions, with the building serving as a tin can storage facility. Between 1942 to 1951, the site has been redeveloped with two commercial and industrial buildings along Clay Street: a two-story structure to the west occupied by a cotton batting manufacturing and a one- and partial two-story structure to the east identified as a paper storage warehouse. The northern portions of the property remained undeveloped. By 1965, both buildings were utilized as non-specific manufacturing uses, and the northern portion of the property is identified as a lumber storage yard.

The City Directory records identified the following previous tenant:

19 Clay Street

Year	Name
1940	Nu Batts Corp.
1945	Idis Chocolate & Candy Manufacturing Co.
1970-1976	Angela Varona Cosmetics, Inc. and Chromex Chemical Corp.
1980	Angela Varona Cosmetics, Inc.
1985	Angela Varona Cosmetics, Inc. Chromex Chemical Corp. and Liqui Mark Corp.
1992	Chromex Chemical Corp. and Liqui Mark Corp.
1994	Interflo Technologies and Liqui Mark Corp.
1997	Interflo Technologies
1999	Interflo Technologies and Computer & Network Integrators
2000	Interflo Technologies, Computer Network Integrators, and a commercial tenant.
2004-2005	A commercial tenant
2014	Alpha Medical Resources, Inc.

29 Clay Street

Year	Name
1940-1949	Silfen Paper Co.
1960-1965	W. Pierro & Co. Metal Novelties
1999	Jerome Aluminum Products Corp. and Liberty Custom Contractors, Inc.
2000-2005	Jerome Aluminum Products Corp.
2014-2017	Jerome Aluminum Products Corp., American Industries, and Probuild.

2.3.2 Phase I and Phase II Reports

The following investigations were previously performed at the Site:

- Phase I Environmental Site Assessment by Athenica Environmental Services, November 2021
- Phase I Environmental Site Assessment by Preferred Environmental Services, June 2022
- Remedial Investigation by Preferred Environmental Services, March 2023
- Supplementary Remedial Investigation by Preferred Environmental Services, May 2023

A summary of the previous investigation is included in the RIR located on the NYSDEC document repository.

2.3.3 Sanborn Maps

A summary of pertinent information obtained from a review of the Sanborn maps is included below:

Year	Description
1887-1905	The Subject Property is developed with multiple structures identified as the Logan Iron Works, including a blacksmith shop, a flange shop and a boiler shop. Commercial Street and additional portions of the iron works are to the north, followed by a sugar refinery. Additional portions of the iron works are to the west, followed by several residences and a brewery and stable. Clay Street is to the south, followed by dense, low-rise retail and residential development, as well as a machine shop. Additional portions of the iron works and a residence are to the east, followed by a railroad car barn. The 1905 map shows a truck and

Year	Description
	wagon building to the east along Commercial Street. Additional portions of the irons works, and a sheet metal works across Clay Street to the south and southwest.
1916	The Subject Property is developed consistent with the 1905 map depictions; however, the buildings are now identified as a tin can storage facility. Commercial Street and a truck, wagon and auto body builder are to the north, followed by the West Street Improvement Co. (former sugar refinery). A boiler making shop is to the west, followed by several residences and a brewery and mineral water facility. Clay Street is to the south, followed by residences, storage buildings, a sheet metal works and a cooperage. A small storage building is the east along Clay Street, followed by a railroad car barn.
1922-1928	The 1922 and 1928 maps were taken from a collection of pier maps. As such, they only depict roadways, terminals and port facilities. The Subject Property improvements are not depicted. The 1922 map does not depict improvements to the south, east or west. The property across Commercial Street to the north is identified as the French Government Storage Warehouses and the Newtown Creek Corporation. The 1928 map does not depict improvements to the north, south and west. The railroad car barn is to the east and a glass company is to the northeast.
1942-1951	The Subject Property has been redeveloped with two commercial/industrial buildings along Clay Street. These include a 2-story structure (west) occupied by a cotton batting manufacturer and a 1- and partial 2-story structure (east) identified as a paper storage warehouse. Northern portions of the property are undeveloped. These structures are consistent with the existing buildings. Commercial Street, a tin can storage facility, and a non-specific manufacturing building are to the north, followed by a trolley car storage yard and several rail lines, with a coal and dock company to the northeast. A lumber and building material supply is to the west, followed by several residences, with a service station beyond. Clay Street is to the south, followed by residences and a metal and wood box manufacture, with an undeveloped lot to the southwest. A railroad car barn is to the east, with Manhattan Avenue beyond. The 1951 map identifies the eastern adjacent tin can storage building as a feather storage building. In addition, the coal and dock corporation to the northeast is now identified as a sand and gravel facility.
1965	The Subject Property is developed consistent with the 1951 map depictions, except that the eastern building is a 1-story structure identified as re-built in 1952. Both buildings are identified as occupied by non-specific manufacturing uses. The northern portion of the property is identified as a lumber storage yard. Commercial Street, a tin can storage facility, and a non-specific manufacturing building are to the north, followed by a NYC transit facility (bus depot). The sand and gravel yard to the northeast was redeveloped with a plastic products manufacturing facility and a lumber yard is to the northwest. A lumber and building material supply is to the west, followed by junk storage (former residences), with a service station beyond. Clay Street is to the south, followed by residences and several storage buildings which appear associated with the Harte Chemical Fabrics Co. facility further to the west-southwest. A hardware warehouse (constructed in 1953) is to the east, with Manhattan Avenue beyond. The 1951 map identifies the eastern adjacent tin can storage building as a feather storage building. In addition, the coal and dock corporation to the northeast is now identified as a sand and gravel facility.
1978-1989	The Subject Property and adjacent properties are shown generally consistent with their 1965 map depictions, except that an auto repair shop is adjacent to the east along Clay Street. In addition, the western adjacent building is now identified as a non-specific manufacturing use. This building is identified as a warehouse beginning on the 1980 map. The residences further to the west have been demolished and the service station is now identified as a junk storage yard.
1991-2007	The Subject Property and adjacent properties are shown generally consistent with their 1989 map depictions, except that the former service station/junk yard building to the west has been demolished. The lumber yard to the northwest is identified as a parking lot and the rail lines are no longer visible on the NYC bus depot property to the north beginning on the 1995 map. The Harte manufacturing facility across

Year	Description
	Commercial Street to the northeast is now identified as a non-specific manufacturing use and warehouse beginning on the 1996 map.

All Sanborn Maps available for this Site were reviewed prior to preparation of the RAWP and are included in **Appendix F**.

2.4 GEOLOGIC AND HYDROGEOLOGIC CONDITIONS

Based on our review of the 1776-7 Original High and Low Grounds, Salt Marsh and Shorelines in the City of Brooklyn Map, the Site lies within the border line of the original shoreline of Newtown Creek. With development, the shoreline was extended west and north by backfilling and raising grades to develop the street grid. Fill used to raise grades is underlain by clayey silts and silty sands.

In September 2024, DPK Land Surveying (DPK) conducted a survey of the Site which showed that the ground elevation ranges (proximate to monitoring wells) from elevations (EL) 14.52 feet above mean sea level (amsl) relative to the North American Vertical Datum 1988 (NAVD88) at the western portion of the Site, to EL 15.51 feet amsl at the eastern portion of the Site. The topographic gradient at the Site slopes generally down from east to west (See **Figure 1**). The nearest water bodies are Newtown Creek located approximately 600 feet to the north, and the East River located approximately 800 feet to the west, of the Site.

Based on Bedrock 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 1990, the bedrock near the Subject Property consists of interbedded units of gray thinly laminated muscovite-biotite-quartz schist, and white to pinkish with light green weathering gneiss. During this RI, bedrock was encountered at approximately EL -25 feet amsl, which is approximately 40 ft bgs.

2.4.1 Stratigraphy of Soil to Bedrock

Based on the results of our subsurface exploration program during the 2024 NYSDEC RI, the subsurface conditions at the Site generally consist of the following observed soil profile.

- SURFACE COVER: Surface cover consisting of concrete was encountered at each soil boring location. The concrete was approximately 4 to 10-inches in thickness.
- FILL: Fill, consisting of dark brown/black/gray/tan fine to coarse sand containing construction debris, such as bricks, concrete, cinders/asphalt millings, was encountered below the Surface Cover in the borings extending to depths of up to approximately 4 ft bgs.
- SAND: Sand stratum was encountered below the fill in most locations, extending to approximately 20 ft bgs. The Sand stratum generally consisted of brown fine to coarse sand, with varying levels of silt and gravel.
- SILTY SAND: A silty sand stratum was also encountered below the fill in some borings and below the sand layer in some of the borings. In some borings, the silty sand stratum extended to termination depths of approximately 39 ft bgs. The stratum consists of light brown/brown silty sand with varying levels of gravel.
- SILTY CLAY / CLAYEY SILT: A silt/clay stratum was encountered interbedded between the sand and silty sand stratum and extended to depths ranging from approximately 15 to 22 ft bgs (approximately 0.5

feet to 4 feet thick) in some of the shallow borings, and between 26 to 32 ft bgs in some of the deep borings (approximately between 2 and 5 feet thick). The stratum consists of brown/dark gray silty clay and clayey silt, and trace fine sand. The thicker shallow layers of silty clay were primarily encountered in the southern portion of the site.

- DECOMPOSED ROCK: Decomposed rock stratum was encountered underlying the sand and silty sand stratum to depths ranging from 37 ft bgs to boring termination depth of 45 ft bgs. Decomposed rock is identified as material that has retained the parent bedrock features.

The subsurface condition at the Site is typical of a subsurface tidal waterbody. The Site was historically part of the shoreline of Newtown Creek, which received intermittent inflow and outflow of discharges. The subsurface profiles are shown included as **Figures 5A to 5D**.

2.4.2 Groundwater Conditions

GZA performed a synoptic groundwater well gauging event at the shallow wells on September 5, 2024. The groundwater elevation data from specific shallow wells (i.e., MW-01S to MW-8S and MW-10S) were used to prepare a groundwater contour map with measurements presented in elevations (EL) above mean sea level (amsl) relative to the North American Vertical Datum 1988 (NAV88). During this groundwater gauging event, depth to groundwater (i.e., from the top of casing [TOC]) ranges from 8.20 to 11.72 ft (EL 4.77 to 6.85 amsl NAVD88), excluding MW-09S and MW-11S. At the time of the gauging event, MW-09S and MW-11S were observed to have not fully recharged after well development and were therefore not included in the groundwater contours.

The groundwater elevation data shows that groundwater flows generally from east to west across the Site, towards the East River. The groundwater contour map from the shallow wells is included as **Figure 6**. **Table 14** and the table below shows the groundwater flow data.

Well ID	Well Diameter (inches)	Depth to Bottom[1] (ft BTOC)[2]	Well Screen Interval (BTOC)	Ground Elevation (ft amsl NAVD88)	TOC Elevation[3] (ft amsl NAVD88)	Depth to Water, (BTOC)	Groundwater Elevation[4] (ft amsl NAVD88)
MW-01S	1	14.58	5-15	14.51	14.72	9.95	4.77
MW-02S	2	15.85	6-16	14.48	15.07	10.23	4.84
MW-03S	2	15.45	5.5-15.5	14.31	15.08	9.61	5.47
MW-04S	2	15.23	5.5-15.5	14.46	14.69	9.40	5.29
MW-05S	2	15.14	5.5-15.5	12.65	13.54	8.20	5.34
MW-06S	2	17.79	8-18	15.45	16.95	11.72	5.23
MW-07S	2	15.84	6-16	15.53	17.06	11.31	5.75
MW-08S	2	17.2	8-18	15.55	17.00	10.15	6.85
MW-09S	2	17.68	8-18	15.36	16.49	13.43	3.06
MW-10S	2	14.61	5-15	15.44	17.05	11.19	5.86
MW-11S	2	13.06	5-15	15.51	15.06	5.23	10.37

Table Notes:
1. BTOC – Below top of casing
2. Depth to bottom – Distance of the top of casing to the bottom of the well during gauging in feet.
3. TOC – Top of casing
4. Elevations – feet above mean sea level based (amsl) on North American Vertical Datum of 1988 (NAVD 88)

2.5 CONTAMINATION CONDITIONS

The information collected during the investigation was compared to the respective regulatory standards and were evaluated to determine the nature and extent of the contamination at the Site. The entire Site is considered the Area of Concern (AOC) based on contaminants in all three media: soil, groundwater, and soil vapor.

During the various phases of investigation onsite, soil boring and well construction logs were completed to describe the Site geology. The Conceptual Model of the Site is based on the findings of the previous investigations.

2.5.1 Conceptual Model of Site Contamination

The onsite soils consist of fill material followed immediately by sand with silty lenses as shown on the cross-sections, **Figures 5A-5D**. Clay is evident at a depth of 15 feet below surface grade (bgs). The clay does appear to dip towards the north from Clay Street. A distinct clay layer exists along Clay Street but does not extend north throughout the Site. Groundwater is approximately 8-10 feet bgs and flows towards the southwest across the site.

Soil samples collected above the groundwater table did have constituents above the NYSDEC PGSCOs throughout the site in the shallow interval of 0-3 feet below surface grade. Contaminants of concern in the shallow soil samples over NYSDEC PGSCOs include the VOCs trichloroethylene (TCE), 1,2 dichloroethylene (DCE), and tetrachloroethylene (PCE); the SVOCs benzo(a)anthracene, chrysene, benzo(b)fluoranthene, and benzo(k)fluoranthene; the metals arsenic, lead, mercury, copper and nickel; and PFOS. Soil samples collected to delineate the vertical extent of the CVOCs showed TCE at depth of up to 40 feet exceeding the NYSDEC PGSCOs. DNAPL was identified in in SB-35 and in borings to the west and east of SB-35 as shown on the isopleth maps, **Figures 13A-13C**.

Groundwater samples were collected from multiple depths across the site to delineate the CVOCs. The groundwater samples indicated that TCE and its breakdown products are impacting the entire site.

Soil vapor samples indicated that the CVOCs found in the soil and the groundwater are impacting the soil vapor beneath the site. The highest results were from SV-21 in the area of SB-35, with TCE detected at 3,900,000 mg/m3 and PCE at 55,000 mg/m3.

2.5.2 Description of Areas of Concern

The Areas of Concern are listed below:

1. Trench – A former trench runs across the eastern lot, 29 Clay Street. The trench runs through the site and appears to cross over the source area of contamination.
2. Dense Non-Aqueous Phase Liquid - DNAPL was observed in two wells in the central portion of Lot 53. DNAPL was first observed in SB-35 at a depth of 16-18 feet bgs. In consultation with the NYSDEC, several step out borings were advanced to assess the nature and extent of the plume. DNAPL was subsequently observed in SB-35_E (15 -17 feet bgs), SB-35_S (15-18 feet bgs) and SB-35_10W (18-22 feet bgs). The

DNAPL has been identified in an interval located approximately 7-9 feet above a clay layer in the central and southern portions of Lot 53.

3. Groundwater – VOC-impacted groundwater was observed across the site. The on-site groundwater data indicates that there is TCE at concentrations as high as 208,000 ug/L or parts per billion (PPB).
4. Historic Fill – Shallow soils across the site exhibit concentrations of VOCs, SVOCs and metals over the NYSDEC PGSCOs.
5. Underground Storage Tanks (USTs) – During a Phase I ESA site inspection in 2022, it was documented that two vent pipes were observed protruding through the roof of the 29 Clay Street building. According to the historic report, the pipes were consistent with the presence of a UST.
6. Soil Vapor – VOC-impacted soil vapor exists on the Site. The highest TCE detection was 3,900,000 ug/m3.

AOCs are described further in sections below.

2.5.3 Identification of Standards, Criteria, and Guidance

See **Table 15** of this document for Applicable SCOs. In addition, the following SGCs also apply:

1. 6 NYCRR Part 375-6 Soil Cleanup Objectives
2. NYSDEC Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations – TOGS 1.1.1
3. NYSDEC DER-10 Technical Guidance for Site Remediation, May 2010
4. NYSDEC DER-31 Green Remediation, August 2010
5. New York State Department of Health Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006
6. New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan
7. NYS Waste Transporter permits – 6 NYCRR Part 364.
8. NYS Solid Waste Management Requirements – 6NYCRR Part 360 and Part 364.
9. NYSDEC Draft Brownfield Cleanup Program Guide – May 2004.

2.5.4 Soil / Fill Contamination

Soil samples were collected at and above the groundwater interface. The shallow soils across the site are indicative of historic fill.

2.5.4.1 Summary of Soil Data

Soils observed in boring logs advanced on Site indicate that subsurface soil at the Site consisted of a surface layer of concrete ranging from 4 to 10 inches bgs and a fill layer, consisting of dark brown/black/gray/tan fine to coarse sand containing bricks, concrete, cinders/asphalt millings extending to depths of up to approximately 4 ft bgs. Sand stratum was encountered below the fill in most locations, extending to approximately 20 ft bgs.

Unsaturated shallow soil samples collected from grade to approximately 8 feet bgs identified soils impacted by VOCs, including petroleum and chlorinated compounds, SVOCs, metals, and PFAS at levels exceeding UUSCOs, RRUSCOs, and PGSCOs.

More specifically, contaminants detected in shallow unsaturated soils above RRSCOs and/or PGSCOs include: VOCs such as chlorinated solvents (PCE, TCE, and methylene chloride) and acetone; SVOCs such as PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene and indeno(1,2,3-cd)pyrene); Metals (arsenic, barium, cadmium, copper, lead, mercury, nickel and zinc); and Perfluorooctanesulfonic Acid (PFOS).

Contamination from historical Site use appears to have impacted both soil and groundwater at the Site. Unsaturated shallow soil samples collected from grade to approximately 8 feet bgs identified soils impacted by VOCS including petroleum and chlorinated compounds, SVOCS, metals, and PFAS at levels exceeding UUSCOs, RRUSCOs, and PGSCOs in some samples on Lot 9 and Lot 53. Saturated soil samples were analyzed for VOCs only and collected at various depths based on changes in lithology and/or evidence of contamination. Saturated soil samples identified soils impacted primarily by chlorinated VOCs as well as some lower-level petroleum related compounds mostly in the central portion of Lot 53 in and around SB-35. The highest concentration of chlorinated VOCs was identified in soil sample SB-35_10W (21') with a TCE concentration of 57,000 mg/kg.

See summary table below for a summary of all soil samples collected at the Site.

SOIL SUMMARY TABLE 2023-2024

Analytes > RRUSCOs	Detections > UUSCOs	Detections > RRUSCOs	Detections > PGSCOs	Maximum Detection (ppm)	UUSCO (ppm)	RRUSCO (ppm)	PGSCO (ppm)	Depth (ft bgs)
1,1,1-Trichloroethane	3	0	3	36	0.68	100	0.68	21
1,1-Dichloroethylene	1	0	1	1.1	0.33	100	0.33	18
1,2,4-Trimethylbenzene	5	3	5	410	3.6	52	3.6	21
1,3,5-Trimethylbenzene	3	3	3	120	8.4	52	3.6	18 & 21
Acetone	1	0	1	0.067	0.05	100	0.05	5-7
cis-1,2-Dichloroethylene	6	0	6	3.6	0.25	100	0.25	20 & 33
Ethyl Benzene	5	1	5	410	1	41	1	21
Methylene Chloride	4	0	4	2.8	0.05	100	0.05	21
Naphthalene	1	0	1	21	12	100	12	21
n-Butylbenzene	2	0	2	21	12	100	12	18
n-Propylbenzene	3	0	3	30	3.9	100	3.9	18
sec-Butylbenzene	2	0	2	17	11	100	11	18 & 21
Tetrachloroethylene	5	4	5	120	1.3	19	1.3	21
Toluene	8	1	8	1,100	0.7	100	0.7	21
Trichloroethene	37	36	37	57,000	0.47	21	0.47	21
Vinyl Chloride	1	1	1	0.08	0.02	0.9	0.02	20
Xylenes, Total	9	3	4	2,700	0.26	100	1.6	21
Benz(a)anthracene	9	8	9	15	1	1	1	0-2
Benzo(a)pyrene	8	8	5	13.1	1	1	22	0-2
Benzo(b)fluoranthene	10	10	10	12	1	1	1.7	0-2
Benzo(k)fluoranthene	7	7	7	10.9	0.8	3.9	1.7	0-2
Chrysene	9	9	9	13.9	1	3.9	1	0-2
Dibenz(a,h)anthracene	7	7	4	3.27	0.33	0.33	1000	0-2

SOIL SUMMARY TABLE 2023-2024								
Analytes > RRUSCOs	Detections > UUSCOs	Detections > RRUSCOs	Detections > PGSCOs	Maximum Detection (ppm)	UUSCO (ppm)	RRUSCO (ppm)	PGSCO (ppm)	Depth (ft bgs)
Indeno(1,2,3-cd)pyrene	12	12	10	8.73	0.5	0.5	8.2	0-2
Phenol	1	0	1	0.459	0.33	100	0.33	0-2
Arsenic, Total	9	7	7	43.6	13	16	16	1-3
Barium, Total	3	3	2	1,010	350	400	820	1-3
Cadmium, Total	3	3	2	6.14	2.5	4.3	7.5	0-2
Copper, Total	17	13	10	2,620	50	270	1720	1-3
Lead, Total	27	24	23	6,870	63	400	450	0-2
Manganese, Total	1	1	1	3,260	1,600	2,000	2,000	0-2
Nickel, Total	9	5	5	443	30	310	130	1-3
Selenium, Total	1	0	1	4.41	4	180	4	1-3
Zinc, Total	24	17	17	1,400	109	10,000	2,480	0-2
Mercury, Total	19	18	18	0.672	0.18	0.81	0.73	1-3
Total PCBs	2	1	1	7.93	0.1	1	3.2	0-2
4,4'-DDE	2	0	0	0.956	0.0033	8.8	17	0-2 & 4-6
4,4'-DDT	4	0	0	0.307	0.0033	7.9	136	0-2 & 4-6
Dieldrin	1	1	1	0.369	0.005	0.2	0.1	0-2
Perfluorooctanesulfonic acid (PFOS)	9	0	2	4.96	0.88	44	3.7	1-3
Perfluorooctanoic acid (PFOA)	1	0	0	0.804	0.66	33	1.1	1-3

Notes:
Analytes > UUSCOs: Displays analytes that exceeded the NYSDEC Part 375 Unrestricted Use Soil Cleanup Objective.
Analytes > RRUSCOs: Displays analytes that exceeded the NYSDEC Part 375 Restricted Residential Use Soil Cleanup Objective.
Analytes > PGSCOs: Displays analytes that exceeded the NYSDEC Part 375 Protection of Groundwater Soil Cleanup Objective.
Maximum Detection (ppm): Maximum detection in parts per million.

2.5.4.2 Comparison of Soil/Fill with SCGs

Results in the unsaturated soils indicate the following over RRUSCO and/or PGSCO with their associated maximum concentration:

VOCs - Acetone (max of 0.067 mg/kg), methylene chloride (max of 0.43 mg/kg)

CVOCs - TCE (max of 3,100 mg/kg), PCE (max of 21 mg/kg)

SVOCs - Polycyclic aromatic hydrocarbons (PAHs) - Benzo(a)anthracene (max of 15 mg/kg), benzo(a)pyrene (max of 13.1 mg/kg), benzo(b)fluoranthene (max of 12 mg/kg), benzo(k)fluoranthene (max of 10.9 mg/kg), chrysene (max of 13.9 mg/kg), dibenzo(a,h)anthracene (max of 1.59 mg/kg), indeno(1,2,3-cd)pyrene (max of 8.73 mg/kg).

Pesticides - Dieldrin (max of 0.369 mg/kg)

Polychlorinated Biphenyls - Total PCB (max of 7.93 mg/kg)

Metals - Arsenic (max of 43.6 mg/kg), barium (max of 1,010 mg/kg), copper (max of 2,620 mg/kg), lead (max of 6,870 mg/kg), mercury (max of 0.672mg/kg), zinc (max of 1,400 mg/kg) and nickel (max of 443 mg/kg).

Results in the saturated soils below the groundwater table indicate the following over RRUSCO and/or PGSCO with their associated maximum concentration:

VOCs - 1,1-Trichloroethane (max of 36 mg/kg), 1,2,4-trimethylbenzene (max of 410 mg/kg), 1,3,5-trimethylbenzene (max of 120 mg/kg), ethyl benzene (max of 410 mg/kg), n-butylbenzene (max of 21 mg/kg), n-propylbenzene (max of 30 mg/kg), naphthalene (max of 21 mg/kg), sec-butylbenzene (max of 17 mg/kg), toluene (1,100 mg/kg), xylene (2,700 mg/kg).

CVOCs - TCE (max of 57,000 mg/kg), PCE (max of 120 mg/kg), 1,1,1-Trichloroethane (max of 36 mg/kg), cis-1,2-Dichloroethylene (max of 3.8 mg/kg), methylene chloride (max of 2.8 mg/kg), vinyl chloride (max of 0.0810 mg/kg),

The soil analytical results for the Remedial Investigations are summarized in **Tables 2 through 8. Figures 7 and 8** show the soil sample locations and spider diagrams summarizing exceedances of UUSCOs, RRUSCOs, and PGSCOs.

2.5.5 On-Site and Off-Site Groundwater Contamination

2.5.5.1 Summary of Groundwater Data

Groundwater samples identified concentrations of VOCs, including petroleum and chlorinated compounds, SVOCs, metals, and PFAS at levels above TOGS 1.1.1 AWQS. A groundwater sampling summary table showing the number of detections exceeding the AWQS and the maximum concentrations is presented below.

GROUNDWATER SUMMARY TABLE 2023-2024			
Analytes > AWQS	Detections > AWQS	Maximum Detection (ppb)	AWQS (ppb)
1,1,1-Trichloroethane	3	134	5
1,1,2,2-Tetrachloroethane	1	9.01	5
1,1,2-Trichloroethane	9	60.5	1
1,1-Dichloroethane	3	16.5	5
1,1-Dichloroethylene	8	106	5
1,2,3-Trichloropropane	1	2.9	0.04
1,2,4-Trimethylbenzene	5	132	5
1,2-Dichloroethane	6	8.3	0.6
1,3,5-Trimethylbenzene	5	205	5
1,4-Dioxane	1	39.1	0.35
Benzene	6	2.92	1
Chloroform	9	68	7
cis-1,2-Dichloroethene	17	48,000	5
Ethyl Benzene	6	2260	5
Isopropylbenzene	3	29.5	5
Methyl tert-butyl ether (MTBE)	3	32	10
Methylene Chloride	3	37	5
Naphthalene	5	92.5	10
n-Propylbenzene	5	48	5
o-Xylene	8	2850	5
p-Isopropyltoluene	1	5.6	5

GROUNDWATER SUMMARY TABLE 2023-2024			
Analytes > AWQS	Detections > AWQS	Maximum Detection (ppb)	AWQS (ppb)
Styrene	1	90.5	5
Tetrachloroethylene	12	532	5
Toluene	7	5570	5
trans-1,2-Dichloroethylene	7	179	5
Trichloroethene	33	208,000	5
Vinyl Chloride	6	385	2
Xylenes, Total	8	9660	5
Benzo(a)anthracene	1	47.1	0.002
Benzo(a)pyrene	1	46.4	0
Benzo(b)fluoranthene	2	36.2	0.002
Benzo(k)fluoranthene	1	39.8	0.002
Chrysene	2	45.9	0.002
Fluoranthene	1	109	50
Hexachlorobutadiene	1	0.588	0.5
Indeno(1,2,3-cd)pyrene	1	31.3	0.002
Phenanthrene	1	62.8	50
Phenol	1	7.22	1
Pyrene	1	78.4	50
Naphthalene	2	45	10
1,4-Dioxane	11	18	0.35
Chromium, Total	3	165	50
Chromium, Dissolved	1	110	50
Copper, Total	2	334	200
Copper, Dissolved	1	230	200
Lead, Total	10	5,310	25
Lead, Dissolved	2	87	25
Magnesium, Total	9	165,000	35,000
Magnesium, Dissolved	8	128,000	35,000
Manganese, Total	23	11,400	300
Manganese, Dissolved	19	74,800	300
Nickel, Total	4	282	100
Nickel, Dissolved	-	-	100
Sodium, Total	21	196,000	20,000
Sodium, Dissolved	21	220,000	20,000
Zinc, Total	1	2,510	2,000
Zinc, Dissolved	1	2,410	2,000
Cadmium, Total	3	19	5
Cadmium, Dissolved	2	12.3	5
Selenium, Total	6	98.3	10
Selenium, Dissolved	6	111	10
Mercury, Total	3	2.5	1
Perfluoroheptanoic acid (PFHpA)	1	113	100
Perfluorohexanesulfonic acid (PFHxS)	2	182	100
Perfluorooctanesulfonic acid (PFOS)	13	543	10
Perfluorooctanoic acid (PFOA)	17	624	10

Notes:

Analytes > AWQS: Displays analytes that exceed the NYSDEC Technical and Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values.

Detections > AWQS: Number of detections over the applicable AWQS.

Maximum Detection (ppb):	Maximum detection in parts per billion.
AWQS (ppb):	Ambient Water Quality Standard and Guidance Value in parts per billion.
ppm:	Parts per million.

2.5.5.2 Comparison of Groundwater with SCGs

VOCs – The maximum concentrations are as follows: 1,2,4-Trimethylbenzene at 526 micrograms per liter (µg/L) in MW-10S, benzene at 2.92 µg/L in MW-01M, ethylbenzene at 2,260 µg/L in MW-10S, isopropylbenzene at 29.5 µg/L in MW-10S, MTBE at 27.3 µg/L in MW-09S, naphthalene at 92.5 µg/L in MW-10S, n-propylbenzene at 48 µg/L in MW-10S, o-xylene at 2,850 µg/L in MW-10S, p-isopropyltoluene at 5.6 µg/L in MW-10D, styrene at 90.5 µg/L in MW-10S, toluene at 5,570 in MW-10S, and total xylenes at 9,660 µg/L in MW-10S.

CVOCs – The maximum concentrations are as follows: 1,1,1-Trichloroethane at 134 µg/L in MW-10S, 1,1,2,2-trichloroethane at 9.01 in MW-11S, 1,1,2-trichloroethane at 60.5 µg/L in MW-07M, 1,1-dichloroethane at 16.5 µg/L MW-06D, 1,1-dichloroethylene at 106 µg/L in MW-06D, 1,2,3-trichlorpropane at 2.9 µg/L in MW-07M, 1,2-dichloroethane at 8.3 in MW-01M, chloroform at 36.5 µg/L, cis-1,2-dichloroethylene at 48,000 in MW-06D, methylene chloride at 37 µg/L in MW-10S, PCE at 532 µg/L in MW-10S, trans-1,2-dichloroethylene at 179 µg/L in MW-06D, TCE at 208,000 in MW-01D, and vinyl chloride at 385 µg/L in MW-06D.

SVOCs – Polycyclic aromatic hydrocarbons (PAHs) (i.e., benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene) were detected above TOGS 1.1.1 AWQS in one groundwater samples in 2023 and one groundwater sample in 2024. 1,4-Dioxane was detected in six shallow groundwater monitoring wells (max of 4.69 µg/L) and five intermediate groundwater monitoring wells (max of 39.5 µg/L) above the TOGS 1.1.1 AWQS. Phenol was detected in one shallow groundwater monitoring well above the TOGS 1.1.1 AWQS. Naphthalene was detected in one shallow groundwater monitoring well above the TOGS 1.1.1 AWQS.

Metals – Dissolved Magnesium was detected above the AWQS in MW-01M, MW-05M, MW-07M, MW-08M, and MW-09S/M, with a maximum concentration of 128,000 µg/L. Dissolved Manganese was detected above the AWGS in in seven shallow wells (MW-02S, MW-04S, MW-05S, MW-07S, MW-09S, MW-10S, MW-11S) with a maximum concentration of 3,150 µg/L, as well as in all intermediate wells, with a maximum concentration of 11,500 µg/L. Dissolved Sodium was detected above the AWGS in nine shallow wells (MW-01S, MW-02S, MW-05S, MW-06S, MW-07S, MW-08S, MW-09S, MW-10S, MW-11S) with a maximum concentration of 220,000 µg/L, as well as in all intermediate wells, with a maximum concentration of 178,000 µg/L. Dissolved Zinc was detected above the AWQS in MW-04M at 2,410 µg/L. Dissolved Cadmium was detected above the AWQS in MW-04M and MW-05S at a maximum concentration of 12.3 µg/L. Dissolved Selenium was detected in above the AWGS in three shallow wells (MW-07S, MW-09S, MW-11S) at a maximum concentration of 111 µg/L and three intermediate wells (MW-07M, MW-08M, MW-09S) at a maximum concentration of 34 µg/L.

PFAS – PFAS was detected at a maximum concentration of 624 nanograms per liter (ng/L) the shallow interval MWs and a maximum concentration of 543 ng/L in the intermediate groundwater monitoring wells.

PFOS –PFOS was detected at a a maximum concentration of 124 ng/L in the shallow interval and a maximum concentration of 447 ng/L in the intermediate interval.

The groundwater analytical results were compared to NYSDEC TOGS 1.1.1 AWQS and Guidance Values. PFAS results were compared to NYSDEC Part 375 PFAS Remedial Program October 2020 levels. The RI sampling summary is presented in **Table 1**. **Figures 9**, **10A**, and **10B** show the sample locations and spider diagrams summarizing the exceedances, compared to TOGS 1.1.1 AWQS.

2.5.6 On-Site and Off-Site Soil Vapor Contamination

Soil vapor samples identified concentrations of VOCS including petroleum and chlorinated compounds. A soil vapor sampling summary table showing the number of detections, and the maximum concentrations are presented below.

SOIL VAPOR CVOCs SUMMARY TABLE 2023-2024			
Analytes	Total Detections	Maximum Detection ($\mu g/m^3$)	Type
1,1,1-Trichloroethane	18	3,600	Soil Vapor
1,1-Dichloroethene	4	45	Soil Vapor
Carbon tetrachloride	11	900	Soil Vapor
Carbon tetrachloride	3	3	Outdoor Air
cis-1,2-Dichloroethene	10	120	Soil Vapor
Methylene chloride	3	11	Soil Vapor
Tetrachloroethene	14	55,000	Soil Vapor
Tetrachloroethene	1	3	Outdoor Air
Trichloroethene	22	3,900,000	Soil Vapor
Trichloroethene	3	3	Indoor Air

Notes:

Analytes: Chlorinated Volatile Organic Compounds (CVOCs) detected during soil gas, sub-slab soil gas, indoor air, and/or ambient air sampling.
Total Detections: Number of samples with detections of CVOCs.
Maximum Detection (µg/m3): Maximum detection in micrograms per cubic meter.
Type: Indicates the range of samples with reported CVOC detection from the Phase II soil vapor, sub-slab soil vapor, indoor air, and/or ambient air samples.

2.5.6.1 Comparison of Soil Vapor with SCGs

VOCs

- PCE (max of 55,000 $\mu g/m^3$) was detected at elevated concentrations in six soil vapor samples.
- TCE (max of 3,900,000 $\mu g/m^3$) was detected at elevated concentrations in each of the 14 soil vapor samples.
- 1,1,1 TCA (max of 3,600 $\mu g/m^3$) was detected at elevated concentrations in 10 soil vapor samples.
- 1,1-DCE (max of 45 $\mu g/m^3$), was detected at elevated concentration in one soil vapor sample.
- Cis-1,1-DCE (max of 1,300 $\mu g/m^3$) was detected at elevated concentrations in seven soil vapor samples.
- Carbon tetrachloride (max of 900 $\mu g/m^3$) was detected at elevated concentrations in seven soil vapor samples.

- Benzene (max of 230 µg/m^3), cyclohexane (max of 160 µg/m^3), n-heptane (max of 810 µg/m^3), and n-hexane (max of 1,600 µg/m^3) were detected at elevated concentration in one soil vapor sample.

The soil vapor, indoor air, and ambient air analytical results were evaluated against the USEPA Method TO-15 Compound List. The RI sampling summary is presented in **Table 1**. The 2023 NYCOER RI soil vapor and outdoor data is presented on **Figure 11** and the 2024 NYSDEC RI soil vapor, indoor air, and outdoor air data is presented on **Figure 12**.

2.6 ENVIRONMENTAL AND PUBLIC HEALTH ASSESSMENTS

2.6.1 Qualitative Human Health Exposure Assessment

A Qualitative Human Health Exposure Assessment (QHHEA) for the Site has been prepared in accordance with the requirements of DER-10/Technical Guidance for Site Investigation and Remediation, Appendix 3B, May 2010, and is presented in the following subsections. The QHHEA characterizes the exposure setting, identifies potentially complete exposure pathways, and qualitatively evaluates potential fate and transport of constituents from one medium to another (i.e., soil-to-air or soil-to-groundwater).

2.6.2 Fish & Wildlife Remedial Impact Analysis

The Fish and Wildlife Impact Analysis (FWIA) is unnecessary for the Site. A search of the United States Fish and Wildlife Service Information for Planning and Consultation indicates that there are no critical habitats within the Site boundary. The Site is located in an area predominantly composed of residential, commercial, and industrial buildings, with minimal ecological habitat. Additionally, the majority of soils on the Site are covered, thereby reducing the potential for ecological impact. Therefore, the potential for Site-related COC to impact fish and wildlife resources, if present, is considered minimal.

2.7 INTERIM REMEDIAL ACTION

GZA has prepared an Interim Remedial Measure Work Plan (IRMWP) to outline the necessary actions for immediate source removal, to mitigate exposure risks to future construction workers, and to eliminate the pathway for sub-grade vapors to migrate off-site. The IRMWP is designed to initiate more immediate remedial actions prior to the approval of this RAWP. The IRM will consist of the following:

1. Site mobilization involving Site security set-up, equipment mobilization and utility mark outs.
2. Performance of a CAMP for particulates and VOCs.
3. Install five DNAPL recovery wells (designated RW-01 through RW-05) in the area of observed DNAPL during the RI. To further delineate the nature and extent of DNAPL, three additional soil borings and a potential DNAPL recovery well (RW-06) will be installed east/northeast of MW-11. The installation of the recovery wells and the advancement of the delineation soil borings will occur during the same mobilization.
4. Gauge and recover DNAPL in the newly installed recovery wells. DNAPL will be recovered using Vacuum Enhanced Fluid Recovery (VEFR). The recovered material will be handled as hazardous waste in accordance with local laws and regulations. DNAPL recovery will begin prior to any proposed injections in the area of the

plume. DNAPL recovery rates and volume will be evaluated in conjunction with the NYSDEC and NYSDOH prior to commencing groundwater injections.

5. Installation of a temporary Soil Vapor Extraction (SVE) treatment system to limit the off-Site migration of elevated concentrations of VOCs in soil vapor.
6. Groundwater injections of emulsified zero valent iron (EZVI) and In-Situ Chemical Reduction (ISCR) to remedy soil and groundwater, primarily for chlorinated VOCs, above the soil cleanup objectives and groundwater above the NYSDEC TOGS 1.1.1 AWQS. The existing slab will remain in place during the IRM; the soil beneath the warehouse will be managed under the RAWP. There will be two phases of injections during the IRM. The injection plan is shown on **Figure 14**, and described in **Appendix M**.
7. A sampling program to potentially allow for disposal of a portion of the site soils as non-hazardous waste through a Contained-In Determination from the NYSDEC Division of Solid and Hazardous Waste.
8. Waste management will include temporarily storing soil, groundwater, and DNAPL generated during the remedial activities in 55-gallon drums or larger capacity storage containers (totes, double walled tanks, etc.) in preparation for off-Site disposal. Utilizing larger capacity containers for the fluids helps to lessen the chance for spilling any material when transferring from the Vac Truck to the storage container. Additionally, all storage containers used to store soil, groundwater, and DNAPL generated during the remedial activities will be staged on appropriately sized secondary containment in the form of spill pallets (or equivalent) pending removal from the Site. All waste generated from the Site will be stored and handled in accordance applicable laws and regulations.
9. Daily and Monthly field reports to the NYSDEC and the NYSDOH will be submitted during the IRM activities.

2.8 REMEDIAL ACTION OBJECTIVES

Based on the results of the Remedial Investigation, the following Remedial Action Objectives (RAOs) have been identified for this Site.

2.8.1 Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater containing contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of, volatiles emanating from contaminated groundwater.

RAOs for Environmental Protection

- Remove the source of groundwater contamination.

2.8.2 Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of, or exposure to, contaminants volatilizing from contaminated soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater contamination.

2.8.3 Soil Vapor

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at the Site.

3.0 DESCRIPTION OF REMEDIAL ACTION PLAN

This section presents an analysis of remedial alternatives that could achieve the RAOs. The Remedial Action standards, criteria and guidance used to develop these remedial alternatives were described in Section 2.5.3. Given the known contamination, correspondence and guidance from the DEC, and the additional Remedial Investigation, the proposed remedial alternatives are Alternative 1 (Track 1 to Unrestricted Use SCOs) or Alternative 2 (Track 4 Restricted Residential SCO). The proposed SCOs under Alternative 1 would be the Part 375 Unrestricted Use SCOs under a Track 1 cleanup. Alternative II would be a Track 4 Restricted Residential cleanup, utilizing the Part 375 Restricted Residential Use SCOs and implementation of long-term institutional controls pursuant to an Environmental Easement and long-term engineering controls under a Site Management Plan. Both alternatives are expected to achieve the identified RAOs.

3.1 TECHNICAL DESCRIPTION OF ALTERNATIVE I – TRACK 1

A remedial program would be implemented to provide the details necessary for construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The following actions would be completed as part of a Track 1 remedy:

1. Green remediation components are as follows:

   - Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
   - Reducing direct and indirect greenhouse gas and other emissions;
   - Increasing energy efficiency and minimizing use of non-renewable energy;
   - Conserving and efficiently managing resources and materials;
   - Reducing waste, increasing recycling, and increasing reuse of materials that would otherwise be considered a waste;
   - Fostering green and healthy communities and working landscapes that balance ecological, economic, and social goals; and
   - Integrating the remedy with the end-use where possible and encouraging green and sustainable re-development.
   - Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this site, any future on-site buildings shall be constructed, at a minimum, to meet the 2020 Energy Conservation Construction Code of New York (or most recent edition) to improve energy efficiency as an element of construction.

As part of the remedial program, to evaluate the remedial alternatives with respect to green and sustainable remediation principles, a *SiteWise*™ environmental footprint analysis has been completed. Water consumption, greenhouse gas emissions, renewable and non-renewable energy use, waste reduction and material use for the

proposed remedy have been estimated, and goals for the project related to these green and sustainable remediation metrics, as well as for minimizing community impacts, protecting habitats and natural and cultural resources, and promoting environmental justice, will be incorporated into the remedial program, as appropriate. The project will include detailed requirements to achieve the green and sustainable remediation goals. Further, progress with respect to green and sustainable remediation metrics that have been established by the *SiteWise*™ model will be tracked during implementation of the remedial action and reported in the FER, including a comparison to the goals established during the remedial program.

Additionally, the remedial program will include a climate change vulnerability assessment, to evaluate the impact of climate change on the project site and the proposed remedy. Potential vulnerabilities associated with extreme weather events (e.g., hurricanes, lightning, heat stress and drought), flooding, and sea level rise will be identified, and the remedial program will incorporate measures to minimize the impact of climate change on potential identified vulnerabilities.

2. Development and implementation of a CHASP and CAMP for the protection of on-site workers, community/residents, and the environmental during remediation and construction activities.

3. Construction of a Support Of Excavation (SOE) system to facilitate remedial excavation of all soil the exceeds the Unrestricted Use SCOs.

4. Implementation of soil erosion, pollution, and sediment control measures in compliance with applicable laws and regulations.

5. Screening for indications of contamination (by visual means, odor, and monitoring with PIDs) of excavated material during intrusive work.

6. Excavation, stockpiling, off-site transportation, and disposal of soil that exceeds Unrestricted Use SCOs. Excavation would extend to approximately 40 feet bgs to remove all VOC impacted soils on the two NYC Tax lots along Clay Street, Lot 53 (9,415 sq ft) and Lot 19 (6,552 sq ft), totaling approximately 23,651 cubic yards. Additionally, excavation would extend to 8 feet on NYC Tax Lot 10 (3,780 sq ft.), totaling approximately1,120 cubic yards. Total excavation would equate to approximately 24,771 cubic yards of soil excavation. Excavation would extend up to approximately 40 feet bgs or near bedrock (assumed to be 45 feet) in the areas of deepest TCE detections, which corresponds to a depth of approximately 30 feet below the groundwater elevation of the Site.

7. Dewatering the Site from the groundwater interface (approximately 8-10 ft bgs) to the base of excavation (approximately 40-45 ft bgs) to allow removal of all soil that exceeds Unrestricted Use SCOs.

8. Off-site soil disposal of material removed from the Site in accordance with federal, state, and local rules and regulations for handling, transport, and disposal.

9. Implementing a groundwater monitoring program for one year after the IRM to evaluate the remedy and need for supplemental injections through the Site. The determination for additional injections will be made prior to building occupancy.

10. Removal and decommissioning of any encountered USTs and/or associated appurtenances (e.g., fill lines, vent line, and electrical conduit) and disposal off-site, in accordance with DER-10, 6 New York Codes, Rules, and

Regulations (NYCRR) Part 613.9, NYSDEC Commissioner Policy 51 (CP-51), and other applicable NYSDEC UST closure requirements.

11. Collection and analysis of confirmation soil samples from the excavation base in accordance with DER-10 to confirm Track 1 SCOs were achieved.

12. Importation and backfilling of remediated areas, as necessary for development with certified-clean material, RCA or virgin, native crushed stone (all meeting Unrestricted use SCOs.)

3.1.1 On-Site Worker, Public Health, and Environmental Protection

A Site-specific CHASP would be enforced during excavation and foundation construction to protect on-site workers from accidents and acute and chronic exposures to the identified contaminated media. Public health would be protected by implementing and enforcing dust, odor, and organic vapor control and monitoring procedures included in the CAMP and in this RAWP. The CAMP would include continuous perimeter monitoring of dust and organic vapor using DustTrak aerosol monitors and PIDs capable of recording data and calculating 15-minute averages. A field engineer, scientist, or geologist would monitor Site perimeters for visible dust and odors. The environment would be protected by implementing and enforcing the appropriate soil erosion prevention measures.

3.1.2 Excavation and Dewatering

Extensive dewatering of groundwater would be required to accommodate remedial excavation of soil that exceeds Unrestricted Use SCOs. The proposed excavation would extend up to approximately 40 feet bgs or near bedrock (assumed to be 45 feet) in the areas of deepest TCE detections, which corresponds to a depth approximately 30 feet below the groundwater elevation at the Site. The contractor would be responsible for dewatering in accordance with applicable laws and regulations. Treatment of dewatering fluids to remove DNAPL impacts would be required to reduce contaminant concentrations below NYCDEP/NYSDEC effluent limitations prior to discharge. The dewatering and treatment system would be designed by the contractor's NYS-licensed Professional Engineer.

3.1.3 SOE Construction and Fill and Soil Removal

VOCs, SVOCs, pesticides, PCBs, and metals were detected at concentrations that exceed the Unrestricted Use SCOs. To achieve a Track 1 remedy, soil removal and disposal would extend from surface grade to between 8 and 45 feet bgs across the Site to remove impacted material. Specifically, the Track 1 excavation would include removal of material to a depth 40 feet bgs on Lots 9 and Lot 53. SOE would be constructed around the perimeter to accommodate a remedial excavation to 40 feet or bedrock (if shallower).

3.1.4 UST System Removal

Although no subsurface metallic anomalies were identified during the RI, the potential exists for USTs to be encountered during Site remediation. Any USTs encountered during remedial excavation, would be decommissioned in accordance with applicable NYSDEC tank closure requirements, including DER-10 Section 5.5 and 6 NYCRR Part 613.9, and NYSDEC CP-51. The USTs and/or associated appurtenances would be registered and administratively closed with the NYSDEC Petroleum Bulk Storage (PBS) unit. All excavation areas would be

screened and inspected for the presence of petroleum-impacts to the surrounding soils. Petroleum-impacted soil, if encountered, would be excavated, stockpiled separately, characterized, and disposed of off-site at a permitted disposal facility in accordance with applicable regulations. If the remedial or development excavation does not extend beyond the bottom of the encountered tank, additional confirmation soil samples would be collected as described below. Following removal of UST(s), affidavits of closure would be submitted to the FDNY, and PBS registration/de-registration applications would be submitted to NYSDEC.

3.1.5 Confirmation Soil Sampling

Confirmation soil samples would be collected from the excavation base at a frequency of one per 900 square feet. An estimated 22 bottom confirmation soil samples, five hotspot endpoint samples, plus QA/QC samples, would be collected to confirm remedial performance and would be analyzed for the Part 375 list of VOCs, SVOCs, PCBs, pesticides/herbicides, cyanide, (metals including hexavalent and trivalent chromium), PFAS and 1,4-dioxane.

In the event that unidentified USTs are discovered during Site remedial activities, if the remedial or development excavation does not extend beyond the bottom of the encountered tank, five documentation samples would be collected from each excavation and would consist of one sample per excavation sidewall and a sample from each excavation base. As necessary, post removal soil samples would be collected in accordance with the requirements of CP-51. Samples would be analyzed for CP-51 List VOCs and SVOCs and compared to the CP-51 Table 2 Soil Cleanup Levels for Gasoline Contaminated Soils or Table 3 Soil Cleanup Levels for Fuel Oil Contaminated Soil and the 6 NYCRR Part 375-6.8(a) Unrestricted Use SCOs, depending on the contents of the USTs.

3.1.6 Excavation Backfill

Approximately 25,000 cubic yards of clean backfill material would be required to restore the Site grade to the development elevation needed for foundation construction. Any imported backfill shall comply with 6 NYCRR Part 375-6.7(d) and NYSDEC DER-10 Section 5.4(e), Table 5.4(e)10, and Appendix 5. Imported material for excavation backfill would consist of clean fill that meets the Unrestricted Use SCOs or other acceptable fill material such as virgin stone from a quarry or RCA. If RCA is imported to the Site, it would come from a NYSDEC-registered facility in compliance with 6 NYCRR Part 360 registration and permitting requirements for the period of RCA acquisition. RCA imported from compliant facilities would not require chemical testing, unless required by NYSDEC under its terms for operation of the facility. Imported RCA must be derived from recognizable and uncontaminated concrete (less than 10% by weight passing through a No. 80 sieve). RCA is not acceptable for, and would not be used as, Site cover or drainage material, and may not be used below the groundwater interface.

3.1.7 Green and Sustainable Remediation

Alternative I was evaluated with respect to green and sustainable remediation principles. An environmental footprint analysis was completed using *SiteWise*™ which is a NYSDEC accepted environmental footprint analysis calculator. Two components of the remedy were evaluated: site preparation and the remedy. The site preparation for the Track 1 remedy includes a waste characterization investigation, and investigation-derived waste (IDW) disposal. Waste characterization sampling will be performed exclusively for the purposes of off-Site soil disposal in a manner suitable to receiving facilities and in conformance with applicable federal, state, and local laws rules and regulations and facility-specific permits. For the purposes of completing the *SiteWise*™ analysis, we have assumed that the amount of contaminated soil to be characterized, excavated, and disposed of for implementation of the remedy is approximately 25,000 cubic yards.

The remedy component includes the excavation of 25,000 cubic yards of contaminated soil, construction of an SOE to facilitate the contaminated soil removal, the import of 25,000 cubic yards of clean material, dewatering during the contaminated soil removal, and the collection of confirmation soil samples for performance monitoring purposes. The Track 1 remedy is anticipated to be completed over 18 months.

An environmental footprint analysis was conducted using the SiteWise™ footprint analysis tool. The footprint calculator provides an evaluation of the alternative's impact related to greenhouse gas emissions, total energy usage, water consumption, electrical usage, onsite and offsite emissions of nitrous oxide, sulfur oxides, and particulate matter, and fatality and injury risks. The Track 1 alternative's remedial components were input into the calculator including the excavation and backfill component and the dewatering system component. Details of the assumptions used for each alternative and its components are outlined in **Appendix E**.

The footprint analysis determined that Track 1's environmental impact was significantly higher than the Track 4 alternative due to the increased excavation volume requiring additional time and resource consumption. The Track 1 footprint analysis results are as follows:

- Greenhouse gas (GHG) emissions = 1,733.74 metric tons
- Total energy used = 29,500 million British thermal units (MMBTU)
- Water consumed = 17,700,000 gallons
- Electricity used = 5.43 megawatt hours (MWH)
- Onsite Nitrous Oxide (NOx) emissions = 0.301 metric tons
- Onsite Sulfur Oxide (SOx) emissions = 0.0705 metric tons
- Onsite particulate under 10 microns (PM10) emissions = 0.0267 metric tons
- Total NOx emissions = 3.76 metric tons
- Total SOx emissions = 6.76 metric tons
- Total PM10 emissions = 8.03 metric tons

3.2 TECHNICAL DESCRIPTION OF ALTERNATIVE II – TRACK 4

Alternative II is a Track 4 Remedy that would include the following tasks:

The Selected Track 4 Restricted Residential remedy will include the following elements:

1. Green remediation components are as follows:

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gas and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling, and increasing reuse of materials that would otherwise be considered a waste;
- Fostering green and healthy communities and working landscapes that balance ecological, economic, and social goals; and
- Integrating the remedy with the end-use where possible and encouraging green and sustainable re-development.

- Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this site, any future on-site buildings shall be constructed, at a minimum, to meet the 2020 Energy Conservation Construction Code of New York (or most recent edition) to improve energy efficiency as an element of construction.

As part of the remedial program, to evaluate the remedial alternatives with respect to green and sustainable remediation principles, a *SiteWise*™ environmental footprint analysis has been completed. Water consumption, greenhouse gas emissions, renewable and non-renewable energy use, waste reduction and material use for the proposed remedy have been estimated, and goals for the project related to these green and sustainable remediation metrics, as well as for minimizing community impacts, protecting habitats and natural and cultural resources, and promoting environmental justice, will be incorporated into the remedial program, as appropriate. The project will include detailed requirements to achieve the green and sustainable remediation goals. Further, progress with respect to green and sustainable remediation metrics that have been established by the *SiteWise*™ model will be tracked during implementation of the remedial action and reported in the FER, including a comparison to the goals established during the remedial program.

Additionally, the remedial program will include a climate change vulnerability assessment, to evaluate the impact of climate change on the project site and the proposed remedy. Potential vulnerabilities associated with extreme weather events (e.g., hurricanes, lightning, heat stress and drought), flooding, and sea level rise will be identified, and the remedial program will incorporate measures to minimize the impact of climate change on potential identified vulnerabilities.

2. Development and implementation of a Construction Health and Safety Plan (CHASP) and Community Air Monitoring Plan (CAMP) for the protection of on-site workers, community/residents, and the environmental during remediation and construction activities.

3. Implementation of soil erosion, pollution, and sediment control measures in compliance with applicable laws and regulations.

4. Excavation, stockpiling, off-site transport, and disposal of the following:
   e. 0-4 feet bgs minimum across the entire Site (approximately 2,962 cubic yards)
   f. Excavation of DNAPL source area to the extent practicable and floor drain system to groundwater at approximately 8 feet bgs. (approximately 120 cubic yards).
   g. Removal of additional soil that exceeds Track 4 SCOs (RRUSCOs and PGSCOs) as needed to shallow groundwater via hot spot excavation to groundwater (approximately 8 cubic yards additional excavation at 19 Clay Street). The Track 4 SCOs are included in **Appendix P**.
   h. Excavation for the elevator pit to approximately 8 ft bgs.

5. Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work.

6. Collection and analysis of documentation and confirmation soil samples to document soil quality remaining after the remedial excavation is complete. Confirmation samples will be collected to confirm contaminants of concern exceeding the Protection of Groundwater SCOs have been excavated. If concentrations of contaminants of concern exceed the Protection of Groundwater SCOs, additional excavation or remediation may be required.

7. Continue the groundwater monitoring program for up to one year after the Interim Remedial Measures (IRM) to evaluate the remedy and the need for supplemental injections at the Site. The determination for additional injections will be made in conjunction with the NYSDEC and prior to building occupancy.

8. Removal and decommissioning of any encountered USTs and/or associated appurtenances (e.g., fill lines, vent line, and electrical conduit) and disposal off-site, in accordance with DER-10, 6 New York Codes, Rules, and Regulations (NYCRR) Part 613.9, NYSDEC Commissioner Policy 51 (CP-51), and other applicable NYSDEC UST closure requirements.

9. Appropriate off-Site disposal of all material removed from the Site in accordance with all Federal, State, and local rules and regulations for handling, transport, and disposal.

10. Import of materials to be used for backfill and cover in compliance with: (1) chemical limits and other specifications included in **Table 16**, (2) all Federal, State, and local rules and regulations for handling and transport of material.

11. Installation of an engineered composite cover system, consisting of the following to prevent human exposure to residual contaminated soil/fill remaining under the Site:
    c. A permanent composite cover system consisting of a 33-inch concrete building slab
    d. It is anticipated the Site will be covered completely by concrete, no impervious surfaces.

12. Installation of a vapor barrier beneath the slab.

13. Conversion of the temporary Soil Vapor Extraction (SVE) system installed as part of the IRM to a permanent structure housed within the building. Details of the IRM are included in Section 2.7.

14. Construction of an active SSDS below the building slab to maintain vacuum under the building slab, including a 12-inch ventilation layer.

15. Completion of a survey to document the extents of the permanent and temporary components of the Site cover system.

16. Recording of an Environmental Easement, including Institutional Controls, to prevent future exposure to any residual contamination remaining at the Site.

17. Publication of a Site Management Plan for long term management of residual contamination as required by the Environmental Easement, including plans for: (1) Institutional and Engineering Controls, (2) monitoring, (3) operation and maintenance and (4) reporting.

18. All responsibilities associated with the Remedial Action, including permitting requirements and pretreatment requirements, will be addressed in accordance with all applicable Federal, State, and local rules and regulations.

The Alternative II remedial plan is based on the data presented in the RI and the IRM. The requirements are described below.

3.2.1 On-Site Worker, Public Health, and Environmental Protection

A Site-specific CHASP would be enforced during excavation and foundation construction to protect on-site workers from accidents and acute and chronic exposures to the identified contaminated media. Public health would be protected by implementing and enforcing dust, odor, and organic vapor control and monitoring procedures included in the CAMP and in this RAWP. The CAMP would include continuous perimeter monitoring of dust and organic vapor using DustTrak aerosol monitors and PIDs capable of recording data and calculating 15-minute averages. Three CAMP stations will be used, as shown on **Figure 22**. A field engineer, scientist, or geologist would monitor Site perimeters for visible dust and odors. The environment would be protected by implementing and enforcing the appropriate soil erosion prevention measures.

3.2.2 Contaminated Fill and Soil Removal in Hot Spot Areas

Alternative II includes excavation of unsaturated soil that exceeds the NYCDEC RRUSCOs and/or the PGSCOs. The minimum excavation will be 4 feet across the site totaling approximately 3,000 cubic yards of soil. Additional hot spot excavation areas will be completed in the area of the source material on 29 Clay and in an area on 19 Clay to removal additional soil found to be over the PGSCOs. The hotspot areas will be excavated to groundwater. Saturated soils will not be excavated. SOE may be required if proper sloping techniques cannot be accommodated by the size of the site. See **Figure 18** for Hot Spot excavation areas.

3.2.3 UST System Removal

Although no subsurface metallic anomalies were identified during the RI, the potential exists for USTs to be encountered during Site remediation. Any USTs encountered during remedial excavation, would be decommissioned in accordance with applicable NYSDEC tank closure requirements, including DER-10 Section 5.5 and 6 NYCRR Part 613.9, and NYSDEC CP-51. The USTs and/or associated appurtenances would be registered and administratively closed with the NYSDEC Petroleum Bulk Storage (PBS) unit. All excavation areas would be screened and inspected for the presence of petroleum-impacts in the surrounding soils. Petroleum-impacted soil, if encountered, would be excavated, stockpiled separately, characterized, and disposed of off-site at a permitted disposal facility in accordance with applicable regulations. If the remedial or development excavation does not extend beyond the bottom of the encountered tank, additional confirmation soil samples would be collected as described below. Following removal of UST(s), affidavits of closure would be submitted to the FDNY, and PBS registration/de-registration applications would be submitted to NYSDEC.

3.2.4 Confirmation Soil Sampling

Confirmation soil samples would be collected from the excavation base at a frequency of one per 900 square feet from the base of the excavation. An estimated 22 bottom confirmation soil samples, five hot spot soil samples, and QA/QC samples, would be collected to confirm remedial performance and would be analyzed for the Part 375 list of VOCs, SVOCs, PCBs, pesticides/herbicides, cyanide, (metals including hexavalent and trivalent chromium), PFAS and 1,4-dioxane. See proposed confirmation sampling plan depicted on **Figure 18**.

In the event that unidentified USTs are discovered during Site remedial activities, if the remedial or development excavation does not extend beyond the bottom of the encountered tank, five documentation samples would be collected from each excavation and would consist of one sample per excavation sidewall and a sample from each excavation base. As necessary, post removal soil samples would be collected in accordance with the requirements of CP-51. Samples would be analyzed for CP-51 List VOCs and SVOCs and compared to the CP-51 Table 2 Soil Cleanup Levels for Gasoline Contaminated Soils or Table 3 Soil Cleanup Levels for Fuel Oil Contaminated Soil and the 6 NYCRR Part 375-6.8(a) Unrestricted Use SCOs, depending on the contents of the USTs.

3.2.5 Excavation Backfill

Approximately 150 cubic yards of clean backfill material would be required to restore the hotspot excavations to the development elevation needed for foundation construction. Any imported backfill shall comply with 6 NYCRR Part 375-6.7(d) and NYSDEC DER-10 Section 5.4(e), Table 5.4(e)10, and Appendix 5. Imported material for excavation backfill would consist of clean fill that meets the Unrestricted Use SCOs or other acceptable fill material such as virgin stone from a quarry or RCA. If RCA is imported to the Site, it would come from a NYSDEC-registered facility in compliance with 6 NYCRR Part 360 registration and permitting requirements for the period of RCA acquisition. RCA imported from compliant facilities would not require chemical testing, unless required by NYSDEC under its terms for operation of the facility. Imported RCA must be derived from recognizable and uncontaminated concrete (less than 10% by weight passing through a No. 80 sieve). RCA is not acceptable for, and would not be used as, Site cover or drainage material, and may not be used below the groundwater interface.

3.2.6 Sub-slab Depressurization System

To mitigate potential soil vapor intrusion, a SSDS consisting of horizontal solid and perforated piping within a gravel vapor collection layer has been designed and would be installed beneath the new building during implementation of the remedy. As shown on **Figure 20A**, the sub-slab portions of the system would consist of three separate subgrade loops. The SSDS would be constructed with 4-inch, Schedule 40 (SCH40) PVC header pipes and associated 4-inch, perforated vapor collection piping within a minimum 12-inch, gas permeable aggregate ventilation layer of ¾-inch gravel. Additionally, four interior vapor monitoring points (VMPs) will be installed.

Once through the building slab, each header line would transition to a 4-inch SCH40 steel riser equipped with a ball valve and sample port for monitoring and performance adjustments. The risers would then manifold below the first-floor ceiling into a 4-inch SCH40 steel combined riser pipe. During the completion of the construction of the building, the system will be completed with the steel combined riser pipe penetrating the first through seventh floor roof. All SSDS manifold piping will be clearly labeled.

The SSDS would be installed as an active system with an in-line fan capable of 150 standard cubic feet per minute (scfm) at 15 inches of water column (IWC). A gate valve, vacuum indicator, and sample port will be installed below the inline fan and a check valve will be installed above the inline fan. A vapor barrier will be placed over the SSDS as a green remedial element. Construction of the SSDS riser and installation of the in-line fan would be completed after issuance of the Certificate of Completion, in accordance with the SMP. Typical SSDS details are provided on **Figure 20B.**

3.2.7 Site Cover System

The permanent Site cover system would be constructed throughout the Site consisting of a concrete building slab and foundation elements. The Site cover system would ensure the protection of human health by preventing contact with residually contaminated Site soil. A map showing the survey results would be included in the FER and an SMP. The proposed site cover system is depicted on **Figure 21**.

3.2.8 Long Term Monitoring Well Placement

Permanent monitoring wells will be strategically placed in foundation of the new building to allow for ongoing monitoring of the effectiveness of the IRM groundwater injections. The monitoring wells will be available for additional injections if necessary. A map depicting the proposed monitoring well network is shown on **Figure 19**.

3.2.9 Green and Sustainable Remediation

Alternative II was evaluated with respect to green and sustainable remediation principles. An environmental footprint analysis was completed using *SiteWise*™ which is a NYSDEC accepted environmental footprint analysis calculator. Two components of the remedy were evaluated: site preparation and the remedy. The site preparation for the Track 4 remedy includes, a waste characterization investigation, and investigation-derived waste (IDW) disposal. Waste characterization sampling will be performed exclusively for the purposes of off-Site soil disposal in a manner suitable to receiving facilities and in conformance with applicable federal, state and local laws rules and regulations and facility-specific permits. For the purposes of completing the *SiteWise*™ analysis, we have assumed that the amount of contaminated soil to be characterized, excavated and disposed of for implementation of the remedy is approximately 3,000 cubic yards.

The footprint analysis determined that Track 4's environmental impact was significantly lower than the Track 1 alternative due to the reduced excavation volume requiring less time and resource consumption. The Track 4 footprint analysis results are as follows:

- GHG emissions = 272.31 metric tons
- Total energy used = 3,710 MMBTU
- Water consumed = 17,600,000 gallons
- Electricity used = 5.43 MWH
- Onsite NOx emissions = 0.0178 metric tons
- Onsite SOx emissions = 0.00419 metric tons
- Onsite PM10 emissions = 0.00248 metric tons
- Total NOx emissions = 1.09 metric tons
- Total SOx emissions = 0.781 metric tons
- Total PM10 emissions = 0.906 metric tons

3.3 EVALUATION OF REMEDIAL ALTERNATIVES

The goal of the remedy selection process is to select a remedy that is protective of human health and the environment taking into consideration the current, intended, and anticipated future use of the property. The remedy selection process begins by establishing RAOs for media in which chemical constituents were found in exceedance of applicable standards, criteria, and guidance values (SCGs). A remedy is then developed based on the following criteria:

- Protection of human health and the environment;
- Compliance with SCGs;
- Short-term effectiveness and impacts;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume of contaminated material;
- Implementability;
- Cost effectiveness;
- Community Acceptance;
- Green and Sustainable Remediation (including climate resiliency); and
- Land use.

The following is a detailed description of the alternatives analysis and remedy selection to address impacted media at the Site. As required, a minimum of two remedial alternatives (including a Track 1 scenario) are evaluated.

3.3.1 Protection of Public Health and the Environment

This criterion is an evaluation of the remedy's ability to protect public health and the environment, and an assessment of how risks posed through each existing or potential pathway of exposure are prevented, reduced, or controlled through the removal, treatment, and implementation of ECs or ICs. Protection of public health and the environment must be achieved for approved remedial actions. The two alternatives proposed will protect human health and the environment by eliminating or reducing levels of contamination, and/or reducing potential pathways of exposure.

Alternative 1 – The remedy would protect human health and the environment through removal of contaminants above unrestricted use standards. Potential post-remediation exposures to on-site residents from soil vapors would require the operation of a SSDS, groundwater use will be restricted at the Site until groundwater quality recovers.

Alternative 2 – The remedy would protect human health and the environment through removal of contaminants above Restricted Residential use standards. Alternative 2 will include a SSDS to mitigate vapor intrusion. Groundwater use will be restricted at the Site. The building will act as a site cover system. In addition, contaminant migration to environmental receptors will be restricted by the ECs/ICs.

3.3.2 Compliance with Standards, Criteria, and Guidelines (SCGs)

The proposed remedies for the Site would conform to relevant and/or applicable standards and soil cleanup objectives.

Alternative 1 demonstrates conformance by eliminating source areas through excavating contaminated soils/fill to approximately 40 feet bgs. Soils across the Site would meet UUSCOs.

Alternative 2 also demonstrates conformance by eliminating source areas through product recovery, and EZVI and ISCR injections completed under the IRM, excavating 4 feet of impacted soils, and excavating two hot spot areas to groundwater (source area and a hot spot area on 19 Clay). Soils across the Site would meet RRUSCOs.

The alternatives will be in compliance with applicable standards, criteria, and guidance by removing site sources of contamination to achieve the RAOs. Under both alternatives, protection of public health and the environment will be maintained by implementing a site-specific CHASP and CAMP. U.S. Occupational Safety and Health Administration (OSHA) requirements for on-site construction safety will be followed by site contractors performing work.

3.3.3 Short-Term Effectiveness and Permanence

Alternative 1 - In the short-term, there would be significantly increased truck traffic and operational noise levels associated with the construction of SOE, excavation and transport of impacted material excavated to achieve Track 1 standards, as well as the import of backfill material required to bring the Site to construction grade.

Disposal of the excavated soil and fill of approximately 24,771 cubic yards would require about 1,239 20-cubic-yard trips and importing material to backfill the excavation and raise Site grades to the development elevation would require about 1,250 20-cubic yard trips. Implementing the Alternative I concept would require approximately 18 months of effort.

Alternative 2 - A Track 4 remedial excavation would remove significantly less soil, would involve far less truck traffic and would occur for a shorter duration than Alternative 1. Disposal of the excavated soil and fill of approximately 3,000 cubic yards would only require approximately 150 20-cubic-fyard truck trips and importing material to backfill the excavation and raise Site grades to the development elevation would require up to about five 20-cy trips. Implementing the Alternative 2 concept would require approximately 6 months of effort.

The smaller excavation volume required for construction would generate less exposure to dust, odors, and potential organic vapor from the excavation and would have a shorter duration of construction-related noise, relative to Alternative 1.

Under both remedial alternatives, dust would be controlled by the on-site application of water spray as needed and the truck inspection station to avoid off-site tracking of soil. Engineering controls, such as slowing the pace of work, applying foam and/or dust suppressant, and/or covering portions of the excavation would be used to suppress odors/dust when required. Work would be modified or stopped according to the action levels defined in the CAMP. Short term impacts are less for Alternative 2.

3.3.4 Long-Term Effectiveness and Permanence

Alternative 1 - Under Remedial Alternative 1, all impacted soil would be removed from the Site resulting in an effective and permanent long-term remedy for soils at the Site. This alternative includes removal and offsite disposal of on-site impacted soil and thus permanently reduces the amount of impacted soil. Remedial Alternative 1 will continue to meet RAOs for soil in the future, providing a permanent long-term solution for

the Site. Long-term exposure to contaminated soil vapor would be prevented by the vapor barrier system. Groundwater remediation will achieve a bulk reduction in on-site groundwater contaminant concentrations. However, performance of the groundwater remedy would require long term periodic groundwater monitoring to evaluate if contaminant loading continues from the off-site source.

Alternative 2 - A Track 4 remedy would leave some residual contamination in place. Contaminated soil and groundwater will be addressed by injection under the IRM. The pathways will be reduced because the Track 4 remedy will eliminate potential exposure pathways to contaminated soi, groundwater, DNAPL, and soil vapor on-site. An EE and SMP will be put into place to establish use restrictions, maintain the site cover system and prohibit the ingestion of groundwater. The long-term effectiveness of this remedy similarly mitigates environmental risks and satisfies the objectives of the long-term effectiveness and permanence criterion.

3.3.5 Reduction of Toxicity, Mobility and Volume

This evaluation criterion assesses the remedial alternative's use of remedial technologies that permanently and significantly reduce toxicity, mobility, or volume of contaminants as their principal element. The following is the hierarchy of source removal and control measures that are to be used to remediate a Site, ranked from most preferable to least preferable: removal and/or treatment, containment, elimination of exposure and treatment of source at the point of exposure. It is preferred to use treatment or removal to reduce contaminants at a Site, reduce the total mass of toxic contaminants, cause irreversible reduction in contaminants mobility, or reduce the total volume of contaminated media.

Alternative 1 - Remedial Alternative 1 provides for a greater reduction of toxicity, mobility, and/or volume of contaminants in the soil and soil vapor by excavating a greater volume of material. Contaminants in on-site groundwater will be reduced in bulk by in-situ treatment within the IRM injection program. Reduction in groundwater contaminants will be achieved by the removal of DNAPL during the IRM.

Alternative 2 - Remedial Alternative 2 provides for a reduction of toxicity, mobility, and volume of contaminants in soil through removal of fill above RRUSCOs and PGSCOs above the groundwater table. Reduction in groundwater contaminants from the Site will also be achieved by the removal of DNAPL and the proposed injection program. Upward mobility of soil vapor contaminants would be reduced by the removal of contaminated soil and the installation of vapor barrier, the SSDS, and the SVE system for new construction and maintaining the ECs/ICs.

3.3.6 Implementability

This evaluation criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation, including technical feasibility of construction and operation, reliability of the selected technology, ease of undertaking remedial action, monitoring considerations, administrative feasibility (e.g., obtaining permits for remedial activities), and availability of services and materials.

Alternative 1 – The Track 1 remedy would consist primarily of excavation and backfilling with an excavator. The implementability of this remedy is low due to the challenging nature of excavating to 40 feet bgs with groundwater at 8 feet. This alternative is not feasible.

Alternative 2 – The technical feasibility of implementing the Track 4 remedy is much greater than Alternative 1. Alternative 2 requires an excavation depth of 4 feet below grade across most of the Site. There will be two additional hot spot excavation areas that will extend to the groundwater interface. This alternative would consist mostly of excavation and backfilling with standard bucket excavators, performance of DNAPL recovery and injections, installation of an active SVE and SSDS, and construction of the Site cover system. The implementability of this remedy is high due to the availability of local contractors, personnel, and suitable equipment. This alternative is considered feasible.

3.3.7 Cost Effectiveness

This evaluation criterion addresses the cost of alternatives, including capital costs (such as construction costs, equipment costs, disposal costs, and engineering expenses) and Site management costs (costs incurred after remedial construction is complete) necessary to meet the continued effectiveness of a remedial action.

Alternative 1 – Based on the assumptions detailed for Alternative 1, the estimated remediation cost of a Track 1 Cleanup is about $18,646,690. This Alternative is not considered a cost-effective option because it requires excavation to approximately 40 feet bgs.

Alternative 2 – Based on the assumptions detailed for Alternative 2, the estimated cost of remediation for the Track 4 Cleanup is $3,224,000.

A breakdown of estimates costs is provided in **Appendix Q** and **Tables 17A** and **17B**.

3.3.8 Community Acceptance

This evaluation criterion addresses community opinion and support for the remedial action. This RAWP will undergo a 45-day public comment period to provide for community input on the remedy. Alternative 2 is expected to be preferable to the community, given that it would have lesser community impacts.

3.3.9 Compatibility with Land Use

The proposed redevelopment of the Site is compatible with its current zoning. Following remediation under either Alternative 1 or Alternative 2, the Site will meet the objectives for its planned mix-use residential/commercial use.

3.3.10 Green and Sustainable Remediation

Each alternative was evaluated with respect to the green and sustainable remediation principles. An environmental footprint analysis was conducted using the SiteWise™ footprint analysis tool. The footprint calculator provides an evaluation of the alternative's impact related to greenhouse gas emissions, total energy usage, water consumption, electrical usage, onsite and offsite emissions of nitrous oxide, sulfur oxides, and particulate matter, and fatality and injury risks. Details of the assumptions used for each alternative and its components are outlined in **Appendix E**. Using the SiteWise™ tool, Alternative 2 was determined to have the lowest environmental impact. Alternative 2's use of smaller excavation volume compared to Alternatives 1 significantly reduced the overall greenhouse gas and

air pollutant emissions as well as the total energy consumption and risks for fatality and injury. The summary of the green and sustainable remediation evaluation is presented in the table below.

Green Sustainable Remediation Evaluation Summary

Evaluation Criterion	Alternative 1	Alternative 2
GHG Emissions (metric ton)	1,733.74	272.31
Total energy Used (MMBTU)	29,500	3,710
Water Consumption (gallons)	17,700,000	17,600,000
Electricity Usage (MWH)	5.43	5.43
Onsite NO_x Emissions (metric ton)	0.301	0.0178
Onsite SO_x Emissions (metric ton)	0.0705	0.00419
Onsite PM_{10} Emissions (metric ton)	0.0267	0.00248
Total NO_x Emissions (metric ton)	6.76	1.09
Total SO_x Emissions (metric ton)	6.03	0.781
Total PM_{10} Emissions (metric ton)	8.03	0.906
Accident Risk Fatality	0.0024	0.000261
Accident Risk Injury	0.445	0.0529

3.4 SELECTION OF THE PREFERRED REMEDY

Utilizing the evaluation criteria, both Alternatives would be protective of human health and the environment and meet the remedy section criteria. Alternative 2 achieves all the remedial action goals established for the redevelopment project, effectively reduces containment mobility, and is effective in the reduction of contaminant toxicity and volume. Alternative 2 will require the implementation of ICs and ECs, however these controls will be implementable through an SMP and EE. Alternative 2 is the selected remedy.

3.4.1 Zoning

The proposed future use of the Site will be constructed with a slab-on-grade mixed-use commercial and residential building. The current zoning designation is M1-2/R6 MX-8. The proposed use is consistent with the existing zoning for the property. The building will cover the entirety of the site boundary. The first floor will consist of commercial/retail space. Floors 2 through 7 will have residential dwelling units and terraces. The preferred remedy will comply with applicable zoning.

3.4.2 Applicable Comprehensive Community Master Plans or Land Use Plans

The proposed redevelopment project and selected remedy are believed to be consistent with current land use plans. The preferred remedy will be in full compliance with any applicable land use plan.

3.4.3 Surrounding Property Uses

The area surrounding the Site consists of a mix of residential and commercial properties, parkland, and asphalt parking lots. An evaluation of the United States Geological Survey (USGS) 7-½ Minute Topographic Map containing the property indicated there are three sensitive receptors present within a 0.125-mile radius of the Subject Property. The three sensitive receptors are Greenpoint Playground, Greenpoint Landing Esplanade, and Newtown Barge Playground. The proposed remedy will not interfere with surrounding property uses and considers the short term effects to neighboring properties.

3.4.4 Citizen Participation

A certification of mailing will be sent by the Volunteer to the NYSDEC project manager following the distribution of all Fact Sheets and notices that includes: (1) certification that the Fact Sheets were mailed, (2) the date they were mailed; (3) a copy of the Fact Sheet, (4) a list of recipients (contact list); and (5) a statement that the repository was inspected on (specific date) and that it contained all of the applicable project documents.

No changes will be made to approved Fact Sheets authorized for release by NYSDEC without written consent of the NYSDEC. The Citizen Participation Plan prepared for this project is available on DEC locator and at document repositories listed below**.**

Brooklyn Public Library - Greenpoint Branch
107 Norman Ave. at Leonard St.
Brooklyn, NY 11222
(718) 389-4394

Brooklyn Community Board 1
435 Graham Avenue,
Brooklyn, NY 11211
(718) 389-0009
bk01@cb.nyc.gov

3.4.5 Environmental Justice

The Site is located within a potential environmental justice area. The NYSDEC defines a potential environmental justice area as a "minority or low-income community that may bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies."

Environmental justice means the fair treatment and meaningful involvement of all people regardless of race, color, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.
Since the goal of the remedy will achieve the applicable SCOs and will remove contaminated materials from the community, the remedy poses no environmental justice concerns.

3.4.6 Proximity to Natural Resources

The proposed remedy will not negatively impact natural resources.

3.4.7 Off-Site Groundwater Impacts

The proposed remedy will improve potential offsite groundwater impacts by removing contaminated soil. The proposed remedy will also eliminate source areas through product recovery, and EZVI and ISCR injections completed under the IRM. The proposed remedy will not affect natural resources other than to potentially improve the quality of groundwater on a local basis.

3.4.8 Proximity to Floodplains

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), the Site is not located within a flood plain.

3.4.9 Current Institutional Controls

There are no known Institutional Controls on the Site.

3.5 SUMMARY OF SELECTED REMEDIAL ACTIONS

Track 4 Remedy would include the following tasks:

1. Green remediation components are as follows:

    - Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
    - Reducing direct and indirect greenhouse gas and other emissions;
    - Increasing energy efficiency and minimizing use of non-renewable energy;
    - Conserving and efficiently managing resources and materials;
    - Reducing waste, increasing recycling, and increasing reuse of materials that would otherwise be considered a waste;
    - Fostering green and healthy communities and working landscapes that balance ecological, economic, and social goals; and
    - Integrating the remedy with the end-use where possible and encouraging green and sustainable re-development.
    - Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this site, any future on-site buildings shall be constructed, at a minimum, to meet the 2020 Energy Conservation Construction Code of New York (or most recent edition) to improve energy efficiency as an element of construction.

As part of the remedial program, to evaluate the remedial alternatives with respect to green and sustainable remediation principles, a *SiteWise*™ environmental footprint analysis has been completed. Water consumption, greenhouse gas emissions, renewable and non-renewable energy use, waste reduction and material use for the proposed remedy have been estimated, and goals for the project related to these green and sustainable remediation metrics, as well as for minimizing community impacts, protecting habitats and natural and cultural resources, and promoting environmental justice, will be incorporated into the remedial program, as appropriate. The project will include detailed requirements to achieve the green and sustainable remediation goals. Further, progress with respect to green and sustainable remediation metrics that have been established by the *SiteWise*™ model will be tracked during implementation of the remedial action and reported in the FER, including a comparison to the goals established during the remedial program.

Additionally, the remedial program will include a climate change vulnerability assessment, to evaluate the impact of climate change on the project site and the proposed remedy. Potential vulnerabilities associated with extreme weather events (e.g., hurricanes, lightning, heat stress and drought), flooding, and sea level rise will be identified, and the remedial program will incorporate measures to minimize the impact of climate change on potential identified vulnerabilities.

2. Development and implementation of a Construction Health and Safety Plan (CHASP) and Community Air Monitoring Plan (CAMP) for the protection of on-site workers, community/residents, and the environmental during remediation and construction activities.

3. Implementation of soil erosion, pollution, and sediment control measures in compliance with applicable laws and regulations.

4. Excavation, stockpiling, off-site transport, and disposal of the following:
   i. 0-4 feet bgs minimum across the entire Site (approximately 2,962 cubic yards)
   j. Excavation of DNAPL source area to the extent practicable and floor drain system to groundwater at approximately 8 feet bgs. (approximately 120 cubic yards).
   k. Removal of additional soil that exceeds Track 4 SCOs (RRUSCOs and PGSCOs) as needed to shallow groundwater via hot spot excavation to groundwater (approximately 8 cubic yards additional excavation at 19 Clay Street). The Track 4 SCOs are included in **Appendix P**.
   l. Excavation for the elevator pit to approximately 8 ft bgs.

5. Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work.

6. Collection and analysis of documentation and confirmation soil samples to document soil quality remaining after the remedial excavation is complete. Confirmation samples will be collected to confirm contaminants of concern exceeding the Protection of Groundwater SCOs have been excavated. If concentrations of contaminants of concern exceed the Protection of Groundwater SCOs, additional excavation or remediation may be required.

7. Continue the groundwater monitoring program for up to one year after the Interim Remedial Measures (IRM) to evaluate the remedy and the need for supplemental injections at the Site. The determination for additional injections will be made in conjunction with the NYSDEC and prior to building occupancy.

8. Removal and decommissioning of any encountered USTs and/or associated appurtenances (e.g., fill lines, vent line, and electrical conduit) and disposal off-site, in accordance with DER-10, 6 New York Codes, Rules, and Regulations (NYCRR) Part 613.9, NYSDEC Commissioner Policy 51 (CP-51), and other applicable NYSDEC UST closure requirements.

9. Appropriate off-Site disposal of all material removed from the Site in accordance with all Federal, State, and local rules and regulations for handling, transport, and disposal.

10. Import of materials to be used for backfill and cover in compliance with: (1) chemical limits and other specifications included in **Table 16**, (2) all Federal, State, and local rules and regulations for handling and transport of material.

11. Installation of an engineered composite cover system, consisting of the following to prevent human exposure to residual contaminated soil/fill remaining under the Site:
    e. A permanent composite cover system consisting of a 33-inch concrete building slab
    f. It is anticipated the Site will be covered completely by concrete, no impervious surfaces.

12. Installation of a vapor barrier beneath the slab.

13. Conversion of the temporary Soil Vapor Extraction (SVE) system installed as part of the IRM to a permanent structure housed within the building. Details of the IRM are included in Section 2.7.

14. Construction of an active SSDS below the building slab to maintain vacuum under the building slab, including a 12-inch ventilation layer.

15. Completion of a survey to document the extents of the permanent and temporary components of the Site cover system.

16. Recording of an Environmental Easement, including Institutional Controls, to prevent future exposure to any residual contamination remaining at the Site.

17. Publication of a Site Management Plan for long term management of residual contamination as required by the Environmental Easement, including plans for: (1) Institutional and Engineering Controls, (2) monitoring, (3) operation and maintenance and (4) reporting.

18. All responsibilities associated with the Remedial Action, including permitting requirements and pretreatment requirements, will be addressed in accordance with all applicable Federal, State, and local rules and regulations.

Remedial activities will be performed at the Site in accordance with this NYSDEC-approved RAWP and the NYSDEC-issued Decision Document. All deviations from the RAWP and/or Decision Document will be promptly reported to NYSDEC for approval and fully explained in the FER.

4.0 REMEDIAL ACTION PROGRAM

The remediation of the site is subject to various guidance documents and rules and regulations from various departments within the NYSDEC and NYSDOH and others.

4.1 GOVERNING DOCUMENTS

The primary documents governing the remedial action are summarized in this section.

4.1.1 Standards, Criteria and Guidance (SCGs)

The following standards, criteria, and guidance are typically applicable to Remedial Action projects in New York State, and will be consulted and adhered to as applicable:

- 6 NYCRR Part 364 - NYS Waste Transporter Permits
- 6 NYCRR Part 360 - NYS Solid Waste Management Requirements
- 6 NYCRR Part 371 - Identification and Listing of Hazardous Wastes
- 6 NYCRR Part 372 - Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities
- 6 NYCRR Subpart 374-2 - Standards for the Management of Used Oil
- 6 NYCRR Part 375 - Environmental Remediation Programs
- 6 NYCRR Part 376 - Land Disposal Restrictions
- 6 NYCRR Part 613 - Petroleum Bulk Storage
- 6 NYCRR Parts 700-706 – Classes and Standards of Quality and Purity
- 6 NYCRR Part 750 - State Pollutant Discharge Elimination System (SPDES) Permits
- 29 CFR Part 1910.120 - Hazardous Waste Operations and Emergency Response
- 40 CFR Part 144 - Underground Injection Control Program
- CP-43 - Commissioner Policy on Groundwater Monitoring Well Decommissioning (December 2009)
- CP-49 – Climate Change and DEC Action (2022)
- CP-51- Soil Cleanup Guidance (2010)
- CP-60 – Screening and Assessment of Contaminated Sediment (2014)
- DER-2 - Making Changes to Selected Remedies (April 2008)
- DER-4 – Management of Coal Tar Waste & Coal Tar Contaminated Soils from Manufactured Gas Plants (2001)
- DER-10 – Technical Guidance for Site Investigation and Remediation (2010)
- DER-13 – Strategy for Evaluating Soil Vapor Intrusion at Remedial Sites in New York (2006)
- DER-23 – Citizen Participation Handbook for Remedial Programs (2010)
- DER-31 – Green Remediation (2010)
- DER-32 – Brownfield Cleanup Program Applications and Agreements (2017)
- DER-33 – Guide to Drafting and Recording Institutional Controls (2010)
- TAGM 3028 - "Contained In" Criteria for Environmental Media: Soil Action Levels (August 1997)
- TOGS 1.1.1 - Ambient Water Quality Standards & Guidance Values and Groundwater Effluent Limitations (1998, Addenda 2000, 2004 and 2023)
- TOGS 1.3.8 - New Discharges to Publicly Owned Treatment Works (1994)
- TOGS 2.1.2 - Underground Injection/Recirculation (UIR) at Groundwater Remediation Sites (1990)

- New York State Standards and Specifications for Erosion and Sediment Control (2016)
- DAR-1 (formerly Air Guide 1) - Guidelines for the Control of Toxic Ambient Air Contaminants (1997)
- U.S. EPA OSWER Directive 9200.4-17 - Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites (December 1997)
- New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan
- NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (2006)
- New York State Climate Act (2019)
- NYSDEC Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (2023)

4.1.2 Green and Sustainable Remediation and Climate Resiliency

According to NYSDEC DER-31 Green Remediation guidance document, green Remediation approaches should be considered during site remediation. GZA, the volunteer and its subcontractors plan to incorporate sustainable practices with the goal to reduce the environmental footprint of the remediation efforts. In accordance with ASTM E2893-16e1 the project GSR goals included the following:

- To minimize total energy use and maximize use of renewable energy,
- To minimize air pollutants and greenhouse gas emissions,
- To minimize water, use and impact to water resources,
- To reduce, reuse and recycle materials and waste; and
- To protect land and ecosystems

GZA plans to incorporate best management practices to lower the environmental footprint during the remediation phase of the project. GZA, the volunteer, and the subcontractors will incorporate the following practicable measures during the implementation of the remedy:

1. Limited the use and idling of generators, excavation equipment, and vehicles to reduce emissions.
2. Minimized truck travel for disposal of waste generated during the implementation of the remedy by selecting local disposal facilities.
3. Managed onsite resources and materials efficiently.
4. Use local subcontractors to minimize vehicle emissions during commute.
5. Requested that subcontractors use clean diesel equipment to reduce emissions.
6. Requested project staff and subcontractors to use public transportation to the extent practicable.
7. Reducing waste, increasing recycling, and increasing reuse of materials that otherwise be considered waste.
8. Implemented an in-situ remediation option for groundwater rather than an extraction and treatment option.

As required a Climate screen checklist and an environmental footprint analysis has been completed for each alternative and are attached in **Appendix E**.

4.1.3 Site-Specific Construction Health & Safety Plan (HASP)

All remedial work performed under this plan will be in full compliance with governmental requirements, including Site and worker safety requirements mandated by OSHA.

During remedial activities, a representative of GZA will be present for additional health and safety observation. The Volunteer and GZA have authority to shut the Site down, if necessary. Remedial work performed under this work plan will follow applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and Hazardous Waste Operations and Emergency Response (HAZWOPER) requirements. Confined space entry, if any, will comply with OSHA requirements and industry standards and will address potential health and safety risks. The parties performing the remedial construction work will document that performance of the work follows the HASP and applicable laws and regulations. The HASP pertains to remedial and invasive work performed at the Site until the issuance of the notice of completion (NOC). The HASP is included as **Appendix D**.

All field personnel involved in remedial activities will participate in training required under 29 CFR 1910.120, including 40-hour hazardous waste operator training and annual 8-hour refresher training. A designated Site Safety Officer will be responsible for maintaining workers' training records.

Personnel entering any remediation work area (exclusion zone) will be trained in the provisions of the HASP and be required to sign a HASP acknowledgment form. Site-specific training will be provided for field personnel and additional safety training may be added depending on the tasks performed. Emergency telephone numbers will be posted at the Site location before any remedial work begins. A safety meeting will be conducted before each shift begins. Topics to be discussed include task hazards and protective measures (physical, chemical, environmental); emergency procedures; PPE levels and other relevant safety topics. Meetings will be documented in a logbook or other specific form.

An emergency contact sheet with names and phone numbers is included in the HASP. That document will define the specific project contacts for use in case of emergency. The Site Safety Coordinator name and resume will be provided to NYSDEC prior to the start of remedial construction. A full emergency contact list will be provided when the appropriate contractors and vendors are selected.

A hospital route map is included as **Figure 25**. The hospital route map shows the directions to the nearest emergency room, New York University Langone Health located at 570 1st Avenue, New York, New York.

4.1.4 Quality Assurance Project Plan (QAPP)

A QAPP has been prepared in accordance with DER-10 that describes the quality control components and will ensure the proposed remedy accomplishes the remedial action objectives. The QAPP has been included as **Appendix I**.

4.1.5 Construction Quality Assurance Plan (CQAP)

A Construction Quality Assurance Plan (CQAP) has been prepared that describes the quality control components that will ensure that the selected remedial alternative accomplishes the remedial goals and is completed in accordance with the design specifications. Because portions of the remedy will be accomplished concurrently with building construction, the contractor and construction manager will have the primary responsibility to provide

construction quality. A list of engineering personnel involved with the implementation of the CQAP and procedures that will be carried out by the remedial engineering team are listed in Section 4.2.1. The CQAP is provided as **Appendix J**.

4.1.6 Soil/Materials Management Plan (SMMP)

A Soils/Materials Management Plan (SMMP) has been prepared that includes detailed plans for managing soils/materials that are disturbed at the Site, including excavation, handling, storage, transport, and disposal. The SMMP also includes controls that will be applied to these efforts to ensure conformance with all applicable federal, state, and local laws and regulations. The SMMP is included as Section 5.4 in this RAWP and appended as **Appendix N**.

4.1.7 Erosion and Sediment Control Plan (ESCP)

Erosion and sediment controls will be implemented as necessary in conformance with requirements presented in the New York State Guidelines for Urban Erosion and Sediment Control. Best management practices for soil erosion and sediment control will be selected to minimize erosion and sedimentation offsite from the onset of remediation to the completion of development.. A Stormwater Pollution Prevention Plan (SWPPP) is not necessary because the project will disturb less than 20,000 square feet.

4.1.8 Community Air Monitoring Plan (CAMP)

The CAMP is provided in **Appendix G**.

4.1.9 Contractors Site Operations Plan (SOP)

The Remedial Engineer has reviewed all plans and submittals for this remedial project (including those listed above and contractor and sub-contractor document submittals) and confirms that they comply with this RAWP. The Remedial Engineer is responsible to ensure that all later document submittals for this remedial project, including contractor and sub-contractor document submittals, comply with this RAWP. All remedial documents will be submitted to NYSDEC and NYSDOH in a timely manner and prior to the start of work.

4.1.10 Citizen Participation Plan

A certification of mailing will be sent to the NYSDEC project manager following the distribution of all Fact Sheets and notices that includes: (1) certification that the Fact Sheets were mailed, (2) the date they were mailed; (3) a copy of the Fact Sheet, (4) a list of recipients (contact list); and (5) a statement that the repository was inspected on (specific date) and that it contained all of applicable project documents.

No changes will be made to approved Fact Sheets authorized for release by NYSDEC without written consent of the NYSDEC. No other information, such as brochures and flyers, will be included with the Fact Sheet mailing. The approved Citizen Participation Plan for this project is attached in **Appendix K**. Document repositories have been established at the following locations and contain all applicable project documents:

Brooklyn Public Library - Greenpoint Branch

107 Norman Ave. at Leonard St.
Brooklyn, NY 11222
(718) 389-4394

Brooklyn Community Board 1
435 Graham Avenue,
Brooklyn, NY 11211
(718) 389-0009
bk01@cb.nyc.gov

In addition, an electronic repository can be accessed via DEC Info Locator at the following link: https://extapps.dec.ny.gov/data/DecDocs/C224390/

4.2 GENERAL REMEDIAL CONSTRUCTION INFORMATION

4.2.1 Project Organization

Principal personnel who will participate in the remedial action include staff of GZA GeoEnvironmental as the Environmental Consultant. Subcontractors will be identified upon acceptance of the RAWP:
Principal personnel who will participate in the remedial action include the following:

- Remedial Engineer – Stephen M. Kline, PE
- Qualified Environmental Professional – Victoria Whelan PG
- Senior Project Manager – Mark Hutson PG
- Project Manager – Jackson Bogach, PE
- Volunteer: Clay Properties, LLC
- Architect of Record: INOA Architecture
- Environmental Consultant: GZA GeoEnvironmental Inc.
- General Contractor: TBD
- Transport and Disposal Contractor: TBD

An organization chart is included in **Figure 23**. Resumes of key personnel are included in **Appendix H**.

4.2.2 Remedial Engineer

The Remedial Engineer for this project will be Stephen M. Kline, P.E. The Remedial Engineer is a registered professional engineer licensed by the State of New York. The Remedial Engineer will have primary direct responsibility for implementation of the remedial program for the Clay Properties LLC Site (NYSDEC BCA Site No. C224390). The Remedial Engineer will certify in the Final Engineering Report (FER) that the remedial activities were observed by qualified environmental professionals under his supervision and that the remediation requirements set forth in the IRMWP, RAWP and other relevant provisions of ECL 27-1419 have been achieved in conformance with that Plan. Other Remedial Engineer certification requirements are listed later in this RAWP.

The Remedial Engineer will coordinate the work of other contractors and subcontractors involved in the remedial construction, including, air monitoring and emergency spill response services. The Remedial Engineer, or their designated representative, will be responsible for appropriate communication with NYSDEC and NYSDOH.

The Remedial Engineer will review pre-remedial plans submitted by contractors for compliance with this RAWP and will certify compliance in the FER. The Remedial Engineer will provide the certifications listed in **Section 10.1** in the FER.

4.2.3 Remedial Action Construction Schedule

A project schedule is included as **Appendix L**.

4.2.4 Work Hours

The hours of operation of remedial construction will conform to the NYC Department of Buildings (DOB) construction code requirements or according to specific variances issued by that agency. NYSDEC will be notified by the Volunteer of any variances issued by DOB. NYSDEC reserves the right to deny alternate remedial construction hours.

4.2.5 Site Security

Security measures including an 8-foot-high construction fence, and 24-hour security will minimize potential exposure to site trespassers. The fence will be maintained as required and secured at the end of each field day.

4.2.6 Traffic Control

Drivers of trucks leaving the Site with soil/fill will be instructed to proceed without stopping in the vicinity of the Site to prevent neighborhood impacts. Drivers of trucks will follow the New York City Department of Transportation (NYC DOT) Truck Route Network as defined in Section 4-13 (pdf) of the New York City Traffic Rules.

4.2.7 Contingency Plan

The General Contractor will provide contingency plans that identify key operational decision points and the expected completion date of each activity. The contingency plan will identify the critical path and establish when a contingency will be implemented.

4.2.8 Worker Training and Monitoring

Site workers will be required, at a minimum, to have completed 29 CFR 1910.120 HAZWOPER, Site safety training, and medical monitoring for Site workers.

4.2.9 Agency Approvals

The Volunteer has addressed all SEQRA requirements for this Site. All permits or government approvals required for remedial construction have been, or will be, obtained prior to the start of remedial construction.

The planned end use for the Site is in conformance with the current zoning for the property as determined by New York City Department of City Planning. Zoning designations will be provided to the NYSDEC prior to issuance of a COC. A Certificate of Completion will not be issued for the project unless conformance with zoning designation is demonstrated.

This list includes a citation of the law, statute, or code to be complied with, the originating agency, and a contact name and phone number in that agency. This list will be updated in the Final Engineering Report.

All planned remedial or construction work in regulated wetlands and adjacent areas will be specifically approved by the NYSDEC Division of Natural Resources to ensure that it meets the requirements for substantive compliance with those regulations prior to the start of construction. Nothing in the approved RAWP or its approval by NYSDEC should be construed as an approval for this purpose.

4.2.10 NYSDEC BCP Signage

A project sign is not required for this Site.

4.2.11 Pre-Construction Meeting with NYSDEC

A pre-construction meeting with the NYSDEC will take place prior to the start of any major construction activities or as required by the NYSDEC.

4.2.12 Emergency Contact Information

An emergency contact sheet with names and phone numbers is included in the HASP. That document will define the specific project contacts for use by NYSDEC and NYSDOH in case of a day or night emergency.

4.2.13 Remedial Action Costs

The total estimated cost of the Remedial Action is approximately $3.2 million. An itemized and detailed summary of estimated costs for all remedial activity is attached as **Appendix Q** and **Table 17B**. This will be revised based on actual costs and submitted as an Appendix to the Final Engineering Report.

4.3 SITE PREPARATION

The following sections describe the Site preparation activities associated with the preferred remedy for the Site.

4.3.1 Mobilization

Mobilization will be conducted as necessary for each phase of work at the Site. Mobilization includes field personnel orientation, equipment mobilization (including securing sampling, dust control and decontamination equipment needed for the remedial action), marking/staking sampling locations and utility mark-outs. Each field team member will attend an orientation meeting to become familiar with the general operation of the Site, health and safety requirements, and field procedures.

4.3.2 Monitoring Well / Vapor Probe Decommissioning

Existing groundwater monitoring wells will either be protected during remediation and development for use in post-remedial monitoring or will be properly decommissioned in accordance with NYSDEC Commissioners Policy CP-43. The only exception to this is if the full length of the well is to be excavated during remediation. Similarly, existing soil vapor probes will be properly decommissioned unless they are to be fully removed during remediation or used for post-remedial monitoring.

4.3.3 Erosion and Sedimentation Controls

Soil erosion and sediment control measures for management of storm water will be installed in accordance with the New York Guidelines for Urban Erosion and Sediment Control. Straw/haybales, coir wattles and/or silt fence will be placed by the remedial contractor at locations surrounding excavation areas and within the perimeter fencing as needed, to control stormwater runoff and surface water from exiting the excavation. These control measures will be installed prior to initiating the soil excavation.

4.3.4 Stabilized Construction Entrance(s)

Stabilized construction entrances will be installed at points of entry and egress from the Site to prevent the tracking of sediment onto public roadways. Construction traffic must enter and exit the Site at the stabilized entrances. Measures will be taken to minimize construction and Site vehicles coming into contact with contaminated soils. If construction or Site vehicles come into contact with contaminated soils, steps will be taken so that vehicles departing the Site will not track soil, fill or debris off-Site onto roadways. Such actions may include use of water, cleaned asphalt or concrete roads, use of stone or other aggregate-based egress paths between the truck inspection station and the property exit, and placement of additional aggregate atop filter fabric to maintain a minimum thickness. Periodic inspections and needed maintenance of entrances will be performed after substantial rainfall events. Adjacent roadways will be kept clean of project related soils, fill and debris.

4.3.5 Utility Marker and Easements Layout

The Volunteer and its contractors are solely responsible for the identification of utilities that might be affected by work under the RAWP and implementation of all required, appropriate, or necessary health and safety measures during performance of work under this RAWP. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this RAWP. The Volunteer and its contractors must obtain any local, State or Federal permits or approvals pertinent to such work that may be required to perform work under this RAWP. Approval of this RAWP by NYSDEC does not constitute satisfaction of these requirements.

The presence of utilities and easements on the Site has been investigated by the Remedial Engineer. It has been determined that no risk or impediment to the planned work under this RAWP is posed by utilities or easements on the Site.

4.3.6 Sheeting and Shoring

Appropriate management of structural stability of on-Site or off-Site structures during on-Site activities include excavation is the sole responsibility of the Volunteer and its contractors. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this RAWP. The Volunteer and its contractors must obtain any local, State or Federal permits or approvals that may be required to perform work under this RAWP. Further, the Volunteer and its contractors are solely responsible for the implementation of all required, appropriate, or necessary health and safety measures during performance of work under the approved RAWP.

4.3.7 Equipment and Material Staging

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations. The location of proposed equipment and material staging areas, truck inspection station, stockpile areas, and other pertinent remedial management features will remain on-Site. It is anticipated that equipment and material staging areas and stockpile areas will be temporary and placed in the immediate vicinity of the work area(s).

4.3.8 Decontamination Area

An outbound-truck inspection station will be set up as decontamination area close to the Site exit. Before exiting the Site, trucks will be required to stop at the truck inspection station and will be examined for evidence of contaminated soil on the undercarriage, body, and wheels and that the material is covered with tarp prior to leaving the Site. In addition, outbound-truck inspection and soil removal will also be performed close to the loading area so that removed soil can be managed within the area of origin and limit soiling on-Site roadways. Brooms, shovels, and potable water will be utilized for the removal of soil from vehicles and equipment, as necessary.

4.3.9 Site Fencing

A construction fence will be erected around the entire property as required by DOB. The fence will be maintained as required and secured at the end of each field day.

4.3.10 Odor, Dust, and Noise Control

Measures to limit off-Site odor and dust nuisances will be taken. Dust will be managed by application of physical covers, by limiting the drop height of soil material, by cleaning of equipment leaving the Site, and by water sprays. Odors will be controlled by limiting the area of open excavations. If nuisance odors are observed or reported physical cover and spray foams will be employed. As described in the SMMP (see **Appendix N**), GZA will closely monitor the presence of odors, dust, and other nuisances during the RAWP.

Odor controls will be employed to prevent on- and off-Site odor nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) use

of odor suppressants to cover exposed odorous soils. If nuisance odors develop and cannot otherwise be controlled, additional means to eliminate them will include: (d) direct load-out of soils to trucks for off-Site disposal; and (e) use of chemical odorant suppressants in spray or misting systems. The proposed odor suppressant for this Site is BioSolve® Pinkwater. The Contractor who uses BioSolve® Pinkwater for odor suppression will fully understand the manufacturer's specifications prior to usage.

This odor control plan is capable of controlling emissions of nuisance odors. If nuisance odors are identified, the source of odors will be identified and corrected. If necessary, to identify or correct a nuisance odor source, work will be temporarily halted and will not resume until such nuisance odors have been identified and abated. NYSDEC will be notified of all odor complaint events on a daily basis in the Daily Reports or via email within 24 hours of the event.

4.3.11 Demobilization

Demobilization will include:

- As necessary, restoration of temporary access areas and areas that may have been disturbed to accommodate support areas (e.g., staging areas, decontamination areas, storage areas, temporary water management areas, and access area);
- Removal of sediment from erosion control measures and truck wash and disposal of materials in accordance with applicable laws and regulations;
- Equipment decontamination; and
- General refuse disposal.

Equipment will be decontaminated and demobilized at the completion of all field activities. Investigation equipment and large equipment (e.g., soil excavators) will be washed at the truck inspection station, as necessary. In addition, all investigation and remediation derived waste will be appropriately disposed.

4.4 REPORTING

All daily and monthly Reports will be included in the FER.

4.4.1 Daily Reports

Daily reports will be submitted to NYSDEC and NYSDOH Project Managers by noon of each day following the reporting period and will include:

- An update of progress made during the reporting day;
- Locations of work and quantities of material imported and exported from the Site;
- References to alpha-numeric map for Site activities;
- A summary of any and all complaints with relevant details (names, phone numbers);
- A summary of CAMP finding, including excursions;
- Photographs of site activities;
- An explanation of notable Site conditions.

Daily reports are not intended to be the mode of communication for notification to the NYSDEC of emergencies (accident, spill), requests for changes to the RAWP or other sensitive or time critical information. However, such

conditions must also be included in the daily reports. Emergency conditions and changes to the RAWP will be addressed directly to NYSDEC Project Manager via personal communication.

Daily Reports will include a description of daily activities keyed to an alpha-numeric map for the Site that identifies work areas. These reports will include a summary of CAMP results, odor and dust excursions and corrective actions, and all complaints received from the public.

A Site map that shows a predefined alpha-numeric grid for use in identifying locations described in reports submitted to NYSDEC is attached in **Figure 16**. The NYSDEC assigned Site number will appear on all reports.

4.4.2 Monthly Reports

Monthly reports will be submitted to NYSDEC and NYSDOH Project Managers by the 10th day of each month following the reporting period and will include:

- Activities relative to the Site during the previous reporting period and those anticipated for the next reporting period, including a quantitative presentation of work performed (e.g., tons/cubic yards of material exported and imported, etc.);
- Description of approved activity modifications, including changes of work scope and/or schedule;
- Sampling results received following internal data review and validation, as applicable; and,
- An update of the remedial schedule including the percentage of project completion, unresolved delays encountered or anticipated that may affect the future schedule, and efforts made to mitigate such delays.
- Tracking of GSR metrics determined during the design process should be included in monthly reports.

4.4.3 Other Reporting

Photographs will be taken of all remedial activities and submitted to NYSDEC in digital (JPEG) format. Photos will illustrate all remedial program elements and will be of acceptable quality. Representative photos of the Site prior to any Remedial Actions will be provided. Representative photos will be provided of each contaminant source, source area and Site structures before, during and after remediation. Photos will be included in the daily reports as needed, and a comprehensive collection of photos will be included in the FER.

Progress with respect to green and sustainable remediation metrics will be tracked during implementation of the remedial action and reported in the FER, including a comparison to the goals established during the remedial program. Regular updates to the metrics used (SEFA, *SiteWise*™ or otherwise approved method) should be included.

The Climate Screening process and results will be documented in the form of a completed checklist and brief letter report. If the Climate Screening results indicate that a Climate Vulnerability Assessment (CVA) is necessary, a complete CVA Report will be developed. The CVA Report will be included as an Appendix or Attachment in relevant documents and/or submitted as a standalone report.

Job-site record keeping for all remedial work will be appropriately documented. These records will be maintained on-Site at all times during the project and be available for inspection by NYSDEC and NYSDOH staff.

4.4.4 Complaint Management Plan

All complaints from citizens will be promptly reported to the NYSDEC. Complaints will be addressed, and outcomes will also be reported to NYSDEC in daily reports. Notices to NYSDEC will include the nature of the complaint, the party providing the complaint, and the actions taken to resolve any problems.

4.4.5 Deviations from the Remedial Action Work Plan

Changes to the RAWP will be presented to the NYSDEC Project Manager for approval prior to implementation and will be documented in daily reports and reported in the FER. The process to be followed if there are any deviations from the RAWP will include a request for approval for the change from NYSDEC noting the following:

- Reasons for deviating from the approved RAWP;
- Effect of the deviations on overall remedy; and
- Determination that the remedial action with the deviation(s) is protective of public health and the environment.

Notification will be provided to the NYSDEC by telephone for conditions requiring immediate action (e.g., conditions judged to be a danger to on-site personnel or the surrounding community).

5.0 REMEDIAL ACTION: MATERIAL REMOVAL FROM SITE

Material removed from the site will include soil, existing structures, and any subsurface anomalies identified during remedial activities. The entire footprint of the Site will be excavated to four feet to remove the upper portions of the contaminated soils. Two hot spots will be excavated to the shallow groundwater at approximately 8 ft. The elevator pit will be excavated to approximately 8 feet.

Approximately 3,000 cubic yards of soil will be excavated during the proposed alternative in the areas depicted in **Figure 18**. The existing structures at the Site will be demolished and removed. This will include the building on 19 Clay Street and the concrete area on 29 Clay Street.

Construction and demolition debris from the demolition of existing structures will be evaluated for potential reuse or recycling., and will only be reused with NYSDEC approval. Any subsurface anomalies identified during the remediation will be excavated, documented, and properly removed from the Site.

5.1 SOIL CLEANUP OBJECTIVES

The Soil Cleanup Objectives for this Site are listed in **Table 15**. Soil and materials management on-Site and off-Site will be conducted in accordance with the Soil/Materials Management Plan as described below.

Tables 2-6 summarize all soil samples that exceed the SCOs proposed for this Remedial Action. A spider map that shows all soil samples that exceed the SCOs proposed for this Remedial Action is shown in **Figures 7-8**. **Figure**

17 shows Residual soil above the SCOs that will remain in place. UST closures will, at a minimum, conform to criteria defined in DER-10.

5.2 REMEDIAL PERFORMANCE EVALUATION (POST EXCAVATION END-POINT SAMPLING)

5.2.1 End-Point Sampling Frequency

Site-wide end-point sampling frequency will be in accordance with DER-10 section 5.4, which recommends the collection of one bottom sample per 900 sf of bottom area. 27 end-point soil samples, 22 bottom samples and 5 hotspot bottom samples, will be collected to determine the residual contamination remaining onsite. The proposed endpoint locations are shown in **Figure 18**. The sampling will be included in the daily/monthly reports.

1. One soil sample will be collected from the excavation bottom for every 900 square feet of excavation area. Based on these requirements 22 bottom samples and five hotspot samples will be collected as shown on **Figure 18**. The grid associated with the bottom endpoint samples is shown on **Figure 16**. Additional samples may be collected as needed to characterize and document conditions depending upon field conditions, excavation shape, etc.
2. For sampling of VOCs, bottom samples will be collected within 24 hours of excavation from zero to six-inch interval at the excavation floor. Samples collected after 24 hours will be collected at 6 to 12 inches. These samples will be collected with encore or Terracore samplers.
3. Post-remediation soil samples for laboratory analysis will be collected after contaminated soil removal. If the excavation is enlarged horizontally, additional soil samples will be taken pursuant to conditions 1 and 2 above.

Post-remediation sample locations and depths will be biased towards the areas and depths of the higher contamination identified during the RI unless field indicators, such as field instrument measurements or visual contamination identified during the remedial action, indicate that other locations and depths may be more heavily contaminated. In all cases, post-remediation samples will be biased toward locations and depths of the higher expected contamination. If the sample area is slated for backfilling, backfilling will be performed following receipt of acceptable analytical results.

5.2.2 Methodology

New York State Environmental Laboratory Accreditation Program (NYS ELAP) certified labs will be used for all end-point sample analyses. Labs for end-point sample analyses will be reported in the FER. The FER will provide a tabular and map summary of all end-point sample results and will include all data including non-detects and applicable standards and/or guidance values. End-point samples will be analyzed for compounds and elements as described below utilizing the following methodology:

- Part 375 VOCs + TICs, including 1-4 Dioxane (EPA Method SW 846 8260),
- Part 375 SVOCs + TICs (EPA Method SW 846 8270),
- Part 375 Pesticides/Herbicides/PCBs (EPA Methods SW846 8081/8151/8082), and
- Part 375 TAL metals (EPA Methods SW 846 6010/6020/7470),

- PFAS (EPA Method 1633)

Sample results will be compared to the Restricted Residential and Protection of Groundwater SCOs depending on the location and purpose of the sample (see Section 5.2.3, below).

The appropriate QA/QC samples will be collected at the appropriate frequency and incorporated into the end-point sampling as specified in the QAPP. QA/QC samples will include a duplicate, equipment blank, trip blank, and matrix spike/matrix spike duplicate.

5.2.3 Reporting of Results

Category B deliverables will be obtained from the lab for all endpoint soil samples. DUSRs will be prepared for all results. Endpoint sampling results will be compared to the Restricted Residential SCOs. Chlorinated VOCs - Tetrachloroethene, Vinyl Chloride, Trichloroethene, cis-1,2-Dichloroethene will be compared to the lower of RRSCOs and PGSCOs across the site. There is a contingency for deeper excavation and additional confirmation sampling in the two-foot cut area if PGSCOs for chlorinated VOCs are exceeded at two feet. Confirmation end-point samples from the western petroleum source area will be compared to the Restricted Residential and Protection of Groundwater SCOs.

5.2.4 Quality Assurance / Quality Control

QA/QC procedures for sampling are included in the QAPP provided in **Appendix I**.

5.2.5 DUSR and EDDs

The Data Usability Summary Report (DUSR) provides a thorough evaluation of analytical data with third party data validation. The primary objective of a DUSR is to determine whether the data, as presented, meets the site/project specific criteria for data quality and data use. Verification and/or performance monitoring samples collected under this RAWP will be reviewed and evaluated in accordance with the Guidance for the Development of Data Usability Summary Reports as presented in Appendix 2B of DER-10. The completed DUSRs for verification/performance samples collected during implementation of this RAWP will be included in the FER.

5.2.6 Reporting of End-Point Data in FER

Chemical labs used for all end-point sample results and contingency sampling will be NYSDOH ELAP certified. End point sampling, including bottom and side-wall sampling, will be performed in accordance with DER-10 sample frequency requirements. Side-wall samples will be collected a minimum of every 30 linear feet. Bottom samples will be collected at a rate of one for every 900 square feet from the base of the remedial excavation. The FER will provide a tabular and map summary of all end-point sample results and exceedances of SCOs.

5.3 ESTIMATED MATERIAL REMOVAL QUANTITIES

The estimated quantity of soil/fill to be removed from the Site is 3,000 cubic yards. The estimated quantity of soil to be imported into the Site for backfill is approximately 150 cubic yards. No soil will be imported for a cover or reused on-site.

5.4 SOIL/MATERIALS MANAGEMENT PLAN

The Soil / Materials Management Plan describes the procedures for remedial excavation operations, including shoring/sheeting, handling, and staging of materials at the Site. A soil Management plan has been prepared for the site and is included as **Appendix N.**

5.4.1 Soil Screening Methods

Visual, olfactory and PID soil screening and assessment will be performed by a qualified environmental professional or experienced field geologist under the direction of the Remedial Engineer during all remedial and development excavations into known or potentially contaminated material. Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during the remedy and during development phase, such as excavations for foundations and utility work, prior to issuance of the COC.

All primary contaminant sources (including but not limited to tanks and hotspots) identified during Site Characterization, Remedial Investigation, and Remedial Action will be surveyed by a surveyor licensed to practice in the State of New York. This information will be provided on maps in the FER.

Screening will be performed by qualified environmental professionals. Resumes will be provided for all personnel responsible for field screening (e.g., those representing the Remedial Engineer) of invasive work for unknown contaminant sources during remediation and development work.

5.4.2 Stockpile Methods

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC. At a minimum, a storm event should be considered a rainfall of three inches or greater in 12 hours. Judgement should be used to evaluate water infiltration, nearby waterbodies where runoff is likely, and engineering controls that may be affected. Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Soil stockpiles will be continuously encircled with silt fences. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

Water will be available on-site at suitable supply and pressure for use in dust control.

5.4.3 Materials Excavation and Load Out

The Remedial Engineer or a qualified environmental professional under his/her supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the Site has been investigated by the Remedial Engineer. It has been determined that no risk or impediment to the planned work under this Remedial Action Work Plan is posed by utilities or easements on the Site.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

Vehicles leaving the Site will not be overloaded. The Remedial Engineer's representative will make reasonable efforts to ensure that vehicles are not loaded beyond their NYSDOT weight rating and that all material is secured beneath the truck bed cover.

A truck wash will be operated on-Site. The Remedial Engineer will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the Site until the remedial construction is complete. Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-Site sediment tracking. The Remedial Engineer will be responsible for ensuring that all egress points for truck and equipment transport from the Site will be clean of dirt and other materials derived from the Site during Site remediation and development. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site - derived materials.

The Volunteer and associated parties preparing the remedial documents submitted to the State, and parties performing this work, are completely responsible for the safe performance of all invasive work, the structural integrity of excavations, and for structures that may be affected by excavations (such as building foundations and bridge footings).

The Remedial Engineer will ensure that Site development activities will not interfere with, or otherwise impair or compromise, remedial activities proposed in this Remedial Action Work Plan.

Each hotspot and structure to be remediated (USTs, vaults and associated piping, transformers, etc.) will be removed and end-point remedial performance sampling completed before excavations related to Site development commence proximal to the hotspot or structure.

Development-related grading cuts and fills will not be performed without NYSDEC approval and will not interfere with, or otherwise impair or compromise, the performance of remediation required by this plan.

Mechanical processing of historical fill and contaminated soil on-Site is prohibited.

All primary contaminant sources (including but not limited to tanks and hotspots) identified during Site Characterization, Remedial Investigation, and Remedial Action will be surveyed by a surveyor licensed to practice in the State of New York. The survey information will be shown on maps to be reported in the FER.

5.4.4 Materials Transport Off-Site

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded. All trucks loaded with Site materials will exit the vicinity of the Site using only these approved truck routes and avoid side streets.

Proposed in-bound and out-bound truck routes to the Site are shown on **Figure 24**. This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off- Site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; (f) overall safety in transport; and (g) community input.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project Site.

Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during Site remediation and development.

Queuing of trucks will be performed on-Site in order to minimize off-Site disturbance. Off-Site queuing will be prohibited.

Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas or mesh truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

All trucks will be washed prior to leaving the Site. Truck wash waters will be collected and disposed of off-Site in an appropriate manner.

5.4.5 Materials Disposal Off-Site

The disposal facilities have not been selected as of the date of this report. Disposal locations established at a later date will be reported to the NYSDEC Project Manager.

All soil/fill/solid waste excavated and removed from the Site will be treated as contaminated and regulated material and will be disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e., clean soil removed for development purposes), a formal request with an associated plan will be made to NYSDEC's Project Manager. Unregulated off-Site management of materials from this Site is prohibited without formal NYSDEC approval.

Material that does not meet Track 1 unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360.15 Registration Facility).

The following documentation will be obtained and reported by the Remedial Engineer for each disposal location used in this project to fully demonstrate and document that the disposal of material derived from the Site conforms with all applicable laws:

> (1) a letter from the Remedial Engineer or BCP Volunteer to the receiving facility describing the material to be disposed and requesting formal written acceptance of the material. This letter will state that material to be disposed is contaminated material generated at an environmental remediation Site in New York State. The letter will provide the project identity and the name and phone number of the Remedial Engineer. The letter will include as an attachment a summary of all chemical data for the material being transported (including Site Characterization data); and
> (2) a letter from all receiving facilities stating it is in receipt of the correspondence (above) and is approved to accept the material.

These documents will be included in the FER.

Non-hazardous historic fill and contaminated soils taken off-Site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360.2. The Remedial Engineer is responsible for assuring material is properly characterized and determining the appropriate disposal methods based on the characterization results.

Historical fill and contaminated soils from the Site are prohibited from being disposed at Part 360.15 Registration Facilities (also known as Soil Recycling Facilities).

Soils that are contaminated but non-hazardous and are being removed from the Site are considered by the NYSDEC Division of Materials Management (DMM) to be Construction and Demolition (C/D) materials with contamination not typical of virgin soils. These soils may be sent to a permitted Part 360 landfill. They may be sent to a permitted C/D processing facility without permit modifications only upon prior notification of NYSDEC DMM. This material is prohibited from being sent or redirected to a Part 360-15 Registration Facility. In this case, as dictated by DMM, special procedures will include, at a minimum, a letter to the C/D facility that provides a detailed explanation that the material is derived from a DER remediation Site, that the soil material is contaminated and that it must not be redirected to on-Site or off-Site Soil Recycling Facilities. The letter will provide the project identity and the name and phone number of the Remedial Engineer. The letter will include as an attachment a summary of all chemical data for the material being transported.

The FER will include an accounting of the destination of all material removed from the Site during this Remedial Action, including excavated soil, contaminated soil, historic fill, solid waste, and hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material. This information will also be presented in a tabular form in the FER.

Bill of Lading system or equivalent will be used for off-Site movement of non-hazardous wastes and contaminated soils. This information will be reported in the FER.

Hazardous wastes derived from on-Site will be stored, transported, and disposed of in full compliance with applicable local, State, and Federal regulations.

Appropriately licensed haulers will be used for material removed from this Site and will be in full compliance with all applicable local, State and Federal regulations.

Waste characterization sampling will be performed exclusively for the purposes of off-Site soil disposal in a manner suitable for receiving facilities and in conformance with applicable federal, state, and local laws rules and regulations and facility-specific permits. Sampling and analytical methods, sampling frequency, analytical results and QA/QC associated with waste characterization activities will be reported in the FER. All data available for soil/material to be disposed at a given facility must be submitted to the disposal facility with suitable explanation prior to shipment and receipt. Waste characterization data will be used solely for complying with requirements for off-site disposal. Waste Characterization sampling cannot be utilized for:

- Delineating the extent of contamination required for remediation at a Site.
- Replacing or substituting data collected as part of Site Characterization and/or Remedial Investigation.
- Replacing or substituting confirmation or documentation sampling as described in NYSDEC DER-10, Section 5.4.
- To modify remedial decisions as formalized in a NYSDEC approved Decision Document or Record of Decision.

5.4.6 Materials Reuse On-Site

The project does not anticipate reusing materials on-site. Contaminated on-Site material, including historic fill and contaminated soil, removed for grading or other purposes will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

5.4.7 Fluids Management

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported, and disposed in accordance with applicable local, State, and Federal regulations. Liquids discharged into the New York City sewer system will be addressed through approval by NYCDEP.

Dewatered fluids will not be recharged back to the land surface or subsurface of the Site. Dewatering fluids will be managed off-Site.

Discharge of water generated during remedial construction to surface waters (i.e., a local pond, stream, river, and/or storm sewer) is prohibited without a SPDES permit.

5.4.8 Demarcation

After the completion of soil removal and any other invasive remedial activities and prior to backfilling, a land survey will be performed by a New York State licensed surveyor. The survey will define the top elevation of residual contaminated soils.

A physical demarcation layer, consisting of orange snow fencing material or equivalent material will be placed on this surface to provide a visual reference. This demarcation layer will constitute the top of the "Residuals Management Zone," the zone that requires adherence to special conditions for disturbance of contaminated residual soils defined in the SMP. The survey will measure the grade covered by the demarcation layer before the placement of cover soils, pavement and sub-soils, structures, or other materials. This survey and the demarcation layer placed

on this grade surface will constitute the physical and written record of the upper surface of the "Residuals Management Zone" in the SMP. A map showing the survey results will be included in the FER and the SMP.

5.4.9 Backfill from Off-Site Sources

All materials proposed for import onto the Site will be approved by the Remedial Engineer and will be in compliance with provisions in this RAWP prior to receipt at the Site.

Material from industrial sites, spill sites, other environmental remediation sites or other potentially contaminated sites will not be imported to the Site. Solid waste will not be imported onto the Site.

The FER will include the following certification by the Remedial Engineer: "I certify that all import of soils from off-Site, including source evaluation, approval and sampling, has been performed in a manner that is consistent with the methodology defined in the Remedial Action Work Plan."

All imported soils will meet NYSDEC approved backfill or cover soil quality objectives for this Site. These NYSDEC approved backfill or cover soil quality objectives are the lower of the protection of groundwater or the protection of public health soil cleanup objectives for restricted-residential use as set forth in Table 375-6.8(b) of 6 NYCRR Part 375 and listed in **Table 16**. Non-compliant soils will not be imported onto the Site without prior approval by NYSDEC. Nothing in the approved RAWP or its approval by NYSDEC should be construed as an approval for this purpose.

Soils that meet 'general fill' requirements under 6 NYCRR Part 360.13, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC. Nothing in this RAWP should be construed as an approval for this purpose.

A "Request to Import/Reuse Fill Material" form will be filed with the NYSDEC project manager for review and approval prior to import to the site. A blank Request to Import/Reuse Fill Material form is included as **Appendix R**.

5.4.10 Stormwater Pollution Prevention

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.

Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the RAWP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

Silt fencing or hay bales will be installed around the entire perimeter of the remedial construction area.

5.4.11 Contingency Plan

If underground tanks or other previously unidentified contaminant sources are found during on-Site remedial excavation or development related construction, sampling will be performed on product, sediment, and surrounding soils, etc. in accordance with DER-10. Chemical analytical work will be for full scan parameters (TAL metals; TCL volatiles and semi-volatiles, TCL pesticides, PCBs and PFAS). Analyses will not be otherwise limited without NYSDEC approval.

Identification of unknown or unexpected contaminated media identified by screening during invasive Site work will be promptly communicated by phone to NYSDEC's Project Manager. These findings will be also included in daily and periodic electronic media reports.

5.4.12 Extreme Storm Preparedness and Response Contingency Plan

Damage from flooding or storm surge can include dislocation of soil and stockpiled materials, dislocation of site structures and construction materials and equipment, and dislocation of support of excavation structures. Damage from wind during an extreme storm event can create unsafe or unstable structures, damage safety structures and cause downed power lines creating dangerous site conditions and loss of power. In the event of emergency conditions caused by an extreme storm event, the Volunteer will undertake the following steps for site preparedness prior to the event and response after the event.

Storm Preparedness

Preparations in advance of an extreme storm event will include the following: containerized hazardous materials and fuels will be removed from the property; loose materials will be secured to prevent dislocation and blowing by wind or water; heavy equipment such as excavators and generators will be removed from excavated areas, trenches and depressions on the property to high ground or removed from the property; an inventory of the property with photographs will be performed to establish conditions for the site and equipment prior to the event; stockpile covers for soil and fill will be secured by adding weights such as sandbags for added security and worn or ripped stockpile covers will be replaced with competent covers; stockpiled hazardous wastes will be removed from the property; stormwater management systems will be inspected and fortified, including, as necessary: clean and reposition silt fences, hay bales; clean storm sewer filters and traps; and secure and protect pumps and hosing.

Storm Response

At the conclusion of an extreme storm event, as soon as it is safe to access the property, a complete inspection of the property will be performed. A site inspection report will be submitted to NYSDEC at the completion of site inspection and after the site security is assessed. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant differences will be noted. Damage from storm

conditions that result in acute public safety threats, such as downed power lines or imminent collapse of buildings, structures or equipment will be reported to public safety authorities via appropriate means such as calling 911. Petroleum spills will be reported to NYSDEC within 2 hours of identification and consistent with State regulations. Public safety structures, such as construction security fences will be repaired promptly to eliminate public safety threats. Debris will be collected and removed.

Dewatering will be performed in compliance with existing laws and regulations and consistent with emergency notifications, if any, from proper authorities. Eroded areas of soil including unsafe slopes will be stabilized and fortified. Dislocated materials will be collected and appropriately managed. Support of excavation structure will be inspected and fortified, as necessary. Impacted stockpiles will be contained and damaged stockpile covers will be replaced. Stormwater control systems and structures will be inspected and maintained, as necessary.

If soil or fill materials are discharged off site to adjacent properties, property owners and NYSDEC will be notified, and corrective measure plan designed to remove and clean dislocated material will be submitted to NYSDEC and implemented following approval by NYSDEC and granting of site access by the property owner. Impacted offsite areas may require characterization based on site conditions, at the discretion of NYSDEC.

If onsite petroleum spills are identified, a qualified environmental professional will determine the nature and extent of the spill and report to NYSDEC's spill hotline at (800) 457-7362 within statutory defined timelines. If the source of the spill is ongoing and can be identified, it should be stopped if this can be done safely. Potential hazards will be addressed immediately, consistent with guidance issued by NYSDEC.

Storm Response Reporting

A site inspection report will be submitted to NYSDEC at the completion of site inspection. An inspection report will be used for this purpose. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant differences will be noted. The site inspection report will be sent to the NYSDEC project manager and will include the site name, address, tax block and lot, site primary and alternate contact name and phone number.

Damage and soil release assessment will include: whether the project had stockpiles; whether stockpiles were damaged; photographs of damage and notice of plan for repair; report of whether soil from the site was dislocated and whether any of the soil left the site; estimates of the volume of soil that left the site, nature of impact, and photographs; description of erosion damage; description of equipment damage; description of damage to the remedial program or the construction program, such as damage to the support of excavation; presence of onsite or offsite exposure pathways caused by the storm; presence of petroleum or other spills and status of spill reporting to NYSDEC; description of corrective actions; schedule for corrective actions.

This report should be completed and submitted to NYSDEC project manager with photographs within 24 hours of the time of safe entry to the property after the storm event.

5.4.13 Community Air Monitoring Plan

Real-time air monitoring for VOCs and particulate levels at the perimeter of the proposed excavation areas will be performed in accordance with the CAMP. Continuous air monitoring will be required during ground intrusive activities and other activities where equipment is disturbing the ground surface. Ground intrusive activities include,

but are not limited to, soil/fill excavation and handling, test pitting or trenching, grading of existing Site soils and the installation of soil borings, or monitoring wells.

Exceedances observed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers and included in the Daily Report.

A map showing the location of fixed and mobile sampling stations is shown in **Figure 22**.

5.4.14 Odor, Dust and Nuisance Control Plan

The FER will include the following certification by the Remedial Engineer: "I certify that all invasive work during the remediation and all invasive development work were conducted in accordance with dust and odor suppression methodology defined in the Remedial Action Work Plan."

5.4.14.1 Odor Control Plan

This odor control plan is capable of controlling emissions of nuisance odors off-Site (note that there will not be residents or tenants on the property during the Remedial Action). Odor controls will be employed to prevent on- and off-Site odor nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) use of odor suppressants to cover exposed odorous soils. If nuisance odors develop and cannot otherwise be controlled, additional means to eliminate them will include: (d) direct load-out of soils to trucks for off-Site disposal; and (e) use of chemical odorant suppressants in spray or misting systems. The proposed odor suppressant for this Site is BioSolve® Pinkwater. The contractor who uses BioSolve® Pinkwater for odor suppression will fully understand the manufacturer's specifications prior to usage
If nuisance odors are identified, work will be halted, and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of all other complaints about the project. Implementation of all odor controls, including the halt of work, will be the responsibility of the Participant's Remedial Engineer, who is responsible for certifying the Final Engineering Report.

All necessary means will be employed to prevent on- and off-Site nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-Site disposal; (e) use of chemical odorants in spray or misting systems; and (f) use of staff to monitor odors in surrounding neighborhoods.

Where odor nuisances have developed during remedial work and cannot be corrected, or where the release of nuisance odors cannot otherwise be avoided due to on-Site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering excavation and handling areas under tented containment structures equipped with appropriate air venting/filtering systems.

5.4.14.2 Dust Control Plan

A dust suppression plan that addresses dust management during invasive on-Site work will include, at a minimum, the items listed below:

- Water will be available on-site at suitable supply and pressure for use in dust control.
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-Site roads will be limited in total area to minimize the area required for water spraying.

6.0 RESIDUAL CONTAMINATION TO REMAIN ON-SITE

Remedial Alternative II, a Track 4 remedy, is the preferred remedial alternative. The Track 4 approach will achieve Restricted Residential Use SCOs to a specified depth at the Site. Remedial Alternative II will include engineering and institutional controls for the protection of public health and the environment. Saturated soil and groundwater contamination will remain on-Site. A site-specific SMP will be developed and included in the FER to address the residual contamination and discuss management of the EC/ICs. A figure showing residual contamination to remain on Site above the Track 4 remedy is included as **Figure 17**.

After the completion of soil removal and any other invasive remedial activities and prior to backfilling, a New York State licensed surveyor will perform a land survey. This survey will define the top of the 'Residuals Management Zone,' the zone that requires adherence to special conditions for disturbance of contaminated residual soils defined in the SMP. The survey will measure the grade covered by the demarcation layer before the placement of cover soils, pavement and sub-soils, structures, or other materials. This survey and the demarcation layer placed on this grade surface will constitute the physical and written record of the upper surface of the 'Residuals Management Zone' in the SMP. A map showing the survey results will be included in the Final Engineering Report and the Site Management Plan.

Since residual contaminated soil and groundwater will exist beneath the Site after the remedy is complete, Engineering and Institutional Controls (ECs and ICs) are required to protect human health and the environment. These ECs and ICs are described hereafter. Long-term management of EC/ICs and of residual contamination will be executed under a Site-specific SMP that will be developed and included in the FER.

Long-term management of the EC/IC will be executed under an environmental easement recorded with the NYC Department of Finance, Office of the City Register. In addition, long-term management of ICs and of residual contamination will be executed under a site-specific SMP that will be developed and included in the FER, if needed. The ECs that will be implemented to protect public health and the environment by appropriately managing residual contamination include:

- A composite cover system (i.e., the building foundation);
- Operation of an active SSDS; and
- Operation of an SVE System.

The FER will report residual contamination remaining on the Site in tabular and map form. This will include presentation of exceedances of both Track 1 and Track 4 standards.

7.0 ENGINEERING CONTROLS: SITE COVER SYSTEM

Exposure to residual contaminated soils will be prevented by an engineered site cover system that will be built on the Site. This site cover system will be comprised of concrete building slabs.

Green remediation BMPs for designing and installing a conventional cover system include:

- Design in ways that mimic rather than alter the site's natural setting, to improve the cover's long-term performance and protect ecosystem services such as potable water, wildlife habitat, and carbon storage;
- Design a cover accounting for potential effects of climate change, which could involve changes in onsite soil development or increased vulnerability to flooding;
- Use uncontaminated soil or sediment from onsite excavation instead of imported soil/sediment for the cover's frost prevention and erosion control layers; similarly, uncontaminated sand, gravel, and rocks from onsite instead of offsite areas may be used for drainage;
- Apply low impact development strategies such as installing earthen berms to manage stormwater;
- Choose geotextile fabric or drainage tubing composed of 100% recycled materials rather than virgin materials for lining, erosion control, and drainage;
- Select materials with biobased content for daily activities during cover construction;
- Use clean fuel and emission control technologies for routine field vehicles and machinery such as backhoes and bulldozers to reduce fuel consumption and emission of air pollutants such as GHGs and particulate matter; and
- Investigate onsite solar and wind resources to power equipment such as leachate pumps and flare units.

For alternative cover designs

- Consider using asphalt rubber (containing recycled tires) where the cover system includes a layer of asphalt;
- Substitute concrete with high albedo pavement, which reflects sunlight and heat away from the cover surface and may aid growth of nearby vegetation; and
- Consider using concrete containing a high percentage of industrial waste by-products as a substitute for cement, if tests show no contaminant leaching.

In addition to BMPs that apply to conventional covers, BMPs for designing and installing an ET cover include:

- Choose recycled (crushed) concrete for biobarriers or capillary breaks instead of natural rock;
- Select native drought-resistant plants for the upper vegetative layer to reduce maintenance needs;
- Preserve biodiversity and related ecosystem services by installing a suitable mix of native shrubs, grasses, and forbs; and
- Use non-synthetic amendments such as compost instead of chemical fertilizers if the soil or vegetation is found to need supplementation over time.

A diagram showing the design detail for each cover type is shown in **Figure 21.**

An Excavation Plan will be included in the Site Management Plan and will outline the procedures to be followed if the site cover system and underlying residual contamination are disturbed after the Remedial Action is complete. The components of the site cover system will be documented in the FER. Maintenance of this site cover system will be described in the SMP.

8.0 ENGINEERING CONTROLS: TREATMENT SYSTEMS

Engineering Controls supplementing the cover system will be employed in the remedial action to address residual contamination remaining at the site. These are:

(1) Active SSDS
(2) SVE System

8.1 SUB-SLAB DEPRESSURIZATION SYSTEM

Migration of soil vapor into the building will be mitigated with the construction of an active SSDS. The SSDS will consist of three separate loops consisting of a network of horizontal pipes set in the middle of a gas permeable layer immediately beneath the building slab and vapor barrier system. The horizontal piping will consist of fabric wrapped, perforated schedule 40 4-inch diameter PVC pipe connected to a 4-inch diameter cast iron riser pipe that penetrates the slab and travels through the building to above the roof. The gas permeable layer will consist of a 12-inch-thick gas permeable aggregate layer of 3/4" Blue Stone. The riser pipe will be finished at the roof line with a 4-inch goose neck pipe to prevent rain infiltration. For the active SSDS, the system will be hardwired and will include a blower installed on the roof line and a pressure gauge and alarm located in an accessible area in the basement, which will provide a vacuum draw on the under-slab gas permeable aggregate layer. The SSDS layout is shown on **Figure 20A**, and general notes for the installation and requirements of the SSDS and plan details are included on **Figure 20B.**

A vapor barrier will consist of a minimum of 20-mil Drago® wrap (or approved equivalent) will be incorporated into the building foundation slab and cellar foundation wall to make the active SSDS more efficient. The vapor barrier will extend under the building footprint area and will be installed in accordance with manufacturer specifications. Product specification sheets will be provided prior to installation for the department's approval. The Final Engineering Report will include record (as-built) drawings and diagrams; manufacturer documentation; and photographs. Vapor Barrier System details are included in **Appendix O.**

The SSDS and vapor barrier installation will be observed and documented by the remedial engineer prior to the placement of building foundation concrete or backfill. The field inspector under the direct supervision of a professional engineer will inspect and photograph the SSDS at several critical stages before during and after the installation is complete, to assure compliance with design specifications.

A vapor intrusion investigation consisting of sub-slab soil gas samples, indoor air samples and background samples will be conducted to evaluate the efficacy of the SSDS to mitigate vapor intrusion. Maintenance of these systems will be described in the SMP included in the FER.

8.2 SOIL VAPOR EXTRACTION SYSTEM

The proposed SVE system will be designed to address off-Site migration of CVOC contamination. The proposed SVE treatment area is shown on **Figure 15**. The IRM will include a pilot test and installation of a SVE system. The SVE system will be converted to a permanent system under this RAWP. All as-built drawings, diagrams, calculation, and manufacturer documentation for treatment systems will be presented in the FER.

9.0 CRITERIA FOR COMPLETION OF REMEDIATION/TERMINATION OF REMEDIAL SYSTEMS

9.1 COMPOSITE COVER SYSTEM

The composite cover system is a permanent control, and the quality and integrity of this system will be inspected at defined, regular intervals in perpetuity.

9.2 SUB-SLAB DEPRESSURIZATION SYSTEM (SSDS)

In the SMP, there will be monitoring criteria for the performance of the SSDS. If the annual SMP monitoring is favorable, then a request may be made to the deactivate the SSDS. A proposal to discontinue the active SSDS may be submitted by the property owner based on confirmatory data that justifies such a request based on sampling of soil vapor during the heating season of the building.

The active SSD system will not be discontinued without written approval by NYSDEC and NYSDOH. A proposal to discontinue the active SSD system may be submitted by the property owner based on confirmatory data that justifies such request. Systems will remain in place and operational until permission to discontinue use is granted in writing by NYSDEC and NYSDOH.

9.3 SOIL VAPOR EXTRACTION SYSTEM (SVE SYSTEM)

The SVE system will not be discontinued without written approval by NYSDEC and NYSDOH. A proposal to discontinue the system may be submitted by the property owner after residual contamination concentrations in groundwater: (1) are cleaned up to levels below NYSDEC standards, (2) have become asymptotic over an extended period of time as mandated by the NYSDEC and the NYSDOH, or (3) if NYSDEC has determined that the SVE system has reached the limit of its effectiveness. This assessment will be based in part on post-remediation contaminant levels in groundwater collected from monitoring wells located throughout the Site. Systems will remain in place and operational until permission to discontinue their use is granted in writing by NYSDEC and NYSDOH. These sampling/monitoring activities will adhere to stipulations outlined in the Monitoring Plan section of the SMP.

9.4 GROUNDWATER MONITORING

Groundwater monitoring activities to assess the performance of the remedy, or natural attenuation following the removal of contaminant sources, will continue, as determined by NYSDOH and YSDEC, until residual groundwater concentrations are found to be below NYSDEC standards or have become asymptotic over an extended period. Monitoring will continue until permission to discontinue is granted in writing by NYSDEC and NYSDOH. Monitoring activities will be outlined in the Monitoring Plan of the SMP. It is anticipated that, following remediation, a minimum of eight quarterly monitoring events will be performed.

9.5 TREATMENT SYSTEMS

SSDS - The long-term treatment systems are the SSDS and groundwater treatment system. The SSDS will be run until such time as the concentration detected in samples through the system reach asymptotic levels. Should that happen, the NYSDEC will have to provide approval to deactivate the system.

Groundwater Injections - Groundwater treatment is expected to be ongoing for several years after injection and will be monitored via permanent monitoring wells that will be strategically placed within the proposed development. The frequency of groundwater sampling will be quarterly until such time that the NYSDEC allows for a less frequent interval.

10.0 INSTITUTIONAL CONTROLS

After the remedy is complete, the Site will have residual contamination remaining in place. Engineering Controls (ECs) for the residual contamination have been incorporated into the remedy to render the overall Site remedy protective of public health and the environment. Two elements have been designed to ensure continual and proper management of residual contamination in perpetuity: an Environmental Easement and a Site Management Plan (SMP).

All as-built drawings, diagrams, calculation, and manufacturer documentation for treatment systems will be presented in the FER. A Site-specific Environmental Easement will be recorded with Kings County to provide an enforceable means of ensuring the continual and proper management of residual contamination and protection of public health and the environment in perpetuity or until released in writing by NYSDEC. It requires that the grantor of the Environmental Easement and the grantor's successors and assigns adhere to all Engineering and Institutional Controls (ECs/ICs) placed on this Site by this NYSDEC-approved remedy. ICs provide restrictions on Site usage and mandate operation, maintenance, monitoring and reporting measures for all ECs and ICs. The SMP describes appropriate methods and procedures to ensure compliance with all ECs and ICs that are required by the Environmental Easement. Once the SMP has been approved by the NYSDEC, compliance with the SMP is required by the grantor of the Environmental Easement and grantor's successors and assigns.

10.1 ENVIRONMENTAL EASEMENT

An Environmental Easement, as defined in Article 71 Title 36 of the Environmental Conservation Law, is required when residual contamination is left on-Site after the Remedial Action is complete. As part of this remedy, an Environmental Easement approved by NYSDEC will be filed and recorded with the Kings County Office of the City Register. The Environmental Easement will be submitted as part of the Final Engineering Report.

The Environmental Easement renders the Site a Controlled Property. The Environmental Easement must be recorded with the NYC Office of the City Register before the Certificate of Completion can be issued by NYSDEC. A series of Institutional Controls are required under this remedy to implement, maintain, and monitor these Engineering Control systems, prevent future exposure to residual contamination by controlling disturbances of the subsurface soil and restricting the use of the Site to restricted-residential use only. These Institutional Controls are requirements or restrictions placed on the Site that are listed in, and required by, the Environmental Easement. Institutional Controls can, generally, be subdivided between controls that support Engineering Controls, and those that place general restrictions on Site usage or other requirements. Institutional Controls in both of these groups are closely integrated with the SMP, which provides all of the methods and procedures to be followed to comply with this remedy.

The Institutional Controls that support Engineering Controls are:

- Compliance with the Environmental Easement by the Grantee and the Grantee's successors and adherence of all elements of the SMP is required;
- All Engineering Controls must be operated and maintained as specified in this SMP;
- A site cover system consisting of asphalt covered roads, concrete covered sidewalks, and concrete building slabs must be inspected, certified, and maintained as required in the SMP;
- A soil vapor mitigation system consisting of a sub-slab depressurization system under all building structures must be inspected, certified, operated and maintained as required by the SMP;
- All Engineering Controls on the Controlled Property must be inspected and certified at a frequency and in a manner defined in the SMP;
- Groundwater monitoring must be performed as defined in the SMP;
- Groundwater monitoring must be performed as defined in the SMP
- Data and information pertinent to Site Management for the Controlled Property must be reported at the frequency and in a manner defined in the SMP;
- On-Site environmental monitoring devices, including but not limited to, groundwater monitor wells and SSDS monitoring points, must be protected and replaced as necessary to ensure proper functioning in the manner specified in the SMP;
- Engineering Controls may not be discontinued without an amendment or extinguishment of the Environmental Easement.

Adherence to these Institutional Controls for the Site is mandated by the Environmental Easement and will be implemented under the SMP (discussed in the next section). The Controlled Property (Site) will also have a series of Institutional Controls in the form of Site restrictions and requirements. The Site restrictions that apply to the Controlled Property are:

- Vegetable gardens and farming on the Controlled Property are prohibited;
- Use of groundwater underlying the Controlled Property is prohibited without treatment rendering it safe for intended purpose;
- All future activities on the Controlled Property that will disturb residual contaminated material are prohibited unless they are conducted in accordance with the soil management provisions in the SMP;
- The Controlled Property may be used for restricted residential use only, provided the long-term Engineering and Institutional Controls included in the SMP are employed;
- The Controlled Property may not be used for a higher level of use, such as unrestricted use without an amendment or extinguishment of this Environmental Easement;
- Grantor agrees to submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls employed at the Controlled Property are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access such Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow. This annual statement must be certified by an expert that the NYSDEC finds acceptable.

10.2 SITE MANAGEMENT PLAN

Site Management is the last phase of remediation and begins with the approval of the FER and issuance of the Certificate of Completion (COC) for the Remedial Action. The SMP is submitted as part of the FER but will be written in a manner that allows its removal and use as a complete and independent document. Site Management

continues in perpetuity or until released in writing by NYSDEC. The property owner is responsible to ensure that all Site Management responsibilities defined in the Environmental Easement and the SMP are performed.

The SMP should include methods to incorporate and track GSR. Measures should be taken to maintain a cost-effective, protective remedy that remains conscientious of the Site's environmental footprint. At a minimum, the following should be assessed: waste generation, energy usage, emissions, and water usage.

The SMP is intended to provide a detailed description of the procedures required to manage residual contamination left in place at the Site following completion of the Remedial Action in accordance with the BCA with the NYSDEC. This includes: (1) development, implementation, and management of all Engineering and Institutional Controls; (2) development and implementation of monitoring systems and a Monitoring Plan; (3) development of a plan to operate and maintain any treatment, collection, containment, or recovery systems (including, where appropriate, preparation of an Operation and Maintenance Manual); (4) submittal of Site Management Reports, performance of inspections and certification of results, and demonstration of proper communication of Site information to NYSDEC; and (5) defining criteria for termination of treatment system operation.

To address these needs, this SMP will include four plans: (1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs; (2) a Monitoring Plan for implementation of Site Monitoring; (3) an Operation and Maintenance Plan for implementation of remedial collection, containment, treatment, and recovery systems; and (4) a Site Management Reporting Plan for submittal of data, information, recommendations, and certifications to NYSDEC. The SMP will be prepared in accordance with the requirements in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation and the guidelines provided by NYSDEC.

Site management activities, reporting, and EC/IC certification will be scheduled on a certification period basis. The certification period will be annually. The SMP will be based on the certifying period relative to the date of issuance of the COC. The first submission will be due 16 months after the issuance of the COC, and annually (or at another frequency as approved by NYSDEC) thereafter.

The SMP in the FER will include a monitoring plan for groundwater at the down-gradient Site perimeter to evaluate Site-wide performance of the remedy. Appropriately placed groundwater monitor wells will also be installed immediately down-gradient of all source remediation areas for the purpose of evaluation of the effectiveness of the remedy that is implemented.

No exclusions for handling of residual contaminated soils will be provided in the SMP. All handling of residual contaminated material will be subject to provisions contained in the SMP.

11.0 FINAL ENGINEERING REPORT

A Final Engineering Report (FER) will be submitted to NYSDEC following implementation of the Remedial Action defined in this RAWP. The FER provides the documentation that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The FER will provide a comprehensive account of the locations and characteristics of all material removed from the Site including the surveyed map(s) of all sources. The Final Engineering Report will include as-built drawings for all constructed elements, calculation and manufacturer documentation for treatment systems, certifications, manifests, bills of lading as well as the complete SMP. The FER will provide a description of the changes in the Remedial Action from the elements provided in the RAWP and associated design documents. The FER will provide a tabular summary of all

performance evaluation sampling results and all material characterization results and other sampling, and chemical analysis performed as part of the Remedial Action. The FER will provide test results demonstrating that all mitigation and remedial systems are functioning properly. The FER will be prepared in conformance with DER-10. Where determined to be necessary by NYSDEC, a Financial Assurance Plan will be required to ensure the sufficiency of revenue to perform long-term operations, maintenance and monitoring tasks defined in the Site Management Plan and Environmental Easement. This determination will be made by NYSDEC in the context of the FER review.

The FER will include written and photographic documentation of all remedial work performed under this remedy. The FER will include an itemized tabular description of actual costs incurred during all aspects of the Remedial Action.

The FER will provide a thorough summary of all residual contamination left on the Site after the remedy is complete. Residual contamination includes all contamination that exceeds the Track 1 Unrestricted Use SCO in 6NYCRR Part 375-6. A table that shows exceedances from Track 1 Unrestricted SCOs for all soil/fill remaining at the Site after the Remedial Action and a map that shows the location and summarizes exceedances from Track 1 Unrestricted SCOs for all soil/fill remaining at the Site after the Remedial Action will be included in the FER.

The FER will provide a thorough summary of all residual contamination that exceeds the SCOs defined for the Site in the RAWP and must provide an explanation for why the material was not removed as part of the Remedial Action. A table that shows residual contamination in excess of Site SCOs and a map that shows residual contamination in excess of Site SCOs will be included in the FER.

The FER will include an accounting of the destination of all material removed from the Site, including excavated contaminated soil, historic fill, solid waste, hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material. It will provide an accounting of the origin and chemical quality of all material imported onto the Site.

The FER must include a discussion of the green remediation practices/technologies employed throughout the remedial program. A final footprint analysis using a DER accepted model, and any tracking methods used through the construction including restoration activities. Before approval of a FER and issuance of a COC, all project reports must be submitted in digital form on electronic media (PDF).

11.1 CERTIFICATIONS

The following certification will appear in front of the Executive Summary of the Final Engineering Report. The certification will be signed by the Remedial Engineer, Stephen M. Kline, who is a Professional Engineer registered in New York State. This certification will be appropriately signed and stamped. The certification will include the following statements:

I, _____, am currently a registered professional engineer licensed by the State of New York, I had primary direct responsibility for implementation of the remedial program activities, and I certify that the Remedial Action Work Plan was implemented and that all construction activities were completed in substantial conformance with the Department-approved Remedial Action Work Plan.

I certify that the data submitted to the Department with this Final Engineering Report demonstrates that the remediation requirements set forth in the Remedial Action Work Plan and in all applicable statutes and regulations have been or will be achieved in accordance with the time frames, if any, established for the remedy.

I certify that all use restrictions, Institutional Controls, Engineering Controls, and/or any operation and maintenance requirements applicable to the Site are contained in an environmental easement created and recorded pursuant ECL 71-3605 and that all affected local governments, as defined in ECL 71-3603, have been notified that such easement has been recorded.
I certify that a Site Management Plan has been submitted for the continual and proper operation, maintenance, and monitoring of all Engineering Controls employed at the Site, including the proper maintenance of all remaining monitoring wells, and that such plan has been approved by Department.

I certify that any financial assurance mechanisms required by the Department pursuant to Environmental Conservation Law have been executed.

I certify that all data generated in support of this report have been submitted in accordance with the Department's electronic data deliverable and have been accepted by the Department.

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as Owner's Designated Site Representative (and if the site consists of multiple properties): [and I have been authorized and designated by all site owners to sign this certification] for the site.
It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.

12.0 SCHEDULE

A project schedule is included as **Appendix L**.