# PARAGON PAINT

# AND VARNISH CORP. SITE

## QUEENS, NEW YORK

# Final Engineering Report

**NYSDEC Site Number: C241108**

**Prepared for:**
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Larchmont, New York 10538

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**NOVEMBER 2016**

# CERTIFICATIONS

I, *Omar Ramotar*, 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 the Department.

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

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 form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, Omar Ramotar, of Remedial Engineering, P.C., am certifying as Owner's Designated Site Representative for the site.


| 077995 | 11/22/16 | |
|---|---|---|
| NYS Professional Engineer # | Date | Signature |

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# LIST OF ACRONYMS

| Acronym | Definition |
|---|---|
| AST | Above Ground Storage Tank |
| AWQSGVS | Ambient Water Quality Standards and Guidance Values |
| BCA | Brownfield Cleanup Agreement |
| BCP | Brownfield Cleanup Program |
| CAMP | Community Air Monitoring Plan |
| C/D | Construction and Demolition |
| CFR | Code of Federal Regulation |
| COC | Certificate of Completion |
| CP | Commissioner Policy |
| DER | Division of Environmental Remediation |
| EC | Engineering Control |
| ECL | Environmental Conservation Law |
| ESA | Environmental Site Assessment |
| EWP | Excavation Work Plan |
| Ft bls | Feet below land surface |
| HASP | Health and Safety Plan |
| IC | Institutional Control |
| ISCO | In Situ Chemical Oxidation |
| LNAPL | Light Non-Aqueous Phase Liquid |
| NYS | New York State |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSDOH | New York State Department of Health |
| NYCRR | New York Codes, Rules and Regulations |
| O&M | Operation and Maintenance |
| PAH | Polycyclic Aromatic Hydrocarbon |
| PCB | Polychlorinated Biphenyls |
| PID | Photoionization Detector |
| PoG | Protection of Groundwater |
| PRR | Periodic Review Report |

| Acronym | Definition |
|---|---|
| QAPP | Quality Assurance Project Plan |
| RA | Remedial Alternative |
| RAO | Remedial Action Objective |
| RAWP | Remedial Action Work Plan |
| RCA | Recycled Concrete Aggregate |
| RI | Remedial Investigation |
| RIR | Remedial Investigation Report |
| ROD | Record of Decision |
| RRSCO | Restricted Residential Use Soil Cleanup Standard |
| RSO | Remedial System Optimization |
| SCG | Standards, Criteria and Guidelines |
| SCO | Soil Cleanup Objective |
| SMP | Site Management Plan |
| SPDES | State Pollutant Discharge Elimination System |
| SVOC | Semivolatile Organic Compound |
| TAL | Target Analyte List |
| TCL | Target Compound List |
| USEPA | United States Environmental Protection Agency |
| UST | Underground Storage Tank |
| VOC | Volatile Organic Compounds |

# FINAL ENGINEERING REPORT

## 1.0 BACKGROUND AND SITE DESCRIPTION

The Site entered into a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) in September, 2008, to investigate and remediate a 33,150 square foot (0.761 acre) property located in Long Island City, Queens, New York. The property was remediated to restricted residential use, and will be used for a mix use development with ground level retail space and residential space above.

The site is located in the County of Queens, New York and is identified as Block 26 and Lot 4 in Long Island City. The site is situated on an approximately 33,150 square foot area bounded by Anable Basin and a one-story commercial property to the north, 46th Avenue to the south, Vernon Boulevard and multi-story commercial and residential properties to the east, and a two-story warehouse to the west (see Figure 1). The boundaries of the site are fully described in Appendix A: Survey Map, Metes and Bounds.

An electronic copy of this FER with all supporting documentation is included as Appendix B.

### 1.1 Prior Environmental Site Work Excluding IRMs

The following narrative provides a brief summary of prior environmental work performed at the Site excluding Interim Remedial Measures (IRMs). The IRMs previously performed at the Site are discussed in Section 3.0. The information and certifications made in the referenced reports were relied upon to prepare this report and certify that the remediation requirements for the Site have been met. Full titles for each of the reports are provided in Section 5.0 – References or are enclosed as an Appendix.

#### 1.1.1 2005 TRC Phase I

In September 2005, TRC Engineers, Inc. (TRC) prepared a Phase I Environmental Site Assessment (ESA) for 5-49 46th Avenue, New York 11101. The Phase I report indicated that the Site has been used for industrial purposes for over 100 years, primarily as a paint

manufacturing company. Multiple storage tanks, including 24 known USTs, 53 known above ground storage tanks (ASTs), and 400 drums were located on the Site. Most of the ASTs and drums were empty, but the tanks could have included mineral spirits, Stoddard solvents, number 2 fuel oil, kerosene, varnoline, linseed oil, fish oil, alkyd resin in mineral spirits, cycled mineral spirits, "direr" and propylene glycol.

### 1.1.2 2006 AKRF Subsurface Investigation

AKRF, Inc. (AKRF) conducted a subsurface investigation at the Site in 2006 on behalf of 549 46th Ave LLC. AKRF's subsurface investigation included the advancement of five soil borings, which were retrofitted with groundwater monitoring wells (MWs) MW-1 through MW-5 and the collection of soil, and groundwater samples for laboratory analysis. AKRF's conclusion of the investigation is as follows:

- Field observations and analytical data indicated that widespread hydrocarbon contamination exists in the shallow soil throughout the Site.
- LNAPL was observed in two of the monitoring wells (MW-2 and MW-3).
- Elevated concentrations of PAHs were detected in soil samples collected in borings MW-1, MW-2, MW-3 and MW-4, several of these detections exceeded applicable NYSDEC Technical and Administrative Guidance Memo (TAGM) #4046 Recommended Soil Cleanup Objectives (RSCOs).
- Xylenes were detected in soil at boring MW-2 at concentrations that exceeded applicable NYSDEC TAGM #4046 RSCOs.
- 2-Butanone, or methyl ethyl ketone (MEK) was detected in soil at boring MW-4 at a concentration that exceeds its applicable NYSDEC TAGM #4046 RSCO.
- Napthalene and ethylbenzene were detected in a water sample at MW-4 at concentrations that exceed the Ambient Water Quality Standards and Guidance Values (AWQSGVs).
- Metals are present in soil and groundwater samples at concentrations that are consistent with naturally occurring metals in the area.

It should be noted that the laboratory did not prepare a Category B deliverable. Additionally, attempts by Roux Associates to have a Category B deliverable prepared were unsuccessful due to the age of the data; therefore, no conclusions can be made with

regard to the analytical data's validity. Detection limits for the soil and groundwater analytical data appear to be within typically acceptable ranges. The case narrative included in the laboratory analytical report notes that all samples were analyzed without any apparent problems.

### 1.1.3 2007 AKRF Additional Subsurface Investigation

AKRF conducted an additional subsurface investigation at the Site in 2007 on behalf of 549 46th Ave LLC. AKRF's additional subsurface investigation included the advancement of eight soil borings which were retrofitted with groundwater monitoring wells (MW-6 through MW-13), the installation of three soil-vapor sampling points inside the Paint Factory, and the collection of soil, groundwater, and soil-vapor samples for laboratory analysis. The findings of the additional subsurface investigation are as follows:

- Field observations and analytical data indicated that widespread hydrocarbon contamination exists throughout the Site, including areas beneath the Paint Factory and Warehouse building. The degree of contamination was found to be more evident at the water table (5 to 7 feet below grade) in areas surrounding the underground storage tanks; whereas the degree of contamination was found to be more evident in deeper sediments (12 to 16 feet below grade) in borings further away from the USTs (i.e., MW-1, MW-6, and MW-9).

- LNAPL was observed in monitoring wells MW-1, MW-2, MW-3, MW-6, MW-8, MW-9,MW-12, and MW-13. The LNAPL was identified as primarily a petroleum-based paint thinner. A second LNAPL, identified as weathered fuel oil, was documented in the sample collected from monitoring well MW-3. Free-phase product samples were found to be less weathered in wells near the USTs and more weathered in wells further away. This suggests the USTs are the probable source for the free-phase product and weathering is occurring as the product disperses away from the source.

- Elevated concentrations of VOCs and SVOCs were detected in soil samples collected from borings MW-6 through MW-9, MW-12, and MW-13. Samples from these borings contained concentrations that exceeded the applicable NYSDEC TAGM #4046 RSCOs.

- There were no polychlorinated biphenyls (PCBs) or pesticides detected in the soil samples above the method detection limits.

- VOCs including isopropylbenzene and isopropyltoluene, which are used in the production of paint products including paint thinner, were detected in groundwater samples from MW-4 and MW-7 at concentrations that exceeded the AWQSGVs. Residual VOCs were detected in MW-11 at concentrations well below the AWQSGVs. VOCs were not detected in groundwater samples collected from monitoring wells MW-5 and MW-10.

- PAHs, a subset of SVOCs, were detected in groundwater collected from monitoring well MW-10 at concentrations that exceeded the AWQSGVs. Bis(2-ethylhexyl) phthalate was detected in monitoring well MW-4 at a concentration of 5 micrograms per liter (µg/L), which is below the AWQSGV. SVOCs were not detected in monitoring wells MW-5, and MW-7. Due to concentration of SVOCs in the groundwater sample from MW-7, the achievable detection limits for many of the SVOC compounds were above the AWQSGVs.

- Metals are present in soil and groundwater samples at concentrations that are generally representative of naturally occurring metals in the area or typical urban fill quality.

- Hydrocarbon, alcohol and solvent-related compounds were detected in the sub-slab and indoor air samples at concentrations ranging from 1.09 micrograms per cubic meter (µg/m3) to 92.4 µg/m3. The hydrocarbon compounds included 1,2,4-trimethylbenzene, ethylbenzene, toluene, xylenes, propylene and methyl tert-butyl ether (MTBE), and ranged in concentrations from 2.68 µg/m3 (1,2,4-trimethylbenzene) in SV-1 to 39.5 µg/m3 (MTBE) in SV-2. The alcohol compounds included ethanol and isopropanol and were detected at concentrations ranging from 1.3 µg/m3 (isopropanol) to 92.4 µg/m3 (ethanol). The solvent-related compounds included 1,2,4-trichlorobenzene, ketones including MEK and acetone, methylene chloride, n-heptane, and tetrahydrofuran. These concentrations ranged from 2.34 µg/m3 of n-heptane in SV-3 to 69.2 µg/m3 of methylene chloride in SV-3 (Subsurface). The detected concentrations in the sub-slab samples were generally higher than the corresponding ambient air samples, but overall the detections were consistent.

### 1.1.4 2009 Off-Site Soil Vapor Intrusion Investigation

Apex completed an off-Site soil vapor intrusion investigation within one off-Site building adjacent to the southwest Site boundaries. Apex collected two soil vapor samples and one sub-slab vapor sample from locations inside the building identified as offsite property E. Additionally one sub-slab vapor sample was collected from the sidewalk directly south of the Site boundaries. One outdoor ambient air sample was collected from southwest of the Site.

In the Soil Vapor Intrusion Investigation Report, Apex noted that none of the VOCs assigned specific thresholds by the New York State Department of Health (NYSDOH) were present exceeding concentrations of concern during the soil vapor intrusion investigation and no further mitigative action was recommended.

### 1.1.5 2010 Additional Off-Site Soil Vapor Intrusion Investigation

EnviroTrac Ltd. (EnviroTrac) was retained by NYSDEC to conduct an off-Site soil vapor intrusion investigation within four off-Site buildings adjacent to the west, north and east Site boundaries. These building are identified as offsite properties A, B, C and D respectively. EnviroTrac collected sub-slab soil vapor samples and indoor air samples from within four off-Site buildings. Additionally, two outdoor ambient air samples were collected to the west and southwest of the Site.

In the Summary and Conclusion Section of the Off-Site Soil Vapor Intrusion Investigation Report, EnviroTrac noted that the NYSDOH evaluated the analytical data to determine if vapor mitigation is warranted within any of the sampled structures. In July 2010, the NYSDOH determined that actions are not needed to address exposures related to soil vapor intrusion at the properties sampled.

### 1.1.6 2014 Remedial Investigation Report

Roux Associates completed Remedial Investigation activities in accordance with the February 7, 2013 NYSDEC-approved Remedial Investigation Work Plan (RIWP), NYSDEC's January 15, 2014 email approving necessary modifications to the RIWP. This investigation provided a thorough analysis of soil borings and monitoring wells, test pitting, LNAPL fingerprinting and UST characterization. The results of the remedial investigation (RI) were presented in the Remedial Investigation Report (RIR) dated May 15, 2015. Results indicate that soil and groundwater exceedances of NYSDEC Part 375 RRSCOs are limited and are largely restricted to polycyclic aromatic hydrocarbons (PAHs), metals commonly associated with historic fill. In addition, four VOCs (benzene, ethylbenzene, isopropylbenzene and xylenes) commonly associated with petroleum derivatives were found to be in exceedance of NYSDEC Part 375 PoG SCOs and were also found in site groundwater in one or more groundwater monitoring wells. The

potential for vapor intrusion was addressed as part of the redevelopment of the Site; therefore, grossly impacted soil, LNAPL and the four VOCs (benzene, ethylbenzene, isopropylbenzene and xylenes) were the primary concerns at the Site.

The soil investigation included 37 soil borings and 122 soil samples. No samples exceeded the RRSCOs for VOCs, PCBs or pesticides. Four VOCs exceeded PoG SCOs and were also found in Site groundwater exceeding NYSDEC AWQSGVs for Class GA groundwater in one or more well locations. These four VOCs detected above the PoG SCOs would become the four VOCs of concern to be addressed by the RAWP: benzene, ethylbenzene, isopropylbenzene and total xylenes.

Semivolatile organic compounds exceeded the RRSCOs in 49 (out of 122) soil samples at 27 locations. All exceedances ranged in depth from 0-2 feet below level surface (feet below land surface [ft bls]) to 10-12 ft bls and are largely restricted to PAHs and metals commonly associated with historic fill. Six metals were detected above the RRSCOs. These metals are likely naturally occurring or attributable to the use of historic fill and are not indicative of a release.

A total of 26 groundwater samples were collected during this investigation. Analytical data for VOCs indicated detections above NYSDEC AWQSGV for seven (7) compounds, of which four were the aforementioned compounds of concern. The remaining three (3) compounds that had exceedances were acetone, M&P xylenes and O-xylenes (the xylene compounds attribute to the total xylenes compound of concern).

Groundwater samples collected from 17 locations were analyzed for Target Analyte List (TAL) metals. Metals were found in concentrations that exceed their respective AWQSGVs at 13 locations.

The exceedances of PAHs and metals in many of the groundwater samples were likely attributable to historic fill and/or may be the result of a turbid sample.

There were no exceedances of NYSDEC AWQSGVs for PCBs or pesticides.

LNAPL was detected in 15 out of 36 groundwater monitoring wells, including MW-2R, MW-3, MW-6/6R, MW-7/7R, MW-8, MW-9, MW-12, MW-13, MW-17, MW-19, MW-23, MW-31, MW-33, MW-34 and MW-35. The analytical data confirmed the presence of two distinct LNAPL plumes located on Site; one plume was centered in the courtyard and the other at the southwestern edge of the Site.

Additionally, test pits were completed in accordance with the May 1, 2014 Test Pit Work Plan (approved by NYSDEC on June 23, 2014) and additional monitoring wells were installed in accordance with the June 24, 2014 Additional Delineation Work Plan (approved by NYSDEC on August 1, 2014) and the December 17, 2014 Additional Delineation Work Plan (approved by NYSDEC on December 19, 2014).

### 1.1.7 2014 Resource Conservation and Recovery Act Closure Report

The Site previously operated as a Large Quantity Generator (LQG) of hazardous waste under United States Environmental Protection Agency (USEPA) Identification Number NYD001495274, and as such is classified as a Resource Conservation and Recovery Act (RCRA) hazardous waste LQG. Due to the former status of the Site as a LQG, and because the Site was not properly closed by the previous owners/operators in accordance with 6 NYCRR Part 373, NYSDEC requested that Vernon 4540 prepare and implement a RCRA Closure Plan. The RCRA Plan was implemented from March 25, 2015 to August 11, 2015. The respective RCRA Closure Report was submitted to the NYSDEC on February 12, 2016 and is provided electronically in Appendix C. A brief overview of the activities performed as part of the implementation of the RCRA Closure Plan is provided below.

The scope focused on the decontamination of the following Hazardous Waste Storage Areas:

- Second, third, and fourth floors of the former Paint Factory Building, which contained approximately 65 ASTs / vessels, pumps, and piping formerly used in paint and varnish manufacturing; and
- The first floor of the garage, which may also have been used to store hazardous waste prior to off-Site shipment and disposal.

As part of the RCRA Closure, all vessels within the Hazardous Waste Storage Areas were decontaminated and removed from Site. Pneumatic chipping guns, pumps, vacuums, scrapers, shovels and a mini-excavator were used to remove residue on the side and/or bottom of these AST/vessels. The following waste was generated through the decontamination and removal of paint and varnish process ASTs/vessels, piping and related process equipment:

- six (6) 55-gallon drums (330 gallons) of hazardous PCB gel;
- three (3) 275-gallons totes (750 gallons) of hazardous flammable paint liquids;
- twenty-nine (29) 55-gallon drums (11,600 lbs) of hazardous flammable paint gel;
- three (3) one-cubic yard (CY) boxes (5500 lbs) of hazardous flammable paint solids;
- 6.95 tons of hazardous solid waste (contains lead);
- 7.01 tons of hazardous solid waste (contains mercury);
- 18.29 tons of hazardous lead paint gel;
- seven (7) 275-gallon totes (19,500 lbs) of non-hazardous white liquid;
- six (6) 275-gallon totes (15,000 lbs) of non-hazardous brown liquid;
- nine (9) one-CY boxes (25,000 lbs) of non-hazardous titanium dioxide;
- nine (9) one-CY boxes (11,700 lbs) of non-hazardous paint gel (solid);
- fifty-seven (57) 55-gallon drums (19,950 lbs) of non-hazardous paint gel;
- 24.93 tons of non-hazardous paint solids/resins; and
- 160 CY of scrap metal from 60 ASTs/vessel and their ancillary piping and equipment.

Decontamination of the floor, wall and ceiling surfaces was completed in the Hazardous Waste Storage Areas. These areas were initially decontaminated by pressure washing, abrasion, and removal of the concrete overlay if the previous two methods did not fully removed hazardous waste residues. Removal of the concrete overlay was only completed on the third floor of the former paint factory building. The following waste was generated during the decontamination activities and was properly disposed off-Site:

- 8,465 gallons of non-hazardous wash and rinse water;
- 28.47 tons of floor paint residue was disposed of as non-hazardous waste;
- 18.29 tons of floor paint residue was disposed of as hazardous lead waste; and
- 18.94 tons of concrete were removed from the third floor and disposed of as non-hazardous.

Post-cleanup rinsate samples were collected from each of the four floors of the former paint factory building following the decontamination activities to verify the absence of impacts. A total of 40 samples were collected, 10 samples per floor, and were analyzed for VOCs, SVOCs, Toxicity Characteristic Leaching Procedure (TCLP) RCRA Metals, RCRA hazardous waste characteristics, and PCBs. The analytical data was compared to the AWQSGVs.

In the initial round of rinsate sampling there were three exceedances of the AWQSGVs: PCBs in two (2) samples and SVOCs in one (1) sample. All three sample locations were re-cleaned using a degreaser coupled with a high pressure rinse. These three locations were resampled and no SVOCs or PCBs were detected in the second round of rinsate sampling.

## 2.0 SUMMARY OF SITE REMEDY

### 2.1 Remedial Action Objectives

Based on the results of the Remedial Investigation, the following Remedial Action Objectives (RAOs) were identified for this site.

#### 2.1.1 Groundwater RAOs

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

- Restore ground water aquifer, to the extent practicable, to pre-disposal/pre-release conditions.
- Prevent the discharge of contaminants to surface water.
- Remove the source of ground or surface water contamination.

#### 2.1.2 Soil RAOs

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 or surface water contamination.

#### 2.1.3 Soil Vapor

RAOs for Public Health Protection

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

## 2.2 Description of Selected Remedy

The site was remediated in accordance with the remedy selected by the NYSDEC in the Remedial Action Work Plan (RAWP) dated October 7, 2015.

The factors considered during the selection of the remedy are those listed in 6NYCRR 375-1.8 (NYCRR). The following are the components of the selected remedy as specified in the approved RAWP:

Implementation of erosion and sediment controls;

1. Site Monitoring of potentially airborne volatile organic compounds (VOCs) and particulates in accordance with a NYSDEC approved Community Air Monitoring Plan (CAMP) during all ground intrusive and soil handling activities;

2. Implementation of proper dust and odor suppression techniques during all ground intrusive and soil handling activities, including use of an odor control tent enclosure for excavation work;

3. Closure of remaining underground storage tanks (USTs) by removal or, as a contingency, closure in place;

4. Excavation and disposal of subsurface piping;

5. Excavation and off-Site disposal of grossly contaminated soil in the courtyard light non-aqueous phase liquid (LNAPL) source area (see Figure 2), including:

    - Grossly contaminated soil as defined in 6NYCRR Part 375-1.2(u);

    - Soil containing LNAPL;

    - Soil containing total Semi-volatile organic compounds (SVOCs) exceeding 500 parts per million (ppm);

    - Soils which exceed the Protection of Groundwater (PoG) Soil Cleanup Objectives (SCOs) as defined by 6 NYCRR Part 375-6.8 for those contaminants found in Site groundwater above standards; and

    - Soils that create a nuisance condition, as defined in NYSDEC Commissioner Policy CP-51 Section G.

6. Screening for indications of contamination (by visual means, odor, and monitoring with a photoionization detector (PID)) of all excavated soil during all ground intrusive Site work;

7. Excavated unsaturated soil free from gross contamination was stockpiled for reuse on Site (if it met soil re-use criteria as noted in NYSDEC's DER-10 Technical Guidance for Site Investigation and Remediation [DER-10]);

8. 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;

9. Backfill of excavated areas with recycled concrete aggregate (RCA) or clean stone to 1 foot above groundwater table, backfill one-foot above the water table to two-feet below proposed development grade with fill reused from the excavation (as available), and backfill the top two-feet with RCA as a temporary cover prior to redevelopment. RCA met NYSDEC Part 360-1.15 requirements and will be free of asphalt.

10. Dewatering and treatment or off-Site disposal of groundwater as needed to facilitate excavation.

11. In-situ chemical oxidation (ISCO) injections for treatment of VOCs in soil and groundwater underneath the three-story brick Warehouse building on-Site;

12. Installation of five automatic LNAPL recovery pumps at property boundary areas where the LNAPL plume extends off-Site, and underneath the brick Warehouse building on-Site;

13. A Site cover system consisting of building slabs (the existing Paint Factory, the Warehouse and the Garage), pavement or 24-inches minimum of RCA as a temporary cover in the courtyard area. Following Site redevelopment, the Site cover system will consist of new concrete building slabs, pavement or a minimum of two feet of clean fill meeting Restricted Residential SCOs (RRSCOs) in new landscaped areas as detailed in the Site Management Plan (SMP).

14. Recording of an Environmental Easement, including Institutional Controls (ICs) and Engineering Controls (ECs), to prevent future exposure to any residual contamination remaining at the Site; and

15. Preparation of an SMP for long term management of residual contamination as required by the Environmental Easement, including plans for: (1) ICs and ECs, (2) monitoring, (3) operation and maintenance (O&M) and (4) reporting.

## 3.0 INTERIM REMEDIAL MEASURES

The following narrative provides a brief summary of IRMs performed at the Site. The information and certifications made in the referenced reports were relied upon to prepare this report and certify that the remediation requirements for the Site have been met. Full titles for each of the reports are provided in Section 5.0 – References or are enclosed as an Appendix.

### 3.1 Interim Remedial Measures

#### 3.1.1 2009 Interim Remedial Measure

On February 11, 2010, the NYSDEC approved a December 18, 2009, *Revised Interim Remedial Measure Work Plan* prepared by Apex Companies, LLC (Apex) for the Site. The December 18, 2009 Work Plan prescribed the use of vacuum extraction on a monthly basis to recover LNAPL, contaminated groundwater, and soil vapor. Apex documented each extraction event in a monthly report (a total of six extraction events were completed by Apex).

A review of available monthly reports indicated one gauging and sampling event occurred in March 2010 followed by six vacuum extraction events which occurred on a monthly basis; the last reported event occurred in August 2010. Apex reports that in total, 434 gallons of total fluid and 224 gallons of LNAPL were recovered during the extraction events. Vacuum extraction occurred only at the monitoring wells which exhibited LNAPL on the day of the event, which most often included monitoring wells: MW-6, MW-8, MW-9, MW-12, MW-13 and occasionally other wells. Thirty-five-percent of the total LNAPL recovered (78 gallons) was recovered from monitoring well MW-8. Also of note, monitoring well MW-3, which typically contained less than one foot of LNAPL thickness, on the last vacuum extraction event, contained more than seven feet of LNAPL. The above vacuum extraction was suspended after the six extraction events due to a change in ownership of the Site from 549 46$^{th}$ Ave LLC to Anable Beach Inc.

#### 3.1.2 2011 Supplemental Interim Remedial Measures

Roux Associates reinitiated LNAPL Interim Remedial Measure (IRM) recovery events at the Site on December 22, 2011 pursuant to the November 17, 2011 IRM Work Plan which was approved by NYSDEC in a letter dated December 12, 2011. The IRM recovery events consisted of manually removing LNAPL using bailers. Beginning December 21, 2012, with NYSDEC approval, the frequency of the IRM recovery visits was reduced from weekly to bi-weekly (twice a month). Bi-weekly IRM recovery events continued at the Site through June of 2014 when vacuum enhanced LNAPL recovery was assessed as per the Vacuum Extraction Interim Remedial Measure Work Plan dated March 20, 2014. The manual LNAPL recovery IRM events resumed in the month of August 2014. In total, Roux Associates has performed 103 LNAPL recovery IRM events.

In total, approximately 2,239-gallons of LNAPL were recovered since initiation of the LNAPL Recovery IRM, with an average of approximately 21-gallons of LNAPL recovered during each of the 103 events. Approximately 1,298 gallons of LNAPL has been recovered from MW-8 alone accounting for approximately 60% of the total. All monthly IRM LNAPL recovery documents are included in Appendix H.

### 3.1.3 2013 Removal of Underground Storage Tank Contents

During completion of the Remedial Investigation UST tank inventory task (Section 1.1.6), LNAPL was observed to be present in USTs GT-2, CT-1 and CT-4. An IRM Work Plan was submitted by Roux Associates to NYSDEC that included removing LNAPL from these USTs with a vacuum truck. The IRM Work Plan was approved by NYSDEC on June 26, 2013 was initiated on July 10, 2013.

In total, 1,865-gallons of mineral spirits and 5,748-gallons of an oil (diesel) water mixture were removed using a vacuum truck and transported offsite for proper disposal. Waste disposal documentation was included in the RI Report.

### 3.1.4 2015 Removal of Underground Storage Tanks and Contents

UST removal activities were completed prior to RAWP implementation due to the location of the majority of the USTs either within or directly adjacent to the driveway, which is the only vehicle access to the courtyard. UST removal activities were completed

in accordance with the UST Removal Notification letter dated December 22, 2014 which proposed the removal of three (3) USTs located in the courtyard and two (2) USTs located in the driveway.

During UST removal in the courtyard it was determined that two (2) of the USTs were actually a single, chambered UST and would need to be removed as a single unit. Following removal of this chambered UST, additional USTs were discovered adjacent to them. A request for permission to remove the two (2) USTs, of which one was a double chambered UST, was competed via email on January 20 and 30, 2015 respectively. The NYSDEC approved the request for the removal of both USTs in separate emails on February 2, 2015.

Following the removal of the second partially exposed UST, a formal letter request was submitted to NYSDEC to remove the remaining known courtyard USTs that were directly adjacent to the 1 story brick building. In a letter dated February 20, 2015, the NYSDEC approved the request and the UST was subsequently removed.

In total, six (6) USTs were removed from the courtyard, of which three (3) were double chambered, and two (2) 550-gallon USTs were removed from the driveway. The following waste was generated through the UST excavation and disposal activities:

- Approximately 75,404 gallons of non-hazardous oily water;
- 151 CY of clean concrete from UST vaults or overlay;
- 70.9 tons of soil surrounding the USTs;
- Eighty-one 55-gallon drums of non-hazardous tank bottom material; and
- Six 55-gallon drums of hazardous material from the 550-gallon USTs.

A tank closure report is included in Appendix D.

## 4.0 DESCRIPTION OF REMEDIAL ACTIONS PERFORMED

Remedial activities completed at the Site were conducted in accordance with the NYSDEC-approved RAWP for the Former Paragon Paint and Varnish Company Manufacturing Facility site (October 2015). All deviations from the RAWP were discussed with the NYSDEC prior to implementation (Appendix E), are noted below and are explained further in Section 4.10:

- The courtyard excavation limits were reduced based on site constraints and at the request of the Support of Excavation (SOE) Engineer retained by the Owner's Representative;

- Pre-delineation sidewall samples were collected, where required along the limits of steel sheeting, instead of post-excavation samples due to SOE steel sheeting being used as the excavation method of choice;

- Excavation limits were expanded due to pre-delineation sampling, increasing the size of the excavation by 3,494.66 square feet;

- Excavation limits were expanded past the Areas of Concern (Figure 2) due to post-excavation sampling exceeding PoG SCOs;

- Residual soil contamination was not removed as identified in Figures 11 and 12, because of the sheeting or shoring limitations or because the residual contamination appeared to extend under building structures;

- Actual size and number of USTs excavated and removed from the courtyard changed based on field observations;

- Actual size and number of USTs abandoned in the garage changed based on field observations;

- A spill occurred onsite during dewatering activities and was cleaned within an hour of the occurrence. The NYSDEC did not require the spill to be reported;

- Some post-abandonment confirmation samples for abandoned USTs were not collected due to concrete or bedrock refusal; and

- The north-west corner of the excavation was backfilled below the water table with

reusable soil generated from the Site.

## 4.1 Governing Documents

The remedial activities were completed in accordance with the approved RAWP and the following project plans:

- Site-specific Health and Safety Plan (HASP), which was included as Appendix C of the RAWP;
- Quality Assurance Project Plan (QAPP), which was included as Appendix D of the RAWP;
- Soil/ Materials Management Plan (S/MMP), which was included as Section 5.4 of the RAWP, and as part of the Site Operations Plan (SOP);
- Community Air Monitoring Plan (CAMP), which was included as part of the Site-specific HASP;
- Contractors SOP; and
- Citizen Participation Plan (CPP), which was included as Appendix B of the RAWP.

The subsequent sections provide additional details for each project plan.

### 4.1.1 Site Specific Health & Safety Plan (HASP)

All remedial work performed under this Remedial Action (RA) was in full compliance with governmental requirements, including Site and worker safety requirements mandated by Federal Occupational Safety and Health Administration (OSHA). As defined in the HASP, all Site workers conducting intrusive activities in the zone of remediation were required to have 40-hour Hazardous Waste Operation Worker (HAZWOPER) training in accordance with the referenced regulations.

As provided in the HASP, Site controls were established to limit potential exposure to impacted materials. Health and safety monitoring, including both work and community monitoring, were performed during all work activities. All monitoring activities were performed in accordance with the NYSDEC TAGM 4031-Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites (NYSDEC, 1989), the NYSDOH protocol for Community Air Monitoring (NYSDEC, 2002), and HASP for the

Site. Confined space entry complied with all OSHA requirements to address the potential risk posed by combustible and toxic gases.

The Health and Safety Plan (HASP) was complied with for all remedial and invasive work performed at the Site.

### 4.1.2 Quality Assurance Project Plan (QAPP)

The QAPP was included as Appendix D of the RAWP approved by the NYSDEC. The QAPP describes the specific policies, objectives, organization, functional activities and quality assurance/ quality control activities designed to achieve the project data quality objectives.

### 4.1.3 Soil/Materials Management Plan (S/MMP)

The S/MMP included detailed plans for managing all soils/materials that were disturbed at the Site, including excavation, handling, storage, transport and disposal. It also included all of the controls that were applied to these efforts to assure effective, nuisance-free performance in compliance with all applicable Federal, State and local laws and regulations. The following key activities were specified in the SMP:

- Soil screening methods;
- Stockpile methods;
- Material excavation and load out;
- Material transport and disposal off-Site;
- Materials reuse on-Site;
- Fluids management;
- Backfill from off-Site sources;
- Heavy equipment decontamination; and
- UST cleaning methods.

All of the controls that were applied to these efforts assured effective, nuisance-free performance in compliance with all applicable Federal, State and local laws and regulations.

### 4.1.4 Storm-Water Pollution Prevention Plan (SWPPP)

The Site is exempt from the NYSDEC State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity (Permit No. GP-02-01) requirement as the area disturbed on the site was less than one acre in size. A Storm Water Pollution Plan was not required.

As necessary, hay bales were placed at locations upgradient of excavation areas to control stormwater runoff and surface water from entering or exiting the excavation to the adjacent body of water (Anable Basin) or the community. Catch basin inlets and surface water immediately adjacent to the work area were protected by the SOE sheet piling and silt fencing along Anable Basin to prevent disturbed soil from entering. Construction water was managed as described in Section 4.3.2. The erosion and sediment controls were inspected and maintained as specified by the Remedial Engineer.

### 4.1.5 Community Air Monitoring Plan (CAMP)

The Site-Specific CAMP is provided in the HASP included in Appendix C of the RAWP. Roux Associates performed real-time continuous air monitoring for VOCs and airborne particulate matter at upwind and downwind locations at the Site perimeter throughout the course of the work during all ground intrusive activities and/or when the potential for exposure to environmental contaminants in on-Site and /or immediately adjacent off-Site soil, groundwater, and soil vapor existed. Implementation and management procedures are specified within the CAMP. For all VOC monitoring, the work was conducted using RAE Systems (MiniRAE 3000) portable VOC monitors, which were able to integrate (average) over periods of 15 minutes . A TSI Dusttrak II Model No. 8530, which can integrate over periods of 15 minutes, was used to monitor for particulates. During all phases of work, the General Remediation Contractor was responsible for mitigating and

vapor and particulate issues, via suppression techniques defined in the CAMP. The action levels and actionable responses were as follows:

| Parameter | Action Levels | | |
|---|---|---|---|
| Total VOCs | <5 parts per million (ppm) above upwind background over a 15 minute time-weighted average (TWA) | >5 ppm and <25 ppm above upwind background over a 15 TWA | >25 ppm above upwind background over a 15 minute TWA |
| PM10 (particulates) | 100 micrograms per cubic meter ($\mu g/m^3$) above upwind background over a 15 minute TWA | >100 $\mu g/m^3$ and <150 $\mu g/m^3$ above upwind background over a 15 minute TWA | >150 $\mu g/m^3$ above upwind background over a 15 minute TWA |
| Response Actions | • Apply vapor/dust suppression agents,; and<br>• Continue monitoring; and<br>• Determine emission source; and<br>• Slow the pace of the offending activity; or<br>• Reduce activity area; or<br>• Temporarily relocate work; or<br>• Stop work and reassess. | • Stop work;<br>• Verify emission source,<br>• Increase vapor/dust suppression agents application;<br>• Continue monitoring;<br>• Reevaluate dust work activities; and<br>• Resume work when concentrations dissipate. | • Stop work and retreat;<br>• Measure offsite and receptor concentrations;<br>• Consult engineer;<br>• Work can resume when perimeter concentrations dissipate and offsite concentrations are below most stringent action level. |

Community air monitoring results collected during the performance of the RA are summarized in Section 4.2.4.

### 4.1.6 Contractors Site Operations Plans (SOPs)

The Remediation Engineer reviewed all plans and submittals for this remedial project (i.e. those listed above plus contractor and subcontractor submittals) and confirmed that they were in compliance with the RAWP. All remedial documents were submitted to NYSDEC and NYSDOH in a timely manner and prior to the start of work.

### 4.1.7 Community Participation Plan

A CPP was prepared and submitted in November 2009. A certification of mailing was 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 electronically submitted, (2) the date they were submitted; (3) a copy of the Fact Sheet, (4) a list of recipients (contact list); and (5) a statement that the repository was inspected and that it contained all of applicable project documents.

## 4.2 Remedial Program Elements

### 4.2.1 Contractors and Consultants

The project team was comprised of the Owner (Vernon 4540), the Owner's Representative, contractors and consultants specializing in one or more critical aspects of the project.

The project team and associated responsibilities were as follows:

- Vernon 4540, Owner – Overall Project Management

- Citistructure, LLC (Citistructure). – Owner's Representative

  Citistructure provided general management of all aspects of the remediation project and communicated with the client. Citistructure was also responsible for services provided by the project structural engineer who was involved during the remedial construction phase of work (Section 4.3.3).

- SCE Environmental Group Inc. (SCE) – Remediation Contractor

  SCE served as the General Remediation Contractor for the overall project and, as such, SCE insured that all components of the Site activities were conducted according to the requirements of the RAWP and design specifications under the direction of Roux Associates As the General Remediation Contractor, SCE had the overall responsibility of coordinating all other trades that were involved during the remedial construction phase of work, including waste disposal contractors, Site surveyor, tent installation support, etc.

- Remedial Engineering, P.C./Roux Associates, Inc. – Remedial Engineer

  Remedial Engineering, P.C. and Roux Associates, Inc. (collectively Roux Associates) coordinated all Site activities that were implemented to achieve remedial objectives defined in the RAWP. Roux Associates also provided the following services:

  - Performed Site pre-delineation and waste characterization sampling of soils to be removed;
  - Provided review of all quality control measures implemented by the contractors to ensure compliance with the Site's remedial objectives;
  - Provided full-time supervision services for the duration of soil removal and UST management activities;
  - Subcontracting with Cascade Technical Services, LLC (Cascade) for implementation of the ISCO injection program and for providing supervision/ quality control during the injection program;
  - Coordinated and oversaw subcontractors (Cascade and Systematic Technologies, Inc. [Systematic]) for the installation of the recovery wells and electrical components of the free-product recovery system; and
  - Implemented the project-specific CAMP.

### 4.2.2 Site Preparation

A pre-construction meeting was held with NYSDEC, Remedial Engineering, Roux Associates, Vernon 4540 and SCE on October 8, 2015.

SCE completed mobilization and site preparation activities listed below throughout implementation of the RA:

- Identified the locations of aboveground and underground on-Site utilities within the work zone;
- Set up temporary construction utilities and facilities such as trailers, electrical service, sanitary facilities and emergency response materials;
- Mobilized remediation equipment and materials;

- Performed concrete surface removal in the garage and courtyard;
- Set up equipment for management of construction water.

Documentation of agency approvals required by the RAWP is included in Appendix E. Other non-agency permits relating to the remediation project were obtained prior to commencement of the related Remedial Activity and are provided in Appendix F:

- New York City Department of Buildings (NYCDOB) Work Permit;
- NYCDOB After Hours Work Variance Permit;
- New York State Department of Transportation (NYSDOT) Roadway Occupancy Permit; and
- NYSDOT Sidewalk Occupancy Permit.

### 4.2.3 General Site Controls

Site access was controlled by a gated entrance to the driveway and courtyard property of the Site. The Site was surrounded by buildings on the west, east, and south side, and Anable Basin bordered to the north. The gate was closed and locked when there was no activity on the Site. Temporary fencing was used to delineate and secure the area of ongoing remediation activities outside of the courtyard, e.g. when excavation was completed in the garage and during periods of heavy equipment operation on the sidewalk of 46$^{th}$ Avenue. In order to restrict access during remediation activities, barricades and barrier tape were installed at certain locations, such as open excavations.

Personnel conducting the work or providing oversight completed the 40-hour OSHA Hazardous Waste Operations and Emergency Response training, with annual refresher as applicable. Construction activities were performed in modified Level D personal protective equipment (PPE), which included steel-toed work boots, hard hats, safety glasses, long sleeved shirts, gloves, and high visibility clothing (e.g., reflective vest). During UST cleaning and management, Level C PPE was utilized, which included the PPE used during modified Level D and the following equipment used in conjunction: disposable coveralls (Tyvek, Poly-coated Tyvek, or Saranex), chemical resistant boots over the work boots required, and full-face, air purifying, canister-equipped respirators.

Half-face respirators were approved for use as modified Level C PPE as dictated by the corporate Health and Safety Officer.

Job site record keeping for all remedial work was appropriately documented by Roux Associates. Documented activities included daily inspections to verify conformance with the RAWP, health and safety monitoring and material tracking. These records were maintained onsite by Roux Associates during the performance of the RA and were available for review by the NYSDEC.

*Soil Screening Methods*

Visual, olfactory and PID soil screening and assessment were performed by a qualified environmental professional during all remedial construction and portions of the redevelopment construction activities at the Site during all remedial and development excavations into known or potentially contaminated material. Soil screening was performed regardless of when the invasive work was done and included all excavation and invasive work performed during the RAWP and the LNAPL recovery system installation post-excavation.

*Stockpiling Methods*

Stockpiles were limited in use as material excavated during the RA was generally directly loaded into trucks for off-Site disposal. The exception was during the stockpiling of soil generated during the demolition of the shed building in the courtyard and soils generated from the excavation within the garage during UST backfilling activities. This soil was stockpiled as described below.

Stockpiles were constructed on double layered 6 mil polyethylene sheeting for unsaturated soil and 40 mil high-density polyethylene sheeting for grossly contaminated or saturated materials and were kept covered with appropriately anchored sheeting when not having material added or removed.

*Materials Excavation and Load Out*

The presence of utilities and easements on the site were investigated by the Remedial Engineer. A single Verizon fiber-optic communication line runs the length of the driveway and adjacent to the former Paint Factory Building in the courtyard. During the excavation this utility was properly secured to prevent damage. No additional utilities or easements posed a risk or impediment to the work under the RAWP.

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

Locations where vehicles enter or exit the site were inspected daily for evidence of offsite soil tracking.

The qualified environmental professional was responsible for ensuring that all egress points for truck and equipment transport from the site were clean of dirt and other materials derived from the site during intrusive activities. Cleaning of the adjacent streets was performed as needed to maintain a clean condition with respect to site-derived materials.

*Materials Transportation and Disposal off-Site*

All materials were transported by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers were appropriately licensed and trucks were properly placarded.

Material transported by trucks exiting the site were secured with a double layer of tarping material, secured tightly using bungee cords to ensure no part of the truck bed was exposed. Loose-fitting canvas-type truck covers were prohibited.

All soil/fill/solid waste excavated and removed from the Site was treated as contaminated and regulated material and was disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. Disposal of non-hazardous solid waste, hazardous soil waste and general construction debris is discussed in Section 4.3.4.

*Materials Reuse On-Site*

The reuse of approved soil as backfill was generally restricted to one-foot above the groundwater table to two-feet below proposed development grade. The reused soil is contained by the Site-wide cap that is a minimum of 24 inches of RCA or impervious surface (i.e., asphalt cap). A physical demarcation layer is present above the reused material and below the cap. The destination and depths of the material reused on-Site is discussed further in Section 4.3.1.4.

*Fluids Management*

Construction wastewater generated during dewatering and decontamination activities were collected and stored on-Site in temporary storage tanks. Containerized wastewater was sampled prior to disposal, and the construction wastewater was disposed off-Site at a permitted disposal/recycling facility. Disposal details concerning the non-hazardous water are discussed in Section 4.3.4.2.

### 4.2.4 Nuisance Controls

All necessary means were employed to prevent on- and off-Site odor nuisances. At a minimum, procedures included: (a) installation and maintenance of an odor control tent around the excavation; (b) limiting the area of open excavations and (c) use of odor suppression foams to cover exposed odorous soils.

A tent enclosure with an air filtration unit was used during excavation and soil loadout activities to reduce the potential for odor generation during excavation and soil movement activities. The tent was closed and contained an air filtration system consisting of activated vapor phase carbon with a blower to create negative pressure within the tent. During soil load-out activities, the doors were opened and the foam unit described above was used to spray the bed of the truck and soil being loaded to prevent odors from leaving the tent area.

A foam unit consisting of a pressure washer and a module containing a water and Carbonil XT[1] mixture was used to suppress vapors and odors that were generated during the soil excavation and load-out activities. In addition, one roaming portable VOC monitor was used to evaluate the VOC concentrations in the neighboring community three times a day during times of active excavation to ensure no potential nuisance odors travel offsite. These efforts confirmed that nuisance odors did not travel offsite during the performance of the Work as documented in the daily reports, which are included in electronic format in Appendix G.

A stabilized construction entrance was installed to cover the entirety of the Site driveway to the excavation area and was the sole point of vehicle ingress and egress to the Site. The stone-based ingress-egress pathway was continuous to prevent trucks from tracking soil into the surrounding roadways. The other purpose of the construction entrance was to avoid truck contact with impacted material during live-loading and backfilling activities.

A truck wash was setup and operated, as needed on-Site at the tent entrance/ exit once impacted or saturated material was encountered. Due to the use of the stabilized construction entrance described above, dry decontamination using brushes was the preferred method of truck decontamination since truck wheels never had direct contact with impacted materials. SCE was responsible for ensuring that all outbound trucks were inspected and washed at the truck wash, as required, to remove loose soils before leaving the Site.

Prior to trucks leaving the Site, proper truck bed management was confirmed by visual means to ensure tight fitting tarps were properly installed.

In-bound and out-bound truck routes to the Site were provided to Roux Associates for review prior to excavation in the courtyard. The accepted routes took into account: (a) limiting transport through residential areas and past sensitive sites, i.e., schools and

[1] Carbonil XT is a water-based, super concentrated encapsulation and deodorization chemical manufactured by Vapor Technologies Inc. that is used to mitigate heavy hydrocarbon and solvent odors.

churches; (b) prohibiting offsite queuing of trucks; (c) overall safety in transport; and (d) controlling the availability of truck access to the Site. Trucks hauling contaminated soils were diverted east on 46th Avenue (against normal flow of traffic) after they left Site with the assistance of flaggers who stopped all oncoming traffic.

During the performance of the Work, there was a complaint received from the community concerning un-tarped and unwashed trucks leaving the Site on November 25, 2015. The complaint was unfounded as at the time as the trucks leaving the Site were being loaded with unsaturated material, were tarped by hand using bungee cords and double-layered tarps, and the truck and wheels were inspected and confirmed to be clean prior to leaving the tent after loading had been completed. A response to this complaint was prepared by Roux Associates and submitted to the NYSDEC on November 11, 2016 (Appendix E).

### 4.2.5 CAMP Results

Community air monitoring was performed consistent with the CAMP during implementation of the RA. VOC and particulate monitoring data were collected during construction activities including excavation, ISCO injections and USTs cleaning and management. Air monitoring data were not collected during periods of continuous precipitation, instrument malfunction or battery change out.

There were no exceedances of the VOC action level during performance of the RA. The following were exceedances of the particulate action level during performance of the RA based on the 15-minute background corrected average, followed with the time and date of exceedances of the particulate action level of 100 µg/m3, the cause, and the resulting response:

- 207 µg/m3 at 11:26 on October 10, 2015: The exceedance was caused by hammering activities taking place when breaking up the concrete flooring inside the garage building nearby the monitoring station. Water was sprayed over the site for dust suppression and work resumed. Multiple exceedances occurred this day while using these corrective measures but no fugitive dust was observed to be leaving the Site.

- 153 µg/m3 at 11:41 on October 10, 2015: Refer to details at 11:26.

- 176 µg/m3 at 13:26 on October 10, 2015: Refer to details at 11:26.

- 225 µg/m3 at 13:41 on October 10, 2015: Refer to details at 11:26.

- 170 µg/m3 at 09:16 on October 14, 2015: The exceedance occurred due to a laborer smoking a cigarette adjacent to the monitoring station. Visual observations confirmed lack of particulates in the area. No corrective action was taken concerning work activities.

- 259 µg/m3 at 16:46 on October 14, 2015: The exceedance occurred due to the monitor not being turned off prior to demobilization of the unit at the end of the day. Visual observations confirmed lack of particulates in the area. No corrective action was taken concerning work activities.

- 140 µg/m3 at 09:16 on October 21, 2015: The exceedance was caused by hammering activities taking place when breaking up the concrete flooring inside the garage building, less than 15 feet away from the monitoring station. Water was sprayed over the area where concrete was being broken for dust suppression and work resumed. Multiple exceedances occurred this day while using these corrective measures but no fugitive dust was observed to be leaving the Site.

- 117 µg/m3 at 11:41 on October 21, 2015: Refer to details at 09:16.

- 105 µg/m3 at 13:26 on October 21, 2015: Refer to details at 09:16.

- 126 µg/m3 at 18:30 on November 3, 2015: The exceedance was caused by the exhaust from a truck idling near the monitoring station. Visual observations confirmed lack of particulates in the area. This exceedance was localized to the area surrounding the monitor and did not require any corrective measures, as particulate levels dropped after the truck had left the area.

- 333 µg/m3 at 11:32 on November 4, 2015: The exceedance occurred at the upwind monitoring station during the hammering activities taking place when breaking up the concrete located in the courtyard within 10 feet of the monitoring station. Water was sprayed over the area where concrete was being broken for dust suppression and work resumed. Multiple exceedances occurred this day while using these corrective measures but no fugitive dust was observed to be leaving the Site.

- 118 µg/m3 at 15:43 on November 4, 2015: Refer to details at 11:32.

- 218 µg/m3 at 16:13 on November 4, 2015: Refer to details at 11:32.

- 183 µg/m3 at 16:10 on November 16, 2015: The exceedance was caused by the exhaust from a generator during start-up activities near the monitoring station. Visual observations confirmed lack of particulates in the area. This exceedance was localized to the area surrounding the monitor and did not require any

corrective measures, as particulate levels dropped after the generator reached steady-operating state.

- 222 µg/m3 at 07:47 on November 18, 2015: The exceedance was caused by a truck pumping its breaks near the monitoring station prior to leaving the Site. Visual observations confirmed lack of particulates in the area. This exceedance was localized to the area surrounding the monitor and particulate levels dropped after the truck had left the area.

Copies of all field data sheets relating to the CAMP are provided in electronic format in Appendix J.

Action levels reports were generated for the aforementioned dust action levels and provided to NYSDEC and NYSDOH project managers within 24-hours of the occurrence with the daily report submittal (Section 4.2.6) and are provided in electronic format in Appendix K.

### 4.2.6 Reporting

Daily reports were generally submitted electronically to the NYSDEC Project Manager by the business day following the reporting period and included:

- Date and weather;
- A summary of work activities performed;
- A summary of samples collected, if any;
- An update of the progress made during the reporting day;
- Locations of work and quantities of material imported and exported from the Site;
- References to a color-coded map for Site activities;
- A summary of any and all complaints with relevant details (names, phones numbers);
- A summary of CAMP findings, including excursions; and
- An explanation of notable Site conditions.

Daily reports were not intended to be the mode of communication for notification to the NYSDEC of emergencies, requests for changes to the RAWP, or other sensitive or time critical information, however, such conditions were included within the reports. Daily Reports included a description of daily activities keyed to a color-coded map of the Site that identified work areas. These reports included a summary of air sampling results, odor and dust problems and corrective actions, and all complaints received from the public.

In accordance with the BCA, monthly reports summarized the work performed during the reporting period, anticipated work activities for the following month, changes to the scope of work or schedule, sampling or other data received or generated during the reporting period, deliverables submitted during the reporting period, and RA planned for the next reporting period.

All daily and monthly reports, including monthly LNAPL IRM documentation, are included in electronic format in Appendix G and H respectively.

The digital photo log required by the RAWP is included in electronic format in Appendix I.

### 4.3 Contaminated Materials Removal

A list of the soil cleanup objectives (SCOs) for the contaminants of concern for this project is provided in Table 1. The SCOs utilized during the Remedial Action were the NYSDEC's PoG SCOs and the RRSCOs.

Another purpose of the RA was to remove grossly contaminated material highlighted in the Areas of Concern shown in Figure 2.

The following sections summarize the remedial activities for soil and groundwater during the RA.

#### 4.3.1 Soil Management

Excavation of soil exceeding Site SCOs that were not targeted for ISCO treatments commenced at the Site on October 9, 2015 and continued to March 11, 2016. The lateral and vertical limits of courtyard, driveway and garage excavations are shown on As-Built Drawings in Appendix L. As discussed in Section 4.8, excavation of all soil exceeding Site SCOs could not occur during the performance of the Work. As a result, there is impacted material within the courtyard that was not removed and will be addressed with area-specific ISCO treatments targeted within the courtyard area during the post-remediation phase. Roux Associates provided full-time oversight of SCE during Site excavation activities to ensure that all soil excavation and disposal was completed in accordance with all applicable regulations and the RAWP. Contaminated soil was transported and disposed as discussed in Section 4.3.4 of this document.

The following subsections provide additional details on the test pit investigation performed, SOE installed, vapor control means and methods, reuse and waste characterization sampling methodology and results; and abandonment of on-site monitoring wells associated with excavation activities.

#### 4.3.1.1 Test Pit Investigations

Due to the lack of information regarding the foundation of the buildings bordering the courtyard, driveway and garage excavations, test pits were completed September 29 to October 2, October 14 and 19, 2016, in advance of the remedial excavation described above on behalf of Structural Engineering Technologies, P.C. (Structural Engineering), who is the SOE Engineer retained by the Owner's Representative for this project. The primary purpose of the test pits were to provide information to the Structural Engineer on the current location, depth, and structural integrity of the current foundations of the surrounding buildings and to determine if SOE could be utilized during the RA. The test pits indicated that the preliminary design of the SOE would need to be modified to be offset from adjacent buildings and that the USTs located inside the garage could not be removed due to structural integrity issues.

Roux Associates was present during intrusive work to monitor for nuisance odors. All required community air monitoring, health and safety monitoring, and odor/dust control

were completed during the test pit investigations. A description of the specific test pit investigations performed in the Courtyard and the garage are discussed below.

#### 4.3.1.1.1 Courtyard Test Pit Investigation

Five (5) test pits were completed within the proposed courtyard excavation footprint on September 29 to October 2, 2016 at the locations shown on Figure 3. The test pits were approximately three to four feet long by four to five feet long and approximately 5 feet deep or shallower when a building footing or underground obstructions were observed. The test pits were completed by first saw cutting in combination with hammering and removing the concrete slab, if present, and then excavating to the desired depth.

Three (3) of the test pits completed did not reach the final excavation depth of 5 ft bls due to encountering underground utilities, which was considered a refusal. Test pits No. 1 and 3 were excavated on the east and north perimeter, respectively, of the proposed excavation SOE. The excavation of both test pits were halted at approximately 3 ft bls when piping was uncovered during the work. Test pit No. 2, completed inside the former shed footprint, had a refusal in form of a concrete sub-slab observed at approximately 3 ft bls that could not be hammered through using the equipment onsite.

Test pit No. 4 was completed on the western perimeter of the proposed excavation SOE. Approximately 2 ft bls an underground wall was found that was offset from the neighboring off-site building by approximately 3 feet. This test pit was excavated to the final proposed test pit depth of 5 ft bls but no footing was found for the neighboring off-site building.

Test pit No. 5 was completed inside the former paint factory building where no excavation would be completed but was adjacent to the proposed eastern side of the excavation SOE. The exploratory test pit determined that the adjacent neighboring building did have a footing present at approximately 5 ft bls. This meant that a footing could potentially be present in the area of test pit No. 2 that could not be observed due to the concreate sub-slab. During the excavation of test pit No. 5 a chalky material non-native to the area was observed. This material has been attributed to past uses of the site and was separated during excavation activities for disposal, as further explained in

Section 4.3.4.5.

No nuisance odors or community air monitoring program exceedances were observed during this work. After each test pit was inspected, they were backfilled with the previously excavated soil.

No samples were collected from the test pits.

Due to the presence of utilities and other underground obstructions observed during the test pitting activities, it was determined that the proposed SOE for the excavation activities in the courtyard would be modified. Therefore the SOE that would be installed along the east side of the excavation would be installed approximately 4 to 6 feet from the existing building as opposed to the originally proposed 2 feet. Structural Engineering believed that these obstructions, in the form of piping, concrete sub-slab, and footings, are part of the existing building concrete foundations that extend to bedrock.

A stamped and certified letter from Structural Engineering attesting to the above is included in Appendix M.

A picture log presenting the finding of the courtyard test pitting activities is included in Appendix N.

#### 4.3.1.1.2 Garage Test Pit Investigation

Two preliminary test pits were completed on October 1, 2016, with additional test pitting completed at the request of Structural Engineering on October 14 and 19, 2016. The test pits were completed at the locations shown on Figure 3. The initial test pits were approximately three to four feet long by four to five feet long and approximately 5 feet deep. The additional test pits completed at the request of Structural Engineering were approximately three to four feet long by four to five feet long and approximately 10 feet deep or shallower if a building footing was observed. The test pits were completed by first saw cutting in combination with hammering and removing the concrete slab, if present, and then excavating to the desired depth.

Test pit No. 6 and 7 were completed during the initial test pit investigation.

Test pit No. 6 was completed on the western wall of the garage building where it was proposed that no utilities or obstructions would be present based on previous investigations. During the test pitting the surface of UST GT-1 was uncovered at approximately 3 ft bls. The UST was both larger and in a different location than originally determined by previous investigations and was in very close proximity to the wall due to its larger size.

Test pit No. 7 was completed in the UST pipe run located on the eastern wall of the garage building. After the piping was removed the test pit was excavated to 5 ft bls, where additional piping was observed to be directly installed into soil. No footing was observed from the adjacent building when the test pit was advanced to its final depth.

Two (2) additional test pits were completed inside the garage footprint upon request of Structural Engineering. The purpose of these test pits were to determine the proximity of the larger USTs to the foundation walls and if a viable SOE could be employed to allow cleaning and removal of the USTs. During these test pitting activities it was observed that the west wall of the garage had a building footing at approximately 7.5 ft bls and the UST that was confirmed to be present (GT-1) extended beyond this footing. The test pit completed on the eastern wall of the garage was excavated to 10.5 ft bls, but no footing was observed. Both test pits also determined that the groundwater level was located above the bottom of the USTs.

No nuisance odors or community air monitoring program exceedances were observed during this work. After each test pit was inspected, they were backfilled with the previously excavated soil.

No samples were collected from the test pits.

Due to the close proximity of the USTs to the foundation walls and the size of the USTs observed from the additional test pitting, Structural Engineering determined that the USTs could not safely be removed from within the garage. The USTs extended beyond the depth of the structural walls and the lack of space for SOE installation could potentially compromise the structural stability of the existing building. Structural

Engineering also determined that excavation by mechanical means could also potentially collapse the tanks prior to cleaning, which could result in spillage of the UST contents. Structural Engineering submitted a certified letter that stated closing the USTs in place would be safer structurally and environmentally, which is further discussed in Section 4.3.3.2.

The findings of the test pit investigation completed October 14 and 19, 2015 were presented in the stamped and certified letter from Structural Engineering, which is included in Appendix M. A picture log presenting the finding of the test pitting activities completed on October 1, 2015 is included in Appendix N. The NYSDEC was informed of this deviation and the approval to clean and abandon the USTs in the garage in place was received on November 24, 2015.

#### 4.3.1.2 Support of Excavation

The structural and technical limitations identified during the performance of the test pit investigation described in Section 4.3.1.1 determined that the SOE and excavation could not be completed any closer than five feet from the adjacent building inside the courtyard and driveway as documented in a letter from the Owner's structural engineer (Structural Engineering) for the project (Appendix M).

Within the courtyard excavation sheet piling SOE was installed on the two sides of the excavation where adjacent properties were located (to the west and east of the excavation footprint) and towards the north of the excavation footprint where Anable Basin is present. The sheet piles were installed prior to erection of the tent enclosure and to a maximum depth of 25 ft bls, though some piles were installed shallower to due to the presence of underground concrete slabs and bedrock. Toe pining of the sheet piles was completed on the east length and northeast corner of the excavation SOE due to the shallow foundation of the nearby building. The limits of the SOE are shown on Figure 4.

In the driveway excavation, in order to maintain stability of the adjacent buildings, soil was removed by excavating using a slide rail trench box. The slide rail trench box utilized was a double slide rail system that used interlocking plates distributed by ICON Equipment Distributors, Inc. The trench box panels were 8 feet high, which allowed a

final depth of approximately 17.5 ft bls to be reached before the limits of the shoring and machinery being utilized was reached. Residual contamination is present in the location, which is further discussed in Section 4.8. The trench box was backfilled with RCA and approved backfill materials prior to removing the trench box to preserve the structural integrity of the adjacent building.

#### 4.3.1.3 Vapor Control

To reduce the potential for nuisance vapors from being generated during excavation, a tent enclosure with an air filtration unit was utilized during the excavation of the LNAPL source area. This tent was installed to cover both the courtyard footprint area where grossly contaminated material was determined to be present and the loadout area where grossly contaminated material was loaded out for off-site disposal. The dimensions of the tent (80 feet by 100 feet) was determined following the pre-delineation sampling events and the modified extent of the SOE dimension, as discussed in Sections 4.5.1 and 4.3.1.1.1 respectively.

When active loadout was not being completed the tent was closed and the air filtration system, which included the use of granular activated carbon as designed by TIGG LLC. (TIGG), was activated to prevent the buildup of odors or hazardous fumes that could potentially occur. The blower used in conjunction with the TIGG unit created negative pressure within the tent and drew air through the activated carbon units.

The vapor control tent was the primary method to control vapors. In addition, a vapor suppressant system as discussion in Section 4.2.6 was utilized as a secondary method to control vapor generation inside, as well as outside of the tent, during the performance of any intrusive work.

Excavation of the original limits of the assumed LNAPL source area in the court yard area, soil stockpiling prior to loadout, and installation of SOE took place within the closed odor control tent. Excavation that was required to the south of the limits of the tent enclosure was performed in a controlled manner to minimize the generation of nuisance odors. As the excavation was completed and respective impacted soils were loaded out, the on-site vapor suppressant system was utilized. In instances where the tent

doors were opened and negative pressure could not be implemented, such as during soil loadout or backfill activities, the vapor suppressant system was similarly utilized.

The tent was dismantled following excavation and backfill of the courtyard and driveway excavations when the potential of uncontrollable odor generation was negated. After the tent was removed, it was assumed that the onsite vapor suppressant system would be utilized if odors, for whatever reason, became a nuisance problem.

#### 4.3.1.4 Characterization of Potentially Reusable Soil

Unsaturated soil within the top five feet of the excavation was initially proposed to be reused in the excavation as backfill. The material proposed to be reused would originate from three on-Site areas: the courtyard, the shed footprint located above original grade in the courtyard, and the garage. The proposed reuse soils were sampled as per DER-10 Table 5.4, and based on that volume discrete grab samples were analyzed for target compound list (TCL) VOCs and composite samples were analyzed for TCL SVOCs, TAL metals, TCL PCBs, and TCL pesticides.

Soil reuse characterization for the soil located in the courtyard was completed prior to the excavation activities of the RA. The Pre-Delineation and Soil Reuse Characterization Work Plan was submitted to the NYSDEC for approval on September 28, 2015 and was approved verbally on September 30, 2015. Three soil boring locations (SC-01, SC-02, and SC-03) were extended to approximately 5 ft bls to collect unsaturated soil samples.

Unsaturated material from the shed footprint and garage excavation were stockpiled separately and staged into the Paint Factory building. Grab samples were collected from the stockpiles with a minimum depth of 1-foot into the stockpile to collect a non-exposed sample.

The amount of samples collected from each area is summarized below:

| Area of Excavation | Number of Grab Soil Samples Collected | Number of Composite Soil Samples Collected |
|---|---|---|
| Courtyard | 6 | 2 |

| | | |
|---|---|---|
| Shed footprint in courtyard | 2 | 1 |
| Garage | 2 | 1 |

The respective results are summarized on Tables 2 through 6. The respective analytical laboratory reports are also provided in Appendix O.

Unsaturated soils originating from the courtyard and the garage area were authorized for reuse due to analytical results and by the NYSDEC approval. Soils excavated from the shed footprint area, a slab of concrete that encased soils above grade, were not approved for reuse due to exceedances of PoG and RRSCOs in SVOCs, metals and PCBs. Disposal of soil associated with this location is discussed in Section 4.3.4.

The location, depths, and approximate volume of reused material are shown in Figure 5.

#### 4.3.1.5 Characterization of Remaining Soil

Roux Associates implemented *in situ* and *ex situ* composite/ grab sampling of soil for waste characterization prior to disposal off-Site. *In situ* waste characterization was performed for impacted soils below the unsaturated soil within the top five feet of the excavation that was sampled as reusable as discussed in Section 4.3.1.4. Material intended to be excavated and disposed off-site were sampled as per DER-10 Table 5.4. Based on anticipated volume to be excavated, discrete soil samples were analyzed for TCL VOCs and composite samples were analyzed at a minimum for TCL SVOCs, TAL metals, TCL PCBs, and TCL pesticides, with additional sampling analysis completed as required by the disposal facility.

The site was divided into three sections (SC-04, SC-05, and SC-06), approximately 900 CY per section, and were *in-situ* sampled according to the disposal facility required frequency. Due to the proposed excavation depths varying from a minimum of 9 ft bls to 19 ft bls, some sections were sampled at multiple intervals. The horizontal and vertical limits of the sampling grids are shown on Figures 6 and 7.

*In-situ* sampling for soil grids SC-04 and SC-05 were completed using a drill rig prior to the start of the RA on October 15, 2015. Soil grid SC-04 was sampled over two intervals (5 to 9 ft bls and 9 to 13 ft bls) and soil grid SC-05 was sampled over two intervals (5 to 9

ft bls and 9 to 19 ft bls).

*Ex situ* sampling was completed from soil grid SC-06. Soil samples for stockpiled soil were collected from approximately the middle of the stockpile height, with a minimum depth of 1-foot into the stockpile to collect a non-exposed sample. An excavator was used to collect samples for soil grid SC-06, excavating to the necessary depth a single interval of 9 to 16 ft bls for sampling purposes and then backfilled following sample collection.

Waste characterization samples were collected in accordance with Table 5.4(e)10 – Recommended Number of Soil Samples for Soil Imported To or Exported From a Site (NYSDEC DER-10 / Technical Guidance for Site Investigation and Remediation). The specific parameter list and sample frequency was determined by the permit requirements of the disposal facilities; the analyses included:

- A minimum of one (1) grab sample was collected and analyzed for TCL VOCs;
- A minimum of one (1) grab sample was collected and analyzed for Total petroleum hydrocarbons (TPH); and
- A minimum of one (1) composite sample was collected and analyzed for TCL SVOCs, Total metals, PCBs/pesticides, Total Solids/Paint Filter, TCLP VOCs, TCLP SVOCs, TCLP metals, and TCLP PCBs/pesticides.

The amount of samples collected from each soil grid is summarized below:

| Soil Grid | Number of Discrete Soil Samples Collected for VOCs | Number of Discrete Soil Samples Collected for TPHs | Number of Composite Soil Samples Collected |
|---|---|---|---|
| SC-04 | 1 | 5 | 2 |
| SC-05 | 2 | 4 | 2 |
| SC-06 | 1 | 2 | 1 |

The soil data generated by Roux Associates submitted to the disposal facilities for waste characteristic purposes are summarized in Appendix P. These results indicated that all soil discussed herein was non-hazardous in nature. Respective disposal of soil associated with each soil sample is discussed in Section 4.3.4.

Acceptance letters from disposal facility owners are attached in Appendix Q.

#### 4.3.1.6 Monitoring Well Abandonment

On-Site monitoring wells located within the excavation areas of the courtyard, driveway and garage were abandoned during the RA. The monitoring well curb boxes, if present, and polyvinyl casing (PVC) casing were removed in their entirety and disposed of appropriately during site demolition and excavation activities. The following shallow monitoring wells located within the courtyard were removed and disposed during the RA:

- MW-1/1R
- MW-6
- MW-6R
- MW-8
- MW-12
- MW-13
- MW-16
- MW-23
- MW-30
- MW-31
- MW-32
- MW-35

Shallow monitoring wells located in the garage, MW-24, MW-25, MW-27 and MW-28, were removed and disposed during the exploratory excavation and UST management and disposal activities. These monitoring wells were replaced during the UST confirmation sampling which is further discussed in Section 4.5.3.

A temporary monitoring well (MW-39) was installed in the stabilized construction entrance as per NYSDEC request to monitor LNAPL migration during the courtyard excavation (Appendix E). During this period of time (December 2 to December 21, 2015) no LNAPL was observed to be present in the monitoring well when gauged using an interface probe. This shallow monitoring well was removed and disposed of when the excavation area expanded to encompass the stabilized construction entrance area and was not replaced.

### 4.3.2 Construction Water Management

Construction wastewater (generated from personnel and equipment decontamination) and dewatering liquids (LNAPL, groundwater and surface runoff entering excavation areas) were generated at the Site during implementation of the RA. Dewatering was required in order to facilitate the excavation on-Site and was accomplished using submersible pumps and three (3) temporary 10,000 gallon storage tanks.

All of the wastewater generated (approximately 26,640 gallons) during the performance of the RA was containerized in the temporary storage tanks on-Site prior to off-Site disposal to Lorco Petroleum Services. Waste characterization samples were collected by SCE and the respective analytical reports are included in Appendix R. Disposal of construction wastewater is discussed in Section 4.3.4.2.

### 4.3.3 Underground Storage Tank Management

A total of 11 USTs were encountered during the RA, with five (5) in the southeast corner of the courtyard excavation and the remaining six (6) located inside the garage excavation footprint. All USTs were intact. There were no visual indications of contamination in the soil and groundwater surrounding the USTs during removal or abandonment activities.

The contents of the USTs discovered on-Site were partially filled with either liquid, semi-solid gels, hard gels, or a mixture of all three. The gel materials removed were containerized in either 55-gallon drums or 275-gallon totes, which were removed off-Site after being sealed. Liquids removed from the USTs were either containerized in 275-gallon totes, removed directly from the UST using a vacuum truck for immediate off-Site treatment and disposal or stored temporarily in the on-Site storage tanks to be removed by vacuum truck at a later date. No UST contents remained on-Site for long-term storage.

All 11 tanks and their chambers encountered during the RA were emptied, cleaned and were either removed or abandoned in place, as discussed in the following subsections. The areas surrounding the USTs were excavated so, at minimum, the tops of the UST could be seen and opened to allow cleaning in-place. In the courtyard area, the area was excavated following the demolition of the shed footprint area. The overall footprint of the garage was excavated to approximately three feet below the surface of the USTs to fully expose the tops of the USTs to allow abandonment in place.

SCE was responsible for the sampling of the UST contents for off-Site disposal. The respective analytical laboratory reports are provided in Appendix S.

Specific details and applicable disposal documentation regarding disposal of USTs and UST contents are provided in Section 4.3.4 and Appendix T. Certificates of cleaning are provided in Appendix U.

Post-remediation confirmatory sampling was conducted in accordance with DER-10 and is further discussed in Section 4.5.

Former location of removed USTs and existing locations of abandoned USTs discussed in following subsections of this FER are shown on Figure 8.

#### 4.3.3.1 Courtyard Underground Storage Tank Removal

A total of five (5) dished USTs were discovered in the courtyard excavation during the RA. Dished UST D-1 was 6-feet in diameter by 12-feet long, and USTs D-2 through D-5 had the same measurements of 6-feet in diameter by 10 feet long. These USTs were located in the southeast corner of the excavation under the installed tent footprint.

The liquid or semi-solid contents were containerized for off-Site disposal and the USTs were cleaned of residual materials. Once cleaned, each UST was detached from the concrete slab they were installed on and removed from the excavation. The dished USTs were disposed of as non-impacted steel and shipped off-Site for disposal at Sims Metal Management. Bills of lading for this metal debris are included in electronic format in Appendix V.

#### 4.3.3.2 Garage Underground Storage Tank Abandonment

During the performance of the UST closure portion of the work, the USTs that were encountered within the limits of the garage and adjacent area (GT-1 through GT-6) were determined to be of varying sizes much larger than reported values and in some cases consisted of multiple chambers per UST. GT-6 was located north of the group of USTs that were originally targeted for removal and the management of this UST was subsequently incorporated into this remediation effort.

The approximate dimension of each UST managed as part of the implementation of the RAWP is provided below:

- GT-1: 10-feet in diameter by 36-feet long;

- GT-2: 10-feet in diameter by 16-feet long;
- GT-3: 10-feet in diameter by 23-feet long with two compartments (GT-3A and GT-3B both 11.5-feet in length);
- GT-4: 10-feet in diameter by 18-feet long with two compartments (GT-4A and GT-4B both 9-feet long);
- GT-5: 10-feet in diameter by 36-feet long with three compartments (GT-5A, GT-5B and GT-5C which are 10-feet, 16-feet and 10-feet long respectively; and
- GT-6: 10-feet in diameter by 36-feet long.

In the "Tank Closure – Garage Underground Storage Tanks Letter" to the NYSDEC, dated November 18, 2015 (Appendix M), Structural Engineering showed that removal of the USTs in the garage footprint could not be conducted in a safe manner because the USTs were observed to potentially be necessary to provide structural support to the garage. Due to the very close proximity of the large USTs to the foundation walls and the fact that they extend deeper than the foundation walls and that groundwater lies well above the bottom of the USTs Structural Engineering specifically conveyed that sheeting and underpinning of the foundation walls could not be done in a safe manner because of the following reasons:

- the size of the USTs were substantial and in close proximity to the foundation walls;
- the USTs extended deeper than the foundation walls; and
- groundwater lies well above the bottom of the USTs.

A stamped and certified letter dated Nov 9, 2016 from Structural Engineering attesting to the above is included in Appendix M.

The NYSDEC was informed of the field conditions on November 18, 2015 and NYSDEC approval to clean and abandon the USTs in the garage in place was received on November 24, 2015.

Since the USTs located in the garage could not be safely removed, they were closed in place in accordance with Section 4.2.7 of the RAWP which reads as follows:

*"…For known USTs, the preferred closure method is removal. If removal of a UST is not feasible due to the size and location of USTs and the close proximity of surrounding buildings, the tank will be closed in place..."*

As discussed in Section 4.3.3, the overall footprint of the garage was excavated to approximately three feet below the surface of the USTs to fully expose the tops of the USTs. The tops of the USTs were cut and removed to allow access, the liquid or semi-solid contents were containerized for off-Site disposal and the USTs were cleaned of residual materials. Prior to abandoning the cleaned USTs, sidewall and bottom confirmation samples were collected as discussed in Section 4.5.3 to determine if there was any residual contamination in the surrounding soils for each respective UST abandoned in place. Once the USTs were cleaned and respective confirmation samples collected to the extent practical, each UST was backfilled with on-site material approved for reuse, off-site recycled concrete aggregate or off-site flowable fill, as noted below:

- GT-3A, GT-3B, GT-4A, and half of GT-5A were backfilled with material from the garage excavation approved for reuse;
- GT-1, GT-2, half of GT-5A, GT-5B, and GT-C were backfilled with clean 1.5" RCA from Vanbro Corporation (NYSDEC registered facility No. 568163NYUTM North: 4494809; and
- GT-6 was backfilled with flowable fill obtained from Nicolia Ready-Mix Corporation.

Weight tickets for these materials are included in Appendix W.

Once the USTs were properly abandoned in place, the area inside the garage was restored to original grade with RCA and compacted following backfilling of the USTs.

### 4.3.4 Waste Disposal Details

During the performance of the work, the following wastes were disposed off-site: excavated soil/ fill; construction wastewater; non-hazardous gel, solids and wastewater

from UST removal work; spent carbon; chalk-like material discovered during the remedial excavation; contaminated piping, and general construction debris were transported and disposed off-site. Table 7 shows the total quantities of each category of material removed from the site and the disposal locations. Table 8 is a tabulated load summary of the soil that was removed off-Site. A summary of the samples collected to characterize the waste, and associated analytical results are provided in Appendix P, R and S.

All respective disposal facility acceptance letters from disposal facility owners are attached in Appendix Q.

The manifests have been divided based on the waste stream: non-hazardous solid waste, hazardous solid waste, non-hazardous construction wastewater, and general construction debris. Manifests and bills of lading are included in electronic format in Appendix X, Y, Z, and V, respectively. Manifests for UST content removal are included in electronic format in Appendix T.

Additional details on disposal for each category of waste are provided in the following subsections of this report.

#### 4.3.4.1 Non-Hazardous Soil and Fill

Approximately 4,809.87 tons of excavated soil/fill were removed and disposed in connection with the Site RA as summarized below:

- Approximately 3,598.46 tons were disposed of as non-hazardous soil at Community Refuse Service, Inc. d.b.a. Cumberland County Landfill located at 142 Vaughn Road, Shippensburg, Pennsylvania;
- Approximately 867.69 tons were disposed of as non-hazardous soil at Clean Earth of Carteret, Inc. located at 24 Middlesex Avenue, Carteret, New Jersey;
- Approximately 201.65 tons were disposed of as non-hazardous soil at Greentree Landfill, LLC. located at 635 Toby Road, Kersey, Pennsylvania;
- Approximately 120.11 tons were disposed of as non-hazardous soil at Clean Earth of North Jersey, Inc., located at 155 Jacobus Avenue, Kearny, New Jersey; and
- Approximately 21.96 tons were disposed of as non-hazardous soil at Western

Berks Community Landfill and Recycling Center, LLC located at 455 Poplar Neck Road, Birdsboro, Pennsylvania.

Due to odors in grossly contaminated soil transported off-site on December 5, 2015, Clean Earth of Carteret would no longer accept soil originating from the Site. This required a new disposal facility to be chosen. Accordingly, ten (10) trucks returned from Clean Earth Carteret to the Site on December 6, 2015, to await re-manifestation for a new disposal facility. Waste profiles were generated, submitted and accepted by Community Refuse Service, Inc. d.b.a. Cumberland County Landfill, Greentree Landfill, LLC. and Western Berks Community Landfill and Recycling Center, LLC. On December 14, 2015, these trucks with non-hazardous, odorous soil were re-manifested for disposal at these three facilities in the following manner:

- One (1) truck to Western Berks Community Landfill and Recycling Center, LLC;
- Five (5) trucks to Community Refuse Service, Inc. d.b.a. Cumberland County Landfill, Greentree Landfill; and
- Three (3) trucks to Greentree Landfill, LLC

An additional four (4) soil loads, of which one was odorous material, were disposed of off-site at Greentree Landfill the following day with the remainder of the project-related non-hazardous soil transported to Cumberland County Landfill for disposal. Documentation may be found in Appendix X.

#### 4.3.4.2 Construction Wastewater

The oily mix wastewater generated from dewatering the courtyard and driveway excavation was stored in frac tanks located on-site prior to off-Site disposal. Approximately 26,640 gallons of oily mix water was disposed of as non-hazardous construction wastewater to Lorco Petroleum Services, located at 450 South Front Street, Elizabeth, New Jersey. Documentation may be found in Appendix Z.

#### 4.3.4.3 Underground Storage Tank Non-Hazardous Waste Material

All UST materials were disposed of to Clean Earth of North Jersey, Inc., located at 155 Jacobus Avenue, Kearny, New Jersey. Documentation may be found in Appendix T.

The USTs contents removed and disposed in connection with the Site RA as summarized below:

- 130 55-gallons drums were disposed of as non-hazardous gel/solid;
- 12 275-gallon totes were disposed of as non-hazardous wastewater; and
- Approximately 14,316 gallons were disposed of as non-hazardous wastewater

#### 4.3.4.4 Spent Activated Carbon

The spent activated carbon from the TIGG air filtration unit was removed from the unit and stockpiled on-Site prior to off-Site disposal. Documentation may be found in Appendix X. Approximately 20.55 tons of material was removed and transported off-site for disposal to Community Refuse Service, Inc. d.b.a. Cumberland County Landfill located at 142 Vaughn Road, Shippensburg, Pennsylvania.

#### 4.3.4.5 Chalk-Material

During excavation activities a chalk-like material was observed and separated from the soil that was disposed as non-hazardous. This material was containerized in a single 55-gallon drum and was transported off-site for disposal to Clean Earth of North Jersey, Inc., located at 155 Jacobus Avenue, Kearny, New Jersey. Documentation may be found in Appendix X.

#### 4.3.4.6 Contaminated Piping

During excavation activities steel piping was removed from the courtyard excavation footprint that contained potentially grossly contaminated material. The material inside the pipes was sampled and was determined to be hazardous for lead. The pipes were cut into smaller sections approximately 2 to 5 foot sections and the insides were cleaned. The cleaned pipe was disposed of as non-contaminated construction debris and four (4) 55-gallon drums of the hazardous piping contents were transported off-site for disposal to Clean Earth of North Jersey, Inc., located at 155 Jacobus Avenue, Kearny, New Jersey. Documentation may be found in Appendix V and Y.

#### 4.3.4.7 Construction and Demolition Debris

All non-impacted metal piping and cleaned UST shells were containerized in 20 CY containers and disposed off-site at Sims Metal Management located at 1 Linden Avenue East, Jersey City, New Jersey. In addition, 1,144 CY of non-contaminated construction debris (recognizable concrete, non-impacted piping, etc.) were disposed of at NYSDEC registered construction and demolition debris processing facilities. Documentation may be found in Appendix V.

### 4.4 In-Situ Groundwater Treatment

A component of the RAWP was an ISCO injection program to treat VOCs in groundwater and soil where excavation could not be completed during the RA, namely the soils under the basement of the Warehouse.

The Design Report detailing the injection work plan and recovery well installation was submitted to the NYSDEC on November 24, 2015 and subsequently approved on November 25, 2015 (Appendix E). On November 24, 2015, Roux Associates completed a baseline (i.e., pre-injection) groundwater gauging and sampling round in preexisting monitoring wells unaffected by the RA excavation: MW-2R, MW-7R, MW-19, MW-33, MW-34, MW-37 and MW-38. The monitoring well locations are shown in Figure 9.

Analytical data for TCL VOCs indicated detections above NYSDEC AWQSGV for seven (7) compounds, details are summarized below:

- Acetone exceeded the NYSDEC AWQSGV (50 micrograms per liter [µg/L]) at one location, MW-19 (52 µg/L);
- Benzene exceeded the AWQSGV (1 µg/L) at MW-34 (1.2 µg/L).
- 1,3,5-Trimethylbenzene exceeded the AWQSGV (5 µg/L) at MW-19 (19 µg/L).
- Isopropylbenzene exceeded the AWQSGV (5 µg/L) at five (5) locations: MW-7R (9.1 µg/L), MW-19 (57 µg/L), MW-34 (58 µg/L), MW-37 (26 µg/L), and MW-38 (16 µg/L).

- N-propylbenzene exceeded the AWQSGV (5 µg/L) at five (5) locations: MW-7R (11 µg/L), MW-19 (93 µg/L), MW-34 (78 µg/L), MW-37 (38 µg/L), and MW-38 (16 µg/L).

- Sec-butylbenzene exceeded the AWQSGV (5 µg/L) at five (5) locations: MW-7R (7.2 µg/L), MW-19 (34 µg/L), MW-34 (26 µg/L), MW-37 (10 µg/L), and MW-38 (8.9 µg/L).

- Tert-butylbenzene exceeded the AWQSGV (5 µg/L) at five (5) locations: MW-7R (5.6 µg/L [estimated]), MW-19 (15 µg/L), MW-34 (11 µg/L), MW-37 (5.3 µg/L [estimated]), and MW-38 (5.5 µg/L).

VOCs were detected, but at concentrations below AWQSGVs in one well; MW-2R. The results of groundwater sampling data pre-injection are respectively presented in Table 9 and included in Appendix AA.

Based on the presence of VOCs above the NYSDEC AWQSGVs, treatment of these VOCs utilizing ISCO was performed in accordance with the NYSDEC-approved RAWP and the approved scope of work in the November 24, 2015 Design Report. Details regarding the implementation of the RAWP component of the In Situ Chemical Oxidation Injection Scope of Work are provided in Section 4.4.1 below.

### 4.4.1 In Situ Chemical Oxidation Injections Beneath the Warehouse

A single round of ISCO injections was conducted to address VOCs in groundwater and soils underneath the Warehouse and was completed on December 2, 2015. The chemical oxidant was injected at a total of 20 locations 16 permanent points installed in the basement of the Warehouse and 4 temporary points installed along the length of the Site driveway adjacent to the Warehouse building.

The injection wells were installed to a depth of approximately 5 ft below grade in the Warehouse basement and approximately 15 ft below grade outside of the Warehouse; both corresponding to approximately 6-7 ft into the water table. The injection points were installed in an approximate grid pattern, with approximate 15-foot spacing around the monitoring wells, with slight spacing variances due to terrain. The permanent injection points in the Warehouse received approximately 115 gallons of injection material and the points outside and adjacent to the Warehouse received approximately

380 gallons of injection material. Three points located inside of the Warehouse building received a smaller amount of injection material due to daylighting, wherein material was forced to the surface.

A combined total of 2,240 pounds of RegenOx™ Part A and Part B were injected. The completed injection point locations and volumes are presented in Figure 10.

Following the injection event, the water quality indicator parameters (pH, conductivity, dissolved oxygen [DO], oxidation-reduction potential [ORP], temperature, and turbidity) were monitored periodically until those parameters stabilized to pre-injection levels.

Analytical data for TCL VOCs indicated detections above NYSDEC AWQSGV for seven (7) compounds, excluding the exceedances in acetone that were most likely caused by laboratory preservative methods:

- 1,3,5-Trimethylbenzene concentrations ranged from 5.5 µg/L (a laboratory diluted sample) to 21 µg/L with the highest concentration detected in MW-33;
- 2-Butanone (MEK) was detected only in MW-38 with a diluted concentration of 65 µg/L;
- Benzene was detected in MW-34, but was not a recorded exceedance;
- Isopropylbenzene concentrations ranged from 5.2 µg/L (a laboratory diluted and estimated value) to 23 µg/L (a laboratory diluted sample) with the highest concentration detected in MW-19;
- n-Propylbenzene concentrations ranged from 5.2 µg/L (a laboratory diluted and estimated value) to 37 µg/L (a laboratory diluted sample) with the highest concentration detected in MW-19;
- sec-Butylbenzene concentrations ranged from 6.9 µg/L to 18 µg/L (a laboratory diluted sample) with the highest concentration detected in MW-19; and
- tert-Butylbenzene concentrations ranged from 6.0 µg/L (a laboratory diluted sample) to 9.6 µg/L (a laboratory diluted sample) with the highest concentration detected in MW-19.

Of the compounds detected, only two (2) were previous identified VOCs of concern, benzene, and isopropylbenzene. The results of groundwater sampling data post-injection are respectively presented in Table 9 and included in Appendix AA.

Groundwater quality has improved following the first-round of ISCO injections in the warehouse area, but some residual VOCs in groundwater still exceed NYSDEC AWQSGVs. As a result, additional in-situ treatment and monitoring will be continued as discussed in Section 4.9.3 during the implementation of the SMP in the post-remediation phase.

### 4.4.2 Residual Contaminant Treatment Using In Situ Chemical Oxidation Injections

Based on the presence of residual VOCs in groundwater following the initial injection treatment event in the warehouse area and residual VOCs in soil after excavation of impacted soil in the courtyard to the extent practical, additional treatment utilizing ISCO will be completed described further in the SMP and Section 4.9.3.

Residual contamination on-Site located in groundwater and soil is further discussed in Section 4.8.

## 4.5 Remedial Performance/ Documentation Sampling

### 4.5.1 Courtyard Excavation Pre-Delineation Documentation/End-Point Sampling

Due to the excavation method chosen, difficulty was encountered in the collection of a sample that was not over-saturated by recharging impacted groundwater or which did not involve overly complicated sampling through the SOE. Also the method of SOE installation required the limits of excavation to be known prior to installation to prevent over excavation due to the limits of the Site. In the Pre-Delineation and Soil Reuse Characterization Work Plan (Appendix E), Roux Associates requested that the NYSDEC approve the use of a Geoprobe drill rig to collect non-saturated soil delineation samples. After NYSDEC approval on, 11 pre-delineation sidewall samples were attempted to be collected at a frequency of one sample per 30 linear feet. Refusals in the form of underground structures resulted in 9 sampling locations either being moved or, for samples adjacent to the eastern extent of the courtyard, not collected.

Each sample was collected at a specified depth using a new designated sleeve to prevent cross-contamination. Soil samples were analyzed for TCL VOCs and compared the

NYSDEC RRSCOs and PoG SCOs. In the event of a recorded exceedance of any of the four compounds of concern, an additional sample was collected and analyzed 10-feet beyond the proposed limits until a compliant sample was collected or the limits of the Site were reached.

The sampling data of the samples that could be collected during the pre-delineation work plan, pending refusal and/or Site excavation limits, were respectively presented in Table 10. These results were utilized to place sheeting and define the initial limits of excavation. Associated analytical results are provided in Appendix BB.

### 4.5.2 Courtyard Post-Excavation Documentation End-Point Soil Sampling

To supplement the collection of pre-delineation documentation samples, twenty-eight (28) end point excavation soil samples were collected as per NYSDEC DER-10 to document that the remedial excavation was successful in the removal of as much impacted material as possible:

- 15 post-excavation bottom samples were collected at an approximate frequency of one samples per 900 square feet; and
- 13 excavation sidewall samples were collected at an approximate frequency of one sample per 30 linear feet.

Each grab sample was collected from the one foot interval below the final depth of the excavation or from one foot extended into the excavation sidewall to allow for the collection of an undisturbed sample. OIL-IN-SOIL™ kits were used in addition to soil screening methods by the Remedial Engineer or person under their supervision to determine if material was grossly contaminated or not and whether an end-point sample should be collected as per the RAWP. The soil samples were analyzed for TCL VOCs.

A table summarizing all end-point sampling is included in Table 10 and all exceedances of SCOs are highlighted. Associated analytical results are provided in Appendix CC.

As shown on Table 10, VOC concentrations exceeded SCOs in four bottom samples (SC-04-SW-B-13SR, SC-05-SW-B-13, PD-12-S-B-11-13, and Driveway-B-17.5) and five sidewall samples (PD-01-4-6, PD-06B-9-11, PD-10-4-6, PD-11-4-6, PD-12-E-SW-4-6,

and PD-12-S-SW-4-6). This residual impacted material that remained on the Site could not be excavated as part of the RA and will be treated by implementation of the ISCO injection phase of the SMP as discussed in Section 4.8.

Quality Assurance/Quality Control (QA/QC) samples, including duplicates and matrix spike/matrix spike duplicates (MS/MSD) were collected at a 5 percent sample frequency (one field duplicate sample and one MS/MSD collected per 20 grab samples collected). These samples were collected and analyzed as required by DER-10 and evaluated as discussed in Section 4.5.4 concerning usability of data generated during the performance of the RA. A total of 41 documentation samples and 12 QA/QC samples were collected during the excavation phase of the RA. Soil sample results were compared to NYSDEC RRSCOs and PoG SCOs. QA/QC results are presented in table-format in Appendix DD.

Associated analytical results are provided in throughout Appendices AA, BB, and CC.

### 4.5.3 Underground Storage Tank Confirmatory Sampling

Compliance UST samples were collected from the courtyard and garage USTs post-cleaning as per the NYSDEC approved Tank Closure Design Plan dated November 18, 2015. Associated analytical results are provided in Appendix EE.

#### 4.5.3.1 Courtyard Dished USTs

The five (5) dished USTs in the courtyard were sampled after the USTs had been cleaned and removed off-Site for disposal. A drill rig was used to sample beneath the concrete slab where the dished USTs were located prior to removal and off-Site disposal. Bottom samples were completed by drilling through the concrete slab the USTs were installed on prior to disposal. Five (5) bottom soil samples were completed for the dished USTs at a depth of 10-12 ft bls and six (6) sidewall samples were collected for the dished USTs at 6-7 ft bls. Three of the five bottom samples showed evidence of gross contamination, which is further discussed in Section 4.8.

The three sidewall samples collected from the east side of USTs D-4, D-5 and the south side of D-5 did not exceed the PGWSCOs for any of the four VOCs of concern. The

three sidewall samples collected respectively from the east side of USTs D-1, D-2 and D-3 exceeded the PGWSCOs for isopropylbenzene and had evidence of gross contamination, discussed in Section 4.8. The exceedances in these locations will be addressed by operation of free-product recovery well RW-4 and RegenOx® injections performed during the SMP phase.

The results of all confirmatory UST sampling data are respectively presented in Tables 11 through 15, and sample locations for USTs located in the courtyard are shown on Figure 11.

#### 4.5.3.2 Garage USTs

The garage USTs were sampled post-cleaning using hand tools and supplemented by a drill rig. Sidewall samples were collected by either cutting through the wall of each UST post-cleaning or utilizing the drill rig to collect samples nearby, in the case of UST GT-6. Concrete refusal was encountered at a majority of sidewall sample attempts due to the proximity of the building foundations. Successful sample and refusal locations located in the garage are shown on Figure 12.

Bottom samples were collected through the concrete slab that was encountered beneath the garage USTs during the RIR. Three (3) bottom soil samples were collected either below the sub-slab concrete located in the garage, with a final depth not exceeding 17 ft bls, where non-impacted material was observed. The three (3) bottom soil samples were advanced to bedrock and monitoring wells were installed at the locations, as discussed below in Section 4.5.3.3.

Analytical results from sample GT-5C-W-B/9-11 exceeded Site-specific SCOs and the area was resampled to determine the extent of contamination. This location was resampled at a deeper depth as "GT-5C-W-B/15-17", which no longer exceeded Site-specific criteria. Six (6) sidewall samples were completed in the garage; three (3) samples were collected using hand tools at 9 ft bls and three (3) were collected using a drill rig for UST GT-6 from 6.5 to 9 ft bls.

The results of all confirmatory UST sampling data are respectively presented in Tables 11 through 15.

Residual impacted material that was confirmed in the sidewalls and bottoms of the USTs in the courtyard and garage areas will be treated or monitored as per the SMP and is further discussed in Section 4.9.

### 4.5.4 Monitoring Well Installation

As part of the remedial action, a total of nine (9) new monitoring wells were installed as discussed below:

- Three (3) monitoring wells (MW-40 through MW-42) were installed within the excavated and backfilled area in the garage to replace wells that were destroyed during the excavation activities. Each well was constructed of 2-inch diameter Schedule 40 polyvinyl chloride (PVC) casing with a 10-foot #20-slot screen. These wells were installed on January 11 to January 12, 2016 by Roux Associates.

- Five (5) monitoring wells (MW-43 through MW-47) were installed within the excavated and backfilled area in the courtyard to replace wells that were destroyed during the excavation activities. Each well was constructed of 4-inch diameter Schedule 40 PVC casing with a 15-foot #20-slot screen. These wells were installed on October 13, 14 and 17, 2016 by Roux Associates.

- One (1) monitoring well (MW-48) was installed within the footprint of the 4 Story Paint Factory Building in close proximity to MW-4 and MW-22 to facilitate continued monitoring of free-product present below the Paint Factory Building. This new monitoring well was installed because the existing monitoring wells (MW-4 and MW-22) that are in close proximity to MW-48 were not installed with well screens that properly covered the entire column of groundwater above bedrock. This well was constructed of a 2-inch diameter Schedule 40 PVC casing with a 15-foot #20-slot screen. This well was installed on October 17, 2016 by Roux Associates.

For all installed monitoring wells, a gravel pack consisting of #1 Morie Sand was placed around the screen to two-feet above the top of the screened interval, followed by a 2-foot seal of bentonite pellets. The bentonite pellet seal was given time to hydrate before filling the remainder of the well annulus with bentonite grout. The locations of the monitoring wells are shown on Figure 9. Monitoring well construction logs are provided in Appendix FF.

### 4.5.5 Data Usability Summary Report

A Data Usability Summary Report (DUSR) was prepared for all data generated in this remedial performance evaluation program. The purpose of the DUSR is to confirm the usability of the data that was collected during the RA and the validation of data provided from Alpha Analytical, Inc. (Alpha) and York Analytical Laboratories Inc. (York), the laboratories utilized during the work. The DUSR also validates the performance and quality control sampling that was completed alongside the remedial performance sampling.

Sample data generated from the RA were found to be generally compliant with the method requirements utilized by the laboratories. Minor qualifiers had to be added to the laboratory data, with some data being noted as being quantitatively estimated or with edits of some positive results to non-detect as per the validator response.

The DUSR is included in Appendix GG, and associated raw analytical is provided electronically in Appendix O, AA, BB, and CC.

## 4.6 Imported Backfill

When excavation and removal of impacted soil was complete in the courtyard and driveway, or no further impacted material could be removed, the excavation was backfilled and compacted using RCA, virgin sand, and the reusable material that had been removed from the top five ft bls of the excavation as discussed in Section 4.3. The area located within the garage was backfilled with RCA, reusable material, and flowable fill after the USTs had been cleaned and abandoned in place.

In accordance with DER-10, the following material was imported, without chemical testing, to be used as backfill beneath pavement, buildings or as part of the final site cover, provided that it contained less than 10% by weight material which would pass through a size 80 sieve and consists of:

- gravel, rock or stone, consisting of virgin material from a permitted mine or quarry; or
- recycled concrete or brick from a DEC registered construction and demolition debris processing facility if the material conforms to the requirements of Section 304 of the New York State Department of Transportation Standard Specifications Construction and Materials Volume 1 (2002).

RCA was used to backfill the bottom of the excavation to 1-foot above the water table, with exception to areas where reusable soil was used, and serves as the minimum two-foot Site-wide cap for areas without an impermeable cover (i.e., asphalt or concrete building slab). All imported media was inspected by the Engineer, and met the specifications of the geotechnical engineer, Remedial Engineer and Redevelopment Construction Documents. Reusable material was used from depth 2 ft bls to 9 ft bls in areas highlighted on Figure 5. Final backfill elevations are shown in the As-Built Drawings in Appendix L.

Backfill was obtained from the following sources:

- Approximately 13.37 tons of certified, clean, virgin sand were obtained from New York Sand and Stone, LLC and were used below the recovery system piping.
- Approximately 5,210.28 tons of NYSDEC-approved RCA from Vanbro Corporation (NYSDEC registered facility No. 568163NYUTM North: 4494809) was used to backfill the courtyard, driveway and garage excavations; and
- Approximately 78.99 tons of certified, clean, virgin stone were obtained from Liberty Aggregates, LLC, a permitted quarry, and were used as surface cover for the entirety of the Site that was not paved with asphalt.

A table of all sources of imported backfill with quantities for each source is shown in Table 16. The NYSDEC email approval to import virgin sand from the permitted mine New York Sand and Stone is provided in Appendix E. Clean fill certifications from each facility are included in Appendix HH. Imported backfill tickets are included in electronic format in Appendix W.

### 4.7 Asphalt Capping

Following the backfill of the excavation with compacted RCA, virgin sand, and the reusable material, an asphalt cap was installed in the driveway of the Site. The asphalt cap was also installed within the courtyard footprint along the western and northern perimeter and in an area approximately 20 feet adjacent to the warehouse building. Figure 9 presents where this asphalt cap was installed.

Approximately 81.62 tons of asphalt was obtained from Flushing Asphalt Corporation, located at 12001 31$^{st}$ Avenue, Flushing, New York to be used in the cap installation.

Asphalt tickets are included in electronic format in Appendix II.

### 4.8 Contamination Remaining At The Site

Due to limits of the SOE, structural engineering concerns associated with the onsite buildings and other Site constraints, all soil contamination was not removed as part of the performance of the RA. As a result, soil contamination remains at several locations across the Site that exceeds the NYSDEC PoG SCOs for one or more of the four VOCs of concern (benzene, ethylbenzene isopropylbenzene and total xylenes and several locations across the Site where soil is contaminated).

Tables 10 and 11 and Figures 11 and 12 summarize the results of all soil samples remaining at the site after completion of Remedial Action that exceed the Track 4 compounds of concern SCOs and show areas where gross contamination remain.

The residual contamination will continue to be addressed by operation of the LNAPL free-product recovery system and ISCO injections that will continue to be performed during the SMP phase (Section 4.9).

### 4.8.1 Courtyard Excavation

*Courtyard Perimeter*

Perimeter samples along the eastern sidewall, PD-01, PD-10 and PD-11, failed the Oil-in-Soil field screening test and exceeded the PoG SCOs for one or more of the four VOCs of concern. The grossly contaminated area associated with PD-01 and PD-11 (GC Area 1) is located approximately 4 to 6 ft bls along the northeast perimeter of the of the excavation. The grossly contaminated area associated with PD-10 (GC Area 6) is located approximately 4 to 6 ft bls east of the removed dished USTs, discussed further below. The residual contaminated soil could not be removed at the time of excavation because of the sheeting or shoring limitations.

The south extent of the excavation in the courtyard was extended to as near the warehouse and garage as a 1:1 slope would allow. Three borings (PD-06B, PD-07B and PD-08) were collected along the southern sidewall. Sample PD-06B did not show evidence of gross contamination but exceeded the PoG SCOs for isopropylbenzene. Sample PD-08 did not have exceedances of the four VOCs of concern, but upon excavation in the area grossly contaminated material was found. This area was excavated to 13 ft below land surface (bls) and as far south as possible until the excavation was limited by 1:1 sloping off of the boiler room. South and east sidewall samples, in addition to a bottom sample were collected (PD-12-S-SW-4-6, PD-12-E-SW-4-6 and PD-12-B-11-13 respectively). All three samples showed evidence of gross contamination (GC Areas 4 and 5) and exceeded the PGWSCOs for isopropylbenzene. Further excavation was completed to the east of the sidewall samples around UST GT-6 in an attempt to remove this gross contamination, but due to the presence of GT-6 under the nearby building structure, there was limited success. Gross contamination is present in this area surrounding the UST structure from 4 to 6 ft bls (GC Area 5).

Samples were collected from three locations beneath the northern edge of the former 20,000 courtyard UST concrete slab during excavation activities. This slab was located approximately 11 ft bls to 13 ft bls, measuring approximately 70 feet long, 40 feet wide and 2 feet thick. This concrete slab was not removed during the RA due to the size and inability to confirm if the slab was some type of structural support to the nearby buildings. Two samples, SC-04-SW-B-13SR and SC-05-SW-B-13 exceeded the PoG SCOs for isopropylbenzene. The samples collected did not fail the Oil-in-Soil field screening test, but fill below the slab at both locations was considered grossly contaminated (GC Area 2).

*Dished Underground Storage Tank Area*

The three sidewall samples collected respectively from the east side of USTs D-1, D-2 and D-3 exceeded the PoG SCOs for isopropylbenzene and grossly contaminated material was present. The area associated with the sidewall samples of the three USTs (GC Area 6) is located approximately 4 to 6 ft bls and is located east of the dished USTs and extends towards the building. The residual contaminated soil could not be removed at the time of excavation because of the sheeting or shoring limitations.

The five sub-slab UST bottom samples collected exceeded the PoG SCOs for one or more of the four VOCs of concern. Three of the five bottom samples failed the Oil-in-Soil field screening test (D2, D4 and D5) and thus grossly contaminated material was present beneath the concrete slab the USTs were installed on at approximately 10 to 12 ft bls (GC Area 7).

*Driveway Excavation*

The bottom sample collected from the middle of the driveway excavation at 17.5 ft showed evidence of gross contamination (GC Area 3). It is assumed the depth of gross contamination extends to approximately 20 ft bls, where bedrock is present. Laboratory analytical results for Driveway-B-17.5 indicated that the concentration of ethylbenzene, isopropylbenzene and xylenes are above the PoG SCOs.

### 4.8.2 Garage Excavation

The sidewall sample collected at GT-2-N-SW-9 exceeded the PoG SCO for isopropylbenzene. The bottom sample collected at GT-5C-W-B-9-11 exceeded the PoG SCOs for benzene and isopropylbenzene. An additional sample was collected deeper at the same location and that soil sample GT-5C-B-15-17 did not exceed the PGSWCOs for any of the four VOCs of concern. The grossly contaminated soil discovered near USTs GT-2 and GT-5C during the test pitting activities (GC Area 8 and GC Area 9, respectively) could not be removed without compromising the foundation of the warehouse building and the building on the neighboring property.

## 4.9 Engineering Controls

Since contaminated soil and groundwater remains beneath the site after completion of the Remedial Action, Institutional and Engineering Controls are required to protect human health and the environment. These Engineering and Institutional Controls (ECs/ICs) are described in the following sections. Long-term management of these EC/ICs and residual contamination will be performed under the Site Management Plan (SMP) approved by the NYSDEC.

### 4.9.1 Composite Cover System

Exposure to remaining contamination in soil/fill at the site is prevented by a composite cover system placed over the site. The composite cover system is comprised of the concrete building slabs for the Paint Factory, the 1-Story Brick Building and the 3-Story Warehouse, concrete pavement, asphalt pavement or a minimum of 2-feet of RCA. Figure 13 shows the location of each cover type built at the Site. Figure 14 shows the details of each installed cover type built at the Site.

An Excavation Work Plan, which outlines the procedures required in the event the cover system and/or underlying residual contamination are disturbed, is provided in Appendix C of the SMP.

### 4.9.2 Site-Related Groundwater Treatment System LNAPL Recovery

As per the RAWP, five (5) automatic product-only recovery pumps were installed in five proposed recovery wells to address any LNAPL following excavation activities. Recovery wells RW-1 and RW-2 were installed on December 14, 2015 by Roux

Associates and recovery wells RW-3 through RW-5 were installed on February 11, 2016 by Roux Associates.

Each recovery well was installed to approximately 14 ft bls and constructed of 4-inch diameter Schedule 40 PVC casing with a 10-foot #20-slot screen. A gravel pack consisting of #2 Morie Sand was placed around the screen to six inches above the top of the screened interval, followed by a sealing the well annulus with bentonite grout. Recovery wells RW-1 through RW-3 were completed with a, flush-mount, metal vault cover. Recovery wells RW-4 and RW-5 were completed using a stick-up covering. Recovery well construction logs are provided in Appendix FF.

The Geotech AC Sipper system (AC Sipper) recovers LNAPL from recovery wells using an AC powered pressure/vacuum pump. Once the pump canister is filled via the vacuum cycle, the pump reverses, pressurizes the system and pumps the recovered LNAPL to the surface and into a 55-gallon drum that is stored on top of a secondary containment pallet. The AC Sipper features a product intake assembly that incorporates a density float and an oleophilic/ hydrophobic filter that differentiates between floating hydrocarbons and water, which floats just above the oil/water interface to collect and remove LNAPL from the recovery wells.

The PVC piping that houses the product line and compressor airline were installed during the RA to approximately 3.5 to 4 ft bls. The PVC piping was installed on 4-inches of clean, virgin-source sand with a minimum of 6-inches of virgin-source sand backfilled on top of the PVC. The recovery system trench was backfilled to grade after sand placement with material removed during trenching. A demarcation layer was placed a 6-inches bls to mark the recovery system layout. The recovery well locations and trench layout are shown on Figure 15. Details of the recovery system, including installation, are shown on Figure 15.

Procedures for monitoring, operating and maintaining the LNAPL recovery system are provided in the Operation and Maintenance Plan in Section 4 of the Site Management Plan (SMP). The Monitoring Plan also addresses inspection procedures that must occur after any severe weather condition has taken place that may affect on-site ECs.

### 4.9.3 Groundwater Treatment Injection Points

The previous treatment event completed at the Site during the RA was effective in breaking down contaminants located under and surrounding the Warehouse area (Section

4.5.1). The SMP contemplates the implementation of ISCO injections inside the courtyard area to remediate residual contaminants in groundwater and soil following completion of the RAWP-phase of work. This plan also includes additional injections rounds to be completed within the warehouse area if VOCs are still present in groundwater.

The monitoring and sampling plan in Section 4 of the SMP will be performed to evaluate the overall performance and effectiveness of the remedy in the two areas (warehouse and courtyard) and ECs.

Additional treatment rounds would consist of additional ISCO injections in the basement of the Warehouse and areas in the courtyard, driveway, and potentially inside the garage if practical where post-remediation soil samples exceeded RRSCOs and PoG SCOs.

As used previously, the chemical oxidant that will be used is RegenOx™, and it will be distributed throughout the areas described above using both preexisting and new injection points.

### 4.10 Institutional Controls

The site remedy requires that an environmental easement be placed on the property to (1) implement, maintain and monitor the Engineering Controls; (2) prevent future exposure to remaining contamination by controlling disturbances of the subsurface contamination; and, (3) limit the use and development of the site to restricted residential, commercial, or industrial uses only.

The environmental easement for the site was executed by the Department on October 27, 2015, and filed with the Queens County Clerk on November 10, 2015. The County Recording Identifier number for this filing is 2015000400038. A copy of the easement and proof of filing is provided in Appendix JJ.

### 4.11 Deviations From The Remedial Action Work Plan

The following list summarized deviations from the approved RAWP. As appropriate, the NYSDEC was notified and deviations were corrected, or approvals for the deviations were obtained. Correspondences referred to below are provided in Appendix E.

- The courtyard excavation limits were reduced based on site constraints and at the

request of the Support of Excavation (SOE) Engineer retained by the Owner's Representative. The site constraints present within the courtyard were the lack of footings present on an adjacent neighboring building to the west and north of the excavation footprint, which would lead to diminished structural integrity, and the presence of footings on the building adjacent to the excavation to the east, which would not allow the SOE to be properly installed. The NYSDEC was informed of this modification via email on November 18, 2015 and the respective modification was conditionally approved on November 24, 2015. Based on reduction of excavation limits, ISCO might have to be utilized during the post-remediation monitoring phase to address inaccessible residual soil contamination. Requirements for ISCO implementation will be addressed in the SMP.

- Pre-delineation samples were collected instead of post-excavation samples due to SOE steel sheeting being used as the excavation method of choice. This allowed the horizontal extent of the excavation to be verified before the SOE design was finalized and the steel sheeting was mobilized to the area. Verbal approval to collect pre-delineation samples was provided by the NYSDEC prior to contractor mobilization. Because there was a potential that residual contamination may be present beyond installed steel sheeting limits that would be based on the results of the proposed pre-delineation sampling effort, ISCO might have to be utilized in the post-remediation monitoring phase to address inaccessible residual soil contamination beyond the proposed steel sheeting limits. Requirements for ISCO implementation will be addressed in the SMP.

- Excavation limits were expanded due to pre-delineation sampling results that required the size of the excavation to increase by 3,494.66 sq ft. These analytical results as well as the revision to the original excavation limits were provided to the NYSDEC, via email, on October 20, 2015. As per the RAWP, excavation in the courtyard is to remove as much grossly contaminated soils as possible. The excavation was expanded due to pre-delineation samples returning with exceedances of the PoG SCO.

- Excavation limits were expanded due to post-excavation sampling exceeding PoG SCOs. Post-excavation sidewall sampling completed towards the south of the original courtyard excavation was not observed to be grossly contaminated material, but did exceed the PoG SCO. As a result, additional impacted material was removed. Excavation continued until a clean endpoint sample was collected

or until further excavation could not be performed due to structural stability concerns of building on the south side of the excavation consistent with the requirements specified in Section 5.2 of the RAWP. ISCO might have to be utilized in the post-remediation monitoring phase to address inaccessible residual soil contamination resulting from inability to excavate due to these structural stability concerns. Requirements for ISCO implementation will be addressed in the SMP.

- Upon completion of the remedial action, residual soil contamination still remains on-site as identified in Figures 11 and 12. The residual soil inside the courtyard along the perimeter, in the driveway, at the northwest corner of GT-6 and in the garage could not be removed at the time of excavation because of the sheeting or shoring limitations or because the residual contamination appeared to extend under building structures (adjacent neighboring buildings, the former paint factory building, and the garage). Residual soil located beneath the concrete slab was not removed during the RA due to the size and inability to confirm if the slab was some type of structural support to the nearby buildings. The residual soil discussed herein will be managed under SMP by utilization of a combination of in-situ chemical oxidation and engineering and institutional controls as contemplated in Section 6.0 of the RAWP. The NYSDEC was informed of the conditions below the concrete slab via email on December 23, 2015. The NYSDEC approved the approach of utilizing in-situ chemical oxidation for this area via email on December 31, 2016.

- Actual size and number of USTs excavated and removed from the courtyard changed based on field observations. The UST Inventory task initiated on April 15, 2013 determined that three (3) dished USTs and a single fuel oil UST were present within the shed footprint and southeast area of the courtyard, respectively. The dished USTs varied in size from 2,000 to 5,000 gallons. During the RA, five (5) dished USTs were excavated and removed from the courtyard and were uniform in size and volume.

- Actual size and number of USTs abandoned in the garage changed based on field observations and NYSDEC approval. The UST Inventory task proposed eleven (11) separate USTs of which a majority was 2,000 to 5,000 gallons in size, with a single UST of 10,000 gallon volume. During the RA it was determined that the USTs were much larger in size and fewer in number due to “chambers” located

within the USTs. The actual USTs that were abandoned included six (6) USTs, of which three (3) had multiple chambers, that ranged in size from 9,000 to 21,000 gallons in size.

- A spill occurred onsite during dewatering activities when a laborer powered up a pump on December 18, 2015. Approximately 25-gallons of product was released to the Paint Factory Floor impacting an area approximately 25-feet by 25-feet. The release was contained to the paint factory floor, did not impact the subsurface, and was cleaned within an hour of the occurrence. The NYSDEC was notified by email on December 18, 2015 and NYSDEC did not require that a spill number be generated.

- Some post-abandonment confirmation samples for abandoned USTs were not collected due to concrete or bedrock refusal. This was determined to be caused by the close proximity of the USTs to the surrounding structures. In an email to the NYSDEC dated December 4, 2015, approval was given to not collect post-confirmatory samples if concrete or bedrock was observed during sampling.

- The north-west corner of the excavation was backfilled below the water table with reusable soil generated from the Site. Because the excavation was dewatered to a level below the typical water table elevation observed at the Site, the Contractor gained the flexibility and ability to install soil below the water table.

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