HIP Cleaners

Supplemental Remedial Investigation Work Plan

169-55 137th Avenue, Jamaica
Block 12495, Lot 2
BCP Site # C241166

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

I, Mohamed K. Ahmed, certify that I am currently a Qualified Environmental Professional as defined in 6NYCRR Part 375 and that this Remedial Investigation Work Plan was prepared in accordance with all applicable statues and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Mohamed K. Ahmed, Ph.D., CPG

September 26, 2016
Date

1.0 INTRODUCTION

On behalf of Rochdale Village, Inc. (Participant), Tenen Environmental, LLC (Tenen) has prepared this Supplemental Remedial Investigation Work Plan (SRIWP) for the property located at 169-47 137th Street (Block 12495, portion of Lot 2) in the Jamaica neighborhood of the borough of Queens, New York (the Site). The Site location and layout are shown on Figures 1 and 2. The scope of work described in this SRIWP is based upon the findings of the remedial investigation (RI) described in the Remedial Investigation Work Plan (RIWP) dated September 2015 and implemented by Tenen in November 2015.

During a conference call on January 7, 2016, the New York State Department of Environmental Conservation (NYSDEC) requested additional sampling to delineate contaminant impacts detected during the 2015 RI. This SRIWP has been designed to further investigate and characterize the nature and extent of contamination previously identified on the Site. The scope of work includes investigation of subsurface soils, soil vapor and groundwater within areas where historic dry cleaning operations have or may potentially impact off-site environmental media and potential receptors. The results of the investigation, in conjunction with the findings of the 2015 RI, will be used to prepare a qualitative human health exposure assessment (QHHEA) and to support the development of a Remedial Action Work Plan (RAWP). This SRIWP has been prepared in accordance with the NYSDEC Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10, May 3, 2010).

1.1 Work Plan Organization

This SRIWP includes an introduction (Section 1), background information (Section 2), scope of work (Section 3) and project schedule (Section 4). Quality assurance/quality control, health and safety (including community air monitoring), citizen participation and project team information are addressed in separate appendices. Supporting tables and figures referenced throughout are included at the end of this SRIWP.

1.2 Work Plan Objective

Previous investigations at the Site, detailed in Section 2.6 and conducted between 2010 and 2015, confirmed the presence of contamination on the Site associated with the use of the Site as a dry cleaner for at least 43 years, and the presence of at least one, and potentially two, underground storage tanks, with no additional documentation. A Phase II environmental site investigation conducted in September 2010 confirmed the presence of tetrachloroethene (PCE), a solvent that was historically used in dry cleaning operations, at concentrations above regulatory limits in soil and groundwater, and at elevated levels in soil vapor. Based upon comparisons to New York State Department of Health (NYSDOH) matrices, the levels of PCE in the indoor air at HIP cleaners require mitigation. The December 2013 soil vapor investigation also detected elevated levels of PCE in the soil vapor.

The results of the subsurface investigations are consistent with the historic and present use of the Site as a dry cleaner for a period of at least 43 years.

Based upon the location and distribution of elevated PCE concentrations, these impacts are attributable to the historic and present dry cleaning operations, involving the use, storage and disposal of PCE.

The Participant is proposing to depressurize beneath the entire footprint of Rochdale Mall #2 (Mall #2) outside of the Site footprint by installing an active sub-slab depressurization system (SSDS). No additional sub-slab soil vapor sampling is proposed within Mall #2.

The objective of this SRIWP is to provide information necessary to prepare a QHHEA and develop a remedial strategy for the Site to be incorporated into a RAWP. This objective will be accomplished by further investigation and characterization of the nature and extent of contamination identified in the November 2015 RI, specifically, the following:

- Identify the extent of the off-site soil vapor impacts in the direction of the neighboring office spaces, residential buildings and a public school.
- Identify the extent of indoor air impacts off Site.
- Assess the off-site soil and groundwater conditions downgradient of the Site, at a location adjacent to the neighboring office spaces.

2.0 BACKGROUND

This section includes a description of the Site and surrounding uses, a summary of the proposed Site development, Site characteristics, and information regarding historic operations and regulatory interactions. Summaries of previous Site investigations are also provided.

2.1 Site Description and Surrounding Uses

The Site is located at 169-47 137th Street, in the Jamaica neighborhood area of Queens, NY. The Site is an active dry cleaner (HIP Cleaners), located within the Rochdale Village Mall (Mall #2), which is part of a larger community development and housing complex known as Rochdale Village.

Rochdale Mall #2 is a one-story retail and office building (approximately 50,000 gross square feet) with associated parking. Rochdale Village complex is bounded by Baisley Boulevard, Bedell Street, 137th Avenue and Guy R. Brewer Boulevard. Mall #2 is located in the southeast corner of the Rochdale Village with associated parking spaces fronting 137th Avenue. The Site is a 2,800 square foot one-story retail space located in the northern end of Rochdale Mall #2. The Site is located in Queens Community Board 12 and is generally identified as a portion of Block 12495, Lot 2.

The surrounding properties include commercial properties within the Rochdale Village Mall #2 and associated parking. The Site is located less than 300 feet from a residential housing complex to the northeast and less than 500 feet from a residential housing complex to the southwest. The adjacent and surrounding area includes predominantly residential and commercial areas within Rochdale Village. The properties across 137th Avenue to the south are residential dwellings.

Previous investigations at the Site, detailed in Section 2.6 and conducted between 2010 and 2015, confirmed the presence of contamination on the Site associated with the use of the Site as a dry cleaner for a known period of approximately 43 years, as well as the presence of at least one, and potentially two, underground storage tanks, with no documentation or known information. Subsurface investigations of the Site confirmed the presence of chlorinated solvents at concentrations above regulatory levels in soil and groundwater and at elevated levels in soil vapor and indoor air. In particular, PCE, a solvent historically used in dry cleaning operations, was detected during subsurface investigations at concentrations above regulatory limits for soil and groundwater and at elevated levels in soil vapor. The results of the subsurface investigations are consistent with the historic and present use of the Site as a dry cleaner for a period of approximately 43 years to present.

2.2 Proposed Project Description

The Participant has proposed the Site use to remain as commercial, with no proposed demolition, renovation or new construction. Similarly, the off-site units in the shopping center are also proposed to remain as commercial use. The presence of PCE is complicating commercial use of the Site and may be affecting off-site commercial units within the existing shopping center. This

Work Plan entails further characterization of the nature and extent of contamination previously identified on the Site and off-site properties.

2.3 Site Characteristics

Site Topography
The surface topography slopes down to the southeast towards Jamaica Bay and the Atlantic Ocean. Based on the U.S. Geological Survey (Brooklyn-NY and Coney Island-NY Quadrangles) topographic map, the property lies at an elevation of approximately 16 feet above the National Geodetic Vertical Datum of 1929 (an approximation of mean sea level).

Site Geology and Hydrogeology
Based on previous sampling completed by Tenen as per the approved RIWP (September 2015) the boring logs identified shallow soils including historic fill material (silty sands mixed with anthropogenic materials) and fine to medium sand and silts to a depth of approximately ten feet below grade (ft-bg). This lithology was underlain by medium to coarse grain sand and gravel to depths of up to 50 ft-bg. Soil boring (HIP-SB-3D) was advanced to a depth of 50 ft-bg to investigate the presence of a confining layer; no clay layer was identified to this depth, which was not encountered. The approximate depth to bedrock (Ravenswood Granodiorite) is 800 ft-bg.

Groundwater was encountered at approximately nine feet below grade. The groundwater flow direction is toward the northwest; inconsistent with previously assumed groundwater flow. Contamination migrating from the Site is expected to flow northwest toward Baisley Pond.

Investigations at the Site have documented concentrations of contaminants above the NYSDEC Technical and Operation Guidance Series for Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (TOGS 1.1.1 AWQS). There are no known wellhead protection areas or specifically designated groundwater recharge areas in the vicinity of the site. Groundwater in this area is not used as a source of potable water.

2.4 Historic Operations

In 2010, a Phase I Environmental Site Assessment (ESA) for the Site was performed in accordance with ASTM E-1527-05, Standard Practice for Environmental Site Assessments. Based on a review of the Phase I ESA, the historic and present uses of the Site as a dry cleaner were identified as a recognized environmental condition (REC). The Phase I ESA addressed the entire village community, of which the Site is only a portion. Based on the information included in the ESA, the duration of the dry cleaning activities was approximately 43 years. HIP Cleaners was identified as a Small Quantity Generator of Hazardous Wastes on the regulatory database, with no violations. At least one, and potentially two, underground storage tanks (USTs) were identified at the rear of the property. The assumed tank(s) capacity was approximately 275-gallons. No documentation or known information was provided regarding the tank(s).

2.5 Regulatory Interaction

A Brownfield Cleanup Agreement was entered into between the Participant and NYSDEC, effective February 5, 2015. In September 2015, a draft Remedial Investigation Work Plan was submitted to NYSDEC by Tenen. The RIWP was implemented in November 2015. Based upon the RI findings, NYSDEC has requested the additional off-site sampling described in this Work Plan.

2.6 Previous Investigations

2010-2013 Investigations

In 2010 and 2013, several environmental assessments or investigations were conducted at the Rochdale Village Community, including the Site, and are summarized in the following reports:

- *Phase I Environmental Site Assessment, Rochdale Village, 169-55 137th Avenue, Queens, NY 11434, May 25, 2010, GRS Group*
- *Phase II Environmental Assessment Limited Subsurface Investigation, Rochdale Village, 169-55 137th Avenue, Queens, NY 11434, September 17, 2010, GRS Group*
- *Soil Vapor Investigation, HIP Cleaners, 169-47 137th Street, Queens, NY, 11434, December 2013, Jet Environmental*

The findings of the above investigations are summarized in the September 2015 RIWP. A. Previous sample locations are shown on Figures 3 and 4.

Remedial Investigation, HIP Cleaners Rochdale Village, 169-55 137th Avenue, Queens, NY 11434, November 2015, Tenen Environmental

In November 2015 Tenen conducted a soil, groundwater, sub-slab and soil vapor remedial investigation at the Site in order to horizontally and vertically delineate the nature and extent of chlorinated solvent impacts at the Site and surrounding commercial and residential spaces with respect to the known location of PCE dry cleaning equipment. The methodology and results of the RI are summarized below.

Soil. A total of five soil borings (two interior and three exterior) were advanced at the Site. Interior soil borings were installed using a 420M Geoprobe® unit; off-site soil borings were installed using a hollow-stem auger (HSA) drill rig. The two interior shallow soil borings were advanced within the Site building footprint at locations adjacent and crossgradient of the location of PCE storage areas and PCE-containing dry cleaning equipment. Three shallow and two deep exterior soil borings were advanced to delineate known impacts to the north, east and west of the Site. Shallow soil borings were advanced to approximately seven feet below the water table; one deep soil boring (HIP-SB-3D) was advanced to a depth of 50 ft-bg to determine if a confining layer exists within this interval. No confining layer was encountered; therefore, the second deep boring was advance to the depth of 35 ft-bg. Within each boring, a soil sample from each of the following intervals was collected and analyzed: two feet below grade, from the zone of highest

suspected contamination (if present), the next apparent non-impacted zone, from the water table interface, and from the terminal depth of the boring.

A photoionization detector (PID) was used to screen the soil borings; elevated field readings [max 277 parts per million (ppm)] were detected in boring HIP-SB-1 from the 4-6 ft-bgs interval, near the dry cleaning equipment. The soil analytical results were compared to the NYSDEC Unrestricted Use, Restricted-Commercial Use and Protection of Groundwater Soil Cleanup Objectives (SCOs) provided in 6 NYCRR Part 375. PCE was detected above Unrestricted and Protection of Groundwater SCOs at 79 milligrams per kilogram (mg/kg) within the shallow interval at HIP-SB1 (0-2 feet); the highest PID reading in this interval was 67 ppm. PCE was detected within the shallow and deep intervals at several exterior soil boring locations; however, there were no detections above the Unrestricted Use SCOs. Several pesticides were detected, largely in the shallow intervals, above Unrestricted Use SCOs including: 4,4'-DDT, 4,4'-DDE and 4,4'-DDD. Two polychlorinated biphenyls (PCBs), (Aroclor 1254 and 1260) were detected at HIP-SB-2D at shallow and deep intervals at elevated levels above Unrestricted, Protection of Groundwater, and Commercial Use SCOs. Metals detected above SCOs include barium, manganese, nickel and zinc.

Groundwater. Three boring locations were converted to permanent groundwater wells (including two cluster wells). One interior shallow groundwater well (HIP-GW-1) was advanced at soil boring location HIP-SB-1. Cluster wells at locations HIP-SB-2 and HIP-SB-3 included co-located shallow and deep wells to evaluate the horizontal and vertical extent of contamination in groundwater. Groundwater samples were collected from all wells (five in total). Groundwater results were compared to the NYSDEC Division of Water TOGS Class GA Water Quality Standards and Guidance Values (Class GA Standards). PCE was detected above the Class GA Standard of 5 micrograms per liter (ug/L) in all three shallow wells at concentrations ranging from 13 ug/L at HIP-GW-2S to 52 ug/L at HIP-GW-1. PCE was detected below the Class GA standard in both deep wells. The highest PCE detection (52 ug/L) was at HIP-GW-1, adjacent to the approximate location of the dry cleaning equipment and corresponding with the location of the highest detections in soil. Total iron was detected in both the shallow and deep intervals at location HIP-GW2 with a maximum concentration in the deep interval of 1,440 ug/L above the Class GA standard of 600 ug/L.

All monitoring wells were surveyed and groundwater was measured to be flowing in a northwesterly direction. Groundwater elevations ranged from approximately 7.41 to 7.67 ft.

Soil Vapor. On- and off-site soil vapor points were installed to confirm and delineate previously identified impacts. Sub-slab and soil vapor concentrations were compared to ambient air concentrations (HIP-AA), collected upwind of the Site. One on-site interior sub-slab soil vapor point (HIP-SS-1) was installed in the vicinity of the dry cleaning machine. PCE was detected at this location at a concentration of 417,000 micrograms per cubic meter (ug/m^3) above the ambient air concentration of 4.24 ug/m^3. Three soil vapor sample points were advanced within the courtyard canopy area at Rochdale Mall #2. PCE was not detected at the two exterior locations closest to the Site (HIP-SV-1 and HIP-SV-2); however, it was detected at HIP-SV-3 at a concentration of 1,340 ug/m^3. Five off-site sub-slab points were installed at a depth of six inches below the slab. PCE was detected in all sub-slab points at elevated concentrations above

those detected in ambient air. Detected concentrations ranged from 110 ug/m^3 (HIP-SS-4) in the commercial space across the courtyard to 800,000 ug/m^3 (HIP-SS-3) in the adjacent commercial store. Trichloroethane (TCE) was detected in several sub-slab samples including on-site and off-site commercial spaces. The highest TCE concentration was identified within the adjacent commercial space at HIP-SS-3 with a concentration of 2,790 ug/m^3. Several petroleum-related compounds were detected at HIP-SS-4, likely attributable to off-site sources.

2.6.1 Summary of Previous Investigations

The findings of past environmental investigations indicate the presence of chlorinated solvents in soil, soil vapor and shallow groundwater above regulatory levels. The concentrations of PCE in soil vapor and indoor air should be mitigated at the Site based on the New York State Department of Health Matrix 2.

The May 2010 Phase I ESA findings identified dry cleaning operations at the site for a period of at least 43 years, as well as the presence of at least one, potentially two, USTs with no documentation or known information. A Phase II investigation conducted in September 2010 confirmed the presence of PCE in soil and groundwater. The soil vapor investigation conducted in December 2013 identified elevated levels of PCE in the indoor ambient air. Based on the comparison with the NYSDOH matrices, the levels of PCE in the indoor ambient air at HIP Cleaners requires reasonable and practical actions to identify the source and reduce the exposure. The December 2013 soil vapor investigation also detected elevated levels of PCE in the soil vapor. Based on comparison with the NYSDOH matrices, the levels at HIP Cleaners (169-47 137th Street) require mitigation.

Expanding upon previous sampling results, the September 2015 RI confirmed the presence of PCE in the shallow groundwater, soil, sub-slab and soil vapor on-site and off-site within the adjacent and surrounding areas. Cluster groundwater wells were installed at two locations to evaluate vertical delineation of chlorinated solvents; one shallow groundwater well was advanced on-site adjacent to the location of dry cleaning equipment. Results showed that PCE was detected at elevated levels above the Class GA Standard in shallow groundwater wells; samples from deep wells contained PCE at concentrations below the Class GA standard. PCE was detected above Unrestricted Use SCOs in the shallow interval at one soil boring located adjacent to the dry cleaning equipment. Samples collected from deeper soil intervals did not contain elevated levels of PCE. Detected sub-slab PCE concentrations above ambient air levels were detected throughout Rochdale Village Mall #2, the highest of which were on-Site and in the adjacent commercial space. TCE, a breakdown component of PCE, and petroleum compounds, likely related to an off-site source, were also detected at elevated levels. Soil vapor sampling did not identify PCE in two of the three courtyard locations.

The concentrations and distribution of chlorinated solvents, specifically PCE, are consistent with the presence of an on-site source and have partially delineated contamination previously documented at the Site. The results of the RI were presented to NYSDEC in a conference call on January 7, 2016. Based on these findings, and noting that the measured groundwater flow from the RI was inconsistent with the assumed flow direction, NYSDEC requested additional

sampling to further delineate horizontal contamination. The supplemental sampling to be performed is described in this Work Plan and includes: additional soil vapor sampling to further delineate impacts in the areas adjacent to public, residential and office spaces within the surrounding area; advancing one soil boring, to be converted to a permanent shallow groundwater well, to horizontally delineate soil impacts; collection of a groundwater sample from the newly-installed well; and surveying the newly-installed well to a common datum.

3.0 SCOPE OF WORK

The remedial investigation proposed for the Site includes installation and sampling of soil borings, soil vapor sampling points and monitoring wells. The objectives of the investigation are to further characterize contamination on the Site and to document off-site impacts in order to prepare a QHHEA and support the preparation of a RAWP. The investigation activities are further described below. The methods are consistent with those detailed in the previously approved RIWP.

3.1 Soil Sampling

A subsurface investigation will be performed in order to horizontally and vertically delineate the extent of chlorinated solvent impacts in soil.

The following scope of work will be implemented:

- Advance one exterior shallow soil boring (HIP-SB-6) to a depth of approximately seven feet below the water table to delineate horizontal contamination between the Site and adjacent office spaces;
- Within the boring, a soil sample from each of the following intervals will be collected and analyzed: two feet below grade, the zone of highest suspected contamination, the next apparent non-impacted zone, at the water table interface, and at the terminal depth of the boring. If no contamination is observed, samples will be collected from the shallow interval, at the groundwater interface and at the terminal depth;
- Convert HIP-SB-6 to a permanent groundwater well; and,
- Analyze soil samples for Target Compound List (TCL) VOCs plus 10 tentatively identified compounds (TICs).

3.1.1 Soil Sampling Methodology

One soil boring (HIB-SB-6) will be advanced off-Site to supplement the five soil borings advanced during the November 2015 RI. This soil boring location is proposed downgradient of the Site, in the direction of the office spaces located approximately 100 feet to the northwest.

The off-Site soil boring will be installed using a hollow-stem auger (HSA) drill rig. Soil samples will be collected from split spoons, which will be decontaminated between samples. The soil boring will be advanced approximately seven feet below the water table; if soil impacts are detected at this depth, the boring will be continued until the first apparent clean zone.

The split spoons for each sample interval will be opened and the soil will be screened for VOCs using a PID and described using the Unified Soil Classification System, including documentation of observations regarding potential contamination such as odors, staining, etc. Soil will be screened from grade to the terminal depth of the boring. If evidence of contamination (elevated PID readings or odor) is documented, the soil boring will be extended, to the extent possible based on the equipment, to delineate the vertical extent of contamination. All descriptions and observations will be documented in a field notebook.

The soil samples from two feet below grade, from the zone of highest PID readings (if encountered), the next apparent non-impacted zone, from the water table interface, and from the terminal depth of the boring will be analyzed. If no contamination is observed, samples will only be collected from the surface interval, the groundwater interface, and at the terminal depth. All soil samples will be placed in pre-cleaned, pre-preserved laboratory provided sample bottles or En Core samplers (En Novative Technologies) cooled to 4°C in the field, and transported under chain-of-custody to the designated laboratory for analysis.

All soil samples will be analyzed for the following with a Category B deliverable data package:

- TCL VOCs by EPA Method 8260C plus 10 TICs.

A record of each sample, including notation of any odors, color, or other observations of the sample matrix, will be kept in the sampler's field logbook. A chain of custody will be maintained throughout the field sampling, transport of samples to the laboratory, and during lab analysis.

All locations are shown on Figure 4.

3.2 Soil Vapor and Indoor Air Sampling

The following scope of work is proposed to identify potential soil vapor impacts in areas that were not previously investigated and includes the following:

- Install three off-site exterior soil vapor points (HIP-SV-4 through HIP-SV-6) at approximately three ft-bg to determine if vapor is migrating to the north, east and west of the Site;
- Collect one indoor air sample off-site (HIP-IA-1);
- Sample and analyze soil vapor and indoor air samples for TO-15 VOCs;

Three soil-vapor points will be installed to investigate the potential presence of chlorinated solvents in locations adjacent to the neighboring public school (HIP-SV-6), office space (HIP-SV-4), and residential building (HIP-SV-5).

One indoor air sample (HIP-IA-1) will be co-located with the former location of off-Site sub-slab soil vapor point HIP-SS-3, installed during the September 2015 RI. This location exhibited the highest off-Site sub slab PCE levels at 800,000 ug/m3.

All sampling locations are shown on Figure 4.

3.2.1 Soil Vapor Sampling Methodology

Three soil vapor samples (HIP-SV-4 through HIP-SV-6) will be collected at off-site locations outside of the mall building.

Temporary soil vapor points will be installed using a hand-held 420M Geoprobe® unit. The soil vapor points will be extended to approximately three ft-bg. At the terminal depth, a sample probe attached to ¼-inch diameter Teflon® tube will be installed. The borehole above the sampling probe to grade will be sealed using an inert sealant to prevent ambient air mixing with the soil vapor. A curb box and flush-mount cap will be installed.

Prior to sampling, ambient air will be purged from the boring hole by attaching the surface end of the ¼-inch diameter Teflon® tube to an air valve and then to a vacuum pump. The vacuum pump will remove three volumes of air (volume of the sample probe and tube) prior to sample collection. The flow rate for both purging and sample collection will not exceed 0.2 liter per minute.

The soil vapor samples will be screened for VOCs using a PID. A tracer gas (helium) will be used in accordance with NYSDOH protocols to verify the integrity of the soil vapor probe seal. Helium will be used as the tracer gas and a bucket will serve to keep it in contact with the probe during testing. A portable monitoring device will be used to analyze a sample of soil vapor for the tracer prior to sampling. If the tracer sample results show a significant presence of the tracer gas, the probe seals will be adjusted to prevent infiltration.

A sample log sheet will be maintained summarizing sample identification, date and time of sample collection, sampling depth, identity of samplers, sampling methods and devices, soil vapor purge volumes, volume of the soil vapor extracted, vacuum of canisters before and after the samples are collected, apparent moisture content of the sampling zone and chain of custody

Soil vapor samples will be collected in laboratory-supplied 2.75-liter Summa canisters using two-hour regulators. All soil vapor samples will be analyzed for VOCs using EPA Method TO-15.

3.3 Groundwater Sampling

The following scope of work is proposed to evaluate the horizontal extent of PCE impacts downgradient of the Site and to evaluate contaminant conditions adjacent to the neighboring office spaces:

- Soil boring HIP-SB-6 will be converted into a shallow interval two-inch diameter permanent monitoring well (HIP-GW-6) and will be screened across the groundwater interface;
- Samples from the well will be analyzed for TCL VOCs;
- The monitoring well elevation will be surveyed to a common datum. Groundwater elevations will be used to establish a groundwater flow contour map; and
- Groundwater sampling results will be used to approximate isoconcentration contours of PCE at the Site.

The locations of the proposed well is shown on Figure 4.

3.3.1 Groundwater Well Installation and Sampling

A permanent shallow monitoring well (HIP-GW-6) will be installed off-site in the area of the neighboring office space located northwest of the Site.

The monitoring well will be installed using a HSA drill rig. A two-inch 10-foot PVC screen (0.020-inch slot) will be installed in the top 7 feet of groundwater in the shallow well. A filter pack of sand (US Std. sieve sizes 30 to 8) will placed in the annular space around the screens and will be extended two feet above the screen.

The annular area around the well casing will be sealed with bentonite pellets for an interval of two feet above the filter pack in the shallow well. The annular space above the bentonite pellets to one foot below grade will be backfilled with drilling cuttings. The remaining one-foot will be sealed with a concrete cap and well apron (expanding cement). A locking well cap will be installed upon completion of each well.

Following installation, at least three well volumes of the water column will be removed using a submersible pump. All permanent wells will be surveyed to a common site datum. Groundwater sampling will not take place until 24 hours or more after well development.

One groundwater sample will be collected using low-flow techniques in accordance with EPA Region 1 Low-Stress (Low-Flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells (EQASOP-GW 001 Revision 3 dated July 30, 1996 Revised: January 19, 2010).

Groundwater sample will be analyzed for the following with a Category B deliverable data package:

- TCL VOCs by EPA Method 8260C plus 10 TICs.

3.4 Quality Assurance / Quality Control (QA/QC)

Samples will be collected in accordance with the Quality Assurance Project Plan (QAPP) included in the RIWP.

Sample analysis will be performed by a NYSDOH ELAP-certified laboratory. The laboratory will report sample results on a five-day turn around time. An independent subconsultant will validate sample results and prepare a Data Usability Summary Report (DUSR).

3.5 Summary Table of Proposed Sampling Locations

As required by Section 3.3(b) 3 of DER-10, below is a table with all proposed sampling locations and QA/QC samples.

Proposed Sampling Locations and Analysis

Sample Location	Matrix	Sampling Intervals	Analytical Parameters	Sampling Method / Minimum Reporting Levels	Rationale
HIP-SB-6	Soil	Within each boring, the soil sample from two feet below grade, from the zone of highest suspected contamination (if encountered), the next apparent non-impacted zone (as appropriate), from the water table interface, and from the terminal depth of the boring will be analyzed.	TCL VOCs	MDL less than Unrestricted Use SCOs	Investigate off-site soil conditions adjacent to the neighboring, downgradient office spaces located approximately 100-feet to the northwest.

Sample Location	Matrix	Sampling Intervals	Analytical Parameters	Sampling Method / Minimum Reporting Levels	Rationale
HIP-GW-6	Groundwater	Seven-foot interval into groundwater interface	TCL VOCs	EPA 8260 / MDL less than Class GA Standards	Assess groundwater conditions in downgradient direction from the Site in order to investigate potential off-site chlorinated solvent impacts.

Sample Location	Matrix	Sampling Intervals	Analytical Parameters	Sampling Method / Minimum Reporting Levels	Rationale
HIP-SV-4	Soil Vapor	3 ft-bg	TO-15 VOCs	EPA TO-15 / MDL less than 1.00 ug/m3 except TCE/PCE less than 0.25 ug/m3	Delineate extent off-site impacts in the directions of nearby public school, residential building and office spaces.
HIP-SV-5					
HIP-SV-6					

HIP-IA-1	Indoor air	--	TO-15 VOCs	EPA TO-15	Delineate extent of off-site indoor air impacts.

Sample Location	Matrix	Sampling Intervals	Analytical Parameters	Rationale
Trip Blanks	QA / QC	--	TCL VOCs	Quality assurance and quality control
Soil Duplicate				
Soil Blank				
Soil MS/MSD				
Groundwater Duplicate				
Groundwater MS/MSD				

MDL – Method Detection Limit
Reporting limits are laboratory- and sampling event-specific. The overall objective is to ensure that the minimum reporting levels are such that they can be used to evaluate potential sources, assess risk from detected compounds, and compare detected concentrations against applicable regulatory levels.

3.6 Qualitative Exposure Assessment

Following receipt of the sample results, a qualitative human health exposure assessment (QHHEA) will be completed in accordance with Section 3.3(c)4 and Appendix B (NYSDOH guidance for preparing a qualitative human health exposure assessment) of DER-10. The QHHHEA will utilize the results of the remedial investigation to evaluate and document potential exposure routes and identify and characterize potential current and future receptors. The samples collected as part of the remedial investigation will be used to identify potential human exposure scenarios associated with contaminants in soil, soil vapor and groundwater. The results of the QHHEA will be included in the remedial investigation report, as described in Section 3.12.

3.7 Health and Safety Plan (HASP)

All work at the Site will be completed in accordance with the Health and Safety Plan (HASP) included in the September 2015 RIWP.

3.8 Air Monitoring

The NYSDOH Generic Community Air Monitoring Plan (CAMP), included as Appendix 1A of DER-10, will be implemented during all ground-intrusive sampling activities. Details of the CAMP are included in the HASP (Appendix B of the September 2015 RIWP).

3.9 Investigation-Derived Waste (IDW)

Following the completion of sampling, boreholes will be backfilled with clean cuttings or sand. If grossly contaminated soil cuttings are encountered or if excess soil cuttings are generated, they will be placed in 55-gallon drums. Any purge water or other investigation-derived waste (IDW) will be containerized in 55-gallon drums. After the investigation is complete, the drum contents will be characterized for off-site disposal.

3.10 Citizen Participation Plan

A Citizen Participation Plan (CPP) has been prepared to provide information about how NYSDEC will inform and involve the public during the investigation and cleanup of the Site. A copy of the CPP is provided in Appendix D of the September 2015 RIWP.

3.11 Reporting

A remedial investigation report will be prepared in accordance with the requirements of DER-10. The report will include details of the sampling performed during the 2015 RI and this supplemental remedial investigation, tabulated sample results and an assessment of the data and conclusions. If warranted, recommendations for additional actions will be included.

Soil sample results will be compared to the Unrestricted Use SCOs, Commercial Use SCOs and the Protection of Groundwater SCOs as included in Part 375-6.8. Groundwater sample results will be compared to the Class GA Standards. Soil vapor, indoor air and ambient air samples will be compared to the NYSDOH AGVs and matrices, where applicable.

The report will also include the qualitative exposure assessment, CAMP results, laboratory data packages, DUSR, geologic logs, well construction diagrams and well purging/sampling logs. All data will also be submitted electronically to NYSDEC via the Environmental Information Management System (EIMS) in EqUIS format.

4.0 SCHEDULE

It is estimated that the soil and soil vapor sampling and well installation tasks described in this work plan can be completed within two field days with an additional ten days for well development prior to groundwater sampling. Project activities will be completed within approximately nine weeks after Work Plan approval by NYSDEC. The following project schedule has been developed:

Work Plan Implementation Schedule

Task	Estimated Task Duration (business days)	Total Duration (business days)
Work Plan Approval	--	1
Mobilization	10	11
Soil and Soil Vapor Sampling	2	13
Monitoring Well Installation	1	14
Monitoring Well Development	10	24
Groundwater Sampling	1	25
Laboratory Analysis	10	35
Draft Report and Data Validation	30	65

5.0 REFERENCES

New York State Department of Environmental Conservation, Division of Environmental Remediation. DER Technical Guidance for Site Investigation and Remediation (DER-10). NYSDEC 2010.

New York State Department of Environmental Conservation DEC Policy. Commissioner's Policy 51 – Soil Cleanup Guidance. October 21, 2010. NYSDEC 2010.

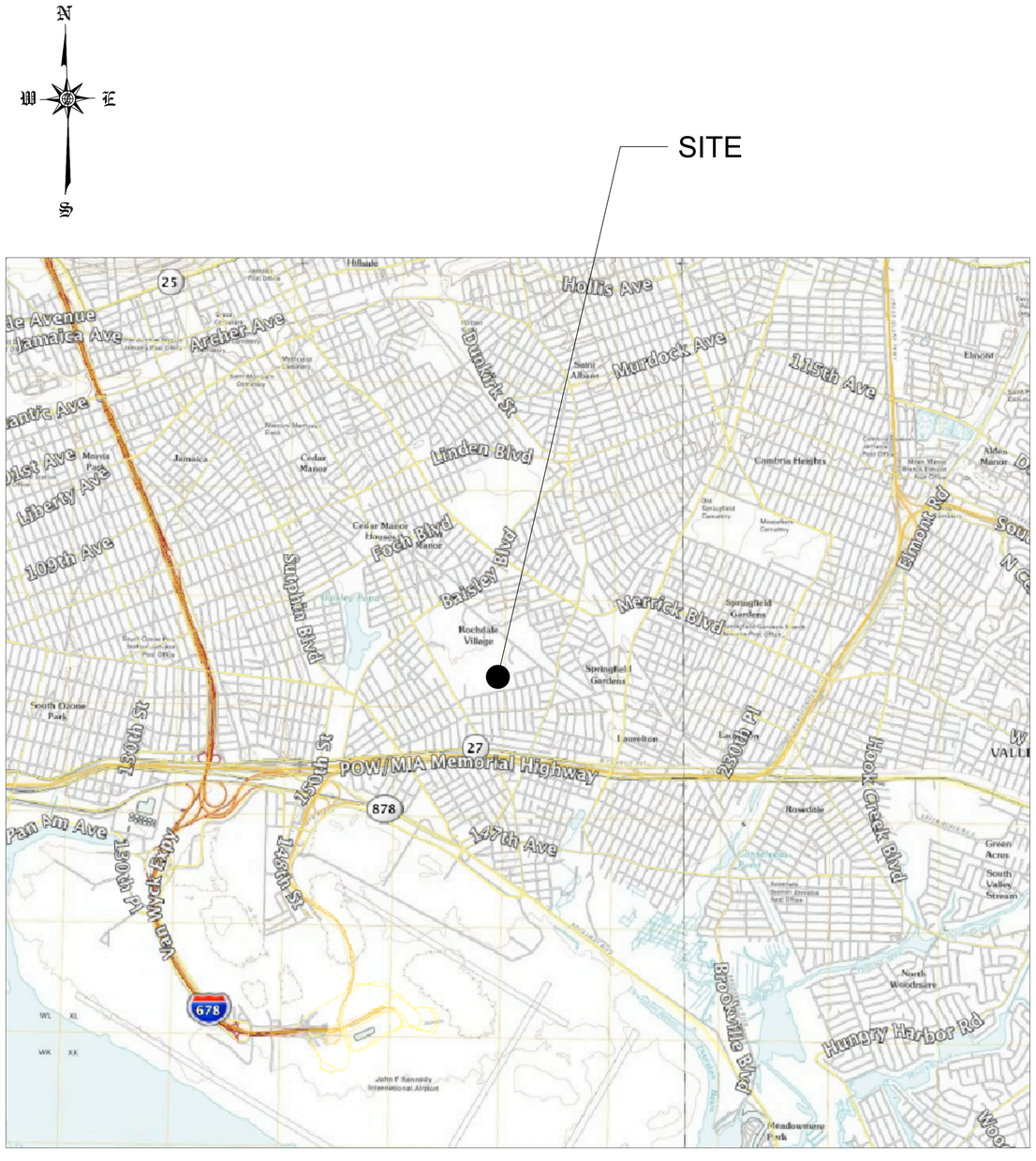
New York State Department of Health. Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, October 2006).

Phase I Environmental Site Assessment, Rochdale Village, 169-55 137th Avenue, Queens, NY 11434, May 25, 2010, GRS Group

Phase II Environmental Assessment Limited Subsurface Investigation, Rochdale Village, 169-55 137th Avenue, Queens, NY 11434, September 17, 2010, GRS Group

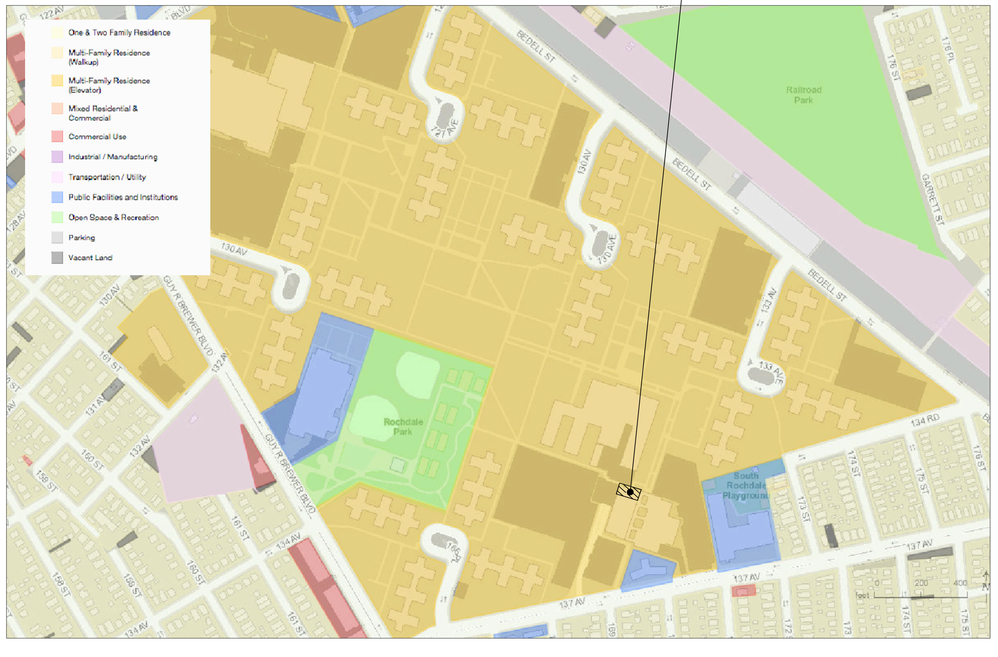
Soil Vapor Investigation, HIP Cleaners, 169-47 137th Street, Queens, NY, 11434, December 2013, Jet Environmental

Figures



Re: USGS JAMAICA - NY QUADRANGLE, 2013
http://www.usgs.gov

Re: DEPARTMENT OF FINANCE, DIGITAL TAX MAP, 2014
http://gis.nyc.gov/taxmap/map.htm



Re: DEPARTMENT OF CITY PLANNING ZOLA, 2014
http://gis.nyc.gov/doitt/nyscitymap/template?applicationsName=ZOLA

CLIENT
HIP Cleaners
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169-47 137th Street
Jamaica, Queens

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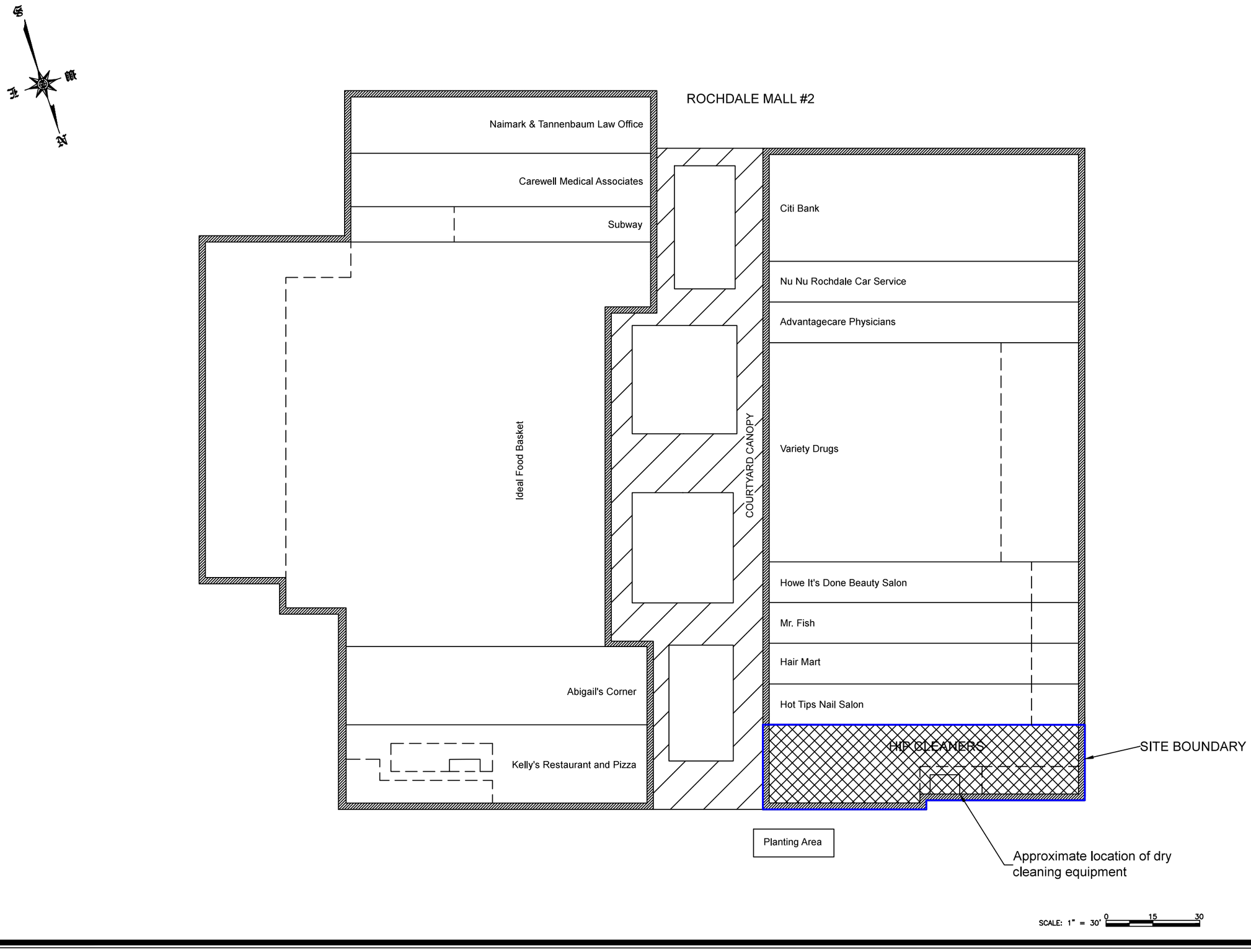
DRAWN BY	CHECKED BY	DATE	SCALE:
KM	MC	MAY 2015	AS NOTED

DRAWING TITLE: Site Location

DRAWING NO.: Figure 1



CLIENT

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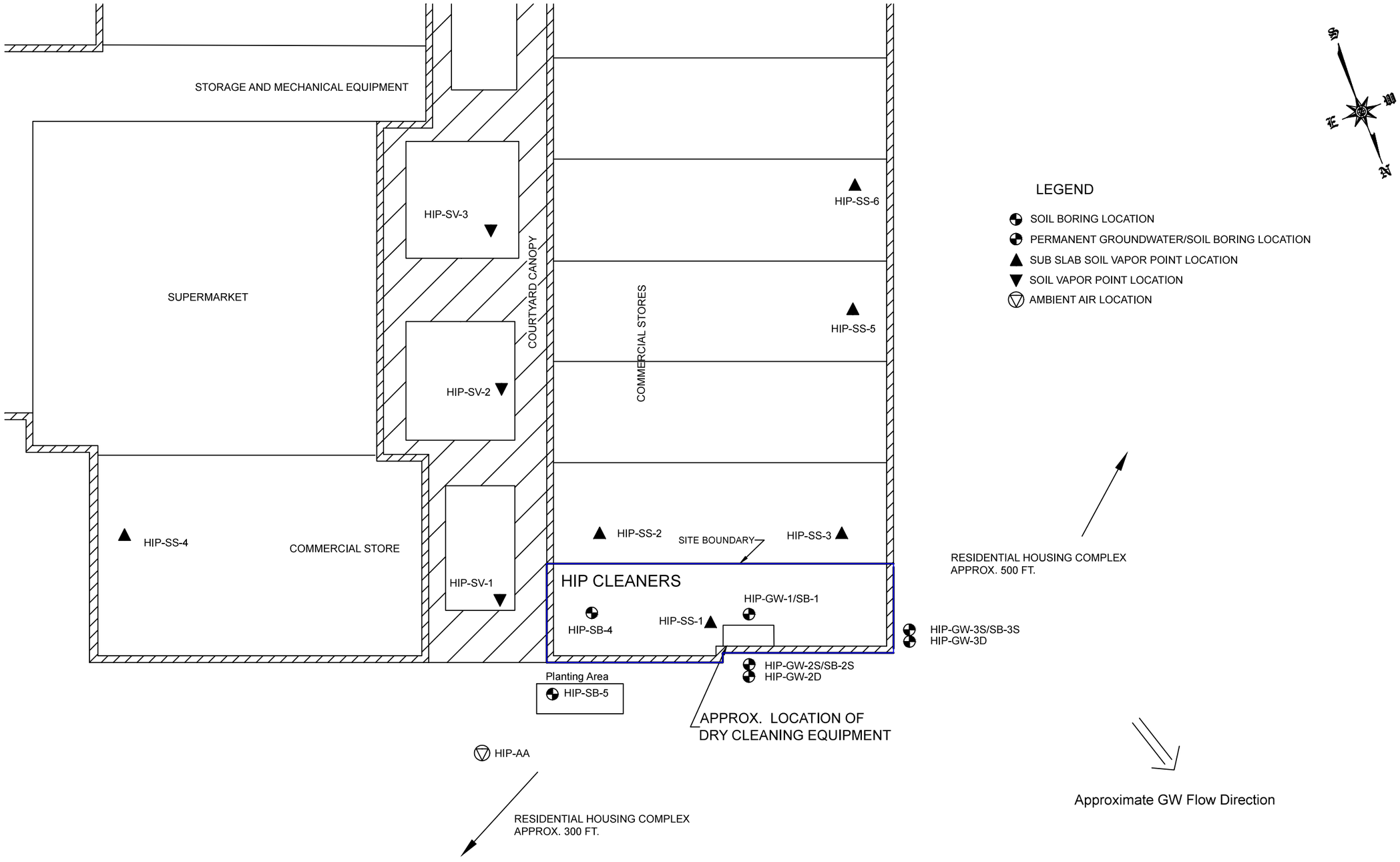
DRAWN BY	CHECKED BY	DATE	SCALE:
KM	MC	MARCH 2016	AS NOTED

DRAWING TITLE: FIGURE 2

DRAWING NO.: SITE LAYOUT



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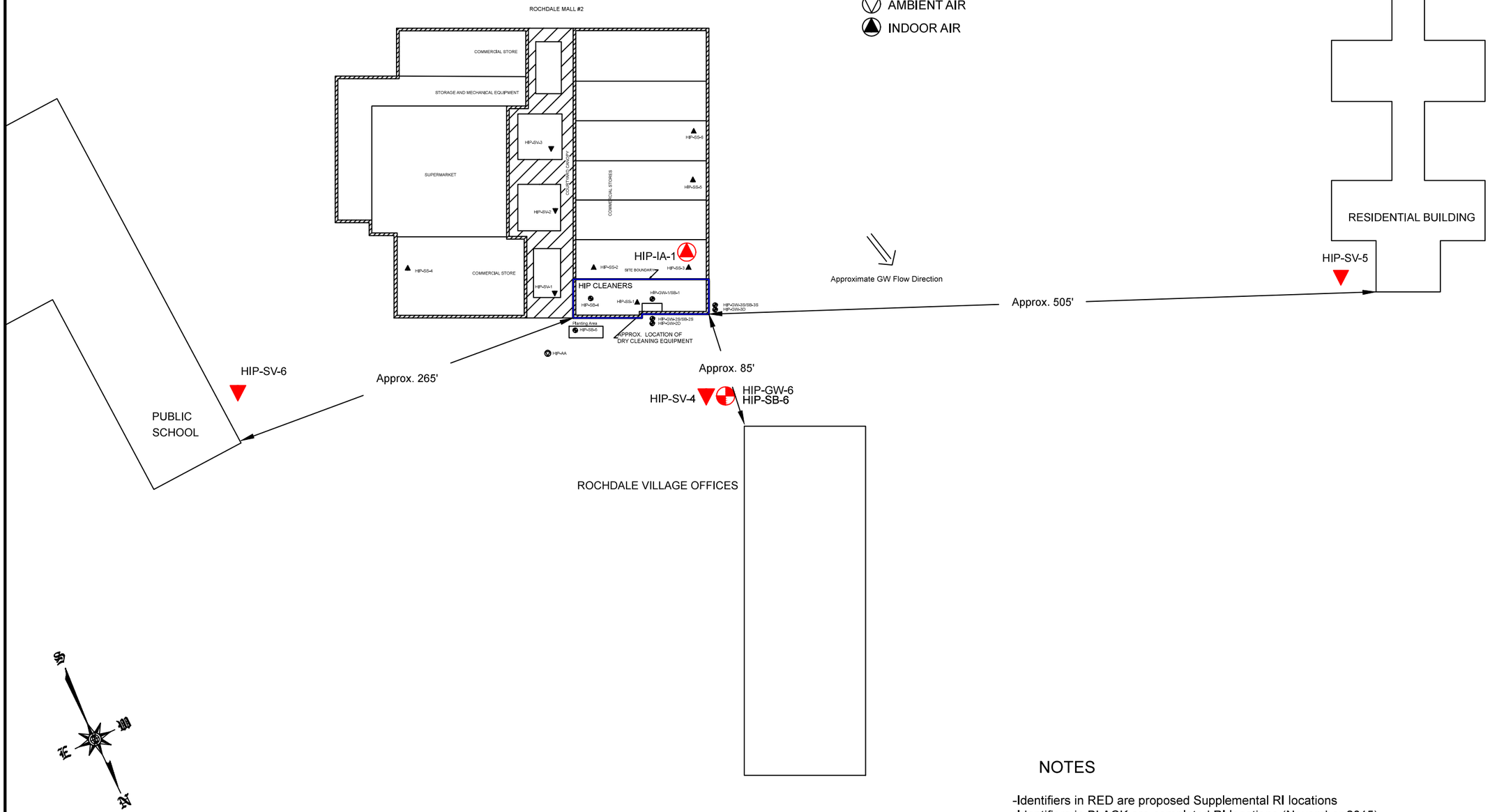
DRAWN BY	CHECKED BY	DATE	SCALE:
KM	MC	SEPTEMBER 2016	AS NOTED

DRAWING TITLE:
Previous RIWP Sampling Locations

DRAWING NO.:
FIGURE 3

LEGEND

- PERMANENT GROUNDWATER/SOIL BORING LOCATION
- SOIL BORING LOCATION
- SUB-SLAB VAPOR POINT
- SOIL VAPOR POINT
- AMBIENT AIR
- INDOOR AIR



NOTES

-Identifiers in RED are proposed Supplemental RI locations
-Identifiers in BLACK are completed RI locations (November 2015)
-RI = Remedial Investigation
-The November 2015 RI sampling event was completed by Tenen Environmental as per the September 2015 approved Remedial Investigation Work Plan

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DRAWN BY	CHECKED BY	DATE	SCALE:
KM	MC	SEPTEMBER 2016	AS NOTED

DRAWING TITLE:
PROPOSED SAMPLING LOCATIONS

DRAWING NO.
FIGURE 4

Appendix A
Quality Assurance Project Plan

Appendix A
Quality Assurance Project Plan

for
HIP Cleaners – Rochdale Mall #2
Supplemental Remedial Investigation Work Plan

169-55 137th Street,
Queens, New York 11434
BCP Site # C241166

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau B
1 Hunters Point Plaza
47-40 21st Street
Long Island City, NY 11101

Prepared for:
Rochdale Village, Inc.
169-55 137th Avenue
Queens, New York 11434

Prepared by:
TENEN ENVIRONMENTAL
121 West 27th Street, Suite 702
New York, NY 10001

September 2016

TABLE OF CONTENTS

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been developed for the Remedial Investigation Work Plan (RIWP) prepared for HIP Cleaners (the Site). The Site is in the Brownfield Cleanup Program (BCP) as Site #C241166.

The Site is identified as HIP Cleaners, located in the Rochdale Village Mall at 169-55 137th Avenue in the Jamaica Section of Queens, New York (Figure 1). HIP Cleaners is an active dry cleaning facility located in a 3,330 square foot (SF) retail space located within the Rochdale Mall. The Rochdale Mall is part of a larger community development known as Rochdale Village, which was constructed in the mid-1960s and encompasses the footprint of the former Jamaica Horse Racing Track that dates back to 1903. Rochdale Village is owned and managed by Rochdale Village Inc. The Site Layout is provided on Figure 2.

1.1 Project Scope and QAPP Objective

The proposed scope of work includes the following:

- advancement of borings for soil, groundwater and soil vapor sampling off the Site and permanent monitor well installation, and;
- collection of soil, groundwater and soil vapor from soil borings, permanent monitoring wells and temporary soil vapor points.

The objective of the QAPP is to detail the policies, organization, objectives, functional activities and specific quality assurance/quality control activities designed to achieve the data quality goals or objectives of the Remedial Investigation Work Plan. This QAPP addresses how the acquisition and handling of samples and the review and reporting of data will be documented for quality control (QC) purposes. Specifically, this QAPP addresses the following:

- The procedures to be used to collect, preserve, package, and transport samples;
- Field data collection and record keeping;
- Data management;
- Chain-of-custody procedures; and,
- Determination of precision, accuracy, completeness, representativeness, decision rules, comparability and level of quality control effort.

2.0 PROJECT ORGANIZATION

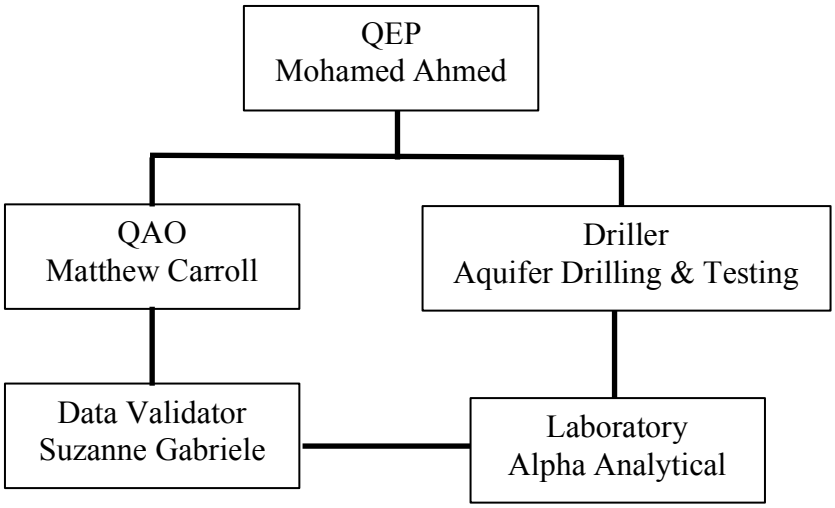
The personnel detailed are responsible for the implementation of the QAPP. Tenen Environmental, LLC (Tenen) will implement the RIWP on behalf of Rochdale Village, Inc. (the Participant) once it has been approved by the New York State Department of Environmental Conservation (NYSDEC).

The Project Manager and Qualified Environmental Professional (QEP) will be Mohamed Ahmed, Ph.D., CPG, principal at Tenen. Dr. Ahmed is a certified professional geologist with over 20 years of experience in the New York City metropolitan area. He has designed and implemented subsurface investigations and is proficient in groundwater modeling, design of groundwater treatment systems, and soil remediation. He has managed numerous projects focused on compliance with the requirements of the New York State Brownfield Cleanup Program and spills programs and the New York City E-designation program. Dr. Ahmed also has extensive experience in conducting regulatory negotiations with the New York State Department of Environmental Conservation, the New York City Department of Environmental Protection, the NYC Office of Housing Preservation and Development, and the Mayor's Office of Environmental Remediation. Dr. Ahmed holds advanced degrees in geology and Earth and Environmental Sciences from Brooklyn College and the Graduate Center of the City University of New York; his resume is included in Appendix A.

The Quality Assurance Officer will be Mr. Matthew Carroll, P.E., principal at Tenen. Mr. Carroll is an environmental engineer experienced in all aspects of site assessment and development and implementation of remedial strategies. His experience involves projects from inception through investigation, remediation and closure. His expertise includes soil, soil vapor and groundwater remediation; remedial selection and design; field/health and safety oversight and preparation of work plans and reports to satisfy the requirements of various regulatory agencies. Mr. Carroll received his Bachelor of Engineering from Stevens Institute of Technology and Bachelor of Science in Chemistry from New York University and is a New York State professional engineer; his resume is included in Appendix A.

In addition, Tenen will utilize subcontractors for drilling (Aquifer Drilling & Testing of Mineola, New York), laboratory services (Alpha Laboratories of Westborough, MA) and data validation (Geosyntec Consultants of Greenwood Village, Colorado). The resume for the DUSR preparer, Ms. Suzanne Gabriele, is included in Appendix A.

An organization chart for the implementation of the Site Characterization Work Plan and QAPP is below.



3.0 SAMPLING AND DECONTAMINATION PROCEDURES

A detailed description of the procedures to be used during this program for collection of the soil, soil vapor, ambient air and groundwater samples is provided below. Proposed sample locations are shown on Figure 4 of the Work Plan. An Analytical Methods/Quality Assurance Summary is provided in Table 1, included in Section 3.11.

3.1 Level of Effort for QC Samples

Field blank, trip blank, field duplicate and matrix spike (MS) / matrix spike duplicate (MSD) samples will be analyzed to assess the quality of the data resulting from the field sampling and analytical programs. Each type of QC sample is discussed below.

- Field and trip blanks consisting of distilled water will be submitted to the analytical laboratories to provide the means to assess the quality of the data resulting from the field-sampling program. Field (equipment) blank samples are analyzed to check for procedural chemical constituents that may cause sample contamination. Trip blanks are used to assess the potential for contamination of samples due to contaminant migration during sample shipment and storage.

- Duplicate samples are analyzed to check for sampling and analytical reproducibility.

- MS/MSD samples provide information about the effect of the sample matrix on the digestion and measurement methodology.

The general level of QC effort will be one field duplicate and one field blank (when non-dedicated equipment is used) for every 20 or fewer investigative samples of a given matrix. Additional sample volume will also be provided to the laboratory to allow one site-specific MS/MSD for every 20 or fewer investigative samples of a given matrix. One trip blank will be included along with each sample delivery group of volatile organic compound (VOC) samples.

The analytical laboratory, Alpha Analytical, is certified under the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) as LabIDs 11148 and 11627. NYSDEC Analytical Services Protocol (ASP) Category B deliverables will be prepared by the laboratory.

3.2 Sample Handling

Samples will either be picked up by the laboratory, delivered to the laboratory in person by the sampler, or transported to the laboratory by overnight courier. All samples will be shipped to the laboratory to arrive within 48 hours after collection, and the laboratory will adhere to the analytical holding times for these analyses, as listed in the current version of the New York State ASP.

3.3 Custody Procedures

Sample custody will be controlled and maintained through the chain-of-custody procedures. The

chain of custody is the means by which the possession and handling of samples is tracked from the site to the laboratory. Sample containers will be cleaned and preserved at the laboratory before shipment to the Site. The following sections (Sections 3.4 and 3.5) describe procedures for maintaining sample custody from the time samples are collected to the time they are received by the analytical laboratory.

3.4 Sample Storage

Samples will be stored in secure, limited-access areas. Walk-in coolers or refrigerators will be maintained at 4°C, ± 2°C, or as required by the applicable regulatory program. The temperatures of all refrigerated storage areas are monitored and recorded a minimum of once per day. Deviations of temperature from the applicable range require corrective action, including moving samples to another storage location, if necessary.

3.5 Sample Custody

Sample custody is defined by this QAPP as the following:

- The sample is in someone's actual possession;
- The sample is in someone's view after being in his or her physical possession;
- The sample was in someone's possession and then locked, sealed, or secured in a manner that prevents unsuspected tampering; or,
- The sample is placed in a designated and secured area.

Samples will be removed from storage areas by the sample custodian or laboratory personnel and transported to secure laboratory areas for analysis. Access to the laboratory and sample storage areas is restricted to laboratory personnel and escorted visitors only; all areas of the laboratory are therefore considered secure.

Laboratory documentation used to establish chain of custody and sample identification may include the following:

- Field chains of custody or other paperwork that arrives with the sample;
- Laboratory chain of custody;
- Sample labels or tags attached to each sample container;
- Sample custody seals;
- Sample preparation logs (i.e., extraction and digestion information) recorded in hardbound laboratory books, filled out in legible handwriting, and signed and dated by the chemist;
- Sample analysis logs (e.g., metals, GC/MS, etc.) information recorded in hardbound laboratory books that are filled out in legible handwriting, and signed and dated by the chemist;
- Sample storage log (same as the laboratory chain of custody); and,
- Sample disposition log, which documents sample disposal by a contracted waste disposal company.

3.6 Sample Tracking

All samples will be maintained in the appropriate coolers prior to and after analysis. Laboratory analysts will remove and return their samples, as needed. Samples that require internal chain of custody procedures will be relinquished to the analysts by the sample custodians. The analyst and sample custodian will sign the original chain of custody relinquishing custody of the samples from the sample custodian to the analyst. When the samples are returned, the analyst will sign the original chain of custody returning sample custody to the sample custodian. Sample extracts will be relinquished to the instrumentation analysts by the preparatory analysts. Each preparation department will track internal chain of custody through their logbooks/spreadsheets.

Any change in the sample during the time of custody will be noted on the chain of custody (e.g., sample breakage or depletion).

3.7 Soil Sampling

One soil boring will be advanced off-site to evaluate horizontal delineation of perchloroethylene (PCE) to the northwest of the Site.

The soil boring will be advanced off-Site to supplement the five soil borings advanced during previous remedial investigation. Prior to the November 2015 remedial investigation, the groundwater flow direction was assumed to be southerly; the 2015 measured groundwater flow was found to be in a northwesterly direction. Based on this information and in coordination with NYSDEC, this additional soil boring location is proposed between the Site and office spaces located approximately 100 feet to the northwest.

The off-Site soil boring will be installed using a hollow-stem auger (HSA) drill rig. Soil samples will be collected from split spoons, which will be decontaminated between samples.

The split spoons for each sample interval will be opened and the soil will be screened for VOCs using a PID and described using the Unified Soil Classification System, including documentation of observations regarding potential contamination such as odors, staining, etc. Soil will be screened from grade to the terminal depth of the boring. If evidence of contamination (elevated PID readings or odor) is documented, the soil boring will be extended, to the extent possible based on the equipment, to delineate the vertical extent of contamination. All descriptions and observations will be documented in a field notebook.

The soil samples from two feet below grade, from the zone of highest PID readings (if encountered), the next apparent non-impacted zone, from the water table interface, and from the terminal depth of the boring will be analyzed. If no contamination is observed, samples will only be collected from the surface interval, groundwater interface, and terminal depth. Soil samples to be analyzed will be collected directly from the acetate sleeve. All soil samples will be placed in pre-cleaned, pre-preserved laboratory provided sample bottles or En Core samplers (En Novative Technologies) cooled to 4°C in the field, and transported under chain-of-custody to the designated laboratory for analysis.

Soil samples, with the exception of those collected in the first apparent non-impacted zone, will

be analyzed for the following with a Category B deliverable data package:

- TCL VOCs by EPA Method 8260C plus 10 TICs;

Soil samples collected from the first apparent non-impacted zone will be analyzed for the following with a Category B deliverable data package:

- TCL VOCs by EPA Method 8260C plus 10 TICs.

A record of each sample, including notation of any odors, color, or other observations of the sample matrix, will be kept in the sampler's field logbook. A chain of custody will be maintained throughout the field sampling, transport of samples to the laboratory, and during lab analysis.

3.8 Monitoring Well Installation and Development

A permanent shallow monitoring well (HIP-GW-6) will be installed off-Site in the area of the neighboring office space located to the northwest of the Site.

The monitoring well will be installed using a HSA drill rig. A two-inch 10-foot PVC screen (0.020-inch slot) will be installed in the top 7 feet of groundwater in the shallow well. A filter pack of sand (US Std. sieve sizes 30 to 8) will placed in the annular space around the screens and will be extended two feet above the screen.

The annular area around the well casing will be sealed with bentonite pellets for an interval of two feet above the filter pack in the shallow well. The annular space above the bentonite pellets to one foot below grade will be backfilled with drilling cuttings. The remaining one-foot will be sealed with a concrete cap and well apron (expanding cement). A locking well cap will be installed upon completion of each well.

Following installation, at least three well volumes of the water column will be removed using a submersible pump. All permanent wells will be surveyed to a common site datum.

Samples will be collected using low-flow techniques in accordance with EPA Region 1 Low-Stress (Low-Flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells. (EQASOP-GW 001 Revision 3 dated July 30, 1996 Revised: January 19, 2010). All groundwater samples will be analyzed for TCL VOCs.

3.9 Groundwater Sampling

Prior to sample collection, static water levels will be measured and recorded from all monitoring wells. Monitoring wells will also be gauged for the presence of dense non-aqueous phase liquid (DNAPL). In the event that DNAPL is detected, Tenen will record the thickness and will not collect a sample. If DNAPL is not detected, Tenen will purge and sample monitoring wells using low-flow/minimal drawdown purge and sample collection procedures (bladder pump system). Prior to sample collection, groundwater will be evacuated from each well at a low-flow rate

(typically less than 0.1 L/min). Field measurements for pH, temperature, turbidity, dissolved oxygen, specific conductance, oxidation-reduction potential and water level, as well as visual and olfactory field observations, will be periodically recorded and monitored for stabilization. Purging will be considered complete when pH, specific conductivity, dissolved oxygen and temperature stabilize and when turbidity measurements fall below 50 Nephelometric Turbidity Units (NTU) or become stable above 50 NTU.

Stability is defined as variation between field measurements of 10 percent or less and no overall upward or downward trend in the measurements. Upon stabilization of field parameters, groundwater samples will be collected and analyzed as discussed below.

Wells will be purged and sampled using dedicated pump tubing following low-flow/minimal drawdown purge and sample collection procedures, as described above. The pump will be decontaminated between samples and a dedicated bladder will be used.

Groundwater samples will be collected through dedicated tubing. Prior to, and immediately following collection of groundwater samples, field measurements for pH, specific conductance, temperature, dissolved oxygen, turbidity and depth-to-water, as well as visual and olfactory field observations will be recorded. All collected groundwater samples will be placed in pre-cleaned, pre-preserved laboratory provided sample bottles, cooled to 4°C in the field, and transported under chain-of-custody command to the designated laboratory for analysis.

All groundwater samples will be analyzed for the following with a Category B deliverable data package:

- TCL VOCs by EPA Method 8260C plus 10 tentatively identified compounds (TICs);

3.10 Soil Vapor and Ambient Air Sampling

Soil vapor samples will be collected in accordance with the NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, dated October 2006. Three soil vapor samples will be collected from locations outside of Rochdale Mall #2.

Temporary soil vapor points will be installed using a hand-held 420M Geoprobe® unit. The soil vapor points will be extended to approximately three ft-bg. At the terminal depth, a sample probe attached to ¼-inch diameter Teflon® tube will be installed. The borehole above the sampling probe to grade will be sealed using an inert sealant to prevent ambient air mixing with the soil vapor. Ambient air will be purged from the boring hole by attaching the surface end of the ¼-inch diameter Teflon® tube to an air valve and then to a vacuum pump. The vacuum pump will remove three volumes of air (volume of the sample probe and tube) prior to sample collection. The flow rate for both purging and sample collection will not exceed 0.2 liter per minute.

The soil vapor samples will be first screened for VOCs using a PID. A tracer gas (helium) will be used in accordance with NYSDOH protocols to verify the integrity of the soil vapor probe seal. Helium will be used as the tracer gas and a bucket will serve to keep it in contact with the probe during testing. A portable monitoring device will be used to analyze a sample of soil vapor for the tracer prior to sampling. If the tracer sample results show a significant presence of the

tracer gas, the probe seals will be adjusted to prevent infiltration.

A sample log sheet will be maintained summarizing sample identification, date and time of sample collection, sampling depth, identity of samplers, sampling methods and devices, soil vapor purge volumes, volume of the soil vapor extracted, vacuum of canisters before and after the samples are collected, apparent moisture content of the sampling zone and chain of custody

Soil vapor samples will be collected in laboratory-supplied 2.75-liter Summa canisters using two-hour regulators. All soil vapor samples will be analyzed for VOCs using EPA Method TO-15.

3.11 Analytical Methods/Quality Assurance Summary Table

A summary of the analytical methods and quality assurance methods are included in Table 1, below.

Table 1
Analytical Methods/Quality Assurance Summary

Matrix	Proposed Samples	QA/QC Samples				Total # Samples	Analytical Parameter	Method	Preservative	Holding Time	Container
		TB	FB	DUP	MS/MSD						
Soil	5	1	1	1	2	10	VOCs plus 10 TICs	8260C	Cool to 4°C, No Headspace	14 days to analysis	(1) 4-oz glass jar
Groundwater	1	1	1	1	2	6	VOCs plus 10 TICs	8260C	Cool to 4°C HCL		(3) 40 mL clear glass vials
Soil Vapor	3	No QA/QC samples				3	VOCs	TO-15	None		2.7 L Summa

TB – Trip Blank
FB – Field Blank
DUP – Duplicate
°C – degrees Celsius
mL – milliliter
L – liter

3.12 Decontamination

Where possible, samples will be collected using new, dedicated sampling equipment so that decontamination is not required. All non-dedicated drilling tools and equipment will be decontaminated between boring locations using potable tap water and a phosphate-free detergent (e.g., Alconox) and/or a steam cleaner. All non-dedicated sampling equipment will also have a final rinse with deionized water. Decontamination water will be collected and disposed as investigation-derived waste (IDW).

3.13 Data Review and Reporting

The NYSDEC ASP Category B data package will be validated by an independent data validation subconsultant and a DUSR summarizing the results of the data validation process will be prepared. All reported analytical results will be qualified as necessary by the data validation and will be reviewed and compared against background concentrations and/or applicable New York State criteria:

Soil – Unrestricted, Commercial and Protection of Groundwater Soil Cleanup Objectives (SCOs) as listed in 6NYCRR Part 375;
Groundwater – Class GA groundwater standards and guidance values for groundwater as listed in NYSDEC Technical and Operations Guidance Series (TOGS) 1.1.1; and,
Soil Vapor – NYSDOH Air Guidance Values (AGVs) and Matrices, as applicable, and ambient air sample results.

Based on the selected VOC analysis method for soil, the following qualifiers will be employed:

- "JL" for results less than 200 micrograms per kilogram (ug/kg); and,
- "UJL" for non detect results.

These are meant to indicate that the results are biased low in both cases. All Part 375 Commercial Use soil cleanup objectives (SCOs) for VOCs are greater than 200 ug/kg.

Following receipt of preliminary laboratory results and groundwater flow direction is determined from the survey of three permanent monitoring wells, additional monitoring wells will be proposed to delineate groundwater contamination further away from the impacted area. A report documenting the Remedial Investigation will be prepared, and will describe Site conditions and document applicable observations made during the sample collection. In addition, the report will include a description of the sampling procedures, tabulated sample results and an assessment of the data and conclusions. The laboratory data packages, DUSR, geologic logs, well construction diagrams, and field notes will be included in the report as appendices. All data will also be submitted electronically to NYSDEC via the Environmental Information Management System (EIMS) in EqUIS format.

Appendix A

Resumes

Mohamed Ahmed, Ph.D., C.P.G.
Sr. Geologist/Principal

Experience Summary

Mohamed Ahmed is a certified professional geologist with nearly 23 years of experience in the New York City metropolitan area. He has designed and implemented subsurface investigations and is proficient in groundwater modeling, design of groundwater treatment systems and soil remediation. He has managed numerous projects focused on compliance with the New York State Brownfield Cleanup and Spills programs and the New York City "e" designation program. Dr. Ahmed also has extensive experience in conducting regulatory negotiations with the New York State Department of Environmental Conservation, the NYC Office of Housing Preservation and Development, and the Mayor's Office of Environmental Remediation.

Selected Project Experience

Willoughby Square, Downtown Brooklyn
As Project Manager, directs all regulatory interaction and investigation on this joint public-private sector redevelopment that will include a public park and four-level underground parking garage. Prepared the remedial investigation work plan and remedial action work plan, conducted investigation activities and waste characterization, and negotiated with the NYC Department of Environmental Protection and the Mayor's Office of Environmental Remediation to transition the site into the NYC Voluntary Cleanup Program.

School Facility, Borough Park, Brooklyn
Managed all regulatory agency coordination, work plan and report preparation and remedial oversight; worked with OER to determine measures to retroactively address the hazardous materials and air quality E-designations on a previously constructed school building and prepared supporting documentation to justify the use of electrical units rather than natural gas.

LGA Hotel Site, East Elmhurst, Queens
Project manager for all work conducted at this former gasoline service station which is being remediated under the NYS Brownfield Cleanup Program; technical oversight of work plans, reports, and design and implementation of field and soil disposal characterization.

436 10th Avenue, Manhattan
As project manager and technical lead, assisted client in developing remedial cost estimates used for property transaction, developed regulatory strategy to address NYS Spills and NYC E-designation requirements, and currently overseeing remedial activities which include removal and disposal of petroleum-contaminated bedrock and dewatering and disposal of impacted groundwater.

Brownfield Cleanup Program Site, Downtown Brooklyn
Managed investigation and remediation under the BCP program for a proposed mixed-use development; designed the remedial investigation and prepared the remedial action work plan which includes an SVE system monitored natural attenuation. Prepared remedial cost

estimates for several scenarios. The project will include a 53-story mixed-use structure and parking garage.

Queens West Development, Long Island City
Directed project team and subcontractors for soil investigation/remediation studies on multiple properties; provided technical support for negotiations with NYSDEC during investigation and remediation.

Former Creosote Site, Long Island City
Designed and implemented a complex investigation to assess the nature and extent of historic creosote contamination at this former industrial site; conducted studies to optimize recovery of LNAPL and DNAPL and developed strategies using bioremediation and natural attenuation in conjunction with conventional remedial approaches. Performed pilot tests for soil vapor extraction system design and coordinated with NYSDEC and NYSDOH to implement sub-slab soil vapor sampling.

NYSDEC Spill Site – Far West Side, Manhattan
Developed a detailed remedial cost estimate for to support client negotiations with a major oil company. The estimate included costs pertaining to: chipping, removal and disposal of petroleum-impacted bedrock; removal/disposal of recycled concrete; costs for dewatering and disposal of impacted groundwater during construction; and design and installation of a vapor barrier below the redevelopment.

Active Industrial Facility, Newburgh, New York
Designed remedial investigation of soil and groundwater contaminated with trichloroethane; performed soil vapor pilot test and pump test to aid in design of soil and groundwater remediation alternatives; conducted sub-slab vapor sampling in accordance with NYSDOH guidance.

Former Dry Cleaning Facility, New York City
Conducted soil and groundwater investigations, designed and installed a soil vapor extraction system and performed extensive testing of indoor air. Negotiated the scope of the RI and IRM with NYSDEC.

Waterfront Redevelopment, Yonkers, NY
Designed and performed geophysics survey of six parcels to determine locations of subsurface features; supervised test pit excavation to confirm geophysics results and evaluate and classify soil conditions prior to development activities.

Prince's Point, Staten Island, New York
Performed soil, groundwater and sediment sampling to delineate the extent of contamination; used field-screening techniques to control analytical costs and supervised soil excavation and disposal.

Apartment Complex, New York City, New York
Coordinated with Con Edison, the owner of the adjacent property and NYSDEC to determine oil recovery protocol; assessed hydrogeological conditions and conducted pilot tests to design cost-effective recovery system; designed and supervised installation of recovery system.

Publications

"Impact of Toxic Waste Dumping on the Submarine Environment: A Case Study from the New York Bight". Northeastern Geology and Environmental Sciences, V. 21, No. 12, p. 102-120. (With G. Friedman)

Metals Fluxes Across the Water/Sediment Interface and the Influence of pH. Northeastern Geology and Environmental Sciences, in press. (With G. Friedman)

"Water and Organic Waste Near Dumping Ground in the New York Bight". International Journal of Coal Geology, volume 43. (With G. Friedman)

Education and Certifications

Ph.D., Earth and Environmental Sciences, Graduate Center of the City of New York (2001)
M.Ph., Earth and Environmental Sciences, City University of New York (1998)
M.A. Geology, Brooklyn College (1993)
B.S. Geology, Alexandria University, Egypt (1982)

American Institute of Professional Geologists, Certified Professional Geologist, 1997-2015

Matthew Carroll, P.E.
Environmental Engineer/Principal

Experience Summary

Matthew Carroll is an environmental engineer experienced in all aspects of site assessment and development and implementation of remedial strategies. He has managed projects from inception through investigation, remediation and closure. His expertise includes soil, soil gas, and groundwater remediation, preparation of cost estimates, remedial alternative selection and design, soil characterization for disposal, field safety oversight, and preparation of work plans and reports to satisfy New York and New Jersey state requirements, and New York City "e" designation and restrictive declarations. Mr. Carroll's project management experience includes past management of a New York City School Construction Authority hazardous materials contract. He is responsible for all engineering work performed by Tenen and is currently the project manager and remedial engineer for several New York State Brownfield Cleanup Program sites.

Selected Project Experience

470 Kent Avenue, Brooklyn
As project manager, supported the client in due diligence and transactional activities, including a Phase I ESA, preliminary site investigation, and remedial cost estimate; preparation of BCP application and remedial investigation work plan. The former manufactured gas plant, sugar refinery and lumberyard will be developed as a mixed-use project with market rate and affordable housing and public waterfront access. As remedial engineer, will be responsible for development of remedial alternatives and oversight and certification of all remedial activities.

500 Exterior Street, Bronx
Designed and implemented the investigation of this former lumberyard and auto repair shop that will be redeveloped as mixed use development with an affordable housing component; prepared BCP application and subsequent work plans and reports. Designed a remedial strategy incorporating both interim remedial measures (IRMs) and remediation during the development phase.

Gateway Elton I and II, Brooklyn
Conducted soil disposal characterization, prepared Remedial Action Work Plans and designed methane mitigation systems for two phases of a nine-building residential development and commercial space; prepared and oversaw implementation of a Stormwater Pollution Prevention Plan during construction and prepared and certified the remedial closure reports for the project.

Affordable Housing Development, Rye, NY
Consultant to the City of Rye on environmental issues pertaining to a county-owned development site slated for an afford senior housing; reviewed environmental documentation for the project and prepared summary memorandum for City Council review; recommended engineering controls to address potential exposure to petroleum constituents, presented report findings at public meetings and currently providing ongoing environmental support during project implementation.

Queens West Development BCP Site, Long Island City, New York
Assistant Project Manager for two developers involved in the site.

- Responsible for oversight of remediation under the New York State Brownfield Cleanup Program
- Technical review of work plans and reports and coordination of the Applicant's investigation and oversight efforts
- Provided input for mass calculations and well placement for an in-situ oxidation remedy implemented on a proposed development parcel and within a City street
- Conducted technical review of work pertaining to a former refinery. Documents reviewed included work plans for characterization and contaminant delineation; pilot test (chemical oxidation); remediation (excavation and groundwater treatment). Managed field personnel conducting full time oversight and prepared progress summaries for distribution to project team
- Following implementation of remedial action, implemented the Site Management Plan and installation/design of engineering controls (SSDS, vapor barrier/concrete slab, NAPL recovery). Also responsible for coordination with NYSDEC

Brownfield Cleanup Program Redevelopment Sites – West Side, New York City
Managed remediation of a development consisting of four parcels being addressed under one or more State and city regulatory programs (NYS Brownfield Cleanup Program, NYS Spills, and NYC "e" designation program). Remediation includes soil removal, screening and disposal; treatment of groundwater during construction dewatering and implementation of a worker health and safety plan and community air monitoring plan (HASP/CAMP)

Managed an additional BCP site, supported the Applicant in coordination with MTA to create station access for the planned No. 7 subway extension; also provided support the client in coordination with Amtrak to obtain access for remedial activities on the portion of the site that is within an Amtrak easement. The site will eventually be used for construction of a mixed-use high-rise building.

BCP Site, Downtown Brooklyn, New York
Performed investigation on off-site properties and designed an SSDS for an adjacent building, retrofitting the system within the constraints of the existing structure; coordinated the installation of the indoor HVAC controls and vapor barrier; provided input to the design of a SVE system to address soil vapor issues on the site.

West Chelsea Brownfield Cleanup Program Site
Designed an in-situ remediation program and sub-slab depressurization system to address contamination remaining under the High Line Viaduct; SSDS design included specification of sub-grade components, fan modeling and selection, identifying exhaust location within building constraints and performance modeling; prepared the Operations Maintenance and Monitoring Plan and Site Management Plan sections pertaining to the SSDS.

Historic Creosote Spill Remediation – Queens, New York – New York State Voluntary Cleanup Program
Modeled contamination volume and extent and prepared mass estimates of historic fill constituents and creosote-related contamination; designed a soil vapor extraction (SVE) and dewatering system to address historic creosote release both above and below static

water table; coordinated with the Metropolitan Transit Authority and prepared drawings to secure approval to drill in the area of MTA subway tunnels.

NYSDEC Spill Site– Far West Side, Manhattan
Provided support to client during negotiations with a major oil company regarding allocation of remedial costs. Worked with client's attorney to develop a regulatory strategy to address the client's obligations under the NYSDEC Spills Program and the New York City "e" designation requirements.

Affordable Housing Site, Brooklyn, New York
Modified prior work plans for soil, soil vapor and groundwater investigation to address requirements for site entry into the New York City Brownfield Cleanup Program. Prepared technical basis for use of prior data previously disallowed by OER. Currently conducting site investigation.

New York City School Construction Authority Hazardous Materials Contract
Provided work scopes and cost estimates, managed and implemented concurrent projects, including Phase I site assessments, Phase II soil, groundwater and soil gas investigations, review of contractor bid documents, preparation of SEQR documents, specifications and field oversight for above- and underground storage tank removal, and emergency response and spill control.

Former Manufacturing Facility, Hoboken, New Jersey
Evaluated site investigation data to support a revision of the current property use to unrestricted; modified the John & Ettinger vapor intrusion model to apply the model to a site-specific, mixed use commercial/residential development; implemented a Remedial Action Work Plan that included the characterization, removal and separation of 9,500 cubic yards of historic fill; designed and implemented a groundwater characterization/delineation program using a real-time Triad approach; designed and implemented an innovative chemical oxidation technology for the property.

F**ormer Varnish Manufacturer – Newark, New Jersey**
Prepared a Phase I environmental site assessment; implemented soil and groundwater sampling to assess presence of petroleum and chlorinated compounds; prepared alternate cost remediation scenarios for settlement purposes and implemented a groundwater investigation plan, including pump tests and piezometer installation to assess the effect of subsurface utilities and unique drainage pathways upon contaminant transport.

Education and Certifications

Professional Engineer, New York
Bachelor of Engineering, Environmental; Stevens Institute of Technology, 2002
Bachelor of Science, Chemistry, New York University, 2002
Technical and Regulatory Training in Underground Storage Tanks, Cook College, Rutgers University, 2006

Kristen Meisner, E.I.T
Project Engineer

Experience Summary

Kristen Meisner is an environmental engineer with experience in soil, groundwater and soil vapor sampling techniques and data analysis, remedial systems, environmental permitting, watershed planning and management, environmental restoration, spill prevention, control, and countermeasure as well as field safety oversight, and preparation of work plans and reports to satisfy various state regulatory requirements. Her experience includes field oversight and preparation of work plans to satisfy New York City and New York State program requirements.

Ms. Meisner's project management experience includes management of a New York City Transit Authority hazardous materials contract. While with a national consulting firm, Ms. Meisner designed and implemented environmental investigations, designed remedial systems and performed watershed analyses for the U.S. Army Corps of Engineers. Her prior experience has also involved projects related to the Spill Prevention, Control, and Countermeasure (SPCC) and Petroleum Bulk Storage (PBS) plan requirements. She has also prepared environmental permits for air, stormwater and wastewater under the NPDES, RCRA, SARA Title II, Title V, OSHA and Discharge Monitoring programs.

Selected Project Experience

Redevelopment Sites, Manhattan, NY
Project Engineer

- Managed remedial oversight including Community Air Monitoring Program in accordance with OER requirements including daily correspondence with OER project manager.
- Remediation includes soil removal, dewatering and end-point sampling.
- Tracked soil loading and advancement of hot-spot excavations

Orangeburg Commons, Orangeburg, NY
Project Engineer

- Performed sampling and reporting for a 15.8-acre property in the site-management phase of the NYS Brownfield Cleanup Program.
- Sampling included groundwater and soil gas field investigations. Reporting included mapping and graphing groundwater concentration trends at the Site
- Visual inspections of several engineering controls in place at the Site including: soil cover system, sub-slab depressurization system, vapor barrier.

Fountain Creek Watershed Study, U.S. Army Corps of Engineers
Project Manager

- Technical design to address flood control, erosion, sedimentation and environmental restoration
- Incorporated public input into watershed plans utilizing geographic information system technology for finalized reports

- Provided final project implementation report assembly including environmental impact assessment and investigation
- Responsibilities include the management, evaluation and improvement of the Storm Water Management Program for compliance with the MS4 Permit

Hydrogeologic Study, Garfield County, Colorado
Project Engineer

- Performed hydrogeological investigations with analysis of water quality data and delineation of petroleum impacts
- Evaluation of temporal groundwater trends concurrent with impacts of increased gas well drilling and gas production in domestic water wells and surface water bodies.
- Performed extensive Phase II Environmental Site Assessment including sampling of groundwater monitoring wells, ponds, gas wells, irrigation ditches, domestic wells and springs.
- Identified impacts to water resources from petroleum activity culminating in a public outreach forum

Willoughby Square Redevelopment Project, Brooklyn, NY
Completed remedial investigations, reporting and mapping of the Site. The remedial investigation completed included field sampling, soil characterization for waste disposal and regulatory coordination with the New York City Department of Environmental Protection (NYCDEP). Based on detections of hazardous levels of lead, the Site was entered into the Office of Environmental Remediation (OER) Voluntary Cleanup Program (VCP).

Automotive Repair Shop, Brooklyn, NY
Completed in-field soil and groundwater monitoring, remediation and design services for a redevelopment project. Provided input for mass calculations and well placement for in-situ oxidation remedy implemented on the proposed development parcel. Following implementation of remedial action, designed engineering controls (SSDS, vapor barrier/concrete slab, NAPL recovery) in coordination with NYSDEC.

New York City Transit Authority Hazardous Materials Contract
Managed and implemented projects including Phase I site assessments, Phase II soil and groundwater investigations as well as lead and asbestos abatement, inspection and removal projects. Provided support to client during all phases of hazardous waste management, chemical removal, enclosure and legal disposal of waste.

Education and Certifications

Engineer in Training, New York
Bachelor of Science, Environmental Engineering - Industrial Processes; University of New Hampshire, 2009

Professional Memberships

American Society of Civil Engineers
Environmental and Water Resources Institute