# 470 Kent Avenue Site
# Remedial Investigation Work Plan

470 Kent Avenue
Brooklyn, NY 11249
Block 2134, Portion of Lots 1 and 150
BCP Site #C224053
PBS #2-612201
NYC OER #12RHAZ115K, CEQR #08DCP056K

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau C, Section A
625 Broadway, 12th Floor
Albany, NY 12233-7016

Prepared for:
470 Kent Avenue LLC
505 Park Avenue
New York, NY 10022

Prepared by:
TENEN ENVIRONMENTAL
121 West 27th Street, Suite 1004
New York, NY 10001

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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 ahmed

11/24/2014

Mohamed K. Ahmed, Ph.D., CPG Date

## 1.0 INTRODUCTION

On behalf of 470 Kent Avenue LLC (Volunteer), Tenen Environmental, LLC (Tenen) has prepared this Remedial Investigation Work Plan (Work Plan) for the property located at 470 Kent Avenue (Block 2134, Portion of Lots 1 and 150) in the South Williamsburg section of Brooklyn, New York (the Site). The Site location and layout are identified on Figures 1 and 2. The Work Plan 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 soil vapor, soils and groundwater. The results of the investigation will be used to prepare a qualitative human health exposure assessment (EA) and to support the development of a Remedial Action Work Plan (RAWP) for the Site. This Work Plan has been prepared in accordance with the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10, May 3, 2010).

### 1.1 Work Plan Organization

This Work Plan 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 and figures referenced throughout are included at the end of this Work Plan.

### 1.2 Work Plan Objective

Previous investigations at the Site, detailed in Section 2.6, have indicated several potential areas of concern including the release of petroleum from abandoned underground storage tanks (USTs), historic fill material and chlorinated solvent impacts at the Site. The objective of this Work Plan is to provide information necessary to prepare a qualitative human health exposure assessment and develop a remedial strategy for the Site to be incorporated into a RAWP by undertaking the following:

- Survey the location of the BCP Site;
- Further investigate and characterize the nature and extent of contamination on Site;
- Further assess the subsurface soil conditions below the proposed depth of excavation in areas impacted by USTs and historic fill and determine if contamination below the proposed excavation depth is a source of groundwater impacts;
- Identify potential sources of chlorinated solvent contamination; and
- Assess the potential for Site-related soil vapor exposure by establishing on-Site soil vapor conditions to the east and south.

## 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 the northwest corner of Kent Avenue and Division Street in the South Williamsburg area of Brooklyn. The property is 2.8 acres. The western boundary of the Site is the Wallabout Channel. The Site is located in Community Board 1 and is generally identified as a Block 2134, Portions of Lots 1 and 150, as shown on Figure 1.

The Site consists of two buildings with a covered area between them. The buildings are two and four stories respectively. Alternate addresses include 462-490 Kent Avenue and 1-19 Division Avenue. A lumberyard currently operates at the Site. Adjoining and surrounding properties are a mix of residential, industrial and park land. A map of the current Site layout is included as Figure 2.

The northern adjoining property was formerly used as a manufactured gas plant (MGP) and this portion of the overall development is not part of the BCP Site.

Based on a review of the New York City Office of Environmental Remediation's (OER's) Searchable Property Environmental E-Database (SPEED), no hospitals, schools or day care centers are present within 500 feet of the Site. However, please note that nearby schools and day care facilities were identified at 430 Kent Avenue, 485 Kent Avenue, 157 Wilson Street, 80 Clymer Street and 114 Taylor Street.

### 2.2 Proposed Project Description

All current structures will be demolished. The bulkhead will be repaired or a new bulkhead will be installed. Impacted soil and groundwater will be remediated during the proposed redevelopment that is detailed below. The Site will be re-graded and capped by buildings or other hard surfaces or at least two feet of clean fill meeting unrestricted use criteria in landscaped areas.

The City Planning Commission has approved a Special Permit for the construction of three residential buildings as part of the overall property redevelopment. One of the buildings (Building A) will be constructed on the BCP Site. The three buildings will have a shared cellar level used predominantly for parking with smaller spaces for mechanicals and amenities. The western portion of the cellar will be above grade due to the topography of the property. Building A will be constructed in the southeastern corner of the Site and will have a 25-story tower. The buildings will be supported on piles. The final design of the buildings will account for the presence of the flood plain.

## 2.3 Site Characteristics

*Site Topography*
The surface topography slopes down to the west from Kent Avenue towards the Wallabout Channel. Based on the U.S. Geological Survey (Brooklyn Quadrangle) topographic map, included as Figure 1, the property lies at an elevation of approximately ten to twenty feet above the National Geodetic Vertical Datum of 1929 (an approximation of mean sea level). The approximate depth to bedrock is 100 feet from grade surface.

*Site Physical Characteristics*
The original shoreline was much closer to Kent Avenue; however the area appears to have been filled by 1880 to approximately the current dimensions. The western border is a steel sheet pile bulkhead along Wallabout Channel.

*Site Geology and Hydrogeology*
The Site is covered by four to 15 feet of surface soil classified as historic fill material consisting of asphalt, concrete, rock fragments and fine- to medium-grained, silty sand. The fill material is underlain by layers of sand and silt with increasing silty clay to clay toward Wallabout Channel.

Groundwater has been measured at depths ranging from approximately five to fifteen feet below grade and flows in a westerly direction toward Wallabout Channel. Groundwater is likely tidally influenced. Breaches in the bulkhead allow brackish water to enter the Site from the western border.

Groundwater beneath the Site is characterized as Class GSA saline groundwater. The concentrations of dissolved sodium detected in the most recent round of sampling (Tenen, 2013) range from approximately 74 to 5,000 milligrams per kilogram (mg/kg), above the Class GA Standard of 20 mg/kg; all but one sample contained sodium above 1,000 mg/kg. The best usage for Class GSA groundwater is as a source of potable mineral waters, or conversion to fresh potable waters, or as raw material for the manufacture of sodium chloride or its derivatives or similar products. Groundwater is not utilized as a source of potable water at the Site. Potable water for the Site is supplied by the City of New York from upstate New York reservoirs.

## 2.4 Historic Operations

The Site has a history of industrial operations spanning over 100 years. Past uses have included molasses storage; sugar refining; warehousing; brewery bottling and case storage; and a lumberyard. Starting in the 1980's, the eastern building, along Kent Avenue, also housed various apparel-related operations. A truck loading area is shown in the historic maps dated 1950 and later.

## 2.5 Regulatory Interaction

The Site was rezoned in 2010 as part of the Rose Plaza on the River Special Permit application under City Environmental Quality Review (CEQR) #08DCP056K. The rezoning action included the placement of a hazardous materials Restrictive Declaration on the two lots that comprise the overall development, and of which the BCP Site is the southern portion (New York City Planning Commission, March 8, 2010). The Site is zoned R7-3 with a C2-4 overlay along Kent Avenue and Division Avenue, denoting a medium-density apartment house district allowing for commercial uses to serve local retail needs. The results of previous environmental investigations, completed as part of a proposal to add rental apartments at the Site, were submitted to the OER and the Site was assigned number 12RHAZ115K.

At least one underground storage tank (UST) is present at the Site. The Site is registered in the NYSDEC Petroleum Bulk Storage (PBS) program under PBS #2-612201. The registered UST is described as one temporarily out of service 2,000 gallon #2 fuel oil tank; however, field observations suggest that there may be two tanks and they may be a larger capacity.

A Brownfield Cleanup Program application for the Site was submitted to NYSDEC on March 17, 2014, and deemed complete in a letter to the Volunteer dated April 1, 2014. A copy of the application and supporting documentation was placed in the designated repository. The public comment period extended from April 9, 2014 through May 9, 2014. No significant comments were received and the application was approved by NYSDEC in a letter dated July 9, 2014. A Brownfield Cleanup Agreement was entered into between the Volunteer (470 Kent Avenue LLC) and the NYSDEC, effective September 8, 2014.

## 2.6 Previous Investigations

Between 2004 and 2014, several environmental investigations were conducted at the Site and are summarized in the following reports:

- *Phase I Environmental Site Assessment Report, 460 Kent Avenue, Brooklyn, New York. AKRF. January 2004*
- *470 Kent Avenue, Subsurface (Phase II) Investigation. AKRF. October 2005*
- *Phase I Environmental Site Assessment Report, 462 Kent Avenue, Brooklyn, New York. Environmental Business Consultants, September 6, 2011*
- *Phase II Subsurface Investigation Report (REVISED), NYCOER Environmental Review Program, CEQR No. 08DCP056K, 462 Kent Avenue, Brooklyn, New York. Environmental Business Consultants. December 28, 2011*
- *470 Kent Avenue, Brooklyn, New York, Subsurface Investigation Letter Report. Tenen Environmental, March 17, 2014.*

Note that several of the earlier reports address both the BCP Site and the non-BCP northern MGP site, which together comprise the property. The findings summarized

below are focused on the BCP Site, especially with respect to the historic sampling results. The above reports are included in Appendix C

### 2.6.1 Phase I Environmental Site Assessment Report, 460 Kent Avenue, Brooklyn, New York. AKRF. January 2004.

Prepared in accordance with ASTM E-1527-00, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process. The findings of the Phase I ESA conducted by AKRF included the following:

- The Site's industrial history spans more than 100 years. Uses included a stave yard, molasses storage, sugar refining, warehouse storage and a brewing company.
- Two MGPs were located within a one-mile radius, including the Peoples Works located to the north and the Nassau Works, located south of the Site on the northwest corner of Cross Street and Kent Avenue. Per Brooklyn Union Gas, all coal tar products had been removed from both MGPs at the time of decommissioning. A database listing indicated that the Peoples Works had operated on the northern property from 1871 through 1895.
- Observations during the Site reconnaissance indicated the presence of several small metal plates and patched areas potentially associated with USTs; potential PCBs in light ballasts, hydraulic lifts, freight elevators, forklifts, and a utility-owned transformer vault within Kent Avenue; and suspect asbestos-containing material and lead-based paint within the Site buildings.

Recommendations included: a Phase II investigation prior to redevelopment to assess on-Site contamination from prior MGP and industrial operations; further work, including a geophysical investigation, to determine the presence and location of USTs; testing for ACM prior to renovation or demolition; handling of lead based paint in accordance with OSHA regulations during any renovation/demolition activities; and management of potential PCB materials in accordance with applicable regulations and guidelines.

### 2.6.2 470 Kent Avenue, Subsurface (Phase II) Investigation. AKRF. October 2005.

Prepared in accordance with New York City CEQR guidelines.

In July-August 2005, AKRF conducted a Phase II Site Investigation to further investigate the 2004 Phase I findings, characterize subsurface conditions and determine if past or present on- or offsite conditions had impacted environmental media on the Site. The investigation included installation of six soil borings (SB-1 through SB-6); installation of monitoring wells (MW-1 and MW-5) at two boring locations; and collection of ten soil samples and two groundwater samples. Soil borings were advanced to a maximum depth of ten feet below grade (below the groundwater table). Where evidence of contamination was not detected, samples were collected at 0-2 feet and at the groundwater interface. All soil and groundwater samples were analyzed for

VOCs, SVOCs, pesticides, PCBs, Target Analyte List (TAL) metals and cyanide and the analytical results compared with the then-current Technical and Administrative Guidance Memorandum (TAGM) Recommended Soil Cleanup Objectives (RSCOs). Groundwater results were compared with the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Class GA Water Quality Standards and Guidance Values (Class GA Standards).

The investigation findings are summarized below:

**Soil.** VOCs, primarily BTEX (benzene, toluene, ethylbenzene and xylene) were detected in all soil samples, and at concentrations above the TAGM RSCOs in samples SB-5 (6-8). Elevated SVOCs were also detected in sample SB-5 (6-8), likely related to the ash and slag identified at this location. SVOCs, primarily fill-related polycyclic aromatic hydrocarbons (PAHs) were detected above the RSCOs in seven of twelve samples, with the highest number of SVOCs detected (19) in sample SB-5 (6-8). Some metals were detected at concentrations above the RSCOs or the established Eastern U.S. background levels. Mercury was detected at concentrations ranging up to 1.9 mg/kg in SB-2 (8-9). Metals concentrations were also typical of historic fill. One pesticide, heptachlor epoxide, was detected above the RSCO of 20 micrograms per kilogram (ug/kg) in samples SB-5 (6-8) at 90 ug/kg.

**Groundwater.** VOCs were detected above Class GA standards in sample MW-1, including benzene at an estimated concentration of 0.76 micrograms per liter (ug/L) and vinyl chloride at 14 ug/L. Total and dissolved metals concentrations, including those above the Class GA levels, were associated with the historic fill quality at the Site and did not appear to be related to Site-related activities. One pesticide, heptachlor epoxide was detected in MW-1 at a concentration of 0.82 ug/L. As with the soil results, the pesticides in groundwater were attributed to historic fill.

Based upon the results of the Phase II investigation, AKRF concluded that the contaminant distribution and concentrations in soil and groundwater were likely attributable to historic petroleum storage and poor quality fill material.

### 2.6.3 Phase I Environmental Site Assessment Report, 462 Kent Avenue, Brooklyn, New York. Environmental Business Consultants, September 6, 2011.

Prepared in accordance with ASTM E-1527-05, Standard Practices for Environmental Site Assessment: Phase I Environmental Site Assessment Process.

In August 2011, EBC conducted a Phase I ESA of the eastern portion (Lot 1) of the Site and identified the following RECs:

- A reference contained in a 2002 Phase I ESA report by Middleton Environmental, Inc. regarding a sealed fill port, possibly related to an UST, observed on the south side of the Lot 1 building, which is on the BCP Site;
- A 500-gallon aboveground diesel storage tank located in the truck loading area

between the two Site buildings; heavily oil-stained concrete was observed around the tank and the reach of the tank's dispenser hose, which may be on the BCP Site;

- Approximately six 55-gallon drums of petroleum products used for repair and maintenance of forklifts observed on the western side of the Lot 1 building, containing hydraulic, waste, lube, and motor oils, which is on the BCP Site.
- A sump pit and pump observed at the base of the ramp into the Lot 1 building basement on the BCP Site; a layer of black material was observed on the surface of the water within the sump pit;
- A Certificate of Occupancy pertaining to a vacant lot at 474 to 490 Kent Avenue, referencing "a gasoline oil selling station for employees only" as a permissible use, which may be related to the BCP Site.

Based upon the identified RECs, EBC recommended the following for the BCP Site: a geophysical investigation and soil borings to investigate the potential UST associated with the sealed fill port observed by Middleton in 2002 and/or the potential past use of the property as a gasoline station; discontinued use of the sump pit until the petroleum-like material observed within the pit has been characterized and the source of the material and the discharge location of the sump pump have been determined.

**2.6.4 Phase II Subsurface Investigation Report (REVISED), NYCOER Environmental Review Program, CEQR No. 08DCP056K, 462 Kent Avenue, Brooklyn, New York. Environmental Business Consultants. December 28, 2011.**

Prepared in accordance with a NYC OER-approved work plan. An investigation conducted by EBC in 2011 included installation of an additional soil boring (B-4) on the BCP Site, to supplement the work previously done by AKRF and address the findings of a Phase I ESA conducted by EBC in 2011. The boring was advanced to 12 feet below grade and samples collected from 0-2 feet below grade (ft-bg) and at the two-foot interval above the groundwater table. Samples were analyzed for VOCs, SVOCs, pesticides and PCBs, and TAL metals and the results compared with the New York State Part 375 Unrestricted Use Soil Cleanup Objectives (UUSCOs) and Restricted Residential Use Soil Cleanup Objectives (RRUSCOs).

Groundwater samples were collected at each boring location via a temporary well and using low-flow sampling techniques and the results compared with the Class GA standards. Soil vapor sample probes were installed at two locations within the BCP Site, and samples (SS1 and SS2) were collected six inches below the building slab. One indoor samples (IA1) was collected within the building and one outdoor sample (OA1) was collected southwest of the building. A pre-sample inventory performed prior to the sampling indicated numerous containers within the building containing chemical products including paints, varnishes, paint and varnish removers, thinners, stains, and wood strippers. PID readings in this area were low and a strong odor was noted. Samples were collected in six-liter Summa canisters equipped with eight-hour regulators. Results for indoor and sub slab samples were compared with the NYSDOH *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York,* October

2006 and the USEPA *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils,* November 2002. Results of the EBC 2011 investigation are summarized below.

**Soil.** No VOCs were detected at levels above their respective UUSCOs. Several PAHs, typical of urban fill, were detected in one or more soil samples at levels above the UUSCOs. Copper, lead, mercury, selenium and zinc were detected above the UUSCOs in several samples.

**Groundwater.** VOCs at concentrations above their corresponding Class GA standards were identified in three of the four groundwater samples. In sample B4, PCE was detected at 14 ug/L and TCE was detected at 15 ug/L, both above the Class GA standard of 5 ug/L for these compounds. No SVOCS or pesticides/PCBs were detected above the Class GA standards in the groundwater samples. Several dissolved metals were detected above the Class GA standards in the sample, of note, lead was at 114 ug/L and chromium was at 74 ug/L.

**Soil Vapor and Indoor Air.** Methylene chloride was detected in the indoor air sample at a concentration of 114 micrograms per cubic meter (ug/m3), above the AGV of 60 ug/m3 and the outdoor ambient sample of 1.5 ug/m3. Based on the location of the indoor air sample locations relative to indoor chemical storage areas, these results were attributed to the high methylene chloride content of products used and stored within the building. Methylene chloride was also detected at levels between 64 ug/m3 and 77.8 ug/m3 in the sub slab soil vapor samples. Concentrations of petroleum-related VOCs in soil vapor were consistent with background concentrations.

The results of the 2011 subsurface investigation indicated the presence of elevated SVOCs and metals in soils and chlorinated solvents in groundwater. Elevated indoor air concentrations of methylene chloride were attributed to product storage and use. Based on these findings, EBC recommended that stored chemicals be removed from the building prior to conversion of the basement to a parking garage.

### 2.6.5 470 Kent Avenue, Brooklyn, New York, Due Diligence Investigation Letter Report. Tenen Environmental, March 17, 2014.

Between February 28 and March 4, 2014, Tenen conducted a subsurface investigation at the Site. The work included a geophysical survey focused upon the area of suspected USTs and proposed boring locations, installation and sampling of eight soil borings (SB1 through SB8), five temporary groundwater sampling points (TMW1 through TMW5) and four soil vapor points (SV1 through SV4). Soil samples were analyzed for full scan VOCs and SVOCs, PCBs, pesticides and TAL metals.

The geophysical survey identified two underground storage tanks south of the area formerly occupied by the MGP. Based on the observed size of the tank vault, the capacity of each tank is between 4,000 and 6,000 gallons; however, please note that only one UST was registered, at a capacity of 2,000 gallons.

On March 2 and 4, 2014, Tenen collected soil samples from eight borings (SB-1 through SB-8), soil vapor samples from four sample locations (SV-1 through SV-4) and groundwater from five temporary monitoring wells (TMW-1 through TWM-5) and one grab of purge water.

Soil samples were analyzed for VOCs, SVOCs, pesticides, PCBs and TAL metals. Soil vapor samples were analyzed for TO-15 VOCs. Groundwater samples were analyzed for VOCs, SVOCs, pesticides, PCBs and TAL metals (total and dissolved). Soil results were compared to the Part 375 UUSCOs. Soil vapor results were compared to the (NYSDOH) Air Guidance Values (AGVs). Groundwater results were compared to the Class GA standards. Although the AGVs and background values apply to indoor air concentrations, they were used to screen the soil vapor results.

**Soil**. Petroleum-related compounds, specifically benzene, toluene, xylenes and naphthalene, were detected above the UUSCOs in sample SB5 (13-15). Benzene was detected at 1.2 mg/kg, toluene at 1.4 mg/kg, xylenes at 2.84 mg/kg and naphthalene at 54 mg/kg. Several other petroleum-related compounds were detected in samples collected from borings SB5 and SB7, consistent with weathered petroleum product. Estimated concentrations of PCE up to 0.00047 mg/kg were detected in shallow samples from borings SB1, SB3 and SB5, and several SVOCs typically related to historic fill were detected above the UUSCOs in samples SB1 (0-5), SB4 (8-10), SB5 (8-10) and SB7 (2-5). Benzo(a)pyrene equivalents ranged up to 12.689 mg/kg in boring SB5 (8-10). Several metals, including arsenic, barium, copper, lead, mercury, nickel and zinc were detected above the Unrestricted Use SCOs. Arsenic was detected at 18 mg/kg, barium at 580 mg/kg, copper at 130 mg/kg, lead at 940 mg/kg, mercury at 2.5 mg/kg, nickel at 40 mg/kg and zinc at 560 mg/kg. Concentrations of the pesticide 4,4'-DDT were detected above the UUSCOs in two samples at a maximum concentration of 0.0156 mg/kg.

**Soil Vapor.** Several petroleum- and chlorinated solvent-related compounds were detected in the soil vapor samples collected at the Site. TCE was detected at 20.3 micrograms per cubic meter (ug/m3), above the NYSDOH AGV of 5 ug/m3.

**Groundwater.** Petroleum-related compounds, specifically benzene, toluene, xylenes and naphthalene, were detected above the Class GA Standards in temporary well TMW5. Benzene was detected at 86 micrograms per liter (ug/L), toluene at 29 ug/L, m/p-xylenes at 33 ug/L, o-xylene at 14 ug/L and naphthalene at 440 ug/L. While the there were no compounds detected above the Class GA Standards in temporary well TMW4, evidence of free product was observed.

The chlorinated solvents PCE and TCE were detected above the Class GA Standards in temporary well TMW1 at concentrations of 28 and 26 ug/L, respectively. The PCE breakdown compound, cis-1,2-dichloroethylene, was also detected in sample TMW1. PCE was also detected in temporary wells TMW2 and TMW4.

Several SVOCs, including naphthalene at 340 ug/L in temporary well TMW5 and several fill-related PAHs, were detected in the groundwater above the Class GA Standards. Dissolved concentrations of antimony, iron, magnesium, manganese, selenium and sodium were detected above the Class GA Standards. These are likely related to fill material, with the exception of sodium, which is an indicator of salt-water intrusion from the Wallabout Channel.

The findings of the due diligence investigation indicated the presence of two formerly unidentified USTs, each with a capacity of between 4,000 and 6,000 gallons. Evidence of a petroleum release was detected in borings SB4, SB5 and SB7, with the highest concentrations in the area of the USTs, including soil and groundwater concentrations above applicable regulatory levels. Consistent with the findings of prior investigations, PAHs and metals, with concentrations above the UUSCOs, were also identified. Chlorinated solvents were detected above regulatory levels in soil vapor and groundwater (AGVs and Class GA Standards, respectively); shallow soil concentrations below regulatory levels were also recorded.

### 2.6.6 Summary of Prior Investigation Findings

As indicated in the 2004 and 2011 Phase I ESAs, and supported by historic documentation, the Site has a history of industrial operations spanning over 100 years. Past uses have included molasses storage; sugar refining; warehousing; brewery bottling and case storage; a lumberyard; and apparel-related operations. A truck loading area is shown in the historic maps dated 1950 and later. The shoreline was originally closer to Kent Avenue and the Site was filled in by 1880.

It is likely that the documented presence of petroleum-related compounds and chlorinated solvents and their breakdown products in soil, soil vapor and groundwater is attributable to these historic operations and historic filling. The sampling performed by Tenen in 2014 confirmed the findings of the prior investigations, identified two formerly unknown petroleum storage tanks, and determined that the highest concentrations of petroleum-related contaminants were in the area of the aforementioned USTs.

Based on the above, further investigation is required to characterize the nature and extent of soil, groundwater, and soil vapor contamination on the Site to determine if contaminant levels related to historic Site operations threaten public health or the environment.

## 3.0 SCOPE OF WORK

The remedial investigation proposed for the Site includes a survey, a test pit program and installation and sampling of soil borings, soil vapor sampling points and monitoring wells. The objective of the investigation is to obtain data that will be used to prepare a qualitative human health exposure assessment and develop remedial alternatives for the Site. The investigation activities are further described below.

### 3.1 Survey

A survey will be completed to define the northern boundary of the BCP Site, so that the work is not completed on the northern MGP property.

### 3.2 Test Pit Excavation

Test pit excavations will be conducted to investigate the known USTs, areas of refusal during due diligence activities and the surface soil in the area of known drum storage.

Any USTs located during the test pitting effort will be opened by the excavation contractor to determine the contents. Tenen will also field screen the soil around any USTs for evidence of petroleum contamination.

### 3.3 Soil Sampling

A subsurface investigation will be performed to investigate historic fill impacts, petroleum impacts and chlorinated solvent impacts from off-site. The following scope of work will be implemented:

- Advance 16 soil borings (BMW-1 through BMW-7 and BSB-8 through BSB-16) on Site;
- Collect soil samples from highest suspected contamination and the first interval with no apparent impacts; and,
- Analyze soil samples for Target Compound List (TCL) VOCs, TCL SVOCs, pesticides PCBs and Target Analyte List (TAL) metals.

The following boring locations are proposed and shown on Figure 3.

#### 3.3.1 Proposed Boring Locations and Rationale for Placement

- BMW-1 – upgradient border, in northeast corner of Site, investigate potential off-site chlorinated impacts.
- BMW-2 – upgradient border, in southeast corner of Site, investigate potential historic fill and potential off-site chlorinated impacts.
- BMW-3 – southern border of Site, investigate potential historic fill impacts.
- BMW-4 and BSB-11 – center of Site, investigate potential releases from drum storage area and potential historic fill impacts.

- BMW-5 and BSB-12 – northern border of Site, investigate potential petroleum impacts from the known USTs and potential historic fill impacts.
- BMW-6 and BSB-16 – downgradient border, northwest corner of Site, investigate potential petroleum impacts from known USTs and dispenser and potential historic fill impacts.
- BMW-7 – downgradient border, southwest corner of Site, investigate potential historic fill impacts.
- BSB-8 – upgradient border, investigate potential off-site chlorinated solvent impacts.
- BSB-9 and BSB-10 – northern border of Site, investigate upgradient extent of petroleum impacts from known USTs.
- BSB-13 – center of Site, investigate crossgradient extent of petroleum impacts from known USTs.
- BSB-14 and BSB-15 – northern border of Site, investigate potential petroleum impacts from known USTs and dispenser and potential historic fill impacts

Based on field measurements and observations, boring locations may be moved or added in coordination with NYSDEC.

### 3.3.2 Soil Sampling Methodology

A Geoprobe® machine with a hollow-stem auger (HSA) will be used to advance soil boring BMW-1, in the basement of the existing building. A hollow-stem auger (HSA) drill rig will be used to advance soil borings BMW-2 through BMW-7. A track-mounted Geoprobe® direct-push unit will be used to advance soil borings BSB-8 through BSB-16. Borings will be advanced at least five feet into the groundwater table, or approximately ten to 20 ft-bg, to assess potential impacts at the Site. If impacts are documented by field screening, borings will be advanced to the first apparent interval with no impacts. The methodologies used for these locations are detailed below.

Soil intervals will be screened between grade and boring termination. For soil that may remain in place (between the depth of proposed excavation and groundwater), the full interval will be screened and a sample will be collected at the interval of highest suspected contamination or, if contamination is not detected, at the groundwater interface.

**HSA Borings**. These borings will be advanced using an HSA drill rig and a steel 24-inch long split-spoon sampler. The sampler will be driven through the subsurface levels ahead of a hollow-stem (6-¼-inch diameter) auger to the desired sampling depth. Soil will be obtained for screening with the split-spoon sampler on a continuous basis until boring termination.

**Geoprobe® Borings.** These borings will be advanced using a track-mounted Geoprobe® unit and a four-foot long steel sampler containing a dedicated plastic liner. Each sampler will be driven through the subsurface to collect soil from grade to five feet below the groundwater interface.

At all soil boring locations, the collected soil volumes will be screened with a PID and visual and olfactory observations will be recorded. Soil samples will be collected from each boring as follows: one soil sample will be collected for laboratory analysis from the two-foot interval of highest suspected contamination and the two-foot interval with no apparent impacts. If no apparent impacts are observed, a sample will be collected from the two-foot interval above the groundwater interface.

Samples will be collected in laboratory-supplied containers and will be sealed, labeled, and placed in a cooler containing ice (to maintain a temperature of approximately 4 degrees Celsius) for delivery to a New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP)-certified analytical laboratory. Soil samples will be analyzed for TCL VOCs, TCL SVOCs, pesticides, PCBs and TAL metals.

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 log book. A chain of custody will be maintained throughout the field sampling, transport of samples to the laboratory, and during lab analysis.

## 3.4 Soil Vapor Sampling

The following scope of work is proposed to investigate potential soil vapor impacts in areas of the Site near adjacent properties and develop the soil vapor information needed for the qualitative EA. The scope of work will include the following:

- Install six soil vapor points at approximately two ft-bg;
- Purge and collect soil vapor samples at each location;
- Collect one ambient air sample;
- Collect one indoor air sample; and,
- Analyze soil vapor, ambient air and indoor air samples for TO-15 VOCs.

The soil vapor locations are proposed to determine the potential presence of VOCs in soil vapor at on-site locations. All locations are shown on Figure 3.

### 3.4.1 Proposed Soil Vapor Locations and Rationale for Placement

Soil vapor sampling points BSV-1 to BSV-6 will be located along the northern, eastern and southern Site boundaries to assess soil vapor conditions in the areas of the Site with adjacent properties. Samples will be collected from a depth of two ft-bg. One ambient air sample (BAA-1) will be collected for an 8-hour duration at the upwind border of the Site and one indoor air sample (BIA-1) will be collected from the basement of the building between BSV-1 and BSV-3.

### 3.4.2 Soil Vapor Methodology

All samples will be collected in accordance with the Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, October 2006). Some sample locations may be adjusted based on field observations or conditions.

A track-mounted geoprobe will be used to install the soil vapor sampling probes. At each soil vapor sampling location, access to the subsurface soil will be gained by drilling through the top surface material (concrete and/or asphalt) using a drill bit. Upon penetration through the surface material, a disposable sampling probe consisting of a 1.5-inch long hardened point and a 6-inch long perforated vapor intake will be installed at two ft-bg.

The soil vapor sampling probe will be connected to ¼-inch diameter tubing to the surface. The borehole above the sampling probe to grade will be sealed using a sand pack and 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 tubing to an air valve and then to a vacuum pump. The vacuum pump will remove one to three volumes of air (volume of the sample probe and tube) prior to sample collection.

The soil vapor sample will be screened for organic vapors using a PID. Samples will be collected in laboratory-supplied Summa canisters, which have been certified clean by the laboratory. The flow rate of both purging and sampling will not exceed 0.2 liters per minute (L/min). Soil vapor sampling will occur for the duration of two hours. 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 protocols.

As part of the soil vapor evaluation, helium tracer gas will be used in accordance with NYSDOH protocols to serve as a quality assurance/quality control (QA/QC) device to verify the integrity of the soil vapor probe seal. A portable monitoring device will be used to analyze a sample of soil vapor for the tracer prior to sampling. If this analysis shows a significant presence of the tracer, the probe seals will be adjusted to prevent infiltration. At the conclusion of the sampling, tracer monitoring will be performed a second time to confirm the integrity of the probe seals.

## 3.5 Groundwater Sampling

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

- Soil borings BMW-1 through BMW-7 will be converted into two-inch diameter permanent monitoring wells (also designated BMW-1 through BMW-7) screened across the groundwater interface;

- Collect groundwater samples from newly-installed wells (BMW-1 through BMW-7) and analyze for TCL VOCs, TCL SVOCs, pesticides, PCBs and TAL metals (total and dissolved).

The locations of the proposed wells and rationale for placement are listed below. All locations are shown on Figure 3.

### 3.5.1 Proposed Monitoring Well Locations and Rationale for Placement

- BMW-1 – upgradient border, in northeast corner of Site, investigate potential off-site chlorinated impacts.
- BMW-2 – upgradient border, in southeast corner of Site, investigate potential historic fill and off-site chlorinated impacts.
- BMW-3 – southern border of Site, investigate potential historic fill impacts.
- BMW-4 – center of Site, investigate potential releases from drum storage area and potential historic fill impacts.
- BMW-5 – northern border of Site, investigate potential petroleum impacts from the known USTs and potential historic fill impacts.
- BMW-6 – downgradient border, northwest corner of Site, investigate potential petroleum impacts from known USTs and dispenser and potential historic fill impacts.
- BMW-7 – downgradient border, southwest corner of Site, investigate potential historic fill impacts.

### 3.5.2 Groundwater Well Installation and Sampling

As previously described, seven soil borings will be converted into permanent and/or temporary groundwater wells. Each of the permanent monitoring wells will consist of two-inch inner diameter (ID) PVC casing and riser.

For the permanent monitoring wells, a seven-foot PVC screen will be installed in the top five feet of groundwater. The slot size will be determined based on the grain size of the soils encountered. A filter pack of sand will be placed in the annular space around the screens and will extend two feet above the screen. The annular area around the well casing will be sealed with bentonite pellets for an interval of two feet. A grout, consisting of a cement and bentonite mixture or an anti-shrink mixture, will then extend from the bentonite pellet seal to two ft-bg. The remaining annular space will be sealed with a concrete cap and well apron (expanding cement). A locking well cap will be installed upon completion of the well.

All monitoring wells will be developed on the day they are installed by pumping using dedicated Teflon tubing. Turbidity will be measured using a nephelometer, and the well developed until the reading is 50 Nephelometric Turbidity Units (NTU) or less, or until at least three well volumes have been evacuated.

The monitoring wells will be sampled approximately ten days after development. All sampling equipment will be decontaminated prior to use. Prior to sampling, water levels will be measured using an electronic product-water level indicator. Sample collection will be accomplished by using low-flow procedures. Samples will not be collected until pH, temperature and conductivity measurements stabilize and the turbidity reading is 10 NTU or less.

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).

In addition, a 24-hour cycle of readings will be collected using pressure transducers in order to understand potential tidal influences at the Site and to prepare a groundwater flow contour map.

## 3.6 Quality Assurance / Quality Control (QA/QC)

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

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

## 3.7 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 |
|---|---|---|---|---|---|
| BMW-1<br>BSB-8 | Soil | Samples will be collected from the two foot interval of highest suspected contamination and the first two foot interval with no apparent impacts. If no impacts are detected, a sample will be collected from the two foot interval above the groundwater interface. | TCL VOCs, TCL SVOCs, Pesticides, PCBs, Metals | MDL less than Unrestricted Use SCOs | Investigate potential off-site chlorinated impacts |
| BMW-2 | | | | | Investigate potential off-site chlorinated impacts and potential historic fill impacts |
| BMW-3<br>BMW-7 | | | | | Investigate potential historic fill impacts |
| BMW-4<br>BSB-11 | | | | | Investigate potential releases from drum storage area and potential historic fill impacts |
| BMW-5<br>BSB-12 | | | | | Investigate potential petroleum impacts from the known USTs and potential historic fill impact |
| BMW-6<br>BSB-14<br>BSB-15<br>BSB-16 | | | | | Investigate potential petroleum impacts from known USTs and dispenser and potential historic fill impacts |
| BSB-9<br>BSB-10 | | | | | Investigate upgradient extent of petroleum impacts from known USTs |
| BSB-13 | | | | | Investigate crossgradient extent of petroleum impacts from known USTs |

| Sample Location | Matrix | Sampling Intervals | Analytical Parameters | Sampling Method / Minimum Reporting Levels | Rationale |
|---|---|---|---|---|---|
| BMW-1<br>BMW-2 | Groundwater | Five-foot interval into groundwater interface | TCL VOCs, TCL SVOCs, Pesticides, PCBs, Metals | MDL less than Class GA Standards | Investigate potential off-site chlorinated impacts |
| BMW-3<br>BMW-7 | | | | | Investigate potential historic fill impacts, general coverage |
| BMW-4 | | | | | Investigate potential releases from drum storage area and potential historic fill impacts |
| BMW-5 | | | | | Investigate potential petroleum impacts from the known USTs and potential historic fill impact |
| BMW6 | | | | | Investigate potential petroleum impacts from known USTs and dispenser and potential historic fill impacts |

| Sample Location | Matrix | Sampling Intervals | Analytical Parameters | Sampling Method / Minimum Reporting Levels | Rationale |
|---|---|---|---|---|---|
| BSV-1<br>BSV-2<br>BSV-5<br>BSV-6 | Soil Vapor | 2 ft-bg | RL less than 1.00 ug/m3 except TCE/PCE less than 0.25 ug/m3 | | Assess conditions along northern Site boundary |
| BSV-2 | | | | | Assess conditions along eastern Site boundary |
| BSV-3 | | | | | Assess conditions along southern Site boundary |
| BAA-1 | Ambient Air | Upwind | | | Assess conditions near upwind direction of the Site boundary |
| BIA-1 | Indoor Air | Inside Basement | | | Assess interior conditions |

| Sample Location | Matrix | Sampling Intervals | Analytical Parameters | Sampling Method / Minimum Reporting Levels | Rationale |
|---|---|---|---|---|---|
| Trip Blanks | QA / QC | -- | TCL VOCs and SVOCs | Same as Soil and GW | Quality assurance and quality control |
| Soil Duplicate | | | | | |
| Soil Blank | | | | | |
| Soil MS/MSD | | | | | |
| Groundwater Duplicate | | | | | |
| Groundwater MS/MSD | | | | | |

MDL – Method Detection Limit
RL – Reporting Limit
ug/m3 – micrograms per cubic meter
Reporting and method detection 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.

### 3.8 Qualitative Exposure Assessment

Following receipt of the sample results, a qualitative exposure assessment (EA) 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 EA 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 EA will be included in the remedial investigation report, as described in Section 3.12.

### 3.9 Health and Safety Plan (HASP)

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

### 3.10 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).

### 3.11 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 and off-Site disposal will be arranged.

### 3.12 Citizen Participation Plan (CPP)

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. The CPP is currently under review by NYSDEC and a copy of the draft CPP is provided in Appendix D.

### 3.13 Reporting

A remedial investigation report will be prepared in accordance with the requirements of DER-10. The report will include details of the sampling, 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, Residential and Restricted Residential Use SCOs and the Protection of Groundwater SCOs as included in Part 375-6.8 and CP-51. Groundwater sample results will be compared to the Class GA Standards. Soil vapor sample and ambient air results will be compared to the NYSDOH AGVs and matrices.

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 field activities described in this work plan can be completed within twelve days with an additional ten days for well development prior to groundwater sampling. Project activities will be completed within approximately eight 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 | 0 | 0 |
| Mobilization | 5 | 5 |
| Geophysical Investigation | 1 | 6 |
| Test Pit Excavation | 2 | 8 |
| Soil and Soil Vapor Sampling | 6 | 14 |
| Monitoring Well Installation | 2 | 16 |
| Monitoring Well Development | 10 | 26 |
| Groundwater Sampling | 3 | 29 |
| Laboratory Analysis | 10 | 39 |
| Draft Report and Data Validation | 30 | 69 |

## 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.

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