56 Frost Street
Phase II Subsurface Investigation Report

56 Frost Street

Brooklyn, New York

Block 2737, Lot 10

OER Project # 14EHAZ352K

E-Designation # E-138

CEQR # 04DCP003K

Prepared for:

56 Frost Street, LLC

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CERTIFICATION

I, Mohamed Ahmed, am a Qualified Environmental Professional, as defined in RCNY § 43-1402(ar). I have primary direct responsibility for implementation of the Remedial Investigation for the 56 Frost Street Site (OER # 13EHAN506M). I am responsible for the content of this Remedial Investigation Report (RIR), have reviewed its contents and certify that this RIR is accurate to the best of my knowledge and contains all available environmental information and data regarding the property.

Mohamed Ahmed, Ph.D., CPG

Qualified Environmental Professional Date Signature

1. EXECUTIVE SUMMARY

The Phase II Subsurface Investigation (Phase II) report provides sufficient information for establishment of remedial action objectives, evaluation of remedial action alternatives, and selection of a remedy pursuant to RCNY§ 43-1407(f). The remedial investigation (RI) described in this document is consistent with applicable guidance.

This Phase II report was prepared for the 56 Frost Street property located in the Green Point section of Brooklyn, New York (the Site). The Site is located on the south side of Frost Street and extends to the north side of Meeker Avenue, as shown on Figure 1. The property has approximately 25 feet of frontage along Frost Street and is approximately 100 feet deep, extending to Meeker Avenue. The property is currently vacant with a one-story building.

The proposed development project consists of a new residential building including a full cellar, four stories and a penthouse. The total excavation depth of the proposed building will be to approximately 10 feet below grade (at Frost Street). The building will contain a total of nine residential units plus the penthouse.

A Phase II subsurface investigation was performed on the Site to address the Phase I and Phase II Testing Protocol E-designation (E-138) placed on the Site by the New York City Department of City Planning (DCP) on May 14, 2005, in connection with Greenpoint-Williamsburg Rezoning. The subsurface investigation included the sampling of soil vapor, soil and groundwater.

Based on the findings of the Phase II subsurface investigation, Tenen concluded the following:

- Based on the laboratory analysis, petroleum constituents were detected in soil vapor samples at concentrations above the NYSDOH indoor air database levels;
- Historic fill is located from below the building slab to depths between two and nine feet;
- Groundwater is present at approximately 7 below building slab;
- PCE, TCE, 1,1,1-TCA and carbon tetrachloride were not detected in soil vapor; 1,1,1-trichloroethane (1,1,1-TCA) was detected in SV-3 at 2.62ug/m^3;
- Gasoline-related constituents (ethylbenzene, toluene, xylene and n-hexane) were detected in soil vapor above the NYSDOH-referenced indoor air background concentrations;
- Two VOCs, Methyl tert butyl ether and 4-Methyl-2-pentanone were detected but were well under Unrestricted Use SCOs;
- No pesticides or PCBs were detected above the Unrestricted Use SCOs in any soil sample;
- SVOCs exceeding Unrestricted Use SCOs are benzo(k)fluoranthene (max. 1.4mg/kg), chrysene (max. 2.4mg/kg), and 3-Methylphenol 4-Methylphenol (max. 0.59mg/kg). SVOCS exceeding Restricted Residential Use SCOs are benzo(a)anthracene (maximum 2.2mg/kg), benzo(a)pyrene (maximum 3.2mg/kg), benzo(b)fluroanthene(maximum 2.5mg/kg), and indeno(1,2,3-cd)pyrene (maximum 2mg/kg);
- Several metals were detected above the Restricted Residential Use SCOs, including arsenic (maximum 51 mg/kg), barium (maximum 630 mg/kg), cadmium (maximum 37 mg/kg), copper (maximum 22,000 mg/kg), lead (maximum 5,600 mg/kg), mercury (maximum 9.1

mg/kg) and zinc (maximum 32,000 mg/kg). Iron (maximum 72,000 mg/kg) was detected above the Residential Use SCO;

- The metals concentrations are likely related to the presence of historic urban fill and C&D debris beneath the Site and, potentially, remnants from the historic uses of the Site including welding and auto repair operations;
- No PCBs or pesticides were detected in any groundwater samples;
- Only one VOC (MTBE, 11 ug/L) and one SVOC (benzo(b)fluoranthene, 0.17 ug/L) were detected in one groundwater sample above the Class GA Standards;
- Several metals including antimony, cadmium, copper, iron, lead, manganese, sodium and zinc exceeded Class GA Standards in one or more of the four total and dissolved metals samples collected. Dissolved exceedances of the Class GA Standards include antimony (maximum 7.58 ug/L), cadmium (maximum 22.1 ug/L), copper (maximum 988.5 ug/L), iron (maximum 445 ug/L), lead (maximum 35.12 ug/L), manganese (maximum 478 ug/L), sodium (maximum 1,430,000 ug/L) and zinc (maximum 9,470 ug/L); and,
- The metals exceedances in the groundwater are likely related to the metals detected in soils beneath the Site.

2. INTRODUCTION

Tenen Environmental, LLC (Tenen) has prepared this Phase II Subsurface Investigation (Phase II) report, on behalf of 56 Frost Street, LLC., for the 56 Frost Street property located in the Green Point section of Brooklyn, New York (the Site). The Site is located on the south side of Frost Street and extends to the north side of Meeker Avenue, as shown on Figure 1.

The purpose of the Phase II investigation was to characterize the soil vapor, soil, and groundwater beneath the Site building. The investigation was designed to address the Phase I and Phase II Testing Protocol E-designation (E-138) placed on the Site by the New York City Department of City Planning (DCP) on May 14, 2005, in connection with Greenpoint-Williamsburg Rezoning. The CEQR Number for the Site is 04DCP003K. This project has been assigned project number 14EHAZ352K by the Mayor's Office of Environmental Remediation (OER).

The Phase II investigation was performed in accordance with the Revised Phase II Subsurface Investigation Work Plan (Phase II WP) and a Site-specific Health and Safety Plan (HASP), both dated December 2013. The HASP and Phase II WP were approved by OER, subject to acceptance of their comments, in an email from Ms. Alysha Alfieri dated January 6, 2014.

3. PROJECT SITE

The Site, located at 56 Frost Street in the Green Point section of Brooklyn, New York, is a rectangular-shaped parcel of 2,315 square feet located on the south side of Frost Street, between Lorimer and Leonard Streets. The property has approximately 25 feet of frontage along Frost Street and is approximately 100 feet deep, extending to Meeker Avenue. Another address associated with the Site is 297 Meeker Avenue. The tax map designation of the property is Block 2737, Lot 10. The property is currently vacant with a one-story building.

3.1 Site History

Tenen Environmental prepared a Phase I Environmental Site Assessment (Phase I) for the Site in December 2013. As indicated in the Phase I, the Site and surrounding areas have been developed urban land since at least 1897. The 1897-1916 Sanborn maps show the Site as mostly vacant, except for two small buildings, one of which was used to store mineral water. By 1942, the Site had been developed with two larger buildings, one along Frost Street and the second fronting Meeker Avenue. The building on Frost Street is shown as an auto house in 1951; the use is not specified in later maps. By 1951, a welder occupied the southern building, with the later use (maps dated 1979 through 2007) shown as an auto repair shop.

The Phase I revealed no evidence of *recognized environmental conditions* in connection with the property, with the exception of the following:

- Historic use of the Site for welding and auto repair operations;
- Historic use of the north adjacent property as a brass foundry and large-scale dry cleaning operation;
- Use of the east adjacent lot as a gasoline service station with underground petroleum storage tanks;
- An open LTANKS case approximately 0.3 mile from the Site with documented offsite free product migration; and
- An open NY SPILLS listing pertaining to a release of approximately 8,000 gallons of petroleum from a feeder line located approximately 0.06 mile from the Site.

3.2 Subsurface Conditions

According to the Brooklyn, New York Quadrangle USGS Topographic Map (1995), included as Figure 1 in Appendix A, the property lies at an elevation of approximately 20 feet above the National Geodetic Vertical Datum of 1929 (an approximation of mean sea level). The surface topography at the Site and surrounding area is relatively flat with a slight downward slope to the northwest.

Based on the Phase II subsurface investigation (Phase II) performed by Tenen Environmental in January 2014, fill material consisting of cinders, ash, coal fragments, red brick fragments, and pieces of glass with tan to black sandy silt was encountered to a depth of approximately nine feet below grade. Groundwater under the Site was encountered during the Phase II sampling at seven

feet below grade. Groundwater flow is assumed to be locally northwest. Boring logs are presented in Appendix A.

3.3 Previous Studies

There are no records of previous environmental subsurface investigations performed on the Site.

3.4 Proposed Development

The Site is located in the Green Point section of Brooklyn and is identified as Block 2737 and Lot 10. Currently, the Site is vacant and contains a one-story building. The proposed development project consists of a new residential building including a full cellar, four stories and a penthouse. The total excavation depth of the proposed building will be to approximately 10 feet below grade (at Frost Street). The building will contain a total of nine residential units plus the penthouse. A minimal amount of landscaping is proposed in the yards fronting both Frost Street and Meeker Avenue. It should be noted that the elevation of Meeker Avenue is approximately two feet higher than that of Frost Street at this location; the slab heights approximately match these elevations in each half of the building. Layout of the proposed Site development is presented in Appendix B.

4. PROJECT MANAGEMENT

4.1 Project Organization

The Qualified Environmental Profession (QEP) responsible for preparation of this RIR is Mohamed Ahmed.

4.2 Health and Safety

All work described in this RIR was performed in full compliance with applicable laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements. The health and safety office during the investigation was Matthew Carroll.

4.3 Materials Management

All material encountered during the RI was managed in accordance with applicable laws and regulations. No soil was generated during this investigation.

5. SAMPLING METHODOLOGY

This section describes the geophysical survey, soil vapor, soil, and groundwater sampling and analytical methodology used during the Phase II investigation. Field sampling was conducted on January 9, 2014. The investigation was completed in general conformance with the approved Phase II WP. The sole deviation from the Phase II WP included collection of two contingency soil samples from borings SB-1 and SB-3 from 2-4 feet below grade. These samples were analyzed subsequent to detected of contamination in the surface soil. This deviation does not affect the conclusions of this report.

5.1 Geophysical Survey

On January 9, 2014, a geophysical survey was performed on the Site by Naeva Geophysics (Naeva) of Congers, New York to: 1) locate potential underground storage tanks (USTs) and associated piping; and 2) determine whether the proposed boring locations were clear of underground structures and utilities. The equipment selected for this investigation included a Fisher TW-6 Pipe and Cable Locator (a type of electromagnetic metal-detector) and a Sensors & Software Smart Cart Ground Penetrating Radar (GPR) system with a 250 antenna and 3M Dynatel 2250 utility locator.

5.2 Soil Vapor Sampling

Three soil vapor samples (SV-1 through SV-3) were collected within the footprint of the existing building. Each sample was collected from a six-inch long dedicated soil vapor probe installed at five feet below the building floor. Soil vapor sampling locations are shown on Figure 2.

A track-mounted geoprobe unit was used to install the soil vapor sampling probes. At each soil vapor sampling location, a boring was advanced to five feet below the building floor. Upon completion of the boring through the surface material, a ⅝-inch diameter retractable stainless steel sampling probe, consisting of a 1.5-inch long hardened point and a six-inch long perforated vapor intake, was installed and embedded in fine sand.

The soil vapor sampling probe was connected to ¼-inch diameter polyethylene tubing that was extended to grade. The borehole above the sampling probe to grade was sealed using an inert sealant to prevent ambient air mixing with the soil vapor. In accordance with the New York State Department of Health (NYSDOH) October 2006 Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (Soil Vapor Guidance) protocols, a tracer gas (helium) was used to verify the integrity of the soil vapor probe and sampling tube seal at each location. A plastic bucket was used as a chamber and sealed above the borehole. The sampling tube was pushed through the top of the sealed chamber. The atmosphere inside the chamber was enriched with the tracer gas (helium). A portable helium monitor was attached to the sampling tube to measure a vapor sample from the probe for the presence of high concentrations (>10%) of the tracer gas.

Ambient air and soil vapor was purged from the boring hole by attaching the surface end of the ¼-inch polyethylene tubing to an air valve and then to a vacuum pump. The vacuum pump removed a minimum three volumes of air (volume of the sample probe and tube) prior to sample

collection. The flow rate for both purging and sample collection did not exceed 0.2 liter per minute.

The soil vapor sample was first screened for organic vapors using a photoionization detector (PID). PID readings of 8 and 1.5 parts per million (ppm) of organic vapor constituents were detected prior to the sample collection at soil locations SV-1 and SV-2, respectively. No PID reading above background was recorded at location SV-3. Soil vapor samples were collected in one-liter Summa canisters using two-hour regulators and analyzed for volatile organic compounds (VOCs) using EPA Method TO-15.

The sample identification, date and time of sample collection, sampling depth, identity of samplers, sampling methods and devices, soil vapor purge volumes, vacuum of canisters before and after the samples were collected and chain of custody protocols were recorded in the field book. Samples collection information is presented in the following Table:

Sample ID	Date	Start Time	End Time	Initial Vacuum	Final Vacuum	PID (ppm)
SV-1	1-9-2014	12:17	2:18	-30.04	-6.27	ND
SV-2	1-9-2014	12:35	2:52	-29.27	-1.03	ND
SV-3	1-9-2014	11:24	1:28	-30.2	-5.87	ND

5.3 Soil Sampling

Four soil borings (SB-1 to SB-4) were advanced inside the on-Site building. Soil boring SB-1 (temporary groundwater well TMW-1) was close to Frost Street. Soil boring SB-2 (TMW-2) was located in the middle of the Site building. Soil boring SB-3 (TMW-3) was adjacent to Meeker Avenue. Soil boring logs are included in Appendix A.

A track-mounted geoprobe unit was used to advance the soil borings. Samples were obtained using two-inch diameter by five-foot long steel macro core samplers containing a dedicated acetate liner.

The soil was field screened using a PID and no readings above 0.0 ppm were recorded. Two soil samples from the 0-2 ft-bg and 5-7 ft-bg intervals were collected from SB-1, SB-2, and SB-4. Samples were collected from the 0-2 ft-bg and 7-9 ft-bg grade intervals at SB-3. Additional samples were collected at SB-1 and SB-3 from 2-4 ft-bg. The purpose these samples was to vertically any delineate soil contamination if detected in surface soil samples. Additional sample volume was collected for reanalysis, if necessary. Soil samples were collected in glass containers. One duplicate sample, a field blank and a trip blank were collected for quality assurance purposes. The table below summarizes the sample designations, locations and depths.

Sample Name	Sample Location	Depth Interval (ft-bg)
SB-1 (0-2) and (2-4)	Boring SB-1	0-2 and 2-4
SB-1 (5-7)	Boring SB-1	5-7

Sample Name	Sample Location	Depth Interval (ft-bg)
SB-2 (0-2)	Boring SB-2	0-2
SB-2 (5-7)	Boring SB-2	5-7
SB-2D (5-7)[1]	Boring SB-2	5-7
SB-3 (0-2) and (2-4)	Boring SB-3	0-2 and 2-4
SB-3 (7-9)	Boring SB-3	7-9
SB-4 (0-2)	Boring SB-4	0-2
SB-4 (5-7)	Boring SB-4	5-7
Field Blank	Laboratory DI water	--
Trip Blank	Laboratory-prepared	--

[1] Duplicate sample.

No grossly contaminated soil was encountered during this investigation; therefore, cuttings were not drummed.

Soil samples were containerized in accordance with EPA analytical protocols. Each sample was labeled, sealed, and placed in a chilled cooler for shipment to the laboratory. A record of each sample, including notation of any odors, color, and sample matrix, was kept in the sampler's field logbook. A chain of custody was maintained throughout the field sampling, transport of samples to the laboratory, and lab analysis. The duplicate soil sample, SB-2D (5-7), was collected from boring SB-2 for quality assurance/quality control (QA/QC) purposes. All samples, except SB-1 (2-4) and SB-3 (2-4), were analyzed for VOCs by EPA Method 8260, semivolatile organic compounds (SVOCs) by EPA Method 8270, pesticides/polychlorinated biphenyls (PCBs) by EPA Method 8081/8082 and Target Analyte List (TAL) Metals by EPA Method 6010. Soil sample SB-1 (2-4) was analyzed for metals while soil sample SB-3 (2-4) was analyzed for SVOCs and metals.

5.4 Groundwater Sampling

Three one-inch diameter groundwater temporary monitoring wells (TMW-1 through TMW-3) were installed during the Phase II investigation.

A track-mounted, Geoprobe® direct-push drill rig was used to set the slotted well screen below the groundwater interface. A filter pack of sand was placed in the annular space around the screen to at least two feet above the groundwater interface and the well was completed with riser to grade. The screen extended five to 15 feet into the groundwater. Measured depths to groundwater ranged from 6.50 to 7.65 ft-bg.

Polyethylene tubing was inserted inside the temporary well to approximately five feet below the groundwater interface and attached at the surface to a peristaltic pump. Water quality readings of temperature, pH, oxidation-reduction potential (ORP), turbidity, dissolved oxygen (DO) and total dissolved solids (TDS) were collected on an approximately 15-minute basis. Samples were collected after temperature, pH and DO stabilized to within 10% of the previous reading and turbidity was below 50 Nephelometric Turbidity Units (NTUs). Sufficient sample volume was collected for each analysis. Groundwater Quality Table is presented in Attachment 1.

Samples were collected and containerized in accordance with EPA analytical protocols. The samples were labeled, sealed, and placed in a chilled cooler for shipment to the laboratory. A groundwater field blank, a groundwater duplicate sample and a trip blank were collected for quality assurance/quality control (QA/QC) purposes. Groundwater samples were analyzed for TCL VOCs by EPA Method 8260, TCL SVOCs by EPA Method 8270, pesticides/PCBs by EPA Method 8081/8082 and total and dissolved TAL Metals by EPA Method 6010. With the exception of for the metals analysis, all samples were collected in glass containers. The VOCs were preserved with hydrochloric acid (HCl) and laboratory-filtered metals were preserved with nitric acid (HNO_3).

6. FINDINGS

6.1 Geology and Hydrogeology

Based on observations during sampling activities, the Site is underlain by a layer of fill material, extending to depths of two to nine feet below the building floor. The fill material consists of cinders, ash, coal fragments, red brick fragments, and pieces of glass with tan to black sandy silt.

The East River is located approximately 0.87 mile to the northwest of the Site. In general, the surface topography at the Site and surrounding area is relatively flat with a slight downward slope to the northwest. Based on the topography and knowledge of groundwater in the surrounding area, groundwater most likely flows northwest toward the East River. Groundwater was encountered at approximately seven feet below the building floor during this Phase II investigation.

6.2 Geophysical Survey Results

The geophysical investigation utilized a Fisher TW-6 Pipe and Cable Locator (a type of hand-held electromagnetic metal-detector), Subsite and 3M Dynatel utility locators, and a Malå RAMAC/Ground Penetrating Radar (GPR) system with a 250-Megahertz (MHz) antenna. It should be noted that the depth of penetration of the GPR's signal was less than 4 feet. Objects located below that depth may not have been detected with GPR. The area of investigation was accessible portions of the approximately 25 by 100-foot interior of the building as well as the frontage sidewalks along Frost Street and Meeker Avenue.

The TW-6 metal-detector was carried over the accessible portions of the property in a series of closely spaced traverses. It should be noted that the TW-6 could not be utilized in the immediate vicinity of above ground metal objects or over the few small areas obscured by furniture or other above ground obstructions. The instrument detected two 5 by 7-foot anomalies in the southwestern portion of the building; however these anomalies were probably caused by the response from two dividing walls with sliding doors that may contain metal frames. The GPR data profiles collected over these anomalies provided no useful information due to the interference from the raised wood floor in this part of the building.

The Subsite and Dynatel were used to delineate conductive utility lines. Using a transmitter, radio frequency signals were conducted onto exposed portions of conduits and piping, and these signals were used to trace the utilities. The main electric and gas lines enter from Frost Street to the northeast and northwest corners of the building, respectively. A water service line enters from Frost Street through a vault at the northwest corner of the building, and it runs along the western wall of the building. A north-south oriented sewer line was detected in the middle of the building. The sanitary sewer line associated with a broken clean-out at the north side of a rest room may run parallel to the water line and connect with the aforementioned sewer line.

All detected utilities and features were marked on the ground with spray paint using the American Public Works Association color code (red for electric, blue for water, green for sewer,

etc.), and indicated on the attached map. Florescent pink paint was used for the metal-detector anomalies and the suspected sewer line. All boring locations were drilled without incident while we were at the site. Naeva's report is included as Attachment 2.

6.3 Soil Vapor Sampling Results

The results of the soil vapor analysis were compared to the NYSDOH Air Guidance Values (AGVs) and three databases based on background studies and the NYSDOH matrices, as referenced in the NYSDOH Soil Vapor Guidance. AGVs have been developed for only three compounds on the VOC list: methylene chloride, tetrachloroethylene (PCE) and trichloroethylene (TCE). The remaining compounds were compared against values from the following background databases:

- Upper fence indoor air values from Table C1, NYSDOH 2003: Study of Volatile Organic Chemicals in Air of Fuel Oil Heated Homes;
- 90th percentile indoor air values from Table C2, EPA 2001: Building Assessment and Survey Evaluation (BASE) Database, and
- 95th percentile indoor air values from Table C5, Health Effects Institute (HEI) 2005: Relationship of Indoor, Outdoor and Personal Air

Note that the AGVs and background values apply to indoor air concentrations and are conservative (i.e., lower) for comparison to soil vapor concentrations. In the absence of soil vapor guidance levels in New York, these levels are used only for screening purposes.

NYSDOH Matrix 1 was used to screen the soil vapor and indoor air results for carbon tetrachloride and TCE. NYSDOH Matrix 2 was used to screen the soil vapor and indoor air results for 1,1-dichloroethene (1,1-DCE); cis-1,2-dichloroethene (cis-1,2-DCE); 1,1,1-trichloroethane (1,1,1-TCA) and PCE.

1,1,1-trichloroethane (1,1,1-TCA) was detected in SV-3 at 2.62ug/m^3.

Based on the laboratory analysis, VOCs, primarily gasoline-related constituents, ethylbenzene, toluene, xylene, and n-hexane were detected in soil vapor samples SV-1 and SV-2 at concentrations above the background database levels. Chloromethane was also detected in SV-1 at a concentration of 13.2 microgram per cubic meter (µg/m^3) above the background database level. N-hexane was the only VOC detected in SV-3 at concentration above the background database level. Detected compounds above the background levels are highlighted in blue in Table 1. Reporting Limit (RL) value above the highest background levels is shaded in gray in Table 1.

A summary of the soil vapor analytical results is included as Table 1, summary of exceedances in soil vapor samples is presented on Figure 3, and the laboratory analytical report is included in Appendix D.

6.4 Soil Sampling Results

The results of the soil analysis were compared to the New York State Department of Environmental Conservation (NYSDEC) Unrestricted Use soil cleanup objectives (SCOs) and Restricted Residential Use SCOs. The Unrestricted Use SCOs are listed in 6 NYCRR Part 375-6.8(a) and the Restricted Residential Use SCOs are listed in 6 NYCRR Part 375-6.8(b). The Unrestricted Use SCOs are used as a screening value, while the Restricted Residential Use SCOs are consistent with the assumed future use of the proposed building. Please note that, as there is no Unrestricted Use or Restricted Residential Use SCO for iron, the results for this parameter are compared to the Residential Use SCO of 2,000 mg/kg.

Summaries of the soil analytical results are included in Tables 2 through 5. Summary of exceedances in soil samples is presented on Figure 4. The laboratory analytical reports are included in Appendix D.

No VOCs, pesticides or PCBs were detected above the Unrestricted Use SCOs in any soil sample.

Two VOCs, Methyl tert butyl ether and 4-Methyl-2-pentanone were detected but were well under Unrestricted Use SCOs.

SVOCs exceeding Unrestricted Use SCOs are benzo(k)fluoranthene (max. 1.4mg/kg), chrysene (max. 2.4mg/kg), and 3-Methylphenol 4-Methylphenol (max. 0.59mg/kg).SVOCS exceeding Restricted Residential Use SCOs are benzo(a)anthracene (max. concentration 2.2mg/kg), benzo(a)pyrene (max. 3.2mg/kg), benzo(b)fluroanthene(max. 2.5mg/kg), and indeno(1,2,3-cd)pyrene (max. 2mg/kg).

Several metals were detected at concentrations above the Unrestricted and Restricted Residential Use SCOs.

Mercury was detected at all four locations above the Restricted Residential Use SCO. Iron was detected at all four locations above the Residential Use SCO. Lead and zinc were detected at all locations above the Unrestricted Use and/or Restricted Residential Use SCOs. Arsenic, barium, cadmium, nickel, and copper, were also detected above the Unrestricted Use and/or Restricted Residential Use SCOs. The specific distribution and concentrations for each detected metal are discussed below.

Arsenic was detected in nine of eleven soil samples at concentrations ranging from 14 mg/kg in sample SB-4 (0-2) to 51 mg/kg in sample SB-2 (5-7) DUP exceeding the Unrestricted Use SCO of 13 mg/kg and the Restricted Residential Use SCO of 16 mg/kg.

Barium was only detected in sample SB-2 (0-2) at a concentration of 630 mg/kg exceeding the Unrestricted Use SCO of 350 mg/kg and the Restricted Residential Use SCO of 400 mg/kg.

Cadmium was detected in eight of eleven soil samples at concentrations ranging from 2.8 in sample SB-4 (0-2) to 37 mg/kg in sample SB-2 (0-2) exceeding the Unrestricted Use SCO of 2.5 mg/kg and the Restricted Residential Use SCO of 4.3 mg/kg.

Copper was detected in ten soil samples at concentrations ranging from 87 in sample SB-2 (0-2) to 22,000 mg/kg in sample SB-2 (5-7) DUP exceeding the Unrestricted Use SCO of 50 mg/kg and the Restricted Residential Use SCO of 270 mg/kg.

Iron was detected at all eleven sample locations above the Residential Use SCO of 2,000 mg/kg at concentrations ranging from 12,000 mg/kg in sample SB-4 (0-2) to 72,000 mg/kg in sample SB-2 (0-2).
Lead was detected in ten samples, at concentrations ranged from 75 mg/kg in sample SB-1 (0-2) to 5,600 in sample SB-2 (0-2), exceeding the Unrestricted Use SCO of 63 mg/kg and the Restricted Residential Use SCO of 400 mg/kg.

Mercury was detected in all eleven samples above the Unrestricted Use SCO of 0.18 mg/kg and in nine samples above the Restricted Residential Use SCO of 0.81 mg/kg at concentrations ranging from 0.5 mg/kg in sample SB-1 (2-4) to 9.1 mg/kg in sample SB-2 (0-2).

Nickel was only detected in one sample SB-2 (0-2) at a concentration of 31 mg/kg exceeding the Unrestricted Use SCO of 30 mg/kg.

Silver was detected in eight of eleven samples at concentrations ranging from 2.1 mg/kg in sample SB-2 (0-2) to 29 mg/kg in sample SB-2 (5-7) DUP exceeding the Unrestricted Use SCO of 2 mg/kg and the Restricted Residential Use SCO of 180 mg/kg.

Zinc was detected at concentrations above the Unrestricted Use SCO of 109 mg/kg in the eleven samples and above the Restricted Residential Use SCO of 10,000 mg/kg in six of the eleven samples. Zinc concentrations ranged from 150 mg/kg in sample SB-1 (0-2) to 32,000 mg/kg in sample SB-2 (5-7) DUP.

6.5 Groundwater Sampling Results

As mentioned above, three groundwater samples were collected at the Site. Groundwater samples were analyzed for VOCs, SVOCs, total and dissolved metals, PCBs and pesticides. Groundwater analytical results are provided in Tables 6 through 10. Summary of exceedances in in groundwater samples is presented on Figure 5. The laboratory data summary sheets are provided in Appendix E. Analytical results were compared to the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. Class GA Groundwater Standards (Class GA Standards).

No VOCs were detected in the groundwater samples with the exception of methyl tert butyl ether (MTBE) in groundwater sample TMW-2 at a concentration of 11 ug/L, exceeding the Class GA Standard of 10 ug/L.

No SVOCs were detected in the groundwater samples with the exception of benzo(b)fluoranthene in groundwater sample TMW-2 at a concentration of 0.17 ug/L exceeding the Class GA Standard of 0.002 ug/L.

No PCBs or pesticides were detected in any groundwater sample.

Antimony, cadmium, copper, iron, lead, manganese, sodium, and zinc exceeded Class GA Standards in one or more of the total metals samples collected.

Dissolved antimony, cadmium, copper, iron, lead, manganese, sodium, and zinc exceeded the Class GA Standards in one or more of the groundwater samples collected.

Dissolved antimony was detected above the Class GA Standard of 3 ug/L in groundwater samples TMW-2 and TMW-3 at concentrations of 7.58 and 5.51 ug/L, respectively.

Dissolved cadmium was detected above the Class GA Standard of 5 ug/L in groundwater samples TMW-2 and TMW-3 at concentrations of 7.48 and 22.1 ug/L, respectively.

Dissolved copper was detected above the Class GA Standard of 200 ug/L in groundwater samples TMW-2 and TMW-3 at concentrations of 275.8 and 988.5 ug/L, respectively.

Dissolved iron was only detected above the Class GA Standard of 300 ug/L in groundwater sample TMW-1, at a concentration of 445 ug/L.

Dissolved lead was only detected above the Class GA Standard of 25 ug/L in groundwater sample TMW-3, at a concentration of 35.12 ug/L.

Dissolved manganese was detected above the Class GA Standard of 300 ug/L in groundwater samples TMW-2 and TMW-3 at concentrations of 416.7 and 478 ug/L, respectively.

Dissolved sodium was detected above the Class GA Standard of 20,000 ug/L in all samples collected, at concentrations ranging from 232,00 ug/L in TMW-1 to 1,430,000 ug/L in TMW-3.

Dissolved zinc was detected above the Class GA Standard of 2,000 ug/L in samples TMW-2 and TMW-3 at concentration of 8,555 and 9,470 ug/L, respectively.

7. DISCUSSION OF SAMPLE RESULTS

7.1 Soil Vapor Discussion

Soil vapor analytical results indicate that several compounds, primarily petroleum constituents were detected in two locations (SV-1 and SV-2) at concentrations above published indoor air background levels. The detected concentrations do not appear to be related to an on-Site historic condition, release, or, generally, the historic uses of the property for welding and auto repair operation. The distribution of petroleum-related compounds most likely related to migration of soil vapor contamination from off-Site sources.

7.2 Soil Discussion

Two VOCs, Methyl tert butyl ether and 4-Methyl-2-pentanone were detected but were well under Unrestricted Use SCOs.

No pesticides or PCBs were detected above the Unrestricted Use SCOs in any soil sample.

SVOCs exceeding Unrestricted Use SCOs are benzo(k)fluoranthene (max. 1.4mg/kg), chrysene (max. 2.4mg/kg), and 3-Methylphenol 4-Methylphenol (max. 0.59mg/kg). SVOCS exceeding Restricted Residential Use SCOs are benzo(a)anthracene (max. concentration 2.2mg/kg), benzo(a)pyrene (max. 3.2mg/kg), benzo(b)fluroanthene(max. 2.5mg/kg), and indeno(1,2,3-cd)pyrene (max. 2mg/kg).. These SVOCs are polycyclic aromatic hydrocarbons (PAHs), which are a class of compounds found in some petroleum products, asphalt and as byproducts of combustion. The type and levels of SVOCs are typical of urban fill material (such as that found on the Site), which often contains cinders, ash, and other combustion byproducts. The soil samples collected from the areas of elevated PAHs did not contain elevated levels of petroleum-related PAHs, such as naphthalene or 2-methylnaphthalene. Therefore, the detected PAH contamination is likely related to fill materials at the Site.

Elevated levels (above the Unrestricted Use SCOs and/or the Restricted Residential Use SCOs) of the metals arsenic, barium, cadmium, copper, lead, iron, mercury, nickel, silver and zinc in varying combinations were observed in most of the soil samples. The presence of these metals is likely related to the presence of historic urban fill and C&D debris beneath the site and, potentially, remnants from the historic uses of the site including welding and auto repair operations.

Most of the detected metals do not pose an indoor air quality concern. The exception is mercury, which can be volatilized at lower temperatures, potentially within the range of typical building temperatures[1].

7.3 Groundwater Discussion

[1] Agency for Toxic Substances and Disease Registry (ATSDR), *Public Health Statement for Mercury*, March 2009.

No pesticides or PCBs were detected above Class GA standards.

No VOCs were detected in the groundwater samples with the exception of MTBE in one groundwater sample at a concentration of 11 ug/L exceeding the Class GA Standard of 10 ug/L. No SVOCs were detected in the groundwater samples with the exception of benzo(b)fluoranthene in one groundwater sample at a concentration of 0.17 ug/L exceeding the Class GA Standard of 0.002 ug/L.

Antimony, cadmium, copper, iron, lead, manganese, sodium, zinc exceeded Class GA Standards in one or more of the four total and dissolved metals samples collected. Iron, manganese, and sodium are common earth materials and are considered a lower risk to human health and the environment compared to the other metals detected in the groundwater. The metals exceedances in the groundwater are likely related to the metals detected in soils beneath the Site.

8. CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the Phase II, Tenen concludes the following:

- Based on the laboratory analysis, petroleum constituents were detected in soil vapor samples at concentrations above the NYSDOH indoor air database levels;
- Historic fill is located from below the building slab to depths between two and nine feet;
- Groundwater is present at approximately 7 below building slab;
- PCE, TCE, and carbon tetrachloride were not detected in soil vapor; 1,1,1-trichloroethane (1,1,1-TCA) was detected in SV-3 at 2.62 ug/m^3.
- Gasoline-related constituents (ethylbenzene, toluene, xylene and n-hexane) were detected in soil vapor above the NYSDOH-referenced indoor air background concentrations;
- No VOCs, pesticides, or PCBs were detected in soil above the Restricted Residential Use SCOs;
- Several metals were detected in soil above the Restricted Residential Use SCOs, including arsenic (maximum 51 mg/kg), barium (maximum 630 mg/kg), cadmium (maximum 37 mg/kg), copper (maximum 22,000 mg/kg), lead (maximum 5,600 mg/kg), mercury (maximum 9.1 mg/kg) and zinc (maximum 32,000 mg/kg). Iron (maximum 72,000 mg/kg) was detected above the Residential Use SCO;
- The metals concentrations are likely related to the presence of historic urban fill and C&D debris beneath the Site and, potentially, remnants from the historic uses of the Site including welding and auto repair operations;
- No PCBs or pesticides were detected in any groundwater samples;
- Only one VOC (MTBE, 11 ug/L) and one SVOC (benzo(b)fluoranthene, 0.17 ug/L) were detected in one groundwater sample above the Class GA Standards;
- Several metals including antimony, cadmium, copper, iron, lead, manganese, sodium and zinc exceeded Class GA Standards in one or more of the four total and dissolved metals samples collected. Dissolved exceedances of the Class GA Standards include antimony (maximum 7.58 ug/L), cadmium (maximum 22.1 ug/L), copper (maximum 988.5 ug/L), iron (maximum 445 ug/L), lead (maximum 35.12 ug/L), manganese (maximum 478 ug/L), sodium (maximum 1,430,000 ug/L) and zinc (maximum 9,470 ug/L); and,
- The metals exceedances in the groundwater are likely related to the metals detected in soils beneath the Site.

Therefore, Tenen recommends the following:

- A Remedial Action Plan (RAP) should be developed to address any potential impacts during construction activities and to the proposed future residential use.

FIGURES

TABLES

ATTACHMENTS

APPENDIX A
BORING LOGS

APPENDIX B
PROPOSED PROJECT PLANS

APPENDIX C
LABORATORY DELIVERABLES