
SUPPLEMENTAL REMEDIAL INVESTIGATION WORK PLAN

**767 East 133rd Street
BRONX, NEW YORK
NYSDEC BCP Site No. TBD**

Prepared for:

**New York State Department of Environmental Conservation
625 Broadway
Albany, NY 12233**

Prepared by:

**Langan Engineering, Environmental, Surveying, Landscape
Architecture and Geology, D.P.C.
21 Penn Plaza
360 West 31st Street, 8th Floor
New York, New York 10001**

DRAFT

**Mimi S. Raygorodetsky
Senior Associate/Vice President**

**Michael Burke, P.G., CHMM
Principal/Vice President**

LANGAN

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CERTIFICATION

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

Jason Hayes, PE, LEED^{AP}

DRAFT

1.0 INTRODUCTION

This Supplemental Remedial Investigation Work Plan (RIWP) was prepared on behalf of MARKLAND 745 LLC (Applicant) for the property located at 767 East 133rd Street, Bronx, New York (the site). The applicant seeks to enroll in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP). A BCP Application was submitted to the NYSDEC concurrently with this RIWP.

The scope of work proposed in this RIWP was developed to supplement soil, soil vapor and groundwater data summarized in the Remedial Investigation Report, prepared by Langan and dated July 2018 and is intended to delineate and characterize the nature and extent of environmental impacts at and emanating from the site and to provide sufficient information to evaluate remedial alternatives. This RIWP was developed in accordance with applicable New York State laws and regulations, including 6 NYCRR 375, the process and requirements identified in the NYSDEC "Division of Environmental Remediation (DER)-10: Technical Guidance for Site Investigation and Remediation" (May 2010) and the New York State Department of Health (NYSDOH) "Guidance for Evaluating Soil Vapor Intrusion in the State of New York, with updates" (October 2006).

2.0 SITE BACKGROUND

2.1 Site Description

The site is located at 767 East 133rd Street in the Port Morris neighborhood of the Bronx, New York and is identified as Block 2562, Lot 49 (formerly Lots 49, 56, 58 and 60) on the Bronx Borough Tax Map. A site location map is provided as Figure 1. The site is approximately 21,000 square feet (0.48 acres) in area and is comprised of a one-story building used as warehouse space, a three-story building with a cellar previously used for commercial office space, a storage shed, and an asphalt-paved parking lot. The site is bound by East 134th Street followed by a multi-story industrial/manufacturing building to the north, Willow Avenue followed by a multi-story industrial/manufacturing building to the east, East 133rd Street followed by multi-story industrial/manufacturing buildings to the south, and one- to two-story industrial/manufacturing and residential buildings to the west. A site plan is provided as Figure 2.

The site was assigned an E-Designation (E-454) for hazardous materials (Phase I and Phase II testing protocol) and air quality (HVAC fuel limited to natural gas and exhaust stack location limitations). The Applicant is seeking enrollment as a Volunteer in the BCP. An environmental investigation was completed at the site between May 21 and 24, 2018 as part of the New York City Community Brownfield Planning Area Program. The investigation identified impacts to soil, groundwater, and soil vapor.

A zoning map amendment (C 180088 ZMX to New York City Planning Commission Zoning Map 6b) was approved on June 7, 2018, that changed the zoning district from an M1-2 to an M1-4/R7D. This paired district promotes development and expansion of the longstanding mix of industrial and residential uses throughout the area. M1 districts typically include light industrial uses such as woodworking shops, repair shops, and wholesale service and storage facilities and R7 districts allow for residential use.

2.2 Surrounding Property Land Use

The site is located in an area generally characterized by single- and multi-story manufacturing/industrial and residential buildings in zoning districts designated for manufacturing and residential uses, as shown below:

DIRECTION	ADJOINING PROPERTIES	SURROUNDING PROPERTIES
North	East 134 th Street	Four-story light industrial/manufacturing building
East	Willow Avenue	Six-story industrial/manufacturing building operating as a commercial drycleaner
South	East 133 rd Street	One-story industrial/manufacturing building
West	740 East 134 th Street and 759 East 133 rd Street	One-story industrial/manufacturing building and two-story residential building

Public infrastructure (storm drains, sewers, and underground utility lines) exists within the streets surrounding the site.

Land use within a half-mile radius is urban and includes residential, commercial, institutional, and light industrial buildings and vacant land. The nearest ecological receptor is the Bronx Kill, located about 1,000 feet south of the site. Sensitive receptors, as defined in DER-10, located within a half mile of the site include those listed below:

Number	Name (Approximate distance from site)	Address
1	South Bronx Charter School For International Cultures & the Arts (approximately 0.22 miles northwest of the site)	164 Bruckner Blvd Bronx, NY 10454
2	ABC Stepping Stone Daycare (approximately 0.28 miles northwest of the site)	235 Cypress Ave Bronx, NY 10454
3	Pamela C Torres Day Care Center (approximately 0.38 miles northwest of the site)	161 St Ann's Ave Bronx, NY 10454
4	Adalgisa Morel Day Care (approximately 0.38 miles northwest of the site)	165 St Ann's Ave Bronx, NY 10454
5	PS 065 Mother Hale Academy (approximately 0.43 miles north of the site)	677 E 141st St Bronx, NY 10454
6	Tender Tots Day Care, Preschool & After School Programs (approximately 0.43 miles northwest of site)	531 E 137th St Bronx, NY 10454

2.3 Site Physical Conditions

2.3.1 Topography

According to the April 6, 2018 Survey prepared by Gerald T. O'Buckley Professional Land Surveyors, the site ground surface elevation ranges from about elevation (el) 12 to 14, relative to the North American Vertical Datum of 1988 (NAVD88). According to the United States Geological Survey (USGS) Brooklyn Quadrangle 7.5-minute Series Topographic Map, the surrounding area slopes gradually to the southeast towards the Bronx Kill.

2.3.2 Geology

According to soil descriptions provided in the July 2018 Remedial Investigation Report (RIR) prepared by Langan and the November 2017 geotechnical investigation conducted by Pillori Associates, historic fill material was identified beneath asphalt or concrete surfaces across the site to depths ranging from 8 to 13 feet below sidewalk grade (bsg). The fill was generally characterized as fine to medium sand with varying amounts of gravel, brick, coal ash, slag, plastic, concrete, and asphalt. The fill material was underlain by soft estuarine deposits and glacial soil. Bedrock was generally encountered between about 30 to 45 feet below grade surface (bgs); however, in some locations, borings were advanced to 85 feet and bedrock was not encountered.

According to the USGS Bedrock and Engineering Geologic Maps of New York County and Parts of Kings and Queens Counties, New York, and parts of Bergen and Hudson Counties, New Jersey, dated 1994, the site is underlain by Manhattan Schist (Lower Cambrian), which generally consists of gray, medium- to coarse-grained layered schist and gneiss with black amphibolite layers 3 feet thick or more.

2.3.3 Hydrogeology

Groundwater flow is typically topographically influenced, as shallow groundwater tends to originate in areas of topographic highs and flows toward areas of topographic lows, such as rivers, stream valleys, ponds, and wetlands. A broader, interconnected hydrogeologic network often governs groundwater flow at depth or in the bedrock aquifer. Groundwater depth and flow direction are also subject to hydrogeologic and anthropogenic variables such as precipitation, evaporation, extent of vegetation cover, coverage by impervious surfaces, and subsurface structures. Other factors influencing groundwater include depth to bedrock, the presence of anthropogenic fill, and variability in local geology and groundwater sources or sinks.

Infiltration of precipitation to the water table is likely minimal due to the presence of impervious surfaces throughout the site. The majority of runoff drains to city sewers and then to one of the several wastewater treatment plants that serve the city. Groundwater in the Bronx is not used

as a potable water source. Potable water provided to the City of New York is derived from surface impoundments in the Croton, Catskill, and Delaware watersheds.

Depth to groundwater encountered during the previous subsurface investigation ranged from about 0.47 feet below cellar slab in the 767 East 133rd Street building to 9.56 feet bsg, corresponding to el 3.59 to 5.54, respectively. Based on synoptic groundwater gauging, site groundwater flows to the southwest.

2.3.4 Wetlands

The possible presence of wetlands on or near the site was evaluated by reviewing the National Wetlands Inventory and NYSDEC regulated wetlands map. There are no wetlands on or adjacent to the site.

2.4 Summary of Previous Environmental Investigations

Previous environmental reports were reviewed to inform this RIWP. These reports are summarized below and are included in Appendix A.

- *Phase I Environmental Site Assessment, dated 24 June 2011, prepared by Omega Environmental Services, Inc. (Omega)*
- *Phase I Environmental Site Assessment, dated 27 June 2011, prepared by Ethan C. Eldon Associates.*
- *Basement Soil Sample Results Summary, dated 29 June, 2011, prepared by Omega*
- *Phase I Environmental Site Assessment, dated 18 November 2016, prepared by Middleton Environmental, Inc.*
- *Preliminary Geotechnical Investigation, dated November 17, 2017, prepared by Pillori Associates*
- *Remedial Investigation Report, dated July 2018, prepared by Langan*

June 24, 2011 Phase I Environmental Site Assessment, by Omega Environmental Services, Inc. (Omega)

The Phase I ESA was conducted in accordance with the ASTM E-1527-05 standards and prepared for Miller Druck Specialty Contracting, Inc. The Phase I ESA identified an out-of-service aboveground storage tank (AST) encased in concrete with unknown capacity at the site and recommended that the tank be registered. No visual indications of impacts were identified near the AST. Omega also recommended further investigation for sampling of "soil-like material" accumulated on the cellar slab from previous flooding events at the site.

June 27, 2011 Phase I Environmental Site Assessment, by Ethan C. Eldon Associates

Ethan C. Eldon Associates prepared a Phase I ESA in accordance with the ASTM E-1527-05 standards. The report was prepared for Altmark Group LLC for the Block 2562 Lots 49, 56, 58, 60, 65 thru 68 for purchasing. Based on a review of the findings specific to the site, the presence of an oil storage tank and oil stains in the basement and in the boiler room at 767 East 133rd Street (Lot 56) were identified as RECs.

The Phase I ESA references an E-Designation (E-143) for hazardous materials and noise (E-144) for 745, 747, 749, and 751 East 133rd Street and documents the location within the 100-year flood plain.

June 29, 2011 Basement Soil Sample Results Summary, by Omega

The letter report summarizes the laboratory analytical results of two soil samples collected at the site. The samples were collected from the area near the AST and the drum that were identified during Omega's Phase I ESA. Sample results are summarized as follows:

- Total PCB concentrations exceed NYSDEC 6 NYCRR Part 375 Restricted Use Restricted Residential Soil Cleanup Objectives (SCO)
- Semivolatile organic compounds (SVOC) did not exceed NYSDEC 6 NYCRR Part 375 Unrestricted Use SCOs.
- TPH DRO concentrations were 154 milligrams per kilogram (mg/kg) near the oil tank and 212 mg/kg near the drum.
- VOCs and TPH GRO concentrations were non-detect.

November 18, 2016 Phase I Environmental Site Assessment Report, by Middleton Environmental, Inc.

The Phase I ESA was prepared for refinancing purposes and did not identify any RECs. Langan's review of Phase I ESA identified the following:

- Historical uses of environmental concern at the site included a piano string manufacturer (circa 1927 to 1976) and an automotive parts and equipment company (circa 1976).
- The report also identified Resource Conservation and Recovery Act (RCRA) hazardous waste generator sites for the generation of halogenated solvents on the eastern-adjointing property and three NYSDEC closed spills within a 0.125-mile radius of the site.

November 17, 2017 Preliminary Geotechnical Investigation, by Pillori Associates

The report describes a geotechnical investigation performed between October 30 and November 7, 2017. Fill material consisting of sand, silt, gravel, and miscellaneous debris, brick, and asphalt

fragments was identified from below the concrete and asphalt surface to 8 to 13 bgs, followed by a discontinuous tidal marsh deposit consisting of silt, clay and peat approximately 6 to 15 feet thick and extending to depths of 16 to 23 feet bgs. A layer of varying thickness of glacial alluvium underlies the marsh deposit layer. Inwood Marble and Gneiss bedrock was encountered in four borings located on the northern half of the site at depths ranging from 30 to 45 feet bgs; however, bedrock was not encountered in two borings. The geotechnical report states that deep zones of decomposed rock are typical for inter-bedded rock formations with steep folds. Groundwater was measured at approximately 8.4 feet bgs.

July 2018 Remedial Investigation Report, prepared by Langan

The Remedial Investigation (RI) was performed under the New York City (NYC) Brownfield Jumpstart Program and the NYC Community Brownfield Planning Area Program and is consistent with applicable guidance. The RI included a geophysical survey, installation of soil borings, groundwater monitoring wells and temporary soil vapor points, and soil, groundwater and soil vapor sampling. The following observations were made during the July 2018 RI:

- The geophysical survey did not identify any anomalies indicative of underground storage tanks (UST).
- The AST that was identified in the 2011 Phase I ESAs with unknown capacity and content was not observed during Langan's site visit on 5 September 2018.
- The investigation included advancement of nine soil borings and installation of five permanent groundwater monitoring wells and eight temporary soil vapor probes.
- The subsurface consisted of historic fill material from below the surface cover (asphalt or building slab) to a maximum depth of about 8 feet bgs. The fill layer was underlain by native soil primarily consisting of silt, sand and clay.
- Grossly impacted material was not observed during the investigation. Photoionization detector (PID) readings in soil did not exceed background conditions. Chemical and petroleum-like staining or odors were not apparent during soil sampling and no petroleum-like sheen was observed on groundwater.
- Groundwater was encountered from 0.47 feet below the cellar slab in the 767 East 133rd Street building to 9.56 feet bgs in the parking lot, corresponding to groundwater elevations ranging from el 3.59 to 5.54. Based on the groundwater measurements, site groundwater flows southwest.
- Soil samples were collected from depths ranging from 0 to 15 feet bgs and results were compared to the NYSDEC Title 6 NYCRR Part 375 Unrestricted Use (UU) and Restricted

Use Restricted-Residential (RURR) Soil Cleanup Objectives (SCO). The results are summarized below:

- Volatile organic compounds (VOC) – VOCs were not detected at concentrations above UU SCOs in any soil samples, with the exception of acetone, which was detected above the UU SCO but below the RURR SCO (maximum [max] concentration 0.19 milligrams per kilogram [mg/kg]). Acetone is a common laboratory artifact and likely not representative of site conditions.
- Semivolatile organic compounds (SVOC) – Seven SVOCs, including benzo(a)anthracene (max concentration 20 mg/kg), benzo(a)pyrene (max concentration 17 mg/kg), benzo(b)fluoranthene (max concentration 24 mg/kg), benzo(k)fluoranthene (max concentration 7.6 mg/kg), chrysene (max concentration 17 mg/kg), indeno(1,2,3-cd)pyrene (max concentration 3.3 mg/kg), and dibenzo[a,h]anthracene (max concentration 3.6 mg/kg), were detected at concentrations above UU and RURR SCOs.
- Pesticides – Four pesticides, including total chlordane (max concentration 0.13 mg/kg), p-p'-DDE (max concentration 0.13 mg/kg), p,p'-DDD (max concentration 0.13 mg/kg), and p-p'-DDT (max concentration 0.13 mg/kg), were detected at concentrations above UU SCOs but not RURR SCOs.
- Polychlorinated biphenyls (PCB) – Total PCBs were not detected at concentrations above UU SCOs in any soil samples,, with the exception of one sample, which was detected above the UU SCO but below the RURR SCO (max concentration 0.29 mg/kg of total PCBs).
- Metals – Eight metals, including barium (max concentration 1,000 mg/kg), cadmium (max concentration 3.5 mg/kg), chromium (max concentration 110 mg/kg), copper (max concentration 440 mg/kg), lead (max concentration 1,000 mg/kg), mercury (max concentration 5.2 mg/kg), nickel (max concentration 100 mg/kg), and zinc (max concentration 2,400 mg/kg), were detected at concentrations exceeding UU and RURR SCOs. Samples with metals concentrations exceeding 20 times the Toxicity Characteristic Leaching Procedure (TCLP) limit for hazardous waste were run for TCLP analysis. All TCLP analytical results were below the hazardous waste limit.
- Groundwater samples were compared to the NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values (SGV) for Class GA water. The results are summarized below:
 - VOCs – Seven chlorinated VOCs (CVOC) including 1,1,1-trichloroethane (TCA - max concentration 130 micrograms per liter [µg/L]), 1,1-dichloroethane (1,1-DCA - max concentration 38 µg/L), 1,1-dichloroethene (1,1-DCE - max concentration 65

- $\mu\text{g/L}$), cis-1,2-dichloroethene (cis-1,2-DCE - max concentration 320 $\mu\text{g/L}$), tetrachloroethene (PCE - max concentration 3,700 $\mu\text{g/L}$), trichloroethene (TCE - max concentration 420 $\mu\text{g/L}$), and vinyl chloride (VC - max concentration 5.6 $\mu\text{g/L}$), were detected at concentrations exceeding their SGVs.
- SVOCs, Pesticides, Herbicides, and PCBs – SVOCs, pesticides, herbicides and PCBs were not detected at concentrations above SGVs in any groundwater samples.
 - Dissolved Metals – Three dissolved metals, iron (max concentration 3,200 $\mu\text{g/L}$), manganese (max concentration 3,000 $\mu\text{g/L}$), and sodium (maximum 520,000 $\mu\text{g/L}$), were detected at concentrations exceeding their SGVs. These compounds are likely associated with regional conditions.
 - Soil vapor samples were compared to New York State Department of Health (NYSDOH) Final Guidance on Soil Vapor Intrusion (May 2017) Matrix A, B, and C guidance values. Samples showed petroleum-related VOCs and chlorinated VOCs present in soil vapor.
 - The total concentration of petroleum-related VOCs (BTEX – benzene, toluene, ethylbenzene, and xylene) ranged from 32.4 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) to 49.7 $\mu\text{g}/\text{m}^3$.
 - PCE and TCE were detected in one sample (SV07_062218) at 160 and 8.4 $\mu\text{g}/\text{m}^3$, respectively. VOCs were not detected above comparison criteria in any other sample. In the absence of indoor air samples, the results for PCE and TCE in soil vapor samples indicate a range of suggested action from “no further action” through “mitigate”.

A summary of soil, groundwater, and soil vapor sampling results as discussed above is provided in Figures 3, 4, and 5, respectively.

2.5 Areas of Concern

Based on site history and the findings of the previous studies, the areas of concern (AOC) to be further investigated during the RI are described below and shown on Figure 6:

AOC 1: Historic Fill Material

Historic fill material from unknown sources was used as backfill during various phases of the site development history. Historic fill was identified at depths ranging from 8 to 13 feet bgs across the site in previous studies and samples collected from the historic fill layer revealed concentrations of metals and SVOCs commonly associated with historic fill above UU and RRU SCOs.

AOC 2: Prior Site Use

The site was historically used as a piano string manufacturer and an automotive parts and equipment company. Releases of petroleum products, solvents or other hazardous substances associated with the past uses may have adversely affected soil, soil vapor, and/or groundwater.

AOC 3: Current and Historical Use of the Adjoining Properties

Potential environmental impacts may be associated with current and historical use of the adjoining properties, including dry cleaning use at the eastern-adjoining property and USTs at the southern-adjoining property. Historical releases of petroleum products, solvents or other hazardous substances associated with these properties may have adversely affected soil, soil vapor, and/or groundwater.

AOC 4: Chlorinated Volatile Organic Compounds in Groundwater and Soil Vapor

CVOCs including 1,1,1-trichloroethane, 1,1-dichloroethane, cis-1,2-dichloroethene, PCE, TCE, and vinyl chloride were detected in four of the five groundwater samples at concentrations exceeding TOGS SGVs. PCE and TCE were also detected in all soil vapor samples, including one soil vapor sample result (SV07), collected from the southwestern part of the site, that exceeded the minimum value at which mitigation is recommended, per the NYSDOH Decision Matrices. Application of the sample results to the NYSDOH Decision Matrices found that recommendations range from “no further action” to “mitigate.” The extent of soil vapor impacts and a possible source for these impacts will be evaluated as part of the RI.

3.0 SCOPE OF WORK

The objective of this RIWP is to investigate and characterize “the nature and extent of the contamination at and/or emanating from the brownfield site”, per Environmental Conservation Law (ECL) Article 27, Title 14 (Brownfield Cleanup Program). The rationale for each sampling location in relation to the AOCs and analytical parameters for each proposed sample are provided in Table 1. The field tasks are briefly outlined below and are discussed in more detail in the following sections.

Geophysical Survey

- Perform a geophysical survey to locate unidentified USTs or underground structures and utilities - sampling locations may be relocated as necessary based on the findings of the geophysical survey.

Soil Borings and Sampling

- Advance 9 soil borings up to 20 feet bgs or about 5 feet below the water table.
- Collect up to 3 soil samples from soil boring locations for a total of 27 soil samples (plus quality assurance/quality control [QA/QC] samples) for laboratory analysis.
- Advance 4 delineation soil borings to 8 feet bgs around previously completed soil boring SB06 and 2 delineation soil borings to 10 feet bgs around previously completed soil boring SB02.

Collect one soil samples from each delineation soil boring locations for a total of 6 soil samples.

Monitoring Well Installation and Sampling

- Install and develop two permanent monitoring wells.
- Collect one groundwater sample from each of five existing and the two newly installed monitoring well for a total of seven samples (plus QA/QC samples) for laboratory analysis.
- Survey and gauge newly installed monitoring wells to establish groundwater elevations
- Evaluate groundwater flow direction by conducting a synoptic gauging event of the newly installed wells and the existing wells (previously surveyed).

Soil Vapor and Ambient Air Sampling

- Install five soil vapor points at a depth of about two feet above the groundwater table.

- Collect one vapor sample from each vapor point (plus QA/QC samples) for laboratory analysis
- Collect one outdoor ambient air sample as a QA/QC sample for laboratory analysis.

Modifications to this scope of work may be required: 1) due to site operations, equipment or other access restrictions; 2) in the event that unexpected contamination is detected and additional analytical data is needed; and 3) to adequately characterize and delineate impacts in compliance with the Brownfield Law, regulations and applicable investigation guidance documents (e.g., DER-10). Decisions to collect additional data may be based on field observations and/or preliminary laboratory data received during the investigation. NYSDEC and NYSDOH will be contacted, as reasonable, during this decision making process.

The field investigation will be completed in accordance with NYSDEC DER-10 Guidance and the procedures specified in the Health and Safety Plan (HASP) and Quality Assurance Project Plan (QAPP) included as Appendices B and C, respectively. A Community Air Monitoring Plan (CAMP) will be implemented during this investigation (see Section 3.8.2 and Appendix D).

The names, contact information and roles of the principal personnel who will participate in the investigation, project managers, and subcontractors are listed below. The HASP contains emergency contact information (HASP Table 5) and a map with a route to the nearest hospital (HASP Figure 2). Resumes for Langan employees involved in the project are included in the QAPP (Appendix C).

Personnel	Investigation Role	Contact Information
Mimi Raygorodetsky Langan	Project Leader	Phone – 212-479-5441 Email – mraygorodetsky@langan.com
Ilkay Cam-Spanos Langan	Project Manager	Phone – 212-479-5410 Email – icam@langan.com
Michael Burke, PG, CHMM Langan	Quality Assurance Officer	Phone – 212-479-5413 Email – mburke@langan.com
Jason Hayes, P.E. Langan	Project Engineer	Phone – 212-479-5427 Email – jhayes@langan.com
Tony Moffa, CHMM, CSP Langan	Langan Health & Safety Officer	Phone – 215-491-6500 Email – tmoffa@langan.com
William Bohrer, PG Langan	Field Safety Officer	Phone – 410-984-3068 Email – wbohrer@langan.com
Julia Leung Langan	Field Team Leader	Phone – 212-479-5438 Email – tchow@langan.com
Maureen Stone Hampton-Clarke	Laboratory Contractor	Phone – 973-244-9770 Email – mstone@hcvlab.com
Emily Strake, CEP Langan	Program Quality Assurance Monitor/	Phone – 215-491-6526 Email – estrake@langan.com

Personnel	Investigation Role	Contact Information
	Data Validator	

3.1 Geophysical Survey

We will coordinate with a geophysical contractor to clear subsurface testing locations of potential subsurface utilities and to attempt to locate any USTs and utilities. The geophysical survey will be completed using a collection of geophysical instruments, including electromagnetic and utility line locator instruments and ground-penetrating radar (GPR). Borings will be relocated as necessary to avoid subsurface utilities, infrastructure, or other impediments identified during the survey.

3.2 Soil Investigation

3.2.1 Drilling and Logging

An environmental drilling subcontractor will advance at least 9 soil borings (designated SB09 through SB17) and 6 delineation soil borings (SB06N, SB06E, SB06S and SB06W to delineate elevated mercury concentration, and SB02W and SB02E to delineate elevated SVOCs concentrations) to further investigate the AOCs identified in Section 2.5. A plan showing the proposed boring locations is included as Figure 6. A Langan field scientist or engineer will document the work, screen the soil samples for environmental impacts, and collect environmental samples for laboratory analyses. Work will comply with the safety guidelines outlined in the HASP (Appendix B).

Soil borings will be advanced using direct-push drilling technology (Geoprobe®) up to 20 feet bgs or 10 feet into the water, whichever is shallower, or until no evidence of a chemical or petroleum release are observed. Soil will be screened continuously to the boring termination depth with a PID equipped with a 10.6 electron volt (eV) bulb and for visual and olfactory evidence of environmental impacts (e.g., staining and odor). Soil will be visually classified for color, grain size, texture, and moisture content, and observations will be recorded in a field log. Non-disposable, down-hole drilling equipment and sampling apparatus will be decontaminated between locations with Alconox® and water.

3.2.2 Soil Sampling and Analysis

Up to three grab soil samples will be collected for laboratory analysis from each soil borings. One surficial soil sample will be collected from the 0- to 2-foot bgs historic fill interval. A second sample will be collected from the interval exhibiting the greatest degree of observed potential impacts (based on the presence of staining, odor, and/or PID readings above background). If no impacts are observed, the sample will be collected from the groundwater interface. A third

sample will be collected from the non-impacted interval immediately below observed impacts or at the bottom of the boring.

Up to two grab soil samples will be collected for laboratory analysis from each delineation soil borings. Soil samples delineating soil boring SB02 will be collected from 7 to 8 feet bgs and 8 to 9 feet intervals. Soil samples delineating soil boring SB06 will be collected from 1 to 2 feet bgs and 6 to 8 feet intervals.

The proposed soil samples are summarized in Table 1.

The samples will be collected in laboratory-supplied containers and will be sealed, labeled, and placed in an ice-chilled cooler (to attempt to maintain a temperature of 4°C) for delivery to a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory. Soil samples will be analyzed using the latest United States Environmental Protection Agency (USEPA) methods as follows:

- Part 375 List and Target Compound List (TCL) VOCs by USEPA methods 8260C/5035;
- Part 375 List and TCL SVOCs by USEPA method 8270D;
- Part 375 List PCBs by USEPA method 8082A;
- Target Analyte List (TAL)/Part 375 List metals (including cyanide and hexavalent and trivalent chromium) by USEPA Methods 6010C/7471B/9010C/7196A; and
- Part 375 List pesticides by USEPA methods 8081B and 8151A;

In addition, twenty percent of soil samples will be analyzed for the following:

- NYSDEC List for per- and poly-fluoroalkyl substances (PFAS) by EPA Method 537; and
- 1,4-dioxane by EPA Method 8270 SIM isotope dilution.

Delineation soil samples from around soil boring SB02 will be analyzed for Part 375 SVOCs by USEPA method 8270D. Delineation soil samples from around soil boring SB06 will be analyzed for total mercury by USEPA Methods 7471B.

A list of the PFAS compounds is provided in Table 2.

QA/QC procedures to be followed are described in the QAPP in Appendix C.

3.3 Groundwater Investigation

3.3.1 Monitoring Well Installation

Two soil borings will be converted to permanent groundwater monitoring wells. A plan showing the proposed well locations is included as Figure 6. Wells will be installed across the observed water table and will be constructed with 2-inch diameter, threaded, flush-joint, polyvinyl chloride (PVC) casing and 0.01-inch slot well screens (about 10 feet in length). Clean sand (e.g. No. 1 or No. 2) will be used to fill the annulus around the screen up to about two feet above the top of the screened interval. A two-foot bentonite seal will be installed above the sand and the borehole annulus will be grouted to the surface. The wells will be finished with flush-mounted steel manhole covers.

After installation, the two new and five existing monitoring wells will be developed using either a weighted bailer or surge block across the well screen to agitate and remove fines. The bailer or surge block will be moved within the well screen in 2- to 3-foot increments for approximately 2 minutes per increment. After surging, the well will be purged via pumping until the water becomes clear (having turbidity less than 50 Nephelometric Turbidity Units [NTU]) and other water quality parameters (pH, specific conductance, temperature, dissolved oxygen, oxidation reduction potential, and drawdown) have stabilized. The well will then be allowed to sit for a minimum of one week prior to collecting groundwater samples.

3.3.2 Monitoring Well Survey

The location and elevation of the newly installed groundwater monitoring wells (top of casing elevations) will be surveyed, and existing and newly installed monitoring wells will be gauged synoptically. Based on the existing monitoring well survey data and the new data to be collected, a groundwater contour map will be prepared to evaluate the direction of groundwater flow. Vertical control will be established by surveying performed relative to the NAVD88 datum by a NYS-licensed land surveyor. Elevations of the top of monitoring well casings and protective well casings will be surveyed to the nearest 0.01 foot.

3.3.3 Groundwater Sampling and Analysis

Groundwater samples will be collected from both newly installed and five existing monitoring wells, as summarized in Table 1. Prior to sampling, the monitoring wells will be gauged for static water levels and purged. Purging will consist of pumping, at minimum, the stabilized drawdown volume plus the pump's tubing volume, and waiting until the physical and chemical parameters (e.g., temperature, dissolved oxygen, oxygen reduction potential, turbidity) stabilize within the ranges specified in the USEPA's Low Stress Purging and Sampling Procedure for the Collection of Groundwater Samples From Monitoring Wells, dated July 30, 1996, and revised January 19, 2010. Samples will be collected with a submersible pump and dedicated polyethylene tubing.

The pump will be decontaminated with Alconox® and water between each sample location. Development and purge water will be containerized for off-site disposal.

The groundwater samples will be collected in laboratory-supplied containers and will be sealed, labeled, and placed in an ice-chilled cooler (to attempt to maintain a temperature of 4°C) for delivery to the laboratory. Groundwater samples will be analyzed using the latest USEPA methods as follows:

- TCL VOCs by USEPA method 8260C;
- TCL SVOCs by USEPA method 8270D;
- Metals (filtered and unfiltered) by USEPA method 6010C/7470;
- NYSDEC List for per- and poly-fluoroalkyl substances (PFAS) by EPA Method 537; and
- 1,4-dioxane by EPA Method 8270 SIM isotope dilution.

A list of the PFAS compounds is provided in Table 2.

QA/QC procedures to be followed are described in the QAPP in Appendix C.

3.4 Soil Vapor Investigation

3.4.1 Soil Vapor Point Installation

Five soil vapor points will be installed using direct-push technology in accordance with the NYSDOH "Guidance for Evaluating Soil Vapor Intrusion in the State of New York" (October 2006, updated May 2017 [NYSDOH Soil Vapor Guidance Document]). A plan showing the proposed soil vapor locations is included as Figure 6. Soil vapor points will be installed by advancing a vapor probe to about 2 feet above the observed groundwater table.

The soil vapor collection points will consist of inert sample tubing (i.e., polyethylene), with the tubing at each of the soil vapor points attached to a 1.875-inch polyethylene implant. The annulus (i.e., the sampling zone) around the installed implants and/or tubing will be filled with a clean, coarse sand pack followed by a hydrated bentonite seal to surface grade.

3.4.2 Soil Vapor Sampling and Analysis

Samples will be collected in general accordance with the NYSDOH Soil Vapor Guidance Document. The proposed vapor samples are summarized in Table 1. Before collecting vapor samples, a minimum of three vapor probe volumes (i.e., the volume of the sample implant and tubing) will be purged from each sample point at a rate of less than 0.2 liters per minute using a RAE Systems MultiRAE® meter. Purged soil vapor will be monitored for VOCs and methane with the MultiRAE® during purging.

A helium tracer gas will be used in accordance with NYSDOH protocols to serve as a QA/QC technique to document the integrity of each soil vapor sampling point seal before and after sampling. The tracer gas will be introduced into a container surrounding the vapor point and seal. Helium will be measured from the sampling tube and inside the container. If the sample tubing contains more than 10% of the tracer gas concentration that was introduced into the container, then the seal is considered compromised and should be enhanced or reconstructed to reduce outside air infiltration.

After integrity of each seal is confirmed, soil vapor samples will be collected into laboratory-supplied, batch-certified clean 2.7- or 6-liter Summa[®] canisters with calibrated flow controllers. Soil vapor samples will be collected over a 2-hour sampling period. All vapor samples will be analyzed for VOCs by USEPA Method TO-15.

A log sheet for each soil vapor sample will be completed to record sample identification, date and time of sample collection, sampling depth, name of the field engineer or scientist responsible for sampling, sampling methods and equipment, vapor purge volumes, volume of vapor extracted, flow rate, and vacuum of canisters before and after sample collection.

3.4.3 Ambient Air Sampling

An ambient air sample will be collected at a height above the ground to represent the breathing zone (about 3 to 5 feet). The air sample will be collected into laboratory-supplied, batch-certified clean 2.7- or 6-liter Summa[®] canisters with calibrated flow controllers over a two-hour sampling period (concurrently with the soil vapor samples) and analyzed for VOCs by USEPA TO-15 to evaluate potential outdoor air interferences with the sampling apparatus.

QA/QC procedures to be followed are described in the QAPP in Appendix C.

3.5 Sampling Contingency

Additional soil, groundwater, and soil vapor sampling locations may be completed, as needed, to evaluate unanticipated contamination and to horizontally and vertically delineate identified contamination (e.g., non-aqueous phase liquid [NAPL], VOCs, SVOCs, metals, or other analytes) based on field observations and/or preliminary (un-validated) analytical results. The objective of sampling contingency is to provide for adequate delineation of AOCs during a single mobilization event. The decision to complete additional sampling and delineation (including step-out distances and target-depth intervals) based on field observations and/or preliminary laboratory data will be made by Langan in consultation with NYSDEC and NYSDOH Project Managers, where appropriate. The location of any step-out soil borings and additional monitoring wells will be based on field observations and analytical data from adjacent borings and wells, site access and drilling considerations. Sampling depths and analyses will be contingent on findings.

3.6 Data Management and Validation

Laboratory analyses of soil, groundwater, vapor, and air samples will be conducted by an NYSDOH ELAP-approved laboratory in accordance with USEPA SW-846 methods and NYSDEC Analytical Services Protocol (ASP) Category B deliverable format. Environmental data will be reported electronically using the database software application EQuIS as part of NYSDEC's Environmental Information Management System (EIMS).

QA/QC procedures required by the NYSDEC ASP and SW-846 methods, including initial and continuing instrument calibrations, standard compound spikes, surrogate compound spikes, and analysis of other samples (blanks, laboratory control samples, and matrix spikes/matrix spike duplicates), will be followed. The laboratory will provide sample bottles, which will be pre-cleaned and preserved in accordance with the SW-846 methods. Where there are differences in the SW-846 and NYSDEC ASP requirements, the NYSDEC ASP shall take precedence.

Data validation will be performed in accordance with the USEPA validation guidelines for organic and inorganic data review. Validation will include the following:

- Verification of QC sample results (both qualitative and quantitative).
- Verification of sample results (both positive hits and non-detects).
- Recalculation of 10 percent of all investigative sample results.
- Preparation of Data Usability Summary Reports (DUSRs).

The DUSRs will be prepared and reviewed by the Program Quality Assurance Monitor (PQAM). The DUSRs will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and COC procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method. A detailed assessment of each sample delivery group (SDG) will follow. Additional details on the DUSRs are provided in the QAPP in Appendix C.

3.7 Management of Investigation-Derived Waste

Soil cuttings will be returned to the borehole unless:

- Free product or grossly-contaminated soil is present in the cuttings;
- Backfilling the borehole with cuttings will create a significant path for vertical movement of contaminants. Soil additives (bentonite) may be added to the cuttings to reduce

permeability; and

- The soil cannot fit into the borehole.

Boreholes requiring disposal of drill cuttings will be filled with hydrated bentonite chips or clean sand and capped with asphalt or concrete. Excess investigation-derived waste (IDW), including soil cuttings, purged groundwater, and decontamination fluids, will be containerized in properly-labeled and sealed United Nations/Department of Transportation (UN/DOT)-approved 55-gallon drums and staged for future waste characterization and off-site disposal at a facility permitted to accept the waste. The drums will be staged in a secure area on-site, pending receipt of laboratory data and off-site disposal to an appropriate facility. Spent disposable sampling equipment, including gloves, bags, and paper towels, will be double-bagged and disposed as municipal trash in a dumpster or garbage can.

3.8 Air Monitoring

Air monitoring will be conducted for site workers and the community (Community Air Monitoring Program) during soil intrusive activities. Air monitoring results will be recorded in the field book during the investigation activities, downloaded from field instruments and summarized in daily reports.

3.8.1 Worker Air Monitoring

Air monitoring of the breathing zone will be performed periodically during drilling and sampling activities to document health and safety protection for the work team. VOCs will be monitored with a PID in accordance with the HASP (Appendix B). If air monitoring during intrusive operations identifies the presence of VOCs, the field engineer or scientist will follow the guidelines outlined in the HASP regarding action levels, permissible exposure, engineering controls, and personal protective equipment. If the VOC action level is exceeded, work will cease and the work location will be evacuated. Monitoring will continue until the levels drops to permissible limits, at which point, work will resume with continued monitoring. If high levels persist, field activities will be halted and the work relocated to another area. If dust emissions are observed, work will stop and dust suppression measures (i.e., water spray) will be implemented.

3.8.2 Community Air Monitoring Plan

In addition to air monitoring in the worker breathing zone, community air monitoring will be performed in compliance with the NYSDOH CAMP during any outdoor intrusive work. The CAMP is included in Appendix D.

CAMP will consist of continuous monitoring for VOCs and dust emissions during ground-intrusive activities (i.e., soil boring and monitoring well installation). Upwind concentrations will be measured at the start of each workday, and periodically thereafter, to establish background concentrations. VOCs and dust emissions will be monitored at the downwind perimeter of the work zone, which will be established at a point on the site where the general public or site employees may be present. VOC monitoring will be conducted with a PID equipped with a 10.6 eV lamp. VOC community air monitoring requirements will be conducted until it is determined that the site is not a source of organic vapors. Dust emissions will be monitored using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM10) and capable of averaging a period of 15 minutes (or less) for comparison to the airborne particulate action level (e.g., DustTrak). If dust emissions are observed, work will stop and dust suppression measures will be used. The results will be presented in the daily reports.

3.9 Qualitative Human Health Exposure Assessment

A Qualitative Human Health Exposure Assessment will be conducted in accordance with Appendix 3B of the NYSDEC DER-10, Technical Guidance for Site Investigation and Remediation. The assessment will be submitted in the RIR.

4.0 REPORTING

4.1 Remedial Investigation Report (RIR)

After completion of the RI and receipt of analytical data, an RIR will be prepared. The report will include:

- A summary of the site history and previous investigations
- A description of on- and off-site conditions
- Sampling methodology and field observations
- An evaluation of the results and findings
- Conclusions and recommendations for any further assessment (if warranted), and remedial action objectives

The report will summarize the nature and extent of contamination at each area of concern and identify unacceptable exposure pathways (as determined through a Qualitative Human Health Exposure Assessment).

The report will include soil boring, monitoring well and soil vapor point construction logs, sampling logs, tabulated analytical results, figures, and laboratory data packages. The tabulated analytical results will include sample location, media sampled, sample depth, field/laboratory identification numbers, analytical results and the applicable Standards, Criteria, and Guidance (SCG) pertaining to the site and contaminants of concern for comparison. The report will include scaled figures showing the locations of soil borings, monitoring wells, and soil vapor points, sample concentrations above SCGs for each media, groundwater elevation contours and flow direction, and, if appropriate, groundwater contaminant concentration contours.

5.0 SCHEDULE

The following table presents an anticipated schedule for the proposed RI and reporting following the approval of the RIWP. If the schedule changes, it will be updated and submitted to the NYSDEC.

Milestone	Weeks from NYSDEC Approval of RIWP	Estimated Duration (weeks)
Supplemental RI Mobilization	2	2
Supplemental RI Field Investigation	4	2
Laboratory Analysis	8	4
Remedial Investigation Report Preparation and Submission to the NYSDEC	16	6

TABLES

**Table 1
Proposed Sample Summary
Remedial Investigation Work Plan
767 East 133rd Street
Bronx, NY
Langan Project No. 170497201**

No.	Sample Name	Type	Boring	Rationale	Depth ¹	Analyses
SITE WIDE SOIL						
1	SB-09_0-2	Grab	SB-09	Investigate AOC 1, 2	upper 2 feet of historic fill	TCL / Part 375-list ² of VOCs & SVOCs, Part 375 PCBs & Pesticides, and TAL / Part 375 Metals including cyanide and hexavalent and trivalent chromium Twenty percent of soil samples will be analyzed for PFCs and 1,4-dioxane
2	SB-09_depth				greatest degree of impacts or groundwater interface	
3	SB-09_depth				clean interval below impacts or boring termination depth	
4	SB-10_0-2		SB-10	Investigate AOC 1, 2	upper 2 feet of historic fill	
5	SB-10_depth				greatest degree of impacts or groundwater interface	
6	SB-10_depth				clean interval below impacts or boring termination depth	
7	SB-11_0-2		SB-11	Investigate AOC 1, 2, 3	upper 2 feet of historic fill	
8	SB-11_depth				greatest degree of impacts or groundwater interface	
9	SB-11_depth				clean interval below impacts or boring termination depth	
10	SB-12_0-2		SB-12	Investigate AOC 1, 2	upper 2 feet of historic fill	
11	SB-12_depth				greatest degree of impacts or groundwater interface	
12	SB-12_depth				clean interval below impacts or boring termination depth	
13	SB-13_0-2		SB-13	Investigate AOC 1, 2, 3	upper 2 feet of historic fill	
14	SB-13_depth				greatest degree of impacts or groundwater interface	
15	SB-13_depth				clean interval below impacts or boring termination depth	
16	SB-14_0-2		SB-14	Investigate AOC 1, 2	upper 2 feet of historic fill	
17	SB-14_depth				greatest degree of impacts or groundwater interface	
18	SB-14_depth				clean interval below impacts or boring termination depth	
19	SB-15_0-2		SB-15	Investigate AOC 1, 2, 3	upper 2 feet of historic fill	
20	SB-15_depth				greatest degree of impacts or groundwater interface	
21	SB-15_depth				clean interval below impacts or boring termination depth	
22	SB-16_0-2		SB-16	Investigate AOC 1, 2, 3	upper 2 feet of historic fill	
23	SB-16_depth				greatest degree of impacts or groundwater interface	
24	SB-16_depth				clean interval below impacts or boring termination depth	
25	SB-17_0-2		SB-17	Investigate AOC 1, 2, 3	upper 2 feet of historic fill	
26	SB-17_depth				greatest degree of impacts or groundwater interface	
27	SB-17_depth				clean interval below impacts or boring termination depth	
28	SBDUP01_date	Duplicate	TBD	QA/QC	TBD	Part 375 VOCs
29	SBDUP02_date					
NA	MS/MSD-SS01_date	MS/MSD	NA	QA/QC	NA	Part 375 VOCs
	MS/MSD-SS02_date					
	SBFB01_date	Field Blank				
	SBFB02_date					
SBTB01_date	Trip Blank					
DELINEATION SOIL						
1	SB-02W_7-8	Grab	SB-02W	Investigate AOC 1	7 to 8	TCL / Part 375-list ² SVOCs
2	SB-02W_8-9				8 to 9	
3	SB-02E_7-8		SB-02E	Investigate AOC 1	7 to 8	
4	SB-02E_8-9				8 to 9	
5	SB-06N_0-2		SB-06N	Investigate AOC 1	0 to 2	Total Mercury
6	SB-06N_6-8				6 to 8	
7	SB-06E_0-2		SB-06E	Investigate AOC 1	0 to 2	
8	SB-06E_6-8				6 to 8	
9	SB-06S_0-2		SB-06S	Investigate AOC 1	0 to 2	
10	SB-06S_6-8				6 to 8	
11	SB-06W_0-2		SB-06W	Investigate AOC 1	0 to 2	
12	SB-06W_6-8				6 to 8	
GROUNDWATER						
1	MW-01_date	Grab	MW-01*	Investigate AOC 2, 3, 4	center of water column	TCL VOCs and SVOCs, Part 375 PCBs & Pesticides, and TAL Metals (total and dissolved [field filtered]), 1,4-dioxane, and PFCs
2	MW-02_date		MW-02*			
3	MW-03_date		MW-03*			
4	MW-04_date		MW-04*			
5	MW-05_date		MW-05*			
6	MW-10_date		MW-10			
7	MW-16_date		MW-16			
8	GWDUP01_date	Duplicate	TBD	QA/QC	NA	TCL VOCs
NA	MS/MSD-GW01_date	MS/MSD				
	GWFB01_date	Field Blank				
	GWTB01_date	Trip Blank				
AIR						
1	SV-13_date	Grab	SV-13	Investigate AOC 2, 3	2 feet above groundwater interface	TO-15 VOCs
2	SV-15_date		SV-15			
3	SV-17_date		SV-17			
4	SV-18_date		SV-18			
5	SV-19_date		SV-19			
6	AA101_date	Blank	NA	QA/QC	breathing height	

Areas of Concern (AOCs):

- AOC 1 - Historic Fill Material
- AOC 2 - Prior Site Use
- AOC 3 - Current and Historical Use of the Adjoining Properties
- AOC 4 - Chlorinated Volatile Organic Compounds in Groundwater and Soil Vapor

Notes:

1. Soil sample depth intervals will be determined in the field.
 2. Soil samples to be analyzed for New York State Department of Environmental Conservation (NYSDEC) Title 6 of the Official Compilation of New York Codes, Rules and Regulations (6 NYCRR) Part 375-list compounds.
 3. TBD = to be determined (in the field)
 4. VOC = volatile organic compound
 5. SVOC = semivolatile organic compound
 6. PCB = polychlorinated biphenyl
 7. TCL = Target Compound List
 8. TAL = Target Analyte List
 9. QA/QC = quality assurance/quality control
 10. NA = not applicable
 11. PFCs = per-fluorinated chemicals as limited to the list of compounds designated by NYSDEC
- * Monitoring wells MW-01 through MW-05 were previously installed during the July 2018 Remedial Investigation.

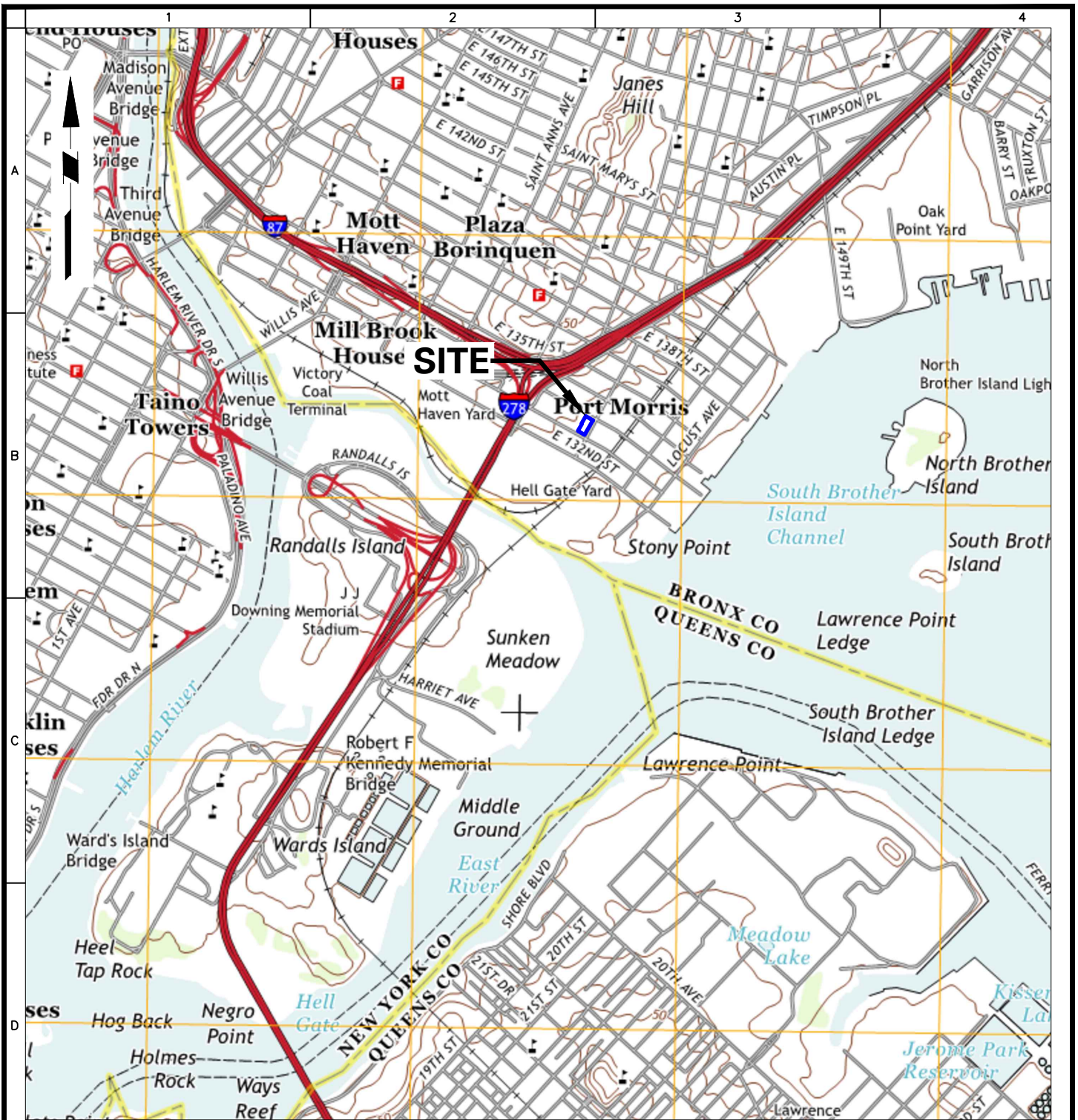
Table 2
PFAS Compound Analyte List for Groundwater Samples
Remedial Investigation Work Plan
111 Willow Avenue
Bronx, NY
Langan Project No.: 170497201

Compound Name	Analytical Method
Perfluorohexanoic acid (PFHxA)	USEPA Method 537
Perfluoroheptanoic acid (PFHpA)	
Perfluorooctanoic acid (PFOA)	
Perfluorobutanoic acid (PFBA)	
Perfluoropentanoic acid (PFPeA)	
Perfluorononanoic acid (PFNA)	
Perfluorodecanoic acid (PFDA)	
Perfluoroundecanoic acid (PFUA/PFUdA)	
Perfluorododecanoic acid (PFDoA)	
Perfluorotridecanoic acid (PFTriA/PFTrDA)	
Perfluorotetradecanoic acid (PFTA/PFTeDA)	
Perfluorobutanesulfonic acid (PFBS)	
Perfluorohexanesulfonic acid (PFHxS)	
Perfluoroheptanesulfonic acid (PFHpS)	
Perfluorodecanesulfonic acid (PFDS)	
Perfluorooctanesulfonic acid (PFOS)	
N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	
N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	
6:2 Fluorotelomer sulfonate (6:2 FTS)	
8:2 Fluorotelomer sulfonate (8:2 FTS)	
Perfluorooctanesulfonamide (FOSA)	

Notes:

1. PFAS - per- and polyfluoroalkyl substances

FIGURES

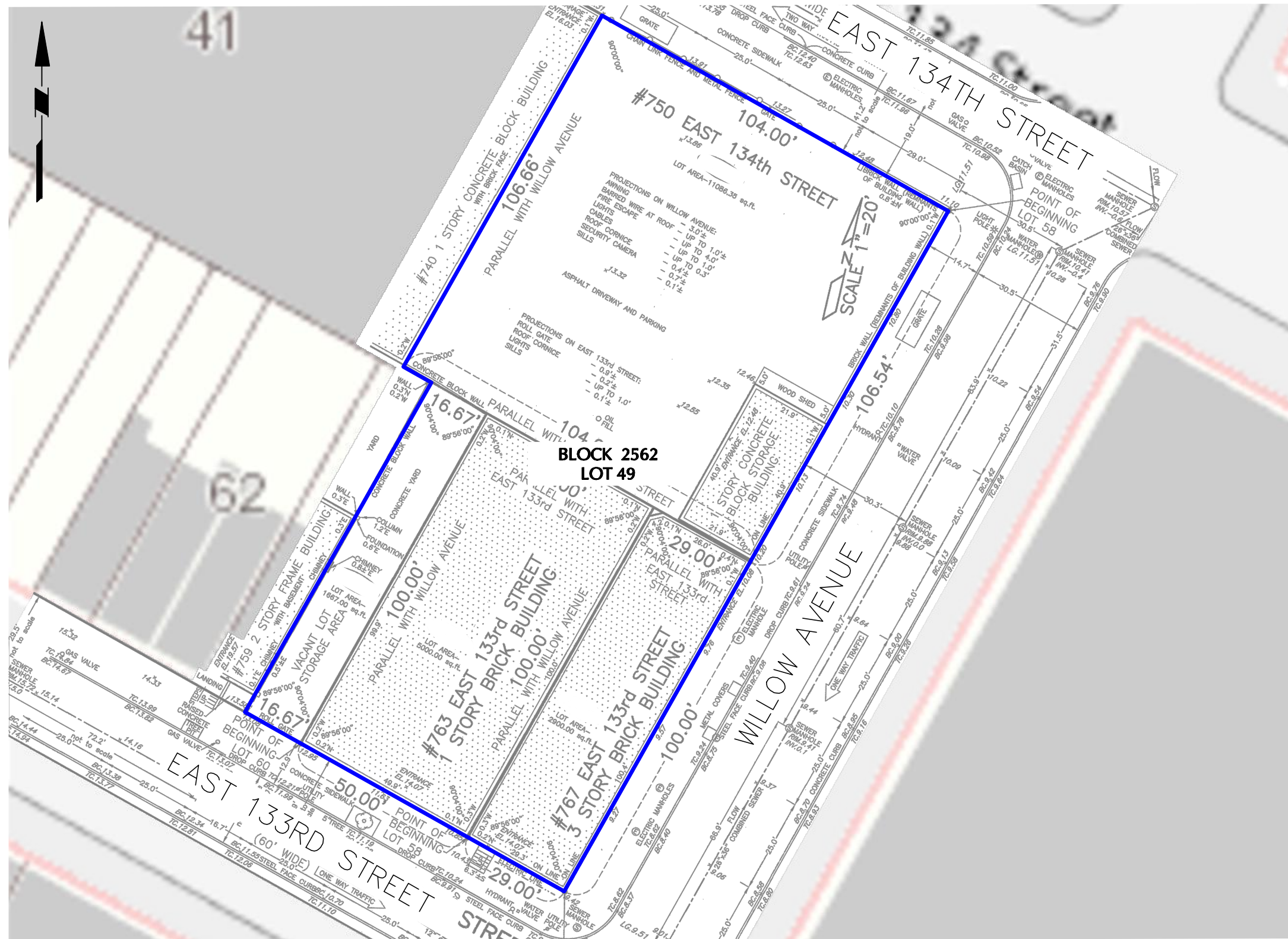


MAP REFERENCE: USGS 7.5-MINUTE JERSEY CITY, N.J., AND BROOKLYN, N.Y. TOPOGRAPHIC QUADRANGLES

LEGEND

— SITE BOUNDARY

<p>LANGAN</p> <p>21 Penn Plaza, 360 West 31st Street, 8th Floor New York, NY 10001 T: 212.479.5400 F: 212.479.5444 www.langan.com</p> <p>Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. Langan Engineering and Environmental Services, Inc. Langan CT, Inc. Langan International LLC Collectively known as Langan</p>	Project	Figure Title	Project No.	Figure
	767 EAST 133RD STREET	SITE LOCATION MAP	170497201	1
	BLOCK No. 2562, LOT No. 49		Date	
	BRONX NEW YORK		10/17/2018	
			Scale	
			NTS	
			Drawn By	Checked By
			JFY	TC
			Page 1 of 6	



LEGEND:

— APPROXIMATE SITE BOUNDARY

NOTES:

1. BASEMAP OBTAINED FROM NYC OASIS MAP ON OCTOBER 17, 2017 AND LAND SURVEY, BY GERALD T. O'BUCKLEY, DATED APRIL, 6 2018.



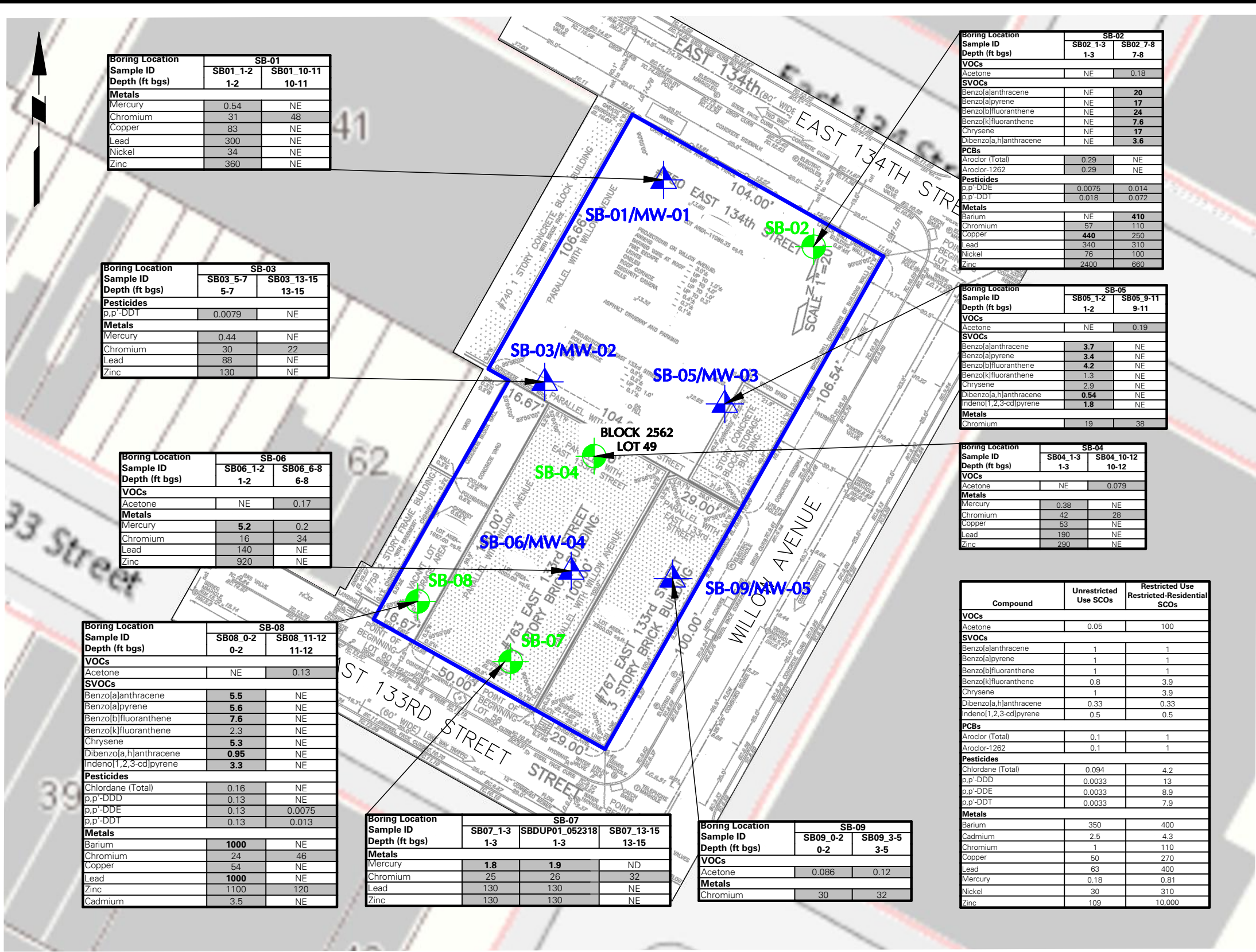
LANGAN
 Langan Engineering, Environmental, Surveying,
 Landscape Architecture and Geology, D.P.C.
 21 Penn Plaza, 360 West 31st Street, 8th Floor
 New York, NY 10001

T: 212.479.5400 F: 212.479.5444 www.langan.com

Project
767 EAST 133RD STREET
BLOCK No. 2562, LOT No. 49
BRONX COUNTY NEW YORK

Figure Title
SITE PLAN

Project No. 170497201	2
Date 10/17/2018	
Drawn By JFY	
Checked By TC	
Page 2 of 6	



Boring Location SB-01		
Sample ID	SB01_1-2	SB01_10-11
Depth (ft bgs)	1-2	10-11
Metals		
Mercury	0.54	NE
Chromium	31	48
Copper	83	NE
Lead	300	NE
Nickel	34	NE
Zinc	360	NE

Boring Location SB-03		
Sample ID	SB03_5-7	SB03_13-15
Depth (ft bgs)	5-7	13-15
Pesticides		
p,p-DDT	0.0079	NE
Metals		
Mercury	0.44	NE
Chromium	30	22
Lead	88	NE
Zinc	130	NE

Boring Location SB-06		
Sample ID	SB06_1-2	SB06_6-8
Depth (ft bgs)	1-2	6-8
VOCs		
Acetone	NE	0.17
Metals		
Mercury	5.2	0.2
Chromium	16	34
Lead	140	NE
Zinc	920	NE

Boring Location SB-08		
Sample ID	SB08_0-2	SB08_11-12
Depth (ft bgs)	0-2	11-12
VOCs		
Acetone	NE	0.13
SVOCs		
Benzo[a]anthracene	5.5	NE
Benzo[a]pyrene	5.6	NE
Benzo[b]fluoranthene	7.6	NE
Benzo[k]fluoranthene	2.3	NE
Chrysene	5.3	NE
Dibenz[a,h]anthracene	0.95	NE
Indeno[1,2,3-cd]pyrene	3.3	NE
Pesticides		
Chlordane (Total)	0.16	NE
p,p-DDD	0.13	NE
p,p-DDE	0.13	0.0075
p,p-DDT	0.13	0.013
Metals		
Barium	1000	NE
Chromium	24	46
Copper	54	NE
Lead	1000	NE
Zinc	1100	120
Cadmium	3.5	NE

Boring Location SB-07			
Sample ID	SB07_1-3	SBDUP01_052318	SB07_13-15
Depth (ft bgs)	1-3	1-3	13-15
Metals			
Mercury	1.8	1.9	ND
Chromium	25	26	32
Lead	130	130	NE
Zinc	130	130	NE

Boring Location SB-09		
Sample ID	SB09_0-2	SB09_3-5
Depth (ft bgs)	0-2	3-5
VOCs		
Acetone	0.086	0.12
Metals		
Chromium	30	32

Boring Location SB-02		
Sample ID	SB02_1-3	SB02_7-8
Depth (ft bgs)	1-3	7-8
VOCs		
Acetone	NE	0.18
SVOCs		
Benzo[a]anthracene	NE	20
Benzo[a]pyrene	NE	17
Benzo[b]fluoranthene	NE	24
Benzo[k]fluoranthene	NE	7.6
Chrysene	NE	17
Dibenz[a,h]anthracene	NE	3.6
PCBs		
Aroclor (Total)	0.29	NE
Aroclor-1262	0.29	NE
Pesticides		
p,p-DDE	0.0075	0.014
p,p-DDT	0.018	0.072
Metals		
Barium	NE	410
Chromium	57	110
Copper	440	250
Lead	340	310
Nickel	76	100
Zinc	2400	660

Boring Location SB-05		
Sample ID	SB05_1-2	SB05_9-11
Depth (ft bgs)	1-2	9-11
VOCs		
Acetone	NE	0.19
SVOCs		
Benzo[a]anthracene	3.7	NE
Benzo[a]pyrene	3.4	NE
Benzo[b]fluoranthene	4.2	NE
Benzo[k]fluoranthene	1.3	NE
Chrysene	2.9	NE
Dibenz[a,h]anthracene	0.54	NE
Indeno[1,2,3-cd]pyrene	1.8	NE
Metals		
Chromium	19	38

Boring Location SB-04		
Sample ID	SB04_1-3	SB04_10-12
Depth (ft bgs)	1-3	10-12
VOCs		
Acetone	NE	0.079
Metals		
Mercury	0.38	NE
Chromium	42	28
Copper	53	NE
Lead	190	NE
Zinc	290	NE

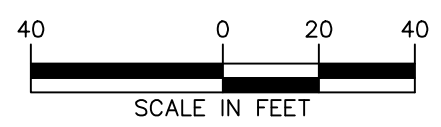
Compound	Unrestricted Use SCOs	Restricted Use Restricted-Residential SCOs
VOCs		
Acetone	0.05	100
SVOCs		
Benzo[a]anthracene	1	1
Benzo[a]pyrene	1	1
Benzo[b]fluoranthene	1	1
Benzo[k]fluoranthene	0.8	3.9
Chrysene	1	3.9
Dibenz[a,h]anthracene	0.33	0.33
Indeno[1,2,3-cd]pyrene	0.5	0.5
PCBs		
Aroclor (Total)	0.1	1
Aroclor-1262	0.1	1
Pesticides		
Chlordane (Total)	0.094	4.2
p,p-DDD	0.0033	13
p,p-DDE	0.0033	8.9
p,p-DDT	0.0033	7.9
Metals		
Barium	350	400
Cadmium	2.5	4.3
Chromium	1	110
Copper	50	270
Lead	63	400
Mercury	0.18	0.81
Nickel	30	310
Zinc	109	10,000

LEGEND:

- APPROXIMATE SITE BOUNDARY
- SOIL BORING LOCATION
- SOIL BORING/MONITORING WELL LOCATION

NOTES:

1. BASEMAP OBTAINED FROM NYC OASIS MAP ON OCTOBER 17, 2017 AND LAND SURVEY, BY GERALD T. O'BUCKLEY, DATED APRIL, 6 2018.
2. DATA GENERATED DURING REMEDIAL INVESTIGATION PERFORMED BY LANGAN ON 5/21/18-5/24/18.
3. ALL LOCATIONS ARE APPROXIMATE.
4. FT BGS = FEET BELOW GROUND SURFACE. SB-09 DEPTHS ARE IN REFERENCE TO FEET BELOW TOP OF CELLAR SLAB.
5. ALL RESULTS ARE PRESENTED IN MILLIGRAMS PER KILOGRAM (mg/kg).
6. SOIL RESULTS ARE COMPARED TO TITLE 6 OF THE OFFICIAL COMPILATION OF NEW YORK CODES, RULES, AND REGULATIONS (NYCRR) PART 375 UNRESTRICTED USE AND RESTRICTED USE RESTRICTED-RESIDENTIAL SOIL CLEANUP OBJECTIVES (SCOs).
7. ONLY COMPOUNDS EXCEEDING COMPARISON CRITERIA ARE SHOWN
8. RESULTS ABOVE PART 375 UNRESTRICTED USE SCOS ARE SHADED.
9. RESULTS ABOVE PART 375 RESTRICTED-RESIDENTIAL SCOS ARE BOLDED AND SHADED.
10. VOC = VOLATILE ORGANIC COMPOUND
11. SVOC = SEMI-VOLATILE ORGANIC COMPOUND
12. PCBs = POLYCHLORINATED BIPHENYLS
13. NE = NO EXCEEDANCES



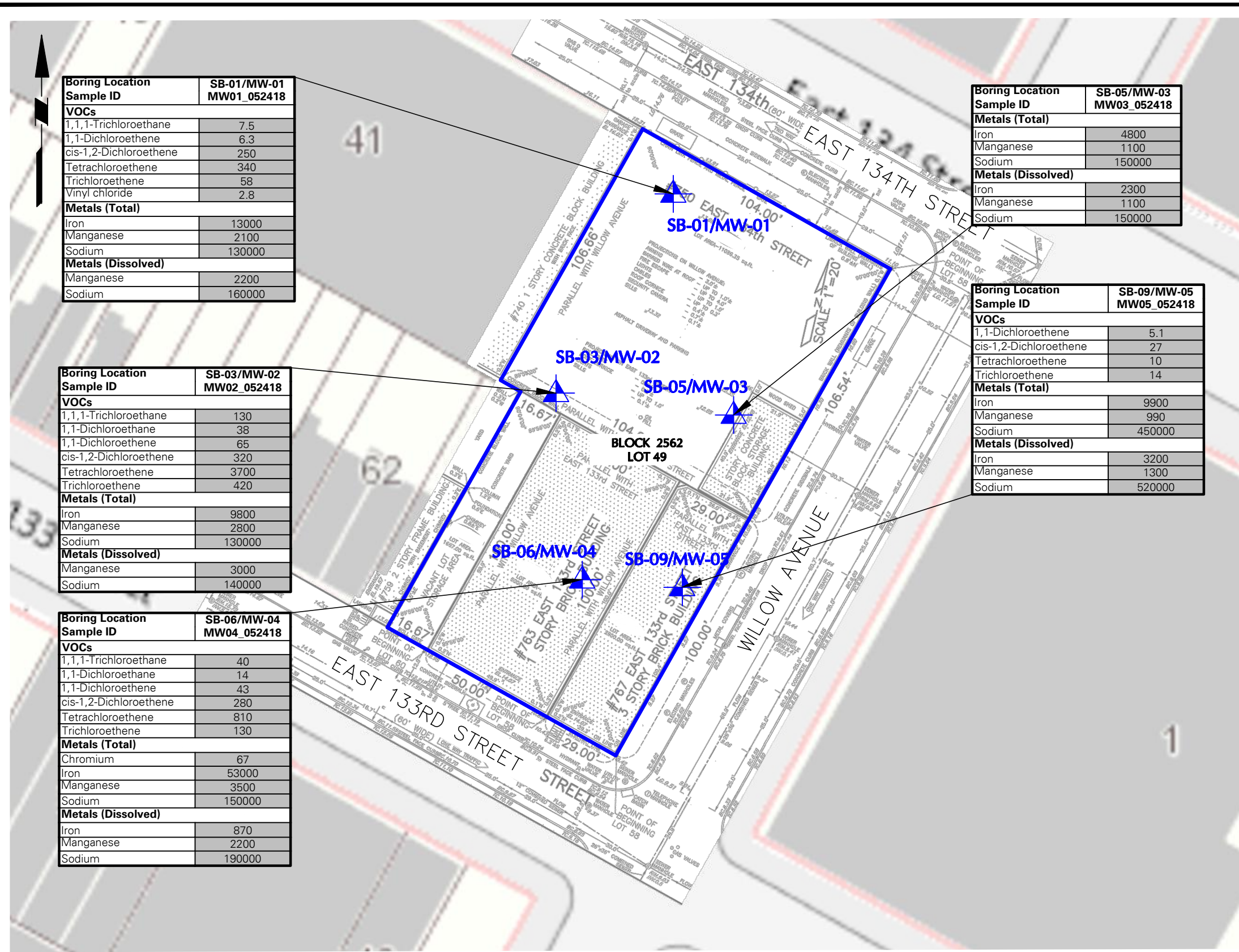
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Project
767 EAST 133RD STREET
 BLOCK No. 2562, LOT No. 49
 BRONX COUNTY NEW YORK

Figure Title
SOIL SAMPLE RESULTS MAP

Project No. 170497201	Figure No. 3
Date 10/17/2018	
Drawn By KG	
Checked By TC	

Page 3 of 6



Boring Location	SB-01/MW-01
Sample ID	MW01_052418
VOCs	
1,1,1-Trichloroethane	7.5
1,1-Dichloroethene	6.3
cis-1,2-Dichloroethene	250
Tetrachloroethene	340
Trichloroethene	58
Vinyl chloride	2.8
Metals (Total)	
Iron	13000
Manganese	2100
Sodium	130000
Metals (Dissolved)	
Manganese	2200
Sodium	160000

Boring Location	SB-03/MW-02
Sample ID	MW02_052418
VOCs	
1,1,1-Trichloroethane	130
1,1-Dichloroethane	38
1,1-Dichloroethene	65
cis-1,2-Dichloroethene	320
Tetrachloroethene	3700
Trichloroethene	420
Metals (Total)	
Iron	9800
Manganese	2800
Sodium	130000
Metals (Dissolved)	
Manganese	3000
Sodium	140000

Boring Location	SB-06/MW-04
Sample ID	MW04_052418
VOCs	
1,1,1-Trichloroethane	40
1,1-Dichloroethane	14
1,1-Dichloroethene	43
cis-1,2-Dichloroethene	280
Tetrachloroethene	810
Trichloroethene	130
Metals (Total)	
Chromium	67
Iron	53000
Manganese	3500
Sodium	150000
Metals (Dissolved)	
Iron	870
Manganese	2200
Sodium	190000

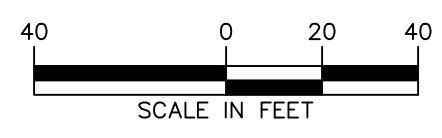
Boring Location	SB-05/MW-03
Sample ID	MW03_052418
Metals (Total)	
Iron	4800
Manganese	1100
Sodium	150000
Metals (Dissolved)	
Iron	2300
Manganese	1100
Sodium	150000

Boring Location	SB-09/MW-05
Sample ID	MW05_052418
VOCs	
1,1-Dichloroethene	5.1
cis-1,2-Dichloroethene	27
Tetrachloroethene	10
Trichloroethene	14
Metals (Total)	
Iron	9900
Manganese	990
Sodium	450000
Metals (Dissolved)	
Iron	3200
Manganese	1300
Sodium	520000

LEGEND:
 APPROXIMATE SITE BOUNDARY
 SOIL BORING/MONITORING WELL LOCATION

Compound	SGVs
VOCs	
1,1,1-Trichloroethane	5
1,1-Dichloroethane	5
1,1-Dichloroethene	5
cis-1,2-Dichloroethene	5
Tetrachloroethene	5
Trichloroethene	5
Vinyl chloride	2
Metals (Total)	
Chromium	50
Iron	300
Manganese	300
Sodium	20,000
Metals (Dissolved)	
Iron	300
Manganese	300
Sodium	20,000

- NOTES:**
- BASEMAP OBTAINED FROM NYC OASIS MAP ON OCTOBER 17, 2017 AND LAND SURVEY, BY GERALD T. O'BUCKLEY, DATED APRIL, 6 2018.
 - DATA GENERATED DURING REMEDIAL INVESTIGATION PERFORMED BY LANGAN ON 5/21/18-5/24/18.
 - ALL LOCATIONS ARE APPROXIMATE.
 - ALL RESULTS ARE PRESENTED IN MICROGRAMS PER LITER (µg/L)
 - GROUNDWATER RESULTS ARE COMPARED TO THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) TECHNICAL AND OPERATIONAL GUIDANCE SERIES (TOGS) 1.1.1 AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES (SGVs) FOR CLASS GA GROUNDWATER
 - ONLY COMPOUNDS EXCEEDING COMPARISON CRITERIA ARE SHOWN
 - RESULTS ABOVE TOGS SGVs ARE SHADED
 - VOCs = VOLATILE ORGANIC COMPOUNDS



 Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. 21 Penn Plaza, 360 West 31st Street, 8th Floor New York, NY 10001 T: 212.479.5400 F: 212.479.5444 www.langan.com	Project 767 EAST 133RD STREET BLOCK No. 2562, LOT No. 49	Figure Title GROUNDWATER SAMPLE RESULTS MAP	Project No. 170497201	Figure No. 4
	BRONX COUNTY NEW YORK	Date 10/17/2018	Drawn By KG	Checked By TC

Sample ID	SV01_052218
Laboratory Sample ID	C1805056-002A
Sample Date	5/22/2018
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	1.6
1,3,5-Trimethylbenzene	0.84
1,3-Dichlorobenzene	1.6
2,2,4-trimethylpentane	5.3
4-ethyltoluene	0.59
Acetone	340
Benzene	4.6
Bromodichloromethane	1.9
Carbon disulfide	4.5
Carbon tetrachloride	0.75
Chloroethane	0.9
Chloroform	320
Chloromethane	1.7
Cyclohexane	2.5
Ethanol	140
Ethyl acetate	10
Ethylbenzene	2.7
Freon 11	1.3
Freon 113	2.8
Freon 12	2.1
Heptane	6.2
Hexane	9.2
Isopropyl alcohol	14
m&p-Xylene	8.2
Methyl Ethyl Ketone	65
Methyl Isobutyl Ketone	1.8
Methylene chloride	6.2
Naphthalene	0.58
o-Xylene	2.4
Styrene	0.72
t-Butyl alcohol	28
Tetrachloroethylene	2.1
Toluene	27
Trichloroethylene	0.86
Total VOCs	1018

Sample ID	SV03_052218
Laboratory Sample ID	C1805056-003A
Sample Date	5/22/2018
VOCs (µg/m³)	
1,1,1-Trichloroethane	8.9
1,2,4-Trimethylbenzene	1.3
1,3,5-Trimethylbenzene	0.64
1,3-Dichlorobenzene	1.5
2,2,4-trimethylpentane	13
Acetone	2000
Benzene	3.2
Carbon disulfide	6.4
Chloroform	21
Chloromethane	0.54
Cyclohexane	3.3
Ethanol	240
Ethyl acetate	10
Ethylbenzene	2.3
Freon 11	1.5
Freon 113	2.8
Freon 12	2
Heptane	17
Hexane	21
m&p-Xylene	6.8
Methyl Ethyl Ketone	320
Methyl Isobutyl Ketone	2.1
Methyl methacrylate	3.6
Methylene chloride	0.94
o-Xylene	2.1
Styrene	0.6
t-Butyl alcohol	35
Tetrachloroethylene	2.8
Tetrahydrofuran	56
Toluene	27
Total VOCs	2813

Sample ID	SV07_052218
Laboratory Sample ID	C1805056-001A
Sample Date	5/22/2018
VOCs (µg/m³)	
1,1,1-Trichloroethane	7.9
1,2,3-Trimethylbenzene	1
1,2,4-Trimethylbenzene	3.1
1,3,5-Trimethylbenzene	2.6
1,3-Dichlorobenzene	15
2,2,4-trimethylpentane	24
4-ethyltoluene	0.74
Acetone	2200
Benzene	5.9
Chloroethane	0.34
Chloroform	9.5
Chloromethane	1.1
cis-1,2-Dichloroethene	2
Cyclohexane	4.2
Ethanol	2000
Ethyl acetate	4.6
Ethylbenzene	1.5
Freon 11	2.2
Freon 12	2
Heptane	16
Hexane	18
m&p-Xylene	3.7
Methyl Ethyl Ketone	2000
Methyl Isobutyl Ketone	1.8
Methyl methacrylate	0.82
Methylene chloride	7
Naphthalene	3.1
o-Xylene	1.4
Styrene	1.3
t-Butyl alcohol	32
Tetrachloroethylene	160
Tetrahydrofuran	1500
Toluene	22
Trichloroethylene	8.40
Total VOCs	8063

Sample ID	SV04_052218
Laboratory Sample ID	C1805056-004A
Sample Date	5/22/2018
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	1.4
1,3,5-Trimethylbenzene	0.64
1,3-Dichlorobenzene	1.7
2,2,4-trimethylpentane	5.7
Acetone	600
Benzene	2.9
Carbon disulfide	210
Chloroethane	0.71
Chloroform	2.1
Chloromethane	2.9
Cyclohexane	3.8
Ethanol	320
Ethyl acetate	13
Ethylbenzene	2.2
Freon 11	1.8
Freon 113	2.8
Heptane	4.5
Hexane	21
m&p-Xylene	7.3
Methyl Ethyl Ketone	51
Methyl Isobutyl Ketone	2
Methylene chloride	4.9
o-Xylene	2.1
Styrene	0.51
t-Butyl alcohol	27
Tetrachloroethylene	3.8
Toluene	26
Vinyl chloride	3.7
Total VOCs	1325

Sample ID	SV02_052318
Laboratory Sample ID	C1805056-008A
Sample Date	5/23/2018
VOCs (µg/m³)	
1,2,3-Trimethylbenzene	0.54
1,2,4-Trimethylbenzene	1.7
1,3,5-Trimethylbenzene	1.1
1,3-Dichlorobenzene	1.7
2,2,4-trimethylpentane	2.9
4-ethyltoluene	0.54
Acetone	760
Benzene	2.9
Bromodichloromethane	35
Carbon disulfide	9
Carbon tetrachloride	2.4
Chloroethane	0.61
Chloroform	710
Chloromethane	1.3
cis-1,2-Dichloroethene	2.9
Cyclohexane	1.1
Ethanol	160
Ethyl acetate	9.4
Ethylbenzene	2.3
Freon 11	1.5
Freon 12	2.3
Heptane	5.5
Hexane	4
Isopropyl alcohol	16
m&p-Xylene	7.7
Methyl Ethyl Ketone	29
Methyl Isobutyl Ketone	2.6
Methylene chloride	3.3
Naphthalene	0.84
o-Xylene	2.5
Styrene	0.6
t-Butyl alcohol	13
Tetrachloroethylene	2.4
Toluene	32
Trichloroethylene	1.4
Total VOCs	1830

Sample ID	SV05_052318
Laboratory Sample ID	C1805056-006A
Sample Date	5/23/2018
VOCs (µg/m³)	
1,1,1-Trichloroethane	1.7
1,2,3-Trimethylbenzene	0.54
1,2,4-Trimethylbenzene	2.1
1,3,5-Trimethylbenzene	1.1
2,2,4-trimethylpentane	4.6
4-ethyltoluene	0.59
Acetone	71
Benzene	2.3
Carbon disulfide	23
Chloroform	1.2
Chloromethane	0.41
Cyclohexane	3.2
Ethanol	110
Ethyl acetate	11
Ethylbenzene	1.7
Freon 11	1.3
Freon 12	2.3
Heptane	6.8
Hexane	7.3
Isopropyl alcohol	9.1
m&p-Xylene	5.5
Methyl Ethyl Ketone	29
Methyl Isobutyl Ketone	1.7
Methylene chloride	18
Naphthalene	0.58
o-Xylene	1.9
Styrene	0.68
t-Butyl alcohol	2.4
Tetrachloroethylene	5.1
Tetrahydrofuran	5.5
Toluene	21
Trichloroethylene	1.5
Total VOCs	354

Sample ID	SV06_052318
Laboratory Sample ID	C1805056-007A
Sample Date	5/23/2018
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	1.4
2,2,4-trimethylpentane	6.9
Acetone	85
Benzene	10
Carbon disulfide	4.3
Chloroform	1.7
Chloromethane	1.1
Ethanol	100
Ethyl acetate	6.9
Ethylbenzene	1.7
Freon 11	1.1
Freon 12	2.1
Heptane	10
Hexane	7.6
Isopropyl alcohol	4.5
m&p-Xylene	6
Methyl Ethyl Ketone	96
Methyl Isobutyl Ketone	1.9
Methyl methacrylate	0.74
Methylene chloride	2.2
o-Xylene	2
Styrene	0.51
t-Butyl alcohol	3.2
Tetrachloroethylene	3.5
Tetrahydrofuran	61
Toluene	30
Total VOCs	451

LEGEND:

- APPROXIMATE SITE BOUNDARY
- SV-01 SUB SLAB/SOIL VAPOR SAMPLE LOCATION

ANALYTE	NYSDOH DECISION MATRIX MINIMUM MITIGATION THRESHOLD
VOCs	
Tetrachloroethene	100
Trichloroethene	6

NOTES:

1. BASEMAP OBTAINED FROM NYC OASIS MAP ON OCTOBER 17, 2017 AND LAND SURVEY, BY GERALD T. O'BUCKLEY, DATED APRIL, 6 2018.
2. DATA GENERATED DURING REMEDIAL INVESTIGATION PERFORMED BY LANGAN ON 5/21/18-5/24/18.
3. ALL LOCATIONS ARE APPROXIMATE.
4. SOIL VAPOR SAMPLE ANALYTICAL RESULTS ARE COMPARED TO THE NEW YORK STATE DEPARTMENT OF HEALTH (NYSDOH) MINIMUM SUB-SLAB SOIL VAPOR CONCENTRATION AT WHICH MITIGATION IS RECOMMENDED ON THE NYSDOH DECISION MATRICES A, B AND C PRESENTED IN THE NYSDOH FINAL GUIDANCE ON SOIL VAPOR INTRUSION (OCTOBER 2006, WITH AMMENDMENTS).
5. ANALYTES THAT EXCEED THE MINIMUM SUB-SLAB SOIL VAPOR CONCENTRATION AT WHICH MITIGATION IS RECOMMENDED ARE SHADED AND BOLDED.
6. ONLY DETECTED ANALYTES ARE SHOWN.
4. ALL RESULTS ARE PRESENTED IN MICROGRAMS PER CUBIC METER (µg/m³).
5. VOCs = VOLATILE ORGANIC COMPOUNDS
6. J = THE RESULTS IS AN ESTIMATE



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Langan Engineering, Environmental, Surveying,
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21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com

Project
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BLOCK No. 2562, LOT No. 49
BRONX COUNTY NEW YORK

Figure Title
SOIL VAPOR SAMPLE RESULTS MAP

Project No. 170497201	Figure No. 5
Date 10/08/2018	Page 5 of 6
Drawn By JFY	
Checked By TC	

APPENDIX A

PREVIOUS ENVIRONMENTAL REPORTS

APPENDIX B

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

FOR

**111 WILLOW AVENUE
BRONX, NEW YORK
New York City Tax Map
Block 2562, Lots 49, 56, 58 and 60**

Prepared For

**JCAL Development Group, LLC
820 Saint Ann's Avenue
Bronx, New York 10456**

Prepared By:

**Langan Engineering, Environmental, Surveying
Landscape Architecture and Geology, D.P.C.
21 Penn Plaza
360 West 31st Street, 8th Floor
New York, New York 10001**

**May 2018
Langan Project No. 170497201**

LANGAN

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Attachment F	Jobsite Safety Inspection Checklist
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* Items to be posted prominently on site, or made readily available to personnel.

1.0 INTRODUCTION

1.1 General

This HEALTH AND SAFETY PLAN (HASP) was developed to address disturbance of known and reasonably anticipated subsurface contaminants and comply with Occupational Safety and Health Administration (OSHA) Standard 29 CFR 1910.120(b) (4), *Hazardous Waste Operations and Emergency Response* during anticipated site work at 111 Willow Avenue, in the borough of the Bronx, New York (Tax Map Block 2562 Lots 49, 56, 58 and 60 ("the Site)). This HASP provides the minimum requirements for implementing site operations during environmental investigation activities. All contractors performing work on this Site shall implement their own Health and Safety Plans that, at a minimum, adhere to this HASP. The contractor is solely responsible for their own health and safety and that of their subcontractors. Langan personnel will implement this HASP while on-site.

The management of the day-to-day site activities and implementation of this HASP in the field is the responsibility of the site Langan Field Team Leader (FTL). Assistance in the implementation of this HASP can also be obtained from the site Langan Health and Safety Officer (HSO) and the Langan Health and Safety Manager (HSM). Contractors operating on the Site shall designate their own FTL, HSO and HSM. The content of this HASP may change or undergo revision based upon additional information made available to health and safety personnel, monitoring results, or changes in the work plan.

1.2 Site Location and Background

The Site is located in the Port Morris Section of the Bronx and is identified as Block 2562 and Lot(s) 49, 56, 58, and 60. Currently, the Site is used for commercial office space, warehouse space, and parking and contains a single-story parking garage and asphalt-paved parking lot on Lot 49, a three-story commercial office building on Lot 56, a single-story warehouse on Lot 58, and vacant land on Lot 60. The development project consists of a new nine-story mixed-use residential and commercial building. The water table is expected at approximately 15 feet below grade surface (bgs). A site location map is included as Figure 1.

Historical businesses at the site included a piano string manufacturer (circa 1927 to 1976), an automotive parts and equipment company (circa 1976), and a natural stone specialty contracting company for marble (circa 1927 to 2008).

1.3 Summary of Work Tasks

The general categories of work tasks being performed during implementation of the work plan include:

1.3.1 Geophysical Investigation

Prior to the commencement of intrusive field activities (i.e., soil borings); a geophysical consultant will conduct a geophysical survey using ground penetrating radar (GPR) and electromagnetic detection equipment. Langan personnel will coordinate the geophysical survey. The objective of the survey will be to identify any underground storage tank (UST) structures and/or associated piping and subsurface utilities that may be encountered during the investigation. During this time Langan personnel will inspect the Site and confirm sample locations.

1.3.2 Soil Investigation and Sampling

Langan will retain a drilling contractor to advance soil borings to a depth below grade surface (bgs) specified in the work plan. Borings locations will be based on the results of the geophysical survey and the site inspection and document review. The drilling contractor is responsible for all permits and will contact the appropriate utility mark-out authority and make available to their drilling staff the verification number and effective dates.

Langan personnel will screen soil for visual, olfactory, and instrumental indicators suggestive of a potential petroleum release. Instrument screening for the presence of volatile organic compounds (VOCs) may be performed with a calibrated photoionization detector (PID). Langan personnel will collect soil samples from the two-foot interval exhibiting the greatest degree of visual, olfactory, instrumental impact, or as otherwise specified in the work. The borings will be filled with clean soil cuttings after samples are collected.

Soil samples will be submitted to a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory and analyzed in accordance with work plan specifications.

1.3.3 Groundwater Investigation and Sampling

One or more soil borings will be converted into temporary or permanent groundwater monitoring wells as specified in the work plan. Groundwater samples will be collected from one or more monitoring wells to evaluate water quality in accordance with the Langan Low Flow Groundwater Sampling SOP (SOP #12). Groundwater samples will be submitted to an NYSDOH ELAP-certified laboratory and analyzed for constituents as specified in the work plan.

1.3.4 Soil Vapor Point Installation and Sampling

The drilling contractor will install soil vapor points to a depth specified by the work plan. Vapor samples will be collected in accordance with the Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (New York State Department of Health [NYSDOH] October 2006) and Langan's Soil Vapor Sampling SOP (SOP #13). Conditions in the field may require

adjustment of sampling locations.

Ambient air sample may be collected for use as a comparison sample. The subsurface soil vapor samples will be collected using a stainless steel soil vapor implant (or equivalent) and tubing. The annulus around the probe and tubing will be filled with sand to two inches above the implant. Bentonite (or equivalent) slurry will be applied to the top of the sand up to seal the sampling points.

1.3.5. Drum Sampling

Investigation derived waste (excess or impacted soil and water) are to be drummed during the remedial action activities and must be labeled in accordance with the Langan Drum Labeling Standard Operating Procedure (SOP-#9). Langan personnel may collect drum samples, as required, prior to off-site drum disposal. Samples will be placed into laboratory-supplied batch-certified clean glassware and submitted to a NYSDOH ELAP-certified laboratory¹.

2.0 IDENTIFICATION OF KEY PERSONNEL/HEALTH AND SAFETY PERSONNEL

The following briefly describes the health and safety (H&S) designations and general responsibilities that may be employed for this site. The titles have been established to accommodate the project needs and requirements and ensure the safe conduct of site activities. The H&S personnel requirements for a given work location are based upon the proposed site activities.

2.1 Langan Project Manager

The Langan Environmental Project Manager (PM) is Tyler Chow. His responsibilities include:

- Ensuring that this HASP is developed and approved prior to on-site activities.
- Ensuring that all the tasks in the project are performed in a manner consistent with

¹ Other derived waste besides excess or impacted soil and water (nitrile gloves, sample bags, etc.) are to be placed in sealable 5-mill trash bags and disposed of in public trash receptacles. Unused sample glassware must be returned to the laboratory or disposed of with the other non-soil/groundwater derived waste.

Langan's comprehensive *Health and Safety Program for Hazardous Waste Operations* practices and this HASP.

2.2 Langan Corporate Health and Safety Manager

The Langan Corporate Health and Safety Manager (HSM) is Tony Moffa. His responsibilities include:

- Updating the *Health and Safety Program for Hazardous Waste Operations*.
- Assisting the site Health and Safety Officer (HSO) with development of the HASP, updating HASP as dictated by changing conditions, jobsite inspection results, etc. and approving changes to this HASP.
- Assisting the HSO in the implementation of this HASP and conducting Jobsite Safety Inspections and assisting with communication of results and correction of shortcomings found.
- Maintaining records on personnel (medical evaluation results, training and certifications, accident investigation results, etc.).

2.3 Langan Site Health & Safety Officer

The Langan site HSO is William Bohrer. His responsibilities include:

- Participating in the development and implementation of this HASP.
- When on-site, assisting the Langan Field Team Leader in conducting Tailgate Safety Meetings and Jobsite Safety Inspections and correcting any shortcomings in a timely manner.
- Ensuring that proper PPE is available, worn by employees and properly stored and maintained.
- Controlling entry into and exit from the site contaminated areas or zones.
- Monitoring employees for signs of stress, such as heat stress, fatigue, and cold exposure.
- Monitoring site hazards and conditions.
- Knowing (and ensuring that all site personnel also know) emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire department, and police department.
- Resolving conflicts that may arise concerning safety requirements and working conditions.
- Reporting all incidents, injuries and near misses to the Langan Incident/Injury Hotline immediately and the client representative.

2.4 Langan Field Team Leader Responsibilities

The Langan Field Team Leader (FTL) is to be determined prior to the start of site activities. The

Field Team Leader's responsibilities include:

- The management of the day-to-day site activities and implementation of this HASP in the field.
- Participating in and/or conducting Tailgate Safety Meetings and Jobsite Safety Inspections and correcting any shortcomings in a timely manner.
- When a Community Air Monitoring Operating Program (CAMP) is part of the scope, the FTL will set up and maintaining community air monitoring activities and instructing the responsible contractor to implement organic vapor or dust mitigation when necessary.
- Overseeing the implementation of activities specified in the work plan.

2.5 Contractor Responsibilities

The contractor shall develop and implement their own HASP for their employees, lower-tier subcontractors, and consultants. The contractor is solely responsible for their own health and safety and that of their subcontractors. Contractors operating on the Site shall designate their own FTL, HSO and HSM. The contractor's HASP will be at least as stringent as this Langan HASP. The contractor must be familiar with and abide by the requirements outlined in their own HASP. A contractor may elect to adopt Langan's HASP as its own provided that it has given written notification to Langan, but where Langan's HASP excludes provisions pertinent to the contractor's work (i.e., confined space entry); the contractor must provide written addendums to this HASP. Additionally, the contractor must:

- Ensure their employees are trained in the use of all appropriate PPE for the tasks involved;
- Notify Langan of any hazardous material brought onto the job site or site related area, the hazards associated with the material, and must provide a material safety data sheet (MSDS) or safety data sheet (SDS) for the material;
- Have knowledge of, understand, and abide by all current federal, state, and local health and safety regulations pertinent to the work;
- Ensure their employees handling hazardous materials, if identified at the Site, have received current training in the appropriate levels of 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER) if hazardous waste is identified at the Site;
- Ensure their employees handling hazardous materials, if identified at the Site, have been fit-tested within the year on the type respirator they will wear;
- Ensure all air monitoring is in place pertaining to the health and safety of their employees as required by OSHA 1910.120; and
- All contractors must adhere to all federal, state, and local regulatory requirements.

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSES

A Task-Hazard Analysis (Table 1) was completed for general construction hazards that may be encountered at the Site. Known and suspected chemical contaminant hazards that could be encountered during site operations are included in Table 2. A complete inventory of MSDS/SDS for chemical products used on site is included as Attachment E.

3.1 Specific Task Safety Analysis

3.1.1 Geophysical Survey

Langan personnel are not permitted to operate or otherwise handle the geophysical equipment including any downhole geophysical equipment subsequently used to survey boreholes. When soil, groundwater or soil vapor points are surveyed with surface geophysical equipment, the locations of the point as well as possible utilities and other artifacts that may interfere with the geophysical survey or visual site attributes are to be marked with indelible paint, flags, or color tape (when marking indoor locations that the client has specifically requested not be marked with indelible paint). When applying paint, proper PPE including at a minimum hand protections should be used.

3.1.2 Soil Investigation and Sampling

Sampling the soil requires the donning of chemical resistant gloves in addition to the standard PPE. Langan personnel are not to operate drilling or excavation equipment nor open sampling devices (acetate liners, sonic sample bags, etc.). These tasks are to be completed by the driller or excavation contractor.

3.1.3 Groundwater Investigation and Sampling

Sampling groundwater requires the donning of chemical resistant gloves in addition to the standard PPE and cut resistant gloves when cutting sampling-tubing to length. Langan personnel are not to operate drilling equipment nor assemble or install monitoring well equipment. These tasks are to be completed by the driller contractor.

3.1.4 Soil Vapor Investigation and Sampling

Sampling soil vapor requires the donning of work gloves in addition to the standard PPE when assembling the Summa™ canister with the regulator and cut resistant gloves when cutting sampling- or silicone-tubing to length. Langan personnel are not to operate drilling equipment nor assemble or install soil vapor point equipment. These tasks are to be completed by the drilling contractor.

3.1.5 Drum Sampling

Drilling fluid, rinse water, grossly-contaminated soil samples and excess cuttings will be containerized in 55-gallon drums for disposed off-site. Each drum must be labeled in accordance with the Langan Drum Labeling Standard Operating Procedure (SOP-#9). Sampling drums requires the donning of work gloves when opening the drums and chemical resistant gloves when sampling in addition to standard PPE.

Langan personnel and contractors are not to move or opened any orphaned (unlabeled) drum found on the site without approval of the project manager.

3.1.6 Indoor Work Using Combustion Engine

Several boreholes and soil vapor points are to be installed indoors. When possible, advancement of these boreholes and vapor points are to be done using electrical or hydraulic powered machinery (provide the hydraulic generator is either electric or operating outside the building). If the advancement of the boreholes or soil vapor points must be done using drilling equipment powered by an internal combustion engine, the drilling contractor and Langan must do the following:

- The drilling contractor must bring heat protected tubing having sufficient length, diameter and fixtures to vent all combustion exhaust from the drill rig directly outdoors;
- The drilling contractor must bring fans to provide adequate circulation of fresh air into the work area;
- All work area windows and doors to the outside must be opened to provide continuous fresh air;
- Langan personnel must monitor indoor air for carbon monoxide using a MultiRAE or equivalent detector:
 - The 8 hour PEL for Carbon Monoxide is 50 ppm, if the detector indicates carbon monoxide concentrations above 50 ppm, work is to stop and steps are to be taken to mitigate the carbon dioxide concentrations.
 - If the detector indicates carbon monoxide concentrations above 100 ppm, all work is to stop and the work area is to be evacuated. Langan personnel will contact the PM to determine the best course of action.

3.2 Radiation Hazards

No radiation hazards are known or expected at the site.

3.3 Physical Hazards

Physical hazards, which may be encountered during site operations for this project, are detailed

in Table 1.

3.3.1 Explosion

No explosion hazards are expected for the scope of work at this site.

3.3.2 Heat Stress

The use of Level C protective equipment, or greater, may create heat stress. Monitoring of personnel wearing personal protective clothing should commence when the ambient temperature is 72°F or above. Table 6 presents the suggested frequency for such monitoring. Monitoring frequency should increase as ambient temperature increases or as slow recovery rates are observed. Refer to the Table 7 to assist in assessing when the risk for heat related illness is likely. To use this table, the ambient temperature and relative humidity must be obtained (a regional weather report should suffice). Heat stress monitoring should be performed by the HSO or the FTL, who shall be able to recognize symptoms related to heat stress.

To monitor the workers, be familiar with the following heat-related disorders and their symptoms:

- **Heat Cramps:** Painful spasm of arm, leg or abdominal muscles, during or after work
- **Heat Exhaustion:** Headache, nausea, dizziness; cool, clammy, moist skin; heavy sweating; weak, fast pulse; shallow respiration, normal temperature
- **Heat Stroke:** Headache, nausea, weakness, hot dry skin, fever, rapid strong pulse, rapid deep respirations, loss of consciousness, convulsions, coma. *This is a life threatening condition.*

Do not permit a worker to wear a semi-permeable or impermeable garment when they are showing signs or symptoms of heat-related illness.

To monitor the worker, measure:

- **Heart rate:** Count the radial pulse during a 30-second period as early as possible in the rest period. If the heart rate exceeds 100 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same. If the heart rate still exceeds 100 beats per minute at the next rest period, shorten the following work cycle by one-third. A worker cannot return to work after a rest period until their heart rate is below 100 beats per minute.
- **Oral temperature:** Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking). If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period. A worker cannot return to work after a rest period

until their oral temperature is below 99.6°F. If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following cycle by one-third. Do not permit a worker to wear a semi-permeable or impermeable garment when oral temperature exceeds 100.6°F (38.1°C).

Prevention of Heat Stress - Proper training and preventative measures will aid in averting loss of worker productivity and serious illness. Heat stress prevention is particularly important because once a person suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat related illness. To avoid heat stress the following steps should be taken:

- Adjust work schedules.
- Mandate work slowdowns as needed.
- Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.
- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.
- Maintain worker's body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, i.e., eight fluid ounces (0.23 liters) of water must be ingested for approximately every eight ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:

- Maintain water temperature 50° to 60°F (10° to 16.6°C).
- Provide small disposal cups that hold about four ounces (0.1 liter).
- Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.
- Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.
- Train workers to recognize the symptoms of heat related illness.

3.3.3 Cold-Related Illness

If work on this project begins in the winter months, thermal injury due to cold exposure can become a problem for field personnel. Systemic cold exposure is referred to as hypothermia. Local cold exposure is generally called frostbite.

- **Hypothermia** - Hypothermia is defined as a decrease in the patient core temperature below 96°F. The body temperature is normally maintained by a combination of central

(brain and spinal cord) and peripheral (skin and muscle) activity. Interference with any of these mechanisms can result in hypothermia, even in the absence of what normally is considered a "cold" ambient temperature. Symptoms of hypothermia include: shivering, apathy, listlessness, sleepiness, and unconsciousness.

- **Frostbite** - Frostbite is both a general and medical term given to areas of local cold injury. Unlike systemic hypothermia, frostbite rarely occurs unless the ambient temperatures are less than freezing and usually less than 20°F. Symptoms of frostbite are: a sudden blanching or whitening of the skin; the skin has a waxy or white appearance and is firm to the touch; tissues are cold, pale, and solid.

Prevention of Cold-Related Illness - To prevent cold-related illness:

- Educate workers to recognize the symptoms of frostbite and hypothermia
- Identify and limit known risk factors:
- Assure the availability of enclosed, heated environment on or adjacent to the site.
- Assure the availability of dry changes of clothing.
- Assure the availability of warm drinks.
- Start (oral) temperature recording at the job site:
- At the FSO or Field Team Leader's discretion when suspicion is based on changes in a worker's performance or mental status.
- At a worker's request.
- As a screening measure, two times per shift, under unusually hazardous conditions (e.g., wind-chill less than 20°F, or wind-chill less than 30°F with precipitation).
- As a screening measure whenever anyone worker on the site develops hypothermia.

Any person developing moderate hypothermia (a core temperature of 92°F) cannot return to work for 48 hours.

3.3.4 Noise

Work activities during the proposed activities may be conducted at locations with high noise levels from the operation of equipment. Hearing protection will be used as necessary.

3.3.5 Hand and Power Tools

The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. All hand and power tools should be inspected for health and safety hazards prior to use. If deemed unserviceable/un-operable, notify supervisor and tag equipment out of service. Ground Fault Circuit Interrupters (GFCIs) are required for all power tools requiring direct electrical service.

3.3.6 Slips, Trips and Fall Hazards

Care should be exercised when walking at the site, especially when carrying equipment. The presence of surface debris, uneven surfaces, pits, facility equipment, and soil piles contribute to tripping hazards and fall hazards. To the extent possible, all hazards should be identified and marked on the Site, with hazards communicated to all workers in the area.

3.3.7 Utilities (Electrocution and Fire Hazards)

The possibility of encountering underground utilities poses fire, explosion, and electrocution hazards. All excavation work will be preceded by review of available utility drawings and by notification of the subsurface work to the N.Y. One –Call–Center. Potential adverse effects of electrical hazards include burns and electrocution, which could result in death.

3.4 Biological Hazards

3.4.1 Animals

No animals are expected to be encountered during site operations.

3.4.2 Insects

Insects are not expected to be encountered during site operations.

3.5 Additional Safety Analysis

3.5.1 Presence of Non-Aqueous Phase Liquids (NAPL)

There is potential for exposure to NAPL at this site. Special care and PPE should be considered when NAPL is observed as NAPL is a typically flammable fluid and releases VOCs known to be toxic and/or carcinogenic. If NAPL is present in a monitoring well, vapors from the well casing may contaminate the work area breathing zone with concentrations of VOCs potentially exceeding health and safety action levels. In addition, all equipment used to monitor or sample NAPL (or groundwater from wells containing NAPL) must be intrinsically safe. Equipment that directly contacts NAPL must also be resistant to organic solvents.

At a minimum, a PID should be used to monitor for VOCs when NAPL is observed. If NAPL is expected to be observed in an excavation or enclosed area, air monitoring must be started

using calibrated air monitoring equipment designed to sound an audio alarm when atmospheric concentrations of VOC are within 10% of the LEL. In normal atmospheric oxygen concentrations, the LEL monitoring may be done with a Wheatstone bridge/catalytic bead type sensor (i.e. MultiRAE). However in oxygen depleted atmospheres (confined space), only an LEL designed to work in low oxygen environments may be used. Best practices require that the LEL monitoring unit be equipped with a long sniffer tube to allow the LEL unit to remain outside the UST excavation.

When NAPL is present, Langan personnel are required to use disposable nitrile gloves at all times to prevent skin contact with contaminated materials. They should also consider having available a respirator and protective clothing (Tyvek® overalls), especially if NAPL is in abundance and there are high concentrations of VOCs.

All contaminated disposables including PPE and sampling equipment must be properly disposed of in labeled 55-gallon drums.

3.6 Job Safety Analysis

A Job Safety Analysis (JSA) is a process to identify existing and potential hazards associated with each job or task so these hazards can be eliminated, controlled or minimized. A JSA will be performed at the beginning of each work day, and additionally whenever an employee begins a new task or moves to a new location. All JSAs must be developed and reviewed by all parties involved. A blank JSA form and documentation of completed JSAs are in Attachment G.

4.0 PERSONNEL TRAINING

4.1 Basic Training

Completion of an initial 40-hour HAZWOPER training program as detailed in OSHA's 29 CFR 1910.120(e) is required for all employees working on a site engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances, health hazards, or safety hazards as defined by 29 CFR 1910.120(a). Annual 8-hour refresher training is also required to maintain competencies to ensure a safe work environment. In addition to these training requirements, all employees must complete the OSHA 10 hour Construction Safety and Health training and supervisory personnel must also receive eight additional hours of specialized management training. Training records are maintained by the HSM.

4.2 Initial Site-Specific Training

Training will be provided to specifically address the activities, procedures, monitoring, and equipment for site operations at the beginning of each field mobilization and the beginning of

each discrete phase of work. The training will include the site and facility layout, hazards, and emergency services at the site, and will detail all the provisions contained within this HASP. For a HAZWOPER operation, training on the site must be for a minimum of 3 days. Specific issues that will be addressed include the hazards described in Section 3.0.

4.3 Tailgate Safety Briefings

Before starting work each day or as needed, the Langan HSO will conduct a brief tailgate safety meeting to assist site personnel in conducting their activities safely. Tailgate meetings will be documented in Attachment H. Briefings will include the following:

- Work plan for the day;
- Review of safety information relevant to planned tasks and environmental conditions;
- New activities/task being conducted;
- Results of Jobsite Safety Inspection Checklist;
- Changes in work practices;
- Safe work practices; and
- Discussion and remedies for noted or observed deficiencies.

5.0 MEDICAL SURVEILLANCE

All personnel who will be performing field work involving potential exposure to toxic and hazardous substances (defined by 29 CFR 1910.120(a)) will be required to have passed an initial baseline medical examination, with follow-up medical exams thereafter, consistent with 29 CFR 1910.120(f). Medical evaluations will be performed by, or under the direction of, a physician board-certified in occupational medicine.

Additionally, personnel who may be required to perform work while wearing a respirator must receive medical clearance as required under CFR 1910.134(e), *Respiratory Protection*. Medical evaluations will be performed by, or under the direction of, a physician board-certified in occupational medicine. Results of medical evaluations are maintained by the HSM.

6.0 PERSONAL PROTECTIVE EQUIPMENT

6.1 Levels of Protection

Langan will provide PPE to Langan employees to protect them from the specific hazards they are likely to encounter on-site. Direct hired contractors will provide their employees with equivalent PPE to protect them from the specific hazards likely to be encountered on-site. Selection of the appropriate PPE must take into consideration: (1) identification of the hazards or suspected hazards; (2) potential exposure routes; and, (3) the performance of the PPE construction (materials and seams) in providing a barrier to these hazards.

Based on anticipated site conditions and the proposed work activities to be performed at the

site, Level D protection will be used. The upgrading/downgrading of the level of protection will be based on continuous air monitoring results as described in Section 6.0 (when applicable). The decision to modify standard PPE will be made by the site HSO or FTL after conferring with the PM. The levels of protection are described below.

Level D Protection (as needed)

- Safety glasses with side shields or chemical splash goggles
- Safety boots/shoes
- Coveralls (Tyvek® or equivalent)
- Hard hat
- Long sleeve work shirt and work pants
- Nitrile gloves
- Hearing protection
- Reflective safety vest

Level D Protection (Modified, as needed)

- Safety glasses with sideshields or chemical splash goggles
- Safety boots/shoes (toe-protected)
- Disposable chemical-resistant boot covers
- Coveralls (polycoated Tyvek or equivalent to be worn when contact with wet contaminated soil, groundwater, or non-aqueous phase liquids is anticipated)
- Hard hat
- Long sleeve work shirt and work pants
- Nitrile gloves
- Hearing protection (as needed)
- Personal floatation device (for work within 5 ft of the water)
- Reflective traffic vest

Level C Protection (as needed)

- Full or Half face, air-purifying respirator, with NIOSH approved HEPA filter
- Inner (latex) and outer (nitrile) chemical-resistant gloves
- Safety glasses with side shields or chemical splash goggles
- Chemical-resistant safety boots/shoes
- Hard hat
- Long sleeve work shirt and work pants
- Coveralls (Tyvek® or equivalent)
- Hearing protection (as needed)
- Reflective safety vest

The action levels used in determining the necessary levels of respiratory protection and upgrading to Level C are summarized in Table 4. The written Respiratory Protection Program is maintained by the HSM and is available if needed. The monitoring procedures and equipment

are outlined in Section 6.0 (when applicable).

6.2 Respirator Fit-Test

All Langan employees who may be exposed to hazardous substances at the work site are in possession of a full or half face-piece, air-purifying respirator and have been successfully fit-tested within the past year. Fit-test records are maintained by the HSM.

6.3 Respirator Cartridge Change-Out Schedule

Respiratory protection is required to be worn when certain action levels (table 2) are reached. A respirator cartridge change-out schedule has been developed in order to comply with 29 CFR 1910.134. The respirator cartridge change-out schedule for this project is as follows:

- Cartridges shall be removed and disposed of at the end of each shift, when cartridges become wet or wearer experiences breakthrough, whichever occurs first.
- If the humidity exceeds 85%, then cartridges shall be removed and disposed of after 4 hours of use.

Respirators shall not be stored at the end of the shift with contaminated cartridges left on. Cartridges shall not be worn on the second day, no matter how short the time period was the previous day they were used.

7.0 AIR QUALITY MONITORING AND ACTIONS LEVELS

7.1 Monitoring During Site Operations

Atmospheric air monitoring results are used to provide data to determine when exclusion zones need to be established and when certain levels of personal protective equipment are required. For all instruments there are Site-specific action level criteria which are used in making field health and safety determinations. Other data, such as the visible presence of contamination or the steady state nature of air contaminant concentration, are also used in making field health and safety decisions. Therefore, the HSO may establish an exclusion zone or require a person to wear a respirator even though atmospheric air contaminant concentrations are below established HASP action levels.

During site work involving disturbance of petroleum-impacted or fill material, real time air monitoring will be conducted for volatile organic compounds (VOCs). A photoionization detector (PID) and/or flame ionization detector (FID) will be used to monitor concentrations of VOCs at personnel breathing-zone height. Air monitoring will be the responsibility of the HSO or designee. Air monitoring will be conducted during intrusive activities associated with the completion of excavation, debris removal, and soil grading. All manufacturers' instructions for instrumentation and calibration will be available onsite. Subcontractors' air monitoring plans

must be equal or more stringent as the Langan plan. An air monitoring calibration log is provided in Attachment D of this HASP.

7.1.1 Volatile Organic Compounds

Monitoring with a PID, such as a MiniRAE 2000 (10.6v) or equivalent will occur during intrusive work in the AOCs. Colormetric Indicator Tubes for benzene may be used as backup for the PID, if measurements remain above background monitor every 2 hours. The HSO will monitor the employee breathing zone at least every 30 minutes, or whenever there is any indication that concentrations may have changed (odors, visible gases, etc.) since the last measurement. If VOC levels are observed above 5 ppm for longer than 5 minutes or if the site PPE is upgraded to Level C, the HSO will begin monitoring the site perimeter at a location downwind of the AOC every 30 minutes in addition to the employee breathing zone. Instrument action levels for monitored gases are provided in Table 4.

7.1.2 Metals

Based upon the site historical fill, there is a potential for the soils to contain PAHs and metals. During invasive procedures which have the potential for creating airborne dust, such as excavation of dry soils, a real time airborne dust monitor such as a Mini-Ram should be used to monitor for air particulates. The HSO will monitor the employee breathing zone at least every 30 minutes, or whenever there is any indication that concentrations may have changed (appearance of visible dust) since the last measurement. If dust levels are observed to be greater than 0.100 mg/m³ or visible dust is observed for longer than 15 minutes or if the site PPE is upgraded to Level C, the HSO will begin monitoring the site perimeter at a location downwind of the AOC every 30 minutes in addition to the employee breathing zone. Instrument action levels for dust monitoring are provided in Table 4.

7.2 Monitoring Equipment Calibration and Maintenance

Instrument calibration shall be documented and included in a dedicated safety and health logbook or on separate calibration pages of the field book. All instruments shall be calibrated before and after each shift. Calibration checks may be used during the day to confirm instrument accuracy. Duplicate readings may be taken to confirm individual instrument response.

All instruments shall be operated in accordance with the manufacturers' specifications. Manufacturers' literature, including an operations manual for each piece of monitoring equipment will be maintained on site by the HSO for reference.

7.3 Determination of Background Levels

Background (BKD) levels for VOCs and dust will be established prior to intrusive activities within the AOC at an upwind location. A notation of BKD levels will be referenced in the daily monitoring log. BKD levels are a function of prevailing conditions. BKD levels will be taken in an appropriate upwind location as determined by the HSO. Table 4 lists the instrument action levels.

8.0 COMMUNITY AIR MONITORING PROGRAM

Community air monitoring may be conducted in compliance with the NYSDOH Generic CAMP outlined below:

Monitoring for dust and odors will be conducted during all ground intrusive activities by the FTL. Continuous monitoring on the perimeter of the work zones for odor, VOCs, and dust may be required for all ground intrusive activities such as soil excavation and handling activities. The work zone is defined as the general area in which machinery is operating in support of remediation activities. A portable PID will be used to monitor the work zone and for periodic monitoring for VOCs during activities such as soil and groundwater sampling and soil excavation. The site perimeter will be monitored for fugitive dust emissions by visual observations as well as instrumentation measurements (if required). When required, particulate or dust will be monitored continuously with real-time field instrumentation that will meet, at a minimum, the performance standards from DER-10 Appendix 1B.

If VOC monitoring is required, the following actions will be taken based on VOC levels measured:

- If total VOC levels exceed 5 ppm above background for the 15-minute average at the perimeter, work activities will be temporarily halted and monitoring continued. If levels readily decrease (per instantaneous readings) below 5 ppm above background, work activities will resume with continued monitoring.
- If total VOC levels at the downwind perimeter of the hot zone persist at levels in excess of 5 ppm above background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps work activities will resume provided that the total organic vapor level 200 feet downwind of the hot zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less – but in no case less than 20 feet, is below 5 ppm above background for the 15-minute average.
- If the total VOC level is above 25 ppm at the perimeter of the hot zone, activities will be shutdown.

If dust monitoring with field instrumentation is required, the following actions will be taken based on instrumentation measurements:

- If the downwind particulate level is 100 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression must be employed. Work may continue with dust suppression techniques provided that downwind PM10 levels do not exceed 150 $\mu\text{g}/\text{m}^3$ above the background level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM10 levels are greater than 150 $\mu\text{g}/\text{m}^3$ above the background level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM10 concentration to within 150 $\mu\text{g}/\text{m}^3$ of the upwind level and in preventing visible dust migration.

8.1 Vapor Emission Response Plan

This section applies if VOC monitoring is required. If the ambient air concentration of organic vapors exceeds 5 ppm above background at the perimeter of the hot zone, boring and well installation, and excavation activities will be halted or odor controls will be employed, and monitoring continued. When work shut-down occurs, downwind air monitoring as directed by the HSO or FTL will be implemented to ensure that vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission section.

If the organic vapor level decreases below 5 ppm above background, sampling and boring and well installation can resume, provided:

- The organic vapor level 200 feet downwind of the hot zone or half the distance to the nearest residential or commercial structure, whichever is less, is below 1 ppm over background, and
- More frequent intervals of monitoring, as directed by the HSO or FTL, are conducted.

8.2 Major Vapor Emission

This section applies if VOC monitoring is required. If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work site, or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted or odor controls must be implemented.

If, following the cessation of the work activities, or as the result of an emergency, organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the hot zone, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20 Foot Zone).

If either of the following criteria is exceeded in the 20 Foot Zone, then the Major Vapor Emission Response Plan shall automatically be implemented.

- Sustained organic vapor levels approaching 5 ppm above background for a period of more than 30 minutes, or
- Organic vapor levels greater than 5 ppm above background for any time period.

8.3 Major Vapor Emission Response Plan

Upon activation, the following activities will be undertaken:

- The local police authorities will immediately be contacted by the HSO or FTL and advised of the situation;
- Frequent air monitoring will be conducted at 30-minute intervals within the 20 Foot Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the HSO or FTL; and
- All Emergency contacts will go into effect as appropriate.

8.4 Dust Suppression Techniques

Preventative measures for dust generation may include wetting site fill and soil, construction of an engineered construction entrance with gravel pad, a truck wash area, covering soils with tarps, and limiting vehicle speeds to five miles per hour.

Work practices to minimize odors and vapors include limiting the time that the excavations remain open, minimizing stockpiling of contaminated-source soil, and minimizing the handling of contaminated material. Offending odor and organic vapor controls may include the application of foam suppressants or tarps over the odor or VOC source areas. Foam suppressants may include biodegradable foams applied over the source material for short-term control of the odor and VOCs.

If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: direct load-out of soils to trucks for off-Site disposal; use of chemical odorants in spray or misting systems; and, use of staff to monitor odors in surrounding neighborhoods.

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

9.0 WORK ZONES AND DECONTAMINATION

9.1 Site Control

Work zones are intended to control the potential spread of contamination throughout the site and to assure that only authorized individuals are permitted into potentially hazardous areas. Any person working in an area where the potential for exposure to site contaminants exists will only be allowed access after providing the HSO with proper training and medical documentation.

Exclusion Zone (EZ) - All activities which may involve exposure to site contaminants, hazardous materials and/or conditions should be considered an EZ. Decontamination of field equipment will also be conducted in the Contaminant Reduction Zone (CRZ) which will be located on the perimeter of the EZ. The EZ and the CRZ will be clearly delineated by cones, tapes or other means. The HSO may establish more than one EZ where different levels of protection may be employed or different hazards exist. The size of the EZ shall be determined by the HSO allowing adequate space for the activity to be completed, field members and emergency equipment.

9.2 Contamination Zone

9.2.1 Personnel Decontamination Station

Personal hygiene, coupled with diligent decontamination, will significantly reduce the potential for exposure.

9.2.2 Minimization of Contact with Contaminants

During completion of all site activities, personnel should attempt to minimize the chance of contact with contaminated materials. This involves a conscientious effort to keep "clean" during site activities. All personnel should minimize kneeling, splash generation, and other physical contact with contamination as PPE is intended to minimize accidental contact. This may ultimately minimize the degree of decontamination required and the generation of waste materials from site operations.

Field procedures will be developed to control over spray and runoff and to ensure that unprotected personnel working nearby are not affected.

9.2.3 Personnel Decontamination Sequence

Decontamination will be performed by removing all PPE used in EZ and placing it in drums/trash cans at the CRZ. Baby wipes shall be available for wiping hands and face. Drums/trash cans will be labeled by the field crews in accordance with all local, state, and federal requirements. Management plans for contaminated PPE, and tools are provided below.

9.2.4 Emergency Decontamination

If circumstances dictate that contaminated clothing cannot be readily removed, then remove gross contamination and wrap injured personnel with clean garments/blankets to avoid contaminating other personnel or transporting equipment. If the injured person can be moved, he/she will be decontaminated by site personnel as described above before emergency responders handle the victim. If the person cannot be moved because of the extent of the injury (a back or neck injury), provisions shall be made to ensure that emergency response personnel will be able to respond to the victim without being exposed to potentially hazardous atmospheric conditions. If the potential for inhalation hazards exist, such as with open excavation, this area will be covered with polyethylene sheeting to eliminate any potential inhalation hazards. All emergency personnel are to be immediately informed of the injured person's condition, potential contaminants, and provided with all pertinent data.

9.2.5 Hand-Held Equipment Decontamination

Hand-held equipment includes all monitoring instruments as stated earlier, samples, hand tools, and notebooks. The hand-held equipment is dropped at the first decontamination station to be decontaminated by one of the decontamination team members. These items must be decontaminated or discarded as waste prior to removal from the CRZ.

To aid in decontamination, monitoring instruments can be sealed in plastic bags or wrapped in polyethylene. This will also protect the instruments against contaminants. The instruments will be wiped clean using wipes or paper towels if contamination is visually evident. Sampling equipment, hand tools, etc. will be cleaned with non-phosphorous soap to remove any potentially contaminated soil, and rinsed with deionized water. All decontamination fluids will be containerized and stored on-site pending waste characterization sampling and appropriate off-site disposal.

9.2.6 Heavy Equipment Decontamination

All heavy equipment and vehicles arriving at the work site will be free from contamination from offsite sources. Any vehicles arriving to work that are suspected of being impacted will not be

permitted on the work site. Potentially contaminated heavy equipment will not be permitted to leave the EZ unless it has been thoroughly decontaminated and visually inspected by the HSO or his designee.

9.3 Support Zone

The support zone or cold zone will include the remaining areas of the job site. Break areas and support facilities (include equipment storage and maintenance areas) will be located in this zone. No equipment or personnel will be permitted to enter the cold zone from the hot zone without passing through the decontamination station in the warm zone (if necessitated). Eating, smoking, and drinking will be allowed only in this area.

9.4 Communications

The following communications equipment will be utilized as appropriate.

- Telephones - A cellular telephone will be located with the HSO for communication with the HSM and emergency support services/facilities.
- Hand Signals - Hand signals shall be used by field teams, along with the buddy system. The entire field team shall know them before operations commence and their use covered during site-specific training. Typical hand signals are the following:

Hand Signal	Meaning
Hand gripping throat	Out of air; cannot breathe
Grip partners wrists or place both hands around waist	Leave immediately without debate
Hands on top of head	Need assistance
Thumbs up	OK; I'm alright; I understand
Thumbs down	No; negative
Simulated "stick" break with fists	Take a break; stop work

9.5 The Buddy System

When working in teams of two or more, workers will use the "buddy system" for all work activities to ensure that rapid assistance can be provided in the event of an emergency. This requires work groups to be organized such that workers can remain close together and maintain visual contact with one another. Workers using the "buddy system" have the following responsibilities:

- Provide his/her partner with assistance.
- Observe his/her partner for signs of chemical or heat exposure.

- Periodically check the integrity of his/her partner's PPE.
- Notify the HSO or other site personnel if emergency service is needed.

10.0 NEAREST MEDICAL ASSISTANCE

The address and telephone number of the nearest hospital:

Harlem Hospital Center
1901 Lenox Avenue
New York, New York
212-939-1000

Map with directions to the hospital are shown in Figure 2. This information will either be posted prominently at the site or will be available to all personnel all of the time. Further, all field personnel, including the HSO & FTL, will know the directions to the hospital.

11.0 STANDING ORDERS/SAFE WORK PRACTICES

The standing orders, which consist of a description of safe work practices that must always be followed while on-site by Langan employees and contractors, are shown in Attachment A. The site HSO and FTL each have the responsibility for enforcing these practices. The standing orders will be posted prominently at the site, or are made available to all personnel at all times. Those who do not abide by these safe work practices will be removed from the site.

12.0 SITE SECURITY

No unauthorized personnel shall be permitted access to the work areas.

13.0 UNDERGROUND UTILITIES

As provided in Langan's Underground Utility Clearance Guidelines, the following safe work practices should be followed by Langan personnel and the contractor before and during subsurface work in accordance with federal, state and local regulations:

- Obtain available utility drawings from the property owner/client or operator.
- Provide utility drawings to the project team.
- In the field, mark the proposed area of subsurface disturbance (when possible).
- Ensure that the utility clearance system has been notified.
- Ensure that utilities are marked before beginning subsurface work.
- Discuss subsurface work locations with the owner/client and contractors.
- Obtain approval from the owner/client and operators for proposed subsurface work locations.
- Use safe digging procedures when applicable.
- Stay at least 10 feet from all equipment performing subsurface work.

14.0 SITE SAFETY INSPECTION

The Langan HSO or alternate will check the work area daily, at the beginning and end of each work shift or more frequently to ensure safe work conditions. The HSO or alternate must complete the Jobsite Safety Inspection Checklist, found in Attachment F. Any deficiencies shall be shared with the FTL, HSM and PM and will be discussed at the daily tailgate meeting.

15.0 HAND AND POWER TOOLS

All hand- and electric-power tools and similar equipment shall be maintained in a safe operating condition. All electric-power tools must be inspected before initial use. Damaged tools shall be removed immediately from service or repaired. Tools shall be used only for the purpose for which they were designed. All users must be properly trained in their safe operation.

16.0 EMERGENCY RESPONSE

16.1 General

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff is essential. Specific elements of emergency support procedures that are addressed in the following subsections include communications, local emergency support units, preparation for medical emergencies, first aid for injuries incurred on site, record keeping, and emergency site evacuation procedures. In case of emergency, in addition to 911 the Langan Incident/Injury Hotline **(800) 9-LANGAN** (800-952-6426) extension 4699 should be called as soon as possible.

16.2 Responsibilities

16.2.1 Health and Safety Officer (HSO)

The HSO is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. The HSO is responsible for ensuring the HSM are notified of all incidents, all injuries, near misses, fires, spills, releases or equipment damage. The HSO is required to immediately notify the HSM of any fatalities or catastrophes (three or more workers injured and hospitalized) so that the HSM can notify OSHA within the required time frame.

16.2.2 Emergency Coordinator

The HSO or their designated alternate will serve as the Emergency Coordinator. The Emergency Coordinator is responsible for ensuring that all personnel are evacuated safely and

that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. They are also responsible for ensuring the HSM are notified of all incidents, all injuries, near misses, fires, spills, releases or equipment damage. The Emergency Coordinator is required to immediately notify the HSM of any fatalities or catastrophes (three or more workers injured and hospitalized).

The Emergency Coordinator shall locate emergency phone numbers and identify hospital routes prior to beginning work on the sites. The Emergency Coordinator shall make necessary arrangements to be prepared for any emergencies that could occur.

The Emergency Coordinator is responsible for implementing the Emergency Response Plan.

16.2.3 Site Personnel

Project site personnel are responsible for knowing the Emergency Response Plan and the procedures contained herein. Personnel are expected to notify the Emergency Coordinator of situations that could constitute a site emergency. Project site personnel, including all subcontractors will be trained in the Emergency Response Plan.

16.3 Communications

Once an emergency situation has been stabilized, or as soon as practically possible, the HSO will contact the Langan Incident/Injury Hotline (1-800-952-6426) or (973-560-4699) and Project Manager of identify any emergency situation.

16.4 Local Emergency Support Units

In order to be able to deal with any emergency that might occur during investigative activities at the site, the Emergency Notification Numbers (Table 5) will be posted and provided to all personnel conducting work within the EZ.

Figure 2 shows the hospital route map. Outside emergency number 911 and local ambulance should be relied on for response to medical emergencies and transport to emergency rooms. Always contact first responders when there are serious or life threatening emergencies on the site. Project personnel are instructed not to drive injured personnel to the Hospital. In the event of an injury, provide first aid and keep the injured party calm and protected from the elements and treat for shock when necessary.

16.5 Pre-Emergency Planning

Langan will communicate directly with administrative personnel from the emergency room at the hospital in order to determine whether the hospital has the facilities and personnel needed to treat cases of trauma resulting from any of the contaminants expected to be found on the site. Instructions for finding the hospital will be posted conspicuously in the site office and in each site vehicle.

16.6 Emergency Medical Treatment

The procedures and rules in this HASP are designed to prevent employee injury. However, should an injury occur, no matter how slight, it will be reported to the HSO immediately. First-aid equipment will be available on site at the following locations:

- First Aid Kit: Contractor Mobile Office and Vehicles
- Emergency Eye Wash: Contractor Mobile office and Vehicles

During the site safety briefing, project personnel will be informed of the location of the first aid station(s) that has been set up. Some injuries, such as severe cuts and lacerations or burns, may require immediate treatment. Any first aid instructions that can be obtained from doctors or paramedics, before an emergency-response squad arrives at the site or before the injured person can be transported to the hospital, will be followed closely.

16.7 Personnel with current first aid and CPR certification will be identified.

Only in non-emergency situations may an injured person be transported to an urgent care facility. Due to hazards that may be present at the site and the conditions under which operations are conducted, it is possible that an emergency situation may develop. Emergency situations can be characterized as injury or acute chemical exposure to personnel, fire or explosion, environmental release, or hazardous weather conditions.

16.8 Emergency Site Evacuation Routes and Procedures

All project personnel will be instructed on proper emergency response procedures and locations of emergency telephone numbers during the initial site safety meeting. If an emergency occurs as a result of the site investigation activities, including but not limited to fire, explosion or significant release of toxic gas into the atmosphere, the Langan Project Manager will be verbally notified immediately. All heavy equipment will be shut down and all personnel will evacuate the work areas and assemble at the nearest intersection to be accounted for and to receive further instructions.

16.9 Fire Prevention and Protection

In the event of a fire or explosion, procedures will include immediately evacuating the site and notification of the Langan Project Manager of the investigation activities. Portable fire extinguishers will be provided at the work zone. The extinguishers located in the various locations should also be identified prior to the start of work. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).

16.9.1 Fire Prevention

Fires will be prevented by adhering to the following precautions:

- Good housekeeping and storage of materials.
- Storage of flammable liquids and gases away from oxidizers.
- Shutting off engines to refuel.
- Grounding and bonding metal containers during transfer of flammable liquids.
- Use of UL approved flammable storage cans.
- Fire extinguishers rated at least 10 pounds ABC located on all heavy equipment, in all trailers and near all hot work activities.

The person responsible for the control of fuel source hazards and the maintenance of fire prevention and/or control equipment is the HSO.

16.10 Significant Vapor Release

Based on the proposed tasks, the potential for a significant vapor release is low. However, if a release occurs, the following steps will be taken:

- Move all personnel to an upwind location. All non-essential personnel shall evacuate.
- Upgrade to Level C Respiratory Protection.
- Downwind perimeter locations shall be monitored for volatile organics..
- If the release poses a potential threat to human health or the environment in the community, the Emergency Coordinator shall notify the Langan Project Manager.
- Local emergency response coordinators will be notified.

16.11 Overt Chemical Exposure

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Material Safety Data Sheet (MSDS) will be followed, when necessary.

SKIN AND EYE: Use copious amounts of soap and water from eye-wash kits and portable hand wash stations.

CONTACT: Wash/rinse affected areas thoroughly, then provide appropriate medical attention. Skin shall also be rinsed for 15 minutes if contact with caustics, acids or hydrogen peroxide occurs. Affected items of clothing shall also be removed from contact with skin.

Providing wash water and soap will be the responsibility of each individual contractor or subcontractor on-site.

16.12 Decontamination During Medical Emergencies

If emergency life-saving first aid and/or medical treatment is required, normal decontamination procedures may need to be abbreviated or omitted. The HSO or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed on site, a plastic barrier placed between the injured individual and clean surfaces should be used to help prevent contamination of the inside of ambulances and/or medical personnel. Outer garments may then be removed at the medical facility. No attempt will be made to wash or rinse the victim if his/her injuries are life threatening, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed.

16.13 Adverse Weather Conditions

In the event of adverse weather conditions, the HSO will determine if work will continue without potentially risking the safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries.
- Potential for cold stress and cold-related injuries.
- Treacherous weather-related working conditions (hail, rain, snow, ice, high winds).
- Limited visibility (fog).
- Potential for electrical storms.
- Earthquakes.
- Other major incidents.

Site activities will be limited to daylight hours, or when suitable artificial light is provided, and acceptable weather conditions prevail. The HSO will determine the need to cease field operations or observe daily weather reports and evacuate, if necessary, in case of severe inclement weather conditions.

16.14 Spill Control and Response

All small spills/environmental releases shall be contained as close to the source as possible. Whenever possible, the MSDS will be consulted to assist in determining proper waste characterization and the best means of containment and cleanup. For small spills, sorbent materials such as sand, sawdust or commercial sorbents should be placed directly on the substance to contain the spill and aid recovery. Any acid spills should be diluted or neutralized carefully prior to attempting recovery. Berms of earthen or sorbent materials can be used to contain the leading edge of the spills. All spill containment materials will be properly disposed. An exclusion zone of 50 to 100 feet around the spill area should be established depending on the size of the spill.

All contractor vehicles shall have spill kits on them with enough material to contain and absorb the worst-case spill from that vehicle. All vehicles and equipment shall be inspected prior to be admitted on site. Any vehicle or piece of equipment that develops a leak will be taken out of service and removed from the job site.

The following seven steps shall be taken by the Emergency Coordinator:

1. Determine the nature, identity and amounts of major spills.
2. Make sure all unnecessary persons are removed from the spill area.
3. Notify the HSO immediately.
4. Use proper PPE in consultation with the HSO.
5. If a flammable liquid, gas or vapor is involved, remove all ignition sources and use non-sparking and/or explosion-proof equipment to contain or clean up the spill (diesel-only vehicles, air-operated pumps, etc.)
6. If possible, try to stop the leak with appropriate material.
7. Remove all surrounding materials that can react or compound with the spill.

In addition to the spill control and response procedures described in this HASP, Langan personnel will coordinate with the designated project manager relative to spill response and control actions. Notification to the Project Manager must be immediate and, to the extent possible, include the following information:

- Time and location of the spill.
- Type and nature of the material spilled.

- Amount spilled.
- Whether the spill has affected or has a potential to affect a waterway or sewer.
- A brief description of affected areas/equipment.
- Whether the spill has been contained.
- Expected time of cleanup completion. If spill cleanup cannot be handled by Langan's on-site personnel alone, such fact must be conveyed to the Project Manager immediately.

Langan shall not make any notification of spills to outside agencies. The client will notify regulatory agencies as per their reporting procedures.

16.15 Emergency Equipment

The following minimum emergency equipment shall be kept and maintained on site:

- Industrial first aid kit.
- Fire extinguishers (one per site).

16.16 Restoration and Salvage

After an emergency, prompt restoration of utilities, fire protection equipment, medical supplies and other equipment will reduce the possibility of further losses. Some of the items that may need to be addressed are:

- Refilling fire extinguishers.
- Refilling medical supplies.
- Recharging eyewashes and/or showers.
- Replenishing spill control supplies.

16.17 Documentation

Immediately following an incident or near miss, unless emergency medical treatment is required, either the employee or a coworker must contact the Langan Incident/Injury Hotline at 1-(800)-9-LANGAN (ext. #4699) and the client representative to report the incident or near miss. For emergencies involving personnel injury and/or exposure, the HSO and affected employee will complete and submit an Employee Exposure/Injury Incident Report (Attachment C) to the Langan Corporate Health and Safety Manager as soon as possible following the incident.

17.0 RECORDKEEPING

The following is a summary of required health and safety logs, reports and recordkeeping.

17.1 Field Change Authorization Request

Any changes to the work to be performed that is not included in the HASP will require an addendum that is approved by the Langan project manager and Langan HSM to be prepared. Approved changes will be reviewed with all field personnel at a safety briefing.

17.2 Medical and Training Records

Copies or verification of training (40-hour, 8-hour, supervisor, site-specific training, documentation of three-day OJT, and respirator fit-test records) and medical clearance for site work and respirator use will be maintained in the office and available upon request. Records for all subcontractor employees must also be available upon request. All employee medical records will be maintained by the HSM.

17.3 Onsite Log

A log of personnel on site each day will be kept by the HSO or designee.

17.4 Daily Safety Meetings (“Tailgate Talks”)

Completed safety briefing forms will be maintained by the HSO.

17.5 Exposure Records

All personal monitoring results, laboratory reports, calculations and air sampling data sheets are part of an employee exposure record. These records will be maintained by the HSO during site work. At the end of the project they will be maintained according to 29 CFR 1910.1020.

17.6 Hazard Communication Program/MSDS-SDS

Material safety data sheets (MSDS) or Safety Data Sheets (SDS) have been obtained for applicable substances and are included in this HASP (Attachment E). Langan’s written hazard communication program, in compliance with 29 CFR 1910.1200, is maintained by the HSM.

17.7 Documentation

Immediately following an incident or near miss, unless emergency medical treatment is required, either the employee or a coworker must contact the Langan incident/injury hotline at 1-800-952-6426, extension 4699 and the Project Manager to report the incident or near miss. The Project Manager will contact the client or client representative. A written report must be completed and submitted HSM within 24 hours of the incident. For emergencies involving personnel injury and/or exposure, employee will complete and submit the Langan incident/injury report to the Langan corporate health and safety manager as soon as possible following the incident. Accidents will be investigated in-depth to identify all causes and to recommend hazard control measures.

18.0 CONFINED SPACE ENTRY

Confined spaces are not anticipated at the Site during planned construction activities. If confined spaces are identified, the contractor must implement their own confined space program that all applicable federal, state and local regulations. Confined spaces **will not** be entered by Langan personnel.

TABLES

**TABLE 1
TASK HAZARD ANALYSES**

Task	Hazard	Description	Control Measures	First Aid
1.3.1 - 1.3.5	Contaminated Soil or Groundwater-Dermal Contact	Contaminated water spills on skin, splashes in eyes; contact with contaminated soil/fill during construction activities or sampling.	Wear proper PPE; follow safe practices, maintain safe distance from construction activities	See Table 2, seek medical attention as required
1.3.1 - 1.3.5	Lacerations, abrasions, punctures	Cutting bailer twine, pump tubing, acetate liners, etc. with knife; cuts from sharp site objects or previously cut piles, tanks, etc.; Using tools in tight spaces	Wear proper PPE; follow safe practices	Clean wound, apply pressure and/or bandages; seek medical attention as required.
1.3.1 - 1.3.5	Contaminated Media Inhalation	Opening drums, tanks, wells; vapors for non-aqueous phase liquids or other contaminated site media; dust inhalation during excavation; vapor accumulation in excavation	Follow air monitoring plan; have quick access to respirator, do not move or open unlabeled drums found at the site, maintain safe distance from construction activities	See Table 2, seek medical attention as required
1.3.1 - 1.3.5	Lifting	Improper lifting/carrying of equipment and materials causing strains	Follow safe lifting techniques; Langan employees are not to carry contractor equipment or materials	Rest, ice, compression, elevation; seek medical attention as required
1.3.1 - 1.3.5	Slips, trips, and falls	Slips, trips and falls due to uneven surfaces, cords, steep slopes, debris and equipment in work areas	Good housekeeping at site; constant awareness and focus on the task; avoid climbing on stockpiles; maintain safe distance from construction activities and excavations; avoid elevated areas over six feet unless fully accredited in fall protection and wearing an approved fall protection safety apparatus	Rest, ice, compression, elevation; seek medical attention as required
1.3.1 - 1.3.5	Noise	Excavation equipment, hand tools, drilling equipment.	Wear hearing protection; maintain safe distance from construction activities	Seek medical attention as required
1.3.1 - 1.3.5	Falling objects	Soil material, tools, etc. dropping from drill rigs, front-end loaders, etc.	Hard hats to be worn at all times while in work zones; maintain safe distance from construction activities and excavations	Seek medical attention as required
1.3.1 - 1.3.5	Underground/overhead utilities	Excavation equipment, drill rig auger makes contact with underground object; boom touches overhead utility	"One Call" before dig; follow safe practices; confirm utility locations with contractor; wear proper PPE; maintain safe distance from construction activities and excavations	Seek medical attention as required
1.3.1 - 1.3.5	Insects (bees, wasps, hornet, mosquitoes, and spider)	Sings, bites	Insect Repellent; wear proper protective clothing (work boots, socks and light colored pants);field personnel who may have insect allergies (e.g., bee sting) should provide this information to the HSO or FSO prior to commencing work, and will have allergy medication on Site.	Seek medical attention as required
1.3.1 - 1.3.5	Vehicle traffic / Heavy Equipment Operation	Vehicles unable to see workers on site, operation of heavy equipment in tight spaces, equipment failure, malfunctioning alarms	Wear proper PPE, especially visibility vest; use a buddy system to look for traffic; rope off area of work with cones and caution tape or devices at points of hazard, maintain safe distance from construction activities and equipment	Seek medical attention as required

**TABLE 2
CONTAMINANT HAZARDS OF CONCERN**

Task	Contaminant	CAS Number	Monitoring Device	PEL/IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.5	1,2,4-Trimethylbenzene	95-63-6	PID	None None	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.5	1,3,5-Trimethylbenzene Mesitylene sym-Trimethylbenzene	108-67-8	PID	None None	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.5	Acenaphthene 1,2-Dihydroacenaphthylene 1,8-Ethylenenaphthalene peri-Ethylenenaphthalene Naphthyleneethylene Tricyclododecapentaene	83-32-9	PID	NA NA	Soil	inhalation, ingestion, skin and/or eye contact,	irritation to the skin, eyes, mucous membranes and upper respiratory tract; If ingested, it can cause vomiting	Eye: Irrigate immediately Skin: Soap wash immediately, if redness or irritation develop, seek medical attention immediately Breathing: Move to fresh air Swallow: do not induce vomiting, seek medical attention immediately
1.3.1 – 1.3.5	Acenaphthylene Cycopental(de)naphthalene, Acenaphthalene	208-96-8	PID	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	irritation to the skin, eyes, mucous membranes and upper respiratory tract	Eye: Irrigate immediately, seek medical attention immediately, Skin: Soap wash immediately, if redness or irritation develop, seek medical attention immediately Breathing: Move to fresh air Swallow: do not induce vomiting, seek medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.5	Acetone Dimethyl ketone Ketone propane 2-Propanone	67-64-1	PID	1000 ppm 2500 ppm	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.5	Anthracene	120-12-7	PID	0.2 mg/m ³ 80 mg/m ³ (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to the skin, eyes, mucous membranes and upper respiratory tract, abdominal pain if ingested.	Eye: Irrigate immediately, seek medical attention immediately, Skin: Soap wash immediately, Breathing: Move to fresh air, refer to medical attention; Swallow: refer to medical attention
1.3.1 – 1.3.5	Asbestos	1332-21- 4	NA	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	Asbestosis (chronic exposure): dyspnea (breathing difficulty), interstitial fibrosis, restricted pulmonary function, finger clubbing; irritation eyes; [potential occupational carcinogen]	Eye: Irrigate immediately Breathing: Fresh air
1.3.1 – 1.3.5	Benzo(a)anthracene Benzanthracene Benzanthrene 1,2-Benzanthracene Benzo(b)phenanthrene Tetraphene	56-55-3	PID	0.2 mg/m ³ 80 mg/m ³ (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	dermatitis, bronchitis, [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.5	Benzo(a)pyrene	50-32-8	PID	0.2 mg/m ³ 80 mg/m ³ (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	dermatitis, bronchitis, [potential occupational carcinogen]	Eye: Irrigate immediately, seek medical attention Skin: Soap wash immediately; Breathing: move to fresh air; Swallow: Induce vomiting if conscious, seek medical attention immediately
1.3.1 – 1.3.5	Benzo(b)fluoranthene	205-99-2	PID	0.2 mg/m ³ 80 mg/m ³ (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.5	Benzo(g,h,i)perylene Benzo(ghi)perylene	191-24-2	PID	0.2 mg/m ³ 80 mg/m ³ (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	NA	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.5	Benzo(k)fluoranthene	207-08-9	PID	0.2 mg/m ³ 80 mg/m ³ (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation (dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.5	BTEX Benzene, Toluene, Ethylbenzene M-Xylene, O-Xylene And P-Xylene; BTEX I; BTEX II; BTEX Mixture I; BTEX Mixture II; BTEX Stock Standard	NA	PID	3.19 mg/m ³ 1,595 mg/mg	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; lassitude (weakness, exhaustion) [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.5	Chromium Hexavalent- Trivalent-	7440-47-3	None	1.0 mg/m ³ 250 mg/m ³	Groundwater Soil	inhalation absorption ingestion	irritation to eye, skin, and respiratory	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.5	Diesel Fuel automotive diesel fuel oil No. 2 distillate diesoline diesel oil diesel oil light diesel oil No. 1-D summer diesel	68334-30-5	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.5	Ethanol Absolute alcohol Alcohol cologne spirit drinking alcohol ethane monoxide ethylic alcohol EtOH ethyl alcohol ethyl hydrate ethyl hydroxide ethylol grain alcohol hydroxyethane methylcarbinol	64-17-5	PID	1000 ppm 3300 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose; headache, drowsiness, lassitude (weakness, exhaustion), narcosis; cough; liver damage; anemia; reproductive, teratogenic effects	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.5	Fluoranthene Benzo(j, k)fluorene	206-44-0	PID	0.2 mg/m ³ 80 mg/m ³ (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.5	Fluorene	86-73-7	PID	0.2 mg/m ³ 80 mg/m ³ (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.5	Fuel Oil No. 2	68476-30-2	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.5	Gasoline	8006-61-9	PID	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.5	Helium	7440-59-7	Helium Detector	NA NA	NA	inhalation	dizziness, headache, and nausea	Breathing: Respiratory support

Task	Contaminant	CAS Number	Monitoring Device	PEL/IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.5	Indeno(1,2,3-cd)pyrene	193-39-5	None	0.2 mg/m ³ 80 mg/m ³ (Coal Pitch Tar)	Groundwater Soil	inhalation, absorption, ingestion, consumption	irritation to eyes, skin, respiratory, and digestion [potential occupational carcinogen]	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support Swallow: Medical attention immediately, wash mouth with water
1.3.1 – 1.3.5	Lead	7439-92-1	None	0.050 mg/m ³ 100 mg/m ³	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation to the eyes; hypertension	Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.5	Methyl <i>tert</i> -butyl ether MTBE Methyl tertiary-butyl ether Methyl t-butyl ether tert-Butyl methyl ether tBME tert-BuOMe	1634-04-4	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.5	Naphthalene Naphthalin Tar camphor White tar	91-20-3	PID	50 mg/m ³ 250 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; hematuria (blood in the urine); dermatitis, optical neuritis	Eye: Irrigate immediately Skin: Molten flush immediately/solid- liquid soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.5	Non-Flammable Gas Mixture CALGAS (Equipment Calibration Gas : Oxygen Methane Hydrogen Sulfide Carbon Monoxide Nitrogen	7782-44- 7 74-82-8 7783-08- 4 830-08-0 7727-37- 9	Multi-Gas PID	NA/NA NA/NA 10/100 ppm 50/1200 ppm NA/NA	NA	inhalation	dizziness, headache, and nausea	Breathing: Respiratory support
1.3.1 – 1.3.5	Non-Flammable Gas Mixture CALGAS (Equipment Calibration Gas : Oxygen Isobutylene Nitrogen	7782-44- 7 115-11-7 7727-37- 9	PID	NA/NA NA/NA NA/NA	NA	inhalation	dizziness, headache, and nausea	Breathing: Respiratory support

Task	Contaminant	CAS Number	Monitoring Device	PEL/IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.5	OilScreenSoil (Indigo Blue)® non-SUDAN-based dye	17354- 14-2	None	NA NA	NA	inhalation, skin absorption, ingestion, skin and/or eye contact	NA	Eye: Irrigate immediately Skin: Water flush promptly Breathing: move into fresh air, provide respiratory support , if required Swallow: Rinse with water
1.3.1 – 1.3.5	Total PCBs Chlorodiphenyl (42% chlorine) Aroclor® 1242 PCB Polychlorinated biphenyl	53469- 21-9	None	0.5 mg/m ³ 5 mg/m ³	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, chloracne	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

EXPLANATION OF ABBREVIATIONS

PID = Photoionization Detector

PEL = Permissible Exposure Limit (8-hour Time Weighted Average

IDLH = Immediately Dangerous to Life and Health

ppm = part per million

mg/m³ = milligrams per cubic meter

500 mg/m³

TABLE 3
Summary of Monitoring Equipment

Instrument	Operation Parameters
Photoionization Detector (PID)	<p>Hazard Monitored: Many organic and some inorganic gases and vapors.</p> <p>Application: Detects total concentration of many organic and some inorganic gases and vapors. Some identification of compounds is possible if more than one probe is measured.</p> <p>Detection Method: Ionizes molecules using UV radiation; produces a current that is proportional to the number of ions.</p> <p>General Care/Maintenance: Recharge or replace battery. Regularly clean lamp window. Regularly clean and maintain the instrument and accessories.</p> <p>Typical Operating Time: 10 hours. 5 hours with strip chart recorder.</p>
Oxygen Meter	<p>Hazard Monitored: Oxygen (O₂).</p> <p>Application: Measures the percentage of O₂ in the air.</p> <p>Detection Method: Uses an electrochemical sensor to measure the partial pressure of O₂ in the air, and converts the reading to O₂ concentration.</p> <p>General Care/Maintenance: Replace detector cell according to manufacturer's recommendations. Recharge or replace batteries prior to expiration of the specified interval. If the ambient air is less than 0.5% C O₂, replace the detector cell frequently.</p> <p>Typical Operating Time: 8 – 12 hours.</p>
Additional equipment (if needed, based on site conditions)	
Combustible Gas Indicator (CGI)	<p>Hazard Monitored: Combustible gases and vapors.</p> <p>Application: Measures the concentration of combustible gas or vapor.</p> <p>Detection Method: A filament, usually made of platinum, is heated by burning the combustible gas or vapor. The increase in heat is measured. Gases and vapors are ionized in a flame. A current is produced in proportion to the number of carbon atoms present.</p> <p>General Care/Maintenance: Recharge or replace battery. Calibrate immediately before use.</p> <p>Typical Operating Time: Can be used for as long as the battery lasts, or for the recommended interval between calibrations, whichever is less.</p>
Flame Ionization Detector (FID) with Gas Chromatography Option <i>(i.e., Foxboro Organic Vapor Analyzer (OVA))</i>	<p>Hazard Monitored: Many organic gases and vapors (approved areas only).</p> <p>Application: In survey mode, detects the concentration of many organic gases and vapors. In gas chromatography (GC) mode, identifies and measures specific compounds. In survey mode, all the organic compounds are ionized and detected at the same time. In GC mode, volatile species are separated.</p> <p>General Care/Maintenance: Recharge or replace battery. Monitor fuel and/or combustion air supply gauges. Perform routine maintenance as described in the manual. Check for leaks.</p> <p>Typical Operating Time: 8 hours; 3 hours with strip chart recorder.</p>
Potable Infrared (IR) Spectrophotometer	<p>Hazard Monitored: Many gases and vapors.</p> <p>Application: Measures concentration of many gases and vapors in air. Designed to quantify one or two component mixtures.</p> <p>Detection Method: Passes different frequencies of IR through the sample. The frequencies absorbed are specific for each compound.</p> <p>General Care/Maintenance: As specified by the manufacturer.</p>

Instrument	Operation Parameters
Direct Reading Colorimetric Indicator Tube	<p>Hazard Monitored: Specific gas and vapors.</p> <p>Application: Measures concentration of specific gases and vapors.</p> <p>Detection Method: The compound reacts with the indicator chemical in the tube, producing a stain whose length or color change is proportional to the compound's concentration.</p> <p>General Care/Maintenance: Do not use a previously opened tube even if the indicator chemical is not stained. Check pump for leaks before and after use. Refrigerate before use to maintain a shelf life of about 2 years. Check expiration dates of tubes. Calibrate pump volume at least quarterly. Avoid rough handling which may cause channeling.</p>
Aerosol Monitor	<p>Hazard Monitored: Airborne particulate (dust, mist, fume) concentrations</p> <p>Application: Measures total concentration of semi-volatile organic compounds, PCBs, and metals.</p> <p>Detection Method: Based on light-scattering properties of particulate matter. Using an internal pump, air sample is drawn into the sensing volume where near infrared light scattering is used to detect particles.</p> <p>General Care/Maintenance: As specified by the mfr. Also, the instrument must be calibrated with particulates of a size and refractive index similar to those to be measured in the ambient air.</p>
Monitox	<p>Hazard Monitored: Gases and vapors.</p> <p>Application: Measures specific gases and vapors.</p> <p>Detection Method: Electrochemical sensor relatively specific for the chemical species in question.</p> <p>General Care/Maintenance: Moisten sponge before use; check the function switch; change the battery when needed.</p>
Gamma Radiation Survey Instrument	<p>Hazard Monitored: Gamma Radiation.</p> <p>Application: Environmental radiation monitor.</p> <p>Detection Method: Scintillation detector.</p> <p>General Care/Maintenance: Must be calibrated annually at a specialized facility.</p> <p>Typical Operating Time: Can be used for as long as the battery lasts, or for the recommended interval between calibrations, whichever is less.</p>

**TABLE 4
INSTRUMENTATION ACTION LEVELS**

<u>Photoionization Detector Action Levels</u>	<u>Action Required</u>
Background to 5 ppm	No respirator; no further action required
> 1 ppm but < 5 ppm for > 5 minutes	<ol style="list-style-type: none"> 1. Temporarily discontinue all activities and evaluate potential causes of the excessive readings. If these levels persist and cannot be mitigated (i.e., by slowing drilling or excavation activities), contact HSO to review conditions and determine source and appropriate response action. 2. If PID readings remain above 1 ppm, temporarily discontinue work and upgrade to Level C protection. 3. If sustained PID readings fall below 1 ppm, downgrading to Level D protection may be permitted.
> 5 ppm but < 150 ppm for > 5 minutes	<ol style="list-style-type: none"> 1. Discontinue all work; all workers shall move to an area upwind of the jobsite. 2. Evaluate potential causes of the excessive readings and allow work area to vent until VOC concentrations fall below 5 ppm. 3. Level C protection will continue to be used until PID readings fall below 1 ppm.
> 150 ppm	Evacuate the work area

- Notes:**
1. 1 ppm level based on OSHA Permissible Exposure Limit (PEL) for benzene.
 2. 5 ppm level based on OSHA Short Term Exposure Limit (STEL) maximum exposure for benzene for any 15 minute period.
 3. 150 ppm level based on NIOSH Immediately Dangerous to Life and Health (IDLH) for tetrachloroethylene.

**TABLE 5
EMERGENCY NOTIFICATION LIST**

ORGANIZATION	CONTACT	TELEPHONE
Local Police Department	NYPD	911
Local Fire Department	NYFD	911
Ambulance/Rescue Squad	NYFD	911
Hospital	Harlem Hospital Center	911 or 212-939-1000
Langan Incident / Injury Hotline		917-613-7234
Langan Project Manager	Tyler Chow	646-689-5438 (cell)
Langan Health and Safety Manager (HSM)	Tony Moffa	215-756-2523 (cell)
Langan Health & Safety Officer (HSO)	William Bohrer	410-984-3068 (cell)
Langan Field Team Leader (FTL)	To Be Determined	
Client's Representative	William Bollinger	718-993-2940
National Response Center (NRC)		800-424-8802
Chemical Transportation Emergency Center (Chemtrec)		800-424-9300
Center for Disease Control (CDC)		404-639-3534
EPA (RCRA Superfund Hotline)		800-424-9346
TSCA Hotline		202-554-1404
Poison Control Center		800-222-1222

Immediately following an incident or near miss, unless emergency medical treatment is required, either the employee or a coworker must contact the Langan Incident/Injury Hotline at 1-(800)-9-LANGAN (ext. #4699).

TABLE 6
SUGGESTED FREQUENCY OF PHYSIOLOGICAL MONITORING
FOR FIT AND ACCLIMATED WORKERS^A

Adjusted Temperature^b	Normal Work Ensemble^c	Impermeable Ensemble
90°F or above (32.2°C) or above	After each 45 min. of work	After each 15 min. of work
87.5°F (30.8°-32.2°C)	After each 60 min. of work	After each 30 min. of work
82.5°-87.5°F (28.1°-30.8°C)	After each 90 min. of work	After each 60 min. of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 min. of work	After each 90 min. of work
72.5°-77.5°F (22.5°-25.3°C)	After each 150 min. of work	After each 120 min. of work

a For work levels of 250 kilocalories/hour.

b Calculate the adjusted air temperature (ta adj) by using this equation: $ta\ adj\ ^\circ F = ta\ ^\circ F + (13 \times \% \text{ sunshine})$. Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

c A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

**TABLE 7
HEAT INDEX**

RELATIVE HUMIDITY	ENVIRONMENTAL TEMPERATURE (Fahrenheit)										
	70	75	80	85	90	95	100	105	110	115	120
	APPARENT TEMPERATURE*										
0%	64	69	73	78	83	87	91	95	99	103	107
10%	65	70	75	80	85	90	95	100	105	111	116
20%	66	72	77	82	87	93	99	105	112	120	130
30%	67	73	78	84	90	96	104	113	123	135	148
40%	68	74	79	86	93	101	110	123	137	151	
50%	69	75	81	88	96	107	120	135	150		
60%	70	76	82	90	100	114	132	149			
70%	70	77	85	93	106	124	144				
80%	71	78	86	97	113	136					
90%	71	79	88	102	122						
100%	72	80	91	108							

*Combined Index of Heat and Humidity...what it "feels like" to the body
Source: National Oceanic and Atmospheric Administration

How to use Heat Index:

1. Across top locate Environmental Temperature
2. Down left side locate Relative Humidity
3. Follow across and down to find Apparent Temperature
4. Determine Heat Stress Risk on chart at right

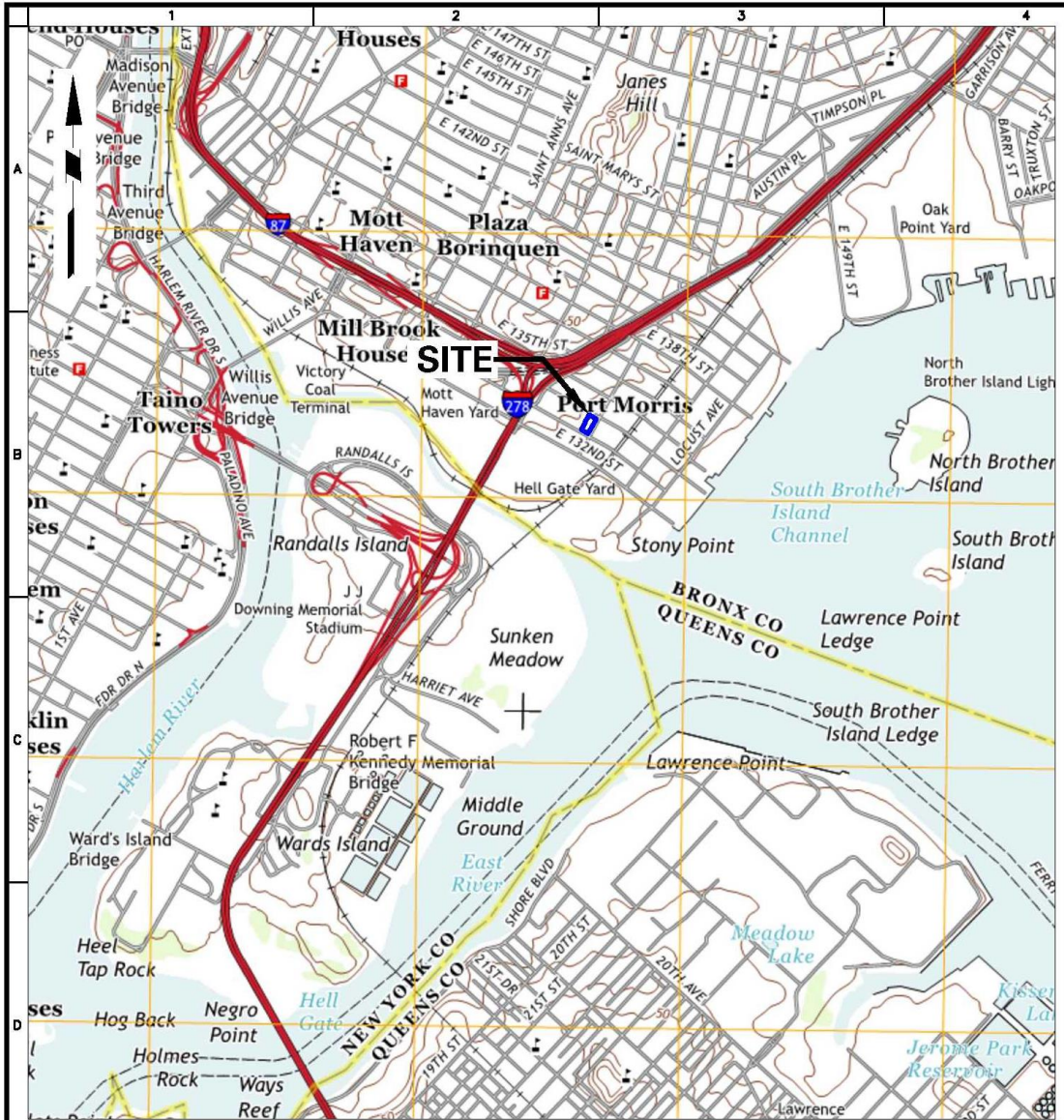
Note: Exposure to full sunshine can increase Heat Index values by up to 15 degrees F.

Apparent Temperature	Heat Stress Risk with Physical Activity and/or Prolonged Exposure
90-105	Heat Cramps or Heat Exhaustion Possible
105-130	Heat Cramps or Heat Exhaustion Likely, Heat Stroke Possible
>130	Heatstroke Highly Likely

FIGURES

FIGURE 1

Site Location Map



MAP REFERENCE: USGS 7.5-MINUTE JERSEY CITY, N.J., AND BROOKLYN, N.Y. TOPOGRAPHIC QUADRANGLES

LEGEND

 SITE BOUNDARY


 21 Penn Plaza, 360 West 31st Street, 8th Floor New York, NY 10001 T: 212.479.6400 F: 212.479.6444 www.langan.com Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. Langan Engineering and Environmental Services, Inc. Langan CT, Inc. Langan International LLC Collectively known as Langan	Project 111 WILLOW AVENUE BLOCK No. 2562, LOT Nos. 49, 56, 58, & 60 BRONX NEW YORK	Figure Title SITE LOCATION MAP	Project No. 170497201 Date 05/04/2018 Scale NTS Drawn By WK Checked By TC	Figure 1
	© 2013 Langan			

FIGURE 2

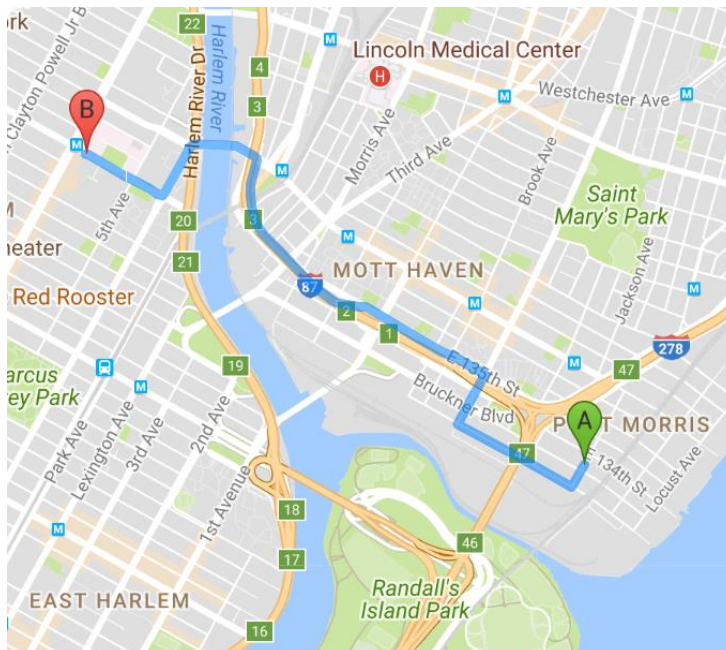
HOSPITAL ROUTE PLAN

**Hospital Location: Harlem Hospital Center
506 Lenox Avenue
New York, New York
212-939-1000**

START: 111 Willow Avenue, Bronx, NY

1. Head southwest on Willow Avenue toward East 133rd Street
2. Turn right onto East 132nd Street
3. Turn right onto St Ann's Avenue
4. Turn left at the 3rd cross street onto East 135th Street
5. Take the Interstate 87 N ramp on the left
6. Merge onto I-87 N
7. Take exit 3 for East 138th Street
8. Turn left onto East 138th Street
9. Slight left onto Madison Avenue Bridge
10. Madison Avenue Bridge turns right and becomes East 135th Street

END: Harlem Hospital Center 506 Lenox Avenue, New York, NY



ATTACHMENT A

STANDING ORDERS

STANDING ORDERS

GENERAL

- No smoking, eating, or drinking in this work zone.
- Upon leaving the work zone, personnel will thoroughly wash their hands and face.
- Minimize contact with contaminated materials through proper planning of work areas and decontamination areas, and by following proper procedures. Do not place equipment on the ground. Do not sit on contaminated materials.
- No open flames in the work zone.
- Only properly trained and equipped personnel are permitted to work in potentially contaminated areas.
- Always use the appropriate level of personal protective equipment (PPE).
- Maintain close contact with your buddy in the work zone
- Contaminated material will be contained in the Exclusion Zone (EZ).
- Report any unusual conditions.
- Work areas will be kept clear and uncluttered. Debris and other slip, trip, and fall hazards will be removed as frequently as possible.
- The number of personnel and equipment in the work zone will be kept to an essential minimum.
- Be alert to the symptoms of fatigue and heat/cold stress, and their effects on the normal caution and judgment of personnel.
- Conflicting situations which may arise concerning safety requirements and working conditions must be addressed and resolved quickly by the site HSO.

TOOLS AND HEAVY EQUIPMENT

- Do not, under any circumstances, enter or ride in or on any backhoe bucket, materials hoist, or any other device not specifically designed to carrying passengers.
- Loose-fitting clothing or loose long hair is prohibited around moving machinery.
- Ensure that heavy equipment operators and all other personnel in the work zone are using the same hand signals to communicate.
- Drilling/excavating within 10 feet in any direction of overhead power lines is prohibited.
- The locations of all underground utilities must be identified and marked out prior to initiating any subsurface activities.
- Check to insure that the equipment operator has lowered all blades and buckets to the ground before shutting off the vehicle.
- If the equipment has an emergency stop device, have the operator show all personnel its location and how to activate it.
- Help the operator ensure adequate clearances when the equipment must negotiate in tight quarters; serve as a signalman to direct backing as necessary.
- Ensure that all heavy equipment that is used in the Exclusion Zone is kept in that zone until the job is done, and that such equipment is completely decontaminated before moving it into the clean area of the work zone.
- Samplers must not reach into or get near rotating equipment such as the drill rig. If personnel must work near any tools that could rotate, the equipment operator must completely shut down the rig prior to initiating such work. It may be necessary to use a remote sampling device.

ATTACHMENT B

DECONTAMINATION PROCEDURES

PERSONNEL DECONTAMINATION

LEVEL C DECONTAMINATION

Station 1:	Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down stations may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and chemical-resistant splash suit with decon solution or detergent and water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Canister or Mask Change	4. If worker leaves Exclusion Zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5:	Boot, Gloves and Outer Garment Removal	5. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 6:	Face piece Removal	6. Face piece is removed (avoid touching face with fingers). Face piece deposited on plastic sheets.
Station 7:	Field Wash	7. Hands and face are thoroughly washed. Shower as soon as possible.

LEVEL D DECONTAMINATION

Station 1:	Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down stations may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and chemical-resistant splash suit with decon solution or detergent and water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Boot, Gloves and Outer Garment Removal	4. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 5:	Field Wash	5. Hands and face are thoroughly washed. Shower as soon as possible.

EQUIPMENT DECONTAMINATION

GENERAL:

Equipment to be decontaminated during the project may include tools, monitoring equipment, respirators, sampling containers, laboratory equipment and drilling equipment.

All decontamination will be done by personnel in protective gear, appropriate for the level of decontamination, as determined by the site HSO. The decontamination work tasks will be split or rotated among support and work crews.

Depending on site conditions, backhoe and pumps may be decontaminated over a portable decontamination pad to contain wash water; or, wash water may be allowed to run off into a storm sewer system. Equipment needed may include a steam generator with high-pressure water, empty drums, screens, screen support structures, and shovels. Drums will be used to hold contaminated wash water pumped from the lined pit. These drums will be labeled as such.

Miscellaneous tools and equipment will be dropped into a plastic pail, tub, or other container. They will be brushed off and rinsed with a detergent solution, and finally rinsed with clean water.

MONITORING EQUIPMENT:

Monitoring equipment will be protected as much as possible from contamination by draping, masking, or otherwise covering as much of the instruments as possible with plastic without hindering the operation of the unit. The PID, HNu or OVA meter, for example, can be placed in a clear plastic bag, which allows reading of the scale and operation of knobs. The probes can be partially wrapped keeping the sensor tip and discharge port clear.

The contaminated equipment will be taken from the drop area and the protective coverings removed and disposed in the appropriate containers. Any dirt or obvious contamination will be brushed or wiped with a disposable paper wipe.

RESPIRATORS:

Respirators will be cleaned and disinfected after every use. Taken from the drop area, the masks (with the cartridges removed and disposed of with other used disposable gear) will be immersed in a cleaning solution and scrubbed gently with a soft brush, followed by a rinse in plain warm water, and then allowed to air dry. In the morning, new cartridges will be installed. Personnel will inspect their own masks for serviceability prior to donning them. And, once the mask is on, the wearer will check the respirator for leakage using the negative and positive pressure fit check techniques.

ATTACHMENT C

EMPLOYEE EXPOSURE/ INJURY INCIDENT REPORT

EMPLOYEE INCIDENT/INJURY REPORT LANGAN ENGINEERING & ENVIRONMENTAL SERVICES

(Complete and return to Tony Moffa in the Doylestown Office)

Affected Employee Name: _____ Date: _____

Incident type: Injury Report Only/No Injury
 Near Miss Other: _____

EMPLOYEE INFORMATION (Person completing Form)

Employee Name: _____ Employee No: _____

Title: _____ Office Location: _____

Length of time employed or date of hire: _____

Mailing address: _____

Sex: M F Birth date: _____

Business phone & extension: _____ Residence/cell phone: _____

ACCIDENT INFORMATION

Project: _____ Project #: _____

Date & time of incident: _____ Time work started & ended: _____

Site location: _____

Incident Type: Possible Exposure Exposure Physical Injury

Names of person(s) who witnessed the incident: _____

Exact location incident occurred: _____

Describe work being done: _____

Describe what affected employee was doing prior to the incident occurring: _____

Describe in detail how the incident occurred: _____

Nature of the incident (List the parts of the body affected): _____

Person(s) to whom incident was reported (Time and Date): _____

List the names of other persons affected during this incident: _____

Possible causes of the incident (equipment, unsafe work practices, lack of PPE, etc.): _____

Weather conditions during incident: _____

MEDICAL CARE INFORMATION

Did affected employee receive medical care? Yes No

If Yes, when and where was medical care received: _____

Provide name of facility (hospital, clinic, etc.): _____

Length of stay at the facility? _____

Did the employee miss any work time? Yes No Undetermined

Date employee last worked: _____ Date employee returned to work: _____

Has the employee returned to work? Yes No

Does the employee have any work limitations or restrictions from the injury? : Yes No

If Yes, please describe: _____

Did the exposure/injury result in permanent disability? Yes No Unknown

If Yes, please describe: _____

HEALTH & SAFETY INFORMATION

Was the operation being conducted under an established site specific CONSTRUCTION HEALTH AND SAFETY PLAN?

Yes No Not Applicable:

Describe protective equipment and clothing used by the employee:

Did any limitations in safety equipment or protective clothing contribute to or affect exposure / injury? If so, explain:

Employee Signature

Date

Langan Representative

Date

ATTACHMENT D
CALIBRATION LOG

ATTACHMENT E

MATERIAL SAFETY DATA SHEETS

SAFETY DATA SHEETS

All Langan Field Personnel Completing This Work Plan Are To Have Real Time Accessibility To Material Safety Data Sheet (MSDs) or Safety Data Sheet (SDSs) Through Their Smart Phone.

*The link is <http://www.msds.com/>
The login name is "drapehead"
The password is "2angan987"*

If You Are Unable To Use the Smart Phone App, You Are To Bring Printed Copies of the MSDs/SDSs to The Site

ATTACHMENT F

JOBSITE SAFETY INSPECTION CHECKLIST

Jobsite Safety Inspection Checklist

Date: _____ **Inspected By:** _____

Location: _____ **Project #:** _____

Check one of the following: **A:** Acceptable **NA:** Not Applicable **D:** Deficiency

	A	NA	D	Remark
1. HASP available onsite for inspection?				
2. Health & Safety Compliance agreement (in HASP) appropriately signed by Langan employees and contractors?				
3. Hospital route map with directions posted on site?				
4. Emergency Notification List posted on site?				
5. First Aid kit available and properly stocked?				
6. Personnel trained in CPR/First Aid on site?				
7. MSDSs readily available, and all workers knowledgeable about the specific chemicals and compounds to which they may be exposed?				
8. Appropriate PPE being worn by Langan employees and contractors?				
9. Project site safe practices ("Standing Orders") posted?				
10. Project staff have 40-hr./8-hr./Supervisor HAZWOPER training?				
11. Project staff medically cleared to work in hazardous waste sites and fit-tested to wear respirators, if needed?				
12. Respiratory protection readily available?				
13. Health & Safety Incident Report forms available?				
14. Air monitoring instruments calibrated daily and results recorded on the Daily Instrument Calibration check sheet?				
15. Air monitoring readings recorded on the air monitoring data sheet/field log book?				
16. Subcontract workers have received 40-hr./8-hr./Spvsr. HAZWOPER training, as appropriate?				
17. Subcontract workers medically cleared to work on site, and fit-tested for respirator wear?				
18. Subcontract workers have respirators readily available?				
19. Mark outs of underground utilities done prior to initiating any subsurface activities?				
20. Decontamination procedures being followed as outlined in HASP?				
21. Are tools in good condition and properly used?				
22. Drilling performed in areas free from underground objects including utilities?				

23. Adequate size/type fire extinguisher supplied?				
24. Equipment at least 20 feet from overhead powerlines?				
25. Evidence that drilling operator is responsible for the safety of his rig.				
26. Trench sides shored, layer back, or boxed?				
27. Underground utilities located and authorities contacted before digging?				
28. Ladders in trench (25-foot spacing)?				
29. Excavated material placed more than 2 feet away from excavation edge?				
30. Public protected from exposure to open excavation?				
31. People entering the excavation regarding it as a permit-required confined space and following appropriate procedures?				
32. Confined space entry permit is completed and posted?				
33. All persons knowledgeable about the conditions and characteristics of the confined space?				
34. All persons engaged in confined space operations have been trained in safe entry and rescue (non-entry)?				
35. Full body harnesses, lifelines, and hoisting apparatus available for rescue needs?				
36. Attendant and/or supervisor certified in basic first aid and CPR?				
37. Confined space atmosphere checked before entry and continuously while the work is going on?				
38. Results of confined space atmosphere testing recorded?				
39. Evidence of coordination with off-site rescue services to perform entry rescue, if needed?				
40. Are extension cords rated for this work being used and are they properly maintained?				
41. Are GFCIs provided and being used?				

Unsafe Acts:

Notes:

ATTACHMENT G

JOB SAFETY ANALYSIS FORM



Job Safety Analysis (JSA) Health and Safety

JSA TITLE:

JSA NUMBER:

DATE CREATED:

CREATED BY:

REVISION DATE:

REVISED BY:

Langan employees must review and revise the Job Safety Analysis (JSA) as needed to address the any site specific hazards not identified. Employees must provide their signatures on the last page of the JSA indicating they have review the JSA and are aware the potential hazards associated with this work and will follow the provided preventive or corrective measures.

PERSONAL PROTECTIVE EQUIPMENT REQUIRED: (PPE): Required As Needed

- | | | |
|---|--|--|
| <input type="checkbox"/> Steel-toed boots | <input type="checkbox"/> Nitrile gloves | <input type="checkbox"/> Dermal Protection (Specify) |
| <input type="checkbox"/> Long-sleeved shirt | <input type="checkbox"/> Leather/ Cut-resistant gloves | <input type="checkbox"/> High visibility vest/clothing |
| <input type="checkbox"/> Safety glasses | <input type="checkbox"/> Face Shield | <input type="checkbox"/> Hard hat |

ADDITIONAL PERSONAL PROTECTIVE EQUIPMENT NEEDED (Provide specific type(s) or descriptions)

- | | | |
|---|---------------------------------------|---------------------------------|
| <input type="checkbox"/> Air Monitoring: | <input type="checkbox"/> Respirators: | <input type="checkbox"/> Other: |
| <input type="checkbox"/> Dermal Protection: | <input type="checkbox"/> Cartridges: | <input type="checkbox"/> Other: |

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE OR CORRECTIVE ACTION
1.	1. 2.	1a. 1b. 2a. 2b.
2.	1.	1
Additional items identified in the field.		
Additional Items.		

If additional items are identified during daily work activities, please notify all relevant personnel about the change and document on this JSA.

JSA Title: Subsurface Investigation

JSA Number: JSA030-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventative/corrective actions.

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):

<input checked="" type="checkbox"/> Safety Shoes	<input checked="" type="checkbox"/> Long Sleeves	<input checked="" type="checkbox"/> Safety Vest (Class 2)	<input checked="" type="checkbox"/> Hard Hat	<input checked="" type="checkbox"/> Hearing Protection
<input checked="" type="checkbox"/> Safety Glasses	<input checked="" type="checkbox"/> Safety Goggles	<input type="checkbox"/> Face Shield	<input type="checkbox"/> Nitrile Gloves	<input type="checkbox"/> PVC Gloves
<input checked="" type="checkbox"/> Leather Gloves	<input checked="" type="checkbox"/> Cut Resist. Gloves	<input type="checkbox"/> Fall Protection	<input type="checkbox"/> Fire Resistant Clothing	<input type="checkbox"/> Rubber Boots
<input type="checkbox"/> Insect/Animal Repellent	<input type="checkbox"/> Ivy Blocker/Cleaner	<input type="checkbox"/> Traffic Cones/Signs	<input type="checkbox"/> Life Vest/Jacket	

Other: Dielectric Overshoes, Sun Block

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
1. Transport equipment to work area	<ol style="list-style-type: none"> Back/strain Slip/Trip/Falls Traffic Cuts/abrasions/contusions from equipment Accidents due to vehicle operations 	<ol style="list-style-type: none"> Use proper lifting techniques/Use wheeled transport Minimize distance to work area/unobstructed path to work area/follow good housekeeping procedures Wear proper PPE (high visibility vest or clothing) Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes) Observe posted speed limits/ Wear seat belts at all times
2. Traffic	<ol style="list-style-type: none"> Hit by moving vehicle 	<ol style="list-style-type: none"> Use traffic cones and signage/ Use High visibility traffic vests and clothing/ Caution tape when working near active roadways.
3. Field Work (drilling, resistivity testing, and inspection)	<ol style="list-style-type: none"> Biological Hazards: insects, rats, snakes, poisonous plants, and other animals Heat stress/injuries Cold Stress/injuries High Energy Transmission Lines Underground Utilities Electrical (soil resistivity testing) 	<ol style="list-style-type: none"> Inspect work area to identify biological hazards. Wear light colored long sleeve shirt and long pants/ Use insect repellent as necessary/ Beware of tall grass, bushes, woods and other areas where ticks may live/ Avoid leaving garbage on site to prevent attracting animals/ Identify and avoid contact with poisonous plants/Beware of rats, snakes, or stray animals. Wear proper clothing (light colored)/ drink plenty of water/ take regular breaks/use sun block Wear proper clothing/ dress in layers/ take regular breaks. Avoid direct contact with high energy transmission lines/ position equipment at least 15 feet or as required by PSE&G from the transmission lines/ wear proper PPE (dielectric overshoes 15 kV minimum rating). Call one-call service before performing intrusive field work/ Review utility mark-outs and available utility drawings (with respect to proposed work locations)/ Follow Underground Utility Guidelines See AGI Sting R1 operating manual for specific concerns during operating instrument
4.All activities	<ol style="list-style-type: none"> Slips/ Trips/ Falls 	<ol style="list-style-type: none"> Be aware of potential trip hazards / Follow good housekeeping

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	2. Hand injuries, cuts or lacerations during manual handling of materials 3. Foot injuries 4. Back injuries 5. Traffic 6. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 7. High Noise levels 8. Overhead hazards 9. Heat Stress/ Cold Stress 10. Eye Injuries	procedures/ Mark significant hazards 8. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 9. Wear Langan approved safety shoes 10. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 11. Wear high visibility clothing & vest / Use cones or signs to designate work area 12. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellent / Use bug spray when needed 13. Wear proper hearing protection 14. Wear hard hat / Avoid areas where overhead hazards exist. 15. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 16. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

<u>Print Name</u>	<u>Sign Name</u>	<u>Date</u>
<i>Prepared by:</i>		
<i>Reviewed by:</i>		

JSA Title: Monitoring Well Development

JSA Number: JSA026-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventative/corrective actions.

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):

<input checked="" type="checkbox"/> Safety Shoes	<input checked="" type="checkbox"/> Long Sleeves	<input checked="" type="checkbox"/> Safety Vest (Class 2)	<input checked="" type="checkbox"/> Hard Hat	<input type="checkbox"/> Hearing Protection
<input checked="" type="checkbox"/> Safety Glasses	<input type="checkbox"/> Safety Goggles	<input checked="" type="checkbox"/> Face Shield	<input checked="" type="checkbox"/> Nitrile Gloves	<input type="checkbox"/> PVC Gloves
<input checked="" type="checkbox"/> Leather Gloves	<input checked="" type="checkbox"/> Cut Resist. Gloves	<input type="checkbox"/> Fall Protection	<input type="checkbox"/> Fire Resistant Clothing	<input type="checkbox"/> Rubber Boots
<input type="checkbox"/> Insect/Animal Repellent	<input type="checkbox"/> Ivy Blocker/Cleaner	<input type="checkbox"/> Traffic Cones/Signs	<input type="checkbox"/> Life Vest/Jacket	

Other: Tyvek Sleeves

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
5. Transport equipment to work area	6. Back Strains 7. Slips/Trips/Falls 8. Traffic 9. Cuts/Abrasions/Contusions from equipment	6. Use proper lifting techniques/ Use wheeled transport/ use buddy system when lifting equipment. 7. Minimize distance from work area/ unobstructed path to collection points and vehicle/ Follow good housekeeping procedures. 8. Wear high-visibility vest or clothing/Exercise caution/ Use traffic cones or signage if needed. 9. Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes).
6. Measure depth of water	1. Exposure to hazardous substances 2. Pinched fingers	1. Wear proper PPE (Nitrile gloves, Safety glasses/Face shield). 2. Wear proper PPE (cut-resistant gloves).
7. Install Tremie pipe in the monitoring well and connect to water source.	1. Hand injuries during installation (pinched fingers/hands). 2. Back strain from holding Tremie pipe. 3. High pressure water spray.	1. Wear proper PPE (Nitrile gloves/cut-resistant gloves). 2. Use proper lifting techniques/ Use two personnel when lowering pump greater than 80 feet. 3. Ensure all hose connections are tight and secure/ Use proper PPE (face shield and safety glasses).
8. Install pump in to well a. Connect pump to sample tubing. b. Lower pump to desired depth in well. c. Connect sample tubing to flow cell d. Connect pump to power source (generator) e. Turn on power source (generator)	1. Hand injuries during pump installation and sample tubing cutting. 2. Back strain 3. Electric shock 4. Exhaust gases from generator 5. Burns from hot equipment	1. Wear proper PPE when installing pump and cutting sample tubing (Nitrile and cut-resistant gloves)/ Use tubing cutter. 2. Proper lifting techniques/ Two personnel when installing pump at depths greater than 80 feet/ Use buddy when lifting heavy loads (pump, generator)/Use wheeled transport. 3. Ensure equipment is (LO/TO: locked out/tagged out) prior to performing any electrical connections/ Inspect wires for frays or cuts/Ensure generator is properly grounded prior to starting. 4. Position generator so that exhaust is flowing away from work area. 5. Do not touch exhaust or any hot part of generator/ Allow equipment time to cool down prior to carrying/ Use proper PPE (long sleeves, leather gloves)
9. Develop monitoring well	11. Hand injuries	17. Wear proper PPE (cut-resistant gloves and nitrile gloves).

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
a. Jet water into well using Tremie pipe b. Turn pump on and adjust to desired flow rate. c. Surge pump up and down well to remove sediment from screen d. Containerize all purge water from well.	12. Face injuries 13. Contaminated spray from water	18. Wear proper PPE (face shield and safety glasses)/do not stand over well opening. 19. Wear proper PPE (Face shield and safety goggles)/Tyvek over garments/ Ensure all connections are secure and tight/ Tubing outlet is contained in an overflow container.
10. Drum staging area.	1. Back, Arm, and shoulder strain. 2. Pinch points 3. Cross contamination 4. Slip/Trips/Falls	1. Use proper lifting techniques/ Use drum carts when moving drums/ use buddy system for moving of drums if needed/Move drums shortest distance needed. 2. Keep fingers and feet away from pinch points/ Use proper PPE (cut-resistant gloves, Langan approved safety shoes) 3. Use proper PPE (Nitrile gloves, Tyvek sleeves) 4. Ensure pathway is clear prior to moving equipment/ Mark all hazards/ Use additional person as a spotter if needed.
11. Equipment pack-up	1. Back Strains 2. Slips/Trips/Falls 3. Traffic 4. Cuts/Abrasions/Contusions from equipment.	1. Use proper lifting techniques/ Use wheeled transport/ use buddy system when lifting equipment. 2. Minimize distance from work area/ Unobstructed path to collection points and vehicle/ Follow good housekeeping procedures. 3. Wear high-visibility vest or clothing/Exercise caution/ Use traffic cones or signage if needed. 20. Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes).
12. All activities	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual handling of materials 3. Foot injuries 14. Back injuries 15. Traffic 16. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 17. High Noise levels 18. Overhead hazards 19. Heat Stress/ Cold Stress 20. Eye Injuries	1. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 2. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 3. Wear Langan approved safety shoes 4. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 5. Wear high visibility clothing & vest / Use cones or signs to designate work area 6. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 7. Wear hearing protection 8. Wear hard hat / Avoid areas were overhead hazards exist. 9. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 10. Wear safety glasses.
Additional items.		

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
Additional Items identified while in the field. (Delete row if not needed.)		

<u>Print Name</u>	<u>Sign Name</u>	<u>Date</u>
<i>Prepared by:</i>		
<i>Reviewed by:</i>		

JSA Title: Direct-Push Soil Borings
JSA Number: JSA004-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventative/corrective actions.

PERSONAL PROTECTIVE EQUIPMENT REQUIRED:

<input checked="" type="checkbox"/> Safety Shoes	<input checked="" type="checkbox"/> Long Sleeves	<input checked="" type="checkbox"/> Safety Vest (Class 2)	<input checked="" type="checkbox"/> Hard Hat	<input checked="" type="checkbox"/> Hearing Protection
<input checked="" type="checkbox"/> Safety Glasses	<input type="checkbox"/> Safety Goggles	<input type="checkbox"/> Face Shield	<input checked="" type="checkbox"/> Nitrile Gloves	<input type="checkbox"/> PVC Gloves
<input checked="" type="checkbox"/> Leather Gloves	<input checked="" type="checkbox"/> Cut Resist. Gloves	<input type="checkbox"/> Fall Protection	<input type="checkbox"/> Fire Resistant Clothing	<input type="checkbox"/> Rubber Boots
<input type="checkbox"/> Insect/Animal Repellent	<input type="checkbox"/> Ivy Blocker/Cleaner	<input type="checkbox"/> Traffic Cones/Signs	<input type="checkbox"/> Life Vest/Jacket	
<input checked="" type="checkbox"/> Other: Half-face respirator, dust cartridges, PID (if applicable)				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
13. Move equipment to work site	10. Back strain when lifting equipment 11. Slips/ Trips/ Falls while moving equipment 12. Traffic (if applicable) 13. Pinched fingers or running over toes during geoprobe set-up 14. Overturn drilling rig while transporting to loading dock on flat-bed tow truck	10. Use proper lifting technique (use legs for bending and lifting and not the back)/ Use wheeled transport for heavy equipment / Get assistance when handling loads greater than 50 lbs. / Minimize distance to vehicle 11. Use proper lifting technique (use legs for bending and lifting and not the back) / Use wheeled transport for heavy equipment / Get assistance when handling loads greater than 50 lbs. / Minimize distance to vehicle / Have unobstructed path to vehicle or collection point / Do not lift/walk with boxes that are heavy/difficult to lift 12. Wear high visibility safety vests or clothing / Exercise caution 13. Wear proper PPE (cut-resistant gloves) / Stay alert, be aware of geoprobe rig at all times 14. Drill rig should be parked in center of flat-bed tow truck / Emergency brake shall be used at all times during transport on the flat-bed truck/ All unnecessary personnel should stay away from the flat-bed truck during moving activities
14. Calibration of monitoring equipment	3. Skin or eye contact with calibration chemicals 4. Pinch fingers in monitoring equipment	3. Wear proper PPE (safety glasses/ goggles) 4. Wear proper PPE (leather gloves)
15. Set-up geoprobe rig	4. Geoprobe rig movement	4. All field personnel should stay clear of the geoprobe rig while moving / Use a spotter when backing up the geoprobe
16. Advance geoprobe rods below ground surface to desired depth	6. Underground utilities 7. High noise levels	6. Clean all subsurface soil borings to a minimum of 5 feet below grade 7. Wear proper PPE (hearing protection)
17. Remove and open acetate liner	21. Pinched fingers while removing macrocore 22. Cuts/lacerations when cutting acetate liner open 23. Exposure to hazardous vapors	1. Wear proper PPE (nitrile gloves, cut-resistant or leather gloves) 2. Wear proper PPE (cut-resistant or leather gloves) 3. Do not place face over acetate liner when opening / Monitor hazardous vapors in air with PID / Upgrade PPE as necessary based on levels contained in the Health and Safety Plan

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
5. Remove and open acetate liner (cont'd)	24. Skin contact with contaminated soil	4. Wear proper PPE (nitrile gloves)
18. Sample Collections a) Monitor parameters b) Prepare sample containers and labels	1. Contact with potentially contaminated soil 2. Lacerations from broken sample bottles 3. Back strain while transporting full coolers 4. Internal exposure to contaminants and metals through inhalation of dust 5. Slips/ Trips/ Falls	1. Use monitoring devices / Wear proper PPE (safety glasses, nitrile gloves) 2. Do not over-tighten bottle caps / Handle bottles safely to prevent breakage 8. Use proper lifting techniques / Do not lift heavy loads without assistance 9. Avoid creating dust / If necessary, wear a half mask respirator with applicable dust cartridge / Inspect respirator for damage and cleanliness prior to use / Clean respirator after each use and store in a clean, secure location 10. Be alert / Follow good housekeeping procedures
19. Remove excess soil from acetate liner and place in 55-gallon drum (IF NOT PERFORMED BY LANGAN, REMOVE!)	1. Cuts/lacerations from acetate liner 2. Pinched fingers/hand while opening/closing drum 3. Skin contact with contaminated soil 4. Soil debris in eyes	1. Wear proper PPE (cut-resistant or leather gloves) 2. Wear proper PPE (cut-resistant or leather gloves) 3. Wear proper PPE (nitrile gloves) 4. Wear proper PPE (safety glasses)
8. Transport drums to central staging location (IF NOT PERFORMED BY LANGAN, REMOVE!)	1. Back, arm or shoulder strain from moving drums 2. Pinch fingers/hand in drum cart when moving drums 3. Pinch fingers/hand when operating lift-gate on vehicle 4. Contact with potentially contaminated groundwater when moving improperly sealed drums 5. Slips when moving drums 6. Drop drum on feet/toes	21. Use drum cart for moving drums / Use proper lifting techniques / Do not lift heavy loads without assistance 22. Wear proper PPE (cut-resistant or leather gloves) 23. Wear proper PPE (cut-resistant or leather gloves) 24. Wear proper PPE (nitrile gloves underneath work gloves) 25. Follow good housekeeping procedures / Ensure route to move drum and storage space is free from obstructions 26. Wear proper PPE (safety shoes) / Work in a safe manner to prevent dropped drum
9. All activities	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual handling of materials 3. Foot injuries 4. Back injuries 5. Traffic 6. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 7. High Noise levels 8. Overhead hazards 9. Heat Stress/ Cold Stress	1. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 2. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 3. Wear Langan approved safety shoes 4. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 5. Wear high visibility clothing & vest / Use cones or signs to designate work area 6. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellent / Use bug spray when needed 7. Wear hearing protection 8. Wear hard hat / Avoid areas where overhead hazards exist. 9. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Take breaks as necessary to avoid heat/cold stress

JSA Title: Groundwater Sampling

JSA Number: JSA008-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventative/corrective actions.

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):

<input checked="" type="checkbox"/> Safety Shoes	<input checked="" type="checkbox"/> Long Sleeves	<input checked="" type="checkbox"/> Safety Vest (Class 2)	<input checked="" type="checkbox"/> Hard Hat	<input checked="" type="checkbox"/> Hearing Protection
<input checked="" type="checkbox"/> Safety Glasses	<input type="checkbox"/> Safety Goggles	<input type="checkbox"/> Face Shield	<input checked="" type="checkbox"/> Nitrile Gloves	<input type="checkbox"/> PVC Gloves
<input checked="" type="checkbox"/> Leather Gloves	<input type="checkbox"/> Cut Resist. Gloves	<input checked="" type="checkbox"/> Fall Protection	<input type="checkbox"/> Fire Resistant Clothing	<input type="checkbox"/> Rubber Boots
<input type="checkbox"/> Insect/Animal Repellent	<input type="checkbox"/> Ivy Blocker/Cleaner	<input type="checkbox"/> Traffic Cones/Signs	<input type="checkbox"/> Life Vest/Jacket	
<input checked="" type="checkbox"/> Other: Tyvek sleeves, Dermal Protection, PID				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
20. Transport equipment to work area	<ol style="list-style-type: none"> Back Strain Slips/ Trips/ Falls Traffic Cuts/abrasions from equipment Contusions from dropped equipment 	<ol style="list-style-type: none"> Use proper lifting techniques / Use wheeled transport Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures Wear proper PPE (high visibility vest or clothing) Wear proper PPE (leather gloves, long sleeves) Wear proper PPE (safety shoes)
21. Remove well cover	<ol style="list-style-type: none"> Scrape knuckles/hand Strain wrist/bruise palm Pinch fingers or hand 	<ol style="list-style-type: none"> Wear proper PPE (leather gloves) Using a hammer, tap the end of the wrench to loosen grip of bolts Wear proper PPE (leather gloves)
22. Remove well cap and lock	<ol style="list-style-type: none"> Well can pops from pressure Exposure to hazardous substances through inhalation or dermal exposure Scrape knuckles/hand Strain wrist/bruise palm 	<ol style="list-style-type: none"> Remove cap slowly to relieve pressure / Do not place face over well when opening / Wear proper PPE (safety glasses) Use direct air monitoring/reading instrument (i.e. PID) / Be familiar with and follow actions prescribed in the HASP / Wear proper PPE (nitrile gloves) Wear proper PPE (leather gloves) Using hammer, tap the end of the wrench to loosen grip
23. Measure head-space vapor levels	<ol style="list-style-type: none"> Exposure to hazardous substances through inhalation 	<ol style="list-style-type: none"> Do not place face over well when collecting measurement
24. Remove dedicated tubing (if necessary)	<ol style="list-style-type: none"> Exposure to hazardous substances through inhalation or dermal exposure Tubing swings around after removal 	<ol style="list-style-type: none"> Wear proper PPE (nitrile gloves, Tyvek sleeves) Wear proper PPE (safety glasses)
25. Set-up plastic sheeting for work site around the well	<ol style="list-style-type: none"> Lacerations when cutting plastic sheeting 	<ol style="list-style-type: none"> Use scissors to cut plastic sheeting / Cut motions should always be away from body and body parts
26. Measure depth to water	<ol style="list-style-type: none"> Exposure to hazardous substances through inhalation or dermal exposure Pinch fingers or hand in water level instrument 	<ol style="list-style-type: none"> Wear proper PPE (nitrile gloves) Wear proper PPE (leather gloves)
27. Calibrate monitoring	<ol style="list-style-type: none"> Skin or eye contact with calibration chemicals 	<ol style="list-style-type: none"> Wear proper PPE (safety glasses, nitrile gloves)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
equipment	2. Pinch fingers or hand in monitoring equipment	2. Wear proper PPE (leather gloves) / Avoid pinch points
28. Install sampling pump in well	<ol style="list-style-type: none"> 1. Hand injuries during installation of pump 2. Lacerations when cutting tubing 3. Back strain during installation of pump 4. Physical hazards associated with manual lifting of heavy equipment 5. Back strain from starting generator 6. Burns from hot exhaust from generator 7. Electrical shock from improper use of generator and pump 8. Contaminated water spray from loose connections 	<ol style="list-style-type: none"> 1. Wear proper PPE (leather gloves, nitrile gloves) 2. Use safety tubing cutter 3. Use proper lifting techniques 4. Use proper lifting techniques / Use wheeled transport for heavy equipment 5. Use arm when starting generator / Do not over-strain if generator does not start 6. Do not touch generator near exhaust / Use proper handle to carry / Allow generator to cool down before moving 7. Properly plug in pump to generator / Do not allow the pump or generator to contact water / Check for breaks in the cord 8. Check all tubing connections to ensure they are tight and secure
10. Purge water	<ol style="list-style-type: none"> 1. Contact with potentially contaminated groundwater 2. Back strain from lifting buckets of water 3. Tripping potential on sample discharge lines and pump electric line 	<ol style="list-style-type: none"> 1. Wear proper PPE (safety glasses, nitrile gloves) 2. Use proper lifting techniques / Use wheeled transport 3. Organize discharge of electric line to keep out of way as much as possible / Mark potential tripping hazards with caution tape or safety cones
11. Sample water collection	<ol style="list-style-type: none"> 1. Contact with potentially contaminated groundwater through dermal exposure 2. Contact with and burns from acid used for sample preservation 3. Tripping potential on sample discharge lines and pump electric line 4. Lacerations from broken sample bottles 5. Back strain when transporting coolers full of collected samples 6. Slips/ Trips/ Falls 	<ol style="list-style-type: none"> 1. Wear proper PPE (safety glasses, nitrile gloves) 2. Wear proper PPE (safety glasses, nitrile gloves) / Ensure sample bottle lids are secure before use and after sample collection 3. Organize line to keep out of the way as much as possible / Mark potential tripping hazards with caution tape or safety cones 4. Do not over-tighten bottle caps / Handle bottles safely to prevent breakage / Wrap glass bottles in bubble wrap, if possible 5. Use proper lifting techniques / Use wheeled transport / Seek assistance if coolers weight exceeds 50lbs. / Minimize distance to vehicle 6. Have unobstructed path to vehicle or collection point / Follow good housekeeping procedures / Do not lift/walk with coolers that are too heavy/difficult to lift
12. Remove pump and pack up equipment	<ol style="list-style-type: none"> 1. Back strain when removing pump or lifting heavy equipment 	<ol style="list-style-type: none"> 1. Use proper lifting technique / Use wheeled transport for heavy equipment
13. Replace well cap and lock	<ol style="list-style-type: none"> 1. Scrape fingers/hand 2. Strain wrist/bruise palm 	<ol style="list-style-type: none"> 1. Wear proper PPE (leather gloves) 2. Using hammer, tap the end of the well cap to tighten grip
14. Replace well cover	<ol style="list-style-type: none"> 1. Scrape knuckles/hand 2. Strain wrist/bruise palm 3. Pinch fingers or hand 	<ol style="list-style-type: none"> 1. Wear proper PPE (leather gloves) 2. Using hammer, tap the end of the wrench to tighten the grip of the bolts 3. Wear proper PPE (leather gloves)
15. Transport drums to disposal staging location	<ol style="list-style-type: none"> 1. Back, arm or shoulder strain from moving drums 2. Pinch hazard 3. Contact with potentially contaminated groundwater when moving improperly sealed drums 4. Slips/ Trips/ Falls when moving drum 5. Drop drum on feet/toes 	<ol style="list-style-type: none"> 1. Use drum cart for moving drums / Use proper lifting techniques / Obtain assistance, if needed 2. Wear proper PPE (leather gloves) 3. Wear proper PPE (nitrile gloves under leather gloves) / Properly seal drum to prevent leak 4. Ensure route to move drum to storage space is dry and free from obstructions 5. Wear proper PPE (safety shoes)
16. Place used PPE in	<ol style="list-style-type: none"> 1. Pressure build-up inside drum 	<ol style="list-style-type: none"> 1. Remove cap from bung hole in drum to relieve pressure

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
designated disposal drum	2. Pinch hazard	2. Wear proper PPE (leather gloves)
17. Decontaminate equipment	1. Splashing water/soap from decontamination 2. Contact with potentially contaminated groundwater through dermal exposure 3. Electrical shock from broken electric cords	1. Wear proper PPE (safety glasses) 2. Wear proper PPE (safety glasses, dermal protection) 3. Properly plug in pump to generator / Do not allow the pump or generator to contact water / Check for breaks in the cord
18. All activities	25. Slips/ Trips/ Falls 26. Hand injuries, cuts or lacerations during manual handling of materials 27. Foot injuries 28. Back injuries 29. Traffic 30. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 31. High Noise levels 32. Overhead hazards 33. Heat Stress/ Cold Stress 34. Eye Injuries	27. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 28. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 29. Wear Langan approved safety shoes 30. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 31. Wear high visibility clothing & vest / Use cones or signs to designate work area 32. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellent / Use bug spray when needed 33. Wear hearing protection 34. Wear hard hat / Avoid areas where overhead hazards exist. 35. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Take breaks as necessary to avoid heat/cold stress 36. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

<u>Print Name</u>	<u>Sign Name</u>	<u>Date</u>
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LANGAN

Job Safety Analysis (JSA) Health and Safety

JSA Title: **Field Sampling**

JSA Number: **JSA022-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventative/corrective actions.

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):

<input checked="" type="checkbox"/> Safety Shoes	<input checked="" type="checkbox"/> Long Sleeves	<input type="checkbox"/> Safety Vest (Class 2)	<input checked="" type="checkbox"/> Hard Hat	<input checked="" type="checkbox"/> Hearing Protection
<input checked="" type="checkbox"/> Safety Glasses	<input type="checkbox"/> Safety Goggles	<input type="checkbox"/> Face Shield	<input checked="" type="checkbox"/> Nitrile Gloves	<input type="checkbox"/> PVC Gloves
<input checked="" type="checkbox"/> Leather Gloves	<input type="checkbox"/> Cut Resist. Gloves	<input type="checkbox"/> Fall Protection	<input type="checkbox"/> Fire Resistant Clothing	<input type="checkbox"/> Rubber Boots
<input type="checkbox"/> Insect/Animal Repellent	<input type="checkbox"/> Ivy Blocker/Cleaner	<input checked="" type="checkbox"/> Traffic Cones/Signs	<input type="checkbox"/> Life Vest/Jacket	

Other:

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
29. Unpack/Transport equipment to work area.	15. Back Strains 16. Slip/Trips/Falls 17. Cuts/Abrasions from equipment 18. Contusions from dropped equipment	15. Use proper lifting techniques/Use wheeled transport 16. Minimize distance to work area/Unobstructed path to work area/follow good housekeeping procedures. Mark slip/trip/fall hazards with orange safety cones. 17. Wear proper PPE (leather gloves, long sleeves). 18. Wear proper PPE (Langan approved safety shoes).
30. Initial Site Arrival-Site Assessment	8. Traffic	5. Situational awareness (be alert of your surroundings). Secure area from through traffic.
31. Surface Water Sampling	9. Contaminated media. Skin/eye contact with biological agents and/or chemicals.	5. Wear appropriate PPE (Safety glasses, appropriate gloves). Review (M)SDS for all chemicals being.
32. Sampling from bridges	8. Struck by vehicles	11. Wear appropriate PPE (Safety Vest). Use buddy system and orange safety cones.
33. Icing of Samples/ Transporting coolers/equipment from work area.	35. Back Strains 36. Slips/Trips/Falls 37. Cuts/Abrasions from equipment 38. Pinch/Crushing Hazards.	37. Drain coolers of water. Use proper lifting techniques. Use wheeled transport. 38. Have unobstructed path from work area. Aware of surroundings. 39. Wear proper PPE (Leather gloves, long sleeves) 40. Wear proper PPE (Leather gloves, long sleeves)
34. Site Departure	1. Contaminated PPE/Vehicle	1. Contaminated PPE should be disposed of on-site. Remove boots and soiled clothing for secure storage in trunk. Wash hands promptly.
35. All activities	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual handling of materials 3. Foot injuries 4. Back injuries 39. Traffic 40. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.)	1. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 2. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 3. Wear Langan approved safety shoes 4. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	41. High Noise levels 42. Overhead hazards 43. Heat Stress/ Cold Stress 44. Eye Injuries	when possible 41. Wear high visibility clothing & vest / Use cones or signs to designate work area 42. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellent / Use bug spray when needed 43. Wear hearing protection 44. Wear hard hat / Avoid areas where overhead hazards exist. 45. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 46. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

<u>Print Name</u>	<u>Sign Name</u>	<u>Date</u>
<i>Prepared by:</i>		
<i>Reviewed by:</i>		

JSA Title: **Geophysical Investigation**

JSA Number: **JSA023-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventative/corrective actions.

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):

<input checked="" type="checkbox"/> Safety Shoes	<input checked="" type="checkbox"/> Long Sleeves	<input checked="" type="checkbox"/> Safety Vest (Class 2)	<input checked="" type="checkbox"/> Hard Hat	<input checked="" type="checkbox"/> Hearing Protection
<input checked="" type="checkbox"/> Safety Glasses	<input type="checkbox"/> Safety Goggles	<input type="checkbox"/> Face Shield	<input checked="" type="checkbox"/> Nitrile Gloves	<input type="checkbox"/> PVC Gloves
<input checked="" type="checkbox"/> Leather Gloves	<input checked="" type="checkbox"/> Cut Resist. Gloves	<input type="checkbox"/> Fall Protection	<input type="checkbox"/> Fire Resistant Clothing	<input type="checkbox"/> Rubber Boots
<input type="checkbox"/> Insect/Animal Repellent	<input type="checkbox"/> Ivy Blocker/Cleaner	<input type="checkbox"/> Traffic Cones/Signs	<input type="checkbox"/> Life Vest/Jacket	

Other:

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
36. Transport equipment to work area	19. Back/strain 20. Slip/Trip/Falls 21. Traffic 22. Cuts/abrasions/contusions from equipment	19. Use proper lifting techniques/Use wheeled transport 20. Minimize distance to work area/unobstructed path to work area/follow good housekeeping procedures 21. Wear proper PPE (high visibility vest or clothing) 22. Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes)
37. Supervision of subcontractor and all other activities	9. Slip/Trips/Falls 10. Hand injuries 11. Foot injuries 12. Back injuries/Strains 13. Traffic 14. Wildlife a. Wildlife b. Mice/rats c. Vectors (i.e. mosquitoes, bees, etc.) 7. Heat/Cold Stress	6. Be aware of potential trip hazards/follow good housekeeping procedures/mark significant below-grade hazards (i.e. holes, trenches, wires, ropes) with safety cones or spray paint. 7. Wear proper PPE (leather gloves)/watch wear you place your hands/inspect material or equipment for jagged, rough or slippery surfaces/ watch for pinch points/ wipe off slippery, wet, or dirty items prior to handling. 8. Wear proper PPE (Langan approved safety shoes)/ Be aware of uneven terrain) 9. Use proper lifting techniques/ Buddy system when lifting/ use wheeled transport. 10. Wear proper PPE (high-visibility shirts and vests)/ use cones if appropriate/ notify equipment operators of work area. 11. Be aware of surroundings at all times for the presence of wildlife. a. Do not approach stray animals b. Carry animal repellent/ use if situation arises. c. Use bug spray when needed. 7. Wear proper attire for weather conditions (sunscreen, protective clothing in sunlight or layer clothing in cold weather)/ drink plenty of fluids/ take regular breaks.
38. All activities	45. Slips/ Trips/ Falls	47. Be aware of potential trip hazards / Follow good housekeeping

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	46. Hand injuries, cuts or lacerations during manual handling of materials 47. Foot injuries 48. Back injuries 49. Traffic 50. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 51. High Noise levels 52. Overhead hazards 53. Heat Stress/ Cold Stress 54. Eye Injuries	procedures/ Mark significant hazards 48. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 49. Wear Langan approved safety shoes 50. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 51. Wear high visibility clothing & vest / Use cones or signs to designate work area 52. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellent / Use bug spray when needed 53. Wear proper hearing protection 54. Wear hard hat / Avoid areas where overhead hazards exist. 55. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 56. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

<u>Print Name</u>	<u>Sign Name</u>	<u>Date</u>
<i>Prepared by:</i>		
<i>Reviewed by:</i>		

ATTACHMENT H

TAILGATE SAFETY BRIEFING FORM

APPENDIX C

QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN

for

**767 EAST 133rd STREET
BRONX, NEW YORK
Block 2562, Lot 49
NYSDEC BCP Site No. TBD**

Prepared For:
**Mayor's Office of Environmental Remediation
800 Gold Street, 2nd Floor
New York, New York 10038**

Prepared By:
**Langan Engineering, Environmental, Surveying,
Landscape Architecture and Geology, D.P.C.
21 Penn Plaza
360 West 31st Street, 8th Floor
New York, New York 10001**

**April 3, 2019
Langan Project No. 170497201**

LANGAN

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ATTACHMENTS

Attachment A:	Resumes
Attachment B:	Laboratory Reporting Limits and Method Detection Limits
Attachment C:	Analytical Methods/Quality Assurance Summary Table
Attachment D:	Sample Nomenclature

1.0 PROJECT DESCRIPTION

1.1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) is for the 21,000-square-foot property located at 767 East 133rd Street in Bronx, New York (the site). The site is seeking enrollment in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP). Additional site information, including site maps, is provided in the RIWP.

This QAPP specifies analytical methods to be used to ensure that data collected during Site management are precise, accurate, representative, comparable, complete, and meet the sensitivity requirements of the project.

1.2 PROJECT OBJECTIVES

The objective of the RIWP is to investigate and characterize the nature and extent of environmental impacts on the site associated with areas of concern (AOC), and provide sufficient information to evaluate remedial actions, as required.

1.3 SCOPE OF WORK

Implementation of the RIWP will include the collection of soil, groundwater and soil vapor samples. The scope of work is described in detail in the RIWP. A dust, odor, and organic vapor control and monitoring plan will be implemented during ground intrusive activities.

The following samples will be collected as part of the RIWP:

Soil Borings and Sampling

- Advance 9 soil borings up to 20 feet bgs or about 5 feet below the water table.
- Collect up to 3 soil samples from soil boring locations for a total of 27 soil samples (plus quality assurance/quality control [QA/QC] samples) for laboratory analysis.

-
- Advance 4 delineation soil borings to 8 feet bgs around previously completed soil boring SB06 and 2 delineation soil borings to 10 feet bgs around previously completed soil boring SB02.
 - Collect one soil samples from each delineation soil boring locations for a total of 6 soil samples.

Monitoring Well Installation and Sampling

- Install and develop two permanent monitoring wells.
- Collect one groundwater sample from each of five existing and the two newly installed monitoring well for a total of seven samples (plus QA/QC samples) for laboratory analysis.
- Survey and gauge newly installed monitoring wells to establish groundwater elevations
- Evaluate groundwater flow direction by conducting a synoptic gauging event of the newly installed wells and the existing wells (previously surveyed).

Soil Vapor and Ambient Air Sampling

- Install five soil vapor points at a depth of about two feet above the groundwater table.
- Collect one vapor sample from each vapor point (plus QA/QC samples) for laboratory analysis
- Collect one outdoor ambient air sample as a QA/QC sample for laboratory analysis

2.0 DATA QUALITY OBJECTIVES AND PROCESS

Data Quality Objectives (DQOs) are qualitative and quantitative statements to help ensure that data of known and appropriate quality are obtained during the project. The overall objective is to evaluate the performance of the SMD through the collection of canister air samples. The sampling program will also provide for collection of soil, soil vapor, indoor air, or groundwater samples as part of a future need for sampling. DQOs for sampling activities are determined by evaluating five factors:

- Data needs and uses: The types of data required and how the data will be used after it is obtained.
- Parameters of Interest: The types of chemical or physical parameters required for the intended use.
- Level of Concern: Levels of constituents, which may require remedial actions or further investigations.
- Required Analytical Level: The level of data quality, data precision, and QA/QC documentation required for chemical analysis.
- Required Detection Limits: The detection limits necessary based on the above information.

The quality assurance and quality control objectives for all measurement data include:

- **Precision** – an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Field sampling precision will be determined by analyzing coded duplicate samples and analytical precision will be determined by analyzing internal QC duplicates and/or matrix spike duplicates.
- **Accuracy** – a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern. For soil and groundwater samples, accuracy will be determined through the assessment of the analytical results of field blanks and trip blanks for each sample set. Analytical accuracy will be assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), internal standards, laboratory method blanks, instrument calibration, and the percent recoveries of matrix spike compounds added to selected samples and laboratory blanks.

For soil vapor or air samples, analytical accuracy will be assessed by examining the percent recoveries that are added to each sample, internal standards, laboratory method blanks, and instrument calibration.

- **Representativeness** – expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is dependent upon the adequate design of the sampling program and will be satisfied by ensuring that the scope of work is followed and that specified sampling and analysis techniques are used. Representativeness in the laboratory is ensured by compliance to nationally-recognized analytical methods, meeting sample holding times, and maintaining sample integrity while the samples are in the laboratory's possession. This is accomplished by following all applicable methods, laboratory-issued standard operating procedures (SOPs), the laboratory's Quality Assurance Manual, and this QAPP. The laboratory is required to be properly certified and accredited.
- **Completeness** – the percentage of measurements made which are judged to be valid. Completeness will be assessed through data validation. The QC objective for completeness is generation of valid data for at least 90 percent of the analyses requested.
- **Comparability** – expresses the degree of confidence with which one data set can be compared to another. The comparability of all data collected for this project will be ensured using several procedures, including standard methods for sampling and analysis as documented in the QAPP, using standard reporting units and reporting formats, and data validation.
- **Sensitivity** – the ability of the instrument or method to detect target analytes at the levels of interest. The project manager will select, with input from the laboratory and QA personnel, sampling and analytical procedures that achieve the required levels of detection.

3.0 PROJECT ORGANIZATION

Any future remedial activities and investigations will be overseen by Langan or another environmental consultant for the Volunteer or a future owner. The environmental consultant will also arrange data analysis and reporting tasks. The analytical services will be performed by an ELAP-certified laboratory. Data validation services will be performed by approved data validation contractor(s).

For the required sampling as stated in the RIWP, sampling will be conducted by Langan, the analytical services will be performed by Hampton-Clarke, Inc. of Westborough, Massachusetts (NYSDOH ELAP certification number 11148). Data validation services will be performed by Emily Strake; résumé attached (Attachment A).

Key contacts for this project are as follows:

Personnel	Investigation Role	Contact Information
Mimi Raygorodetsky Langan	Project Leader	Phone – 212-479-5441 Email – mraygorodetsky@langan.com
Ilkay Cam-Spanos Langan	Project Manager	Phone – 212-479-5410 Email – icam@langan.com
Michael Burke, PG, CHMM Langan	Quality Assurance Officer	Phone – 212-479-5413 Email – mburke@langan.com
Jason Hayes, P.E. Langan	Project Engineer	Phone – 212-479-5427 Email – jhayes@langan.com
Tony Moffa, CHMM, CSP Langan	Langan Health & Safety Officer	Phone – 215-491-6500 Email – tmoffa@langan.com
William Bohrer, PG Langan	Field Safety Officer	Phone – 410-984-3068 Email – wbohrer@langan.com
Julia Leung Langan	Field Team Leader	Phone – 212-479-5438 Email – tchow@langan.com
Maureen Stone Hampton-Clarke	Laboratory Contractor	Phone – 973-244-9770 Email – mstone@hcvlab.com
Emily Strake, CEP Langan	Program Quality Assurance Monitor/ Data Validator	Phone – 215-491-6526 Email – estrake@langan.com

4.0 QUALITY ASSURANCE OBJECTIVES FOR COLLECTION OF DATA

The overall quality assurance objective is to develop and implement procedures for sampling, laboratory analysis, field measurements, and reporting that will provide data of sufficient quality to evaluate the engineering controls on the site. The sample set, chemical analysis results, and interpretations must be based on data that meet or exceed quality assurance objectives established for the site. Quality assurance objectives are usually expressed in terms of accuracy or bias, sensitivity, completeness, representativeness, comparability, and sensitivity of analysis. Variances from the quality assurance objectives at any stage of the investigation will result in the implementation of appropriate corrective measures and an assessment of the impact of corrective measures on the usability of the data.

4.1 PRECISION

Precision is a measure of the degree to which two or more measurements are in agreement. Field precision is assessed through the collection and measurement of field duplicates. Laboratory precision and sample heterogeneity also contribute to the uncertainty of field duplicate measurements. This uncertainty is taken into account during the data assessment process. For field duplicates, results less than 2x the reporting limit (RL) meet the precision criteria if the absolute difference is less than $\pm 2x$ the RL and acceptable based on professional judgment. For results greater than 2x the RL, the acceptance criteria is a relative percent difference (RPD) of $\leq 50\%$ (soil and air), $< 30\%$ (water). RLs and method detection limits (MDL) are provided in Attachment B.

4.2 ACCURACY

Accuracy is the measurement of the reproducibility of the sampling and analytical methodology. It should be noted that precise data may not be accurate data. For the purpose of this QAPP, bias is defined as the constant or systematic distortion of a measurement process, which manifests itself as a persistent positive or negative deviation from the known or true value. This may be due to (but not limited to) improper sample collection, sample matrix, poorly calibrated analytical or sampling equipment, or limitations or errors in analytical methods and techniques.

Accuracy in the field is assessed through the use of field blanks and through compliance to all sample handling, preservation, and holding time requirements. All field blanks should be non-detect when analyzed by the laboratory. Any contaminant detected in an

associated field blank will be evaluated against laboratory blanks (preparation or method) and evaluated against field samples collected on the same day to determine potential for bias. Trip blanks are not required for non-aqueous matrices but are planned for non-aqueous matrices where high concentrations of VOCs are anticipated.

Laboratory accuracy is assessed by evaluating the percent recoveries of matrix spike/matrix spike duplicate (MS/MSD) samples, laboratory control samples (LCS), surrogate compound recoveries, and the results of method preparation blanks. MS/MSD, LCS, and surrogate percent recoveries will be compared to either method-specific control limits or laboratory-derived control limits. Sample volume permitting, samples displaying outliers should be reanalyzed. All associated method blanks should be non-detect when analyzed by the laboratory.

4.3 COMPLETENESS

Laboratory completeness is the ratio of total number of samples analyzed and verified as acceptable compared to the number of samples submitted to the fixed-base laboratory for analysis, expressed as a percent. Three measures of completeness are defined:

- Sampling completeness, defined as the number of valid samples collected relative to the number of samples planned for collection;
- Analytical completeness, defined as the number of valid sample measurements relative to the number of valid samples collected; and
- Overall completeness, defined as the number of valid sample measurements relative to the number of samples planned for collection.

Air, soil vapor, soil, and groundwater data will meet a 90% completeness criterion. If the criterion is not met, sample results will be evaluated for trends in rejected and unusable data. The effect of unusable data required for a determination of compliance will also be evaluated.

4.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or

temporal boundary. Representativeness is dependent upon the adequate design of the sampling program and will be satisfied by ensuring that the scope of work is followed and that specified sampling and analysis techniques are used. This is performed by following applicable SOPs and this QAPP. All field technicians will be given copies of appropriate documents prior to sampling events and are required to read, understand, and follow each document as it pertains to the tasks at hand.

Representativeness in the laboratory is ensured by compliance to nationally-recognized analytical methods, meeting sample holding times, and maintaining sample integrity while the samples are in the laboratory's possession. This is performed by following all applicable EPA methods, laboratory-issued SOPs, the laboratory's Quality Assurance Manual, and this QAPP. The laboratory is required to be properly certified and accredited.

4.5 COMPARABILITY

Comparability is an expression of the confidence with which one data set can be compared to another. Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the sampling plan is followed and that sampling is performed according to the SOPs or other project-specific procedures. Analytical data will be comparable when similar sampling and analytical methods are used as documented in the QAPP. Comparability will be controlled by requiring the use of specific nationally-recognized analytical methods and requiring consistent method performance criteria. Comparability is also dependent on similar quality assurance objectives. Previously collected data will be evaluated to determine whether they may be combined with contemporary data sets.

4.6 SENSITIVITY

Sensitivity is the ability of the instrument or method to detect target analytes at the levels of interest. The project director will select, with input from the laboratory and QA personnel, sampling and analytical procedures that achieve the required levels of detection and QC acceptance limits that meet established performance criteria. Concurrently, the project director will select the level of data assessment to ensure that only data meeting the project DQOs are used in decision-making.

Field equipment will be used that can achieve the required levels of detection for analytical measurements in the field. In addition, the field sampling staff will collect and

submit full volumes of samples as required by the laboratory for analysis, whenever possible. Full volume aliquots will help ensure achievement of the required limits of detection and allow for reanalysis if necessary. The concentration of the lowest level check standard in a multi-point calibration curve will represent the reporting limit.

Analytical methods and quality assurance parameters associated with the sampling program are presented in Attachment C. The frequency of associated field blanks and duplicate samples will be based on the recommendations listed in DER-10, and as described in Section 5.3.

Site-specific MS and MSD samples will be prepared and analyzed by the analytical laboratory by spiking an aliquot of submitted sample volume with analytes of interest. Additional sample volume is not required by the laboratory for this purpose. An MS/MSD analysis will be analyzed at a rate of 1 out of every 20 samples, or one per analytical batch. MS/MSD samples are only required for soil and groundwater samples.

5.0 SAMPLE COLLECTION AND FIELD DATA ACQUISITION PROCEDURES

Soil sampling will be conducted in accordance with the established NYSDEC protocols contained in DER-10/Technical Guidance for Site Investigation and Remediation (May 2010). The following sections describe procedures to be followed for specific tasks.

5.1 FIELD DOCUMENTATION PROCEDURES

Field documentation procedures will include summarizing field data in field books and proper sample labeling. These procedures are described in the following sections.

5.1.1 Field Data and Notes

Field notebooks contain the documentary evidence regarding procedures conducted by field personnel. Hard cover, bound field notebooks will be used because of their compact size, durability, and secure page binding. The pages of the notebook will not be removed.

Entries will be made in waterproof, permanent blue or black ink. No erasures will be allowed. If an incorrect entry is made, the information will be crossed out with a single strike mark and the change initialed and dated by the team member making the change. Each entry will be dated. Entries will be legible and contain accurate and complete documentation of the individual or sampling team's activities or observations made. The level of detail will be sufficient to explain and reconstruct the activity conducted. Each entry will be signed by the person(s) making the entry.

The following types of information will be provided for each sampling task, as appropriate:

- Project name and number
- Reasons for being on-site or taking the sample
- Date and time of activity
- Sample identification numbers
- Geographical location of sampling points with references to the site, other facilities or a map coordinate system. Sketches will be made in the field logbook when appropriate

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- Physical location of sampling locations such as depth below ground surface
 - Description of the method of sampling including procedures followed, equipment used and any departure from the specified procedures
 - Description of the sample including physical characteristics, odor, etc.
 - Readings obtained from health and safety equipment
 - Weather conditions at the time of sampling and previous meteorological events that may affect the representative nature of a sample
 - Photographic information including a brief description of what was photographed, the date and time, the compass direction of the picture and the number of the picture on the camera
 - Other pertinent observations such as the presence of other persons on the site, actions by others that may affect performance of site tasks, etc.
 - Names of sampling personnel and signature of persons making entries

Field records will also be collected on field data sheets including boring logs, which will be used for geologic and drilling data during soil boring activities. Field data sheets will include the project-specific number and stored in the field project files when not in use. At the completion of the field activities, the field data sheets will be maintained in the central project file.

5.1.2 Sample Labeling

Each sample collected will be assigned a unique identification number in accordance with the sample nomenclature guidance included in Attachment D, and placed in an appropriate sample container. Each sample container will have a sample label affixed to the outside with the date and time of sample collection and project name. In addition, the label will contain the sample identification number, analysis required and chemical preservatives added, if any. All documentation will be completed in waterproof ink.

5.2 EQUIPMENT CALIBRATION AND PREVENTATIVE MAINTENANCE

A PID will be used during the sampling activities to evaluate work zone action levels and screen soil samples. Field calibration and/or field checking of the PID will be the

responsibility of the field team leader and the site HSO, and will be accomplished by following the procedures outlined in the operating manual for the instrument. At a minimum, field calibration and/or field equipment checking will be performed once daily, prior to use. Field calibration will be documented in the field notebook. Entries made into the logbook regarding the status of field equipment will include the following information:

- Date and time of calibration
- Type of equipment serviced and identification number (such as serial number)
- Reference standard used for calibration
- Calibration and/or maintenance procedure used
- Other pertinent information

Equipment that fails calibration or becomes inoperable during use will be removed from service and segregated to prevent inadvertent utilization. The equipment will be properly tagged to indicate that it is out of calibration. Such equipment will be repaired and recalibrated to the manufacturer's specifications by qualified personnel. Equipment that cannot be repaired will be replaced.

Off-site calibration and maintenance of field instruments will be conducted as appropriate throughout the duration of project activities. All field instrumentation, sampling equipment and accessories will be maintained in accordance with the manufacturer's recommendations and specifications and established field equipment practice. Off-site calibration and maintenance will be performed by qualified personnel. A logbook will be kept to document that established calibration and maintenance procedures have been followed. Documentation will include both scheduled and unscheduled maintenance.

5.3 SAMPLE COLLECTION

Soil Samples

Soil samples will be visually classified and field screened using a PID to assess potential impacts from VOCs and for health and safety monitoring. Soil samples collected for analysis of VOCs will be collected using either EnCore® or Terra Core® sampling

equipment. For analysis of non-volatile parameters, samples will be homogenized and placed into glass jars. After collection, all sample jars will be capped and securely tightened, and placed in iced coolers and maintained at $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$ until they are transferred to the laboratory for analysis, in accordance with the procedures outlined in Section 5.4. Analysis and/or extraction and digestion of collected soil samples will meet the holding times required for each analyte as specified in Attachment C. In addition, analysis of collected soil sample will meet all quality assurance criteria set forth by this QAPP and DER-10.

Groundwater Samples

Groundwater sampling will be conducted using low-flow sampling procedures following USEPA guidance ("Low Stress [low flow] Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells", EQASOP-GW 004, January 19, 2017).

During purging, field parameters should be measured, including: water level drawdown, purge rate, pH, specific conductance, temperature, dissolved oxygen, turbidity and oxidation-reduction-potential (ORP), every five minutes using a water quality meter (Horiba U-52 or similar) and a depth-to-water interface probe that should be decontaminated between wells. Samples should generally not be collected until the field parameters have stabilized. Field parameters will be considered stable once three sets of measurements are within ± 0.1 standard units for pH, $\pm 3\%$ for conductivity and temperature, ± 10 millivolts for ORP, and $\pm 10\%$ for turbidity and dissolved oxygen. Purge rates should be adjusted to keep the drawdown in the well to less than 0.3 feet, as practical. Additionally, an attempt should be made to achieve a stable turbidity reading of less than 10 Nephelometric Turbidity Units (NTU) prior to sampling. If the turbidity reading does not stabilize at reading of less than 10 NTU for a given well, then both filtered and unfiltered samples should be collected from that well. If necessary, field filtration should be performed using a 0.45 micron disposable in-line filter. Groundwater samples should be collected after parameters have stabilized as noted above or the readings are within the precision of the meter. Deviations from the stabilization and drawdown criteria, if any, should be noted on the sampling logs.

Groundwater sampling for PFAS and 1,4-dioxane will be performed in accordance with the NYSDEC-approved Groundwater Monitoring Plan, dated August 27, 2004, which specifies purging three to five well volumes prior to sample collection. The pump will

be decontaminated with Alconox and water. Field personnel will wear nitrile gloves while collecting and handling groundwater samples.

Groundwater sampling for PFAS will be conducted in accordance with EPA Method 537 Field Sampling Guidelines. PFAS samples will be collected first in High Density Polyethylene (HDPE)/polypropylene containers using sampling equipment either made with stainless steel, HDPE, or polypropylene. Food and beverages will be prohibited near the sampling equipment. Additionally, no cosmetics, moisturizers, hand cream, sun screen or clothing materials containing Gore-Tex™ or Tyvek® will be worn during sampling.

Samples should be collected directly into laboratory-supplied jars. After collection, all sample jars will be capped and securely tightened, and placed in iced coolers and maintained at 4°C ±2°C until they are transferred to the laboratory for analysis, in accordance with the procedures outlined in Section 5.4. Analysis and/or extraction and digestion of collected groundwater samples will meet the holding times required for each analyte as specified in Attachment C. In addition, analysis of collected groundwater sample will meet all quality assurance criteria set forth by this QAPP and DER-10.

A list of the PFCS is provided in Attachment B. Groundwater samples collected for analysis of per- and polyfluoroalkyl substances (PFAS) will be collected in accordance with the specialized protocol outlined in Attachment E.

Air Samples

Prior to sample collection, a pre-sampling inspection will be conducted to document chemicals and potential subsurface pathways at the Site. The pre-sampling inspection will assess the potential for interference from chemical storage nearby or within the building. Air samples will be collected into laboratory-supplied, batch certified-clean 6-L Summa® canisters calibrated for a sampling rate of two hours. The pressure gauges on each calibrated flow controller should be monitored throughout sample collection. Sample collection should be stopped when the pressure reading reaches -4 mmHg.

Sample Field Blanks and Duplicates

Field blanks will be collected for quality assurance purposes at a rate of one per 20 soil and groundwater investigation samples per analysis. Field blanks will be obtained by

pouring laboratory-demonstrated analyte-free water on or through a decontaminated sampling device following use and implementation of decontamination protocols. The water will be collected off of the sampling device into a laboratory-provided sample container for analysis. Field blank samples will be analyzed for the complete list of analytes on the day of sampling. Trip blanks will be collected at a rate of one per day if soil samples are analyzed for VOCs during that day.

Duplicate soil and groundwater samples will be collected and analyzed for quality assurance purposes. Duplicate samples will be collected at a frequency of 1 per 20 investigative soil samples per analysis and will be submitted to the laboratory as “blind” samples. If less than 20 samples are collected during a particular sampling event, one duplicate sample will be collected.

5.4 SAMPLE CONTAINERS AND HANDLING

Certified, commercially clean sample containers will be obtained from the analytical laboratory. If soil or groundwater samples are being collected, the laboratory will also prepare and supply the required trip blanks and field blank sample containers and reagent preservatives. Sample bottle containers, including the field blank containers, will be placed into plastic coolers by the laboratory. These coolers will be received by the field sampling team within 24 hours of their preparation in the laboratory. Prior to the commencement of field work, Langan field personnel will fill the plastic coolers with ice in Ziploc® bags (or equivalent) to maintain a temperature of $4^{\circ} \pm 2^{\circ} \text{C}$.

Soil, groundwater and soil vapor samples collected in the field for laboratory analysis will be placed directly into the laboratory-supplied sample containers. Soil and groundwater samples will then be placed and stored on-ice in laboratory provided coolers until shipment to the laboratory. Blue ice will not be used to cool PFAS samples. The temperature in the coolers containing samples and associated field blanks will be maintained at a temperature of $4^{\circ} \pm 2^{\circ} \text{C}$ while on-site and during sample shipment to the analytical laboratory.

Possession of samples collected in the field will be traceable from the time of collection until they are analyzed by the analytical laboratory or are properly disposed. Chain-of-custody procedures, described in Section 5.9, will be followed to maintain and document sample possession. Samples will be packaged and shipped as described in Section 5.6.

5.5 SPECIAL CONSIDERATIONS FOR PFAS SAMPLE COLLECTION

The following special considerations apply to the collection of groundwater samples for PFAS analysis to prevent cross-contamination:

- Field equipment will not contain Teflon®
- All sampling material will be made from stainless steel, HDPE, acetate, silicon, or polypropylene
- No waterproof field books will be used
- No plastic clipboards, binders, or spiral hard cover notebooks will be used
- No adhesives will be used
- No sharpies or permanent markers will be used; ball point pens are acceptable
- Aluminum foil will not be used
- PFAS samples will be kept in a separate cooler from other sampling containers
- Coolers will be filled only with regular ice

PFAS compound sampling protocol is provided in Attachment E.

5.6 SAMPLE PRESERVATION

Sample preservation measures will be used in an attempt to prevent sample decomposition by contamination, degradation, biological transformation, chemical interactions and other factors during the time between sample collection and analysis. Preservation will commence at the time of sample collection and will continue until analyses are performed. Should chemical preservation be required, the analytical laboratory will add the preservatives to the appropriate sample containers before shipment to the office or field. Samples will be preserved according to the requirements of the specific analytical method selected, as shown in Attachment C.

5.6 SAMPLE SHIPMENT

5.6.1 Packaging

Soil sample containers will be placed in plastic coolers. Ice in Ziploc® bags (or equivalent) will be placed around sample containers. Cushioning material will be added around the sample containers if necessary. Chains-of-custody and other paperwork will

be placed in a Ziploc® bag (or equivalent) and placed inside the cooler. The cooler will be taped closed and custody seals will be affixed to one side of the cooler at a minimum. If the samples are being shipped by an express delivery company (e.g. FedEx) then laboratory address labels will be placed on top of the cooler.

5.6.2 Shipping

Standard procedures to be followed for shipping environmental samples to the analytical laboratory are outlined below.

- All environmental samples will be transported to the laboratory by a laboratory-provided courier under the chain-of-custody protocols described in Section 5.9.
- Prior notice will be provided to the laboratory regarding when to expect shipped samples. If the number, type or date of shipment changes due to site constraints or program changes, the laboratory will be informed.

5.7 DECONTAMINATION PROCEDURES

Decontamination procedures will be used for non-dedicated sampling equipment. Decontamination of field personnel is discussed in the site-specific HASP included in Appendix B of the RIWP. Field sampling equipment that is to be reused will be decontaminated in the field in accordance with the following procedures:

1. Laboratory-grade glassware detergent and tap water scrub to remove visual contamination
2. Generous tap water rinse
3. Distilled/de-ionized water rinse

5.8 RESIDUALS MANAGEMENT

Debris (e.g., paper, plastic and disposable PPE) will be collected in plastic garbage bags and disposed of as non-hazardous industrial waste. Debris is expected to be transported to a local municipal landfill for disposal. If applicable, residual solids (e.g., leftover soil cuttings) will be placed back in the borehole from which it was sampled. If gross contamination is observed, soil will be collected and stored in Department of Transportation (DOT)-approved 55-gallon drums in a designated storage area at the Site.

The residual materials stored in a designated storage area at the site for further characterization, treatment or disposal.

Residual fluids (such as purge water) will be collected and stored in DOT-approved (or equivalent) 55-gallon drums in a designated storage area at the site. The residual fluids will be transported to the on-site wastewater treatment plant or analyzed, characterized and disposed off-site in accordance with applicable federal and state regulations. Residual fluids such as decontamination water may be discharged to the ground surface, however, if gross contamination is observed, the residual fluids will be collected, stored, and transported similar purge water or other residual fluids.

5.9 CHAIN OF CUSTODY PROCEDURES

A chain-of-custody protocol has been established for collected samples that will be followed during sample handling activities in both field and laboratory operations. The primary purpose of the chain-of-custody procedures is to document the possession of the samples from collection through shipping, storage and analysis to data reporting and disposal. Chain-of-custody refers to actual possession of the samples. Samples are considered to be in custody if they are within sight of the individual responsible for their security or locked in a secure location. Each person who takes possession of the samples, except the shipping courier, is responsible for sample integrity and safe keeping. Chain-of-custody procedures are provided below:

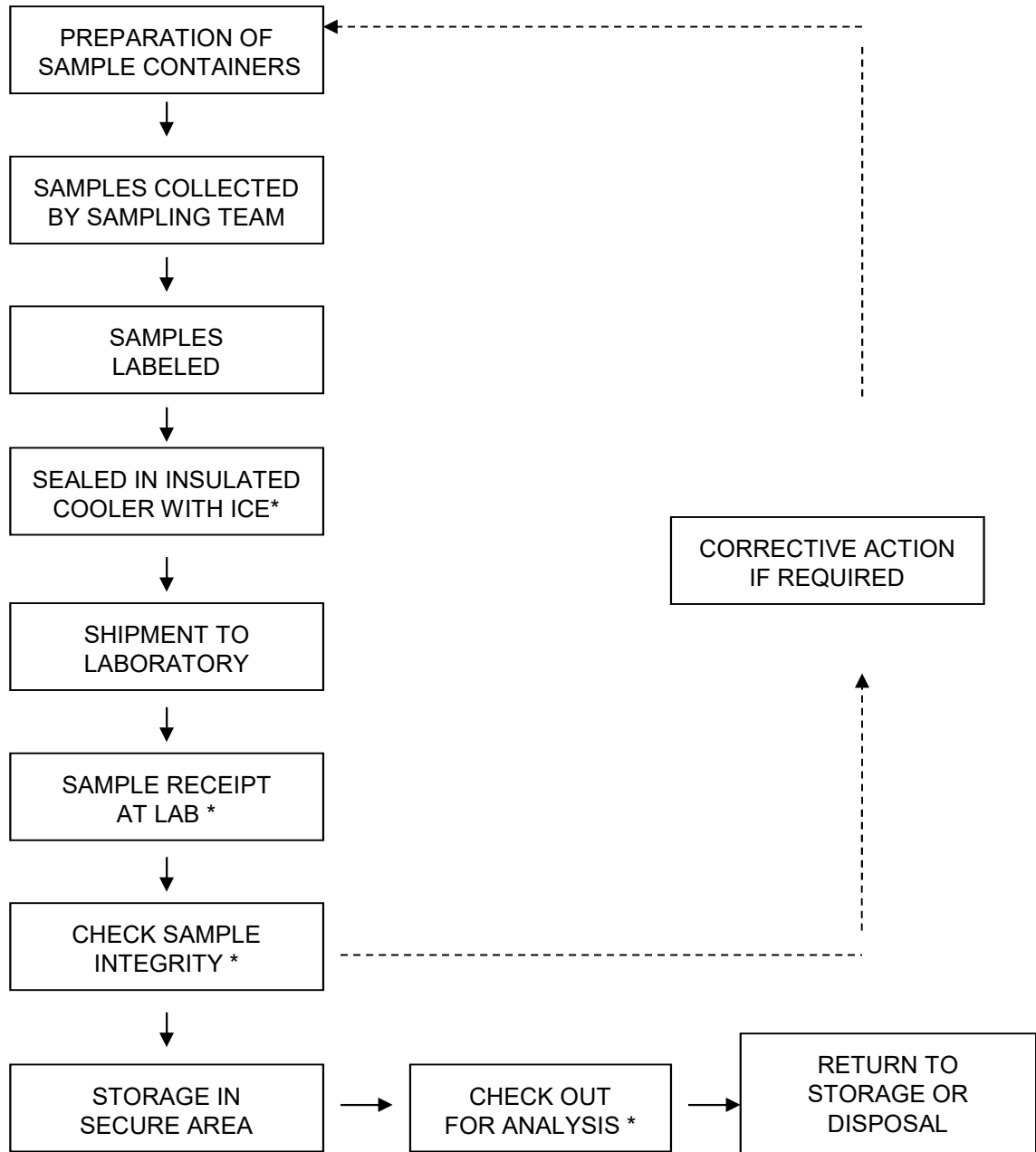
- Chain-of-custody will be initiated by the laboratory supplying the pre-cleaned and prepared sample containers. Chain-of-custody forms will accompany the sample containers.
- Following sample collection, the chain-of-custody form will be completed for the sample collected. The sample identification number, date and time of sample collection, analysis requested and other pertinent information (e.g., preservatives) will be recorded on the form. All entries will be made in waterproof, permanent blue or black ink.
- Langan field personnel will be responsible for the care and custody of the samples collected until the samples are transferred to another party, dispatched to the laboratory, or disposed. The sampling team leader will be responsible for enforcing chain-of-custody procedures during field work.

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- When the form is full or when all samples have been collected that will fit in a single cooler, the sampling team leader will check the form for possible errors and sign the chain-of-custody form. Any necessary corrections will be made to the record with a single strike mark, dated, and initialed.

Sample coolers will be accompanied by the chain-of-custody form, sealed in a Ziploc® bag (or equivalent) and placed on top of the samples or taped to the inside of the cooler lid. If applicable, a shipping bill will be completed for each cooler and the shipping bill number recorded on the chain-of-custody form.

Samples will be packaged for shipment to the laboratory with the appropriate chain-of-custody form. A copy of the form will be retained by the sampling team for the project file and the original will be sent to the laboratory with the samples. Bills of lading will also be retained as part of the documentation for the chain-of-custody records, if applicable. When transferring custody of the samples, the individuals relinquishing and receiving custody of the samples will verify sample numbers and condition and will document the sample acquisition and transfer by signing and dating the chain-of-custody form. This process documents sample custody transfer from the sampler to the analytical laboratory. A flow chart showing a sample custody process is included as Figure 5.1, and chain-of-custody forms from York are included as Figures 5.2 and 5.3.

Figure 5.1 Sample Custody



* REQUIRES SIGN-OFF ON CHAIN-OF-CUSTODY FORM

Laboratory chain-of-custody will be maintained throughout the analytical processes as described in the laboratory's Quality Assurance (QA) Manual. The analytical laboratory will provide a copy of the chain-of-custody in the analytical data deliverable package. The chain-of-custody becomes the permanent record of sample handling and shipment.

5.10 LABORATORY SAMPLE STORAGE PROCEDURES

The subcontracted laboratory will use a laboratory information management system (LIMS) to track and schedule samples upon receipt by the analytical laboratories. Any sample anomalies identified during sample log-in must be evaluated on individual merit for the impact upon the results and the data quality objectives of the project. When irregularities do exist, the environmental consultant must be notified to discuss recommended courses of action and documentation of the issue must be included in the project file.

For samples requiring thermal preservation, the temperature of each cooler will be immediately recorded. Each sample and container will be assigned a unique laboratory identification number and secured within the custody room walk-in coolers designated for new samples. Samples will be, as soon as practical, disbursed in a manner that is functional for the operational team. The temperature of all coolers and freezers will be monitored and recorded using a certified temperature sensor. Any temperature excursions outside of acceptance criteria (i.e., below 2°C or above 6°C) will initiate an investigation to determine whether any samples may have been affected. Samples for VOCs will be maintained in satellite storage areas within the VOC laboratory. Following analysis, the laboratory's specific procedures for retention and disposal will be followed as specified in the laboratory's SOPs and/or QA manual.

6.0 DATA REDUCTION, VALIDATION, AND REPORTING

6.1 INTRODUCTION

Data collected during the field investigation will be reduced and reviewed by the laboratory QA personnel, and a report on the findings will be tabulated in a standard format. The criteria used to identify and quantify the analytes will be those specified for the applicable methods in the USEPA SW-846 and subsequent updates. The data package provided by the laboratory will contain all items specified in the USEPA SW-846 appropriate for the analyses to be performed, and be reported in standard format.

The completed copies of the chain-of-custody records (both external and internal) accompanying each sample from time of initial bottle preparation to completion of analysis shall be attached to the analytical reports.

6.2 DATA REDUCTION

The Analytical Services Protocol (ASP) Category B data packages and an electronic data deliverable (EDD) will be provided by the laboratory after receipt of a complete sample delivery group. The Project Manager will immediately arrange for archiving the results and preparation of result tables. These tables will form the database for assessment of the site contamination condition.

Each EDD deliverable must be formatted using a Microsoft Windows operating system and the NYSDEC data deliverable format for EQulS. To avoid transcription errors, data will be loaded directly into the ASCII format from the laboratory information management system (LIMS). If this cannot be accomplished, the consultant should be notified via letter of transmittal indicating that manual entry of data is required for a particular method of analysis. All EDDs must also undergo a QC check by the laboratory before delivery. The original data, tabulations, and electronic media are stored in a secure and retrievable fashion.

The Project Manager or Task Manager will maintain close contact with the QA reviewer to ensure all non-conformance issues are acted upon prior to data manipulation and assessment routines. Once the QA review has been completed, the Project Manager may direct the Team Leaders or others to initiate and finalize the analytical data assessment.

6.3 DATA VALIDATION

Data validation will be performed in accordance with the USEPA validation guidelines for organic and inorganic data review. Validation will include the following:

- Verification of the QC sample results,
- Verification of the identification of sample results (both positive hits and non-detects),
- Recalculation of 10% of all investigative sample results, and
- Preparation of Data Usability Summary Reports (DUSR).

A DUSR will be prepared and reviewed by the QAO before issuance. The DUSR will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and COC procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method. A detailed assessment of each SDG will follow. For each of the organic analytical methods, the following will be assessed:

- Holding times;
- Instrument tuning;
- Instrument calibrations;
- Blank results;
- System monitoring compounds or surrogate recovery compounds (as applicable);
- Internal standard recovery results;
- MS and MSD results;
- Target compound identification;
- Chromatogram quality;
- Pesticide cleanup (if applicable);
- Compound quantitation and reported detection limits;
- System performance; and
- Results verification.

For each of the inorganic compounds, the following will be assessed:

- Holding times;
- Calibrations;
- Blank results;
- Interference check sample;
- Laboratory check samples;
- Duplicates;
- Matrix Spike;
- Furnace atomic absorption analysis QC;
- ICP serial dilutions; and
- Results verification and reported detection limits.

Based on the results of data validation, the validated analytical results reported by the laboratory will be assigned one of the following usability flags:

- "U" - Not detected. The associated number indicates the approximate sample concentration necessary to be detected significantly greater than the level of the highest associated blank;
- "UJ" - Not detected. Quantitation limit may be inaccurate or imprecise;
- "J" - Analyte is present. Reported value may be associated with a higher level of uncertainty than is normally expected with the analytical method
- "N" – Tentative identification. Analyte is considered present in the sample;
- "R" – Unreliable result; data is rejected or unusable. Analyte may or may not be present in the sample; and
- No Flag - Result accepted without qualification.

7.0 QUALITY ASSURANCE PERFORMANCE AUDITS AND SYSTEM AUDITS

7.1 INTRODUCTION

Quality assurance audits may be performed by the project quality assurance group under the direction and approval of the QAO. These audits will be implemented to evaluate the capability and performance of project and subcontractor personnel, items, activities, and documentation of the measurement system(s). Functioning as an independent body and reporting directly to corporate quality assurance management, the QAO may plan, schedule, and approve system and performance audits based upon procedures customized to the project requirements. At times, the QAO may request additional personnel with specific expertise from company and/or project groups to assist in conducting performance audits. However, these personnel will not have responsibility for the project work associated with the performance audit.

7.2 SYSTEM AUDITS

System audits may be performed by the QAO or designated auditors, and encompass a qualitative evaluation of measurement system components to ascertain their appropriate selection and application. In addition, field and laboratory quality control procedures and associated documentation may be system audited. These audits may be performed once during the performance of the project. However, if conditions adverse to quality are detected or if the Project Manager requests, additional audits may occur.

7.3 PERFORMANCE AUDITS

The laboratory may be required to conduct an analysis of Performance Evaluation samples or provide proof that Performance Evaluation samples submitted by USEPA or a state agency have been analyzed within the past twelve months.

7.4 FORMAL AUDITS

Formal audits refer to any system or performance audit that is documented and implemented by the QA group. These audits encompass documented activities performed by qualified lead auditors to a written procedure or checklists to objectively verify that quality assurance requirements have been developed, documented, and

instituted in accordance with contractual and project criteria. Formal audits may be performed on project and subcontractor work at various locations.

Audit reports will be written by auditors who have performed the site audit after gathering and evaluating all data. Items, activities, and documents determined by lead auditors to be in noncompliance shall be identified at exit interviews conducted with the involved management. Non-compliances will be logged, and documented through audit findings, which are attached to and are a part of the integral audit report. These audit-finding forms are directed to management to satisfactorily resolve the noncompliance in a specified and timely manner.

The Project Manager has overall responsibility to ensure that all corrective actions necessary to resolve audit findings are acted upon promptly and satisfactorily. Audit reports must be submitted to the Project Manager within fifteen days of completion of the audit. Serious deficiencies will be reported to the Project Manager within 24 hours. All audit checklists, audit reports, audit findings, and acceptable resolutions are approved by the QAO prior to issue. Verification of acceptable resolutions may be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the QAO will close out the audit report and findings.

8.0 CORRECTIVE ACTION

8.1 INTRODUCTION

The following procedures have been established to ensure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, evaluated, and corrected.

8.2 PROCEDURE DESCRIPTION

When a significant condition adverse to quality is noted at site, laboratory, or subcontractor location, the cause of the condition will be determined and corrective action will be taken to preclude repetition. Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the QAO, Project Manager, Field Team Leader and involved contractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action.

All project personnel have the responsibility, as part of the normal work duties, to promptly identify, solicit approved correction, and report conditions adverse to quality. Corrective actions will be initiated as follows:

- When predetermined acceptance standards are not attained;
- When procedure or data compiled are determined to be deficient;
- When equipment or instrumentation is found to be faulty;
- When samples and analytical test results are not clearly traceable;
- When quality assurance requirements have been violated;
- When designated approvals have been circumvented;
- As a result of system and performance audits;
- As a result of a management assessment;
- As a result of laboratory/field comparison studies; and
- As required by USEPA SW-846, and subsequent updates, or by the NYSDEC ASP.

Project management and staff, such as field investigation teams, remedial response planning personnel, and laboratory groups, monitor on-going work performance in the normal course of daily responsibilities. Work may be audited at the sites, laboratories, or contractor locations. Activities, or documents ascertained to be noncompliant with quality assurance requirements will be documented. Corrective actions will be mandated through audit finding sheets attached to the audit report. Audit findings are logged, maintained, and controlled by the Task Manager.

Personnel assigned to quality assurance functions will have the responsibility to issue and control Corrective Action Request (CAR) Forms (Figure 12.1 or similar). The CAR identifies the out-of-compliance condition, reference document(s), and recommended corrective action(s) to be administered. The CAR is issued to the personnel responsible for the affected item or activity. A copy is also submitted to the Project Manager. The individual to whom the CAR is addressed returns the requested response promptly to the QA personnel, affixing his/her signature and date to the corrective action block, after stating the cause of the conditions and corrective action to be taken. The QA personnel maintain the log for status of CARs, confirms the adequacy of the intended corrective action, and verifies its implementation. CARs will be retained in the project file for the records.

Any project personnel may identify noncompliance issues; however, the designated QA personnel are responsible for documenting, numbering, logging, and verifying the close out action. The Project Manager will be responsible for ensuring that all recommended corrective actions are implemented, documented, and approved.

FIGURE 8.1

CORRECTIVE ACTION REQUEST					
Number: _____		Date: _____			
TO: _____ You are hereby requested to take corrective actions indicated below and as otherwise determined by you to (a) resolve the noted condition and (b) to prevent it from recurring. Your written response is to be returned to the project quality assurance manager by _____					
CONDITION:					
REFERENCE DOCUMENTS:					
RECOMMENDED CORRECTIVE ACTIONS:					
_____	_____	_____	_____	_____	_____
Originator	Date	Approval	Date	Approval	Date
RESPONSE					
CAUSE OF CONDITION					
CORRECTIVE ACTION					
(A) RESOLUTION					
(B) PREVENTION					
(C) AFFECTED DOCUMENTS					
C.A. FOLLOWUP:					
CORRECTIVE ACTION VERIFIED BY: _____ DATE: _____					

9.0 REFERENCES

- NYSDEC. Division of Environmental Remediation. DER-10/Technical Guidance for Site Investigation and Remediation, dated May 3, 2010.
- Taylor, J. K., 1987. Quality Assurance of Chemical Measurements. Lewis Publishers, Inc., Chelsea, Michigan
- USEPA, 1986. SW-846 "Test Method for Evaluating Solid Waste," dated November 1986. U.S. Environmental Protection Agency, Washington, D.C.
- USEPA, 1987. Data Quality Objectives for Remedial Response Actions Activities: Development Process, EPA/540/G-87/003, OSWER Directive 9355.0-7- U.S. Environmental Protection Agency, Washington, D.C.
- USEPA, 1992a. CLP Organics Data Review and Preliminary Review. SOP No. HW-6, Revision #8, dated January 1992. USEPA Region II.
- USEPA, 1992b. Evaluation of Metals Data for the Contract Laboratory Program (CLP) based on SOW 3/90. SOP No. HW-2, Revision XI, dated January 1992. USEPA Region II.
- USEPA. Hazardous Waste Support Section. Analysis of Volatile Organic Compounds in Air Contained in Canisters by Method TO-15. SOP No. HW-31, Revision #6, dated June 2014.

ATTACHMENT A
Resumes

Ilkay Cam-Spanos, LEED Green Associate

Senior Project Manager

Environmental Engineering & Project Management



16 years in the industry

Ms. Cam-Spanos is an environmental engineer with experience in Phase I Environmental Site Assessments, Phase II Environmental Site Investigations, site remediation (soil and groundwater), field and office management of remedial investigations and tank closures, preparation of environmental reports, indoor air sampling, health and safety, and environmental and geotechnical database management. She manages large redevelopment projects from due diligence phases through remedial closures.

Ms. Cam-Spanos has experience working with regulatory agencies such as New York State Department of Environmental Conservation (NYSDEC), New York City Department of Environmental Protection (NYCDEP), New York City Office of Environmental Remediation (OER), and the United States Environmental Protection Agency (EPA), and she works closely with project teams to integrate remediation strategies with construction and development activities. She is also experienced in underground storage tank closures, remedial excavation oversight, spill closures, design of sub-slab vapor mitigation, and excavation and off-site treatment and/or disposal of contaminated material.

In 2017, Ms. Cam-Spanos was honored at the Pioneering Women in Real Estate Awards Gala.

Selected Projects

- 1802-1810 Second Avenue, Spill Closure and Waste Characterization, New York, NY
- Alley Creek, Soil Sampling, Bayside, NY
- 55 Bank Street, Brownfield Cleanup Program, White Plains, NY
- Monroe College, Brownfield Cleanup Program, (2409 Jerome Avenue), Bronx, NY
- 22-36 Second Avenue, Brownfield Cleanup Program, Brooklyn, NY
- Madison Square Boys and Girls Club, Environmental Assessments, New York, NY
- 19 East Houston, Phase II, Noise RAP and Waste Characterization, New York, NY
- 85 Jay Street, Environmental Due Diligence, Brooklyn, NY
- 400 West 42nd Street, Environmental Remediation, New York, NY
- Environmental Assessments, Sea Cliff, NY
- Phase I ESA, Trinity Real Estate, New York, NY
- Second Avenue/East 127th Street, Phase I ESA, New York, NY
- Oval Concierge, Peter Cooper Village/Stuyvesant Town, Site Characterization, New York, NY
- Trinity Square, Phase I ESA, New York, NY

Education

MBA, Masters of Business Administration, University of Cyprus

M.S., Environmental Science
New Jersey Institute of Technology/
Rutgers University

B.S., Environmental Engineering
Marmara University, Turkey

Professional Registration

LEED Green Associate

OSHA 40-Hour HAZWOPER

OSHA HAZWOPER Site Supervisor

EQUS Database Management

Turkish Professional Environmental
Personnel

Affiliations

American Society of Civil Engineers
(ASCE)

Society of Women Environmental
Professionals- New Jersey

Commercial Real Estate Women
(CREW)

Professional Women in Construction

Turkish Engineers and Architect
Society

Ilkay Cam-Spanos, LEED Green Associate

- Phase I and II for Newburgh Waterfront Development, Newburgh, NY
- Confidential Residential Complex, New York, NY
- Gateway Center II Retail, Brooklyn, NY
- Columbia University, Manhattanville Development, New York, NY
- Port Authority of New York and New Jersey (PANYNJ), Southwest Brooklyn Waterfront Study, Brooklyn, NY
- 50 West Street, Mixed-Use Hotel/Residential, New York, NY
- 261 Hudson Street, Brownfield Cleanup Program, New York, NY
- 42 Crosby Street, Voluntary Cleanup Program, New York, NY
- 422 West 15th Street, Spill Site, New York, NY
- Terracity Shopping Center, Environmental Due Diligence, Antalya, Turkey
- Port Authority of New York and New Jersey, Microsoft Access and EQUIS Databases, Newark, NJ
- NYCDEP Dewatering Permit, Private Client, New York, NY
- Element West 59th Street, Site Remediation, New York, NY
- The Shops at Atlas Park, Management of EQUIS Chemistry Database, Glendale, NY
- Columbia University, The Studebaker Building (615 West 131st Street), Environmental Services, New York, NY
- The Alexander Development Project, Soil Remediation, New York, NY
- Jacob Javits Convention Center Site Assessment, Management of EQUIS Chemistry Database, New York, NY
- Avalon Clinton (Apartments), Management of EQUIS Chemistry Database, New York, NY
- NYCSCA UST Investigations, New York, NY
- Schmid Labs, Monitoring Well Sampling, Little Falls, NJ
- Confidential Developers, Phase I, Phase II and Phase III Environmental Site Assessments, Various Locations, Nationwide
- Con Edison of New York, Management of EQUIS Chemistry Database, New York, NY
- Random House, NY Contaminated Soil Investigation, New York, NY
- Monitoring of Well Sampling, Penick Lyndhurst, NJ
- Gateway Shopping Center, Geotechnical Site Investigations, Brooklyn, NY
- Polytechnic University, Sampling of TPH Contaminated Soil, Brooklyn, NY
- 1st Avenue Properties (Con Edison), Site Investigation, New York, NY
- NYCSCA Primary School 192, Environmental Site Assessments, New York, NY

Selected Publications, Reports, and Presentations

Vitamin Effect on Bioremediation of Phenanthrene, Anthracene, Fluoranthene, and Pyrene in a Contaminated Soil from an Industrial Site.
M.S Thesis, New Jersey Institute of Technology, New Jersey

Natural Polymers in Turkey: Their Application to Drinking Water Treatment.
Senior Project, Marmara, University, Turkey

Jason J. Hayes, PE, LEED AP

**Principal/Vice President
Environmental Engineering**



18 years in the industry

Mr. Hayes has experience in New York, New Jersey, Washington D.C., California, Washington, Oregon, Alaska, and Internationally. His experience includes Environmental Protection Agency (EPA), New York State (NYS) Brownfields applications, investigation, and remediation; New York City Department of Environmental Protection (NYCDEP) and New York City Office of Environmental Remediation (OER) E-designated site applications, investigations, and remediation. His expertise also includes Phase I and II Environmental Site Investigations and Assessments; contaminated building cleanup and demolition; Underground Storage Tank (UST) permitting, removal specifications, and closure reporting; soil vapor intrusion investigation and mitigation system design (depressurization systems, etc.); development of groundwater contaminant plume migration models; environmental analysis; and oversight, design and specification generation for remediation operations with contaminants of concern to include polychlorinated biphenyls (PCBs), solvents, mercury, arsenic, petroleum products, asbestos, mold and lead.

Selected Projects

- Confidential Location (Remediation for Mercury-Contaminated Site), New York, NY
- Confidential Location (Phase II ESI and Remedial Design for Mercury Impacted Site), Brooklyn, NY
- NYC School Construction Authority (PCB Remediation), Various Locations, New York, NY
- 28-29 High Line (Phase I ESA, Phase II ESI, and Environmental Remediation), New York, NY
- Georgetown Heating Plant (Phase II ESI and Remedial Design for Mercury Impacted Site), Washington D.C.
- 268 West Street (BCP Application, RI and RIWP), New York, NY
- Confidential Multiple Mixed-Use Tower Location (BCP Application, RI, Phase I ESA, and Phase II ESI), New York, NY
- Dock 72 at Brooklyn Navy Yard, (NYS Voluntary Cleanup Program), Brooklyn, NY
- 27-21 44th Drive (BCP Application, Remedial Investigation Phase I ESA, and Phase II ESI), Long Island City, NY
- Purves Street Development, BCP Application, RAWP, and Phase II ESI, Long Island City, NY
- 267-273 West 87th Street (BCP Application, Remedial Investigation, RIWP, RAWP), New York, NY
- New York Aquarium, Shark Tank and Animal Care Facility (Environmental Remediation), Coney Island, NY
- International Leadership Charter School (Environmental Remediation), Bronx, NY
- West & Watts (BCP Application), New York, NY

Education

M.S., Environmental Engineering
Columbia University

B.S., Chemistry, Environmental
Toxicology
Humboldt State University

Business Administration (minor)
Humboldt State University

Professional Registration

Professional Engineer (PE) in NY

LEED Accredited Professional
(LEED AP)

Troxler Certification for Nuclear
Densometer Training

CPR and First Aid Certification

OSHA 40-Hour HAZWOPER

OSHA HAZWOPER Site Supervisor

Affiliations

US Green Building Council,
NYC Chapter (USGBC),
Communications Committee

Urban Land Institute (ULI), member

Commercial Real Estate Development
Association (NAIOP), member

NYC Brownfield Partnership, member

Jason Hayes, PE, LEED AP

- Hudson Yards Redevelopment (Phase I ESA and Phase II ESI), New York, NY
- 627 Smith Street (RI and Report), Brooklyn, NY
- Gateway Center II Retail (Phase I ESA and Phase II ESI), Brooklyn, NY
- 261 Hudson Street (Phase I ESA, Phase II ESI, BCP, and RAWP), New York, NY
- Riverside Center, Building 2 (BCP, Phase I ESA and Phase II ESI), New York, NY
- New York Police Academy, (Sub-Slab Depressurization and Vapor Barrier System), College Point, NY
- Bronx Terminal Market (BCP, RIWP, RAWP, Phase I ESA and Phase II ESI), Bronx, NY
- Jacob Javits Convention Center (Phase I ESA and Phase II ESI), New York, NY
- Yankee Stadium Development Waterfront Park (NYSDEC Spill Sites), Bronx, NY
- Bushwick Inlet Park (Phase I ESA, Approvals for NYC E-Designation), Brooklyn, NY
- Silvercup West (BCP, RIWP, RIR, RAWP, and RAA), Long Island City, NY
- 29 Flatbush, Tall Residential Building (Groundwater Studies, RIR and RAWP), Brooklyn, NY
- Gowanus Village I (BCP, RIWP and RIR), Brooklyn, NY
- Sullivan Street Hotel (Site Characterization Study and Owner Representation), New York, NY
- Riker's Island Co-Generation Plant (Soil and Soil Vapor Quality Investigations), Bronx, NY
- The Shops at Atlas Park (Sub-Slab Depressurization and Vapor Barrier Design), Glendale, NY
- Memorial Sloan-Kettering Cancer Center (Subsurface and Soil Vapor Intrusion Investigations), New York, NY
- Element West 59th Street (Oversight and Monitoring of Sub-Slab Depressurization and Vapor Barrier Systems), New York, NY
- Teterboro Airport (Delineation and Remedial Oversight of Petroleum-Contaminated Soils), Teterboro, NJ
- Proposed New York JETS Stadium (Phase I ESA), New York, NY
- Former Con Edison Manufactured Gas Plant Sites (Research Reports), New York, NY
- 7 World Trade Center (Endpoint Sampling and Final Closure Report), New York, NY
- Peter Cooper Village, Environmental Subsurface Investigations, New York, NY

Selected Publications, Reports, and Presentations

NYC Mayor's Office of Environmental Remediation – Big Apple Brownfield Workshop – Presented on Soil Vapor Intrusion Remedies (e.g., SSD Systems, Vapor Barriers, Modified HVAC)

New York City Brownfield Partnership – Presented on environmental considerations and complications of the Hudson Yards Development

Waterfront Development Technical Course – Presented on Impacted Waterfront Planning Considerations

Emily G. Strake

**Project Chemist/ Risk Assessor
Environmental Engineering**



17 years in the industry

Ms. Strake has 17 years of environmental chemistry, risk assessment, auditing, and quality assurance experience. Most recently, she has focused her efforts on human health risk assessment, and has been the primary author or key contributor of risk assessment reports and screening evaluations for projects governed under RCRA, CERCLA, NJDEP, DNREC, SWRCB, DTSC, PADEP, CTDEEP, ODEQ, NYSDEC and MDE. She has experience in site-specific strategy development, which has enabled her to perform assessments to focus areas of investigation and identify risk-based alternatives for reducing remediation costs. Ms. Strake is a member of the Interstate Technology and Regulatory Council Risk Assessment Team responsible for the development and review of organizational risk assessment guidance documents and serves as a National Trainer in risk assessment for the organization.

Ms. Strake has extensive experience in environmental data validation, focused on ensuring laboratory deliverables follow specific guidelines as described by regulatory agencies and the analytical methods employed. In addition, she has experience in EQulS chemical database management. She also has a broad range of environmental field experience and maintains current OSHA HAZWOPER certification. Ms. Strake is experienced in auditing laboratory and field-sampling activities for compliance with Quality Assurance Project Plans (QAPPs), the National Environmental Laboratory Accreditation Conference Standards Quality Systems manual, and applicable USEPA Guidance. Ms. Strake has also audited on-site laboratories in support of groundwater treatment operations and implemented corrective actions. Her responsibilities include writing reports on the value of laboratory work, writing/editing QAPPs for clients and project-specific sites, peer reviewing colleague's work, and mentoring staff within the office. She has also served as the Quality Assurance officer for several long-term projects, responsible for the achievement of all forms of Quality Control/Quality Assurance by onsite personnel relating to sampling, analysis, and data evaluation.

Selected Project Experience

- Major League Soccer's San Jose Earthquakes Stadium, Santa Clara, CA
- DuPont, Waynesboro, VA
- PECO/Exelon, Various Locations
- Texas Instruments, San Francisco, CA
- Regency, Philadelphia, PA
- Veteran's Affairs, Palo Alto, CA
- DOW Chemical, Various Locations
- Avon, Rye, NY
- Golden Gate National Parks Conservancy, San Francisco, CA
- Sunoco Refineries, Various Locations
- Honeywell, Highland Park, NJ
- Delaware City Refinery, DE
- Occidental Chemical, Bakersfield, CA

Education

MBA
The University of Scranton

B.S., Chemistry
Cedar Crest College

Professional Licenses

Board Certified Environmental
Professional (CEP)

Training

40 hr. OSHA HAZWOPER Training/Nov
2002

8 hr. HAZWOPER Supervisor/June 2004

8 hr. OSHA HAZWOPER Refresher/2013

Affiliations

The Society for Risk Analysis

Interstate Technology and Regulatory
Council

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ATTACHMENT B
Laboratory Reporting Limits and Method Detection Limits

ATTACHMENT B

AIR SAMPLES
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	Analyte	RL	MDL	Units	RL	MDL	Units
Volatile Organic Compounds								
EPA TO-15	Air	1,1,1,2-Tetrachloroethane	1.37	0.38	ug/m ³	0.2	0.0547	ppbV
EPA TO-15	Air	1,1,1-Trichloroethane	1.09	0.31	ug/m ³	0.2	0.057	ppbV
EPA TO-15	Air	1,1,2,2-Tetrachloroethane	1.37	0.38	ug/m ³	0.2	0.0548	ppbV
EPA TO-15	Air	1,1,2-Trichloro-1,2,2-Trifluoroethane	1.53	0.39	ug/m ³	0.2	0.0511	ppbV
EPA TO-15	Air	1,1,2-Trichloroethane	1.09	0.36	ug/m ³	0.2	0.0667	ppbV
EPA TO-15	Air	1,1-Dichloroethane	0.81	0.31	ug/m ³	0.2	0.0771	ppbV
EPA TO-15	Air	1,1-Dichloroethene	0.79	0.22	ug/m ³	0.2	0.0566	ppbV
EPA TO-15	Air	1,1-Dichloropropene	0.91	0.32	ug/m ³	0.2	0.0715	ppbV
EPA TO-15	Air	1,2,3-Trichlorobenzene	1.48	0.32	ug/m ³	0.2	0.0436	ppbV
EPA TO-15	Air	1,2,3-Trichloropropane	1.21	0.46	ug/m ³	0.2	0.0767	ppbV
EPA TO-15	Air	1,2,3-Trimethylbenzene	0.98	0.37	ug/m ³	0.2	0.0751	ppbV
EPA TO-15	Air	1,2,4,5-Tetramethylbenzene	1.1	0.44	ug/m ³	0.2	0.0795	ppbV
EPA TO-15	Air	1,2,4-Trichlorobenzene	1.48	0.45	ug/m ³	0.2	0.0611	ppbV
EPA TO-15	Air	1,2,4-Trimethylbenzene	0.98	0.34	ug/m ³	0.2	0.0694	ppbV
EPA TO-15	Air	1,2-Dibromo-3-chloropropane	1.93	0.72	ug/m ³	0.2	0.0744	ppbV
EPA TO-15	Air	1,2-Dibromoethane	1.54	0.6	ug/m ³	0.2	0.0779	ppbV
EPA TO-15	Air	1,2-Dichloro-1,1,2,2-tetrafluoroethane	1.4	0.29	ug/m ³	0.2	0.0419	ppbV
EPA TO-15	Air	1,2-Dichlorobenzene	1.2	0.37	ug/m ³	0.2	0.0614	ppbV
EPA TO-15	Air	1,2-Dichloroethane	0.81	0.22	ug/m ³	0.2	0.0552	ppbV
EPA TO-15	Air	1,2-Dichloroethene (total)	0.79	0.23	ug/m ³	0.2	0.0587	ppbV
EPA TO-15	Air	1,2-Dichloropropane	0.92	0.32	ug/m ³	0.2	0.0697	ppbV
EPA TO-15	Air	1,3,5-Trimethylbenzene	0.98	0.29	ug/m ³	0.2	0.0584	ppbV
EPA TO-15	Air	1,3-Butadiene	0.44	0.18	ug/m ³	0.2	0.0799	ppbV
EPA TO-15	Air	1,3-Dichlorobenzene	1.2	0.38	ug/m ³	0.2	0.0637	ppbV
EPA TO-15	Air	1,3-Dichloropropane	0.92	0.36	ug/m ³	0.2	0.0776	ppbV
EPA TO-15	Air	1,3-Dichloropropene, Total	0.91	0.31	ug/m ³	0.2	0.0693	ppbV
EPA TO-15	Air	1,4-Dichlorobenzene	1.2	0.25	ug/m ³	0.2	0.0418	ppbV
EPA TO-15	Air	1,4-Dioxane	0.72	0.28	ug/m ³	0.2	0.078	ppbV
EPA TO-15	Air	1-Methylnaphthalene	5.82	1.66	ug/m ³	1	0.286	ppbV
EPA TO-15	Air	2,2,4-Trimethylpentane	0.93	0.31	ug/m ³	0.2	0.0659	ppbV
EPA TO-15	Air	2,2-Dichloropropane	0.92	0.27	ug/m ³	0.2	0.0581	ppbV
EPA TO-15	Air	2-Butanone	1.47	0.15	ug/m ³	0.5	0.0522	ppbV
EPA TO-15	Air	2-Ethylthiophene	0.92	0.26	ug/m ³	0.2	0.0571	ppbV
EPA TO-15	Air	2-Hexanone	0.82	0.25	ug/m ³	0.2	0.0604	ppbV
EPA TO-15	Air	2-Methylnaphthalene	5.82	0.16	ug/m ³	1	0.0273	ppbV
EPA TO-15	Air	2-Methylthiophene	0.8	0.32	ug/m ³	0.2	0.0789	ppbV
EPA TO-15	Air	3-Chloropropene	0.63	0.25	ug/m ³	0.2	0.0812	ppbV
EPA TO-15	Air	3-Methylthiophene	0.8	0.27	ug/m ³	0.2	0.0669	ppbV
EPA TO-15	Air	4-Ethyltoluene	0.98	0.38	ug/m ³	0.2	0.0776	ppbV
EPA TO-15	Air	4-Methyl-2-pentanone	2.05	0.25	ug/m ³	0.5	0.0607	ppbV
EPA TO-15	Air	Acetaldehyde	4.5	0.99	ug/m ³	2.5	0.547	ppbV
EPA TO-15	Air	Acetone	2.38	0.64	ug/m ³	1	0.269	ppbV
EPA TO-15	Air	Acetonitrile	0.34	0.13	ug/m ³	0.2	0.0761	ppbV
EPA TO-15	Air	Acrolein	1.15	0.26	ug/m ³	0.5	0.114	ppbV
EPA TO-15	Air	Acrylonitrile	1.09	0.17	ug/m ³	0.5	0.079	ppbV
EPA TO-15	Air	Benzene	0.64	0.17	ug/m ³	0.2	0.0537	ppbV
EPA TO-15	Air	Benzothiophene	2.74	0.26	ug/m ³	0.5	0.0468	ppbV
EPA TO-15	Air	Benzyl chloride	1.04	0.33	ug/m ³	0.2	0.0645	ppbV
EPA TO-15	Air	Bromobenzene	0.79	0.31	ug/m ³	0.2	0.079	ppbV
EPA TO-15	Air	Bromodichloromethane	1.34	0.44	ug/m ³	0.2	0.0656	ppbV
EPA TO-15	Air	Bromoform	2.07	0.54	ug/m ³	0.2	0.0523	ppbV
EPA TO-15	Air	Bromomethane	0.78	0.27	ug/m ³	0.2	0.0696	ppbV
EPA TO-15	Air	Butane	0.48	0.11	ug/m ³	0.2	0.0442	ppbV
EPA TO-15	Air	Butyl Acetate	2.38	0.54	ug/m ³	0.5	0.114	ppbV
EPA TO-15	Air	Carbon disulfide	0.62	0.11	ug/m ³	0.2	0.0345	ppbV
EPA TO-15	Air	Carbon tetrachloride	1.26	0.3	ug/m ³	0.2	0.0471	ppbV
EPA TO-15	Air	Chlorobenzene	0.92	0.36	ug/m ³	0.2	0.0789	ppbV
EPA TO-15	Air	Chlorodifluoromethane	0.71	0.22	ug/m ³	0.2	0.0626	ppbV

ATTACHMENT B

AIR SAMPLES
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	Analyte	RL	MDL	Units	RL	MDL	Units
EPA TO-15	Air	Chloroethane	0.53	0.2	ug/m ³	0.2	0.0767	ppbV
EPA TO-15	Air	Chloroform	0.98	0.22	ug/m ³	0.2	0.0452	ppbV
EPA TO-15	Air	Chloromethane	0.41	0.2	ug/m ³	0.2	0.0958	ppbV
EPA TO-15	Air	cis-1,2-Dichloroethene	0.79	0.23	ug/m ³	0.2	0.0587	ppbV
EPA TO-15	Air	cis-1,3-Dichloropropene	0.91	0.34	ug/m ³	0.2	0.0745	ppbV
EPA TO-15	Air	Cyclohexane	0.69	0.23	ug/m ³	0.2	0.0656	ppbV
EPA TO-15	Air	Decane (C10)	1.16	0.28	ug/m ³	0.2	0.0484	ppbV
EPA TO-15	Air	Dibromochloromethane	1.7	0.64	ug/m ³	0.2	0.0747	ppbV
EPA TO-15	Air	Dibromomethane	1.42	0.34	ug/m ³	0.2	0.0476	ppbV
EPA TO-15	Air	Dichlorodifluoromethane	0.99	0.23	ug/m ³	0.2	0.0466	ppbV
EPA TO-15	Air	Dichlorofluoromethane	0.84	0.24	ug/m ³	0.2	0.0572	ppbV
EPA TO-15	Air	Dodecane (C12)	1.39	0.39	ug/m ³	0.2	0.0564	ppbV
EPA TO-15	Air	Ethyl Acetate	1.8	0.47	ug/m ³	0.5	0.131	ppbV
EPA TO-15	Air	Ethyl Alcohol	4.71	1.02	ug/m ³	2.5	0.542	ppbV
EPA TO-15	Air	Ethyl ether	0.61	0.18	ug/m ³	0.2	0.0591	ppbV
EPA TO-15	Air	Ethylbenzene	0.87	0.24	ug/m ³	0.2	0.0555	ppbV
EPA TO-15	Air	Ethyl-Tert-Butyl-Ether	0.84	0.22	ug/m ³	0.2	0.0515	ppbV
EPA TO-15	Air	Heptane	0.82	0.23	ug/m ³	0.2	0.0553	ppbV
EPA TO-15	Air	Hexachlorobutadiene	2.13	0.78	ug/m ³	0.2	0.0732	ppbV
EPA TO-15	Air	Indane	0.97	0.38	ug/m ³	0.2	0.0795	ppbV
EPA TO-15	Air	Indene	0.95	0.29	ug/m ³	0.2	0.0608	ppbV
EPA TO-16	Air	iso-Propyl Alcohol	1.23	0.28	ug/m ³	0.5	0.114	ppbV
EPA TO-17	Air	Isopropyl Ether	0.84	0.27	ug/m ³	0.2	0.0656	ppbV
EPA TO-18	Air	Isopropylbenzene	0.98	0.21	ug/m ³	0.2	0.043	ppbV
EPA TO-19	Air	Methanol	6.55	0.96	ug/m ³	5	0.736	ppbV
EPA TO-20	Air	Methyl Methacrylate	2.05	0.61	ug/m ³	0.5	0.148	ppbV
EPA TO-21	Air	Methyl tert butyl ether	0.72	0.16	ug/m ³	0.2	0.0452	ppbV
EPA TO-22	Air	Methylene chloride	1.74	0.65	ug/m ³	0.5	0.188	ppbV
EPA TO-23	Air	Naphthalene	1.05	0.23	ug/m ³	0.2	0.0432	ppbV
EPA TO-24	Air	n-Butylbenzene	1.1	0.35	ug/m ³	0.2	0.0639	ppbV
EPA TO-25	Air	n-Heptane	0.82	0.23	ug/m ³	0.2	0.0553	ppbV
EPA TO-26	Air	n-Hexane	0.7	0.18	ug/m ³	0.2	0.0518	ppbV
EPA TO-27	Air	Nonane (C9)	1.05	0.34	ug/m ³	0.2	0.0644	ppbV
EPA TO-28	Air	n-Propylbenzene	0.98	0.27	ug/m ³	0.2	0.0559	ppbV
EPA TO-29	Air	o-Chlorotoluene	1.04	0.25	ug/m ³	0.2	0.0487	ppbV
EPA TO-30	Air	Octane	0.93	0.2	ug/m ³	0.2	0.0421	ppbV
EPA TO-31	Air	o-Xylene	0.87	0.27	ug/m ³	0.2	0.0631	ppbV
EPA TO-32	Air	p/m-Xylene	1.74	0.6	ug/m ³	0.4	0.139	ppbV
EPA TO-33	Air	p-Chlorotoluene	1.04	0.4	ug/m ³	0.2	0.0764	ppbV
EPA TO-34	Air	Pentane	0.59	0.14	ug/m ³	0.2	0.0475	ppbV
EPA TO-35	Air	p-Isopropyltoluene	1.1	0.33	ug/m ³	0.2	0.0608	ppbV
EPA TO-36	Air	Propane	0.9	0.21	ug/m ³	0.5	0.114	ppbV
EPA TO-37	Air	Propylene	0.86	0.16	ug/m ³	0.5	0.0929	ppbV
EPA TO-38	Air	sec-Butylbenzene	1.1	0.4	ug/m ³	0.2	0.0731	ppbV
EPA TO-39	Air	Styrene	0.85	0.34	ug/m ³	0.2	0.0799	ppbV
EPA TO-40	Air	tert-Butyl Alcohol	1.52	0.18	ug/m ³	0.5	0.0599	ppbV
EPA TO-41	Air	tert-Butylbenzene	1.1	0.22	ug/m ³	0.2	0.0402	ppbV
EPA TO-42	Air	Tertiary-Amyl Methyl Ether	0.84	0.33	ug/m ³	0.2	0.0795	ppbV
EPA TO-43	Air	Tetrachloroethene	1.36	0.51	ug/m ³	0.2	0.0758	ppbV
EPA TO-44	Air	Tetrahydrofuran	1.47	0.18	ug/m ³	0.5	0.0622	ppbV
EPA TO-45	Air	Thiophene	0.69	0.18	ug/m ³	0.2	0.0528	ppbV
EPA TO-46	Air	Toluene	0.75	0.24	ug/m ³	0.2	0.0628	ppbV
EPA TO-47	Air	Total HC As Hexane	39.34	0.2	ug/m ³	10	0.0518	ppbV
EPA TO-48	Air	Total VOCs As Toluene	37.69	0.24	ug/m ³	10	0.0628	ppbV
EPA TO-49	Air	trans-1,2-Dichloroethene	0.79	0.29	ug/m ³	0.2	0.074	ppbV
EPA TO-50	Air	trans-1,3-Dichloropropene	0.91	0.31	ug/m ³	0.2	0.0693	ppbV
EPA TO-51	Air	Trichloroethene	1.07	0.38	ug/m ³	0.2	0.071	ppbV
EPA TO-52	Air	Trichlorofluoromethane	1.12	0.23	ug/m ³	0.2	0.0416	ppbV
EPA TO-53	Air	Undecane	1.28	0.34	ug/m ³	0.2	0.0528	ppbV
EPA TO-54	Air	Vinyl acetate	3.52	0.2	ug/m ³	1	0.0567	ppbV
EPA TO-55	Air	Vinyl bromide	0.87	0.31	ug/m ³	0.2	0.0699	ppbV
EPA TO-56	Air	Vinyl chloride	0.51	0.14	ug/m ³	0.2	0.0533	ppbV
EPA TO-57	Air	Xylene (Total)	0.87	0.27	ug/m ³	0.2	0.0631	ppbV

ATTACHMENT B

GROUNDWATER SAMPLES
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	Analyte	RL	MDL	Units
Volatile Organic Compounds					
EPA 8260C	Groundwater	1,1,1,2-Tetrachloroethane	0.5	0.164	ug/L
EPA 8260C	Groundwater	1,1,1-Trichloroethane	0.5	0.158	ug/L
EPA 8260C	Groundwater	1,1,2,2-Tetrachloroethane	0.5	0.144	ug/L
EPA 8260C	Groundwater	1,1,2-Trichloro-1,2,2-Trifluoroethane	10	0.148	ug/L
EPA 8260C	Groundwater	1,1,2-Trichloroethane	0.75	0.144	ug/L
EPA 8260C	Groundwater	1,1-Dichloroethane	0.75	0.21	ug/L
EPA 8260C	Groundwater	1,1-Dichloroethene	0.5	0.142	ug/L
EPA 8260C	Groundwater	1,1-Dichloropropene	2.5	0.173	ug/L
EPA 8260C	Groundwater	1,2,3-Trichlorobenzene	2.5	0.234	ug/L
EPA 8260C	Groundwater	1,2,3-Trichloropropane	5	0.176	ug/L
EPA 8260C	Groundwater	1,2,4,5-Tetramethylbenzene	2	0.542	ug/L
EPA 8260C	Groundwater	1,2,4-Trichlorobenzene	2.5	0.22	ug/L
EPA 8260C	Groundwater	1,2,4-Trimethylbenzene	2.5	0.191	ug/L
EPA 8260C	Groundwater	1,2-Dibromo-3-chloropropane	2.5	0.327	ug/L
EPA 8260C	Groundwater	1,2-Dibromoethane	2	0.193	ug/L
EPA 8260C	Groundwater	1,2-Dichlorobenzene	2.5	0.184	ug/L
EPA 8260C	Groundwater	1,2-Dichloroethane	0.5	0.132	ug/L
EPA 8260C	Groundwater	1,2-Dichloropropane	1.75	0.133	ug/L
EPA 8260C	Groundwater	1,3,5-Trimethylbenzene	2.5	0.174	ug/L
EPA 8260C	Groundwater	1,3-Dichlorobenzene	2.5	0.186	ug/L
EPA 8260C	Groundwater	1,3-Dichloropropane	2.5	0.212	ug/L
EPA 8260C	Groundwater	1,4-Dichlorobenzene	2.5	0.187	ug/L
EPA 8260C	Groundwater	1,4-Diethylbenzene	2	0.392	ug/L
EPA 8270 SIM Isotope Dilution	Groundwater	1,4-Dioxane	0.15	0.075	ug/L
EPA 8260C	Groundwater	2,2-Dichloropropane	2.5	0.204	ug/L
EPA 8260C	Groundwater	2-Butanone	5	1.94	ug/L
EPA 8260C	Groundwater	2-Hexanone	5	0.515	ug/L
EPA 8260C	Groundwater	4-Ethyltoluene	2	0.34	ug/L
EPA 8260C	Groundwater	4-Methyl-2-pentanone	5	0.416	ug/L
EPA 8260C	Groundwater	Acetone	5	1.46	ug/L
EPA 8260C	Groundwater	Acrolein	5	0.633	ug/L
EPA 8260C	Groundwater	Acrylonitrile	5	0.43	ug/L
EPA 8260C	Groundwater	Benzene	0.5	0.159	ug/L
EPA 8260C	Groundwater	Bromobenzene	2.5	0.152	ug/L
EPA 8260C	Groundwater	Bromochloromethane	2.5	0.138	ug/L
EPA 8260C	Groundwater	Bromodichloromethane	0.5	0.192	ug/L
EPA 8260C	Groundwater	Bromoform	2	0.248	ug/L
EPA 8260C	Groundwater	Bromomethane	1	0.256	ug/L
EPA 8260C	Groundwater	Carbon disulfide	5	0.299	ug/L
EPA 8260C	Groundwater	Carbon tetrachloride	0.5	0.134	ug/L
EPA 8260C	Groundwater	Chlorobenzene	0.5	0.178	ug/L
EPA 8260C	Groundwater	Chloroethane	1	0.134	ug/L
EPA 8260C	Groundwater	Chloroform	0.75	0.162	ug/L
EPA 8260C	Groundwater	Chloromethane	2.5	0.176	ug/L
EPA 8260C	Groundwater	cis-1,2-Dichloroethene	0.5	0.187	ug/L
EPA 8260C	Groundwater	cis-1,3-Dichloropropene	0.5	0.144	ug/L
EPA 8260C	Groundwater	Cyclohexane	10	0.271	ug/L
EPA 8260C	Groundwater	Dibromochloromethane	0.5	0.149	ug/L
EPA 8260C	Groundwater	Dibromomethane	5	0.363	ug/L
EPA 8260C	Groundwater	Dichlorodifluoromethane	5	0.245	ug/L
EPA 8260C	Groundwater	Ethyl ether	2.5	0.15	ug/L
EPA 8260C	Groundwater	Ethylbenzene	0.5	0.168	ug/L
EPA 8260C	Groundwater	Hexachlorobutadiene	0.5	0.217	ug/L
EPA 8260C	Groundwater	Isopropylbenzene	0.5	0.187	ug/L
EPA 8260C	Groundwater	Methyl Acetate	10	0.234	ug/L
EPA 8260C	Groundwater	Methyl cyclohexane	10	0.396	ug/L
EPA 8260C	Groundwater	Methyl tert butyl ether	1	0.16	ug/L
EPA 8260C	Groundwater	Methylene chloride	3	0.289	ug/L
EPA 8260C	Groundwater	Naphthalene	2.5	0.216	ug/L
EPA 8260C	Groundwater	n-Butylbenzene	0.5	0.192	ug/L
EPA 8260C	Groundwater	n-Propylbenzene	0.5	0.173	ug/L
EPA 8260C	Groundwater	o-Chlorotoluene	2.5	0.17	ug/L
EPA 8260C	Groundwater	o-Xylene	1	0.33	ug/L
EPA 8260C	Groundwater	p/m-Xylene	1	0.332	ug/L
EPA 8260C	Groundwater	p-Chlorotoluene	2.5	0.185	ug/L
EPA 8260C	Groundwater	p-Isopropyltoluene	0.5	0.188	ug/L
EPA 8260C	Groundwater	sec-Butylbenzene	0.5	0.181	ug/L
EPA 8260C	Groundwater	Styrene	1	0.359	ug/L
EPA 8260C	Groundwater	tert-Butyl Alcohol	10	0.899	ug/L
EPA 8260C	Groundwater	tert-Butylbenzene	2.5	0.185	ug/L
EPA 8260C	Groundwater	Tetrachloroethene	0.5	0.181	ug/L
EPA 8260C	Groundwater	Toluene	0.75	0.161	ug/L
EPA 8260C	Groundwater	trans-1,2-Dichloroethene	0.75	0.163	ug/L
EPA 8260C	Groundwater	trans-1,3-Dichloropropene	0.5	0.164	ug/L
EPA 8260C	Groundwater	trans-1,4-Dichloro-2-butene	2.5	0.173	ug/L
EPA 8260C	Groundwater	Trichloroethene	0.5	0.175	ug/L
EPA 8260C	Groundwater	Trichlorofluoromethane	2.5	0.161	ug/L
EPA 8260C	Groundwater	Vinyl acetate	5	0.311	ug/L
EPA 8260C	Groundwater	Vinyl chloride	1	0.0699	ug/L
EPA 8260C	Groundwater	Xylenes, Total	1	0.33	ug/L

ATTACHMENT B

GROUNDWATER SAMPLES
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	Analyte	RL	MDL	Units
		Semivolatile Organic Compounds			
EPA 8270D	Groundwater	1,2,4,5-Tetrachlorobenzene	10	0.357	ug/L
EPA 8270D	Groundwater	1,2,4-Trichlorobenzene	5	0.21	ug/L
EPA 8270D	Groundwater	1,2-Dichlorobenzene	2	0.302	ug/L
EPA 8270D	Groundwater	1,3-Dichlorobenzene	2	0.35	ug/L
EPA 8270D	Groundwater	1,4-Dichlorobenzene	2	0.323	ug/L
EPA 8270D	Groundwater	2,3,4,6-Tetrachlorophenol	5	0.59	ug/L
EPA 8270D	Groundwater	2,4,5-Trichlorophenol	5	0.748	ug/L
EPA 8270D	Groundwater	2,4,6-Trichlorophenol	5	0.775	ug/L
EPA 8270D	Groundwater	2,4-Dichlorophenol	5	0.564	ug/L
EPA 8270D	Groundwater	2,4-Dimethylphenol	5	0.578	ug/L
EPA 8270D	Groundwater	2,4-Dinitrophenol	20	1.4081	ug/L
EPA 8270D	Groundwater	2,4-Dinitrotoluene	5	1.05	ug/L
EPA 8270D	Groundwater	2,6-Dinitrotoluene	5	0.89	ug/L
EPA 8270D	Groundwater	2-Chloronaphthalene	2	0.455	ug/L
EPA 8270D	Groundwater	2-Chlorophenol	2	0.58	ug/L
EPA 8270D	Groundwater	2-Methylnaphthalene	2	0.355	ug/L
EPA 8270D	Groundwater	2-Methylphenol	5	0.703	ug/L
EPA 8270D	Groundwater	2-Nitroaniline	5	0.956	ug/L
EPA 8270D	Groundwater	2-Nitrophenol	10	1.05	ug/L
EPA 8270D	Groundwater	3,3'-Dichlorobenzidine	5	0.478	ug/L
EPA 8270D	Groundwater	3-Methylphenol/4-Methylphenol	5	0.72	ug/L
EPA 8270D	Groundwater	3-Nitroaniline	5	0.668	ug/L
EPA 8270D	Groundwater	4,6-Dinitro-o-cresol	10	1.36	ug/L
EPA 8270D	Groundwater	4-Bromophenyl phenyl ether	2	0.428	ug/L
EPA 8270D	Groundwater	4-Chloroaniline	5	0.835	ug/L
EPA 8270D	Groundwater	4-Chlorophenyl phenyl ether	2	0.355	ug/L
EPA 8270D	Groundwater	4-Nitroaniline	5	0.83	ug/L
EPA 8270D	Groundwater	4-Nitrophenol	10	1.09	ug/L
EPA 8270D	Groundwater	Acenaphthene	2	0.284	ug/L
EPA 8270D	Groundwater	Acenaphthylene	2	0.372	ug/L
EPA 8270D	Groundwater	Acetophenone	5	0.428	ug/L
EPA 8270D	Groundwater	Anthracene	2	0.2	ug/L
EPA 8270D	Groundwater	Atrazine	10	0.794	ug/L
EPA 8270D	Groundwater	Azobenzene	2	0.537	ug/L
EPA 8270D	Groundwater	Benzaldehyde	5	0.986	ug/L
EPA 8270D	Groundwater	Benzidine	20	5.24	ug/L
EPA 8270D	Groundwater	Benzo(a)anthracene	2	0.323	ug/L
EPA 8270D	Groundwater	Benzo(a)pyrene	2	0.658	ug/L
EPA 8270D	Groundwater	Benzo(b)fluoranthene	2	0.371	ug/L
EPA 8270D	Groundwater	Benzo(ghi)perylene	2	0.574	ug/L
EPA 8270D	Groundwater	Benzo(k)fluoranthene	2	0.3	ug/L
EPA 8270D	Groundwater	Benzoic Acid	50	1.0104	ug/L
EPA 8270D	Groundwater	Benzyl Alcohol	2	0.677	ug/L
EPA 8270D	Groundwater	Biphenyl	2	0.237	ug/L
EPA 8270D	Groundwater	Bis(2-chloroethoxy)methane	5	0.596	ug/L
EPA 8270D	Groundwater	Bis(2-chloroethyl)ether	2	0.409	ug/L
EPA 8270D	Groundwater	Bis(2-chloroisopropyl)ether	2	0.597	ug/L
EPA 8270D	Groundwater	Bis(2-Ethylhexyl)phthalate	3	0.928	ug/L
EPA 8270D	Groundwater	Butyl benzyl phthalate	5	1.13	ug/L
EPA 8270D	Groundwater	Caprolactam	10	0.3895	ug/L
EPA 8270D	Groundwater	Carbazole	2	0.374	ug/L
EPA 8270D	Groundwater	Chrysene	2	0.304	ug/L
EPA 8270D	Groundwater	Dibenz(a,h)anthracene	2	0.438	ug/L
EPA 8270D	Groundwater	Dibenzofuran	2	0.218	ug/L
EPA 8270D	Groundwater	Diethyl phthalate	5	0.393	ug/L
EPA 8270D	Groundwater	Dimethyl phthalate	5	0.333	ug/L
EPA 8270D	Groundwater	Di-n-butylphthalate	5	0.768	ug/L
EPA 8270D	Groundwater	Di-n-octylphthalate	5	1.2	ug/L
EPA 8270D	Groundwater	Fluoranthene	2	0.401	ug/L
EPA 8270D	Groundwater	Fluorene	2	0.32	ug/L
EPA 8270D	Groundwater	Hexachlorobenzene	2	0.396	ug/L
EPA 8270D	Groundwater	Hexachlorobutadiene	2	0.417	ug/L
EPA 8270D	Groundwater	Hexachlorocyclopentadiene	20	0.585	ug/L
EPA 8270D	Groundwater	Hexachloroethane	2	0.298	ug/L
EPA 8270D	Groundwater	Indeno(1,2,3-cd)Pyrene	2	0.433	ug/L
EPA 8270D	Groundwater	Isophorone	5	0.787	ug/L
EPA 8270D	Groundwater	Naphthalene	2	0.332	ug/L
EPA 8270D	Groundwater	Nitrobenzene	2	0.401	ug/L
EPA 8270D	Groundwater	NitrosoDiphenylAmine(NDPA)/DPA	2	0.34	ug/L
EPA 8270D	Groundwater	n-Nitrosodimethylamine	2	0.498	ug/L
EPA 8270D	Groundwater	n-Nitrosodi-n-propylamine	5	0.645	ug/L
EPA 8270D	Groundwater	p-Chloro-M-Cresol	2	0.543	ug/L
EPA 8270D	Groundwater	Pentachlorophenol	10	3.22	ug/L
EPA 8270D	Groundwater	Phenanthrene	2	0.23	ug/L
EPA 8270D	Groundwater	Phenol	5	0.27	ug/L
EPA 8270D	Groundwater	Pyrene	2	0.524	ug/L
EPA 8270D-SIM	Groundwater	2-Chloronaphthalene	0.2	0.035	ug/L
EPA 8270D-SIM	Groundwater	2-Methylnaphthalene	0.2	0.045	ug/L
EPA 8270D-SIM	Groundwater	Acenaphthene	0.2	0.035	ug/L
EPA 8270D-SIM	Groundwater	Acenaphthylene	0.2	0.035	ug/L
EPA 8270D-SIM	Groundwater	Anthracene	0.2	0.035	ug/L
EPA 8270D-SIM	Groundwater	Benzo(a)anthracene	0.2	0.016	ug/L
EPA 8270D-SIM	Groundwater	Benzo(a)pyrene	0.2	0.039	ug/L
EPA 8270D-SIM	Groundwater	Benzo(b)fluoranthene	0.2	0.016	ug/L
EPA 8270D-SIM	Groundwater	Benzo(ghi)perylene	0.2	0.042	ug/L
EPA 8270D-SIM	Groundwater	Benzo(k)fluoranthene	0.2	0.042	ug/L
EPA 8270D-SIM	Groundwater	Chrysene	0.2	0.038	ug/L
EPA 8270D-SIM	Groundwater	Dibenz(a,h)anthracene	0.2	0.039	ug/L
EPA 8270D-SIM	Groundwater	Fluoranthene	0.2	0.038	ug/L
EPA 8270D-SIM	Groundwater	Fluorene	0.2	0.037	ug/L
EPA 8270D-SIM	Groundwater	Hexachlorobenzene	0.8	0.032	ug/L
EPA 8270D-SIM	Groundwater	Hexachlorobutadiene	0.5	0.036	ug/L
EPA 8270D-SIM	Groundwater	Hexachloroethane	0.8	0.03	ug/L
EPA 8270D-SIM	Groundwater	Indeno(1,2,3-cd)Pyrene	0.2	0.04	ug/L
EPA 8270D-SIM	Groundwater	Naphthalene	0.2	0.043	ug/L
EPA 8270D-SIM	Groundwater	Pentachlorophenol	0.8	0.22	ug/L
EPA 8270D-SIM	Groundwater	Phenanthrene	0.2	0.015	ug/L
EPA 8270D-SIM	Groundwater	Pyrene	0.2	0.04	ug/L

ATTACHMENT B

GROUNDWATER SAMPLES
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	Analyte	RL	MDL	Units
Pesticides					
EPA 8081B	Groundwater	4,4'-DDD	0.04	0.00464	ug/L
EPA 8081B	Groundwater	4,4'-DDE	0.04	0.00381	ug/L
EPA 8081B	Groundwater	4,4'-DDT	0.04	0.00432	ug/L
EPA 8081B	Groundwater	Aldrin	0.02	0.00216	ug/L
EPA 8081B	Groundwater	Alpha-BHC	0.02	0.00439	ug/L
EPA 8081B	Groundwater	Beta-BHC	0.02	0.0056	ug/L
EPA 8081B	Groundwater	Chlordane	0.2	0.0463	ug/L
EPA 8081B	Groundwater	cis-Chlordane	0.02	0.00666	ug/L
EPA 8081B	Groundwater	Delta-BHC	0.02	0.00467	ug/L
EPA 8081B	Groundwater	Dieldrin	0.04	0.00429	ug/L
EPA 8081B	Groundwater	Endosulfan I	0.02	0.00345	ug/L
EPA 8081B	Groundwater	Endosulfan II	0.04	0.00519	ug/L
EPA 8081B	Groundwater	Endosulfan sulfate	0.04	0.00481	ug/L
EPA 8081B	Groundwater	Endrin	0.04	0.00429	ug/L
EPA 8081B	Groundwater	Endrin aldehyde	0.04	0.0081	ug/L
EPA 8081B	Groundwater	Endrin ketone	0.04	0.00477	ug/L
EPA 8081B	Groundwater	Heptachlor	0.02	0.0031	ug/L
EPA 8081B	Groundwater	Heptachlor epoxide	0.02	0.00415	ug/L
EPA 8081B	Groundwater	Lindane	0.02	0.00434	ug/L
EPA 8081B	Groundwater	Methoxychlor	0.2	0.00684	ug/L
EPA 8081B	Groundwater	Toxaphene	0.2	0.0627	ug/L
EPA 8081B	Groundwater	trans-Chlordane	0.02	0.00627	ug/L
Polychlorinated Biphenyls					
EPA 8082A	Groundwater	Aroclor 1016	0.083	0.05478	ug/L
EPA 8082A	Groundwater	Aroclor 1221	0.083	0.05312	ug/L
EPA 8082A	Groundwater	Aroclor 1232	0.083	0.03071	ug/L
EPA 8082A	Groundwater	Aroclor 1242	0.083	0.05976	ug/L
EPA 8082A	Groundwater	Aroclor 1248	0.083	0.05063	ug/L
EPA 8082A	Groundwater	Aroclor 1254	0.083	0.03403	ug/L
EPA 8082A	Groundwater	Aroclor 1260	0.083	0.03154	ug/L
EPA 8082A	Groundwater	Aroclor 1262	0.083	0.02905	ug/L
EPA 8082A	Groundwater	Aroclor 1268	0.083	0.03735	ug/L
EPA 8082A	Groundwater	PCBs, Total	0.083	0.02905	ug/L
Herbicides					
EPA 8151A	Groundwater	2,4,5-T	2	0.531	ug/L
EPA 8151A	Groundwater	2,4,5-TP (Silvex)	2	0.539	ug/L
EPA 8151A	Groundwater	2,4-D	10	0.498	ug/L
Metals					
EPA 6010A	Groundwater	Aluminum, Dissolved	0.01	0.00169	mg/L
EPA 6010A	Groundwater	Aluminum, Total	0.01	0.00169	mg/L
EPA 6010A	Groundwater	Antimony, Dissolved	0.0005	0.000699	mg/L
EPA 6010A	Groundwater	Antimony, Total	0.0005	0.000699	mg/L
EPA 6010A	Groundwater	Arsenic, Dissolved	0.0005	0.000123	mg/L
EPA 6010A	Groundwater	Arsenic, Total	0.0005	0.00123	mg/L
EPA 6010A	Groundwater	Barium, Dissolved	0.0005	0.000625	mg/L
EPA 6010A	Groundwater	Barium, Total	0.0005	0.000625	mg/L
EPA 6010A	Groundwater	Beryllium, Dissolved	0.0005	0.00015	mg/L
EPA 6010A	Groundwater	Beryllium, Total	0.0005	0.00015	mg/L
EPA 6010A	Groundwater	Cadmium, Dissolved	0.0002	0.00005	mg/L
EPA 6010A	Groundwater	Cadmium, Total	0.0002	0.00005	mg/L
EPA 6010A	Groundwater	Calcium, Dissolved	0.1	0.032	mg/L
EPA 6010A	Groundwater	Calcium, Total	0.1	0.032	mg/L
EPA 6010A	Groundwater	Chromium, Dissolved	0.001	0.000253	mg/L
EPA 6010A	Groundwater	Chromium, Total	0.001	0.000253	mg/L
EPA 7196A	Groundwater	Chromium, Hexavalent, Dissolved	0.01	0.003	mg/L
EPA 7196A	Groundwater	Chromium, Hexavalent, Total	0.01	0.003	mg/L
EPA 6010A	Groundwater	Cobalt, Dissolved	0.0002	0.0000621	mg/L
EPA 6010A	Groundwater	Cobalt, Total	0.0002	0.0000621	mg/L
EPA 6010A	Groundwater	Copper, Dissolved	0.001	0.000262	mg/L
EPA 6010A	Groundwater	Copper, Total	0.001	0.000262	mg/L
EPA 6010A	Groundwater	Iron, Dissolved	0.05	0.012	mg/L
EPA 6010A	Groundwater	Iron, Total	0.05	0.012	mg/L
EPA 6010A	Groundwater	Lead, Dissolved	0.001	0.000129	mg/L
EPA 6010A	Groundwater	Lead, Total	0.001	0.000129	mg/L
EPA 6010A	Groundwater	Magnesium, Dissolved	0.07	0.0223	mg/L
EPA 6010A	Groundwater	Magnesium, Total	0.07	0.0223	mg/L
EPA 6010A	Groundwater	Manganese, Dissolved	0.001	0.000302	mg/L
EPA 6010A	Groundwater	Manganese, Total	0.001	0.000302	mg/L
EPA 7470A	Groundwater	Mercury, Dissolved	0.0002	0.000066	mg/L
EPA 7470A	Groundwater	Mercury, Total	0.0002	0.000066	mg/L
EPA 6010A	Groundwater	Nickel, Dissolved	0.0005	0.0000865	mg/L
EPA 6010A	Groundwater	Nickel, Total	0.0005	0.0000865	mg/L
EPA 6010A	Groundwater	Potassium, Dissolved	0.1	0.0193	mg/L
EPA 6010A	Groundwater	Potassium, Total	0.1	0.0193	mg/L
EPA 6010A	Groundwater	Selenium, Dissolved	0.005	0.001	mg/L
EPA 6010A	Groundwater	Selenium, Total	0.005	0.001	mg/L
EPA 6010A	Groundwater	Silver, Dissolved	0.00025	0.0000779	mg/L
EPA 6010A	Groundwater	Silver, Total	0.00025	0.0000779	mg/L
EPA 6010A	Groundwater	Sodium, Dissolved	0.1	0.0161	mg/L
EPA 6010A	Groundwater	Sodium, Total	0.1	0.0161	mg/L
EPA 6010A	Groundwater	Thallium, Dissolved	0.0002	0.0000566	mg/L
EPA 6010A	Groundwater	Thallium, Total	0.0002	0.0000566	mg/L
EPA 6010A	Groundwater	Vanadium, Dissolved	0.005	0.000551	mg/L
EPA 6010A	Groundwater	Vanadium, Total	0.005	0.000551	mg/L
EPA 6010A	Groundwater	Zinc, Dissolved	0.01	0.00256	mg/L
EPA 6010A	Groundwater	Zinc, Total	0.01	0.00256	mg/L
Other					
SM21 5210B	Groundwater	Biological Oxygen Demand	2	1.1	mg/L
SM21 5220C	Groundwater	Chemical Oxygen Demand	20	5.7	mg/L
SM21 5310B, SW8469060	Groundwater	Total Organic Carbon	1	0.35	mg/L
ASTM516-90.02	Groundwater	Sulfate	5	1.1	mg/L
SM21 4500 S F	Groundwater	Sulfide	2	0.94	mg/L
EPA 353.2	Groundwater	Nitrate	0.1	0.018	mg/L
SM 21 4500 NO2 B	Groundwater	Nitrite	0.1	0.001	mg/L
EPA 365.4/4500PE	Groundwater	Total Phosphorous	0.1	0.04	mg/L
SM18 4500 NH3F	Groundwater	Ammonia	0.1	0.034	mg/L
N/A	Groundwater	Naphthalene Dioxygenase (NAH)	100	5000	cells/mL
N/A	Groundwater	Naphthalene Inducible Dioxygenase (NIDA)	100	5000	cells/mL
N/A	Groundwater	Phenol Hydroxylase (PHE)	100	5000	cells/mL
N/A	Groundwater	Naphthyl-2-methyl-succinate synthase (NMS)	100	5000	cells/mL
N/A	Groundwater	Naphthalene Carboxylase (ANC)	100	5000	cells/mL

ATTACHMENT B

GROUNDWATER SAMPLES
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	Analyte	RL	MDL	Units
PFAS Compounds					
EPA 537 Rev 1.15	Groundwater	Perfluorohexanoic acid (PFHxA)	2	0.404	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluoroheptanoic acid (PFHpA)	2	0.236	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorooctanoic acid (PFOA)	2	0.26	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorononanoic acid (PFNA)	2	0.256	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorodecanoic acid (PFDA)	2	0.288	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluoroundecanoic acid (PFUnA)	2	0.216	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorododecanoic acid (PFDoA)	2	0.284	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorotridecanoic Acid (PFTriA)	2	0.576	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorotetradecanoic acid (PFTeA)	2	0.516	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorobutanesulfonic acid (PFBS)	2	0.648	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorohexanesulfonic acid (PFHxS)	2	0.328	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorooctanesulfonic acid (PFOS)	2	0.224	ng/L
EPA 537 Rev 1.15	Groundwater	N-methyl perfluorooctanesulfonamidoacetic acid (MeFOSA)	2	0.636	ng/L
EPA 537 Rev 1.15	Groundwater	N-ethyl perfluorooctanesulfonamidoacetic acid (EtFOSAA)	2	0.596	ng/L

ATTACHMENT B

SOIL SAMPLES
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	Analyte	RL	MDL	Units
Volatile Organic Compounds					
EPA 8260C/5035	Soil	1,1,1,2-Tetrachloroethane	0.001	0.000318	mg/kg
EPA 8260C/5035	Soil	1,1,1-Trichloroethane	0.001	0.0001108	mg/kg
EPA 8260C/5035	Soil	1,1,2,2-Tetrachloroethane	0.001	0.0001008	mg/kg
EPA 8260C/5035	Soil	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.02	0.000274	mg/kg
EPA 8260C/5035	Soil	1,1,2-Trichloroethane	0.0015	0.000304	mg/kg
EPA 8260C/5035	Soil	1,1-Dichloroethane	0.0015	0.0000856	mg/kg
EPA 8260C/5035	Soil	1,1-Dichloroethene	0.001	0.000262	mg/kg
EPA 8260C/5035	Soil	1,1-Dichloropropene	0.005	0.0001414	mg/kg
EPA 8260C/5035	Soil	1,2,3-Trichlorobenzene	0.005	0.0001476	mg/kg
EPA 8260C/5035	Soil	1,2,3-Trichloropropane	0.01	0.0001626	mg/kg
EPA 8260C/5035	Soil	1,2,4,5-Tetramethylbenzene	0.004	0.0001302	mg/kg
EPA 8260C/5035	Soil	1,2,4-Trichlorobenzene	0.005	0.0001818	mg/kg
EPA 8260C/5035	Soil	1,2,4-Trimethylbenzene	0.005	0.0001414	mg/kg
EPA 8260C/5035	Soil	1,2-Dibromo-3-chloropropane	0.005	0.000396	mg/kg
EPA 8260C/5035	Soil	1,2-Dibromoethane	0.004	0.0001744	mg/kg
EPA 8260C/5035	Soil	1,2-Dichlorobenzene	0.005	0.0001532	mg/kg
EPA 8260C/5035	Soil	1,2-Dichloroethane	0.001	0.0001134	mg/kg
EPA 8260C/5035	Soil	1,2-Dichloropropane	0.0035	0.000228	mg/kg
EPA 8260C/5035	Soil	1,3,5-Trimethylbenzene	0.005	0.0001434	mg/kg
EPA 8260C/5035	Soil	1,3-Dichlorobenzene	0.005	0.000135	mg/kg
EPA 8260C/5035	Soil	1,3-Dichloropropane	0.005	0.0001452	mg/kg
EPA 8260C/5035	Soil	1,4-Dichlorobenzene	0.005	0.0001384	mg/kg
EPA 8260C/5035	Soil	1,4-Diethylbenzene	0.004	0.0001598	mg/kg
EPA 8260C/5035	Soil	1,4-Dioxane	0.1	0.01442	mg/kg
EPA 8260C/5035	Soil	2,2-Dichloropropane	0.005	0.000226	mg/kg
EPA 8260C/5035	Soil	2-Butanone	0.01	0.000272	mg/kg
EPA 8260C/5035	Soil	2-Hexanone	0.01	0.000666	mg/kg
EPA 8260C/5035	Soil	4-Ethyltoluene	0.004	0.000124	mg/kg
EPA 8260C/5035	Soil	4-Methyl-2-pentanone	0.01	0.000244	mg/kg
EPA 8260C/5035	Soil	Acetone	0.01	0.001036	mg/kg
EPA 8260C/5035	Soil	Acrolein	0.025	0.00806	mg/kg
EPA 8260C/5035	Soil	Acrylonitrile	0.01	0.000514	mg/kg
EPA 8260C/5035	Soil	Benzene	0.001	0.000118	mg/kg
EPA 8260C/5035	Soil	Bromobenzene	0.005	0.000208	mg/kg
EPA 8260C/5035	Soil	Bromochloromethane	0.005	0.000276	mg/kg
EPA 8260C/5035	Soil	Bromodichloromethane	0.001	0.0001732	mg/kg
EPA 8260C/5035	Soil	Bromoform	0.004	0.000236	mg/kg
EPA 8260C/5035	Soil	Bromomethane	0.002	0.000338	mg/kg
EPA 8260C/5035	Soil	Carbon disulfide	0.01	0.001102	mg/kg
EPA 8260C/5035	Soil	Carbon tetrachloride	0.001	0.00021	mg/kg
EPA 8260C/5035	Soil	Chlorobenzene	0.001	0.000348	mg/kg
EPA 8260C/5035	Soil	Chloroethane	0.002	0.000316	mg/kg
EPA 8260C/5035	Soil	Chloroform	0.0015	0.00037	mg/kg
EPA 8260C/5035	Soil	Chloromethane	0.005	0.000294	mg/kg
EPA 8260C/5035	Soil	cis-1,2-Dichloroethene	0.001	0.0001428	mg/kg
EPA 8260C/5035	Soil	cis-1,3-Dichloropropene	0.001	0.0001176	mg/kg
EPA 8260C/5035	Soil	Cyclohexane	0.02	0.000146	mg/kg
EPA 8260C/5035	Soil	Dibromochloromethane	0.001	0.0001536	mg/kg
EPA 8260C/5035	Soil	Dibromomethane	0.01	0.0001636	mg/kg
EPA 8260C/5035	Soil	Dichlorodifluoromethane	0.01	0.0001908	mg/kg
EPA 8260C/5035	Soil	Ethyl ether	0.005	0.00026	mg/kg
EPA 8260C/5035	Soil	Ethylbenzene	0.001	0.0001274	mg/kg
EPA 8260C/5035	Soil	Hexachlorobutadiene	0.005	0.000228	mg/kg
EPA 8260C/5035	Soil	Isopropylbenzene	0.001	0.0001038	mg/kg
EPA 8260C/5035	Soil	Methyl Acetate	0.02	0.00027	mg/kg
EPA 8260C/5035	Soil	Methyl cyclohexane	0.004	0.0001546	mg/kg
EPA 8260C/5035	Soil	Methyl tert butyl ether	0.002	0.0000844	mg/kg
EPA 8260C/5035	Soil	Methylene chloride	0.01	0.001104	mg/kg
EPA 8260C/5035	Soil	Naphthalene	0.005	0.0001384	mg/kg
EPA 8260C/5035	Soil	n-Butylbenzene	0.001	0.0001148	mg/kg
EPA 8260C/5035	Soil	n-Propylbenzene	0.001	0.0001092	mg/kg
EPA 8260C/5035	Soil	o-Chlorotoluene	0.005	0.0001598	mg/kg
EPA 8260C/5035	Soil	o-Xylene	0.002	0.0001718	mg/kg
EPA 8260C/5035	Soil	p/m-Xylene	0.002	0.0001978	mg/kg
EPA 8260C/5035	Soil	p-Chlorotoluene	0.005	0.0001328	mg/kg
EPA 8260C/5035	Soil	p-Isopropyltoluene	0.001	0.000125	mg/kg
EPA 8260C/5035	Soil	sec-Butylbenzene	0.001	0.000122	mg/kg
EPA 8260C/5035	Soil	Styrene	0.002	0.000402	mg/kg
EPA 8260C/5035	Soil	tert-Butyl Alcohol	0.06	0.00292	mg/kg
EPA 8260C/5035	Soil	tert-Butylbenzene	0.005	0.0001354	mg/kg
EPA 8260C/5035	Soil	Tetrachloroethene	0.001	0.0001402	mg/kg
EPA 8260C/5035	Soil	Toluene	0.0015	0.0001948	mg/kg
EPA 8260C/5035	Soil	trans-1,2-Dichloroethene	0.0015	0.000212	mg/kg
EPA 8260C/5035	Soil	trans-1,3-Dichloropropene	0.001	0.0001208	mg/kg
EPA 8260C/5035	Soil	trans-1,4-Dichloro-2-butene	0.005	0.000392	mg/kg
EPA 8260C/5035	Soil	Trichloroethene	0.001	0.000125	mg/kg
EPA 8260C/5035	Soil	Trichlorofluoromethane	0.005	0.000388	mg/kg
EPA 8260C/5035	Soil	Vinyl acetate	0.01	0.0001322	mg/kg
EPA 8260C/5035	Soil	Vinyl chloride	0.002	0.0001174	mg/kg
EPA 8260C/5035	Soil	Xylenes, Total	0.002	0.0001978	mg/kg

ATTACHMENT B

SOIL SAMPLES
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	Analyte	RL	MDL	Units
Semivolatile Organic Compounds					
EPA 8270D	Soil	1,2,4,5-Tetrachlorobenzene	0.1665	0.0515817	mg/kg
EPA 8270D	Soil	1,2,4-Trichlorobenzene	0.1665	0.0545787	mg/kg
EPA 8270D	Soil	1,2-Dichlorobenzene	0.1665	0.0546453	mg/kg
EPA 8270D	Soil	1,3-Dichlorobenzene	0.1665	0.0524808	mg/kg
EPA 8270D	Soil	1,4-Dichlorobenzene	0.1665	0.050616	mg/kg
EPA 8270D	Soil	2,3,4,6-Tetrachlorophenol	0.1665	0.028305	mg/kg
EPA 8270D	Soil	2,4,5-Trichlorophenol	0.1665	0.053946	mg/kg
EPA 8270D	Soil	2,4,6-Trichlorophenol	0.0999	0.0314019	mg/kg
EPA 8270D	Soil	2,4-Dichlorophenol	0.14985	0.053946	mg/kg
EPA 8270D	Soil	2,4-Dimethylphenol	0.1665	0.049617	mg/kg
EPA 8270D	Soil	2,4-Dinitrophenol	0.7992	0.227772	mg/kg
EPA 8270D	Soil	2,4-Dinitrotoluene	0.1665	0.0359307	mg/kg
EPA 8270D	Soil	2,6-Dinitrotoluene	0.1665	0.042624	mg/kg
EPA 8270D	Soil	2-Chloronaphthalene	0.1665	0.054279	mg/kg
EPA 8270D	Soil	2-Chlorophenol	0.1665	0.050283	mg/kg
EPA 8270D	Soil	2-Methylnaphthalene	0.1998	0.0531801	mg/kg
EPA 8270D	Soil	2-Methylphenol	0.1665	0.053613	mg/kg
EPA 8270D	Soil	2-Nitroaniline	0.1665	0.046953	mg/kg
EPA 8270D	Soil	2-Nitrophenol	0.35964	0.051948	mg/kg
EPA 8270D	Soil	3,3'-Dichlorobenzidine	0.1665	0.044289	mg/kg
EPA 8270D	Soil	3-Methylphenol/4-Methylphenol	0.23976	0.054612	mg/kg
EPA 8270D	Soil	3-Nitroaniline	0.1665	0.045954	mg/kg
EPA 8270D	Soil	4,6-Dinitro-o-cresol	0.4329	0.060939	mg/kg
EPA 8270D	Soil	4-Bromophenyl phenyl ether	0.1665	0.038295	mg/kg
EPA 8270D	Soil	4-Chloroaniline	0.1665	0.043956	mg/kg
EPA 8270D	Soil	4-Chlorophenyl phenyl ether	0.1665	0.0506493	mg/kg
EPA 8270D	Soil	4-Nitroaniline	0.1665	0.044955	mg/kg
EPA 8270D	Soil	4-Nitrophenol	0.2331	0.053946	mg/kg
EPA 8270D	Soil	Acenaphthene	0.1332	0.034299	mg/kg
EPA 8270D	Soil	Acenaphthylene	0.1332	0.0311355	mg/kg
EPA 8270D	Soil	Acetophenone	0.1665	0.051615	mg/kg
EPA 8270D	Soil	Anthracene	0.0999	0.0277056	mg/kg
EPA 8270D	Soil	Atrazine	0.1332	0.0377289	mg/kg
EPA 8270D	Soil	Azobenzene	0.1665	0.044622	mg/kg
EPA 8270D	Soil	Benzaldehyde	0.21978	0.067266	mg/kg
EPA 8270D	Soil	Benzidine	0.54945	0.130203	mg/kg
EPA 8270D	Soil	Benzo(a)anthracene	0.0999	0.0326007	mg/kg
EPA 8270D	Soil	Benzo(a)pyrene	0.1332	0.0407259	mg/kg
EPA 8270D	Soil	Benzo(b)fluoranthene	0.0999	0.033633	mg/kg
EPA 8270D	Soil	Benzo(ghi)perylene	0.1332	0.034632	mg/kg
EPA 8270D	Soil	Benzo(k)fluoranthene	0.0999	0.0317682	mg/kg
EPA 8270D	Soil	Benzoic Acid	0.53946	0.168498	mg/kg
EPA 8270D	Soil	Benzyl Alcohol	0.1665	0.051282	mg/kg
EPA 8270D	Soil	Biphenyl	0.37962	0.0549117	mg/kg
EPA 8270D	Soil	Bis(2-chloroethoxy)methane	0.17982	0.0504162	mg/kg
EPA 8270D	Soil	Bis(2-chloroethyl)ether	0.14985	0.0466866	mg/kg
EPA 8270D	Soil	Bis(2-chloroisopropyl)ether	0.1998	0.058608	mg/kg
EPA 8270D	Soil	Bis(2-Ethylhexyl)phthalate	0.1665	0.043623	mg/kg
EPA 8270D	Soil	Butyl benzyl phthalate	0.1665	0.0325341	mg/kg
EPA 8270D	Soil	Caprolactam	0.1665	0.045954	mg/kg
EPA 8270D	Soil	Carbazole	0.1665	0.0357975	mg/kg
EPA 8270D	Soil	Chrysene	0.0999	0.0327006	mg/kg
EPA 8270D	Soil	Dibenzo(a,h)anthracene	0.0999	0.0322344	mg/kg
EPA 8270D	Soil	Dibenzofuran	0.1665	0.0555777	mg/kg
EPA 8270D	Soil	Diethyl phthalate	0.1665	0.0351981	mg/kg
EPA 8270D	Soil	Dimethyl phthalate	0.1665	0.042291	mg/kg
EPA 8270D	Soil	Di-n-butylphthalate	0.1665	0.0321345	mg/kg
EPA 8270D	Soil	Di-n-octylphthalate	0.1665	0.040959	mg/kg
EPA 8270D	Soil	Fluoranthene	0.0999	0.0305694	mg/kg
EPA 8270D	Soil	Fluorene	0.1665	0.0477189	mg/kg
EPA 8270D	Soil	Hexachlorobenzene	0.0999	0.0310356	mg/kg
EPA 8270D	Soil	Hexachlorobutadiene	0.1665	0.046953	mg/kg
EPA 8270D	Soil	Hexachlorocyclopentadiene	0.47619	0.106893	mg/kg
EPA 8270D	Soil	Hexachloroethane	0.1332	0.0302697	mg/kg
EPA 8270D	Soil	Indeno(1,2,3-cd)Pyrene	0.1332	0.036963	mg/kg
EPA 8270D	Soil	Isophorone	0.14985	0.044289	mg/kg
EPA 8270D	Soil	Naphthalene	0.1665	0.055278	mg/kg
EPA 8270D	Soil	Nitrobenzene	0.14985	0.039627	mg/kg
EPA 8270D	Soil	NitrosoDiPhenylAmine(NDPA)/DPA	0.1332	0.034965	mg/kg
EPA 8270D	Soil	n-Nitrosodimethylamine	0.333	0.0539127	mg/kg
EPA 8270D	Soil	n-Nitrosodi-n-propylamine	0.1665	0.049617	mg/kg
EPA 8270D	Soil	p-Chloro-M-Cresol	0.1665	0.048285	mg/kg
EPA 8270D	Soil	Pentachlorophenol	0.1332	0.035631	mg/kg
EPA 8270D	Soil	Phenanthrene	0.0999	0.0325674	mg/kg
EPA 8270D	Soil	Phenol	0.1665	0.049284	mg/kg
EPA 8270D	Soil	Pyrene	0.0999	0.0323676	mg/kg

ATTACHMENT B

**SOIL SAMPLES
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS**

Method	Matrix	Analyte	RL	MDL	Units
Pesticides					
EPA 8081B	Soil	4,4'-DDD	0.007992	0.00285048	mg/kg
EPA 8081B	Soil	4,4'-DDE	0.007992	0.00184815	mg/kg
EPA 8081B	Soil	4,4'-DDT	0.014985	0.0064269	mg/kg
EPA 8081B	Soil	Aldrin	0.007992	0.00281385	mg/kg
EPA 8081B	Soil	Alpha-BHC	0.00333	0.00094572	mg/kg
EPA 8081B	Soil	Beta-BHC	0.007992	0.0030303	mg/kg
EPA 8081B	Soil	Chlordane	0.064935	0.0264735	mg/kg
EPA 8081B	Soil	cis-Chlordane	0.00999	0.00278388	mg/kg
EPA 8081B	Soil	Delta-BHC	0.007992	0.0015651	mg/kg
EPA 8081B	Soil	Dieldrin	0.004995	0.0024975	mg/kg
EPA 8081B	Soil	Endosulfan I	0.007992	0.00188811	mg/kg
EPA 8081B	Soil	Endosulfan II	0.007992	0.00267066	mg/kg
EPA 8081B	Soil	Endosulfan sulfate	0.00333	0.00158508	mg/kg
EPA 8081B	Soil	Endrin	0.00333	0.0013653	mg/kg
EPA 8081B	Soil	Endrin aldehyde	0.00999	0.0034965	mg/kg
EPA 8081B	Soil	Endrin ketone	0.007992	0.00205794	mg/kg
EPA 8081B	Soil	Heptachlor	0.003996	0.00179154	mg/kg
EPA 8081B	Soil	Heptachlor epoxide	0.014985	0.0044955	mg/kg
EPA 8081B	Soil	Lindane	0.00333	0.00148851	mg/kg
EPA 8081B	Soil	Methoxychlor	0.014985	0.004662	mg/kg
EPA 8081B	Soil	Toxaphene	0.14985	0.041958	mg/kg
EPA 8081B	Soil	trans-Chlordane	0.00999	0.00263736	mg/kg
Polychlorinated Biphenyls					
EPA 8082A	Soil	Aroclor 1016	0.0335	0.0026465	mg/kg
EPA 8082A	Soil	Aroclor 1221	0.0335	0.0030887	mg/kg
EPA 8082A	Soil	Aroclor 1232	0.0335	0.0039262	mg/kg
EPA 8082A	Soil	Aroclor 1242	0.0335	0.0041004	mg/kg
EPA 8082A	Soil	Aroclor 1248	0.0335	0.0028274	mg/kg
EPA 8082A	Soil	Aroclor 1254	0.0335	0.0027537	mg/kg
EPA 8082A	Soil	Aroclor 1260	0.0335	0.0025527	mg/kg
EPA 8082A	Soil	Aroclor 1262	0.0335	0.0016616	mg/kg
EPA 8082A	Soil	Aroclor 1268	0.0335	0.0048575	mg/kg
EPA 8082A	Soil	Total PCBs	0.0335	0.0016616	mg/kg
Herbicides					
EPA 8151A	Soil	2,4-D	0.1665	0.0051615	mg/kg
EPA 8151A	Soil	2,4,5-TP (Silvex)	0.1665	0.0044289	mg/kg
EPA 8151A	Soil	2,4,5-T	0.1665	0.0104895	mg/kg
Metals					
EPA 6010C	Soil	Aluminum	4	0.8	mg/kg
EPA 6010C	Soil	Antimony	2	0.32	mg/kg
EPA 6010C	Soil	Arsenic	0.4	0.08	mg/kg
EPA 6010C	Soil	Barium	0.4	0.12	mg/kg
EPA 6010C	Soil	Beryllium	0.2	0.04	mg/kg
EPA 6010C	Soil	Cadmium	0.4	0.028	mg/kg
EPA 6010C	Soil	Calcium	4	1.2	mg/kg
EPA 6010C	Soil	Chromium	0.4	0.08	mg/kg
EPA 7196A	Soil	Hexavalent Chromium	0.8	0.16	mg/kg
EPA 6010C	Soil	Cobalt	0.8	0.2	mg/kg
EPA 6010C	Soil	Copper	0.4	0.08	mg/kg
EPA 6010C	Soil	Iron	2	0.8	mg/kg
EPA 6010C	Soil	Lead	2	0.08	mg/kg
EPA 6010C	Soil	Magnesium	4	0.4	mg/kg
EPA 6010C	Soil	Manganese	0.4	0.08	mg/kg
EPA 7473	Soil	Mercury	0.08	0.016896	mg/kg
EPA 6010C	Soil	Nickel	1	0.16	mg/kg
EPA 6010C	Soil	Potassium	100	16	mg/kg
EPA 6010C	Soil	Selenium	0.8	0.12	mg/kg
EPA 6010C	Soil	Silver	0.4	0.08	mg/kg
EPA 6010C	Soil	Sodium	80	12	mg/kg
EPA 6010C	Soil	Thallium	0.8	0.16	mg/kg
EPA 6010C	Soil	Vanadium	0.4	0.04	mg/kg
EPA 6010C	Soil	Zinc	2	0.28	mg/kg
Other					
ASTM D422-63	Soil	Grain Size	N/A	N/A	N/A
SM21 5210B	Soil	Biological Oxygen Demand (BOD)	N/A	N/A	N/A
SM21 5220C	Soil	Chemical Oxygen Demand (COD)	100	28	mg/kg
EPA 9040C	Soil	pH	N/A	N/A	N/A
SM21 5310B, SW8469060	Soil	Total Organic Carbon (TOC)	1000	160	mg/kg
ASTM516-90,02	Soil	Sulfate	50	7	mg/kg
SM21 4500 S F	Soil	Sulfide	4	1.5	mg/kg
EPA 351.2	Soil	Total Kjeldahl Nitrogen (TKN)	5	1.2	mg/kg
EPA 365.4/4500PE	Soil	Total Phosphorous	10	0.24	mg/kg
SM18 4500 NH3F	Soil	Ammonia	5	1.8	mg/kg

PFAS Compound Analyte List for Groundwater Samples
27-01 Jackson Avenue
Long Island City, NY
Langan Project No.: 170720021

Compound Name	Analytical Method
Perfluorohexanoic acid (PFHxA)	USEPA Method 537
Perfluoroheptanoic acid (PFHpA)	
Perfluorooctanoic acid (PFOA)	
Perfluorobutanoic acid (PFBA)	
Perfluoropentanoic acid (PFPeA)	
Perfluorononanoic acid (PFNA)	
Perfluorodecanoic acid (PFDA)	
Perfluoroundecanoic acid (PFUA/PFUdA)	
Perfluorododecanoic acid (PFDoA)	
Perfluorotridecanoic acid (PFTrIA/PFTrDA)	
Perfluorotetradecanoic acid (PFTA/PFTeDA)	
Perfluorobutanesulfonic acid (PFBS)	
Perfluorohexanesulfonic acid (PFHxS)	
Perfluoroheptanesulfonic acid (PFHpS)	
Perfluorodecanesulfonic acid (PFDS)	
Perfluorooctanesulfonic acid (PFOS)	
N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	
N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	
6:2 Fluorotelomer sulfonate (6:2 FTS)	
8:2 Fluorotelomer sulfonate (8:2 FTS)	
Perfluorooctanesulfonamide (FOSA)	

Notes:

1. PFAS - per- and polyfluoroalkyl substances

ATTACHMENT C
Analytical Methods/Quality Assurance Summary Table

ATTACHMENT C

ANALYTICAL METHODS/QUALITY ASSURANCE SUMMARY TABLE

Matrix Type	Field Parameters	Laboratory Parameters	Analytical Methods	Sample Preservation	Sample Container Volume and Type	Sample Hold Time	Field Duplicate Samples	Field Blank Samples	Trip Blank Samples	Ambient Air Samples	MS/MSD Samples
Soil	Total VOCs via PID	Part 375 + TCL VOCs	EPA 8260C	Cool to 4°C	Two 40-ml VOC vials with 5ml H ₂ O, one with MeOH or 3 En Core Samplers (separate container for % solids)	14 days	1 per 20 samples (minimum 1)	1 per 20 samples (minimum 1)	NA	NA	1 per 20 samples
		Part 375 + TCL SVOCs	EPA 8270D	Cool to 4°C	4 oz. amber glass jar	14 days extract, 40 days after extraction to analysis					
		Part 375 + TAL Metals + Cyanide	EPA 6010C, EPA 7470A, EPA 7196A, EPA 9014/9010C	Cool to 4°C	2 oz. amber glass jar	6 months, except mercury 28 days					
		Part 375 + TCL Pesticides	EPA 8081B	Cool to 4°C	4 oz. amber glass jar	14 days extract, 40 days after extraction to analysis					
		Part 375 + TCL PCBs	EPA 8082A	Cool to 4°C	4 oz. amber glass jar	14 days extract, 40 days after extraction to analysis					
Groundwater	Temperature, Turbidity, pH, ORP, Conductivity, DO	Part 375 + TCL VOCs	EPA 8260C	Cool to 4°C; HCl to pH <2; no headspace	Three 40-mL VOC vials with Teflon®-lined cap	Analyze within 14 days of collection	1 per 20 samples (minimum 1)	1 per 20 samples (minimum 1)	1 per shipment of VOC samples	NA	1 per 20 samples
		Part 375 + TCL SVOCs	EPA 8270D	Cool to 4°C	Two 1-Liter amber glass	7 days to extract, 40 days after extraction to analysis					
		Part 375 + TAL Metals	EPA 6010C, EPA 7470A	HNO ₃	250 ml plastic	6 months, except Mercury 28 days					
		Hexavalent Chromium	EPA 7196A	Cool to 4°C	250 ml plastic	24 hours					
		Cyanide	SM 4500 C/E	NaOH plus 0.6g ascorbic acid	250 ml plastic	14 days					
		Part 375 + TCL Pesticides	EPA 8081B	Cool to 4°C	Two 1-Liter Amber Glass for Pesticides/PCB	7 days to extract, 40 days after extraction to analysis					
		PCBs	EPA 8082A	Cool to 4°C		7 days to extract, 40 days after extraction to analysis					
		PFAS	EPA 537	Cool to 4°C	Two 250 mL HDPE or polypropylene	14 days to extract, 28 days after extraction to analysis					
		1,4-dioxane	8270 SIM	Cool to 4°C	One 1-Liter Amber Glass	Analyze within 14 days of collection					
Soil Vapor	Total VOCs, Oxygen, LEL, CO, and H ₂ S, with MultiGas Meter	TO-15 Listed VOCs	TO-15	Ambient Temperature	2.7-Liter Summa Canister	Analyze within 30 days of collection	1 per 20 samples (minimum 1)	NA	NA	1 per 10 samples (minimum 1)	NA
Ambient/Indoor Air	Total VOCs via PID				6-Liter Summa Canister		NA	NA			

- Notes:**
 1. PID - Photoionization Detector
 2. VOC - Volatile organic compound
 3. EPA - Environmental Protection Agency
 4. TCL - Target compound list
 5. TAL - Target analyte list
 6. ORP - Oxidation reduction potential
 7. DO - Dissolved oxygen
 8. LEL - Lower explosive limit
 9. CO - Carbon monoxide
 10. H₂S - Hydrogen sulfide
 11. PFAS - Per-fluoroalkyl substances
 12. HDPE - High-Density Polyethylene

ATTACHMENT D
Sample Nomenclature

SAMPLE NOMENCLATURE

The sample nomenclature outlined below provides consistency between sample events and projects but, most importantly, establish unique sample IDs that will avoid confusion months or years after the sample has been collected. Furthermore, unique sample IDs are required for any data submitted to the NYSDEC in EDD format or being uploaded to an EQulS database.

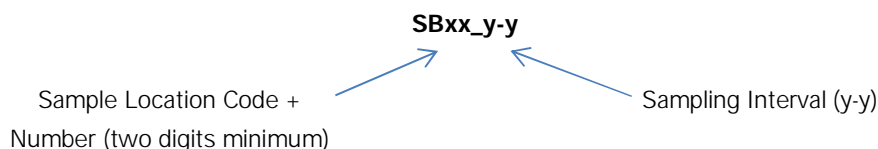
1.0 INVESTIGATION LOCATION CODES

SB	Soil Boring	SV	Soil Vapor Point
WC	Waste Characterization Boring	IA	Indoor Air
TP	Test Pit	AA	Ambient Air
EPSW	Endpoint Location (Sidewall)	SVE	Vapor Extraction Well
EPB	Endpoint Location (Bottom)	DS	Drum
MW	Monitoring Well	IDW	Investigation Derived Waste
TMW	Temporary Monitoring Well	SL	Sludge
SW	Surface Water	FP	Free Product

2.0 SAMPLE NOMENCLATURE

Each sample at a site must have a unique value.

- Soil/Sediment Samples:**

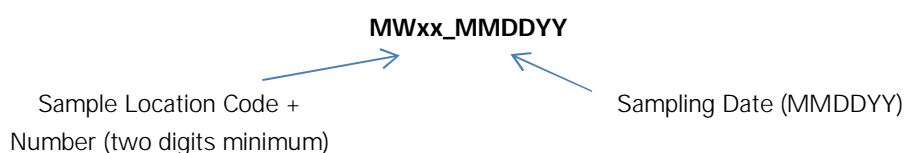


Sample Type	Sample Location Code	Sampling Depth or Interval (feet bgs or approx. elevation)	Sample Name
Phase II/Remedial Investigation			
Grab Soil Sample	SB01	2 to 4	SB01_2-4
	SB02	4	SB02_4
Waste Characterization			
Grab Soil Sample	WC01	2 to 4	WC01_2-4
	WC02	4	WC02_4
Composite Soil Sample from one or more locations	COMP01 or COMP02 + COMP03	0 to 10 (Fill)	COMP01_0-10

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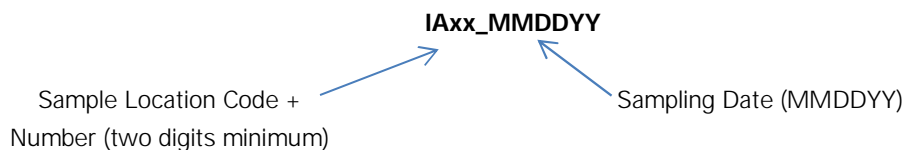
Sample Type	Sample Location Code	Sampling Depth or Interval (feet bgs or approx. elevation)	Sample Name
Endpoint Sampling			
Grab Soil Sample	EPSW01_N	5	EPSW01_N_5
	EPSW01_S	5	EPSW01_S_5
	EPSW01_E	5	EPSW01_E_5
	EPSW01_W	5	EPSW01_W_5
	EPB01	6	EPB01_6

- Groundwater/Surface Water Samples:**



Sample Type	Sample Location Code	Sampling Date	Sample Name
Groundwater Sample	MW01	02/21/2013	MW01_022113

- Air/Soil Vapor Samples:**



Sample Type	Sample Location Code	Date	Sample Name
Air Sample	IA01	02/21/2013	IA01_022113
Soil Vapor Sample	SV01	02/21/2013	SV01_022113
Vapor Extraction Well Sample	SVE01 (INLET/MIDPOINT/OUTLET)	02/21/2013	SVE01_IN_022113 SVE01_MID_022113 SVE01_OUT_022113

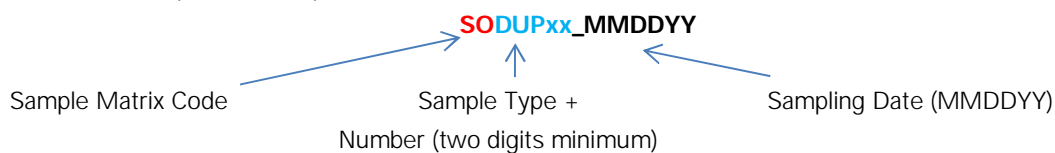
- QA/QC Samples:**

Sample Matrix Codes

SO	Soil	AS	Air
SE	Sediment	SV	Soil Vapor
GW	Groundwater	SL	Sludge
SW	Surface Water	FP	Free Product

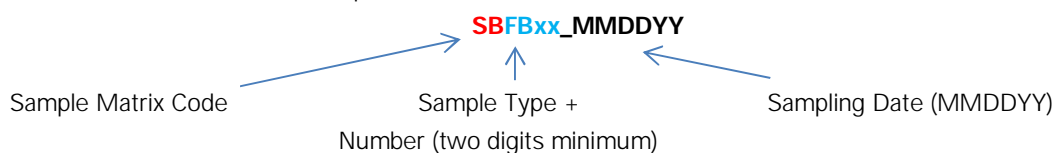
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- o Duplicates Samples



Sample Type	Parent Sample Code	Date	Sample Name
Groundwater Duplicate Sample (DUP)	MW01_022113	02/21/2013	GWDUP01_022113
Soil boring Duplicate Sample (DUP)	SBP01_022113	02/21/2013	SODUP01_022113
Grab Waste Characterization	WC01	02/21/2013	WCDUP01_022113
Composite Waste Characterization	COMP01	02/21/2013	COMPDUP01_022113

- o Field Blanks and Trip Blanks



Sample Type	Date	Sample Name
Groundwater Field Blank (FB)	02/21/2013	GWFB01_022113
Groundwater Trip Blank (TB)	02/21/2013	GWTB01_022113
Soil Field Blank	02/21/2013	SOFB01_022113
Soil Trip Blank	02/21/2013	SOTB01_022113

- o Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Parent Sample Name_MS or MSD

Sample Type	Sample Location	Parent Sample Name	Sample Name
Matrix Spike Soil (MS)	SB01	SB01_2-4	SB01_2-4_MS
Matrix Spike Soil Duplicate (MSD)	SB01	SB01_2-4	SB01_2-4_MSD
Matrix Spike GW (MS)	MW01	MW01	MW01_MS
Matrix Spike GW Duplicate (MSD)	MW01	MW01	MW01_MSD

3.0 NOTES

1. The sample location code should not exceed 20 characters and the sample name should not exceed 40 characters.
2. Sample location code (**SB01, MW01, etc.**) is a sequential number (starting with 01) and should be a minimum of two digits.
3. Sample Interval (**SB01_0-5**) is separated from the sample location code with an underscore, and the top and bottom interval with a dash. Soil and sediment sample intervals should always be in

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- feet. Soil and sediment sample intervals should contain no "/" or "()" or unit.
4. Sample date (MW01_022113) is separated from the sample location code with an underscore and should be provided in MMDDYY format [the date should contain no "/" or "-"].
 5. If groundwater samples are collected from multiple intervals within one well, you may assign a letter designation (in lower case) to the well ID to differentiate between intervals (i.e., MW01a_022113, MW01b_022113, and MW01c_022113). The letter "a" would indicate the shallowest interval and "c" the deepest. The actual depth intervals should be documented in the project field book or field sheets and the letter designations should be used consistently between sampling events.
 6. According to USEPA's Contract Laboratory Program (CLP) Guidance for Field Samplers (January 2011), field duplicate samples should remain "blind" to the laboratory (i.e., they should have separate CLP Sample numbers). Assign two separate (unique) CLP sample numbers (i.e., one number to the field sample and one to the duplicate). Submit blind to the laboratory. (<http://www.epa.gov/superfund/programs/clp/download/sampler/CLPSamp-01-2011.pdf>)

ATTACHMENT E
Perfluorinated Compound Sampling Protocol

Collection of Groundwater Samples for Perfluorooctanoic Acid (PFOA) and Perfluorinated Compounds (PFCs) from Monitoring Wells Sample Protocol

Samples collected using this protocol are intended to be analyzed for perfluorooctanoic acid (PFOA) and other perfluorinated compounds by Modified (Low Level) Test Method 537.

The sampling procedure used must be consistent with the NYSDEC March 1991 SAMPLING GUIDELINES AND PROTOCOLS

<http://www.dec.ny.gov/regulations/2636.html> with the following materials limitations.

At this time acceptable materials for sampling include: stainless steel, high density polyethylene (HDPE) and polypropylene. Additional materials may be acceptable if proven not to contain PFCs. **NOTE: Grunfos pumps and bladder pumps are known to contain PFC materials (e.g. Teflon™ washers for Grunfos pumps and LDPE bladders for bladder pumps).** All sampling equipment components and sample containers should not come in contact with aluminum foil, low density polyethylene (LDPE), glass or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer. Standard two step decontamination using detergent and clean water rinse should be considered for equipment that does come in contact with PFC materials. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFC materials must be avoided. Many food and drink packaging materials and “plumbers thread seal tape” contain PFCs.

All clothing worn by sampling personnel must have been laundered multiple times. The sampler must wear nitrile gloves while filling and sealing the sample bottles.

Pre-cleaned sample bottles with closures, coolers, ice, sample labels and a chain of custody form will be provided by the laboratory.

1. Fill two pre-cleaned 500 mL HDPE or polypropylene bottle with the sample.
2. Cap the bottles with an acceptable cap and liner closure system.
3. Label the sample bottles.
4. Fill out the chain of custody.
5. Place in a cooler maintained at $4 \pm 2^{\circ}$ Celsius.

Collect one equipment blank for every sample batch, not to exceed 20 samples.

Collect one field duplicate for every sample batch, not to exceed 20 samples.

Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, not to exceed 20 samples.

Request appropriate data deliverable (Category A or B) and an electronic data deliverable.

APPENDIX D

COMMUNITY AIR MONITORING PLAN

New York State Department of Health Generic Community Air Monitoring Plan

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area and when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH. Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a **continuous** bases or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment

should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less – but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

All 15-minute readings must be recorded and available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored **continuously** at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m³) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m³ above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m³ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m³ of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.

Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures

When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.

- If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring should occur within the occupied structure(s). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work.
- If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m³, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m³ or less at the monitoring point.
- Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions should be pre-determined, as necessary, for each site.

Special Requirements for Indoor Work with Co-Located Residences or Facilities

Unless a self-contained, negative-pressure enclosure with proper emission controls will encompass the work area, all individuals not directly involved with the planned work must be absent from the room in which the work will occur. Monitoring requirements shall be as stated above under “Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures” except that in this instance “nearby/occupied structures” would be adjacent occupied rooms. Additionally, the location of all exhaust vents in the room and their discharge points, as well as potential vapor pathways (openings conduits, etc.) relative to adjoining rooms, should be understood and the monitoring locations established accordingly. In these situations, it is strongly recommended that exhaust fans or other engineering controls be used to create negative air pressure within the work area during remedial activities. Additionally, it is strongly recommended that the planned work be implemented during hours (e.g. weekends or evenings) when building occupancy is at a minimum.