REMEDIAL DESIGN WORK PLAN
FOR ON-SITE VAPOR MITIGATION

for

FORMER ACME STEEL/METAL WORKS
95 LOMBARDY STREET/46 ANTHONY STREET
Brooklyn, New York 11222
NYSDEC Site No. 224131

Prepared For:

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LANGAN

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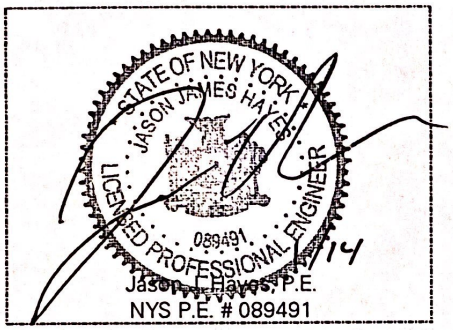
Langan Project No. 170157201

CERTIFICATION

I, Jason J. Hayes, P.E., certify that I am currently a NYS-registered professional engineer as defined in 6 NYCRR Part 375 and that this Remedial Design Work Plan for On-Site Vapor Mitigation was prepared in accordance with applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10).



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1.0 INTRODUCTION

1.1 General

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan) prepared this Remedial Design Work Plan for On-site Vapor Mitigation (referred to hereafter as the "work plan") at 95 Lombardy Street and 46 Anthony Street in the Greenpoint section of Brooklyn, New York (the "site"). The site is a New York State Department of Environmental Conservation (NYSDEC) Class 2 Inactive Hazardous Waste Disposal Site and is also known as NYSDEC Site No. 224131. Whitehead Company (the Respondent and owner of the site) will implement the work plan.

Langan prepared this work plan as directed by NYSDEC in its 14 May 2021 letter in response to Langan's 26 February 2021 Potential Chlorinated Volatile Organic Compound (CVOC) Source Investigation Summary Report, 31 January 2020 Groundwater Data Summary Report, and February 2019 loading dock trench drain investigation. This work plan addresses potential on-site soil vapor intrusion via installation of two sub-slab depressurization (SSD) systems to depressurize areas of the site that are continuously occupied during business hours, and proposes further investigation for evidence of an on-site source of CVOC contamination detected at the site.

This work plan has been prepared in accordance with the requirements of the NYSDEC May 2010 Department of Environmental Remediation (DER)-10 - Technical Guidance for Site Investigation and Remediation and New York State Department of Health (NYSDOH) guidance[1] (NYSDOH Guidance).

1.2 Site Description and Background

The site occupies an area of about 44,000 square feet at 95 Lombardy Street (Tax Block 2819, Lot 8) and 46-60 Anthony Street (Tax Block 2819, Lot 11) in Brooklyn, New York. The site has three 2-story brick buildings and one 1-story brick building, and is adjoined by Anthony Street to the north, Porter Avenue to the east, Lombardy Street and warehouse buildings to the south, and Vandervoort Avenue to the west. A site location map is provided as Figure 1.

The site was used for fabricating and painting metal building products from the 1930s until circa 1998. These uses include a metal staircase manufacturer from the 1930s until circa 1977, and then the former Acme Steel facility, which manufactured metal doors and frames. The site is now used for kitchen cabinet fabrication and stone showrooms/warehousing, stone cutting, woodworking and office space.

The site is underlain by the Meeker Avenue Plume Trackdown (Trackdown) site, which occupies the Greenpoint/East Williamsburg Industrial Area in Brooklyn. The Trackdown site is located within a region of historical petroleum refining and storage operations that occupied a significant

[1] Guidance for Evaluating Soil Vapor Intrusion in the State of New York (2006), with updates.

part of the Greenpoint neighborhood, straddles the Brooklyn-Queens Expressway, and extends southwest to northeast from Kingsland Avenue to Newtown Creek. Investigations conducted within the Trackdown site have identified CVOCs, including tetrachloroethene (PCE) and trichloroethene (TCE), in soil, groundwater, and soil vapor. In response to these findings, the NYSDEC initiated several investigations to identify the sources of the chlorinated solvents. The following section briefly discusses the previous environmental investigations performed by Langan.

1.3 Previous Environmental Investigations Summary

2012 Remedial Investigation and 2017 Supplemental Remedial Investigation

Langan completed a remedial investigation (RI) in 2012 and a supplemental RI (SRI) in 2017 to investigate and characterize the nature and extent of contamination in soil, groundwater and soil vapor at the site. In general, CVOCs (including PCE, TCE, and their degradation products) were detected in soil only at low concentrations two to three orders of magnitude less than the Unrestricted Use and Protection of Groundwater Soil Cleanup Objectives (SCOs) in the 35 soil samples throughout the site. TCE was detected at one location at a concentration of 2.3 milligrams per kilogram (mg/kg), at a depth of about 65.5 feet below grade surface (bgs). CVOCs were detected in shallow and deep overburden groundwater at concentrations above the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (AWQS) and Guidance Values for Class GA groundwater. PCE and TCE were detected in sub-slab soil vapor at concentrations above the Air Guideline Values (AGVs) during the RI. An on-site source of CVOCs was not identified.

2019 to 2020 Quarterly Groundwater Gauging and Sampling

Based on RI and SRI findings, the NYSDEC directed the Respondent to conduct quarterly groundwater gauging and a site-wide groundwater sampling event to further evaluate solvent impacts in groundwater. Site-wide and off-site groundwater gauging was performed in all four quarters of 2019 and ceased after the first quarter of 2020. Gauging results indicated that shallow overburden groundwater appears to flow to the north and east, toward the Newtown and Maspeth Creeks, and deep groundwater also generally appears to flow east. Site-wide and off-site groundwater sampling was also performed by Langan, in December 2019. The VOCs TCE, PCE, 1,1,2-trichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, and vinyl chloride were detected at concentrations exceeding the NYSDEC TOGS AWQS and Guidance Values for Class GA water.

2019 Trench Drain Investigation

The NYSDEC also requested further investigation at a trench drain at the base of a ramp at a loading dock in the northwestern part of the site. Langan investigated the trench drain in February 2019. The trench drain investigation revealed two lengths of abandoned 3-inch-diameter piping and a vertical 4-inch-diameter feature that appeared to terminate at a concrete base beneath the trench drain. Three sediment samples were collected from accumulated sediment within the

trench drain; analytical results for all of these sediment samples contained PCE and TCE at concentrations at least three times lower than the Unrestricted Use SCOs.

2020 Potential CVOC Source Investigation

Pursuant to a request in the NYSDEC's 9 March 2020 Groundwater Data Summary Report comment letter, Langan implemented the Potential CVOC Source Investigation Work Plan in December 2020. The investigation included the completion of a NYSDOH Indoor Air Quality (IAQ) Questionnaire and Building Survey, collection of indoor air and sub-slab soil vapor samples, and installation and screening of 79 temporary sub-slab soil vapor points across the site and the adjacent sidewalks. The results of the Potential CVOC Source Investigation Work Plan were consistent with those observed in the 2012 RI and 2017 SRI and did not indicate the presence of an on-site CVOC source.

Sub-slab vapor and indoor sample analytical results were compared to the concentration thresholds used in the NYSDOH Guidance, yielding the following recommendations:

- "No further action" (1,1-dichloroethene, cis-1,2-dichloroethene, carbon tetrachloride, and vinyl chloride)
- "Identify source(s) and resample or mitigate" (methylene chloride)
- "Mitigate" (1,1,1-trichloroethane, PCE, and TCE)

In response to the results of the Potential CVOC Source Investigation, the NYSDEC and NYSDOH requested implementation of a remedial design for on-site vapor mitigation.

2.0 DESIGN INVESTIGATION – COMMUNICATION TEST

Langan performed a design investigation consisting of a sub-slab vacuum conveyance communication test in accordance with the scope of work provided to the NYSDEC on July 30, 2021. The communication test results were used to develop the remedial design provided in this work plan.

2.1 Summary of Communication Test

2.1.1 SSD System Communication Test

Langan performed a communication test from 20 to 22 September 2021 to assess sub-slab airflow parameters and derive criteria for design of a soil vapor mitigation system. Communication testing included installation of four central depressurization (suction) points (ACME-SP-01 through ACME-SP-04) followed by a series of vacuum monitoring points installed radially outward from the central suction point at intervals of approximately 10 feet. Additional vacuum monitoring points were installed as needed to better understand subsurface airflow and vacuum propagation. The communication test locations are shown on Figure 2.

AARCO Environmental Services Corporation (AARCO) of Lindenhurst, New York, used a core drill to install the suction points and a rotary hammer drill to install the associated monitoring points. Prior to testing, suction and monitoring point seals were verified using smoke tubes. During communication testing, AARCO used an AMETEK Rotron DR505 regenerative blower to apply varying vacuums at suction points; Langan measured the corresponding airflow at suction points and vacuum at surrounding monitoring points using an air velocity meter (TSI 9565). Applied vacuum, blower flow rate, and vacuum monitoring point measurements were recorded for each test area. After the communication test was completed, the concrete slab was repaired in-kind. Site observation reports documenting the communication test are provided in Appendix B.

2.1.2 Communication Test Results

Vacuum influence or "communication" (defined as a differential pressure reading of greater than or equal to -0.02 inches of water column [IWC]) was observed in monitoring points associated with each suction point, with the exception of select monitoring points as described below. Varying vacuums were applied to each suction point to evaluate sub-slab communication in differing vacuum conditions. A summary of the findings by test area is presented below.

95 Lombardy Street Mitigation Area

- ACME-SP-01
    - With the exception of monitoring point MP06, consistent communication was observed at each monitoring point under each applied vacuum condition, at distances of about 10 to 20 feet from the suction point.

  - No communication was observed at monitoring point MP06. Additional monitoring points MP03/06 and MP05/06 were added within 10 feet of monitoring point MP06; adequate vacuum influence was observed at both additional monitoring points.
  - Communication was recorded at the maximum tested distance of 20 feet during the low vacuum test (using 10 IWC at a flow rate of 24 cubic feet per minute [cfm]).
- ACME-SP-04
  - With the exception of monitoring points MP04 and MP07, communication was observed at each monitoring point under each applied vacuum condition, at distances from about 10 to 25 feet from the suction point.
  - No communication was observed at monitoring points MP04 and MP07.
  - Communication was recorded at the maximum tested distance of 20 feet during the low vacuum test (using 70 IWC at a flow rate of 26 cfm).

60 Anthony Street Mitigation Area

- ACME-SP-02
  - With the exception of monitoring points MP05 and MP11, communication was observed at each monitoring point under one or more applied vacuum condition, at distances from about 10 to 40 feet from the suction point.
  - No communication was observed at monitoring points MP05 or MP11. Communication at MP07 was limited to -0.024 under one vacuum condition and showed poor communication under the other vacuum conditions.
  - Communication was recorded at the maximum tested distance of 40 feet during the low vacuum test (using 8 IWC at a flow rate of 21 cfm).
- ACME-SP-03
  - With the exception of monitoring points MP07, MP08, MP09 and MP07/09, communication was observed at each monitoring point under one or more applied vacuum condition, at distances from about 10 to 35 feet from the suction point.
  - No communication was observed at monitoring point MP07, MP08, MP09 and MP07/09. Communication at MP10 was limited to -0.021 and -0.020 under two vacuum condition and showed poor communication under the other vacuum condition.
  - Positive (pressure) readings were consistently recorded at monitoring points MP07 and MP09 beyond 5 minutes. Additional monitoring MP-07/09 was added within 10 feet of monitoring points MP07 and MP09, and indicated that vacuum was negative, but did not show adequate communication. Field observations indicated that operation of a supplemental HVAC system near the south wall of

the marble cutting area interfered with vacuum monitoring and results in the positive readings while the HVAC operated. According to the owner, the supplemental HVAC exhausts above the roof and is periodically operated during marble cutting as a dust control measure to address worker safety.

- Communication was recorded at the maximum tested distance of 35 feet during the low vacuum test (using 0 IWC[2] at a flow rate of 24 cfm).

Factors that may have impacted the results of the communication test include below-slab foundation elements (i.e., footings, grade beams, and utilities), variability in the sub-slab soil type, and ventilation. The communication test field results are tabulated in Table 1, and the communication test layout is shown on Figure 2.

[2] The anomalous vacuum reading was likely due to an equipment malfunction. The IWC was assumed to be about -10 IWC based on collected data at similar flow rates.

3.0 SUMMARY OF VAPOR MITIGATION IMPLEMENTATION

The measures described herein will be implemented in accordance with applicable federal, state, and city regulations and a Health and Safety Plan (HASP), which is provided as Appendix A.

3.1 Mitigation Objectives

The objective of this work plan is to mitigate potential intrusion of CVOC-impacted soil vapor into continuously occupied areas of the site buildings by installing two active SSD systems. The SSD systems will include depressurization pits connected to above- and below-grade piping and roof-mounted blowers. The systems will create sub-slab vacuum fields, establish a sub-slab air pressure lower than that of the indoor air, and collect sub-slab vapor that will be discharged to the ambient air above the roof. The areas that are continuously occupied during business hours are as follows:

- 95 Lombardy Street (operated by Wise Cabinet & Countertop and occupied by workers and customers during business hours): An about 3,000-square-foot portion of the 1-story brick building is used as a kitchen cabinet fabrication and stone countertop office space and showroom.
- 60 Anthony Street (operated by Lee's Kitchen Cabinet & Stone Inc.):
    - An about 3,500-square-foot portion of the 1-story brick building is used as a kitchen cabinet fabrication and stone countertop office space and showroom, and occupied by workers and customers during business hours.
    - An about 1,300-square-foot portion of the 2-story brick building is used for marble cutting (first floor) and occupied by workers during business hours.

The spaces listed above are herein referred to as the two "target mitigation areas", as shown on Figures 2 and 3. The remaining ground floor uses of the building include active loading docks, warehouse space for storage of marble and cabinetry, utility spaces, staircase corridors, an unused restroom used for storage, and general storage. These areas are not continuously occupied during business hours and are not proposed for depressurization based on the following:

- The warehouse spaces open up to one of two loading docks containing bay doors that, according to the tenants and owner, typically remain open during periods of occupancy to allow for fresh air ventilation.
- The loading docks and warehouse spaces are unheated and, according to the tenants and owner, the bay doors typically remain open during the majority of business hours year-round.

The site will remain in use by tenants during implementation of this work plan.

3.2 SSD System Design and Installation

3.2.1 SSD System Design

The SSD systems were designed in accordance with United States Environmental Protection Agency (USEPA) guidance[3], NYSDOH Guidance, NYC Mechanical Code MC 512 Sub-Slab Exhaust Systems, and NYC Local Law 2009/071. The results from the communication test were used to evaluate subsurface airflow potential and radii of vacuum influence to design the layout of the SSD systems, the quantity of pits needed, and the number and type of blowers required for adequate vapor mitigation in the target areas. Adequate vacuum (-0.02 IWC or greater) was generally achieved using varying flows at a minimum radius of influence of about 10 feet in the 95 Lombardy Street occupied spaces and about 15 to 25 feet in the 60 Anthony Street occupied spaces. Based on the footprints of the target mitigation areas and the communication results, the selected 240-volt OBAR GBR 76UD blower (or equivalent) can provide a total airflow rate of about 100 cfm at 11 IWC at maximum power, resulting in a minimum radius of influence at each depressurization pit of about 10 feet at 95 Lombardy, and 15 to 25 feet at 60 Anthony Street.

Based on these parameters, the mitigation design includes seven depressurization pits and two roof-mounted blowers. The seven sub-slab depressurization pits (ACME-DP-01 through ACME-DP-07) will be connected by conveyance piping to riser pipes, which run through the building to roof-mounted blowers and exhaust points. The two systems will include the following:

- Three depressurization pits (ACME-DP-01 through ACME-DP-03) will be located at 95 Lombardy Street, and the associated conveyance piping will manifold together on the roof before connecting to a single roof-mounted blower (the proposed design includes three depressurization pits, due to an area of poor communication observed during the communication test).

- Four depressurization pits (ACME-DP-04 through ACME-DP-07) will be located at 60 Anthony Street, and the associated conveyance piping will manifold together on the roof before connecting to a single blower.

The locations and dimensions of the depressurization pits are subject to change based on accessibility constraints and field observations.

The depressurization pits will be backfilled with virgin 1.5-inch stone (ASTM International C33 coarse aggregate number 3) and will contain solid sub-slab Schedule 80 polyvinyl chloride (PVC) conveyance pipes connecting to through-slab and above-slab metal riser pipes. With the exception of depressurization pit ACME-DP-07, which will require a length of solid sub-slab piping

[3] NYS Guidance References: EPA/600/R-08-115 October 2008 Indoor Air Vapor Intrusion Mitigation Approaches; EPA/625/R-93/011 October 1993 Technical Guidance for Active Soil Depressurization Systems; and EPA/625/R-92/016 - June 1994 Radon Prevention in the Design and Construction of Schools and Other Large Buildings.

installed in a trench between the pit and the slab penetration location, riser piping will penetrate the floor slab above each pit. The riser pipes will extend from the sub-slab, through the slab, through the interior of the buildings, through the roof, and terminate at connections to roof-mounted blowers. Seven vacuum monitoring points (ACME-SSV-01 through ACME-SSV-07) will be installed throughout the target mitigation areas. The SSD system design drawing and details are provided on Figures 3 and 4, respectively. A cost estimation is shown in Table 2. SSD system design support documents are included as Appendix C.

3.2.2 Site Preparation

After completion of the communication test and prior to design, a site walk was performed with ownership and tenants to evaluate accessibility constraints and confirm depressurization pit and roof-mounted blower locations. Before construction of the SSD systems, the remedial design team will complete an additional site walk with the licensed installation contractor to establish work zones. The floor slab will be inspected for preferential pathways such as penetrations, cracks, or voids that will need to be sealed.

Prior to ground-intrusive activities, a geophysical contractor will pre-clear proposed depressurization pit and underground piping locations for potential subsurface utilities and structures using ground-penetrating radar (GPR) and electromagnetic (EM) detectors.

3.2.3 SSD System Installation

A licensed contractor will be retained to complete the following SSD system installation and construction activities within the target mitigation areas:

- Excavation of seven about 4-foot-long, 4-foot-wide, and 2-foot-deep depressurization pits;
- Excavation of a trench to about 1 foot below slab grade between the depressurization pits and riser pipe locations (at depressurization pit ACME-DP-07 only, unless other slab penetrations require relocation due to access constraints);
- Installation of geotextile fabric with negligible air flow restriction along the base and sidewalls of the depressurization pits and trenches;
- Installation of solid 4-inch-diameter Schedule 80 PVC piping with a minimum slope of 1 inch per 8 linear feet (sloping downward towards the depressurization pits) between the depressurization pits and riser pipe locations (at depressurization pit ACME-DP-07 only, unless other slab penetrations require relocation due to access constraints);
- Backfill of depressurization pits with imported air-permeable 1.5-inch clean quarry stone (ASTM International C33 coarse aggregate number 3);
- Backfill of pipe trenches with imported environmentally clean backfill (e.g., clean, coarse sand or pea gravel), as necessary (at depressurization pit ACME-DP-07 only, unless other slab penetrations require relocation due to access constraints);

- Export of material excavated or removed as part of SSD system installation, including historic fill and concrete debris;
- Installation of seven 4-inch-diameter metal riser pipes, in accordance with NYC Mechanical Code, which will originate from the slab and penetrate the roof;
- Installation of two roof-mounted blowers equipped with remote alarm systems that will alert tenants if the blowers are not operating;
- Sealing of any preferential pathways (e.g., cracks or voids) in the slab with ASTM International C920 class 25 or higher or equivalent caulk, hydraulic cement, or other appropriate material;
- Completion of a pressure/leak test of the above-grade SSD system piping and replacement or repair of observed leaks or pipe defects, if any; and
- Restoration of the building slab and roof penetrations to pre-existing condition.

Components of the SSD system design, such as depressurization pit and vacuum monitoring point locations, and depressurization pit dimensions, are subject to change based on accessibility constraints and field observations during construction.

An inspection will be performed prior to the system startup to document that required components are in place. Equipment will be started in accordance with the manufacturer's recommendations. System testing will include: a smoke test to check for leaks through slab penetrations, floor joints, and paved depressurization pits; system alarm testing; and measurement of airflow (at sample ports) and pressure (at vacuum monitoring points) to document that the systems are operating in accordance with design calculations. Monitoring and maintenance of the SSD systems is described in Section 6.0.

The SSD systems will operate until decommissioning is approved by the NYSDEC. The approximate target mitigation areas and SSD system layout are presented on Figure 3, the roof layout is presented on Figure 4, and the SSD system details are shown on Figure 5.

3.2.4 Post-SSD System Startup Monitoring and Sampling

Post-SSD system startup monitoring will include pressure monitoring at each vacuum monitoring point and one round of post-mitigation indoor air samples. One ambient air sample and three indoor air samples (one in each of the continuously occupied spaces) will be collected in accordance with the NYSDOH Guidance during the 2022 heating season and after at least 30 days of continuous operation of the SSD systems. The SSD systems will be operational during sample collection. Prior to sample collection, a NYSDOH Indoor Air Quality Questionnaire and Building Survey will be completed to document the potential presence of equipment or chemicals that could interfere with the laboratory analytical results. The building will be screened using a photoionization detector (PID) (MultiRAE or equivalent) during the survey.

Samples will be collected about 3 to 4 feet above the ground surface for a duration of 8 hours, and will be collected in appropriately sized Summa canisters that have been certified clean by the laboratory and will be analyzed using United States Environmental Protection Agency (USEPA) Method TO-15. Flow rate for both purging and sampling will not exceed 0.2 liters per minute (L/min). A sample log sheet will be maintained summarizing sample identification, date and time of sample collection, sampling height, identity of samplers, sampling methods and devices, volume of the air extracted, vacuum of canisters before and after the samples are collected, apparent moisture content of the sampling zone, and chain of custody protocols. Samples will be submitted to a NYSDOH Environmental Laboratory Approval Program (ELAP)-approved laboratory for analysis.

3.3 SSD System Installation Oversight

A Langan engineer will be on-site full-time during construction of the SSD systems. SSD systems installation will be documented in daily reports.

3.3.1 Soil Screening Methods

Visual, olfactory, and PID soil screening and assessment will be performed by an engineer, geologist or scientist under the direct supervision of the Remedial Engineer (RE) or Qualified Environmental Professional (QEP) during soil-intrusive work performed pursuant to the work plan. Instrumental screening will be performed with a PID equipped with a 10.6 electron volt (eV) bulb and calibrated daily, at a minimum. Grossly-impacted material, if any, will be segregated and placed in a separate United Nations/Department of Transportation (UN/DOT)-approved 55-gallon drum pending waste characterization sampling and off-site disposal.

3.3.2 Waste Characterization

Waste characterization samples of excavated soil will be collected in accordance with general disposal facility requirements and DER-10 Section 5.4 (including Table 5.4(e)10) to characterize material subject to off-site disposal. Sampling will be coordinated and overseen by a representative of the RE. Samples will be representative of the material requiring disposal, will be collected at a frequency consistent with disposal facility requirements, and will be analyzed for parameters that are typically required by disposal facilities. The following list is provided for planning purposes and may not reflect the final analyses performed for waste characterization:

- 6 NYCRR Part 375/TCL/New Jersey Department of Environmental Protection (NJDEP) volatile organic compounds (VOCs), extractable petroleum hydrocarbons (EPH), semivolatile organic compounds (SVOCs), pesticides, herbicides, polychlorinated biphenyls (PCBs), and target analyte list (TAL) metals (including hexavalent chromium);
- Toxicity Characteristic Leaching Procedure (TCLP) VOCs, SVOCs, pesticides, herbicides, and metals;
- Resource Conservation and Recovery Act (RCRA) characteristics, including ignitability, corrosivity, and reactivity (sulfide and cyanide);

- Total cyanide; and
- Paint filter analysis.

Waste characterization samples will be submitted to a NYSDOH ELAP-approved laboratory for analysis.

3.3.3 Stockpiles

Soil stockpiles are not anticipated, but may be constructed as necessary during excavation of depressurization pits and pipe trenches. Excavated soil will be initially handled as hazardous waste, and will be staged and transported for disposal in UN/DOT-approved 55-gallon drums, roll-offs lined with 8-mil low-permeability liners, or an approved equivalent. Stockpiles derived from other waste streams (e.g., concrete debris) will meet the following requirements:

- Different waste streams will be segregated into separate stockpiles.
- Stockpiles will be covered upon reaching capacity or, if active, at the end of each workday with minimum 8-mil plastic sheeting or tarps which will be securely anchored to the ground.
- Each stockpile area will be encircled with silt fences and hay bales as needed to contain and filter particulates from rainwater runoff, and to mitigate the potential for surface water run-on.
- Stockpiles will be inspected once each week, at a minimum, and after every storm event. Deficiencies will be promptly addressed. Damaged tarps or coverings will be promptly replaced.
- Results of inspections will be recorded in a logbook, maintained at the site, and made available for inspection by NYSDEC.

3.3.4 Material Load Out and Transport

Soil/fill material, grossly-impacted material (if any), and construction and demolition (C&D) debris generated during SSD system installation will be handled, transported, and disposed of by a licensed hauler in accordance with applicable 6 NYCRR Part 360 and Part 364 regulations and other applicable federal, state, and local regulations. A Langan representative under the direct supervision of the RE will observe and document load-out of material, including UN/DOT-approved 55-gallon drum disposal.

The owner and its contractors are solely responsible for safe execution of invasive work performed under this work plan. Loaded vehicles leaving the site will be appropriately secured, manifested, and placarded in accordance with appropriate federal, state, local and New York State Department of Transportation requirements.

3.3.5 Materials Disposal Off-site

The RE will review submittals for proposed disposal facilities before materials leave the site, to document that the facility has the proper permits and to review their acceptance requirements. Waste characterization of excavated soil will be performed per Section 3.3.2. Waste characterization data available for soil/fill material to be disposed of at a given facility will be submitted to the disposal facility with suitable explanation prior to shipment and receipt. A letter from the disposal facility stating it is in receipt of the correspondence and is approved to accept the material will be provided before material is transported.

Concrete debris will not require waste characterization sampling unless it exhibits evidence of impacts (e.g., visual, olfactory, or instrumental evidence) and has not been in contact with grossly impacted or hazardous soil, and may be transported to a NYSDEC-permitted or registered Part 360 C&D debris recycling facility.

The waste removal contractor will provide the appropriate permits, certifications, and written commitments from disposal facilities to accept the soil and fill throughout the duration of the project. Disposal facility documentation will be presented to the NYSDEC and a response will be received prior to disposal activities.

3.3.6 Materials Reuse On-site

Reuse of excavated soil during implementation of this work plan is not proposed.

3.3.7 Import of Backfill

Imported stone will be used to backfill the depressurization pits. Virgin stone (gravel) imported from compliant facilities containing less than 10% by weight passing a No. 80 sieve will not require analytical data, unless required by NYSDEC under the terms for operation of the facility. Environmentally clean backfill (e.g. clean, coarse sand or pea gravel) will be used to backfill the trenches between the depressurization pits and the riser pipes, as necessary, and will be sampled by the contractor in accordance with DER-10 Table 5.4(e)10 (Recommended Number of Soil Samples for Soil Imported to a Site). Analytical results will meet the general fill requirements (i.e., the lower [more restrictive] of the 6 NYCRR Part 375 Restricted Use Restricted-Residential and Protection of Groundwater SCOs.

Prior to material import, the RE will review documentation from each import facility, including the facility name, address, permit/registration, and site history, if necessary, in accordance with DER-10. Proposed import material will be approved by both the RE and the NYSDEC. Upon arrival, import material will be screened for any visual, olfactory, or instrumental evidence of contamination.

3.4 Supplemental Shallow Soil Sampling

Soil samples will be collected from the depressurization pits to further inform shallow soil quality in and near the target mitigation areas.

During SSD system installation, two shallow soil samples will be collected from each depressurization pit for laboratory analysis. One sample will be collected from the interval directly beneath the concrete slab, and an additional sample collected at the base of the pit. The samples will be collected in laboratory-supplied containers that are sealed, labeled, and placed in a cooler containing ice (to maintain a temperature of approximately 4 degrees Celsius) for delivery to a NYSDOH ELAP-certified analytical laboratory. Soil samples will be analyzed for TCL VOCs via USEPA Method 8260C.

Shallow soil sampling will be performed in accordance with the Quality Assurance Project Plan (QAPP) originally attached to the NYSDEC-approved Potential CVOC Source Investigation Work Plan. A copy of the QAPP is included in Appendix D.

2.5.1 Data Validation

Laboratory analyses will be conducted for the supplemental shallow soil samples in accordance with NYSDEC Analytical Services Protocol (ASP) B deliverable format, and data will be reported electronically using the database software application EQuIS as part of NYSDEC's Environmental Information Management System. The laboratory will provide sample bottles that have been 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 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 shallow soil sample results.
- Preparation of a Data Usability Summary Report (DUSR).

The DUSR will be prepared and reviewed by the Program Quality Assurance Monitor before issuance. The DUSR will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain of custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method. A detailed assessment of each sample delivery group will follow.

3.5 Contingency Plan

If underground storage tanks (USTs) or other previously unidentified contaminant sources are found during SSD system installation, UST decommissioning will be performed in conformance with the criteria defined in 6 NYCRR Part 613-3.5 and NYSDEC DER-10 Chapter 5.5, and sampling will be performed on product and surrounding subsurface material (e.g., soil, stone, etc.). Chemical analysis will include full scan parameters (Part 375 VOCs, SVOCs, PCBs, pesticides, metals, and per- and polyfluoroalkyl substances [PFAS]). Analyses will not be otherwise limited without NYSDEC approval.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to the NYSDEC Project Manager.

3.6 Dust, Odor, Vapor and Nuisance Control Plan

This dust, odor, vapor and nuisance control plan was developed in accordance with the NYSDOH Generic Community Air Monitoring Plan (CAMP) and Occupational Safety and Health Administration (OSHA) standards for construction (29 CFR 1926).

Action levels for protection of tenants, community, and visitors are set forth in the CAMP that is included in Section 3.9.

3.6.1 Odor and Vapor Control

This odor control plan is capable of controlling off-site emissions of nuisance odors. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until nuisance odors have been abated. NYSDEC and NYSDOH will be notified of odor events and of any other complaints about the project. Implementation of odor control perimeter monitoring, including advising on the temporary suspension of work, will be the responsibility of the RE. The contractor is responsible for implementing odor controls as required.

All necessary means will be employed to prevent on- and off-site nuisances. If odors develop and cannot be otherwise controlled, means to eliminate odor nuisances may include: (a) shrouding open excavations with tarps and other covers; (b) use of odor-suppressing foam; (c) use of chemical odorants in spray or misting systems; and, (d) use of staff to monitor odors in the surrounding neighborhood.

3.6.2 Dust Control

A dust suppression plan that addresses dust management during invasive work will include, at a minimum, the use of a dedicated water distribution system, water trucks, or an alternate source with suitable supply and pressure.

3.6.3 Other Nuisances

A plan for rodent control will be developed and utilized by the contractor prior to and during remedial work. A plan for noise control will be developed and utilized by the contractor for SSD system installation work and will conform, at a minimum, to New York City Department of Environmental Protection (NYCDEP) noise control standards.

3.7 Contractor's Means and Methods

The contractor is solely responsible for safe execution of invasive and other work performed under this work plan and will be responsible for obtaining local, state or federal permits or approvals that may be required to perform work under this work plan. Refer to Section 4.0 for anticipated agency approvals and permits.

3.8 Health and Safety Plan

The RE prepared a site-specific HASP, which is provided as Appendix A. The HASP specifically addresses health and safety requirements pertaining to site contamination and will apply to all remedial and construction-related work on-site. Contractors are required to adhere to their own HASP that, at a minimum, meets the requirements of the site-specific HASP. The HASP requires that all remedial work performed under this plan be in full compliance with governmental requirements, including site and worker safety requirements mandated by Federal OSHA. The HASP provides a mechanism for establishing on-site safe working conditions, safety organization, procedures, and personal protective equipment requirements during the SSD system installation. The HASP meets the requirements of 29 CFR 1910 and 29 CFR 1926 (which includes 29 CFR 1910.120 and 29 CFR 1926.65, respectively).

3.9 Community Air Monitoring Plan

Community air monitoring will be conducted in compliance with the NYSDOH Generic CAMP, Special Requirements for Work within 20 feet of Potentially Exposed Individuals or Structures (NYSDOH Special Requirements), and with the following Special Requirements for Indoor Work with Co-located Residences or Facilities:

- Monitoring locations will be established based on the evaluation of exhaust vents/discharge points as well as potential vapor pathways (opening, conduits, etc.) in the work area; and
- Exhaust fans or other engineering controls should be used to create negative air pressure within the work area.

Langan will monitor for VOCs and particulates in the work zone during indoor excavation activities. Indoor air monitoring will be performed to document the absence of contaminant exposure to on-site personnel not associated with the remedial work (e.g., employees or customers of the on-site businesses).

Air monitoring will be conducted with the following equipment (or equivalent):

- MiniRAE 3000 PIDs (for VOCs)
- TSI DustTrak aerosol monitors (for particulate matter less than 10 microns in diameter [PM10])

Monitoring for particulates, vapor, and odors will be conducted in the work zone during ground-intrusive activities (i.e., excavation for depressurization pits and associated trenching) by the RE's field inspector. The work zone is defined as the general area in which machinery is operating in support of SSD system installation activities. A portable PID will be used within the work zone for periodic monitoring of VOCs during SSD system installation activities. As feasible, the use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices may be used to prevent exposures related to the work activities and to control dust and odors. The site perimeter will be visually monitored for fugitive dust emissions and odor.

The following actions will be taken based on measured VOC levels:

- If total VOC levels exceed 5 parts per million (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 work 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 will resume if the total organic vapor level 200 feet downwind of the work 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 work zone, work will be shut down.
- *NYSDOH Special Requirement*: Background readings in the occupied spaces must be taken prior to commencement of the planned work. 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. Unusual background readings should be discussed with NYSDOH prior to the commencement of the work.

The following actions will be taken based on elevated PM10 concentrations and/or visual dust observations:

- If the downwind PM10 concentration is 100 micrograms per cubic meter ($\mu g/m^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is

observed leaving the work zone, then dust suppression must be employed. Work may continue with dust suppression techniques provided that downwind PM10 levels do not exceed 150 µg/m³ above the background level and provided that no visible dust is migrating from the work zone.

- If, after implementation of dust suppression techniques, downwind PM10 levels are greater than 150 µg/m³ 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 µg/m³ of the upwind level and in preventing visible dust migration.
- *NYSDOH Special Requirement*: If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 µg/m³, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentrations to 150 µg/m³ or less at the monitoring point.

Concentrations detected above the CAMP action levels and subsequent corrective measures taken will be reported to the NYSDEC and NYSDOH project managers within 24 hours.

4.0 PERMITS AND AGENCY APPROVALS

The following permits and agency approvals will be obtained by the owner and/or their contractor to implement the design scope provided in this work plan:

1. Approval of this work plan by the NYSDEC and NYSDOH

2. SSD system construction permit from the New York City Department of Buildings (NYCDOB)

    - Prior to SSD system installation, a hazardous buildings materials (i.e., asbestos) inspection will be performed to support a SSD system construction permit filing with the NYCDOB. The hazardous building materials inspection will be non-invasive, and sampling will likely not be required. Once the NYCDOB permit is received, SSD system installation will begin.

3. Approval of disposal facilities for soil and concrete debris by the NYSDEC

4. Approval of imported material for the SSD system by the NYSDEC

5.0 SCHEDULE AND NOTIFICATIONS

Construction of the SSD systems is scheduled to begin in the first quarter of 2022, pending NYCDOB permit acquisition, and is anticipated to take up to 30 days to complete. Langan anticipates the following SSD system implementation schedule:

Task	Duration	Anticipated Date
Remedial Design Work Plan Submission to NYSDEC	-	November 3, 2021
Formal NYSDEC Remedial Design Work Plan Approval	2 months	November 3 to December 28, 2021
Contractor Procurement, Field Preparation, and Coordination	1.5 months	December 28, 2021 to February 9, 2022
Hazardous Building Materials Inspection	1 day	January 20, 2022
SSD Construction Permit Coordination and Approval	1 month	January 21 to February 25, 2022
Mobilization and SSD System Installation	1.5 months	February 28 to April 20, 2022
Post-Mitigation Indoor Air Sampling	1 day	May 23, 2022
Operations, Maintenance and Monitoring (OM&M) Plan Preparation	2 months	April 21 to June 20, 2022
OM&M Plan Submission to NYSDEC and NYSDOH	-	June 20, 2022
Construction Completion Report Submission to NYSDEC	-	July 15, 2022
Annual SSD System Inspection and Reporting	-	Annually until system decommissioning

5.1 Notification

The NYSDEC will be contacted to arrange a pre-construction meeting at least seven calendar days before beginning SSD system construction.

Concentrations detected above the CAMP action levels and subsequent corrective measures will be reported to the NYSDEC and NYSDOH project managers within 24 hours.

6.0 POST-CONSTRUCTION PLANS

After construction of the SSD systems, Langan and ownership will perform maintenance and monitoring activities as described in this section. The forthcoming OM&M Plan will further detail monitoring and maintenance, and annual reporting requirements. OM&M requirements will be incorporated into a future Site Management Plan, as applicable.

6.1 Routine SSD System Performance Monitoring and Maintenance

A baseline inspection of the roof-mounted blowers and other equipment will be conducted within 24 hours after initial startup. Inspections will then be conducted on an annual basis and after severe conditions (i.e., flooding). A checklist will be completed for each inspection. The inspection checklist will include, but not be limited to, a record of the pressure readings, verifying active operation of the roof-mounted blowers, and verifying the competency of couplings and seals in the SSD system riser pipes.

The roof-mounted blowers will operate continuously after initial startup. Adjustments may be needed to calibrate the systems to perform as designed. Required maintenance, adjustments, or repairs to the blower systems will be conducted as per the manufacturer's recommendations. The need for future repairs and/or adjustments will be based on comparisons between the startup testing and ongoing system performance.

The tenants at 60 Anthony Street periodically operate a supplemental HVAC system during marble cutting as a dust control measure to address worker safety. The HVAC system will be turned off to avoid backflow interference with sub-slab vacuum field measurements during routine and non-routine inspections.

6.2 Non-Routine SSD System Performance Monitoring and Maintenance

Unscheduled inspections and/or sampling may take place when a suspected failure of the SSD systems has been reported or an emergency occurs that is deemed likely to affect the operation of the systems. Non-routine maintenance may be required during the operation of the SSD systems, including, but not limited to, the following situations:

- The building's owner or occupants report that the warning device indicates the system is not operating properly;
- The system is damaged; and/or
- The building undergoes renovations that may reduce the effectiveness of the systems.

On-site personnel will be trained to identify system alarms, blowers, risers, and other system components.

7.0 REPORTING

During SSD system installation, daily progress reports will be prepared and submitted as described below. Daily reports will be provided in electronic format (e.g., PDF) to the NYSDEC Project Manager during SSD system installation.

7.1 Daily Reports

Daily reports will be submitted to the NYSDEC and NYSDOH project managers by the end of each week following the reporting period and will include:

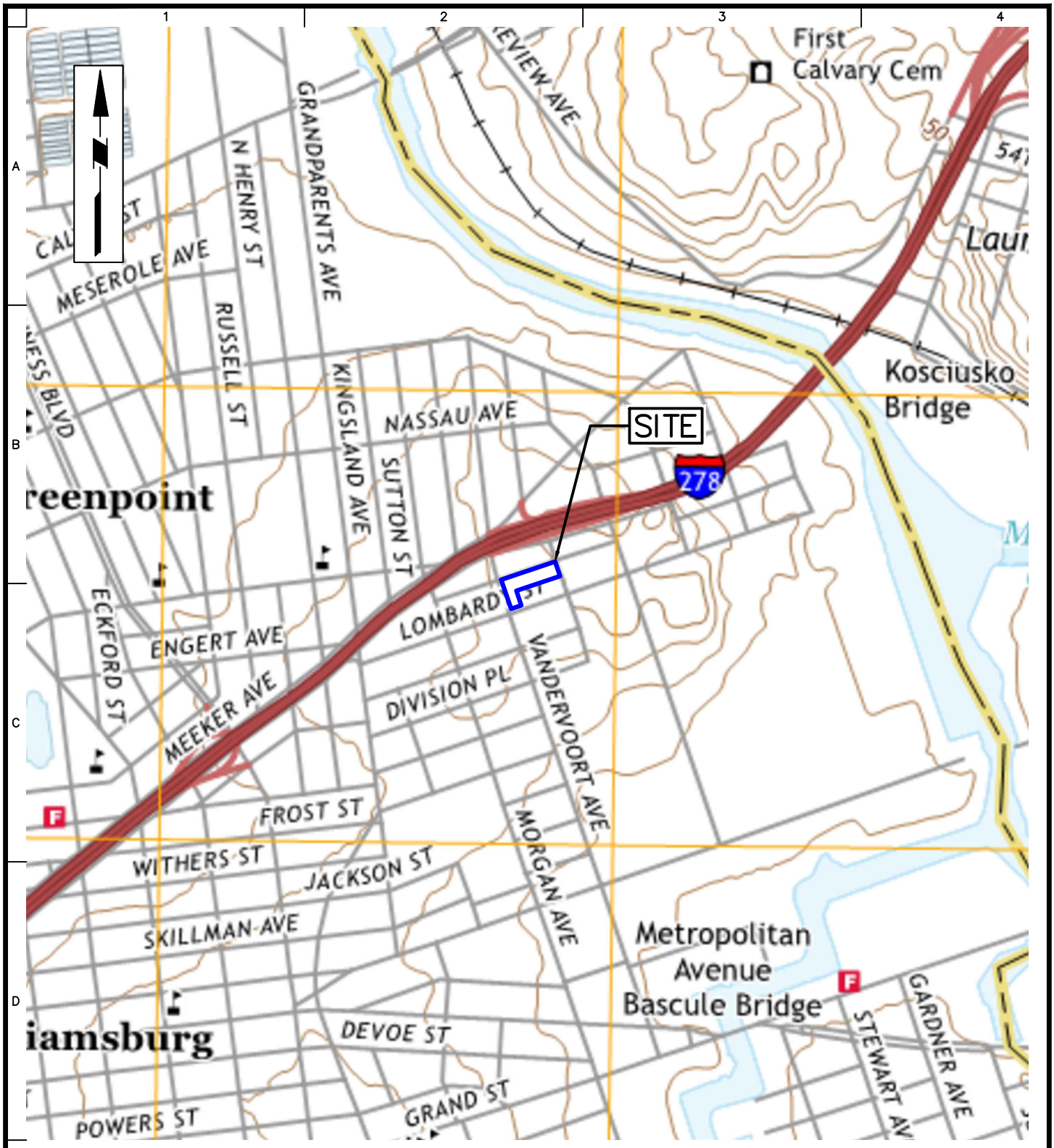
- A progress update;
- A description of work locations;
- A site plan depicting relevant SSD system installation activities;
- A summary of complaints with relevant details (names, phone numbers); and
- Deviations from the work plan (if applicable).

Daily reports are not intended to be the mode of communication for notification to the NYSDEC of emergencies (accident, spill), requests for changes to the work plan, or other sensitive or time-critical information; however, such conditions will also be included in the daily reports. Emergency conditions and deviations from the work plan will be addressed directly to the NYSDEC Project Manager via personal communication. If site conditions warrant, the RE may request to change from daily to weekly reports that include the above information.

7.2 Construction Completion Report

A Construction Completion Report (CCR), prepared and certified in accordance with DER-10 Section 5.8, will be submitted to the NYSDEC following installation of the SSD systems. The CCR will include PE-stamped as-built drawings and document that the remedial work substantially conforms to this work plan.

FIGURES



WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, LAND SURVEYOR OR GEOLOGIST, TO ALTER THIS ITEM IN ANY WAY.

NOTE:
1. BASEMAP ADAPTED FROM UNITED STATES GEOLOGICAL SURVEY (USGS) 7.5-MINUTE SERIES TOPOGRAPHICAL MAPS, BROOKLYN, NEW YORK, QUADRANGLE, DATED 2019.

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95 LOMBARDY STREET/
46 ANTHONY STREET
BROOKLYN NEW YORK

Figure Title
SITE LOCATION MAP

Project No.	170157201
Date	06/01/2021
Drawn By	MA
Checked By	KN

Figure No. 1

Sheet 1 of 5

Filename: \\langan.com\data\NYC\data2\170157201\Cadd Data - 170157201\SheetFiles\Site 224131\SSDS Work Plan\Figure 1 - Site Location Map.dwg Date: 7/8/2021 Time: 16:59 User: jcambeiro Style Table: Langan.stb Layout: Site Location Map

ANTHONY STREET

LOMBARDY STREET

VANDERVOORT AVENUE

PORTER AVENUE

95 LOMBARDY STREET
KITCHEN CABINET FABRICATION
AND STONE COUNTERTOPS
OFFICE SPACE AND SHOWROOM

60 ANTHONY STREET
KITCHEN CABINET FABRICATION
AND STONE COUNTERTOPS
OFFICE SPACE AND SHOWROOM

60 ANTHONY STREET
MARBLE CUTTING OPERATION

BUILDING

CURB

ACME-SP-01

ACME-SP-02

ACME-SP-03

ACME-SP-04

03/06

05/06

07/09

41.20

42.86

MW-DEC-026D
CASING EL=47.85
LAT: 40°43'24.2444"
LON: 73°56'12.0562"
48.22

48.69
MW-DEC-026
COVER EL=48.69
CASING EL=48.31
LAT: 40°43'24.2745"
LON: 73°56'11.9067"

40.44
ACME-MW-3D
COVER EL=40.40
CASING EL=40.10
LAT: 40°43'23.3762"
LON: 73°56'13.1371"

40.35
ACME-MW-3
COVER EL=40.32
CASING EL=39.81
LAT: 40°43'23.3985"
LON: 73°56'13.0128"

42.06
MW-DEC-005
COVER EL=42.04
CASING EL=41.68
LAT: 40°43'22.8132"
LON: 73°56'13.7004"

42.23
MW-DEC-005D
COVER EL=42.20
CASING EL=41.51
LAT: 40°43'22.7274"
LON: 73°56'13.6671"

44.13
ACME-MW-1D
COVER EL=44.13
CASING EL=43.68
LAT: 40°43'22.6671"
LON: 73°56'13.2681"

44.17
ACME-MW-1
COVER EL=44.18
CASING EL=43.64
LAT: 40°43'22.6006"
LON: 73°56'13.2425"

54.79
ACME-MW-2
COVER EL=54.79
CASING EL=53.89
LAT: 40°43'24.1058"
LON: 73°56'09.5899"

54.44
ACME-MW-2D
COVER EL=54.80
CASING EL=54.44
LAT: 40°43'24.0736"
LON: 73°56'09.5246"

44.85
MW-DEC-039D
COVER EL=44.80

45.14
MW-DEC-039
COVER EL=45.12

51.75
MW-DEC-022D
COVER EL=51.76

LEGEND:

- SITE BOUNDARY
- TARGET MITIGATION AREAS (CONTINUOUSLY OCCUPIED SPACES)
- ACME-SP-01 — TEMPORARY SUCTION POINT
- 1 — TEMPORARY VACUUM MONITORING POINT
- 05/06 — ADDITIONAL TEMPORARY VACUUM MONITORING POINT (ADDED BASED ON FIELD OBSERVATIONS)

GENERAL NOTES:

1. BASE MAP SOURCE: SURVEY TAKEN FROM "ENVIRONMENTAL FEATURE LOCATION PLAN" BY LANGAN, DATED NOVEMBER 2020.
2. TEMPORARY VACUUM MONITORING POINTS IDs ARE ABRIDGED FOR CLARITY (I.E., MP-01 IS LABELED AS "1")

15 0 3.5 7.5 15
SCALE IN FEET

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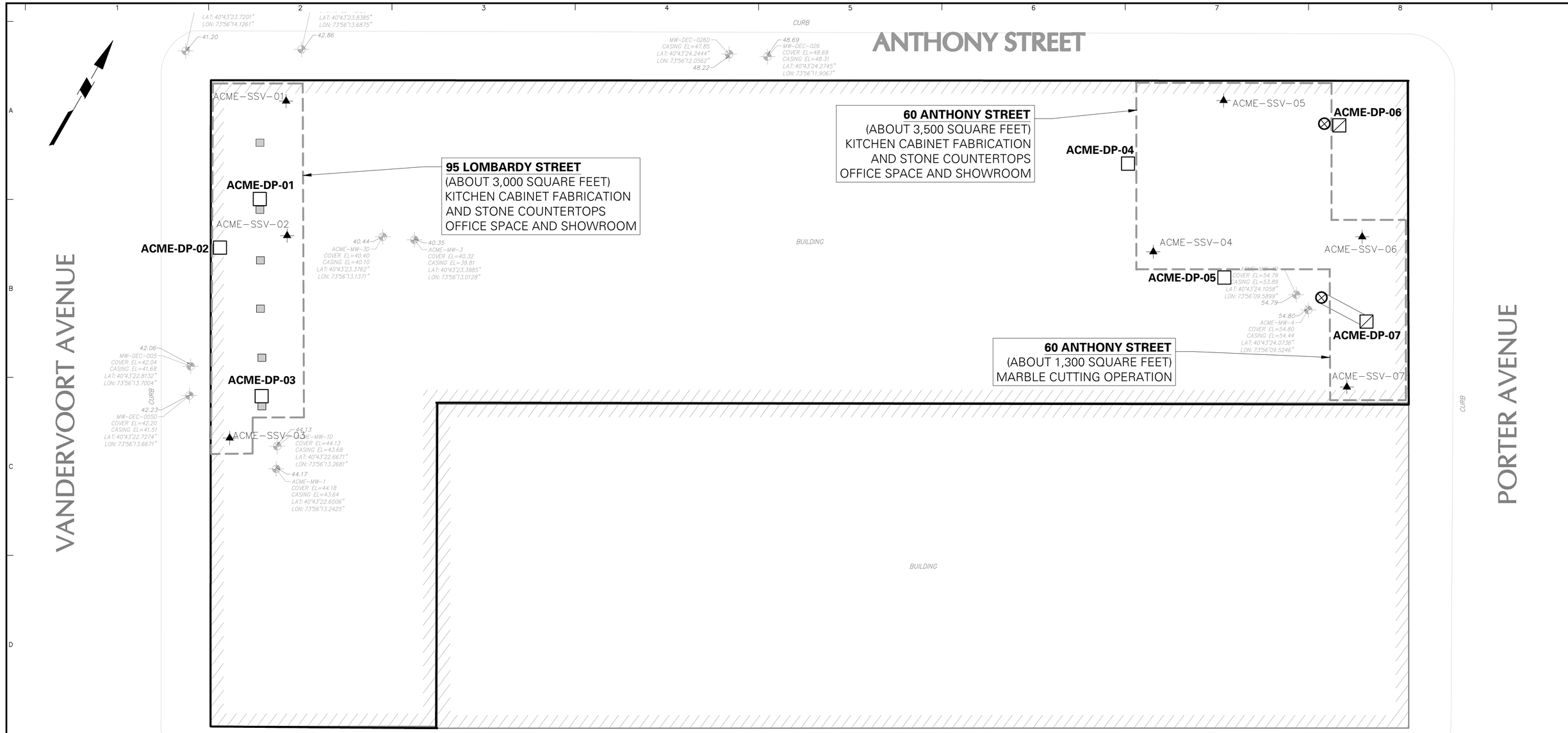
46 ANTHONY STREET
BROOKLYN NEW YORK

Figure Title
COMMUNICATION TEST LAYOUT

Project No.	Figure No.
170157201	2
Date: 10/06/2021	
Drawn By: LH	
Checked By: PTF	Figure 2 of 5

PROJECT NO. 170157201

Filename: \\langan.com\data\NYC\data2\170157201\Cadd Data - 170157201\SheetFiles\Site 224131\SSDS Work Plan\Figure 2 - Proposed Communication Test Plan.dwg Date: 10/26/2021 Time: 09:10 User: knagotko Style Table: Langan.stb Layout: SSDS Layout



LEGEND:

- SITE BOUNDARY
- TARGET MITIGATION AREAS (CONTINUOUSLY OCCUPIED SPACED)
- **ACME-DP-01** PROPOSED DEPRESSURIZATION PIT AND ROOF PENETRATION
- **ACME-DP-07** PROPOSED DEPRESSURIZATION PIT
- PROPOSED ROOF PENETRATION
- ACME-SSV-07 PROPOSED VACUUM MONITORING POINT
- PROPOSED SUB-SLAB TRENCH TO METAL RISER PIPE
- BUILDING COLUMN

15 0 7.5 15
SCALE IN FEET

DATE	Description	No.
REVISIONS		

NOTES:

1. BASE MAP SOURCE: SURVEY TAKEN FROM "ENVIRONMENTAL FEATURE LOCATIONS PLAN" BY LANGAN, DATED NOVEMBER 2020.
2. DRAWING SHALL NOT BE USED FOR STRUCTURAL, ARCHITECTURAL, UTILITY, OR OTHER REFERENCE EXCEPT FOR THE SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM.
3. CRACKS, VOIDS, AND PENETRATIONS IN THE BUILDING SLAB SHALL BE SEALED WITH POLYURETHANE-BASED CAULKING, HYDRAULIC CEMENT, OR APPROVED ALTERNATIVE.
4. INTERIOR COLUMN LOCATIONS AT 46 ANTHONY STREET AND INTERIOR WALL LOCATIONS AT 60 ANTHONY STREET ARE APPROXIMATE. SSD SYSTEM PIT LOCATIONS MAY CHANGE BASED ON ACCESS RESTRICTIONS DURING INSTALLATION.
5. VAPOR COLLECTION PIPES, FITTINGS, AND CONNECTIONS SHALL BE CONSTRUCTED WITH SOLID 4-INCH-DIAMETER SCHEDULE 80 POLYVINYL CHLORIDE PIPING.
6. RISER PIPES, FITTINGS, AND CONNECTIONS SHALL BE CONSTRUCTED WITH 4-INCH-DIAMETER METAL OR OTHER MATERIAL THAT COMPLIES WITH THE NEW YORK CITY MECHANICAL CODE.
7. RISER PIPES SHALL EXTEND TO THE BLOWERS WITH MINMAL CHANGES IN DIRECTION. HORIZONTAL PIPE RUNS MUST MAINTAIN A MINIMUM SLOPE OF $\frac{1}{8}$ INCHES PER LINEAR FOOT, SLOPING BACK TOWARDS THE DEPRESSURIZATION PIT.
8. RISER PIPE PENETRATIONS THROUGH THE SLAB SHALL BE SEALED WITH A POLYURETHANE-BASED CAULK OR APPROVED ALTERNATIVE.
9. METAL RISER PIPE WILL BE ROUTED VERTICALLY TO ROOF-MOUNTED BLOWERS FROM DEPRESSURIZATION PITS THROUGH FIRST FLOOR SPACES TO THE CEILING/ROOF, EXCEPT AS FOLLOWS:
   A. ACME-DP-03: PENETRATION REQUIRED FROM FIRST FLOOR SHOWROOM, THROUGH CEILING INTO SECOND FLOOR OFFICE SPACE, THROUGH CEILING/ROOF.
   B. ACME-DP-06: PENETRATION REQUIRED FROM FIRST FLOOR HALLWAY, THROUGH INTERIOR WALL TO FIRST FLOOR OFFICE, THROUGH CEILING/ROOF.
   C. ACME-DP-07: TRENCHING REQUIRED FROM FIRST FLOOR MARBLE CUTTING ROOM TO THE WAREHOUSE. RISER FROM WAREHOUSE WILL PENETRATE THROUGH CEILING/ROOF.
10. WALL AND CEILING PENETRATIONS SHALL BE COMPLETED AND RESTORED IN ACCORDANCE WITH NYC BUILDING CODE.
11. RISER PIPES MUST BE CLEARLY LABELED "CAUTION: DO NOT ALTER SUBS-LAB VAPOR VENT PIPE" IN EACH ACCESSIBLE AREA (A MINIMUM OF EVERY 10 LINEAR FEET OF RISER PIPE RUN).
12. SYSTEM INSTALLATION SHALL ADHERE TO THE GUIDANCE FOR EVALUATING SOIL VAPOR INTRUSIONS IN THE STATE OF NEW YORK (2006), WITH UPDATES, PREPARED BY THE NEW YORK STATE DEPARTMENT OF HEALTH (NYSDOH), AND 2014 NEW YORK CITY MECHANICAL CODE, CHAPTER 5, SECTION MC 512-SUB-SLAB SOIL EXHAUST SYSTEMS.

STATE OF NEW YORK · JASON JAMES HAYES · 089491 · LICENSED PROFESSIONAL ENGINEER

SIGNATURE DATE SIGNED

JASON HAYES
PROFESSIONAL ENGINEER NY Lic. No. 089491

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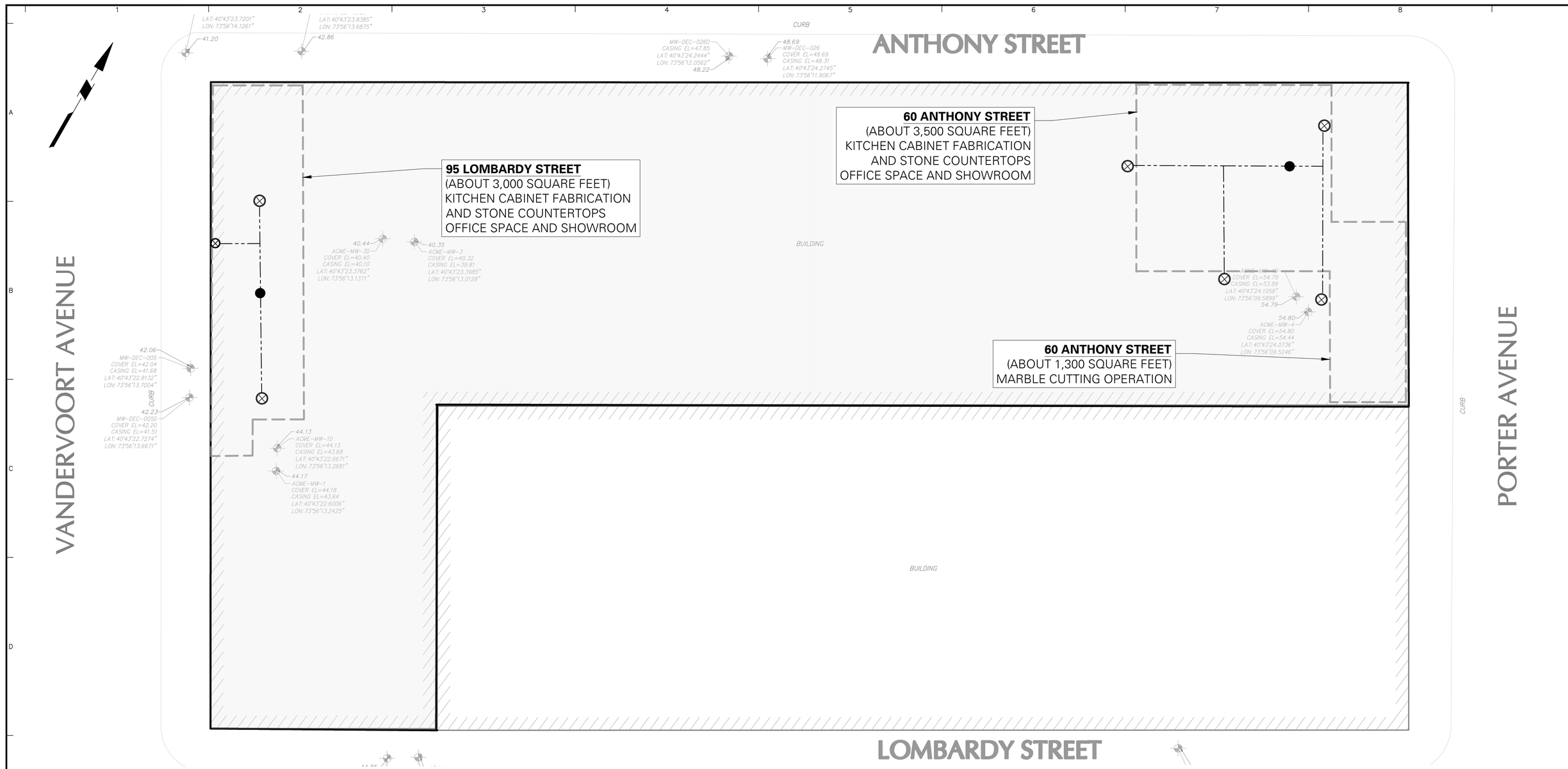
Figure Title
SUB-SLAB DEPRESSURIZATION SYSTEM LAYOUT

Project No.	Figure No.
170157201	3
Date: 10/06/2021	
Drawn By: LH	
Checked By: PTF	Figure 3 of 5

LANGAN
PROJECT NO. 170157201

Filename: \\langan.com\data\NYC\data2\170157201\Cadd Data - 170157201\SheetFiles\Site 224131\SSDS Work Plan\Figure 3 - SSDS Layout.dwg Date: 11/3/2021 Time: 15:27 User: knagotko Style Table: Langan.stb Layout: SSDS Layout



LEGEND:

- SITE BOUNDARY
- TARGET MITIGATION AREAS (CONTINUOUSLY OCCUPIED SPACED)
- ROOF EXTENTS
- PROPOSED ROOF PENETRATION
- 4-INCH-DIAMETER ROOF-MOUNTED CONVEYANCE PIPING
- PROPOSED BLOWER LOCATION

NOTES:

1. BASE MAP SOURCE: SURVEY TAKEN FROM "ENVIRONMENTAL FEATURE LOCATIONS PLAN" BY LANGAN, DATED NOVEMBER 2020.
2. POINTS OF EXHAUST SHALL BE:
   - A. ABOVE THE EAVE OF THE ROOF (PREFERABLE ABOVE THE HIGHEST EAVE OF THE BUILDING) AND AT LEAST 24 INCHES ABOVE THE SURFACE OF THE ROOF;
   - B. AT LEAST 10 FEET ABOVE THE GROUND LEVEL;
   - C. AT LEAST 10 FEET AWAY FROM ANY OPERABLE AIR INTAKE THAT IS LESS THAN 2 FEET BELOW THE EXHAUST; AND
   - D. AT LEAST 10 FEET FROM ANY ADJOINING OR ADJACENT BUILDINGS, HVAC INTAKES, OR HVAC SUPPLY REGISTERS.
3. ALL EXTERNAL PIPES SHALL BE PAINTED WITH A CORROSION RESISTANT COATING, DEPENDING ON PIPE MATERIAL, AND INSULATED.
4. RAIN GUARDS OR CAPS SHALL BE INSTALLED ON THE EXHAUST POINTS.

15 0 7.5 15
SCALE IN FEET

DATE	Description	No.
REVISIONS		

STATE OF NEW YORK JASON JAMES HAYES 089491 LICENSED PROFESSIONAL ENGINEER

SIGNATURE DATE SIGNED

JASON HAYES
PROFESSIONAL ENGINEER NY Lic. No. 089491

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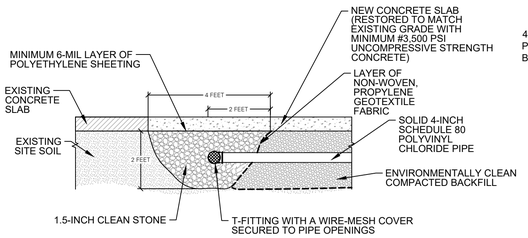
Figure Title
ROOF LAYOUT

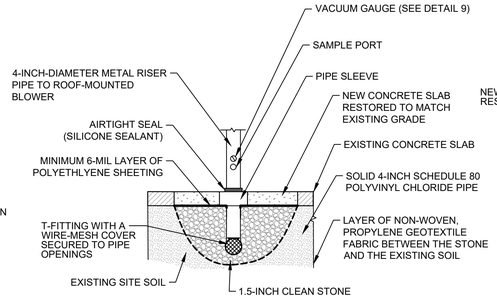
Project No.	Figure No.
170157201	4
Date: 10/06/2021	
Drawn By: LH	
Checked By: PTF	Figure 4 of 5

LANGAN
PROJECT NO. 170157201

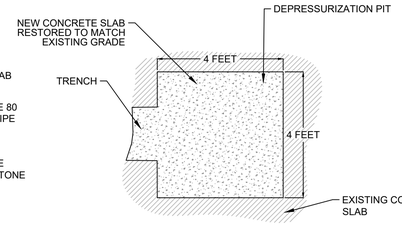
Filename: \\langan.com\data\NYC\data2\170157201\Cadd Data - 170157201\SheetFiles\Site 224131\SSDS Work Plan\Figure 4 - Roof Layout.dwg Date: 11/3/2021 Time: 12:38 User: knagotko Style Table: Langan.stb Layout: SSDS Layout



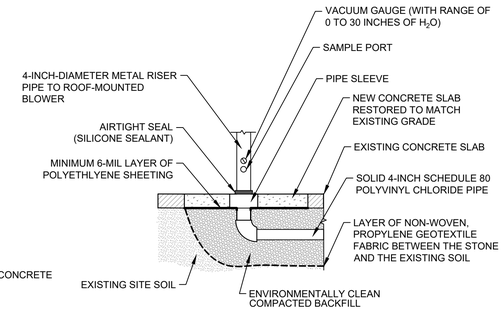
DETAIL 1: 4' X 4' DEPRESSURIZATION PIT SECTION VIEW
NOT TO SCALE



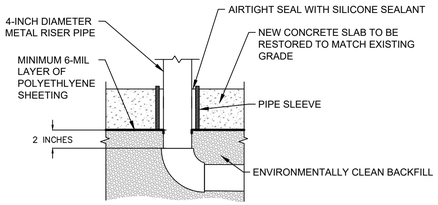
DETAIL 2: TYPICAL 4' X 4' DEPRESSURIZATION PIT SECTION VIEW
NOT TO SCALE



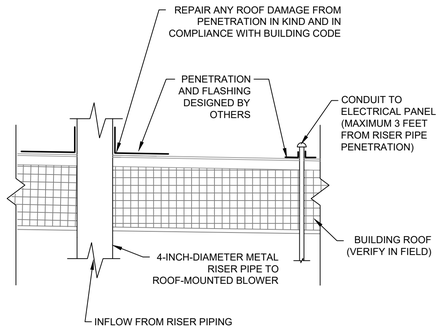
DETAIL 3: TYPICAL 4' X 4' DEPRESSURIZATION PIT (PLAN VIEW)
NOT TO SCALE



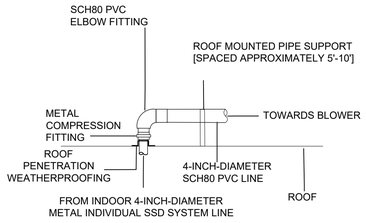
DETAIL 4: VAPOR COLLECTION PIPE TO RISER PIPE SECTION
NOT TO SCALE



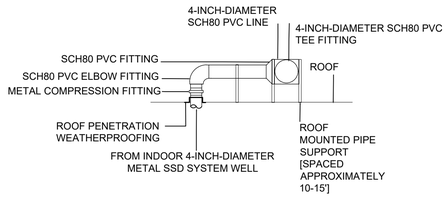
DETAIL 5: VAPOR COLLECTION PIPE TO RISER PIPE CONNECTION
NOT TO SCALE



DETAIL 6: ROOF PENETRATION (SECTION VIEW)
NOT TO SCALE

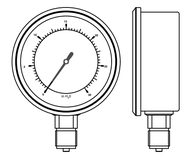


DETAIL 7: CONNECTION OF INDIVIDUAL SSD SYSTEM LINES
NOT TO SCALE

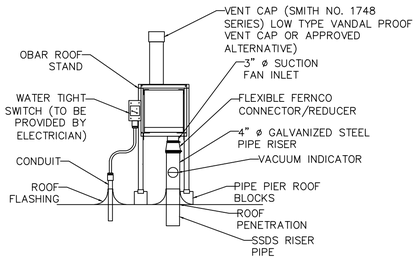


DETAIL 8: [FRONT VIEW] CONNECTION OF INDIVIDUAL SSD SYSTEM LINES
NOT TO SCALE

NOTE: VACUUM GAUGE MAXIMUM READING SHOULD NOT EXCEED 30 in H_2O.



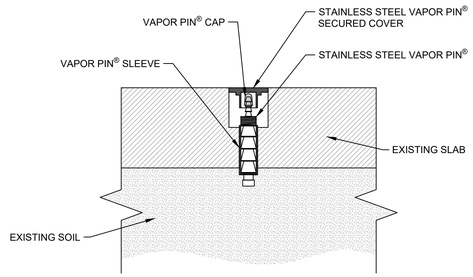
DETAIL 9: TYPICAL VACUUM GAUGE
NOT TO SCALE



DETAIL 10: ROOF-MOUNTED BLOWER
NOT TO SCALE

VACUUM BLOWER NOTES:

1. CONTRACTOR TO PROVIDE SUBMITTALS FOR ALL SYSTEM COMPONENTS TO THE ENGINEER FOR REVIEW.
2. THE COMPLETE PROPOSED BLOWER ASSEMBLY SHALL BE PROVIDED BY THE MANUFACTURER.
3. THE PROPOSED BLOWER ASSEMBLY (OBAR GBR 76DU OR EQUIVALENT) SHALL PROVIDE AN AIRFLOW RATE OF ABOUT 25 CUBIC FEET PER MINUTE (CFM) AT 11 INCHES OF WATER COLUMN (IWC) AT CONTINUOUS OPERATION.
4. THE BLOWER SCHEMATIC IS SHOWN TO ILLUSTRATE THE REQUIRED COMPONENTS AND THE GENERAL LOCATION IN THE PIPE RUN AND IS NOT FOR CONSTRUCTION. FINAL DESIGN AND BLOWER SYSTEM SELECTION IS SUBJECT TO REVIEW BY THE ENGINEER. PROVIDE ALL BLOWER SPECIFICATIONS AND CUT SHEETS FOR ENGINEER'S REVIEW PRIOR TO INSTALLATION.
5. THE PROPOSED BLOWERS SHALL BE INSTALLED WITHIN A SOUND/WEATHER ENCLOSURE DESIGNED AND PROVIDED BY THE BLOWER MANUFACTURER.
6. A REMOTE ALARM SYSTEM SHALL BE LOCATED WITHIN THE BUILDING AND MADE EASILY ACCESSIBLE. THE ALARM CONSISTS OF A WARNING LIGHT AND ASSOCIATED RELAYS. THE REMOTE ALARM AND CONTROL PANEL IS CONFIGURED SUCH THAT IF ANY OF THE ROOF-MOUNTED BLOWERS STOP OPERATING, THE REMOTE ALARM WILL BE ACTIVATED.
7. SUPPLY POWER TO ROOF-MOUNTED BLOWER ASSEMBLY, INCLUDING BLOWER AND REMOTE ALARM, IN ACCORDANCE WITH THE ELECTRICAL REQUIREMENTS.
8. PROPOSED VACUUM BLOWER ASSEMBLY LOCATIONS ARE SUBJECT TO APPROVAL BY THE ENGINEER.
9. CONTRACTOR TO PROVIDE AS-BUILT DRAWINGS OF THE SUB-SLAB AND ABOVE-SLAB COMPONENTS TO THE ENGINEER FOLLOWING INSTALLATION. AS-BUILT DRAWINGS MUST BE PROVIDED IN AUTO CAD AND PDF FORMATS.



DETAIL 11: TYPICAL SUB-SLAB SOIL VAPOR POINT
NOT TO SCALE

GENERAL NOTES:

1. CEILING PENETRATIONS SHALL BE COMPLETED AND RESTORED BY THE CONTRACTOR IN ACCORDANCE WITH NYC BUILDING CODE.
2. CAULK SEALANT USED TO SEAL PENETRATIONS, CRACKS, OR VOIDS MUST BE ASTM C920 CLASS 25 OR HIGH (OR EQUIVALENT).

No.	Description	DATE
REVISIONS		

STATE OF NEW YORK · JASON JAMES HAYES · 089491 · LICENSED PROFESSIONAL ENGINEER

SIGNATURE DATE SIGNED

JASON HAYES
PROFESSIONAL ENGINEER NY Lic. No. 089491

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Project
FORMER ACME STEEL/BRASS FOUNDRY
NYSDEC SITE No. 224132
95 LOMBARDY STREET/
46 ANTHONY STREET
BROOKLYN NEW YORK

Figure Title
SUB-SLAB DEPRESSURIZATION SYSTEM DETAILS

Project No.	170157201
Date	10/06/2021
Drawn By	LH
Checked By	PTF

Figure No. 5

Figure 5 of 5

LANGAN PROJECT NO. ########

Filename: \\langan.com\data\NYC\data2\170157201\Cadd Data - 170157201\SheetFiles\Site 224131\SSDS Work Plan\Figure 5 - SSDS Details.dwg Date: 10/26/2021 Time: 12:12 User: knagotko Style Table: Langan.stb Layout: ANSID-BL

TABLES

Table 1
Communication Test Field Results Summary
Remedial Design Work Plan for On-Site Mitigation

95 Lombardy Street/46 Anthony Street
Brooklyn, New York
Langan Project No. 170157201
NYSDEC Site No. 224131

Test Area 1 - Suction Point ACME-SP-01													
Baseline Data				Test 1: -36 IWC @ 30 CFM (dilution 50% open)				Test 2: -68 IWC @ 40 CFM (dilution 0% open)			Test 3: -10 IWC @ 24 CFM (dilution 75% open)		
Monitoring Point	Approx. Distance From Suction Point (feet)	PID Reading (ppb)	Baseline Vacuum (IWC)	Vacuum (IWC)				Vacuum (IWC)			Vacuum (IWC)		
				5 min	15 min	30 min	60 min	5 min	15 min	30 min	5 min	10 min	15 min
MP01	10	0.0	0.001	-0.860	-1.289	-1.282	-1.411	-2.064	-2.066	-2.065	-1.438	-1.461	-1.470
MP02	11	0.0	-0.003	-0.631	-0.917	-0.567	-0.469	-1.062	-1.495	-1.162	-0.382	-0.352	-0.332
MP03	10	0.6	-0.001	-0.592	-1.750	-0.661	-0.705	-1.054	-1.036	-1.056	-0.732	-0.730	-0.723
MP04	20	0.0	0.000	-0.124	-0.038	0.120	-0.121	-0.042	-0.126	-0.138	-0.132	-0.095	-0.033
MP05	20	0.0	0.001	-0.032	-0.023	-0.058	-0.042	-0.082	-0.075	-0.077	-0.053	-0.045	-0.041
MP06	20	0.0	0.007	-0.006	-0.003	-0.006	-0.005	-0.006	-0.009	0.009	-0.003	-0.002	-0.002
MP03/06	15	0.0	N/A								-0.027	-0.029	-0.031
MP05/06	20	0.0	N/A								-0.504	-0.505	-0.504

Test Area 2 - Suction Point ACME-SP-02												
Baseline Data				Test 1: -10 IWC @ 26 CFM (dilution 25% open)			Test 2: -40 IWC @ 48 CFM (dilution 15% open)			Test 3: -8 IWC @ 21 CFM (dilution 75% open)		
Monitoring Point	Approx. Distance From Suction Point (feet)	PID Reading (ppb)	Baseline Vacuum (IWC)	Vacuum (IWC)			Vacuum (IWC)			Vacuum (IWC)		
				5 min	15 min	30 min	5 min	15 min	30 min	5 min	10 min	30 min
MP01	10	0.0	-0.066	-0.079	-0.874	-0.915	-0.991	-0.107	-1.291	-0.460	-0.458	-0.446
MP02	12	0.0	-0.004	-0.053	-0.048	-0.047	-0.040	-0.009	-0.068	-0.032	-0.037	-0.030
MP03	8	0.0	-0.005	-0.682	-0.486	-0.678	-0.877	-0.795	-0.063	-0.263	-0.167	-0.269
MP04	19	0.0	-0.026	-0.147	-0.148	-0.147	-0.177	-0.169	-0.019	-0.087	-0.092	-0.082
MP05	20	0.0	0.001	-0.001	-0.001	-0.004	-0.004	-0.007	-0.004	-0.002	-0.002	-0.001
MP06	14	0.0	-0.003	-0.156	-0.225	-0.223	-0.284	-0.277	-0.170	-0.056	-0.089	-0.072
MP07	29	0.1	-0.003	-0.002	-0.004	-0.003	-0.002	-0.002	-0.024	-0.003	-0.004	-0.001
MP08	29	0.0	-0.002	-0.017	-0.022	-0.004	-0.035	-0.041	-0.062	-0.023	-0.025	-0.021
MP09	27	0.0	-0.003	-0.055	-0.055	-0.055	-0.062	-0.069	-0.060	-0.026	-0.028	-0.029
MP10	40	0.0	-0.042	-0.050	-0.045	-0.052	-0.032	-0.032	-0.027	-0.055	-0.053	-0.045
MP11	38	0.0	-0.005	-0.007	-0.005	-0.004	-0.005	-0.007	-0.008	-0.003	-0.005	-0.005

Test Area 3 - Suction Point ACME-SP-03												
Baseline Data				Test 1: -0 IWC* @ 24 CFM (dilution 75% open)			Test 2: -10 IWC @ 18 CFM (dilution 60% open)			Test 3: -58 IWC @ 30 CFM (dilution 0% open)		
Monitoring Point	Approx. Distance From Suction Point (feet)	PID Reading (ppb)	Baseline Vacuum (IWC)	Vacuum (IWC)			Vacuum (IWC)			Vacuum (IWC)		
				5 min	15 min	30 min	5 min	15 min	30 min	5 min	10 min	15 min
MP01	8	0.0	-0.001	-0.018	-0.021	-0.065	-0.083	-0.085	-0.081	-0.097	-0.112	-0.098
MP02	11	0.0	-0.006	-0.053	-0.066	-0.064	-0.095	-0.082	-0.051	-0.041	-0.021	-0.020
MP03	13	0.0	-0.011	-0.026	-0.019	-0.015	-0.009	-0.022	-0.024	-0.029	-0.016	-0.024
MP04	14	0.0	-0.001	-0.013	-0.019	-0.020	-0.022	-0.023	-0.013	-0.014	-0.016	-0.021
MP05	18	0.0	-0.007	-0.030	-0.038	-0.039	-0.049	-0.045	-0.036	-0.037	-0.040	-0.053
MP06	26	0.0	-0.043	-0.031	-0.036	-0.038	-0.046	-0.045	-0.031	-0.022	-0.032	-0.046
MP07	29	0.0	-0.015	-0.008	6.327	4.690	6.022	5.947	3.953	2.854	2.378	2.631
MP08	36	0.0	-0.001	-0.002	-0.001	-0.006	-0.008	-0.005	-0.008	-0.002	-0.002	-0.001
MP09	36	0.0	-0.054	0.008	0.008	0.251	4.262	3.562	2.105	1.351	0.560	4.216
MP10	41	0.0	-0.012	-0.014	-0.026	-0.021	-0.028	-0.015	-0.006	-0.015	-0.009	-0.020
MP07/09	32	0.0	N/A							-0.008	-0.008	-0.014

Test Area 4 - Suction Point ACME-SP-04													
Baseline Data				Test 1: -70 IWC @ 26 CFM (dilution 10% open)				Test 2: -40 IWC @ 20 CFM (dilution 30% open)			Test 3: -72 IWC @ 36 CFM (dilution <5% open)		
Monitoring Point	Approx. Distance From Suction Point (feet)	PID Reading (ppb)	Baseline Vacuum (IWC)	Vacuum (IWC)				Vacuum (IWC)			Vacuum (IWC)		
				5 min	15 min	30 min	45 min	5 min	15 min	30 min	5 min	15 min	30 min
MP01	9	0.0	-0.001	-0.025	-0.027	-0.024	-0.025	-0.015	-0.014	-0.016	-0.027	-0.026	-0.022
MP02	11	0.0	0.000	-0.890	-1.190	-1.205	-1.208	-0.793	-0.741	-0.754	-1.253	-1.228	-1.225
MP03	11	0.8	0.000	-0.845	-0.889	-0.784	-0.805	-0.502	-0.514	-0.518	-0.797	-0.724	-0.671
MP04	19	0.0	0.001	-0.017	-0.020	-0.018	0.016	-0.009	-0.009	-0.010	-0.020	-0.017	-0.016
MP05	21	0.0	0.001	-0.172	-0.195	-0.196	-0.188	-0.119	-0.112	-0.117	-0.183	-0.191	-0.201
MP06	21	0.0	-0.002	-0.162	-0.165	-0.168	-0.161	-0.106	-0.103	-0.107	-0.172	-0.171	-0.168
MP07	26	0.0	-0.001	-0.005	-0.018	-0.014	-0.013	-0.012	-0.012	-0.012	-0.013	-0.018	-0.015

Notes:

1. PID = photoionization detector
2. CFM = cubic feet per minute
3. IWC = inches of water column
4. ppb = parts per billion
5. N/A = Not Available
6. * = the anomalous vacuum reading was likely due to an equipment malfunction. The IWC was assumed to be about -10 IWC based on data collected at similar CFMs.

Vacuum equal to or greater than -0.02 IWC in 30 minute or longer test
Measurement not collected

Table 2
Cost Estimation Summary
Remedial Design Work Plan for On-Site Mitigation

95 Lombardy Street/46 Anthony Street
Brooklyn, New York
Langan Project No. 170157201
NYSDEC Site No. 224131

ITEM	DESCRIPTION	APPROX. QUANTITY	UNIT	APPROXIMATE UNIT COST	APPROXIMATE TOTAL COST
1. GENERAL CONSTRUCTION SERVICES - SSD System					
a	**Hazardous Materials Survey and New York City Department of Buildings Construction Permit**	1	LS	11,000	$ 11,000
b	**SSD System - Trench Excavation** (including but not limited to: odor, vapor and dust control; saw cutting, stockpiling, transport, and disposal of concrete; and soil excavation and stockpiling.	1	LS	2,000	$ 6,000
c	**SSD System - Below-Grade Materials** (including but not limited to: 4-inch diameter SCH 80 PVC piping; 4-inch diameter SCH 80 PVC elbow fittings; 4-inch diameter SCH 80 PVC T-fittings; and wire-mesh cover secured to pipe openings)	1	LS	4,000	$ 4,000
d	**SSD System - Above-Grade Materials** (including but not limited to: 4-inch diameter metal riser and horizontal pipe; pipe sleeve and associated accessories; pipe supports and roof/wall mounting materials; vacuum gauges, electrical junction box and sleeves; and blowers	1	LS	30,000	$ 20,000
e	**SSD System - Completion and restoration of trench, wall and roof/ceiling penetrations**	1	LS	10,000	$ 15,000
f	**SSD System - Construction/installation of all required piping, and performance of all required mechanical connections and leak testing.**	1	LS	40,000	$ 20,000
g	**Disposal of Excavated Soil** (Assumed to be disposed of as non-hazardous soil)	1	LS	3,000	$ 3,000
2. ENGINEERING SERVICES					
a	**SSD System Oversight** (Langan oversight and documentation during SSD system installation. Assumes work will occur Monday through Friday, and excludes weekends)	20	Day	1,360	$ 27,200
b	**Community Air Monitoring Equipment** (including DustTraks and photoionization detectors)	1	Month	2,500	$ 2,500
Approximate Subtotal (Rounded)					**$ 108,700**
10% Contingency (Rounded)					**$ 10,870**
APPROXIMATE TOTAL (Rounded)					**$ 119,570**

Notes:
SSD - Sub-Slab Depressurization
SCH 80 PVC - Schedule 80 Polyvinyl Chloride
LS - Lump Sum
ft - Feet

APPENDIX A
HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

for

FORMER ACME STEEL/METAL WORKS
95 LOMBARDY STREET/46 ANTHONY STREET
BROOKLYN, NEW YORK
Brooklyn Borough Tax Map
Block 2819, Lots 8 and 11

Prepared For:

Whitehead Company
251 Lombardy Street
Brooklyn, NY 11222

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

LANGAN

June 2021
Langan Project Number: 170157201

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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 95 Lombardy Street/46 Anthony Street in the East Williamsburg neighborhood of Brooklyn, New York ("the Site"). The Site is identified on the New York City (NYC) Brooklyn Borough/Kings County Tax Map as Tax Block 2189, Lots 8 and 11. This HASP provides the minimum requirements for implementing site operations during future remedial measure activities. All contractors performing work on this site shall implement their own HASP that, at a minimum, adheres to this HASP. The contractor is responsible for their own health and safety and that of their subcontractors. Langan personnel will implement this HASP while onsite.

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 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 occupies an area of about 44,000 square feet at 95 Lombardy Street and 46-60 Anthony Street (Tax Block 2819, Lots 8 and 11) in Brooklyn, New York. The site is improved with three 2 story brick buildings and one 1-story brick building, and is adjoined by Anthony Street to the north, Porter Avenue to the east, Lombardy Street and warehouse buildings to the south, and Vandervoort Avenue to the west. A site location map is provided as Figure 1.

The site was used for metal fabrication and painting from the 1930s until circa 2000, and is now used for kitchen cabinet and stone showrooms/warehousing and office space.

1.3 Summary of Work Tasks

1.3.1 Geophysical Investigation

Prior to the commencement of intrusive field activities (i.e., soil borings); a geophysical consultant may 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, drains, underground utilities, and other subsurface anomalies that may be encountered during the investigation. During this time Langan personnel will inspect the site and confirm sample locations.

1.3.2 Hand Clearing of Borehole Locations

If there is no geophysical survey for utility clearance or the results of the geophysical survey are inconclusive at specific locations subject to intrusive work, the contractor may hand clear each location to confirm utilities or other known or suspected subsurface structures. Hand clearing of a soil boring location should extend to a depth of 5-feet and be about 1.5 times the anticipated diameter of the borehole when drilled. Langan personnel will confirm that hand clearing activities are completed to these specifications.

1.3.3 Excavation Observation and Screening

Langan personnel will observe soil excavation at selected locations per the work plan. The work plan specifies that the contractor will excavate to specified depth at specified location on site. Excavated soil and concrete debris from the excavated slab may be segregated for separate disposal, including disposal via drums. If stockpiled, Langan will record the location of the stockpiles and note that the contractor has complied with the stockpile instructions specified in the work plan.

Langan will screen excavated spoil material for visual, olfactory, and instrumental indicators suggestive of a potential chemical or petroleum release. Instrument screening for the presence of Volatile Organic Compounds (VOCs) may be performed with a duly field-calibrated Photoionization Detector (PID). Contractors will excavate for utilities, foundation components and potential grading using heavy equipment and hand tools in such a manner as to avoid negatively impacting buried utilities or foundation components.

Langan will coordinate trucking in cooperation with soil disposal contractors. Langan will only sign non-hazardous manifests if instructed by the project manager (PM) and provide the specific language. Langan is not to sign hazardous waste manifests unless specifically instructed by the PM to do so. Langan will record the information associated with each manifest as specified in the work plan. Contaminated material shall be handled and property disposed in accordance with federal, state and city regulations, criteria and guidelines. If excavation occur over several days, Langan will confirm that the contractor has placed a barrier around the excavation and stockpile to prevent 3rd party injury.

1.3.4 Soil Screening & Reporting

As part of excavation activities, the Langan personnel will report when they have observed visual and olfactory indications of possible soil impact. Langan personnel will also report concentrations of VOCs above background when using a duly calibrated hand held PID, or equivalent.

1.3.5 Soil Sampling

As part of the excavation activities, soil samples (remediation outcome, excavation endpoint, delineation, or quality assurance/quality control [QA/QC]) may be collected during construction, as required. Langan personnel will coordinate with the contractor in sampling soil (in accordance with the work plan, where applicable).

Soil samples excavation endpoint or delineation sampling (along with quality assurance/quality control [QA/QC] samples) may be collected and subsequently 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.

1.3.6 Trench Pipe Excavation, Geophysical Trace and other Construction Activity Inspections and Observations

In accordance with the work plan, Langan will observe contractors removing a trench pipe. Activities may include geophysical means to trace the pipe to its terminus discharge point. Other construction activities oversight are specified in the work plan, general construction documents, or special inspection requirements administered by the New York City Department of Buildings. Materials used for construction will be inspected by Langan for conformance to the design documents.

1.3.7 Soil Investigation and Sampling

Langan will retain a drilling contractor to advance soil borings to a depth below grade surface (bgs) and locations specified in the work plan. Borings will be installed at the approximate locations indicated in Langan's work plan, but may be moved in the field based on utility clearance and accessibility. The drilling contractor will contact the appropriate utility mark-out authority and make available to their drilling staff the verification number and effective dates. Langan will record the verification number and effective dates from the drillers. Langan will also note the location of marked out utilities on the site plan and scan the data into the project folder.

Langan personnel will screen soil for visual, olfactory, and instrumental indicators suggestive of a potential petroleum release. Instrument screening for the presence of VOCs may be performed

with a duly field-calibrated PID. Langan personnel will collect soil samples from the proposed soil boring locations following the sampling plan outlined in the work plan. The borings may be completed as monitoring wells or will be filled with clean soil cuttings, clean sand or bentonite grout and capped at grade to match the surrounding surface after samples are collected.

Soil samples will be submitted to a NYSDOH ELAP-certified laboratory and analyzed in accordance with work plan specifications.

1.3.8 Groundwater Investigation and Sampling

Selected soil borings will be converted into groundwater monitoring wells and sampled to evaluate groundwater quality. Groundwater samples will be collected from one or more of the new and if available, pre-existing monitoring wells in accordance with the Langan Low Flow Groundwater Sampling SOP (SOP #12). Groundwater samples will be submitted to an approved laboratory and analyzed for constituents as specified in the work plan. Temporary monitoring wells will be plugged and abandoned during the investigation in the manner defined in Section 1.3.2 for soil boring. Permanent monitoring wells will be completed with a road box set in concrete, Permanent monitoring wells will be eventually backfilled and abandoned in accordance with State and Local regulations.

Groundwater samples will be submitted to a NYSDOH ELAP-certified laboratory and analyzed in accordance with work plan specifications.

1.3.9 Site-Wide Groundwater Gauging and Sampling

Langan will conduct a site-wide groundwater gauging and sampling event. Groundwater samples will be collected groundwater samples from one or more of the new and pre-existing monitoring wells in accordance with the Langan Low Flow Groundwater Sampling SOP (SOP #12).

Groundwater samples will be submitted to a NYSDOH ELAP-certified laboratory and analyzed in accordance with work plan specifications.

1.3.10 Sub-Slab Soil Vapor Pin Installation, Monitoring and Sampling

Langan may installed open-ended stainless steel sub-slab vapor pins (Vapor Pin® or equivalent) at selected locations defined by the work plan. The sub-slab vapor pins will be installed per manufacture instructions and set below the concrete slab surface to facilitate a permanent cap designed to protect the vapor point between sampling events. The sub-slab points will be installed using electric hammers with chucks designed for the drill bits to be used. Conditions in

the field may require adjustment of sampling locations.

Langan will monitor vapor pins for air flow velocity and vacuum calibration/confirmation. In addition, Langan may collect vapor samples as part of the install verification. If collected, vapor sample may be collected in accordance with the Final Guidance for Evaluating Soil Vapor Intrusion published by the NYSDOH in October 2006 and Langan's Sub-Slab Vapor Sampling SOP (SOP #14) and will be submitted to a NYSDOH ELAP-certified laboratory and analyzed in accordance with work plan specifications.

Ambient air sample may be collected for use as a comparison sample and submitted to a NYSDOH ELAP-certified laboratory and analyzed in accordance with work plan specifications.

1.3.11 Installation of Sub-Slab Depressurization (SSD) System

A properly licensed contractor will install the sub-slab depressurization system by first excavating trenches in accordance with specifications outlined in the work plan. The contractor will contact the appropriate utility mark-out authority and make available to their staff the verification number and effective dates. The excavations will be completed with equipment and plumbing necessary to support the sub-slab depressurization (SSD) system and are defined in the work plan. Upon completion of the excavation and install, the contractor will backfill the excavation with approved fill material and seal the surface with the concrete slab in accordance with specifications defined in the work plan. Excess soil will be drummed and labeled in accordance with standard SOP and this HASP sections on Management of Investigative-Derived Waste and Drum Sampling.

As part of the installation oversight, Langan may screen soil for visual, olfactory, and instrumental indicators suggestive of a potential VOCs. Instrument screening for the presence of VOCs may be performed with a calibrated PID. Langan may collect soil samples exhibiting a degree of visual, olfactory, instrumental impact, or as otherwise specified in the work plan. Soil samples will be submitted to a NYSDOH ELAP-certified laboratory and analyzed in accordance with work plan specifications.

1.3.12 Equipment Decontamination

Before the start of the day's sampling and after sampling each run, sampling equipment will be decontaminated by the decontamination process outlined Attachment B - Decontamination Procedures. Decontamination wastes and purge water will be temporarily stored on site pending analytical results.

1.3.13 Management of Investigative-Derived Waste

The investigative-derived waste (IDW) generated during this investigation will be contained in

DOT-approved 55-gallon drums. The drums will be temporarily stored on the site or as directed by the client representative. All drums will be filled between to two-thirds full to allow easy maneuvering during drum pickup and disposal. Drum labels are to be provided by Langan (Environmental Closet). All drums will be labeled as "IDW Pending Analysis" until sample data are reported from the laboratory. Drum labels will include date filled and locations where waste was generated along with the standard information required by the labels in accordance with the Langan SOP09, Drum Labeling..

Closed top drums are to be used to store liquids. Debris, including plastic sheeting, polyethylene tubing, personal protection equipment (PPE), decontamination debris, etc. will be segregated from and disposed in large heavy duty garbage bags and disposed of at the site. Excess unused glassware should be returned to the lab along with the last day of collection samples.

1.3.14 Drum Sampling

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 an approved laboratory and analyzed in accordance with work plan specifications, if required.

1.3.15 Surveying

Surveying activities may be completed by Langan. Surveying will be conducted by licensed surveyors.

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 Patrick Farnham, his responsibilities include:

- Ensuring that this HASP is developed, current, and approved prior to on-site activities.
- Ensuring that all the tasks in the project are performed in a manner consistent with Langan's comprehensive *Health and Safety Program for Hazardous Waste Operations* 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 *Construction 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 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) will be determined prior to the start of the start of field 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 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; and
- 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 adherer 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. The potential contaminants that might be encountered during the field activities and the exposure limits are listed in Table 2 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 boring locations are surveyed with surface geophysical equipment, the locations of the borings as well as possible utilities and other artifacts that may interfere with the subsurface investigation 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). This information must also be added to the site map. When applying paint, proper PPE including at a minimum hand protections should be used.

3.1.2 Hand Clearing of Borehole Locations

Hand clearing will be completed by the contractor. Langan personnel are not permitted to operate or otherwise handle the contractor equipment. Langan will update the site map to include the locations of the cleared borehole locations as well as possible utilities and other artifacts that may interfere with the subsurface investigation.

3.1.3 Excavation and Soil Screening

Langan personnel will observe excavation and SOE activities including the general oversight, observation of landscaping activities, and other select observation project management and supervision as specified in the work plan or in accordance with the construction documents, or special inspection requirements administered by the New York City Department of Buildings. Materials used for construction may be inspected by Langan personnel for conformance to the design documents. Prior to entering excavation, Langan personnel will insure that excavation shoring conforms to proper shoring/benching/sloping techniques, at a minimum that soil and equipment is kept at least 2 feet from the edge of the excavation, that there is no water in the excavation, and that a competent person has inspected excavation prior to allow persons to enter. When entering excavation via a ladder, Langan personnel will only use ladders that are properly situated in accordance with the Ladder section of the CHASP.

Sampling the soil requires the donning of chemical resistant gloves in addition to the standard PPE. Langan personnel are not to operate nor direct the use of excavation equipment. These

tasks are to be completed by the excavation contractor.

3.1.4 Soil 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.

3.1.5 Stockpile Sampling

Langan personnel are not to scale or otherwise climb stockpiles. If the soil sampling plan requires sampling from the stockpile above ground level, samples are to be obtained using suitable excavation equipment operated by the contractor (i.e. front end loader).

3.1.6 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.

3.1.7 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.

3.1.8 Electric Hammer Drill

Langan will used electric hammer drills to install the sub-slab vapor points. Langan will inspect each hammer drill prior to use and specifically note the condition of each hammer and attached electrical cord. The electrical cord must be a grounded and connect to the power source using a functional three prong grounded plug. The power source must be a Ground Fault Circuit Interrupter (GFI or GFCI) receptacle. Langan will also use a portable GFCI circuit from the outlet to the extension cord. Langan must test the GFCI before commencing drilling activities.

3.1.9 Vapor Sampling

Vapor sampling 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. In addition,,

When retaining a drilling contractor, Langan personnel are not to operate drilling equipment nor assemble or install soil vapor point equipment; these tasks are to be completed by the contractor.

3.1.10 Indoor Drilling and Excavation

The work scope may require indoor drilling or drilling in locations where there may not be adequate ventilation sufficient to safely operate any rig or excavation equipment powered by an internal combustion engine. Where possible, all such work should be done by equipment powered by electricity. If such equipment is used and must be directly wired to the buildings electrical system or to an independent system, this work must be completed by a licensed electrician in accordance with all electrical codes applicable to the work.

Indoor work which is to be completed with equipment powered by an internal combustion engine must incorporate air monitoring of carbon monoxide (CO) using calibrated air monitoring equipment (MultiRAE or equivalent). In addition, the work plan should incorporate mitigation for venting engine exhaust fumes directly to the outdoors and for circulating fresh air into the work area.

The OSHA Time Weighted Average (TWA) Permissible Exposure Limit (PEL) for CO from 50 to 35 parts per million (ppm). Langan will monitor CO with a suitable monitoring device. If CO levels exceed 5 ppm, Langan will instruct contractors to begin mitigation measures. These measures are at a minimum:

- Increase air circulation using industrial size fans to bring additional fresh air into the building or vent exhaust to the outside;
- Modify the passive exhaust method being used to increase venting circulation by using wider diameter tubing or sealing tubing connections; or
- Modify the work schedule where the rig is turned off to allow time for CO levels to fall back to background

All work must cease if CO levels reach 35 ppm. The Langan engineer is to report to the PM and H&S officer when an action level is reached.

3.1.11 Installation of SSD System

Specifically trained contractors are to install the SSD system. Langan personnel are there only to observe and record the data required in the work plan. Installation and assemblage of the SSD system is to be done exclusively by the contractor following their own health and safety specifications outlined in their HASPs.

3.1.12 Construction Activity Inspection

The contractor will operate equipment used to install the SSD infrastructure. In addition, the contractor will provide equipment and training to their staff to perform the aerial work. Langan personnel will inspect in accordance with specification in the work plan and record the data the work plan requires. The installation of the SSD structural, electrical, and pneumatic equipment is to be done exclusively by the contractor following their own health and safety specifications outlined in their HASPs. Other activities assigned to Langan as part of construction activities are limited to inspection and observations as specified in the work pan. Langan personnel are not to operate or assist in the operation of equipment used in construction activities unless defined as part of an inspection or observation in the work plan.

3.1.13 Drum Sampling

Drilling fluid, rinse water, grossly-contaminated soil samples and 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.

3.2 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, id., 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^{o}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 (GFCI) 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)

3.3.7.1 Utility Clearance

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.

3.3.7.2 Lockout-Tagout

The potential adverse effects of electrical hazards include burns and electrocution, which could result in death. Therefore, there is a procedure that establishes the requirements for the lockout/tagout (LOTO) of energy isolating devices in accordance with the OSHA electrical lockout and tagging requirements as specified in 29 CFR 1926.417. This procedure will be used to ensure that all machines and equipment are isolated from potentially hazardous energy. If possible, equipment that could cause injury due to unexpected energizing, start-up, or release of stored energy will be locked/tagged, before field personnel perform work activities.

Depending upon the specific work task involved, Langan's SSC or FTL will serve as the authorized lockout/tagout coordinator, implement the lockout/tagout procedure and will be responsible to locate, lock and tag valves, switches, etc.

SPECIAL NOTE: Project personnel will assume that all electrical equipment at surface, subsurface and overhead locations is energized, until equipment has been designated and confirmed as de-energized by a utility company representative. Langan will notify the designated utility representative prior to working adjacent to this equipment and will verify that the equipment is energized or de-energized in the vicinity of the work location.

No project work shall be performed by Langan personnel or subcontractors on or near energized electrical lines or equipment unless hazard assessments are completed in writing, reviewed by Langan's SSHO, and clearly communicated to the field personnel.

The FTL shall conduct a survey to locate and identify all energy isolating devices. They shall be certain which switches, valves or other isolating devices apply to the equipment. The lockout/tagout procedure involves, but is not limited to, electricity, motors, steam, natural gas, compressed air, hydraulic systems, digesters, sewers, etc.

3.3.8 Physical Hazard Considerations for Material Handling

There are moderate to severe risks associated with moving heavy objects at the Site. The following physical hazards should be considered when handling materials at the Site:

- Heavy objects will be lifted and moved by mechanical devices rather than manual effort whenever possible.
- The mechanical devices will be appropriate for the lifting of moving task and will be operated only by trained and authorized personnel.

- Objects that require special handling or rigging will only be moved under the guidance of a person who has been specifically trained to move such objects.
- Lifting devices will be inspected, certified, and labeled to confirm their weight capacities. Defective equipment will be taken out of service immediately and repaired or destroyed.
- The wheels of any trucks being loaded or unloaded will be chocked to prevent movement. Outriggers will be fully extended on a flat, firm surface during operation.
- Personnel will not pass under a raised load, nor will a suspended load be left unattended.
- Personnel will not be carried on lifting equipment, unless it is specifically designed to carry passengers.
- All reciprocating, rotating, or other moving parts will be guarded at all times.
- Accessible fire extinguishers, currently (monthly) inspected, will be available in all mechanical lifting devices.
- Verify all loads/materials are secure before transportation.

Material handling tasks that are unusual or require specific guidance will need a written addendum to this HASP. The addendum must identify the lifting protocols before the tasks are performed. Upon approval, the plan must be reviewed with all affected employees and documented. Any deviation from a written plan will require approval by the Langan HSM.

3.3.9 Hearing Conservation

Under the construction industry standard, the maximum permissible occupational noise exposure is 90 dbA (8-hour TWA), and noise levels in excess of 90 dbA must be reduced through feasible administrative and engineering controls (20 CFR 1926.52). Hearing protection is required when working within 15 feet of vacuum extraction equipment and drill rigs.

3.3.9 Open Water

Employees working over or near water, where the danger of drowning exists, shall be provided with U.S. Coast Guard-approved life jackets or buoyant work vests. Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects which would alter their strength or buoyancy. Defective units shall not be used.

And should a worker fall into the water, OSHA requires (29 CFR 1926.106(c)) that ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. The distance between ring buoys shall not exceed 200 feet. Another remedial action required by OSHA (29 CFR 1926.106(d)) is the use of lifesaving skiffs.

OSHA requires that at least one lifesaving skiff shall be immediately available at locations where employees are working over or adjacent to water and must include the following provisions.

- The skiff must be in the water or capable of being quickly launched by one person.
- At least one person must be present and specifically designated to respond to water emergencies and operate the skiff at all times when there are employees above water.
- When the operator is on break another operator must be designated to provide requisite coverage when there are employees above water.
- The designated operator must either have the skiff staffed at all times or have someone remain in the immediate area such that the operator can quickly reach the skiff and perform rescue services.
- The skiff operator maybe assigned other tasks provided the tasks do not interfere with the operator's ability to quickly reach the skiff.
- A communication system, such as a walkie-talkie, must be used to inform the skiff operator of an emergency and to inform the skiff operator where the skiff is needed.
- The skiff must be equipped with both a motor and oars.

With regard to the number of skiffs required and the appropriate maximum response time, the following factors must be evaluated:

- The number of work locations where there is a danger of falling into water;
- The distance to each of those locations;
- Water temperature and currents;
- Other hazards such as, but not limited to, rapids, dams, and water intakes;

Other regulations that present S&H practices and PPE for work on or near water include: 29 CFR 1910, Subpart T (401 – 440)

3.4 Biological Hazards

3.4.1 Animals

There is a possibility of encountering wildlife including reptiles, rodents and other small and medium size mammals. The Langan personnel is to avoid interacting with any wildlife.

3.4.2 Insects

Ticks and other biting or stinging insects may to be encountered during site operations. Langan personnel should take necessary precautions including donning long sleeve shirts and insecticide to prevent bites and stings. After field work, Langan personnel should perform a complete visual inspection of their clothing to insure they are not inadvertently harboring ticks. If they do observe a tick bite, they are to contact the HSM or HSO and report the event.

3.4.3 Plants

Poisonous plants may to be encountered during site operations. Langan personnel should take necessary precautions including donning long sleeve shirts and applying preventative poison Ivy/Sumac lotion to prevent or limit effects of exposure. If after field work, Langan employees do observe a reaction to poisonous plant exposure, they are to contact the HSM or HSO and report the event.

3.4.4 Coronavirus

3.4.4.1 General Preventative Measures

Field personnel must follow general proper hygiene measures while in the field including:

- Avoid touching eyes, nose and mouth.
- Cover cough or sneeze with tissue, and throw in trash.
- Wash hands often with soap and water for 20 seconds after going to bathroom, before eating, after blowing nose, coughing or sneezing.
- Use hand sanitizer with at least 60% alcohol if soap and water are not available.
- Avoid physical contact with other people (e.g., no handshakes).
- Maintain a safe distance of at least 6 feet from other people (social distancing).
- Wear face coverings when around other worker to minimize spread of COVID-19. (May be required in certain states or locations.)

3.4.4.2 Construction Trailers

Employees should avoid use of shared construction trailers or where employees cannot maintain a safe distance (minimum 6 feet) from other workers. If trailer use is needed, areas such as desks, phones, chairs and other common areas, should be cleaned and disinfected before and after use. Protocols should be developed to minimize trailer use to essential personal, restrict use from any workers who are ill or showing symptoms of being ill, and ensure a safe distance of 6 feet can be established between workers.

3.4.4.3 Communication

Include Coronavirus topics and prevention topics in daily tailgate meetings to ensure Coronavirus awareness is communicated daily. Discussions can focus on general topics including: social distancing, prevention measures for field personnel, signs and symptoms and recent news on the Coronavirus. Site-specific topics should include minimizing face-to-face contact, disinfecting/sterilizing field equipment, use of PPE to reduce exposure, site security and other

potential exposure issues/concerns.

3.4.4.4 Sick/Ill Workers

No Langan employee is permitted to be onsite when ill and/or showing potential symptoms of the Coronavirus. Symptoms of the Coronavirus may appear 2-14 days after exposure and can range from mild to severe. The most common symptoms include: fever, fatigue, dry cough and shortness of breath. If an employee or subcontractor is observed being ill or exhibiting symptoms of Coronavirus, employees must immediately utilize their Stop Work Authority and contact their project manager to address the situation. If an employee observes another worker onsite exhibiting symptoms of Coronavirus, immediately utilize Stop Work Authority and notify their project manager and site construction manager or safety officer. Work should resume when the safety and health of Langan and subcontractors is adequately addressed.

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 ground water 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 feet 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, 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 ACTION LEVELS

7.1 Monitoring During Site Operations

Atmospheric air monitoring results may be collected and 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 may 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 may 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 may 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 may 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/m^3 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 local standards or the 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 local standards or, default to the performance standards below:

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 shut down.

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 (µg/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 µg/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 µg/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 µg/m^3 of the upwind level and in preventing visible dust migration.

8.1 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 may be performed by removing all PPE used in EZ and placing it in drums/trash cans at the CRZ. Baby wipes should 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:

Woodhull Medical and Mental Health Center
760 Broadway Street
Brooklyn, New York
718-963-8000

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, and 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, call *Incident Intervention®* at 1-888-479-7787 to report their injuries. For all other communications, contact the Langan Incident Hotline at **(800) 9-LANGAN** (800-952-6426) extension 4699 as soon as possible.

Should outside assistance be needed for accidents, fire, or release of hazardous substances, the emergency numbers will be available and posted at the site (Table 5) where a readily accessible telephone is made available for emergency use.

Also, in the event of an incident where a team member becomes exposed or suffers from an acute symptom from contact with site materials and has to be taken to a hospital, a short medical data sheet (Attachment T) for that individual will be made available to the attending physician. The medical data sheet will include the following:

- Name, address, home phone
- Age, height, weight

- Name of person to be notified in case of an accident
- Allergies
- Particular sensitivities
- Does he/she wear contact lenses
- Short checklist of previous illness
- Name of personal physician and phone
- Name of company physician and phone
- Prescription and non-prescription medications currently used.

A sample medical data sheet is included in Attachment T.

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, the injured Langan personnel should contact *Incident Intervention®* at 1-888-479-7787 to report their injuries. For all other communications, contact the Langan Incident Hotline at **(800) 9-LANGAN** (800-952-6426) extension 4699 as soon as possible.

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 Vehicles
- Emergency Eye Wash: Contractor 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.

In the event that an emergency situation arises, the FTL will implement an immediate evacuation of all project personnel due to immediate or impending danger. The FTL will also immediately communicate with the contractor to coordinate any needed evacuation of the property.

The FTL or Site Supervisor will give necessary instructions until the Designated Incident Commander (IC) assumes control. After the emergency has been resolved, the FTL or Site Supervisor will coordinate with the IC and indicate when staff should resume their normal duties. If dangers are present for those at the designated assembly point, another designated location of assembly will be established.

It will be the responsibility of the FTL or Site Supervisor to report a fire or emergency, assess the seriousness of the situation, and initiate emergency measures until the arrival of the local fire fighters or other first responders, should they be necessary. The FTL, working with emergency responders, may also order the closure of the Site for an indefinite period as long as it is deemed necessary.

Under no circumstances will incoming visitors be allowed to proceed to the area of concern, once

an emergency evacuation has been implemented. Visitors or other persons present in the area of the emergency shall be instructed to evacuate the area. The FTL will ensure that access roads are not obstructed and will remain on-site to provide stand-by assistance upon arrival of emergency personnel.

If it is necessary to temporarily control traffic in the event of an emergency, those persons controlling traffic will wear proper reflection warning vests until the arrival of police or fire personnel.

16.8.1 Designated Assembly Locations

All personnel will evacuate the site and assemble at a designated assembly location. The assembly location will be designated by Langan personnel and discussed during each shift's pre-job safety briefing.

16.8.2 Accounting for Personnel

All contractor and subcontractor supervisors are responsible for the accounting of all personnel assembled at the designed assembly area. The Designated Incident Commander shall be notified if personnel are not found.

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 advice 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 SPECIAL CONDITIONS

This guideline contains information and requirements for special conditions that may not be routinely encountered.

17.1 Scope

The guideline applies to the specific projects identified within this document. Additional provisions will be addressed in each Site-Specific HASP, as needed.

17.2 Responsibilities

Site Personnel - All site personnel must be alert to safety hazards on work sites and take action to minimize such hazards. Personnel must utilize the buddy system, watch for inappropriate behavior, and be alert to changes in site conditions.

Health and Safety Officer (HSO) - The HSO is responsible for considering these procedures in the development of site specific HASPs. The HSO shall schedule frequent "tail gate" safety briefings to enhance safety awareness and discuss potential problems.

17.3 Procedures

The procedures outlined below shall be followed when such conditions are encountered.

17.3.1 Ladders

Langan safety procedures shall be used to ensure employee safety when using ladders in the

office or work sites. All ladders shall be coated or repaired to prevent injury to the employee from punctures or lacerations and to prevent snagging or clothing. Any wood ladders used must have an opaque covering except for identification or warning labels, which may be placed on one face only of a side rail.

17.3.1.1 Ladder Use

Employees shall only use ladders for the purposes, which they were designed and shall not be used as scaffolding. Ladders will be maintained and inspected prior to use for slip hazards including oil and grease. Employees shall use ladders only on stable and level surfaces unless the ladder is secured to prevent possible displacement. Ladders should not be used on slippery surfaces unless secured or provided with slip resistant feet to prevent accidental displacement. Ladders should not be used in locations where they could be displaced by workplace activities or traffic. Ladder rungs, cleats and steps shall be parallel, level and uniformly spaced when the ladder is in the use position.

Employees should not be carrying anything including equipment that could cause injury if there was a fall while utilizing the ladder. The top and bottom of the ladder area must remain clear while in use. When ascending and descending the ladder, employees must face the ladder.

Ladders shall not be loaded beyond the maximum intended load for which they were built or the manufacturer's rated capacity.

17.3.1.2 Portable Ladders

Rungs, cleats and steps for portable ladders and fixed ladders shall be spaced not less than 10 inches apart, nor more than 14 inches apart, as measured between center lines of the rungs, cleats and steps. When used to access an upper landing surface, the ladder side rails must extend at least three feet above the upper landing surface to which the ladder is used to gain access. If this is not possible, due to the ladders length, then the top of the ladder shall be secured at its top to a rigid support.

17.3.1.3 Step Stools

Rungs, cleats and steps of step stools shall not be less than 8 inches apart, nor more than 12 inches apart, as measured between center lines of the rungs, cleats and steps.

17.3.1.4 Extension Ladders

Rungs, cleats and steps of the base section of extension trestle ladders shall be spaced not less

than 8 inches apart, nor more than 18 inches apart, as measured between center lines of the rungs, cleats and steps. The rung spacing on the extension section of the extension trestle ladder shall not be less than 6 inches nor more than 12 inches, as measured between center lines of the rungs, cleats and steps. Ladders shall be used at an angle such that the horizontal distance from the top support to the foot of the ladder is approximately one-quarter of the working length of the ladder (the distance along the ladder between the foot and the top support).

17.3.1.5 Inspection

Ladders will be inspected for visible detects periodically, prior to utilization or after any occurrence that could have negatively affected the ladder. Portable ladders with defects including broken or missing rungs, cleats, or steps, broken or split rails, corroded components or other faulty or defective components shall not be used. The ladder will be immediately marked as defective, tagged as "Do Not Use" or blocked from being used and removed from service until repaired.

17.3.2 First Aid/Cardiopulmonary Resuscitation (CPR)

Langan field and office personnel will be encouraged to be trained in First Aid and Cardiopulmonary Resuscitation (CPR). Training will be provided free of charge by Langan to all employees. Employees will receive a training certificate that will be kept on file with the Health & Safety Coordinator (HSC). Training and certification will be provided by a credited provider such as American Red Cross or equivalent.

17.3.2.1 Emergency Procedures

Prior to work at sites the Langan employees certified in first aid and CPR will be identified in the site specific HASP. Langan will endear to have at least one employee at a job site trained and able to render first aid and CPR. The site specific HASP will contain first aid information on both potential chemical and physical hazards. Emergency procedures to be followed are in case of injury or illnesses are provided in the HASP. The HASP will include emergency contact information including local police and fire departments, hospital emergency rooms, ambulance services, on-site medical personnel and physicians. The HASP will also include directions and contact information to the nearest emergency facility in case immediate medical attention is required. The emergency contact information will be conspicuously posted at the worksite. Employees that are injured and require immediate medical attention shall call either 911 or the local posted emergency contacts. Employees should use ambulatory services to transport injured workers to the nearest facility for emergency medical care. In areas where 911 is not available, the telephone numbers of the physicians, hospitals, or ambulances shall be conspicuously posted.

17.3.2.2 First Aid Supplies

First aid supplies are readily available to all Langan employees when required. First aid kits are located in each Langan office. Portable first aid kits are available for employees to use at work sites. First aid kits should consist of items needed to treat employees for potential chemical and physical injuries. At a minimum, first aid kits should contain items to allow basic first aid to be rendered. Where the eyes or body of an employee may be exposed to corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use including eye wash.

First aid kits will be weatherproof with individual sealed packages of each item. All portable first aid kits shall be inspected by Langan employees before and after use to ensure all used items are replaced. When out in the field, employees shall check first aid kits weekly to ensure used items are replaced.

17.3.3 Hydrogen Sulfide

Langan employees with the potential to be exposed to hydrogen sulfide while at work sites shall have training in hydrogen sulfide awareness. The training will include identification of areas where employees could be exposed to hydrogen sulfide, health effects, permissible exposure limits, and first aid procedures and personnel protective equipment. Langan employees could be exposed to hydrogen sulfide while at job sites including petroleum refineries, hazardous waste treatment, storage and disposal facilities, uncontrolled hazardous waste sites and remediation projects.

17.3.3.1 Characteristics

Hydrogen sulfide is a colorless gas with a strong odor of rotten eggs that is soluble in water. Hydrogen sulfide is used to test and make other chemicals. It is also found as a by-product of chemical reactions, such as in sewer treatment. It is a highly flammable gas and a dangerous fire hazard. Poisonous gases are produced in fires including sulfur oxides. Hydrogen sulfide is not listed as a carcinogen.

17.3.3.2 Health Effects

Hydrogen Sulfide can affect employees if inhaled or through contact with skin or eyes. Acute (or short term) health effects of hydrogen sulfide exposure include irritation of the nose and throat, dizziness, confusion, headache and trouble sleeping. Inhalation of hydrogen sulfide can irritate the lungs causing coughing and/or shortness of breath. Higher levels of exposure can cause build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of

breath.

Chronic (or long term) health effects of low levels of exposure to hydrogen sulfide can cause pain and redness of the eyes with blurred vision. Repeated exposure may cause bronchitis with cough, phlegm and shortness of breath.

17.3.3.3 Protective Clothing and Equipment

Respirators are required for those operations in which employees will be exposed to hydrogen sulfide above OSHA permissible exposure level. The maximum OSHA permissible exposure limit (PEL) for hydrogen sulfide is 20 parts of hydrogen sulfide vapor per million parts of air (20 ppm) for an 8-hour workday and the maximum short-term exposure limit (STEL) is 10 ppm for any 10-minute period.

Where employees are exposed to levels up to 100 parts of hydrogen sulfide vapor per million parts of air (100 ppm), the following types of respiratory protection are allowed:

- Any powered, air purifying respirator with cartridge(s);
- Any air purifying, full-facepiece respirator (gas mask) with a chin style, front- or back-mounted canister;
- Any supplied air system with escape self-contained breathing apparatus, if applicable; and,
- Any self-contained breathing apparatus with a full facepiece.

Respirators used by employees must have joint Mine Safety and Health Administration and the National Institute for Occupational Safety and Health (NIOSH) seal of approval. Cartridges or canisters must be replaced before the end of their service life, or the end of the shift, whichever occurs first. Langan employees that have the potential to be exposed to hydrogen sulfide will be trained in the proper use of respirators. Respirator training is discussed under– Langan's Respiratory Protection Program.

Employees with potential exposure to hydrogen sulfide, or when required by the client, will wear a portable hydrogen sulfide gas detector. The detector should have an audible, visual and vibrating alarm. The detector may also provide detection for carbon monoxide, sulfur dioxide and oxygen deficient atmospheres. The hydrogen sulfide monitor will, at a minimum, be calibrated to detect hydrogen sulfide at a level of 20 parts of hydrogen sulfide vapor per million parts of air (20 ppm). Many portable gas detectors will have factory defaults with a low level alarm at 10 ppm and a high level alarm at 15 ppm. Langan employees shall consult clients to determine if any site specific threshold levels exist.

If the hydrogen sulfide gas detector sounds and employees are not wearing appropriate respiratory protection, employees must immediately vacate the area and meet at the assigned emergency location. Langan employees may not re- enter the site without proper respiratory protection and approval from the client or property owner, if needed.

Employees shall wear PPE to prevent eye and skin contact with hydrogen sulfide. Employees must wear appropriate protective clothing including boots, gloves, sleeves and aprons, over any parts of their body that could be exposed to hydrogen sulfide. Non-vented, impact resistant goggles should be worn when working with or exposed to hydrogen sulfide.

17.3.3.4 Emergency and First Aid Procedures

Eye and Face Exposure

If hydrogen sulfide comes in contact with eyes, it should be washed out immediately with large amounts of water for 30 minutes, occasionally lifting the lower and upper eye lids. Seek medical attention immediately.

Skin Exposure

If hydrogen sulfide contaminates clothing or skin, remove the contaminated clothing immediately and wash the exposed skin with large amounts of water and soap. Seek medical attention immediately. Contaminated clothing should either be disposed of or washed before wearing again.

Breathing

If a Langan employee or other personnel breathe in hydrogen sulfide, immediately get the exposed person to fresh air. If breathing has stopped, artificial respiration should be started. Call for medical assistance or a doctor as soon as possible.

Safety Precautions

Hydrogen sulfide is a highly flammable gas and a dangerous fire hazard. Containers of hydrogen sulfide may explode in a fire situation. Poisonous gases are produced during fires.

Langan employees should contact property owners and operators prior to conducting work onsite to be aware of any site specific contingency plans, identify where hydrogen sulfide is used at the facility and be informed about additional safety rules or procedures.

19.3.4 Fire Protection/Extinguishers

Langan field personnel that have been provided with portable fire extinguishers for use at worksites will be trained to familiarize employees with general principles of fire extinguisher use and hazards associated with the incipient stage of firefighting. Training will be provided prior to initial assignment for field work and annually thereafter.

Portable fire extinguishers shall be visually inspected monthly and subjected to an annual maintenance check. Langan shall retain records of the annual maintenance date.

17.3.5 Overhead lines

When field work is performed near overhead lines, the lines shall be deenergized and grounded, or other protective measures shall be provided before the work shall commence. If overhead lines are to be deenergized, arrangements shall be made with the client, property owner or organization that operates or controls the electric circuits involved to deenergize and ground them. If protective measures, such as guarding, isolating, or insulating, are provided, these precautions shall prevent employees from contacting such lines directly with any part of their body or indirectly through conductive materials, tools, or equipment.

When unqualified Langan personnel are working in an elevated position near overhead lines, the location shall be such that the person and the longest conductive object they may contact cannot come closer to any unguarded, energized overhead line than the following distances:

1. For voltages to ground 50kV or below - 10 feet; and
2. For voltages to ground over 50kV - 10 feet, plus 4 inches for every 10kV over 50kV.

As previously indicated, Langan does not retain qualified employees to perform work on energized equipment.

17.3.5.1 Vehicle and Equipment Clearance

Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of 10 feet is maintained. If the voltage of the overhead lines is higher than 50kV, the clearance shall be increased 4 inches for every 10kV over that voltage.

If any of the following discussed conditions occur, the clearance may be reduced.

- If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 ft. If the voltage is higher than 50kV, the clearance shall be increased 4 in. for every 10 kV over that voltage.

- If insulating barriers are installed to prevent contact with the lines, and if the barriers are rated for the voltage of the line being guarded and are not a part of or an attachment to the vehicle or its raised structure, the clearance may be reduced to a distance within the designed working dimensions of the insulating barrier.

Employees standing on the ground may not contact the vehicle or mechanical equipment or any of its attachments, unless the employee is using protective equipment rated for the voltage; or the equipment is located so that no uninsulated part of its structure (that portion of the structure that provides a conductive path to employees on the ground) can come closer to the overhead line than permitted.

If any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines is intentionally grounded, employees working on the ground near the point of grounding may not stand at the grounding location whenever there is a possibility of overhead line contact. Additional precautions, such as the use of barricades or insulation, shall be taken to protect employees from hazardous ground potentials, depending on earth resistivity and fault currents, which can develop within the first few feet or more outward from the grounding point.

17.3.6 Trade Secret

Langan employees could potentially be provided trade secret information by the client or property owner when site specific information is provided about highly hazardous chemicals. Trade secret means any confidential formula, pattern, process, device, information or compilation of information that is used in an employer's business, and that gives the employer an opportunity to obtain an advantage over competitors who do not know or use it. Langan employees understand that this information should be kept confident and if required, may enter into a confidentially agreement with the client.

17.3.7 Bloodborne Pathogens

Langan employees that can reasonably anticipate exposure to blood or other potentially infectious material while at work sites shall have training in bloodborne pathogens. Applicable employees would include those trained in first aid and serving a designated role as an emergency medical care provider. Bloodborne pathogens are pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus and human immunodeficiency virus.

17.3.7.1 Training

Langan employees with potential occupational exposure to blood or other potentially infectious material must participate in a training program. Training must be conducted prior to initial assignment where there would be potential for exposure and annually thereafter within one year of previous training. The training program will be provided to Langan employees at no cost to them and during working hours.

Langan will ensure the training program shall consist of the following:

- An accessible copy of the regulatory text of 29 CFR 1910.1030 and an explanation of its contents;
- A general explanation of the epidemiology and symptoms of bloodborne diseases;
- An explanation of the modes of transmission of bloodborne pathogens;
- An explanation of Langan's exposure control plan and the means by which the employee can obtain a copy of the written plan;
- An explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials;
- An explanation of the use and limitations of personal protective
    - equipment (PPE) to prevent and reduce exposure;
    - Information on the types, proper use, location, removal, handling and disposal of PPE;
    - An explanation of the basis for selection of PPE;
    - Information on the hepatitis B vaccine, including information on its efficacy, safety, method of administration, the benefits of being vaccinated, and that the vaccine and vaccination will be offered free of charge;
    - Information on the appropriate actions to take and persons to contact in an emergency involving blood or other potentially infectious materials;
    - An explanation of the procedure to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available;
    - Information on the post-exposure evaluation and follow-up that the
    - employer is required to provide for the employee following an exposure incident;
    - An explanation of the signs and labels and/or color coding required by paragraph 29 CFR 1910.1030(g)(1); and
    - An opportunity for interactive questions and answers with the person conducting the training session.

Langan will develop and implement a written Exposure Control Plan, which will be designed to eliminate or minimize employee exposure to bloodborne pathogens. The Exposure Control Plan will contain the following elements:

- An exposure determination for employees;
- The schedule and method of implementation for Methods of Compliance (29 CFR 191.1030(d)), Hepatitis B Vaccination and Post-Exposure Evaluation and Follow-up (29 CFR 1910.1030(f)), Communication of Hazards to Employees (29 CFR 1910.1030(g)) and (h) Recordkeeping (29 CFR 1910.1030(h));
- The procedure for the evaluation of circumstances surrounding exposure incidents;
- Ensure a copy of the Exposure Control Plan will be accessible to employees; and,
- The Exposure Control Plan shall be reviewed and updated at least annually.

Langan employees with occupational exposure to bloodborne pathogens include any employees trained in first aid that would be expected to provide emergency medical care. This determination is made without regards to the use of PPE, which could eliminate or minimize exposure.

Universal precautions shall be observed to prevent contact with blood or other potentially infectious materials. According to the concept of Universal Precautions, all human blood and certain human body fluids are treated as if known to be infectious for bloodborne pathogens. Under circumstances in which differentiation between body fluid types is difficult or impossible, all body fluids shall be considered potentially infectious materials.

Work practice controls shall be used to eliminate or minimize employee exposure, if applicable. Since Langan employees will have occupational exposure only during rendering of first aid, personnel protective equipment will be utilized to reduce or minimize exposure. PPE that could be available to Langan personnel when administering first aid includes safety glasses, gloves, and Tyvek suits or sleeves. PPE and first aid kits will be provided to employees at no cost to them.

Langan employees that render first aid in office areas will have access to hand washing facilities or restrooms. For first aid rendered at field locations, first aid kits will contain an appropriate antiseptic hand cleanser and clean cloth/paper towels or antiseptic towelettes. After using antiseptic hand cleansers or towelettes, employees shall wash their hands with soap and running water as soon as feasible.

After administering first aid, potentially infectious materials, including towels, personnel protective equipment, clothes and bandages, shall be placed in a container, which prevents leakage during collection, handling, processing, storage, transport, or shipping. All PPE will be dispose of after use. Any equipment or working surfaces which was been exposed to blood or potentially infectious materials due to an injury, will be decontaminated prior to reuse.

Langan will make available the hepatitis B vaccine and vaccination series to all employees who have occupational exposure, and post-exposure evaluation and follow-up to all employees who

have had an exposure incident. These services will be available to the employee at no cost to them through a medical provider.

17.3.7.2 Recordkeeping

Langan will maintain training and medical records for each employee with occupational exposure to blood or potentially infectious materials. Medical and training records will be maintained by Langan's H&S Department.

Training records will include the following:

- Dates of the training sessions;
- Contents or a summary of the training sessions;
- Names and qualifications of persons conducting the training; and
- Names and job titles of all persons attending the training sessions.

Training records shall be maintained for 3 years from the date on which the training occurred. Medical records will be will be preserved and maintained for the duration of employment plus 30 years.

All records will be made available upon request to employees, the Assistant Secretary of Labor for Occupational Safety and Health, and Director of National Institute for Occupational Safety and Health Director of OSHA for examination and copying. Medical records must have written consent from employee before releasing.

If Langan ceases to do business, all records shall be transferred to the successor employer. The successor employer shall receive and maintain these records.

If there will not be a successor, Langan will notify current employees of their rights to access records at least three months prior to the cessation of business.

18.0 RECORDKEEPING

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

18.1 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.

18.2 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.

18.3 Onsite Log

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

18.4 Daily Safety Meetings ("Tailgate Talks")

Completed safety briefing forms will be maintained by the HSO.

18.5 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.

18.6 Hazard Communication Program/MSDS-SDS

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

18.7 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.

18.7.1 Accident and Injury Report Forms

18.7.1.1 Accident/Incident Report

All injuries, no matter how slight, shall be reported to the FTL and the PM immediately. The accident/incident report forms, attached in Attachment U and Attachment V will be filled out on all accidents by the applicable contractor supervision personnel, the FTL, or the HSO. Copies of all accident/incident reports shall be kept on-site and available for review. Project personnel will be instructed on the location of the first aid station, hospital, and doctor and ambulance service near the job. The emergency telephone numbers will be conspicuously posted in site vehicles near the work zone. First aid supplies will be centrally located and conspicuously posted between restricted and non-restricted areas to be readily accessible to all on the site.

18.7.1.2 First Aid Treatment Record

The forms in will be used for recording all non-lost time injuries treated by the project first-aid attendant, the local physician or hospital will be entered in detail on this record. "Minor" treatment of scratches, cuts, etc. will receive the same recording attention as treatment of more severe injuries.

18.7.1.3 OSHA Form 300

An OSHA Form 300 will be kept at the Langan Corporate Office in Parsippany, New Jersey. All recordable injuries or illnesses will be recorded on this form. Subcontractor employers must also meet the requirements of maintaining an OSHA 300 form. The Incident Report form used to capture the details of work-related injuries/illnesses meets the requirements of the OSHA Form 301 (supplemental record) and must be maintained with the OSHA Form 300 for all recordable injuries or illnesses. Forms for recording OSHA work-related injuries and illnesses are included in Attachment U and Attachment V.

19.0 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.

20.0 HASP ACKNOWLEDGEMENT FORM

All Langan personnel and contractors will sign this HASP Compliance Agreement indicating that they have become familiar with this HASP and that they understand it and agree to abide by it.

Printed Name	Signature	Company	Date

TABLES

TABLE 1
TASK HAZARD ANALYSES

Task	Hazard	Description	Control Measures	First Aid
1.3.1 – 1.3.15	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	Noise	Excavation equipment, hand tools, drilling equipment.	Wear hearing protection; maintain safe distance from construction activities	Seek medical attention as required
1.3.1 – 1.3.15	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	(1-Ethylpropyl)cyclohexane pentan-3-ylcyclohexane 3-cyclohexylpentyl Methyldiethylcyclohexane 3-cyclohexyl-3-pentyl (1-Ethylpropyl) cyclohexane	26321-98-2	NA	NA NA	Soil	NA	NA	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	1,1,1,2-Tetrachloroethane R-130a	630-20-6	NA	None None	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes (redness, pain), skin (redness, burning sensation, pain); Inhalation: jaundice, enlarged liver, headaches, tremors, dizziness, numbness, and drowsiness. Ingestion: burning sensation, headache, nausea	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	1,1,2-Trichloro-1,2,2-trifluoroethane Chlorofluorocarbon-113 CFC-113 Freon® 113 Genetron® 113 Halocarbon 113 Refrigerant 113 TTE Frigen 113 TR Freon TF Trichlorotrifluoroethane	76-13-1	PID	1000 ppm 2000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation skin, throat, drowsiness, dermatitis; central nervous system depression; dizziness, tremor, asphyxia, unconsciousness, cardiac arrhythmias, cardiac arrest; liquid: frostbite. In animals: cardiac arrhythmias, narcosis,	Eye: Irrigate immediately Skin: Soap wash promptly 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 – 1.3.15	1,1,2-Trichloroethane 1,1,2-TCA Ethane trichloride β-Trichloroethane Vinyl trichloride	79-00-5	PID	10 ppm 100 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, nose; central nervous system depression; liver, kidney damage; dermatitis	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention
1.3.1 – 1.3.15	1,1,3-Trimethylcyclohexane 1,1,3-Trimethyl cyclohexane	2073-66-3	NA	NA NA	Soil;	inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	1,1-Dichloroethane Asymmetrical dichloroethane Ethylidene chloride 1,1-Ethylidene dichloride 1,1-DCA	75-34-3	PID	100 ppm 3000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the skin; central nervous system depression; liver, kidney, lung damage	Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	1,1-Dimethylcyclohexane	590-66-9	PID	NA NA	Vapor	inhalation, ingestion, skin absorption, skin and/or eye contact	irritation to the eyes, skin, mucous membrane	Eye: Irrigate immediately Skin: Soap wash promptly 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 – 1.3.15	1,2,3-Trichlorobenzene vic-Trichlorobenzene 1,2,6-Trichlorobenzene	87-61-6	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 – 1.3.15	1,2,4-Trichlorobenzene Unsym-Trichlorobenzene 1,2,4-Trichlorobenzol	120-82-1	NA	None None	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, mucous membrane; In Animals: liver, kidney damage; possible teratogenic effects	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.15	1,2-Dibromo-3-chloropropane Dibromochloropropane DBCP	96-12-8	PID	None None	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, nose, throat; drowsiness; nausea, vomiting; pulmonary edema; liver, kidney injury; sterility; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	1,2-Dichlorobenzene	95-50-1	PID	50 ppm 200 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eye, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	1,2-Dichloroethane Ethylene dichloride 1,2-DCA DCE[1] Ethane dichloride Dutch liquid, Dutch oil Freon 150 Glycol dichloride	107-06-2	PID	1 ppm 50 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin absorption, skin and/or eye contact	irritation to the eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly 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 – 1.3.15	1,2-Dichloroethene 1,2-Dichloroethylene 1,2-DCE Total 1,2-Dichloroethene cis-1,2-Dichloroethylene mixture of cis and trans Acetylene dichloride cis-Acetylene dichloride sym-Dichloroethylene cis-1,2-Dichloroethene cDCE 1,1-dimethyl-;dimethyl1,1-cyclohexane	156-59-2 540-59-0	PID	200 ppm 4000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	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
1.3.1 – 1.3.15	1,3-Butadiene Biethylene Bivinyl Butadiene Divinyl Erythrene Vinylethylene	106-99-0	PID	1 ppm 2000 ppm	Vapor	inhalation, skin and/or eye contact (liquid)	irritation to the eyes, nose, throat; drowsiness, dizziness; liquid: frostbite; teratogenic, reproductive effects; [potential occupational carcinogen]	Eye: Frostbite Skin: Frostbite 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 – 1.3.15	1,3-Dichlorobenzene m-Dichlorobenzol; m-Phenylene dichloride m-dichlorobenzene	541-73-1	PID	None None	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	1,3-Dichloropropene Trans-1,3-dichloroproplyene AQL Agrocelhone DD92 1,3-D Dorlone, Nematox, Telone, Nemex, cis-Dichloropropene Di-Trapex CP, Vorlex 20 dichloro-1,3-propene 1,3-dichloro-1-propene 1,3-dichloro-2-propene alpha-chloroallylchloride Chloroallylchloride gamma-chloroallylchloride, chloroallyl chloride chloroorpropenyl chloride 1,3-dichloropropylene 2,2-Dichlorobenzene 3-D, DCP 3-Chloroallyl chloride Trans-1,3-Dichloropropen Cis-1,3-Dichloropropene	542-75-6	PID	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, respiratory system; eye, skin burns; lacrimation (discharge of tears); headache, dizziness; in animals; liver, kidney damage; [potential occupational carcinogen]	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 – 1.3.15	1,4-Dichlorobenzene para-Dichlorobenzene p-Dichlorobenzene 1,4-Dichlorobenzene 1,4-DCB para-Dichlorobenzene p-Dichlorobenzene p-DCB PDB Paramoth Para crystals Paracide Dichlorocide	106-46-7	PID	75 ppm 150 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	1,4-Dioxane 1,4-Dioxacyclohexane [1,4]Dioxane p-Dioxane [6]-crown-2 Diethylene dioxide Diethylene ether Dioxan Dioxane 1,4-Dioxane	123-91-1	PID	100 ppm 500 ppm	Groundwater Soil Vapor	Inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	1.2-Dibromoethane Ethylene Dibromide Ethylene bromide Glycol dibromide 1,2-Dibromoethane	106-93-4	PID	20 ppm 100 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, respiratory system; dermatitis with vesiculation; liver, heart, spleen, kidney damage; reproductive effects; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	17-Pentatriacontene	6971-40-0	NA	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	NA	Eye: Irrigate immediately Skin: Water wash immediately Breathing: Fresh air Swallow: Rinse mouth with water

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.15	1-Ethyl-2-methylcyclohexane	3728-54-9	NA	NA NA	Soil	Inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	1-Hexyl-3-methyl-cyclopentane 1-hexyl-3-methylcyclopentane 1-Hexyl-3-methylcyclopentane	61142-68-5	NA	NA NA	Vapor	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	2,3,6-Trimethyldecane 2,3,6-T2,3,6-Trimethyldecane Decane, 2,3,6-trimethyl- 2,3,6-trimethyl-decane 2,3,6-Trimethyldecane rimethyl decane	62238-12-4	NA	NA NA	Vapor	Inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	2,4-Dimethyl-2-pentene	625-65-0	NA	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly 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 – 1.3.15	2,6- Dimethyl-2-pentene	690-08-4	NA	NA NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	Irritation to the eyes, skin, respiratory system, Blue lips or finger nails. Blue skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Unconsciousness	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	2,6-dimethyl undecane	17301-23-4	PID	NA NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	Irritation to the eyes, skin, respiratory system, Blue lips or finger nails. Blue skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Unconsciousness	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	2-Butanone Ethyl methyl ketone MEK Methyl acetone Methyl ethyl ketone	78-93-3	PID	200 ppm 3000 ppm	Soil Groundwater Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose; headache; dizziness; vomiting; dermatitis	Eye: Irrigate immediately Skin: Water wash immediately Breathing: Fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.15	2-Hexanone Butyl methyl ketone MBK Methyl butyl ketone Methyl n-butyl ketone	591-78-6	PID	100 ppm 1600 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose; peripheral neuropathy: lassitude (weakness, exhaustion), paresthesia; dermatitis; headache, drowsiness	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 – 1.3.15	2-Methyl undecane 2-Methylundecane ISODODECANE Undecane, 2-methyl- 2-Methylhendecane isodo-decane Isododecane, mixture of isomers	7045-71-8	NA	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	Irritation to the eyes, skin, respiratory system, Blue lips or finger nails. Blue skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Unconsciousness	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	2-Methyldecane 2-Methyl decane	6975-98-0	NA	NA NA	Vapor	inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Remove to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.15	2-Methyldodecane 2-Methyl-dodecane	1560-97-0	PID	NA NA	Vapor	inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Remove to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.15	2-Methylundecane	7045-71-8	NA	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly 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 – 1.3.15	2-phenylethanamine Benzeneethanamine isomer Phenethylamine 2-phenylethylamine	64-04-0	NA	NA NA	Vapor	Inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	3,8-Dimethyldecane 3,8-Dimethyl decane	17312-55-9	NA	NA NA	Vapor	Inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	3-Methyl undecane 3-METHYLUNDECANE Undecane, 3-methyl- Nonane, ethylmethyl- 2-Ethyl-decane Undecane,3-methyl-	1002-43-3	NA	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Remove to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.15	3-Methyldecane 3-Methyl decane	13151-34-3	NA	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system, anesthetic effects (drowsiness, dizziness, and headache, May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Remove 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 – 1.3.15	3-Methyldodecane 3-Methyl dodecane	17312-57-1	NA	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system, anesthetic effects (drowsiness, dizziness, and headache, May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Remove to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.15	4-Isopropyltoulene 1-Methyl-4-(1-methylethyl)benzene 4-Isopropyltoluene; 4-Methylcumene; 1-Methyl-4-isopropylbenzene Dolcymene Camphogen Paracymene Cymene p-Cymene p-Isopropyltoluene	99-87-6	PID	NA NA	Soil Groundwater Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; dermatitis; headache, narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	4-Methyl-2-pentanone Hexone Isobutyl methyl ketone Methyl isobutyl ketone MIBK	108-10-1	PID	100 ppm 500 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; headache, narcosis, coma; dermatitis; in animals: liver, kidney damage	Eye: Irrigate immediately Skin: Water flush promptly 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 – 1.3.15	4-Methyldodecane 4-Methyl dodecane	6117-97-1	NA	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	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
1.3.1 – 1.3.15	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.15	Acrolein Acraldehyde Acrylaldehyde Acrylic aldehyde Allyl aldehyde Propenal 2-Propenal	107-02-8	PID	0.1 ppm 2 ppm	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 – 1.3.15	Aluminum	7429-90-5	None	0.5 mg/m3 50 mg/m3	Soil	inhalation, skin and/or eye contact	irritation to the eyes, skin, respiratory system	Eye: Irrigate immediately Breathing: Fresh air
1.3.1 – 1.3.15	Arsenic	NA	None	0.5 mg/m^3 NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation skin, possible dermatitis; resp distress; diarrhea; muscle tremor, convulsions; possible gastrointestinal tract	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Arsorous acid Arsenous acid isomer	13464-5-8-9	None	NA NA	Soil Groundwater	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, respiratory system	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 – 1.3.15	Barium	10022-31-8	None	0.5 mg/m^3 50 mg/m^3	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Benzene Benzol Phenyl hydride Alkyl benzene isomers	71-43-2	PID	3.19 mg/m^3 1,595 mg/mg^3	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	Benzoic acid Carboxybenzene E210 Dracylic acid Phenylmethanoic acid Benzenecarboxylic acid Benzoic acid isomer	65-85-0	None	NA NA	Groundwater Soil Vapor	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air
1.3.1 – 1.3.15	Beryllium	7440-41-7	None	0.002 mg/m^3 4 mg/m^3	Soil	inhalation, skin and/or eye contact	berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation to the eyes; dermatitis; [potential occupational carcinogen]	Eye: Irrigate immediately Breathing: Fresh air
1.3.1 – 1.3.15	Bromochloromethane Halon 1011 Methyl Chlorobromide Chlorobromoethane Fluorocarbon	74-97-5		200 ppm 2000 ppm	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation eyes, skin, throat; confusion, dizziness, central nervous system depression; pulmonary edema	Eye: Irrigate immediately Skin: Soap wash promptly 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 – 1.3.15	Calcium	7440-70-2	None	NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, upper resp tract; ulcer, perforation nasal septum; pneumonitis; dermatitis	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Carbon disulfide	75-15-0	PID	20 ppm 500 ppm	Soil Groundwater Vapor	inhalation, skin or eye contact, ingestion	irritation to the eyes, skin, respiratory system	Eye: Irrigate immediately (liquid) Skin: Water flush immediately (liquid) Breathing: Respiratory support
1.3.1 – 1.3.15	Carbon tetrachloride Carbon chloride Carbon tet Freon® 10 Halon® 104 Tetrachloromethane	56-23-5	PID	10 ppm 200 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; central nervous system depression; nausea, vomiting; liver, kidney injury; drowsiness, dizziness, incoordination; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Chlorobenzene benzene chloride monochlorobenzene Phenyl chloride Chlorobenzol MCB	108-90-7	PID	75 ppm 1000 ppm	Groundwater Soil Vapor	inhalation, skin or eye contact, ingestion	irritation to the eyes, skin, nose; drowsiness, incoordination; central nervous system depression; in animals: liver, lung, kidney injury	Eye: Irrigate immediately Skin: Soap wash promptly 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 – 1.3.15	Chloroform Methane trichloride Trichloromethane Chloro-3-methyl phenol	67-66-3	None	50 ppm 500 ppm	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Chromium Total Chromium Chromium, Total	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
1.3.1 – 1.3.15	Chrysene Benzo[a]phenanthrene 1,2-Benzphenanthrene	218-01-9	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, absorption, ingestion, consumption	irritation to eye, skin, and respiratory, gastrointestinal irritation nausea, vomit, diarrhea [potential occupational carcinogen]	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Cis-1,4-Dimethylcyclohexane cis-1,4,-Dimethylcyclohexane	624-29-3	NA	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	Irritant to eyes and skin May be fatal if swallowed and enters airways, may cause drowsiness or dizziness	Eye: Irrigate immediately Skin: Water flush promptly Breathing, Remove 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 – 1.3.15	Cis-Decahydronaphthalene Decalin Perhydronaphthalene Decahydronaphthalin Bicyclo(4.4.0)decane	493-01-6	NA	NA NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	Causes series injury to eyes and skin May be fatal if swallowed and enters airways, may cause drowsiness or dizziness	Eye: Irrigate immediately Skin: Water flush promptly Breathing, Remove to fresh air, Swallow: Medical attention immediately
1.3.1 – 1.3.15	Cobalt	7440-48-4	None	0.1mg/m^3 20 mg/m^3	Soil	inhalation, ingestion, skin and/or eye contact	Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function; weight loss; dermatitis; diffuse nodular fibrosis; resp hypersensitivity, asthma	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Copper	7440-50-8	None	1.0 mg/m^3 100 mg/m^3	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose, metallic taste; dermatitis; anemia	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Cumene Cumol Isopropylbenzene 2-Phenyl propane	98-82-8	PID	50 ppm 900 ppm	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; dermatitis; headache, narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly 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 – 1.3.15	Cyanide	57-12-5	None	5 mg/m^3 25 mg/m^3	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	Exposure to cyanide can cause weakness, headaches, confusion, dizziness, fatigue, anxiety, sleepiness, nausea and vomiting. Breathing can speed up then become slow and gasping. Coma and convulsions also occur. If large amounts of cyanide have been absorbed by the body, the person usually collapses and death can occur very quickly. Long-term exposure to lower levels of cyanide can cause skin and nose irritation, itching, rashes and thyroid changes.	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Cyclododecene	1501-82-2	NA	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly Breathing: move to fresh air Swallow: Rinse mouth with water
1.3.1 – 1.3.15	Cyclohexane Benzene hexahydride Hexahydrobenzene Hexamethylene Hexanaphthene	110-82-7	PID	300 ppm 1300 ppm	Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, respiratory system; drowsiness; dermatitis; narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly 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 – 1.3.15	Cyclotrisiloxane Cyclotrisiloxane isomer 1,3,5,2,4,6-trioxatrisilinane	291-50-9	NA	NA NA	Soil	ingestion, inhalation, skin and/or eye contact	Irritant to eyes , skin mucous membranes and respiratory system, irritant to digestive track	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	DDT 4,4-DDT 4,4'-DDT p,p'-DDT Dichlorodiphenyltrichloroethane 1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane	50-29-3	None	1 mg/m³ 500 mg/m³	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Decahydro-2-methylnaphthalene Decahydro-2-methyl naphthalene	2958-76-1	NA	NA NA	Soil Vapor	inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly 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 – 1.3.15	Decane n-decane	124-18-5	PID	NA NA	Soil Vapor	inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Dibenz(a,h)anthracene Dibenzo(a,h)anthracene	53-70-3	PID	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 PID Swallow: Medical attention immediately
1.3.1 – 1.3.15	Dibromomethane Methylene bromide	74-95-3	NA	20 ppm 250 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numb, tingle limbs; nausea; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Dichlorodifluoromethane Difluorodichloromethane, Fluorocarbon 12 Freon 12 Freon® 12 Genetron® 12 Halon® 122 Propellant 12 Refrigerant 12 Dichlorodifluromethane	75-71-8	None	1000 pp, 15,000 ppm	Groundwater Soil Vapor	inhalation, skin and/or eye contact (liquid)	dizziness, tremor, asphyxia, unconsciousness, cardiac arrhythmias, cardiac arrest; liquid: frostbite	Eye: Frostbite Skin: Frostbite 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 – 1.3.15	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 – 1.3.15	Di-n-octyl phthalate Di-n-cotylphthalate Di-sec octyl phthalate DEHP, Di(2-ethylhexyl)phthalate, DOP, bis-(2-Ethylhexyl)phthalate, Octyl phthalate	117-84-0	None	5 mg/m^3 5000 mg/m^3	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, mucous membrane; in animals: liver damage; teratogenic effects; [potential occupational carcinogen]	Eye: Irrigate immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	DL-3-Phenyllactic acid Phenyllactic acid isomer 2-Hydroxy-3-phenylpropanoic acid 3-Phenyllactic acid DL-beta-Phenyllactic acid	828-01-3	NA	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Ethanedioic acid Ethanedioic acid isomer Ethanedioic acid Dehydrate Oxalic acid Oxalic acid dehydrate Ethanedioic acid	6153-56-6	NA	NA NA	Soil Vapor	inhalation, skin and/or eye contact (liquid)	dizziness, tremor, asphyxia, unconsciousness, cardiac arrhythmias, cardiac arrest; liquid: frostbite	Eye: Frostbite Skin: Frostbite 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 – 1.3.15	Ethyl acetate Acetic ester Acetic ether Ethyl ester of acetic acid Ethyl ethanoate	141-78-6	PID	400 ppm 2000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation eyes, skin, nose, throat; narcosis; dermatitis	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Ethyl benzene Ethylbenzene Ethylbenzol Phenylethane	100-41-4	PID	435 mg/m^3 3,472 mg/m^3	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Ethyl chloride Chloroethane Hydrochloric ether Monochloroethane Muriatic ether Hydrochloric ether	75-00-3	PID	1000 ppm 3800 ppm	Groundwater Soil Vapor	inhalation, skin absorption (liquid), ingestion (liquid), skin and/or eye contact	incoordination, inebriation; abdominal cramps; cardiac arrhythmias, cardiac arrest; liver, kidney damage	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	Helium	7440-59-7	Helium Detector	NA NA	NA	inhalation	dizziness, headache, and nausea	Breathing: Respiratory support
1.3.1 – 1.3.15	Heptane n-Heptane	142-82-5	PID	500 ppm 750 ppm	Goundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	dizziness, stupor, incoordination; loss of appetite, nausea; dermatitis; chemical pneumonitis (aspiration liquid); unconsciousness	Eye: Irrigate immediately Skin: Soap wash promptly 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 – 1.3.15	Hexachlorobenzene Perchlorobenzene Pentachlorophenylchloride Benzene hexachloride Phenyl perchloryl HCB BHC	118-74-1	NA	NA NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	Irritating to eyes, skin and mucous membranes. Prolonged periods of ingestion may cause cutaneous porphyria	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Hexachlorobutadiene HCBD Hexachloro-1,3-butadiene 1,3-Hexachlorobutadiene Perchlorobutadiene	87-68-3	PID	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	In animals: irritation to the eyes, skin, respiratory system; kidney damage; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Hexachlorocyclopentadiene	77-47-4	PID	NA NA	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system; eye, skin burns; lacrimation (discharge of tears); sneezing, cough, dyspnea (breathing difficulty), salivation, pulmonary edema; nausea, vomiting, diarrhea; In Animals: liver, kidney injury	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Hexavalent Chromium Chromium VI Chromium, Hexavalent	18540-29-9	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 – 1.3.15	Indeno(1,2,3-cd)pyrene Indeno(1,2,3-c,d)Pyrene 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 – 1.3.15	Iron	7439-89-6	None	10 mg/m^3 NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; abdominal pain, diarrhea, vomiting	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Isopropyl alcohol Iso-Propyl Alcohol Carbinol IPA Isopropanol 2-Propanol sec-Propyl alcohol Rubbing alcohol Isopropylalcohol	67-63-0	PID	400 ppm 2000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; drowsiness, dizziness, headache; dry cracking skin; in animals: narcosis	Eye: Irrigate immediately Skin: Water flush 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 – 1.3.15	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 – 1.3.15	Magnesium	7439-95-4	None	15 mg/m^3 NA	Soil	inhalation, skin and/or eye contact	irritation to the eyes, skin, respiratory system; cough	Eye: Irrigate immediately Breathing: Fresh air
1.3.1 – 1.3.15	Manganese	7439-96-5	None	5 mg/m^3 500 mg/m^3	Groundwater Soil	inhalation, ingestion	aerosol is irritating to the respiratory tract	Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Methyl Acetate	79-20-9	PID	200 ppm 3100 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; headache, drowsiness; optic nerve atrophy; chest tightness; in animals: narcosis	Eye: Irrigate immediately Skin: Water flush promptly 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 – 1.3.15	Methyl Bromide Bromomethane Monobromomethane	74-83-9	PID	20 ppm 250 ppm	Soil Groundwater Vapor	inhalation, skin absorption (liquid), skin and/or eye contact (liquid)	irritation to the eyes, skin, respiratory system; muscle weak, incoordination, visual disturbance, dizziness; nausea, vomiting, headache; malaise (vague feeling of discomfort); hand tremor; convulsions; dyspnea (breathing difficulty); skin vesiculation; liquid: frostbite; [potential occupational carcinogen]	Eye: Irrigate immediately (liquid) Skin: Water flush immediately (liquid) Breathing: Respiratory support
1.3.1 – 1.3.15	Methyl Chloride Chloromethane Monochloromethane Refrigerant-40 R-40	74-87-3	NA	100 ppm 2000 ppm	Groundwater Soil	inhalation, skin and/or eye contact	dizziness, nausea, vomiting; visual disturbance, stagger, slurred speech, convulsions, coma; liver, kidney damage; liquid: frostbite; reproductive, teratogenic effects; [potential occupational carcinogen]	Eye: Frostbite Skin: Frostbite Breathing: Respiratory support
1.3.1 – 1.3.15	Methyl chloroform Chlorothene 1,1,1-Trichloroethane 1,1,1-Trichloroethane-(stabilized) 1,1,1-TCA	71-55-6	PID	350 ppm 700 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin; headache, lassitude (weakness, exhaustion), central nervous system depression, poor equilibrium; dermatitis; cardiac arrhythmias; liver damage	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.15	Methyl methacrylate Methacrylate monomer Methyl ester of methacrylic acid Methyl-2-methyl-2-propenoate	80-62-6	PID	100 ppm 1000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation eyes, skin, nose, throat; dermatitis	Eye: Irrigate immediately Skin: Water wash immediately Breathing: Fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.15	Methyl *tert*-butyl ether MTBE Methyl tertiary-butyl ether Methyl t-butyl ether tert-Butyl methyl ether tBME tert-BuOMe Methyl tert butyl ether	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
1.3.1 – 1.3.15	Methylcyclohexane Methyl cyclohexane Hexahydrotoluene Cyclohexylmethane Toluene hexahydride	108-87-2	PID	500 ppm 1200 ppm	Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, drowsiness; in animals: narcosis	Eye: Irrigate immediately Skin: Soap wash promptly 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 – 1.3.15	Methylene Chloride Dichloromethane Methylene dichloride	75-09-2	PID	25 ppm 2300 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numb, tingle limbs; nausea; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	m-Xylenes 1,3-Dimethylbenzene m-Xylol Metaxylene	108-38-3 179601-23-1	PID	100 ppm 900 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.15	n-Butylbenzene Butylbenzene 1-phenylbutane	104-51-8	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin; dry nose, throat; headache; low blood pressure, tachycardia, abnormal cardiovascular system stress; central nervous system, hematopoietic depression; metallic taste; liver, kidney injury	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	n-Dodecane	112-40-3	PID	125 ppm 1000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin; dry nose, throat; headache; low blood pressure, tachycardia, abnormal cardiovascular system stress; central nervous system, hematopoietic depression; metallic taste; liver, kidney injury	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	n-Hexane Hexane, Hexyl hydride, normal-Hexane	110-54-3	PID	500 ppm 1100 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose; nausea, headache; peripheral neuropathy: numb extremities, muscle weak; dermatitis; dizziness; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Nickel	7440-02-0	None	NA 10 mg/m³	Groundwater Soil	ion, ingestion, skin and/or eye contact	sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Skin: Water 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 – 1.3.15	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 – 1.3.15	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
1.3.1 – 1.3.15	n-Propylbenzene Isocumene Propylbenzene 1-Phenylpropane 1-Propylbenzene Phenylpropane	103-65-1	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin; dry nose, throat; headache; low blood pressure, tachycardia, abnormal cardiovascular system stress; central nervous system, hematopoietic depression; metallic taste; liver, kidney injury	Eye: Irrigate immediately Skin: Water flush promptly 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 – 1.3.15	o-Cresol ortho-Cresol 2-Cresol o-Cresylic acid 1-Hydroxy-2-methylbenzene 2-Hydroxytoluene 2-Methyl phenol 2-Methylphenol 2-Metyhlphenol	95-48-7	PID	5 ppm 250 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; central nervous system effects: confusion, depression, resp failure; dyspnea (breathing difficulty), irreg rapid resp, weak pulse; eye, skin burns; dermatitis; lung, liver, kidney, pancreas damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediatelyethylphhhhhhhhhh
1.3.1 – 1.3.15	Octamethylcyclotetrasiloxane Cyclotetrasiloxane isomer	556-67-2 293-51-6	PID	NA NA	Groundwater Soil Vapor	ingestion, inhalation, skin and/or eye contact	Irritant to eyes , skin mucous membranes and respiratory system, irritant to digestive track	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	o-Xylenes 1,2-Dimethylbenzene ortho-Xylene o-Xylol	95-47-6 179601-23-1	PID	100 ppm 900 ppm	Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis	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 – 1.3.15	Pentachlorophenol PCP; Penta; 2,3,4,5,6-Pentachlorophenol	87-86-5	PID	0.5 mg/m^3 2.5 mg/m^3	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; sneezing, cough; lassitude (weakness, exhaustion), anorexia, weight loss; sweating; headache, dizziness; nausea, vomiting; dyspnea (breathing difficulty), chest pain; high fever; dermatitis	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Pentylcyclohexane Cyclohexane, pentyl-	4292-92-6	NA	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	p-Ethyltoluene 4-Ethyltoluene 1-ethyl-4-methyl-benzene 1-methyl-4-ethylbenzene	622-96-8	NA	NA NA	Soil	ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly 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 – 1.3.15	Phenanthrene	85-01-8	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
1.3.1 – 1.3.15	Phenol Carbolic acid Hydroxybenzene, Monohydroxybenzene Phenyl alcohol Phenyl hydroxide	108-95-2	PID	5 ppm 250 ppm	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; anorexia, weight loss; lassitude (weakness, exhaustion), muscle ache, pain; dark urine, skin burns; dermatitis; tremor, convulsions, twitching	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	p-Nitrophenol 4-Nitrophenol 4-hydroxynitrobenzene	100-02-7	NA	NA NA	Groundwater Soil	ingestion, inhalation, skin and/or eye contact	Irritant to eyes , skin mucous membranes and respiratory system, irritant to digestive track	Eye: Irrigate immediately, medical attention immediately; Skin: Water flush promptly, medical attention 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 – 1.3.15	Potassium	7440-09-7	None	NA NA	Soil	inhalation, skin absorption, ingestion, skin and/or eye contact inhalation, ingestion, skin and/or eye contact	eye: Causes eye burns. Skin: Causes skin burns. Reacts with moisture in the skin to form potassium hydroxide and hydrogen with much heat. ingestion: Causes gastrointestinal tract burns. inhalation: May cause irritation of the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema. Causes chemical burns to the respiratory tract. inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema.	Eyes: Get medical aid immediately Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Ingestion: If victim is conscious and alert, give 2-4 full cups of milk or water. Get medical aid immediately. inhalation: Get medical aid immediately.
1.3.1 – 1.3.15	Propylene dichloride Dichloro-1,2-propane 1,2-Dichloropropane	78-87-5	PEL	75 ppm 400 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, respiratory system; drowsiness, dizziness; liver, kidney damage; in animals: central nervous system depression; [potential occupational carcinogen]	irritation to the eyes, skin, respiratory system; drowsiness, dizziness; liver, kidney damage; in animals: central nervous system depression; [potential occupational carcinogen]

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.15	Pulegone	89-82-7	PID	NA NA	Soil	ingestion, inhalation, skin and/or eye contact	Irritant to eyes , skin mucous membranes and respiratory system, irritant to digestive track	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	p-Xylenes 1,4-Dimethylbenzene para-Xylene p-Xylol	106-42-3	PID	100 ppm 900 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Pyrene benzo[def]phenanthrene	129-00-0	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 – 1.3.15	sec-Butylbenzene	135-98-8	PID	10 ppm 100 ppm	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; inhalation: nausea or vomiting	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Sec-Butylcyclohexane (1-methylpropyl)-Cyclohexane 2-Cyclohexylbutane Cyclohexane sec-butyl-cyclohexane 1-methylpropyl)-;s-Butylcyclohexane	7058-01-7	NA	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, inhalation or skin absorption.	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Selenium	7782-49-2	None	1 mg/m^3 0.2 mg/m^3	Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; in animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Sodium	7440-23-5	None	NA NA	Groundwater Soil	ion, ingestion, skin and/or eye contact	sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Skin: Water 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 – 1.3.15	Spiro [4,5] decane	176-63-6	NA	NA NA	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	In animals: irritation to the eyes, skin, respiratory system	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Styrene Ethenyl benzene Phenylethylene Styrene monomer Styrol Vinyl benzene	100-42-5	PID	100 ppm 700 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose, respiratory system; headache, lassitude (weakness, exhaustion), dizziness, confusion, malaise (vague feeling of discomfort), drowsiness, unsteady gait; narcosis; defatting dermatitis; possible liver injury; reproductive effects	Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Tert-Butyl Alcohol Tertiary Butyl Alcohol Tert-Butanol Butyl alcohol 2-Methyl-2-propanol Trimethyl carbinol TBA	75-65-0	PID	100 ppm 1600 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; drowsiness, narcosis	Eye: Irrigate immediately Skin: Water flush promptly 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 – 1.3.15	tert-Butylbenzene *t*-Butylbenzene 2-Methyl-2-phenylpropane Pseudobutylbenzene	98-06-6	PID	10 ppm NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	eye, skin irritation; dry nose, throat; headaches; low blood pressure, tachycardia; abnormal cardiovascular system; central nervous system depression; hematopoietic depression	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Tetrachloroethane 1,1,2,2-Tetrachloroethane Acetylene tetrachloride Symmetrical tetrachloroethane	79-34-5	PID	5 ppm 100 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	nausea, vomiting, abdominal pain; tremor fingers; jaundice, hepatitis, liver tenderness; dermatitis; leukocytosis (increased blood leukocytes); kidney damage; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Tetrachloroethylene Perchlorethylene Perchloroethylene PCE Perk Tetrachlorethylene Tetrachloroethene	127-18-4	PID	100 ppm 150 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Tetradecane n-Tetradecane	629-59-4	PID	NA NA	Groundwater Soil Vapor	ingestion, inhalation, skin and/or eye contact	Irritant to eyes , skin mucous membranes and respiratory system, irritant to digestive track	Eye: Irrigate immediately Skin: Water flush promptly 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 – 1.3.15	Tetrahydrofuran Diethylene oxide 1,4-Epoxybutane Tetramethylene oxide THF	109-99-9	PID	200 ppm 2000 ppm	Groundwater Soil Vapor	inhalation, skin and/or eye contact, ingestion	irritation to the eyes, upper respiratory system; nausea, dizziness, headache, central nervous system depression	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immedi
1.3.1 – 1.3.15	Tetrasiloxane Tetrasiloxane isomer silyloxy(silyloxysilyloxy)silane	17082-47-2	NA	NA NA	Soil	ingestion, inhalation, skin and/or eye contact	Irritant to eyes , skin mucous membranes and respiratory system, irritant to digestive track	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Toluene Methyl benzene Methyl benzol Phenyl methane Toluol	108-88-3	PID	200 ppm 500 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, paresthesia; dermatitis	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.15	Total Xylenes Dimethylbenzene Xylol	1330-20-7	PID	100 ppm 900 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Trans-1,2-Dichloroethene trans-1,2-Dichloroethylene tDEC trans-Acetylene dichloride	156-60-5	PID	200 ppm 4000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Trans-1,3-dichloropropylene trans-1,3-Dichloropropene Propene 1,3-dichloro- (E) (E)-1,3-Dichloropropene trans-1,3-Dichloro-1-Propene trans-1,3-Dichloropropene trans-1,3-Dichloropropylene (1E)-1,3-Dichloro-1-propene	10061-02-6	None	Na NA	Groundwater Soil Vapor	inhalation, ingestion, skin absorption, skin and/or eye contact	irritation to the eyes, skin, mucous membrane	Eye: Irrigate immediately Skin: Soap wash promptly 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 – 1.3.15	Trichloroethylene Ethylene trichloride TCE Trichloroethene Trilene	79-01-6	PID	100 ppm 1000 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Trichlorofluoromethane Fluorotrichloromethane Freon® 11 Monofluorotrichloromethane Refrigerant 11 Trichloromonofluoromethane	75-69-4	PID	1000 ppm 2000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	incoordination, tremor; dermatitis; cardiac arrhythmias, cardiac arrest; asphyxia; liquid: frostbite	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Tridecane n-Tridecane	629-50-5	PID	NA NA	Groundwater Soil Vapor	ingestion, inhalation, skin and/or eye contact	Causes series injury to eyes and skin May be fatal if swallowed and enters airways, may cause drowsiness or dizziness	Eye: Irrigate immediately Skin: Water flush promptly Breathing, Remove 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 – 1.3.15	Undecane n-Undecane	1120-21-4	PID	NA NA	Groundwater Soil Vapor	ingestion, inhalation, skin and/or eye contact	Causes series injury to eyes and skin May be fatal if swallowed and enters airways, may cause drowsiness or dizziness	Eye: Irrigate immediately Skin: Water flush promptly Breathing, Remove to fresh air, Swallow: Medical attention immediately
1.3.1 – 1.3.15	Vanadium	7440-62-2	None	0.1 mg/m3 15 mg/m3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peri neuritis, tremor; retrosternal (occurring behind the sternum) tightness, chest pain, pulmonary edema; convulsions, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Vinyl Chloride Chloroethene Chloroethylen Ethylene monochloride Monochloroethene Monochloroethylene VC Vinyl chloride monomer (VCM)	75-01-4	PID	1 ppm NA	Groundwater Soil Vapor	inhalation, skin and/or eye contact (liquid)	lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]	Eye: Frostbite Skin: Frostbite 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 – 1.3.15	Vinylidene chloride 1,1-DCE 1,1-Dichloroethene 1,1-Dichloroethylene VDC Vinylidene chloride monomer Vinylidene dichloride	75-35-4	PID	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney disturbance; pneumonitis; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Zinc	7440-62-2	None	15 mg/m^3 500 mg/m^3	Groundwater Soil	inhalation	chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function	Breathing: Respiratory support`

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/m^3 = milligrams per cubic meter

TABLE 3
Summary of Monitoring Equipment

Instrument	Operation Parameters
Photoionization Detector (PID)	**Hazard Monitored:** Many organic and some inorganic gases and vapors. **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. **Detection Method:** Ionizes molecules using UV radiation; produces a current that is proportional to the number of ions. **General Care/Maintenance:** Recharge or replace battery. Regularly clean lamp window. Regularly clean and maintain the instrument and accessories. **Typical Operating Time:** 10 hours. 5 hours with strip chart recorder.
Oxygen Meter	**Hazard Monitored:** Oxygen (O_2). **Application:** Measures the percentage of O_2 in the air. **Detection Method:** Uses an electrochemical sensor to measure the partial pressure of O_2 in the air, and converts the reading to O_2 concentration. **General Care/Maintenance:** Replace detector cell according to manufacturer's recommendations. Recharge or replace batteries prior to explanation of the specified interval. If the ambient air is less than 0.5% C O_2, replace the detector cell frequently. **Typical Operating Time:** 8 – 12 hours.
Additional equipment (if needed, based on site conditions)	
Combustible Gas Indicator (CGI)	**Hazard Monitored:** Combustible gases and vapors. **Application:** Measures the concentration of combustible gas or vapor. **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. **General Care/Maintenance:** Recharge or replace battery. Calibrate immediately before use. **Typical Operating Time:** Can be used for as long as the battery lasts, or for the recommended interval between calibrations, whichever is less.
Flame Ionization Detector (FID) with Gas Chromatography Option *(i.e., Foxboro Organic Vapor Analyzer (OVA))*	**Hazard Monitored:** Many organic gases and vapors (approved areas only). **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. **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. **Typical Operating Time:** 8 hours; 3 hours with strip chart recorder.
Potable Infrared (IR) Spectrophotometer	**Hazard Monitored:** Many gases and vapors. **Application:** Measures concentration of many gases and vapors in air. Designed to quantify one or two component mixtures. **Detection Method:** Passes different frequencies of IR through the sample. The frequencies absorbed are specific for each compound. **General Care/Maintenance:** As specified by the manufacturer.

Instrument	Operation Parameters
Direct Reading Colorimetric Indicator Tube	**Hazard Monitored:** Specific gas and vapors. **Application:** Measures concentration of specific gases and vapors. **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. **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.
Aerosol Monitor	**Hazard Monitored:** Airborne particulate (dust, mist, fume) concentrations **Application:** Measures total concentration of semi-volatile organic compounds, PCBs, and metals. **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. **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.
Monitox	**Hazard Monitored:** Gases and vapors. **Application:** Measures specific gases and vapors. **Detection Method:** Electrochemical sensor relatively specific for the chemical species in question. **General Care/Maintenance:** Moisten sponge before use; check the function switch; change the battery when needed.
Gamma Radiation Survey Instrument	**Hazard Monitored:** Gamma Radiation. **Application:** Environmental radiation monitor. **Detection Method:** Scintillation detector. **General Care/Maintenance:** Must be calibrated annually at a specialized facility. **Typical Operating Time:** Can be used for as long as the battery lasts, or for the recommended interval between calibrations, whichever is less.

TABLE 4
INSTRUMENTATION ACTION LEVELS

Photoionization Detector Action Levels	**Action Required**
Background to 5 ppm[1]	No Respirator, no further action
>5ppm but </= 15 ppm at the parameter of the work area	Work temporarily halted and monitoring continues If instantaneous readings decrease below 5 ppm above background, work activities will resume with continued monitoring
>5ppm but </= 25 ppm at the downwind parameter of the hot zone	Work activities will be halted Source of vapors identified Corrective actions taken to abate emissions Continued monitoring Workers will don appropriate respirators and work can resume if vapor levels 200 feet downwind or the hot zone or half the distance to the nearest potential receptor or residential/commercial structure, Work can continue when vapor levels be whichever is less – but in no case less than 20 feet, is below 5 ppm above background for the 15-minute average
>25ppm at the perimeter of the hot zone	Activities will shut down

Particulate Monitoring Action Levels	**Action Required**
Background to 100 micrograms per cubic meter ($\mu g/m^3$)[2] , no dust observed	No further action
Background to 100 $\mu g/m^3$, dust observed leaving the work area	Dust suppression must be employed
100 to 150 $\mu g/m^3$ at the downwind perimeter of the hot zone	Work activities will be halted Source of dust identified Dust suppression activities initiated Corrective actions taken to abate emissions Continued monitoring Workers will don appropriate respirators Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM10 concentration to within 150 $\mu g/m^3$ of the upwind level and in preventing visible dust migration.
>150 $\mu g/m^3$ at the perimeter of the hot zone	Activities will shut down

[1] VOC concentrations are 15-minute averages above site background (upwind parameter)
[2] Particulate concentrations are 15 minute averages above site background (upwind parameter)

TABLE 5
EMERGENCY NOTIFICATION LIST

ORGANIZATION	CONTACT	TELEPHONE
Local Police Department		911
Local Fire Department		911
Ambulance/Rescue Squad		911
Hospital	Woodhull Medical and Mental Health Center	911 or 718-963-8000
Langan Incident Hotline		800-952-6426 ex 4699
Medical Treatment Hotline	Incident Intervention	888-449-7787
Langan Environmental Project Manager	Patrick Farnham	646-593-0849 (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	Jack Teich	914-536-3880 (cell)
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 injury, unless immediate emergency medical treatment is required, the injured employee must contact Incident Intervention® at 888-449-7787.

For all other incidents or near misses, unless emergency response is required, either the employee or a coworker must contact the Langan Incident 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 ^{o}F = ta ^{o}F + (13 x % 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

	ENVIRONMENTAL TEMPERATURE (Fahrenheit)										
	70	**75**	**80**	**85**	**90**	**95**	**100**	**105**	**110**	**115**	**120**
RELATIVE HUMIDITY	**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

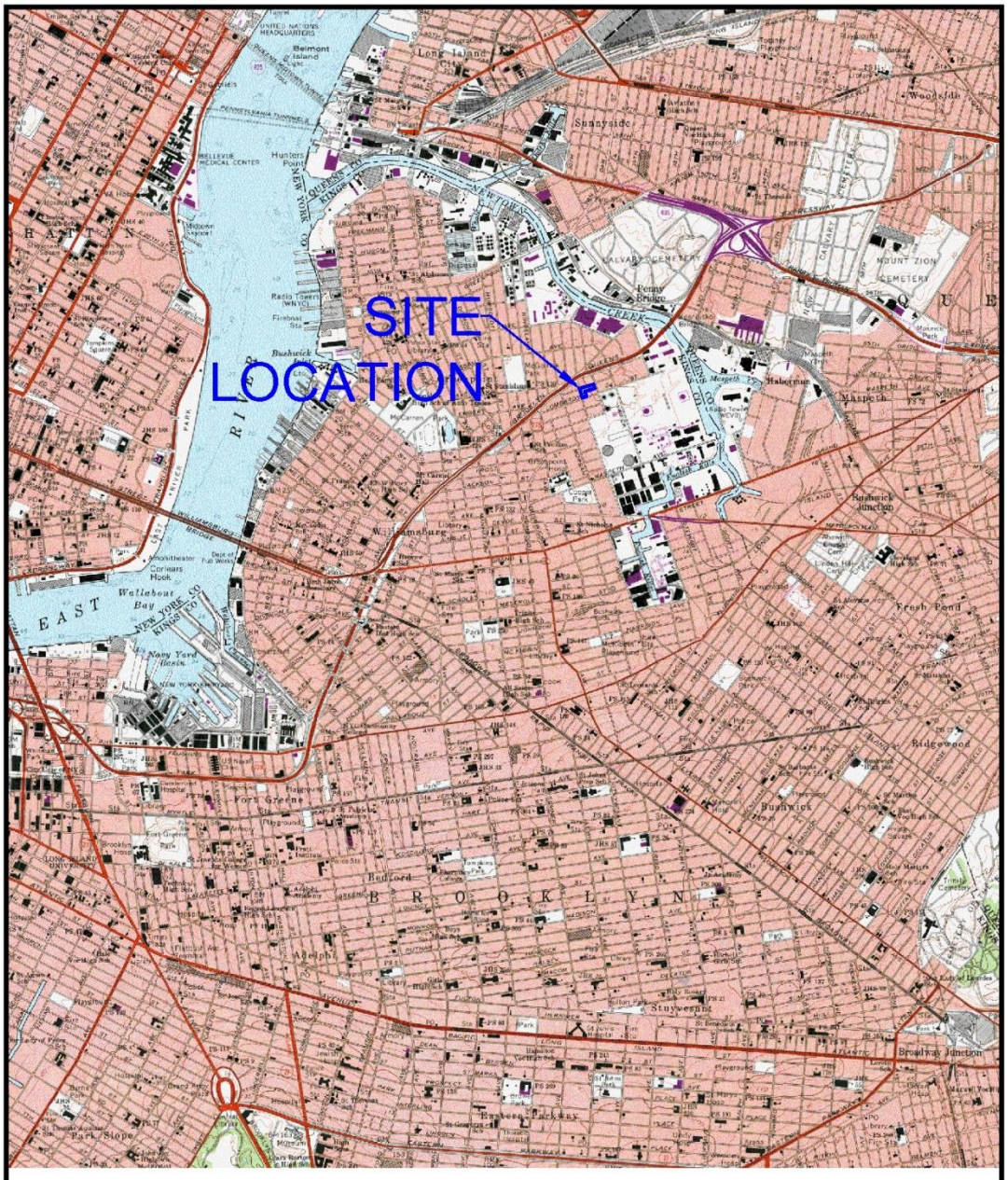
Note: Exposure to full sunshine can increase Heat Index values by up to 15 degrees F.

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: NEW YORK, CATSKILLS/N.Y.C./LONG ISLAND - BROOKLYN MAP, DATED 1967, REVISED 1979.

LANGAN
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NJ Certificate of Authorization No: 24GA27996400

Project
46 ANTHONY STREET/95 LOMBARDY STREET
SITE LOCATION MAP
BROOKLYN NEW YORK

Project No.	Date	Scale	Dwg. No.
170157201	5/24/11	NTS	1

2\170157201\Cadd Data – 170157201\2D-Design Files\Resource\46 Anthony St\Figure 1 – Site Location Map.dwg Date: 5/27/2011 Time: 12:23 User: slowes Style Table: Langan.stb Layout: A Size Sheet (Bottom)

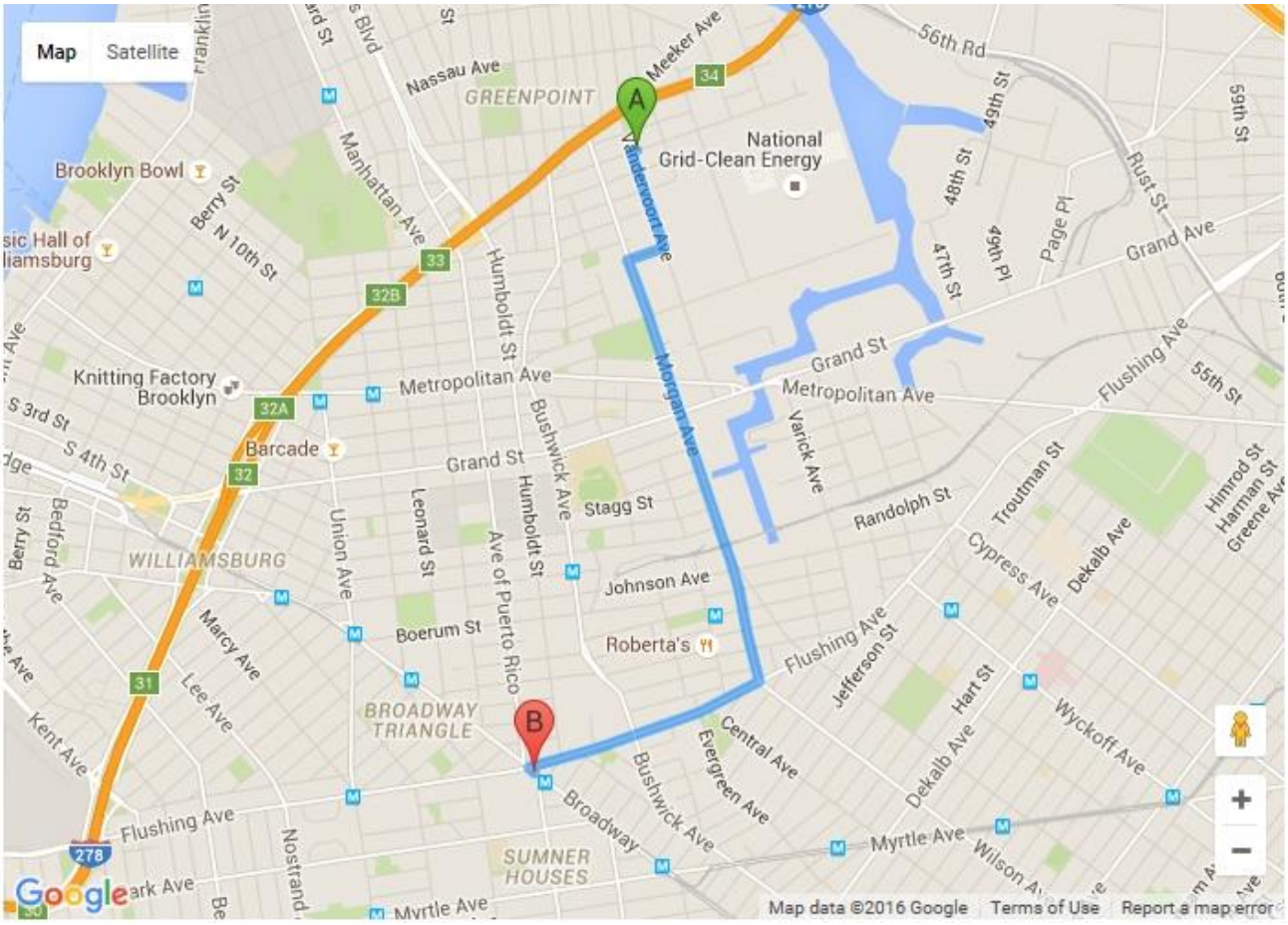
FIGURE 2
HOSPITAL ROUTE PLAN

Hospital Location: **Woodhull Medical and Mental Health Center**
760 Broadway Street
Brooklyn, New York
718-963-8000

START: 95 Lombardy Street, Brooklyn, NY

1. Head west on Lombardy Street toward Vandervoort Avenue
2. Turn left at the first cross street onto Vandervoort Avenue
3. Turn right onto Withers Street
4. Turn left onto Morgan Avenue
5. Turn right onto Flushing Avenue
6. Turn left onto Broadway Street, medical center in on the right.

END: Woodhull Medical and Mental Health Center, 760 Broadway Street, Brooklyn, 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 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 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

DATE:________________ PROJECT:____________________

CALIBRATION LOG

Date & Time	Inst Type	Inst #	Media	Initial Reading	Span #	Calibrat. Reading	Performed By:

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 power lines?				
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

LANGAN	Job Safety Analysis (JSA) Health and Safety
JSA Title: COVID-19 Awareness – Site Work **JSA Number: JSA046-00**	
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 preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.	

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Boots	☐ Long Sleeves	☐ Safety Vest (Class 2)	☐ Hard Hat	☐ Hearing Protection
☐ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☐ Nitrile Gloves	☐ PVC Gloves
☐ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: Alcohol-based hand sanitizer, disinfectant wipes/spray				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
1. All Activities	1. Transmittal/exposure of COVID-19	1. Ask yourself and your managers – is this work essential? Can this be done remotely? 2. Stay home if sick or showing symptoms of COVID-19 (e.g. fever, cough, etc.). 3. Carry nitrile gloves, alcohol-based hand sanitizer, face coverings and disinfectant wipes/spray during field work. 4. Check federal, state, and/or local travel restrictions **prior** to travel. Many states, counties, and cities are passing strict "shelter-in-place" or business restrictions in response to COVID-19. 5. Immediately notify Beverly Williams or Rory Johnston (Supervisor if employee chooses) if you display symptoms of COVID-19. Symptoms include fever (over 100.4 F), cough, and shortness of breath. 6. Notify Beverly Williams or Rory Johnston, Supervisor and Coronavirus Task Force if you had close contact with an individual who tested positive or displayed symptoms of COVID-19. 7. Do not touch your face, to the extent possible. 8. Wear face coverings when around other worker to minimize spread of COVID-19. (May be required in certain states or locations.)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		9. Practice social distancing, maintaining at least 6 feet of distance between yourself and others. Avoid gatherings of more than 10 people. Limit, to the extent possible, contact with public items/objects. 10. Clean your hands frequently with soap and water for at least 20 seconds especially after you have been in a public place, or after blowing your nose, coughing, sneezing, or using the rest room. 11. If soap and water are not readily available, use a hand sanitizer that contains at least 60% alcohol. Cover all surfaces of your hands and rub them together until they feel dry. 12. Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow. 13. Clean and disinfect frequently touched surfaces daily, for example, cell phones, computer equipment, headsets, tables, doorknobs, light switches, countertops, handles, desks, toilets, faucets, and sinks.
2. Travel to Jobsite	1. Transmittal/exposure of COVID-19 between passengers 2. Transmittal/exposure of COVID-19 from previous occupants (rental and fleet vehicles) 3. Transmittal/exposure of COVID-19 while refueling	1. Limit the number of occupants to each vehicle to 2 people. Employees should sit as far away from each other as possible. 2. Disinfect high “hand-traffic” areas of the vehicle: Door handles, steering wheel, turn signal and control rods, dashboard controls, seatbelts, armrests, etc. To the extent possible, do not use recycled air for heat/AC and travel with the windows open. 3. Use hand sanitizer before and after pumping gas and only return to the inside of the vehicle after refueling is complete. 4. Wear nitrile gloves if available or disinfect the key pad, pump handle, and fuel grade button prior to use. 5. Recommend face coverings are worn to minimize spread of COVID-19.
3. Conduct Tailgate Safety Meeting & Complete H&S Paperwork	1. Transmittal/exposure of COVID-19 between meeting participants	1. Practice social distancing, maintaining at least 6 feet of distance between yourself and others. 2. Recommend face coverings are worn when around other workers to minimize spread of COVID-19, 3. Hold meetings outside and keep in mind wind direction. To the extent possible, remain cross-wind from other people. 4. Designate a single person to maintain sign-in sheets/permits throughout the day to limit the passing of pens/clipboards between people. 5. Each person should complete their own JSA, even if they are completing similar tasks as others in order to limit the passing of paper/pens/clipboards between people. 6. Include COVID-19 topics and prevention measures in safety meetings.
4. Conduct Site Work	1. Transmittal/exposure of COVID-19 between site workers and public.	1. Practice social distancing maintaining 6 feet of distance between yourself and others. 2. Recommend face coverings are worn when around other workers to minimize spread of COVID-19, 3. To the extent possible, do not interact with the public. If it is necessary, politely explain you are practicing social distance and request they stay at least 6 feet away and they do not attempt to pass objects to you. 4. Wear nitrile gloves during site work underneath the appropriate gloves for your task. Utilize appropriate decontamination procedures, securely bag all waste (including nitrile gloves) generated during site work and dispose of.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		5. Do not share tools. Each person should be equipped with the tools to complete their task or tasks should be divided to remove the need to share tools. If tools must be shared, surfaces should be disinfected. 6. Clean and disinfect surfaces of rental tools and equipment upon receipt. To the extent possible rent equipment from Langan's internal equipment reservation center, where cleaning/disinfecting procedures can be verified.
5. Use of Construction Trailers	1. Transmittal/exposure of COVID-19 between site workers and others.	1. Avoid use of shared trailers, if possible. Minimize trailer use to essential personnel. 2. Practice social distancing; maintaining 6 feet of distance between yourself and others in trailer. 3. Clean and disinfect areas including desks, phones, chairs and other common areas, before and after use.
6. Purchasing Food from a Restaurant	1. Transmittal/exposure of COVID-19 from other customers, staff, surfaces.	1. To the extent possible, bring your own food. 2. If you must visit a restaurant, call ahead for take-out or "contactless delivery". Do not dine in. When picking up food, follow guidelines for Job Step #8: Purchasing Supplies at Retail/Shipping Centers. 3. Wash hands before and after eating.
7. Smoking Cigarettes	1. Transmittal/exposure of COVID-19 by touching mouth with hands	1. Cigarette smokers maybe at greater risk of complications arising from COVID-19. Nicotine patches/lozenges/gum, smoking cessation programs, and prescription medications may aid in "kicking the habit" if you decide to quit. 2. Wash hands thoroughly before and after smoking. 3. Discard cigarette butts properly. Do not light cigarettes from others and do not give cigarettes to others.
8. Hotel Stay	1. Transmittal/exposure of COVID-19 from previous occupants, hotel staff, common areas.	1. Verify the hotel chain/brand has modified cleaning procedures to reflect risk of COVID-19. Most hotel companies have issued statements on their websites and in email blasts reflecting these new procedures. 2. Use the front door, and not peripheral entrances. Front doors of hotels are generally automatic. 3. Request ground floor room to avoid elevator use and a room that has not be utilized in 48-72 hours. 4. If elevator use is required, do not directly touch elevator buttons with your hands. Do not ride elevators with other people, to the extent possible. 5. Bring disinfecting wipes or sanitizing spray. Upon arrival, disinfect high "hand-traffic" areas of the hotel room: Door handles, light switches, shower/sink faucet handles, TV remote, curtain/blind handles. Clean these surfaces daily. 6. Place the "Do Not Disturb" Sign on your door to prevent people (housekeeping) from entering your room. 7. Avoid common spaces and hotel sponsored events where crowds will be present. 8. Confirm hotel cleaning procedures have been modified to address COVID-19. Confirm no COVID-19 cases have occurred in hotel
9. Purchasing Supplies at Retail/Shipping Centers	1. Transmittal/exposure of COVID-19 from other customers, staff, surfaces.	1. Plan your travel to limit the need to visit retail/shipping centers. 2. Practice social distancing, maintaining at least 6 feet of distance between yourself and others. If the store is too crowded/small, consider visiting another store or returning at a different time. 3. Avoid high "hand-traffic" items/areas like door handles (i.e. use your shoulder, hip/butt, or open with a disposable napkin/paper towel), credit cards terminals (i.e. use Apple/Android pay if available), shopping carts/baskets (i.e. bring your own shopping

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		bags), counter tops (i.e. ask clerk if you can hold the items while they are scanned) and bulk/buffet items (i.e. just avoid them). 4. Disinfect your hands before and after visiting a retail/shipping center.

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **Environmental Sampling**
JSA Number: **JSA021-01**

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 preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – ***Stop,*** *what has changed?*

T – ***Think*** *about the task*

E – ***Evaluate*** *potential hazards*

P – ***Plan*** *safe approach*

S - ***Start*** *task /* ***Stop*** *& regroup*

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☐ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☐ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☒ Fire Resistant Clothing	☐ Rubber Boots
☒ Insect/Animal Repellent	☒ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: Tyvek Sleeves				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
1. Drive to sample location	1. Rough/Off Road terrain	1. Pay attention to road conditions such as road erosion, unprotected embankments, and soft road conditions.
2. Sample Collection (Walking)	1. Slip/Trips/Falls 2. Back strains 3. Wildlife (Insects, Stray animals, rodents) 4. Poisonous vegetation	1. Minimize distance to sample area/ Plan route and check surface prior to carrying heavy equipment/ Locate safest access point/ Follow good housekeeping procedures/ Mark significant below grade hazards (holes, trenches) with spray paint or cones/ Wear foot protection with ankle support and gripping soles. 2. Use proper lifting techniques/ Use wheeled transport/ Obtain assistance where and when needed/ Consider load weight when evaluating what is safe and unsafe to carry. 3. Be aware of surroundings for the presence of wildlife. Do not approach stray animals. Carry and use animal repellant when needed/ Use bug spray when needed. 4. Keep skin covered/ Identify and avoid poisonous vegetation/ Clean areas after contact with suspected vegetation.
3. Sample Collection (Water)	1. Drowning Hazards 2. Chemical burns (when adding acid preservative to sample) 3. Back Strains 4. Ergonomic issues 5. Slip/Trips/Falls	1. Use buddy system/ Wear flotation vest if water is deeper than 2 feet or swift moving/ Select working area with stable footing. Do not attempt to cross or stand in swift moving water. 2. Wear proper PPE (Nitrile gloves, Tyvek Sleeves) 3. Use proper lifting techniques/ Use wheeled transport/ Obtain assistance where and when needed/ Consider load weight when evaluating what is safe or unsafe to carry. 4. When possible avoid bending over for long periods of time/ Use a small stool for sitting or knee pad for kneeling.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		5. Minimize distance to sample area/ Plan route and check surface prior to carrying heavy equipment/ Locate safest access point/ Follow good housekeeping procedures/ Mark significant below grade hazards (holes, trenches) with spray paint or cones/ Wear foot protection with ankle support and gripping soles/ Avoid standing water or slippery terrain.
4. 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 10. 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.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

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 preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – *Stop,* what has changed?
T – *Think* about the task
E – *Evaluate* potential hazards
P – *Plan* safe approach
S - *Start* task / *Stop* & regroup

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☒ Safety Goggles	☐ Face Shield	☐ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☒ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: Dielectric Overshoes, Sun Block				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
5. Transport equipment to work area	2. Back/strain 3. Slip/Trip/Falls 4. Traffic 5. Cuts/abrasions/contusions from equipment 6. Accidents due to vehicle operations	1. Use proper lifting techniques/Use wheeled transport 2. Minimize distance to work area/unobstructed path to work area/follow good housekeeping procedures 3. Wear proper PPE (high visibility vest or clothing) 4. Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes) 5. Observe posted speed limits/ Wear seat belts at all times
6. Traffic	1. Hit by moving vehicle	1. Use traffic cones and signage/ Use High visibility traffic vests and clothing/ Caution tape when working near active roadways.
7. Field Work (drilling, resistivity testing, and inspection)	1. Biological Hazards: insects, rats, snakes, poisonous plants, and other animals 2. Heat stress/injuries 3. Cold Stress/injuries 4. High Energy Transmission Lines 5. Underground Utilities 6. Electrical (soil resistivity testing)	1. Inspect work area to identify biological hazards. Wear light colored long sleeve shirt and long pants/ Use insect repellant 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. 2. Wear proper clothing (light colored)/ drink plenty of water/ take regular breaks/use sun block 3. Wear proper clothing/ dress in layers/ take regular breaks. 4. 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).

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		5. 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 6. See AGI Sting R1 operating manual for specific concerns during operating instrument
8. 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 10. Eye Injuries	7. Be aware of potential trip hazards / Follow good housekeeping 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 repellant / Use bug spray when needed 13. Wear proper hearing protection 14. Wear hard hat / Avoid areas were 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.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

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 preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – ***Stop,*** *what has changed?*
T – ***Think*** *about the task*
E – ***Evaluate*** *potential hazards*
P – ***Plan*** *safe approach*
S - ***Start*** *task /* ***Stop*** *& regroup*

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☐ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☒ Traffic Cones/Signs	☐ Life Vest/Jacket	
☐ Other:				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
9. Unpack/Transport equipment to work area.	7. Back Strains 8. Slip/Trips/Falls 9. Cuts/Abrasions from equipment 10. Contusions from dropped equipment	6. Use proper lifting techniques/Use wheeled transport 7. Minimize distance to work area/Unobstructed path to work area/follow good housekeeping procedures. Mark slip/trip/fall hazards with orange safety cones. 8. Wear proper PPE (leather gloves, long sleeves). 9. Wear proper PPE (Langan approved safety shoes).
10. Initial Site Arrival-Site Assessment	5. Traffic	5. Situational awareness (be alert of your surroundings). Secure area from through traffic.
11. Surface Water Sampling	6. Contaminated media. Skin/eye contact with biological agents and/or chemicals.	6. Wear appropriate PPE (Safety glasses, appropriate gloves). Review (M)SDS for all chemicals being.
12. Sampling from bridges	1. Struck by vehicles	1. Wear appropriate PPE (Safety Vest). Use buddy system and orange safety cones.
13. Icing of Samples/ Transporting coolers/equipment from work area.	11. Back Strains 12. Slips/Trips/Falls 13. Cuts/Abrasions from equipment 14. Pinch/Crushing Hazards.	17. Drain coolers of water. Use proper lifting techniques. Use wheeled transport. 18. Have unobstructed path from work area. Aware of surroundings. 19. Wear proper PPE (Leather gloves, long sleeves) 20. Wear proper PPE (Leather gloves, long sleeves)
14. 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.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
15. All activities	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual handling of materials 3. Foot injuries 4. 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 21. Wear high visibility clothing & vest / Use cones or signs to designate work area 22. 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 23. Wear hearing protection 24. Wear hard hat / Avoid areas were overhead hazards exist. 25. 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 26. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN	Job Safety Analysis (JSA) Health and Safety
JSA Title: Equipment Transportation and Set-up **JSA Number:** JSA012-01	 **S** – ***Stop,*** *what has changed?* **T** – ***Think*** *about the task* **E** – ***Evaluate*** *potential hazards* **P** – ***Plan*** *safe approach* **S** - ***Start*** *task /* ***Stop*** *& regroup*
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 preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.	

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☐ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☐ Other:				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
16. Transport equipment to work area	11. Back Strain 12. Slips/ Trips/ Falls 13. Traffic 14. Cuts/abrasions from equipment 15. Contusions from dropped equipment	1. Use proper lifting techniuqes / Use wheeled transport 2. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 3. Wear proper PPE (high visibility vest or clothing) 4. Wear proper PPE (leather gloves, long sleeves) 5. Wear proper PPE (safety shoes)
17. Moving equipment to its planned location	6. Pinch Hazard 7. Slips/ Trips/ Falls	1. Wear proper PPE (leather gloves) 2. Be aware of potential trip hazards / Practice good housekeeping procedures / Mark significant below-grade hazards (i.e. holes, trenches) with safety cones or spray paint
18. Equipment Set-up	7. Pinch Hazard 8. Cuts/abrasions to knuckles/hands 9. Back Strain	1. Wear proper PPE (leather gloves) 2. Wear proper PPE (leather gloves) 3. Use proper lifting techniques / Use wheeled transport
19. All activities	21. Slips/ Trips/ Falls 22. Hand injuries, cuts or lacerations during manual handling of materials 23. Foot injuries 24. Back injuries 25. Traffic 26. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.)	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

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
4. All activities (cont'd)	27. High Noise levels 28. Overhead hazards 29. Heat Stress/ Cold Stress 30. Eye Injuries	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 repellant / Use bug spray when needed 33. Wear hearing protection 34. Wear hard hat / Avoid areas were 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 / Takes 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.)		

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **55-gallon Drum Sampling**
JSA Number: **JSA043-01**

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 preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – ***Stop,*** *what has changed?*
T – ***Think*** *about the task*
E – ***Evaluate*** *potential hazards*
P – ***Plan*** *safe approach*
S - ***Start*** *task /* ***Stop*** *& regroup*

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☐ Hearing Protection
☒ Safety Glasses	☒ Safety Goggles	☒ Face Shield	☒ Nitrile Gloves	☒ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: All Drums are required to be labeled. Langan employees do not open or move undocumented drums or unlabeled drums without proper project manager authorization.				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
20. Unpack/Transport equipment to work area.	16. Back Strains 17. Slip/Trips/Falls 18. Cuts/Abrasions from equipment 4. Contusions from dropped equipment	10. Use proper lifting techniques/Use wheeled transport 11. Minimize distance to work area/Unobstructed path to work area/follow good housekeeping procedures. Mark slip/trip/fall hazards with orange safety cones. 12. Wear proper PPE (leather gloves, long sleeves). 4. Wear proper PPE (Langan approved safety shoes).
21. Open Drums	1. Hand Injuries, cuts or lacerations when untightening drum locking bolt, removing drum lid strap, or removing lid. 2. Pressure from drums.	1. 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. Use non-metallic mallet and non-sparking tools/wrenches. 2. Open drum slowly to relieve pressure. Wear proper PPE: face shield and goggles; correct gloves; and over garments.
22. Collecting Soil/Fluid Sample	8. Irritation to eye from vapor, soil dust, or splashing 9. Irritation to exposed skin	6. Wear proper eye protection including safety glasses/ face shield/googles and when necessary, splash guard. If dust or vapor phase is present, wear appropriate safety breathing gear (1/2 mask or full face mask with correct filter) 7. Wear proper skin protection including nitrile gloves.
23. Closing Drums	1. Hand Injuries, cuts or lacerations when untightening drum locking bolt, removing drum lid strap, or removing lid.	7. 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. Use non-metallic mallet and non-sparking tools/wrenches.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
24. Moving Drums	2. Hand Injuries, cuts or lacerations when untightening drum locking bolt, removing drum lid strap, or removing lid. 3. Back Strains	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. Use non-metallic mallet and non-sparking tools/wrenches. 3. Use proper lifting techniques/Use wheeled transport
25. All activities	31. Slips/ Trips/ Falls 32. Hand injuries, cuts or lacerations during manual handling of materials 33. Foot injuries 34. Back injuries 35. Traffic 36. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 37. High Noise levels 38. Overhead hazards 39. Heat Stress/ Cold Stress 40. Eye Injuries	37. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 38. 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 39. Wear Langan approved safety shoes 40. 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 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 repellant / Use bug spray when needed 43. Wear hearing protection 44. Wear hard hat / Avoid areas were 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.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

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 preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – ***Stop,*** *what has changed?*
T – ***Think*** *about the task*
E – ***Evaluate*** *potential hazards*
P – ***Plan*** *safe approach*
S - ***Start*** *task /* ***Stop*** *& regroup*

PERSONAL PROTECTIVE EQUIPMENT REQUIRED:				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☒ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: Half-face respirator, dust cartridges, PID (if applicable)				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
26. Move equipment to work site	19. Back strain when lifting equipment 20. Slips/ Trips/ Falls while moving equipment 21. Traffic (if applicable) 22. Pinched fingers or running over toes during geoprobe set-up 23. Overturn drilling rig while transporting to loading dock on flat-bed tow truck	13. 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 14. 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 15. Wear high visibility safety vests or clothing / Exercise caution 16. Wear proper PPE (cut-resistant gloves) / Stay alert, be aware of geoprobe rig at all times 17. 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
27. Calibration of monitoring equipment	10. Skin or eye contact with calibration chemicals 11. Pinch fingers in monitoring equipment	8. Wear proper PPE (safety glasses/ goggles) 9. Wear proper PPE (leather gloves)
28. Set-up geoprobe rig	10. Geoprobe rig movement	8. All field personnel should stay clear of the geoprobe rig while moving / Use a spotter when backing up the geoprobe
29. Advance geoprobe rods below ground surface to desired depth	4. Underground utilities 5. High noise levels	4. Clean all subsurface soil borings to a minimum of 5 feet below grade 5. Wear proper PPE (hearing protection)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
30. Remove and open acetate liner 5. Remove and open acetate liner (cont'd)	41. Pinched fingers while removing macrocore 42. Cuts/lacerations when cutting acetate liner open 43. Exposure to hazardous vapors 44. Skin contact with contaminated soil	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 4. Wear proper PPE (nitrile gloves)
31. 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 6. Use proper lifting techniques / Do not lift heavy loads without assistance 7. 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 8. Be alert / Follow good housekeeping procedures
32. 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)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
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	47. Use drum cart for moving drums / Use proper lifting techniques / Do not lift heavy loads without assistance 48. Wear proper PPE (cut-resistant or leather gloves) 49. Wear proper PPE (cut-resistant or leather gloves) 50. Wear proper PPE (nitrile gloves underneath work gloves) 51. Follow good housekeeping procedures / Ensure route to move drum and storage space is free from obstructions 52. Wear proper PPE (safety shoes) / Work in a safe manner to prevent dropped drum
9. All activities 9. All activities (cont'd)	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 10. 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.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date

Prepared by:		
Reviewed by:		

LANGAN	Job Safety Analysis (JSA) Health and Safety
JSA Title: Sub-slab soil gas temporary point installation and sampling **JSA Number:** JSA037-01	
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 preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.	

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☐ Hearing Protection
☒ Safety Glasses	☒ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☒ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☒ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: Tyvek Sleeves				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
33. Transport equipment to work site	24. Back injuries 25. Slips/Trips/Falls 26. Traffic 27. Hand injuries	18. Use proper lifting techniques/ Use wheeled transport/ Get assistance when need with moving equipment/ Minimize distance from vehicle 19. Minimize distance from vehicle/ Have unobstructed pathway to vehicle and collection points/ Mark tripping hazards with spray paint, cones, or caution tape/ Observe good housekeeping procedures. 20. Wear proper PPE (High Visibility vest and clothing)/ Exercise caution (stay alert-stay alive) 21. Wear proper PPE (leather gloves)/ Keep finger and hands clear of pinch points.
34. Mark area for drilling	12. Slips/Trips/Falls	10. Minimize distance from vehicle/ Have unobstructed pathway to vehicle and collection points/ Mark tripping hazards with spray paint, cones, or caution tape/ Observe good housekeeping procedures
35. Drill sampling points with hammer drill	11. Eye injuries 12. Dust exposure 13. Hand injuries 14. Catch items (clothing) 15. Electric shock 16. Chemical atmosphere hazard (vapor) 17. Slips/Trips/Falls	9. Wear proper PPE (safety glasses) 10. Wear proper PPE (dust mask) 11. Wear proper PPE (leather gloves)/ Keep hands and fingers out of pinch points/ Avoid drill catching on ground and twisting wrist or hand/ Release drill grip if drill becomes caught/ Ensure drill is unplugged prior to inserting bit. 12. Tie up or tuck-in all loose clothing/ Maintain distance from drill 13. Inspect power cable for cuts or nicks before use/ Use GFCI outlet on power cord/ Do not use in wet conditions 14. Monitor air, vapors with Photo-ionization detector (PID)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		15. Minimize distance from vehicle/ Have unobstructed pathway to vehicle and collection points/ Mark tripping hazards with spray paint, cones, or caution tape/ Observe good housekeeping procedures
36. Measure vapor content and depth to bottom of hole	1. Chemical atmosphere hazard (vapors)	1. Monitor air, vapors with Photo-ionization detector (PID)/ Keep face away from opening of hole while collecting measurements
37. Set-up of shroud and sampling canister system	1. Hand injuries 2. Chemical atmosphere hazard (vapors) 3. Slips/Trips/Falls	1. Wear proper PPE (leather gloves, nitrile gloves)/ Keep fingers away from pinch points when installing pump/ Do not use open blades, use tubing cutter 2. Monitor air, vapors with Photo-ionization detector (PID)/ Keep face away from opening of hole while collecting measurements 3. Minimize distance from vehicle/ Have unobstructed pathway to vehicle and collection points/ Mark tripping hazards with spray paint, cones, or caution tape/ Observe good housekeeping procedures
38. Purge soil gas	1. Chemical atmosphere hazard (vapors)	1. Monitor air, vapors with Photo-ionization detector (PID)/ Keep face away from exhaust port of pump
39. Sample collection (opening and closing valves)	1. Hand injuries	1. Wear proper PPE (leather gloves)/ Keep fingers away from pinch points
40. Sealing sampling holes	1. Back injuries 2. Concrete dust 3. Eye injuries	1. Use proper lifting techniques for lifting of cement bags 2. Wear proper PPE (dust mask) 3. Wear proper PPE (safety glasses)
41. All activities	45. Slips/ Trips/ Falls 46. Hand injuries, cuts or lacerations during manual handling of materials 47. Foot injuries 48. Back injuries 49. Traffic 50. Wildlife: Stray animals, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 51. High Noise levels 52. Overhead hazards 53. Heat or cold injuries 54. Eye Injuries	53. Be aware of potential trip hazards/ Follow good housekeeping procedures/ Mark significant hazards 54. 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 Wear proper PPE (Langan approved safety shoes) 55. 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 56. Wear high visibility clothing & vest/ Use cones or signs to designate work area 57. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray animals/ Carry and use animal repellant when needed/ Use bug spray when needed 58. Wear hearing protection 59. Wear hard hat/ Avoid areas were overhead hazards exist. 60. 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 61. Wear safety glasses

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

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: Indoor Air Sampling
JSA Number: JSA007-01

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 preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – *Stop,* what has changed?
T – *Think* about the task
E – *Evaluate* potential hazards
P – *Plan* safe approach
S - *Start* task / *Stop* & regroup

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☒ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: PID, Respiratory Protection (if necessary)				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
42. Building walkthrough and background contaminant removal	28. Slips / Trips/ Falls 29. Exposure to substances/vapors during removal	6. Be aware of potential trip hazards / Follow good housekeeping procedures / Mark significant below-grade hazards (i.e. holes, trenches) with safety cones or spray paint 7. Monitor indoor air concentrations with a PID / Wear proper PPE (nitrile gloves) / Wear proper respiratory protection if necessary
43. Transport equipment to work area	1. Back Strain 2. Slips/ Trips/ Falls 3. Traffic 4. Cuts/abrasions from equipment 5. Contusions from dropped equipment	1. Use proper lifting techniques / Use wheeled transport 2. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 3. Wear proper PPE (high visibility vest or clothing) 4. Wear proper PPE (leather gloves, long sleeves) 5. Wear proper PPE (safety shoes)
44. Mark out areas for indoor air sampling	13. Slips/ Trips/ Falls	3. Be aware of potential trip hazards / Follow good housekeeping procedures / Mark significant below-grade hazards (i.e. holes, trenches) with safety cones or spray paint
45. Set-up canisters and begin indoor air sampling	18. Dropping crates or canisters 19. Pinch hazard	5. Exercise caution when moving crates and canisters / Use proper housekeeping of materials during sample events / Do not carry too many items at one time / Perform several trips, if necessary 6. Wear proper PPE (leather gloves)
46. Sample collection	1. Dropping crates or canisters 2. Pinched fingers from opening valves	1. Exercise caution when moving crates and canisters / Use proper housekeeping of materials during sample events / Do not carry too many items at one time / Perform several trips, if necessary 2. Wear proper PPE (leather gloves) / Keep fingers away from pinch points
47. Pack up equipment	1. Back strain	1. Use proper lifting techniques / Use wheeled transport

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	2. Slips/ Trips/ Falls 3. Traffic	2. Be aware of potential trip hazards / Follow good housekeeping procedures / Minimize distance to vehicle 3. Wear proper PPE (safety vest)
48. All activities	55. Slips/ Trips/ Falls 56. Hand injuries, cuts or lacerations during manual handling of materials 57. Foot injuries 58. Back injuries 59. Traffic 60. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 61. High Noise levels 62. Overhead hazards 63. Heat Stress/ Cold Stress 64. Eye Injuries	62. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 63. 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 64. Wear Langan approved safety shoes 65. 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 66. Wear high visibility clothing & vest / Use cones or signs to designate work area 67. 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 68. Wear hearing protection 69. Wear hard hat / Avoid areas were overhead hazards exist. 70. 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 71. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: Hammer Drill
JSA Number: JSA049

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 preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – ***Stop,*** *what has changed?*
T – ***Think*** *about the task*
E – ***Evaluate*** *potential hazards*
P – ***Plan*** *safe approach*
S - ***Start*** *task /* ***Stop*** *& regroup*

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☒ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☒ Traffic Cones/Signs	☐ Life Vest/Jacket	
☐ Other:				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
49. Transport equipment to work area	30. Back Strain 31. Slips/ Trips/ Falls 32. Traffic 33. Cuts/abrasions from equipment 34. Contusions from dropped equipment	8. Use proper lifting techniques / Use wheeled transport 9. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 10. Wear proper PPE (high visibility vest or clothing) 11. Wear proper PPE (leather gloves, long sleeves) 12. Wear proper PPE (safety shoes)
50. Electrical Connection	14. Inspect electrical cord to drill 15. Inspect hammer drill 16. Inspect extension cord 17. Test GFCI	4. Check the plug, insure all connections are in place, check cord for frayed sections. If plug or cord are worn, do not use equipment until repaired 5. Inspect chuck for proper grasping and holding of bit, check that plastic housing is not cracked or missing pieces. Do not use if chuck doesn't work properly or housing is compromised. 6. Inspect extension cord, if worn or stripped pull from service and replace 7. Test GFCI, replace if GFCI fails
51. Drill Bit	1. Inspect drill bit	1. Replace if worn 2. Wear proper PPE (leather gloves) when installing and removing drill bit. 3. Ensure equipment is unplugged from electrical power when removing and installing drill bit.
52. Use of Hammer Drill	1. Hazards associated with using hammer drill, flying objects, heavy equipment, ground level hazards and dust 2. Slips/ Trips/ Falls 3. Hazards associated drilling into concrete slab	1. Maintain a safe distance from other site operations / Wear proper PPE (hard hat, safety glasses, safety shoes, safety vest, ear protection and leather gloves) 2. Be aware of potential trip hazards / Follow good housekeeping procedures / Mark extension chord pathway with safety cones 3. Do not push hammer drill during use.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
53. All activities 4. All activities (cont'd)	65. Slips/ Trips/ Falls 66. Hand injuries, cuts or lacerations during manual handling of materials 67. Foot injuries 68. Back injuries 69. Traffic 70. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 71. High Noise levels 72. Overhead hazards 73. Heat Stress/ Cold Stress 74. Eye Injuries	72. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 73. 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 74. Wear Langan approved safety shoes 75. 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 76. Wear high visibility clothing & vest / Use cones or signs to designate work area 77. 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 78. Wear hearing protection 79. Wear hard hat / Avoid areas were overhead hazards exist. 80. 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 81. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN	Job Safety Analysis (JSA) Health and Safety
JSA Title: Geophysical Investigation **JSA Number:** JSA023-01	 **S** – ***Stop,*** *what has changed?* **T** – ***Think*** *about the task* **E** – ***Evaluate*** *potential hazards* **P** – ***Plan*** *safe approach* **S** - ***Start*** *task /* ***Stop*** *& regroup*
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 preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.	

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☒ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☐ Other:				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
54. Transport equipment to work area	35. Back/strain 36. Slip/Trip/Falls 37. Traffic 38. Cuts/abrasions/contusions from equipment	22. Use proper lifting techniques/Use wheeled transport 23. Minimize distance to work area/unobstructed path to work area/follow good housekeeping procedures 24. Wear proper PPE (high visibility vest or clothing) 25. Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes)
55. Supervision of subcontractor and all other activities	18. Slip/Trips/Falls 19. Hand injuries 20. Foot injuries 21. Back injuries/Strains 22. Traffic 23. Wildlife a. Wildlife b. Mice/rats c. Vectors (i.e. mosquitoes, bees, etc.) 7. Heat/Cold Stress	11. 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. 12. 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. 13. Wear proper PPE (Langan approved safety shoes)/ Be aware of uneven terrain) 14. Use proper lifting techniques/ Buddy system when lifting/ use wheeled transport. 15. Wear proper PPE (high-visibility shirts and vests)/ use cones if appropriate/ notify equipment operators of work area. 16. Be aware of surroundings at all times for the presence of wildlife. a. Do not approach stray animals b. Carry animal repellant/ use if situation arises. c. Use bug spray when needed. 7. Wear proper attire for weather conditions (sunscreen, protective clothing in

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		sunlight or layer clothing in cold weather)/ drink plenty of fluids/ take regular breaks.
56. All activities	75. Slips/ Trips/ Falls 76. Hand injuries, cuts or lacerations during manual handling of materials 77. Foot injuries 78. Back injuries 79. Traffic 80. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 81. High Noise levels 82. Overhead hazards 83. Heat Stress/ Cold Stress 84. Eye Injuries	82. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 83. 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 84. Wear Langan approved safety shoes 85. 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 86. Wear high visibility clothing & vest / Use cones or signs to designate work area 87. 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 88. Wear proper hearing protection 89. Wear hard hat / Avoid areas were overhead hazards exist. 90. 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 91. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

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 preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – ***Stop,*** *what has changed?*
T – ***Think*** *about the task*
E – ***Evaluate*** *potential hazards*
P – ***Plan*** *safe approach*
S - ***Start*** *task /* ***Stop*** *& regroup*

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☒ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: Tyvek sleeves, Dermal Protection, PID				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
57. Transport equipment to work area	6. Back Strain 7. Slips/ Trips/ Falls 8. Traffic 9. Cuts/abrasions from equipment 10. Contusions from dropped equipment	6. Use proper lifting techniques / Use wheeled transport 7. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 8. Wear proper PPE (high visibility vest or clothing) 9. Wear proper PPE (leather gloves, long sleeves) 10. Wear proper PPE (safety shoes)
58. Remove well cover	24. Scrape knuckles/hand 25. Strain wrist/bruise palm 26. Pinch fingers or hand	8. Wear proper PPE (leather gloves) 9. Using a hammer, tap the end of the wrench to loosen grip of bolts 10. Wear proper PPE (leather gloves)
59. Remove well cap and lock	20. Well can pops from pressure 21. Exposure to hazardous substances through inhalation or dermal exposure 22. Scrape knuckles/hand 23. Strain write/bruise palm	7. Remove cap slowly to relieve pressure / Do not place face over well when opening / Wear proper PPE (safety glasses) 8. Use direct air monitoring/reading instrument (i.e. PID) / Be familiar with and follow actions prescribed in the HASP / Wear proper PPE (nitrile gloves) 9. Wear proper PPE (leather gloves) 10. Using hammer, tap the end of the wrench to loosen grip
60. Measure head-space vapor levels	3. Exposure to hazardous substances through inhalation	3. Do not place face over well when collecting measurement
61. Remove dedicated tubing (if necessary)	4. Exposure to hazardous substances through inhalation or dermal exposure 5. Tubing swings around after removal	4. Wear proper PPE (nitrile gloves, Tyvek sleeves) 5. Wear proper PPE (safety glasses)
62. Set-up plastic sheeting for work site around the well	1. Lacerations when cutting plastic sheeting	1. Use scissors to cut plastic sheeting / Cut motions should always be away from body and body parts

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
63. Measure depth to water	1. Exposure to hazardous substances through inhalation or dermal exposure 2. Pinch fingers or hand in water level instrument	1. Wear proper PPE (nitrile gloves) 2. Wear proper PPE (leather gloves)
64. Calibrate monitoring equipment	1. Skin or eye contact with calibration chemicals 2. Pinch fingers or hand in monitoring equipment	1. Wear proper PPE (safety glasses, nitrile gloves) 2. Wear proper PPE (leather gloves) / Avoid pinch points
65. Install sampling pump in well	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	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

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
10. Purge water	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	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	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	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	1. Back strain when removing pump or lifting heavy equipment	1. Use proper lifting technique / Use wheeled transport for heavy equipment
13. Replace well cap and lock	1. Scrape fingers/hand 2. Strain wrist/bruise palm	1. Wear proper PPE (leather gloves) 2. Using hammer, tap the end of the well cap to tighten grip
14. Replace well cover	1. Scrape knuckles/hand 2. Strain write/bruise palm 3. Pinch fingers or hand	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	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	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 designated disposal drum	1. Pressure build-up inside drum 2. Pinch hazard	1. Remove cap from bung hole in drum to relieve pressure 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	85. Slips/ Trips/ Falls 86. Hand injuries, cuts or lacerations during manual handling of materials 87. Foot injuries 88. Back injuries 89. Traffic 90. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.)	92. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 93. 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 94. Wear Langan approved safety shoes

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	91. High Noise levels 92. Overhead hazards 93. Heat Stress/ Cold Stress 94. Eye Injuries	95. 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 96. Wear high visibility clothing & vest / Use cones or signs to designate work area 97. 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 98. Wear hearing protection 99. Wear hard hat / Avoid areas were overhead hazards exist. 100. 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 101. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN	Job Safety Analysis (JSA) Health and Safety
JSA Title: Well Installation **JSA Number: JSA019-01**	 **S** – ***Stop,*** *what has changed?* **T** – ***Think*** *about the task* **E** – ***Evaluate*** *potential hazards* **P** – ***Plan*** *safe approach* **S** - ***Start*** *task /* ***Stop*** *& regroup*
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 preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.	

PERSONAL PROTECTIVE EQUIPMENT REQUIRED:				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: PID, Tyvek sleeves				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
66. Move equipment to work site	39. Back strain when lifting equipment 40. Slips/ Trips/ Falls while moving equipment 41. Traffic (if applicable) 42. Pinched fingers or running over toes during geoprobe set-up 43. Overturn drilling rig while transporting to loading dock on flat-bed tow truck	26. 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 27. 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 28. Wear high visibility safety vests or clothing / Exercise caution 29. Wear proper PPE (cut-resistant gloves) / Stay alert, be aware of geoprobe rig at all times 30. 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
67. Calibration of monitoring equipment	27. Skin or eye contact with calibration chemicals 28. Pinch fingers in monitoring equipment	17. Wear proper PPE (safety glasses/ goggles) 18. Wear proper PPE (leather gloves)
19. Set-up geoprobe rig	24. Geoprobe rig movement	16. All field personnel should stay clear of the geoprobe rig while moving / Use a spotter when backing up the geoprobe
20. Advance geoprobe rods below ground surface to desired depth	6. Underground utilities 7. High noise levels	9. Clean all subsurface soil borings to a minimum of 5 feet below grade 10. Wear proper PPE (hearing protection)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
21. Remove and open acetate liner 5. Remove and open acetate liner (cont'd)	95. Pinched fingers while removing macrocore 96. Cuts/lacerations when cutting acetate liner open 97. Exposure to hazardous vapors 98. Skin contact with contaminated soil	5. Wear proper PPE (nitrile gloves, cut-resistant or leather gloves 6. Wear proper PPE (cut-resistant or leather gloves) 7. 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 8. Wear proper PPE (nitrile gloves)
6. Remove excess soil from acetate liner and place in 55-gallon drum (IF NOT PERFORMED BY LANGAN, REMOVE!)	5. Cuts/lacerations from acetate liner 6. Pinched fingers/hand while opening/closing drum 7. Skin contact with contaminated soil 8. Soil debris in eyes	5. Wear proper PPE (cut-resistant or leather gloves) 6. Wear proper PPE (cut-resistant or leather gloves) 7. Wear proper PPE (nitrile gloves) 8. Wear proper PPE (safety glasses)
7. Attach hollow-stem augers to the geoprobe rig; Advance augers and attach additional augers until desired depth is reached	1. Strain wrist/bruise palm 2. Pinched fingers 3. Back Strain 4. Clothing entanglement 5. Carbon monoxide poisoning 6. Bruise toes/foot 7. High noise levels 8. Skin contact with contaminated soil	1. Wear proper PPE (cut-resistant or leather gloves) 2. Wear proper PPE (cut-resistant or leather gloves) 3. Use proper lifting techniques 4. Wear proper work attire(no loose clothing/strings) 5. Properly ventilate work area 6. Wear proper PPE (safety shoes) 7. Wear proper PPE (hearing protection) 8. Wear proper PPE (Tyvek sleeves, nitrile gloves)
8. Install monitoring well	1. Pinched fingers 2. Lacerations/abrasions 3. Back Strain	1. Wear proper PPE (cut-resistant or leather gloves) 2. Wear proper PPE (cut-resistant or leather gloves) 3. Use proper lifting techniques
9. Tremie-grout annulus space above bentonite seal	1. Back strain 2. Pinched fingers	1. Use proper lifting techniques 2. Wear proper PPE (cut-resistant or leather gloves)
10. Install flush-mount monitoring well pad	1. Splashed concrete 2. Pinched fingers 3. Cuts/lacerations	1. Wear proper PPE (safety glasses) 2. Wear proper PPE (cut-resistant or leather gloves) 3. Wear proper PPE (cut-resistant or leather gloves)
11. Decontaminate equipment	1. Splashing water/soap 2. Contact with potentially contaminated groundwater/soil 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
12. Transport drums to central staging location (IF NOT PERFORMED BY LANGAN, REMOVE!)	7. Back, arm or shoulder strain from moving drums 8. Pinch fingers/hand in drum cart when moving drums 9. Pinch fingers/hand when operating lift-gate on vehicle 10. Contact with potentially contaminated groundwater when moving improperly sealed drums 11. Slips when moving drums 12. Drop drum on feet/toes	102. Use drum cart for moving drums / Use proper lifting techniques / Do not lift heavy loads without assistance 103. Wear proper PPE (cut-resistant or leather gloves) 104. Wear proper PPE (cut-resistant or leather gloves) 105. Wear proper PPE (nitrile gloves underneath work gloves) 106. Follow good housekeeping procedures / Ensure route to move drum and storage space is free from obstructions 107. Wear proper PPE (safety shoes) / Work in a safe manner to prevent dropped drum

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
13. All activities 13. All activities (cont'd)	11. Slips/ Trips/ Falls 12. Hand injuries, cuts or lacerations during manual handling of materials 13. 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	11. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 12. 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 13. Wear Langan approved safety shoes 14. 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 15. Wear high visibility clothing & vest / Use cones or signs to designate work area 16. 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 17. Wear hearing protection 18. Wear hard hat / Avoid areas were overhead hazards exist. 19. 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 20. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

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 preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – *Stop*, what has changed?
T – *Think* about the task
E – *Evaluate* potential hazards
P – *Plan* safe approach
S - *Start* task / *Stop* & regroup

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☐ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☒ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☒ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: Tyvek Sleeves				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
68. Transport equipment to work area	44. Back Strains 45. Slips/Trips/Falls 46. Traffic 47. Cuts/Abrasions/Contusions from equipment	31. Use proper lifting techniques/ Use wheeled transport/ use buddy system when lifting equipment. 32. Minimize distance from work area/ unobstructed path to collection points and vehicle/ Follow good housekeeping procedures. 33. Wear high-visibility vest or clothing/Exercise caution/ Use traffic cones or signage if needed. 34. Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes).
69. Measure depth of water	29. Exposure to hazardous substances 30. Pinched fingers	22. Wear proper PPE (Nitrile gloves, Safety glasses/Face shield). 23. Wear proper PPE (cut-resistant gloves).
70. Install Tremie pipe in the monitoring well and connect to water source.	25. Hand injuries during installation (pinched fingers/hands). 26. Back strain from holding Tremie pipe. 27. High pressure water spray.	17. Wear proper PPE (Nitrile gloves/cut-resistant gloves). 18. Use proper lifting techniques/ Use two personnel when lowering pump greater than 80 feet. 19. Ensure all hose connections are tight and secure/ Use proper PPE (face shield and safety glasses).
71. 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	8. Hand injuries during pump installation and sample tubing cutting. 9. Back strain 10. Electric shock 11. Exhaust gases from generator 12. Burns from hot equipment	11. Wear proper PPE when installing pump and cutting sample tubing (Nitrile and cut-resistant gloves)/ Use tubing cutter. 12. 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. 13. Ensure equipment is (LO/TO: locked out/tagged out) prior to preforming any electrical connections/ Inspect wires for frays or cuts/Ensure generator is properly grounded prior to starting.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
(generator) e. Turn on power source (generator)		14. Position generator so that exhaust is flowing away from work area. 15. 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)
72. Develop monitoring well 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.	99. Hand injuries 100. Face injuries 101. Contaminated spray from water	108. Wear proper PPE (cut-resistant gloves and nitrile gloves). 109. Wear proper PPE (face shield and safety glasses)/do not stand over well opening. 110. 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.
73. 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.
74. 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. 111. Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes).
75. All activities	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual handling of materials 3. Foot injuries 102. Back injuries 103. Traffic 104. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 105. High Noise levels 106. Overhead hazards 107. Heat Stress/ Cold Stress 108. 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

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

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **Excavation Oversight**
JSA Number: **JSA041-01**

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 preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – ***Stop,*** *what has changed?*
T – ***Think*** *about the task*
E – ***Evaluate*** *potential hazards*
P – ***Plan*** *safe approach*
S - ***Start*** *task /* ***Stop*** *& regroup*

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☒ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☐ Other:				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
76. Transport equipment to work area	48. Back Strain 49. Slips/Trips/Falls 50. Traffic 51. Cuts/abrasions/contusions from equipment	35. Use proper lifting techniques / Use wheeled transport 36. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 37. Wear proper PPE (high visibility vest or clothing) 38. Wear proper PPE (leather gloves, long sleeves, safety shoes)
77. Earth Moving Equipment	31. Equipment running over employee	24. Ensure you have direct line of sight with operator of equipment; don't walk behind equipment; maintain a safe distance away from equipment. 25. Wear proper PPE (high vis vest/clothing)
78. Excavation	28. Excavation collapse 29. Confined space 30. Soil	20. Use proper shoring/benching/sloping techniques; Ladder is properly situated in excavation; no water in excavation; competent person has inspected excavation prior to allow employees to enter. 21. Langan employees are not authorized to enter a confined space; 22. Soil and equipment is kept atleast 2 feet from edge of excavation
79. Excavated soil	1. Hazardous substances	1. Use proper equipment to monitor excavated soil for contaminates; ensure levels do not exceed PEL's for contaminates; Wear proper PPE
80. All activities	109. Slips/ Trips/ Falls 110. Hand injuries, cuts or lacerations during manual handling of materials 111. Foot injuries 112. Back injuries 113. Traffic	112. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 113. 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 114. Wear proper PPE (Langan approved safety shoes)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	114. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 115. High Noise levels 116. Overhead hazards 117. Heat Stress/ Cold Stress 118. Eye Injuries	115. 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 116. Wear high visibility clothing & vest / Use cones or signs to designate work area 117. 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 118. Wear hearing protection 119. Wear hard hat / Avoid areas were overhead hazards exist. 120. 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 121. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: General Construction Activities
JSA Number: JSA010-01

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 preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – ***Stop,*** *what has changed?*
T – ***Think*** *about the task*
E – ***Evaluate*** *potential hazards*
P – ***Plan*** *safe approach*
S - ***Start*** *task /* ***Stop*** *& regroup*

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☒ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☒ Traffic Cones/Signs	☐ Life Vest/Jacket	
☐ Other:				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
81. Transport equipment to work area	52. Back Strain 53. Slips/ Trips/ Falls 54. Traffic 55. Cuts/abrasions from equipment 56. Contusions from dropped equipment	13. Use proper lifting techniques / Use wheeled transport 14. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 15. Wear proper PPE (high visibility vest or clothing) 16. Wear proper PPE (leather gloves, long sleeves) 17. Wear proper PPE (safety shoes)
82. Installation of piping from vapor wells to skid connections and from discharge pipping to effluent stack	32. Pinch fingers when connecting pipes 33. Slips/ Trips/ Falls 34. Machinery Hazards	11. Wear proper PPE (leather gloves) 12. Be aware of potential trip hazards / Practice good housekeeping procedures / Mark significant below-grade hazards (i.e. holes, trenches) with safety cones or spray paint 13. Wear proper PPE (safety vest) / Maintain safe distance from operating machinery
83. Remediation equipment installation	31. Back strain when lifting heavy equipment 32. Slips/ Trips/ Falls 33. Traffic	11. Use proper lifting techniques / Use wheeled transport / Minimize distance to vehicle 12. Be aware of potential trip hazards / Practice good housekeeping procedures / Mark significant below-grade hazards (i.e. holes, trenches) with safety cones or spray pain 13. Wear proper PPE (safety vest)
84. All activities	119. Slips/ Trips/ Falls 120. Hand injuries, cuts or lacerations during manual handling of materials 121. Foot injuries 122. Back injuries 123. Traffic	122. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 123. 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 124. Wear Langan approved safety shoes

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
4. All activities (cont'd)	124. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 125. High Noise levels 126. Overhead hazards 127. Heat Stress/ Cold Stress 128. Eye Injuries	125. 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 126. Wear high visibility clothing & vest / Use cones or signs to designate work area 127. 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 128. Wear hearing protection 129. Wear hard hat / Avoid areas were overhead hazards exist. 130. 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 131. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

ATTACHMENT H

TAILGATE SAFETY BRIEFING FORM

LANGAN TAILGATE SAFETY BRIEFING

Date:_____ Time: _____

Leader:_____ Location:_____

Work Task:

_____

_____

SAFETY TOPICS (*provide some detail of discussion points*)

Chemical Exposure Hazards and Control:_____

_____

Physical Hazards and Control: _____

Air Monitoring: _____

PPE: _____

_____

Communications:_____

Safe Work Practices: _____

_____

Emergency Response: _____

Hospital/Medical Center Location: _____

Phone Nos.: _____

Other: _____

FOR FOLLOW-UP (the issues, responsibilities, due dates, etc.**)**

_____

_____

_____

ATTENDEES

PRINT NAME	COMPANY	SIGNATURE

APPENDIX B
COMMUNICATION TEST SITE OBSERVATION REPORTS

SITE OBSERVATION REPORT

PROJECT No.:	170157201	**CLIENT:**	Whitehead Company	**DATE:**	09/20/2021
LOCATION:	Brooklyn, NY			**WEATHER:**	Partial clouds, 60s-70s°F Wind: NE @ 0-13 mph
PROJECT:	Former Acme Steel/Metal Works NYSDEC Site No. 224131 46 Anthony St./95 Lombardy St. Brooklyn, New York 11222			**TIME:**	8:00 a.m. to 5:30 p.m.

EQUIPMENT:	**PRESENT AT SITE:**
RKI GX-6000 PID VelociCalc Multi-Function Ventilation Meter 9565 Hilti TE 50-AVR Rotary Hammer Hilti Diamond Core Drill AMETEK Rotron DR505 Regenerative Blower	Langan: Jessica Babb [9.5 hours], Ashley Stappenback [9 hours], William Bohrer [2 hours] AARCO: Juan Paredes [7.5 hours], Will Sheiner [7.5 hours], Roy [6.5 hours]

OBSERVATIONS, DISCUSSIONS, TEST RESULTS, ETC.:

Langan was on site to conduct a sub-slab depressurization (SSD) system communication test.

Site Activities

- AARCO used a core drill to install suction points ACME-SP-01 and ACME-SP-04, and a rotary hammer to install the associated vacuum monitoring points for ACME-SP-01 (MP01 through MP06) and ACME-SP-04 (MP01 through MP07).
    - Vacuum monitoring points were advanced in approximate 10-foot offsets from each suction point in three directions, and sealed with putty when not in use.
    - Suction point and vacuum monitoring point seals were verified using smoke tubes.
- AARCO used an AMETEK Rotron DR505 Regenerative Blower to apply varying vacuums at ACME-SP-01.
    - Langan used an air velocity meter and photoionization detector (PID) to collect differential pressure and total VOC baseline readings from the subsurface, and an air velocity meter to measure the differential pressure at each monitoring point while vacuum was applied to the suction point.
    - Based on the vacuum field measurements, AARCO installed additional vacuum monitoring points as needed.
- AARCO restored the concrete surface in kind after completing the SSD system communication test at ACME-SP-01.

Anticipated Activities

- AARCO will continue to install suction points and monitoring points and conduct the communication test at ACME-SP-04 tomorrow, 9/21/2021.

To:	Jack Teich, Marc Teich, Michael Teich, Michael Haggerty, Shaun Surani, and Christine Leas	**By:**	Jessica Babb Langan

SITE OBSERVATION REPORT

PROJECT No.:	170157201	**CLIENT:**	Whitehead Company	**DATE:**	09/20/2021
LOCATION:	Brooklyn, NY			**WEATHER:**	Partial clouds, 60s-70s°F Wind: NE @ 0-13 mph
PROJECT:	Former Acme Steel/Metal Works NYSDEC Site No. 224131 46 Anthony St./95 Lombardy St. Brooklyn, New York 11222			**TIME:**	8:00 a.m. to 5:30 p.m.

SITE PHOTOGRAPHS:

Photo 1:

View of AARCO installing MP-03 for SP-01 (facing northeast).

Photo 2:

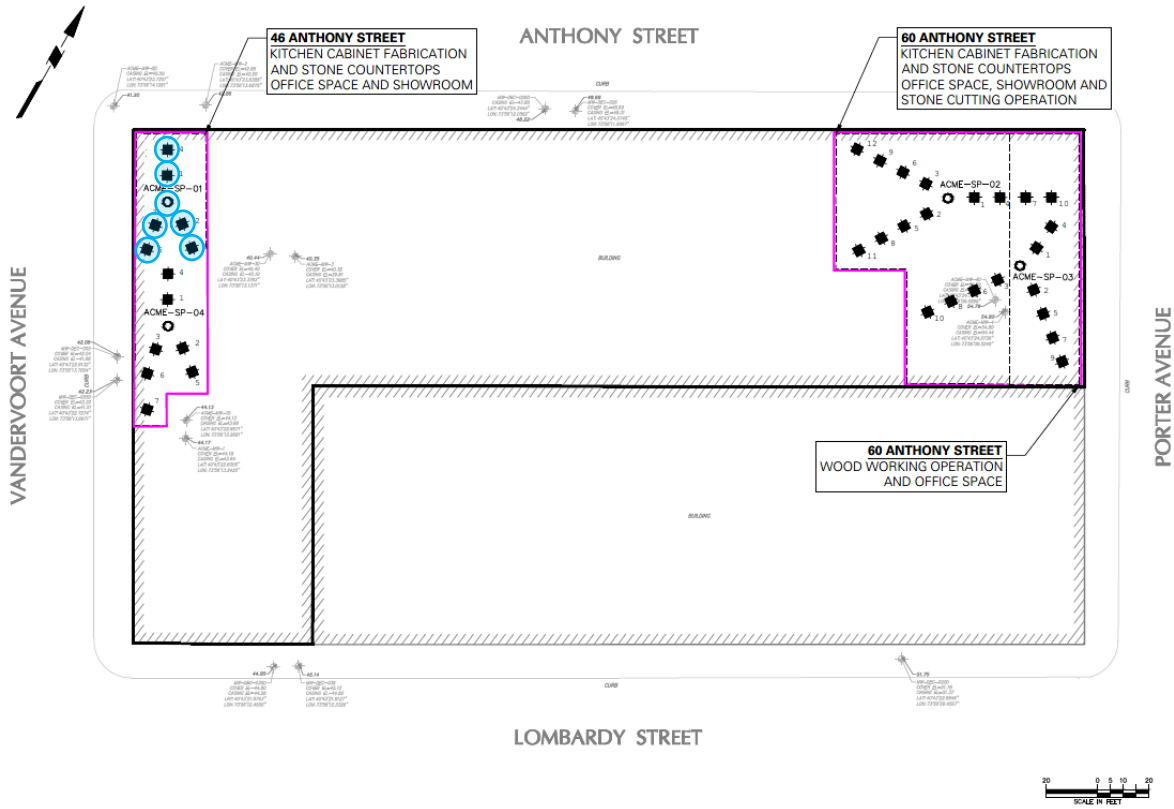
View of Langan using an air velocity meter to measure the airflow at ACME-SP-01 (facing northeast).

To:	Jack Teich, Marc Teich, Michael Teich, Michael Haggerty, Shaun Surani, and Christine Leas	**By:**	Jessica Babb Langan

SITE OBSERVATION REPORT

PROJECT No.:	170157201	**CLIENT:**	**DATE:**	09/20/2021
LOCATION:	Brooklyn, NY	Whitehead Company	**WEATHER:**	Partial clouds, 60s-70s°F Wind: NE @ 0-13 mph
PROJECT:	Former Acme Steel/Metal Works NYSDEC Site No. 224131 46 Anthony St./95 Lombardy St. Brooklyn, New York 11222		**TIME:**	8:00 a.m. to 5:30 p.m.

SITE PLAN:



Legend:

- Site Boundary
- Target Mitigation Areas
- Continuously Occupied Spaces
- Proposed Temporary Suction Point
- Proposed Temporary Vacuum Monitoring Point
- Approximate Location of SSD System Communication Test

Notes:

1. Drawing background is based on "Draft Figure 2 – SSD Pilot Test Plan", prepared by Langan and dated 02 September 2021.

To:	Jack Teich, Marc Teich, Michael Teich, Michael Haggerty, Shaun Surani, and Christine Leas	**By:**	Jessica Babb Langan

SITE OBSERVATION REPORT

PROJECT No.:	170157201	**CLIENT:**	Whitehead Company	**DATE:**	09/21/2021
LOCATION:	Brooklyn, NY			**WEATHER:**	Partial clouds, 60s-70s°F Wind: E @ 0-14 mph
PROJECT:	Former Acme Steel/Metal Works NYSDEC Site No. 224131 46 Anthony St./95 Lombardy St. Brooklyn, New York 11222			**TIME:**	8:00 a.m. to 4:30 p.m.

EQUIPMENT:	**PRESENT AT SITE:**
RKI GX-6000 PID VelociCalc Multi-Function Ventilation Meter 9565 Hilti TE 50-AVR Rotary Hammer Hilti Diamond Core Drill AMETEK Rotron DR505 Regenerative Blower	Langan: Jessica Babb [8.5 hours] AARCO: Juan Paredes and Will Sheiner [7.75 hours]

OBSERVATIONS, DISCUSSIONS, TEST RESULTS, ETC.:

Langan was on site to conduct a sub-slab depressurization (SSD) system communication test.

Site Activities

- AARCO used a core drill to install suction points ACME-SP-03, and a rotary hammer to install the associated vacuum monitoring points for ACME-SP-03 (MP01, MP03, MP05 through MP08, and MP10).
    - Vacuum monitoring points were advanced in approximate 10-foot offsets from each suction point in three directions, and sealed with putty when not in use.
    - Suction point and vacuum monitoring point seals were verified using smoke tubes.
- AARCO used an AMETEK Rotron DR505 Regenerative Blower to apply varying vacuums at ACME-SP-04.
    - Langan used an air velocity meter and photoionization detector (PID) to collect differential pressure and total VOC baseline readings from the subsurface, and an air velocity meter to measure the differential pressure at each monitoring point while vacuum was applied to the suction point.
- AARCO restored the concrete surface in kind after completing the SSD system communication test at ACME-SP-04.

Anticipated Activities

- AARCO will finish installing the remaining vacuum monitoring points at ACME-SP-03, install suction point ACME-SP-02 and associated monitoring points, and conduct communication tests at ACME-SP-02 and ACME-SP-03 tomorrow, 09/22/2021.

To:	Jack Teich, Marc Teich, Michael Teich, Michael Haggerty, Shaun Surani, and Christine Leas	**By:**	Jessica Babb Langan

SITE OBSERVATION REPORT

PROJECT No.:	170157201	**CLIENT:**	Whitehead Company	**DATE:**	09/21/2021
LOCATION:	Brooklyn, NY			**WEATHER:**	Partial clouds, 60s-70s°F Wind: E @ 0-14 mph
PROJECT:	Former Acme Steel/Metal Works NYSDEC Site No. 224131 46 Anthony St./95 Lombardy St. Brooklyn, New York 11222			**TIME:**	8:00 a.m. to 4:30 p.m.

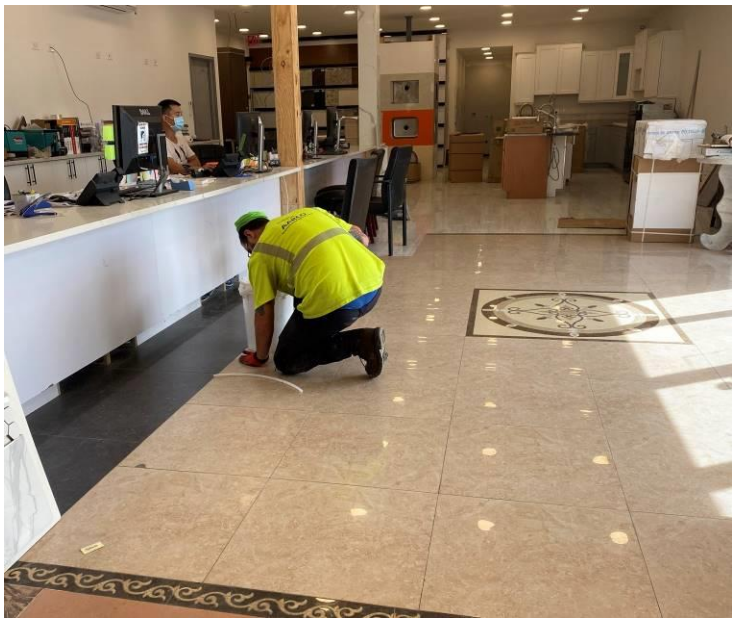
SITE PHOTOGRAPHS:

Photo 1:

View of Langan using an air velocity meter to measure differential pressure at MP-06 for ACME-SP-04 (facing south).

Photo 2:

View of AARCO restoring a vacuum monitoring point for ACME-SP-04 (facing south).



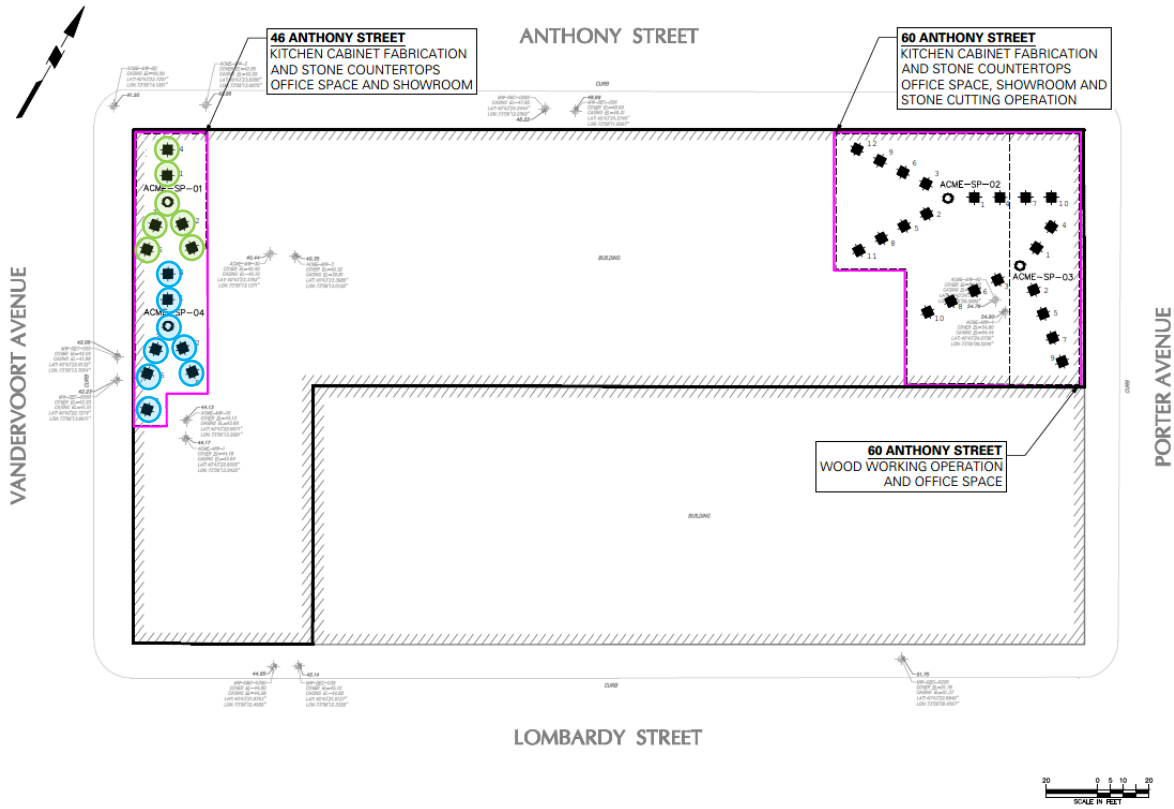
To:	Jack Teich, Marc Teich, Michael Teich, Michael Haggerty, Shaun Surani, and Christine Leas	**By:**	Jessica Babb Langan

LANGAN

SITE OBSERVATION REPORT

PROJECT No.:	170157201	**CLIENT:**	Whitehead Company	**DATE:**	09/21/2021
LOCATION:	Brooklyn, NY			**WEATHER:**	Partial clouds, 60s-70s°F Wind: E @ 0-14 mph
PROJECT:	Former Acme Steel/Metal Works NYSDEC Site No. 224131 46 Anthony St./95 Lombardy St. Brooklyn, New York 11222			**TIME:**	8:00 a.m. to 4:30 p.m.

SITE PLAN:



Legend:

- Site Boundary
- Target Mitigation Areas
- Continuously Occupied Spaces
- Proposed Temporary Suction Point
- Proposed Temporary Vacuum Monitoring Point
- Approximate Location of SSD System Communication Test
- Approximate Location of Completed SSD System Communication Test

Notes:

1. Drawing background is based on "Draft Figure 2 – SSD Pilot Test Plan", prepared by Langan and dated 02 September 2021.

To:	Jack Teich, Marc Teich, Michael Teich, Michael Haggerty, Shaun Surani, and Christine Leas	**By:**	Jessica Babb Langan

SITE OBSERVATION REPORT

PROJECT No.:	170157201	**CLIENT:**	Whitehead Company	**DATE:**	09/22/2021
LOCATION:	Brooklyn, NY			**WEATHER:**	Partial clouds, 60s-70s°F Wind: SE @ 0-16 mph
PROJECT:	Former Acme Steel/Metal Works NYSDEC Site No. 224131 46 Anthony St./95 Lombardy St. Brooklyn, New York 11222			**TIME:**	8:00 a.m. to 7:00 p.m.

EQUIPMENT:	**PRESENT AT SITE:**
RKI GX-6000 PID VelociCalc Multi-Function Ventilation Meter 9565 Hilti TE 50-AVR Rotary Hammer Hilti Diamond Core Drill AMETEK Rotron DR505 Regenerative Blower	Langan: Jessica Babb [11 hours] AARCO: Juan Paredes and Will Sheiner [10.75 hours]

OBSERVATIONS, DISCUSSIONS, TEST RESULTS, ETC.:

Langan was on site to conduct a sub-slab depressurization (SSD) system communication test.

Site Activities

- AARCO used a core drill to install suction point ACME-SP-02, and a rotary hammer to install the associated vacuum monitoring points for ACME-SP-02 (MP01 through MP06) and the remaining vacuum monitoring points at ACME-SP-03 (MP02, MP04, and MP09).
    - Vacuum monitoring points were advanced in approximate 10-foot offsets from each suction point in three directions, and sealed with putty when not in use.
    - Suction point and vacuum monitoring point seals were verified using smoke tubes.
- AARCO used an AMETEK Rotron DR505 Regenerative Blower to apply varying vacuums at ACME-SP-02 and ACME-SP-03.
    - Langan used an air velocity meter and photoionization detector (PID) to collect differential pressure and total VOC baseline readings from the subsurface, and an air velocity meter to measure the differential pressure at each monitoring point while vacuum was applied to the suction point.
    - Based on the vacuum field measurements, AARCO installed additional vacuum monitoring points as needed.
- AARCO restored the concrete surface in kind after completing the SSD system communication tests at ACME-SP-02 and ACME-SP-03.

Anticipated Activities

- Langan will advance SSD system design and submit the design to the NYSDEC.

To:	Jack Teich, Marc Teich, Michael Teich, Michael Haggerty, Shaun Surani, and Christine Leas	**By:**	Jessica Babb Langan

SITE OBSERVATION REPORT

PROJECT No.:	170157201	**CLIENT:**	Whitehead Company	**DATE:**	09/22/2021
LOCATION:	Brooklyn, NY			**WEATHER:**	Partial clouds, 60s-70s°F Wind: SE @ 0-16 mph
PROJECT:	Former Acme Steel/Metal Works NYSDEC Site No. 224131 46 Anthony St./95 Lombardy St. Brooklyn, New York 11222			**TIME:**	8:00 a.m. to 7:00 p.m.

SITE PHOTOGRAPHS:

Photo 1:

View of vacuum being applied at ACME-SP-03 (facing north).

Photo 2:

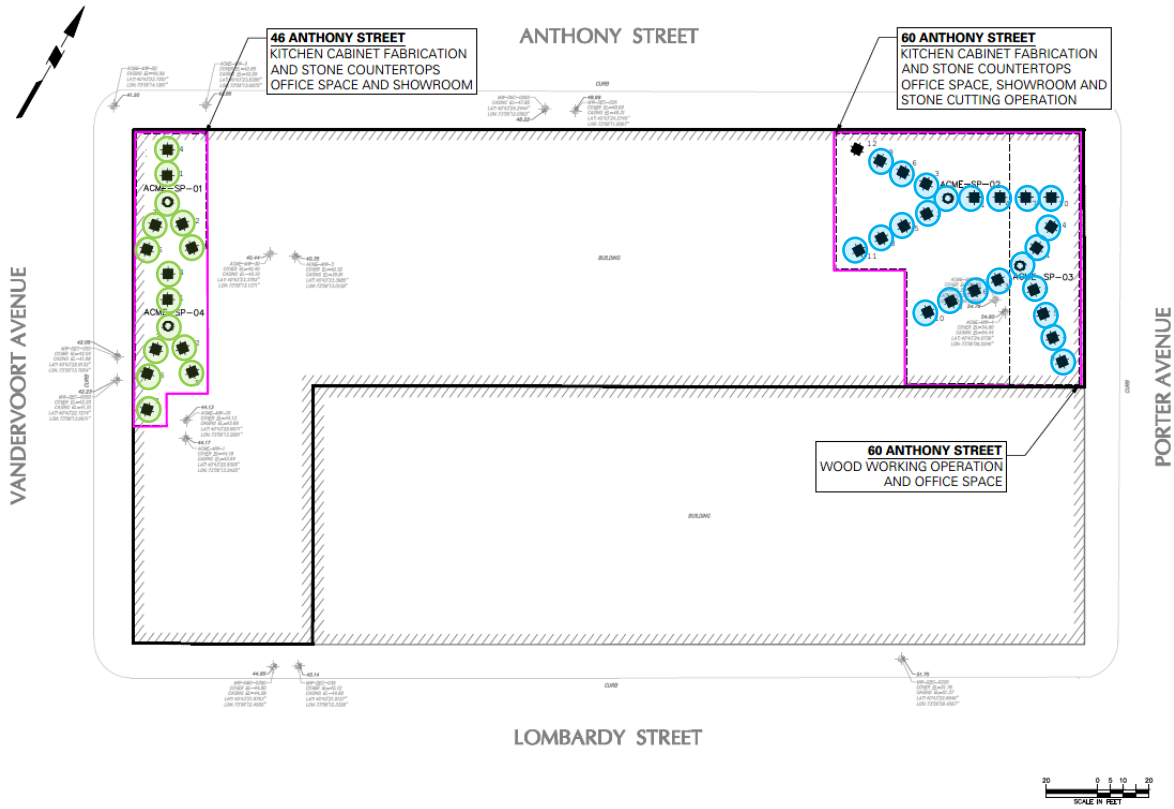
View of Langan using an air velocity meter to measure differential pressure at a monitoring point for ACME-SP-02.

To:	Jack Teich, Marc Teich, Michael Teich, Michael Haggerty, Shaun Surani, and Christine Leas	**By:**	Jessica Babb Langan

SITE OBSERVATION REPORT

PROJECT No.:	170157201	**CLIENT:**	Whitehead Company	**DATE:**	09/22/2021
LOCATION:	Brooklyn, NY			**WEATHER:**	Partial clouds, 60s-70s°F Wind: SE @ 0-16 mph
PROJECT:	Former Acme Steel/Metal Works NYSDEC Site No. 224131 46 Anthony St./95 Lombardy St. Brooklyn, New York 11222			**TIME:**	8:00 a.m. to 7:00 p.m.

SITE PLAN:



Legend:

- Site Boundary
- Target Mitigation Areas
- Continuously Occupied Spaces
- Proposed Temporary Suction Point
- Proposed Temporary Vacuum Monitoring Point
- Approximate location of SSD System Communication Test
- Approximate Location of Completed SSD System Communication Test

Notes:

1. Drawing background is based on "Draft Figure 2 – SSD Pilot Test Plan", prepared by Langan and dated 02 September 2021.

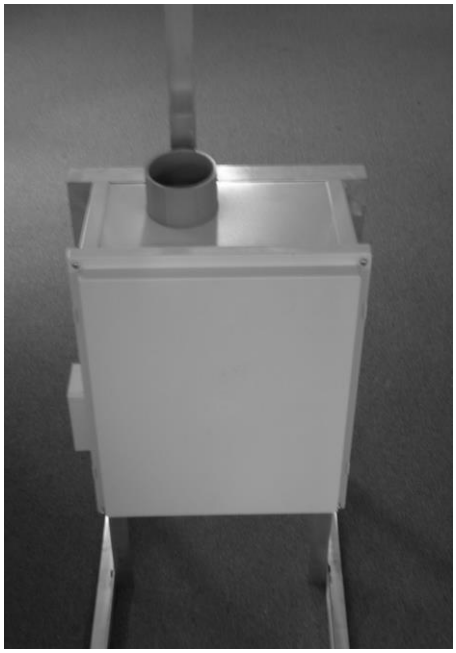
To:	Jack Teich, Marc Teich, Michael Teich, Michael Haggerty, Shaun Surani, and Christine Leas	**By:**	Jessica Babb Langan

APPENDIX C
SSD SYSTEM DESIGN SUPPORT DOCUMENTS

THE OBAR GBR76

COMPACT RADIAL BLOWER

Based on 25 years of experience and 2 years of research and development, the patent pending GBR series of compact radial blowers provide the perfect combination of performance and design.



GBR76 WITH ROOF MOUNT

PERFORMANCE

- GBR76 SOE 16" WC @ 0 Max flow 155 CFM.
- GBR76 UD 40" WC @ 0 Max flow 195 CFM.
- Built in speed control to customize performance.
- Condensate bypass built in.
- 12 month warranty - 40,000 hr sealed bearings.

DESIGN

- Our modular design means the blower and manifold assembly can be removed and replaced as a unit. This makes repairs cost effective and easy and allows contractors to upgrade systems simply by swapping assemblies.
- The GBR series is based on a bypass blower designed to handle combustible materials.
- The housing is not required to be air tight, so you can add gauges and alarms without compromising the system.
- Built in condensate bypass.
- Built in speed control.
- Quick disconnect electrical harness.
- All UL listed components including UL listed enclosure for outside use.
- Wall fastening lugs included.
- GBR series roof and wall mounts available to quickly configure the blowers for your installation while providing a custom built look.
- Compact design 16"x 14"x 8" weighing only 18 lbs.
- 3" schedule 40 inlet and exhaust.
- Universal Drive model accepts voltage from 120-240V without alteration

COST	GBR76 SOE	GBR76 UD
COMPLETE UNIT	**$1289.00**	**$1489.00**
3 YEAR WARRANTY	**$450.00**	**$550.00**

OBAR SYSTEMS INC 2969 ROUTE 23 SOUTH NEWFOUNDLAND NJ 07435 800 949 6227

GBR76 SOE	0”	2”	4”	6”	8”	10”	12”	16”	Wattage
SOE 16	150	140	129	118	105	90	75	35	150-320
SOE 12	125	115	100	83	62	39	0		110-200
SOE 8	105	90	70	42	0				60-120
SOE 4	75	50	0						37-50

GBR SOE performance using built in potentiometer set at sealed vacuums of 16, 12, 8, and 4” WC

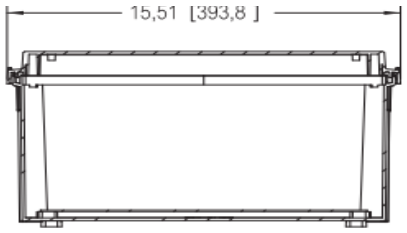
GBR76 UD	0”	10”	20”	30”	37”	Wattage
110V	195	158	118	63	20	700-870
220V	197	162	130	89	50	800-1100

Blower Specifications

Notes:

- **Input Voltage Range:** 108-132 Volts AC RMS, 50/60 Hz, single phase.
- **Input Current:** 6 amps AC RMS
- **Operating Temperature (Ambient Air and Working Air):** 0°C to 50°C
- **Storage Temperature:** -40°C to 85°C
- **Dielectric Testing:** 1500 Volts AC RMS 60 Hz applied for one second between input pins and ground, 3mA leakage maximum.
- **Speed Control Methods:** PWM (Pulse Width Modulation) (1 kHz to 10 kHz)
  0 to 10 VDC speed control.
  Mechanical: A potentiometer is available for speed control of the blower. The potentiometer can be preset for a specific speed. Access for speed adjustment located in motor housing.
- **Approximate Weight:** 4.8 Lbs. / 2.2 Kg
- **Regulatory Agency Certification:** Underwriters Laboratories Inc. UL507 Recognized under File E94403 and compliant under the CE Low Voltage Directive 2006/95/EC.
- **Design Features:** Designed to provide variable airflow for low NOx & CO emission in high efficiency gas fired combustion systems. Built with non-sparking materials. Blower housing assembly constructed of die cast aluminum. Impeller constructed from hardened aluminum. Rubber isolation mounts built into blower construction to dampen vibration within the motor. Two piece blower housing assembly sealed with O-ring gasket for combustion applications. Customer is responsible to check for any leakage once the blower is installed into the final application.
- **Miscellaneous:** Blower inlet, discharge, and all motor cooling inlet and discharge vents must not be obstructed. Motor ventilation air to be free of oils and other foreign particles, (i.e. breathing quality air). Blower is to be mounted so ventilation air cannot be re-circulated.
  POWER CONNECTION: Blower connector, AMP Universal MATE-N-LOK, part no. 1-350943-0.
  SPEED CONNECTION: Blower connector, Molex Mini-Fit Jr., part no. 39-30-3056.
  Mating harnesses available upon request.

Enclosure Specifications



Screw cover

Ratings:

Ingress Protection (EN 60529): 66/67

Electrical insulation: Totally insulated

Halogen free (DIN/VDE 0472, Part 815): yes

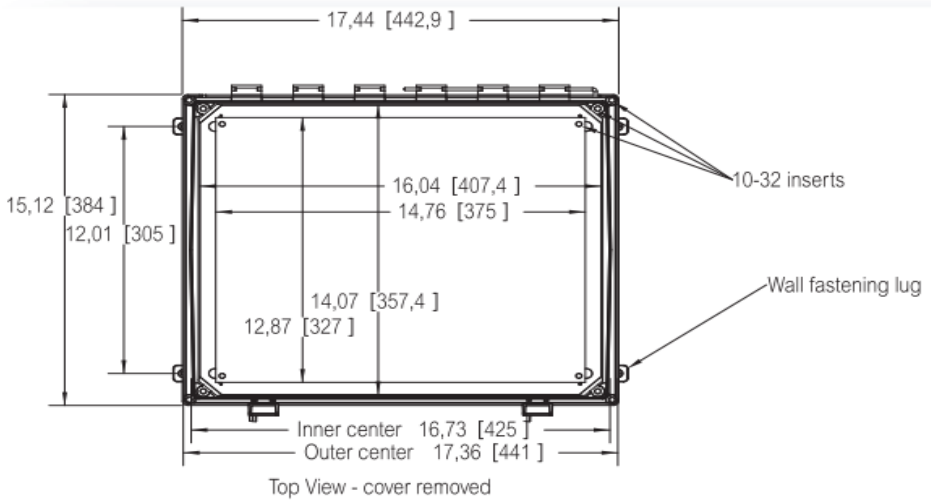
UV resistance: UL 508

Flammability Rating (UL 746 C 5): complies with UL 508

Glow Wire Test (IEC 695-2-1) °C: 960

NEMA Class: UL Type 4, 4X, 6, 6P, 12 and 13

Certificates: Underwriters Laboratories



Top View - cover removed

Distributed by Obar Systems

Installation & Warranty

Read these instructions completely and retain for future reference.

1. Warning! The use of this fan may affect combustion devices, always check for a backdraft on all combustion devices before and after installation.
2. Warning! This fan is not intended for use in hazardous environments where a motor spark could ignite combustible or flammable materials.
3. All wiring must be performed by a licensed electrical contractor in accordance with the National Electrical Code and all local and state codes governing the municipality in which it is installed.
4. The GBR series blowers are intended for use and installation by professionals familiar with installation and design of systems for the remediation of radon and volatile organic compounds. Unqualified or unlicensed individuals should not undertake the installation or service of this product.

INSTALLATION

The installation instructions provided are for guidance only, any installation should meet all state and local codes and guidelines.

1. Temperature restrictions: The GBR SOE/UD will run and start in a temperature range from -20 to 180 degrees F. The GBR HA will run at a temperature of -20 to 180 degrees F but may not start if the motor temperature is below 0 degrees F at time of startup.
2. Ground water restrictions: The blower should not be installed at a height above water table that is less than the vacuum setting for the blower, if the water table is unknown then the base of the slab should be used as a default. The GBR series is a high vacuum blower and will draw water into the assembly and damage the impeller and motor if not properly installed.
3. Speed control: The GBR series blowers have a built in speed control that can be used to field adjust the vacuum on your system. These should only be adjusted by an experienced installer familiar advanced systems design and installation. For information regarding on site adjustments please contact Obar Systems for further information.
4. Enclosure: It is not recommended that the enclosure be opened except for repairs and adjustments. Contact Obar Systems before removing the cover.
5. Mounting: The fan should be mounted in a vertical orientation with the discharge pointing

upward. The inlet and discharge should be attached with a PipeConx or similar flexible connector of the appropriate size. The connector should provide a gap of 1.5 inches between the inlet pipe and inlet fitting and discharge pipe and discharge fitting. This will allow for motor assembly replacement in future repairs. The GBR comes with wall fastening lugs that provide for a flush installation on a flat even surface. Optional roof and wall mounts are available and are designed to reduce installation times dramatically. Contact Obar Systems for additional information on mounting systems. The fan should be located in an area that provides easy access and does not obstruct the operations of the building to which it is attached.

6. Discharge: Make sure the discharge meets or exceeds National guidelines and local codes for the installation and venting of Radon and or VOCs (Volatile Organic Compounds). In the event that there is the possibility of debris entering the discharge of the fan, it is recommended that a guard be installed to protect the blower from damage.

Warranty

Subject to any applicable consumer protection legislation, Obar Systems warrants the GBR series fans for 12 months from the date of purchase.

Obar systems will repair or replace any fan which fails due to defects in materials and workmanship. A RMA must be obtained and proof of purchase is required to be serviced by this warranty.

This warranty is contingent upon the fan having been installed as per the installation requirements set forth by Obar Systems and in accordance with the requirements of federal and state authorities governing the installation systems designed for radon and volatile organic compounds.

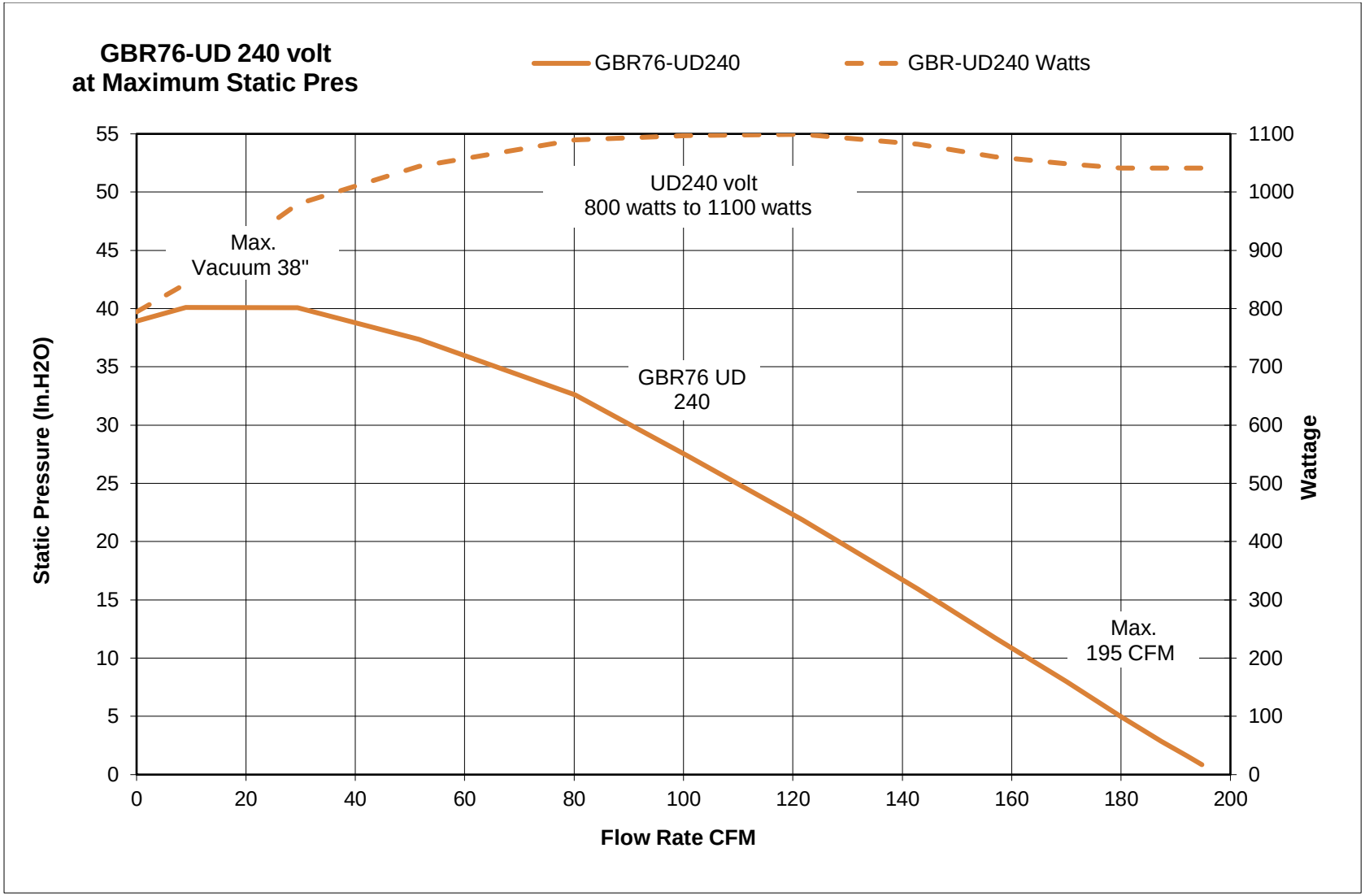
Obar systems is not responsible for the installation, removal or delivery costs associated with this warranty.

Except as stated, the GBR series are provided without warranty of any kind, either expressed or implied, including without limitation, implied warranties of merchantability and fitness for a particular use.

Obar systems is in no way responsible for any direct or indirect damages relating to the performance of the GBR series fan. Any liability shall not exceed the purchase price of the unit. The sole remedy under this warranty shall be the repair or replacement of the unit

Contact Obar Systems to obtain a RMA (Return Material Authorization) number for any and all warranties. If return is required, the customer is responsible for all freight charges.

Obar Systems Inc.
2969 Route 23 South
Newfoundland NJ 07435
800 949 6227


GBR76-UD 240 volt
at Maximum Static Pres
GBR76-UD240
GBR-UD240 Watts
UD240 volt
800 watts to 1100 watts
Max.
Vacuum 38"
GBR76 UD
240
Max.
195 CFM
Static Pressure (In.H2O)
Wattage
Flow Rate CFM
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140
160
180
200

APPENDIX D
QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN

for

FORMER ACME STEEL/METAL WORKS
95 LOMBARDY STREET/46 ANTHONY STREET
BROOKLYN, NEW YORK
NYSDEC Site No. 224131

Prepared For:

Whitehead Company
251 Lombardy Street
Brooklyn, New York 11222

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

LANGAN

November 2020
170157201

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF ATTACHMENTS

1.0 PROJECT DESCRIPTION

1.1 Introduction

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan) has prepared this Quality Assurance Project Plan (QAPP) on behalf of Whitehead Company (Whitehead) for the about 44,000-square-foot property at 95 Lombardy Street and 46 Anthony Street (Tax Block 2819, Lots 8 and 11) in Brooklyn, New York (the "site"). The site is a New York State Department of Environmental Conservation (NYSDEC) Class 2 Inactive Hazardous Waste Disposal Site (IHWDS), Site No. 224131. A Site Location Map is included as Figure 1 of the Potential Chlorinated Volatile Organic Compound (CVOC) Source Investigation Work Plan.

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

1.2 Project Objectives

Langan prepared this QAPP to support the objectives of the Potential CVOC Source Investigation Work Plan. The primary goal of the investigation is to confirm the presence or absence of a CVOC source on-site, pursuant to a request in the NYSDEC's 9 March 2020 Groundwater Data Summary Report comment letter.

Four areas of concern (AOC) were established during the previous investigations. A description of each AOC is provided in the Potential CVOC Source Investigation Work Plan. The AOCs are listed below:

- AOC 1: Former Metal Fabrication Area
- AOC 2: Dry Well/Underground Injection Well
- AOC 3: Dip Tank and Associated Piping and Floor Trench
- AOC 4: Apparent Dry Well

This investigation and the associated objectives have been established in order to meet standards that will protect public health and the environment for the site.

1.3 Scope of Work

In order to confirm the presence or absence of a CVOC source on-site, a high density of sub-slab soil vapor screening points will be installed and screened

throughout the site footprint and on adjoining sidewalks. The field investigation will include the following scope:

Geophysical Survey

A geophysical survey will be performed to identify potential underground utilities, drains, underground storage tanks (USTs), and other subsurface anomalies across the site. The geophysical survey will be completed using a collection of geophysical instruments, including electromagnetic instruments and ground-penetrating radar (GPR). Screening point locations may be moved as necessary based on the findings of the geophysical survey.

Permanent Sub-Slab Soil Vapor Point Installation and Sampling

About one week prior to site-wide sub-slab soil vapor screening, a Langan field engineer/geologist/scientist will install four permanent sub-slab soil vapor sampling points (ACME-SSV-01 through ACME-SSV-04) using a hammer drill by drilling a 5/8-inch diameter hole through the concrete slab to a depth about one inch into the underlying soil. The sampling points will be completed with Vapor Pin™ assemblies consisting of a steel barb fitting with a silicone sleeve sealing the 5/8-inch-diameter hole.

Sub-slab soil vapor samples will be collected in accordance with the Guidance for Evaluating Soil Vapor Intrusion in the State of New York (2006), with updates (hereafter referred to as "New York State Department of Health [NYSDOH] Guidance"). Sampling will occur for a duration of 8 hours, and samples will be collected into 6-liter Summa canisters that have been batch-certified clean by the laboratory. Samples will be delivered under standard chain of custody procedures to York Analytical Laboratories (York), a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified analytical laboratory, and analyzed using United State Environmental Protection Agency (USEPA) Method TO-15.

Flow rate for both purging and sampling will not exceed 0.2 liters per minute (L/min). Prior to sample collection, one to three implant volumes shall be purged. A sample log sheet will be maintained summarizing sample identification, date and time of sample collection, sampling depth, identity of samplers, sampling methods and devices, soil vapor purge volumes, volume of the soil vapor extracted, vacuum of canisters before and after the samples are collected, apparent moisture content of the sampling zone, and chain of custody protocols.

A tracer gas (e.g. helium) will be used as a quality assurance/quality control (QA/QC) device to verify the integrity of the sub-slab soil vapor point seal in accordance with NYSDOH protocols. A shroud (box, plastic pail, etc.) will serve to keep the tracer gas in contact with the sampling point during testing. A portable helium detector will be used to analyze a sample of soil vapor for the tracer gas before sample collection. If the tracer sample results show a significant presence of the tracer, the screening point seals will be adjusted to prevent infiltration.

Tracer monitoring will be performed a second time after sample collection to confirm the integrity of the sampling point seals.

Indoor Air Sampling

Four indoor air samples (ACME-IA-01 through ACME-IA-04) will be co-located at sub-slab soil vapor point locations ACME-SSV-1 through ACME-SSV-4 and collected during sub-slab soil vapor sampling in accordance with the NYSDOH Guidance. Prior to sample collection, a NYSDOH Indoor Air Quality Questionnaire and Building Survey will be completed to document the potential presence of equipment or chemicals in the buildings that could interfere with the laboratory analytical results. Ambient air inside the buildings will be screened using a PID (MultiRAE or equivalent) during the survey. All windows and exterior doors should remain closed during sample collection.

The indoor air samples (and one outdoor ambient air sample [ACME-OA-01]) will be collected about 3 to 4 feet above the ground surface for a duration of 8 hours, and will be collected in 6-liter Summa canisters that have been batch-certified clean by the laboratory and analyzed using USEPA Method TO-15. Sampling flow rate will not exceed 0.2 L/min. A sample log sheet will be maintained summarizing sample identification, date and time of sample collection, sampling height, identity of samplers, sampling methods and devices, volume of the air extracted, vacuum of canisters before and after the samples are collected, apparent moisture content of the sampling zone, and chain of custody protocols.

Temporary Sub-Slab Soil Vapor Point Installation, Screening, and Sampling

About one week after co-located sub-slab vapor and indoor air samples are collected at the four permanent sub-slab vapor points, a Langan field professional will use a hammer drill to install at least 49 on-site (ACME-SSVS-01 through ACME-SSVS-49) and at least 20 off-site (ACME-SSVS-50 through ACME-SSVS-69) temporary sub-slab soil vapor screening points. The target screening frequency is about one point per 900 square feet of site area and about one point per 35 linear feet of sidewalk; if contamination is suspected based on screening results, additional locations will be added in the vicinity of the observed impacts. Screening locations may be relocated due to obstructions and logistical considerations to minimize business interruptions for the existing tenants. A proposed screening point location plan is presented as Figure 3.

Each sub-slab soil vapor screening point will be installed and screened as follows:

1. A hammer drill will be used to drill a 5/8-inch-diameter hole through the concrete slab to a depth of about one inch into the underlying soil.

2. The screening point will be completed with a temporary Vapor Pin™ assembly consisting of a steel barb fitting with a silicone sleeve sealing the 5/8-inch-diameter hole.

3. A water dam (i.e., a plastic cylinder) will be placed around the screening point, sealed to the concrete slab with hydrated bentonite, putty, or equivalent, and filled with water to check for leaks and prevent short-circuiting.

4. One to three screening points will be purged from the point using a personal air sampling pump, connected to the point with Teflon tubing. The pump will be calibrated to a flow rate at or below 0.2 L/min. After purging, the point will then be capped and allowed to equilibrate for about one hour.

5. After at least one hour, one to three screening points will be purged from the point using a personal air sampling pump.

6. A vacuum chamber (which prevents pump-related cross-contamination) will then be used in conjunction with the personal air sampling pump to fill a dedicated 1-liter Tedlar bag with sub-slab vapor from the screening point.

7. A handheld PID with a 10.6 electron volt (eV) lamp will be used to screen a small amount of the collected vapor from the Tedlar bag and measure total volatile organic compounds (VOCs).

A log sheet will be maintained summarizing the screening point identification, date and time of screening, screening methods and devices, soil vapor purge and extracted volumes, ambient background VOC concentration and total VOCs within each screening location. Based on total VOC concentrations measured by PID, the following will occur:

1. If the total VOC concentration measures below 10 parts per million (ppm) at a given screening point, no sample will be analyzed.

2. If the total VOC concentration measures at or above 10 ppm at a given screening point, then the dedicated 1-liter Tedlar bag will be sealed and submitted under standard chain of custody procedures to York for VOC analysis via USEPA Method TO-15.

After sample collection, all temporary screening points will be removed and the corresponding slab penetrations restored with hydraulic cement.

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. 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. Analytical precision will be determined by analyzing internal QC duplicates.
- Accuracy – a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern. Analytical accuracy will be assessed by examining the percent recoveries of laboratory control samples, internal standards, laboratory method blanks, clean canister certification sample analyses, 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 AND RESPONSIBILITY

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

For the required sampling as stated in the Potential CVOC Source Investigation Work Plan, sampling will be conducted by Langan; the analytical services will be performed by

York Analytical Laboratories, Inc. of Stratford, Conn. (NYSDOH ELAP certification number 10854). Data validation services will be performed by Langan's in-hour data validator.

Key contacts for this project are summarized below; Langan resumes are included in Attachment A.

Whitehead Company:	Jack Teich Telephone: (718) 384-7800 ext. 3202
Langan Project Manager:	Patrick Farnham, P.E. Telephone: (212) 479-5578
Langan Health & Safety Officer (HSO):	Tony Moffa, CHMM Telephone (215)-491-6500
Langan Quality Assurance Officer (QAO):	Michael Burke, CHMM Telephone: (212) 479-5578
Langan Data Validator/Program Quality Assurance Manager:	TBD (Langan) Telephone: (212) 479-5400
Laboratory Representative:	York Analytical Laboratories, Inc. Phil Murphy Telephone: (203) 598-1371

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 soil vapor impacts at the site. The sample set, chemical analysis results, and interpretations must meet or exceed quality assurance objectives established for the site. 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

Laboratory duplicate precision is determined from the analysis of two samples taken from the same sample container. The duplicate precision is determined as the absolute value of the difference between the two analyses divided by their average value and expressed as a percentage. For laboratory duplicates, results less than the reporting limit (RL) meet the precision criteria if the absolute difference is less than ±5X the RL. For results greater

than 5X the RL, the acceptance criteria is a relative percent difference (RPD) of ≤25%. 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 interferences, poorly calibrated analytical or sampling equipment, or limitations or errors in analytical methods and techniques.

Accuracy in the field is assessed through compliance to all sample handling, preservation, and holding time requirements.

Laboratory accuracy is assessed by evaluating the percent recoveries of laboratory control samples and duplicates (LCS/LCSDs), internal standard responses and the results of method preparation blanks and clean canister certification results. LCS/LCSD recoveries and internal standard responses are 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 and clean canister certifications should be non-detect for target analytes when analyzed by the laboratory.

4.3 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent 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 was 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 will be 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 and standard methods, laboratory-issued SOPs, the laboratory's Quality

Assurance Manual, and this QAPP. The laboratory is required to be properly certified and accredited.

4.4 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.

Soil vapor 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.

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. Comparability will also be ensured by requiring traceability of all analytical standards and/or source materials, requiring that all calibrations be verified with an independently prepared standard from a source other than that used for calibration, using standard reporting units and reporting formats, performing complete data validation of the analytical results, including the use of data qualifiers, and requiring that all calibration qualifiers be used any time an analytical result is used for any purpose. These steps will ensure that all future users of either the data or the conclusions drawn from them will be able to judge the comparability of these data and conclusions.

Sensitivity

Sensitivity is 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 and QC acceptance limits that meet established performance criteria. Concurrently, the Project Manager 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.

5.0 SAMPLE COLLECTION AND FIELD DATA ACQUISITION PROCEDURES

Sub-slab soil vapor sampling will be conducted in accordance with the NYSDEC-Approved Potential CVOC Source Investigation Work Plan and 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 were made in waterproof, permanent blue or black ink. No erasures will be allowed. Incorrect entries 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 were made in the field logbook when appropriate;
- 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.; and
- Names of sampling personnel and signature of persons making entries.

Field records will also be collected on field data sheets. 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. Each Summa® canister and Tedlar bag sample will have a sample tag affixed to the outside with the date and time of sample collection and project name. In addition, the tag will contain the sample identification number. All documentation will be completed in waterproof ink. Sample nomenclature procedures are included in Attachment D.

5.2 Equipment Calibration and Preventative Maintenance

A PID equipped with a 10.6 electron volt bulb will be used during the sampling activities to evaluate screening point locations. 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

Sub-Slab Soil Vapor Samples (from Permanent Sample Points)

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-liter Summa® canisters calibrated for a sampling rate of eight 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.

Indoor and Outdoor Ambient Air Samples

Indoor and outdoor ambient air samples will be collected following the same protocol as the sub-slab vapor samples collected from permanent sample points.

Sub-Slab Soil Vapor Samples (from Temporary Sample Points)

Sub-slab soil vapor samples collected from temporary sub-slab soil vapor screening points will be collected according to the protocol described in Section 1.3. Key differences from the sampling procedure conducted at permanent sub-slab vapor points include the sampling duration (about 5 to 10 minutes, depending on personal air sampling pump flow rate) and container (dedicated 1-liter Tedlar bags, instead of 6-liter Summa canisters).

5.4 Sample Containers and Handling

Batch-certified Summa® canisters will be obtained from the analytical laboratory, and dedicated Tedlar bags will be obtained either from the analytical laboratory or from an environmental equipment supplier. Possession of samples collected in the field will be traceable from the time of collection until they are analyzed by the analytical laboratory. 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 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

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 from the site or Langan office by a laboratory provided courier under the chain-of-custody protocols described in Section 5.9. A third-party courier may be used if necessary.

- 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

Due to the nature of sampling, only dedicated sampling equipment (e.g. tubing, Tedlar bags, etc.) is expected to be used during associated sampling events. Decontamination of field personnel is discussed in the site-specific Health and Safety Plan (HASP) included in Appendix A of the Work Plan.

5.8 Residuals Management

Debris (e.g., paper, plastic and disposable personal protective equipment [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. The residual materials stored in a designated storage area at the site for further characterization, treatment or disposal.

5.9 Chain of Custody Procedures

A chain-of-custody protocol has been established for collected samples was and 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 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 Summa® canisters. Chain-of-custody forms will accompany the canisters. Chain-of-custody forms for dedicated Tedlar bags will be prepared by Langan using laboratory templates, in coordinated with the analytical laboratory.

- Following sample collection, the chain-of-custody form will be completed for the samples collected. The sample identification number, date and time of sample collection, analysis requested and other pertinent information (e.g., residual vacuum) will be recorded on the form. 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/Field Team Leader

will be responsible for enforcing chain-of-custody procedures during field work.

- When the form is full or when all samples have been collected that will fit in a single cooler, the sampling/Field 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.

Samples will be packaged for shipment or pickup via courier to the laboratory with the appropriate chain-of-custody form. 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.

Laboratory chain-of-custody will be maintained throughout the analytical processes as described in the laboratory's Quality Assurance 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, Langan must be notified to discuss recommended courses of action and documentation of the issue must be included in the project file.

Each Summa® canister and dedicated Tedlar bag (for screening points that are sampled) 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. 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 USEPA Method TO-15. The data package provided by the

laboratory will contain all items specified in the DER-10 Technical Guidance 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 canister 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 EQuIS. To avoid transcription errors, data will be loaded directly into the American Standard Code for Information Interchange (ASCII) format from the 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 data review (USEPA 2017) and the Region II Standard Operating Procedure for the Analysis of Volatile Organic Compounds in Air Contained in Canisters by Method TO-15 (USEPA 2016). Validation will include the following:

- Verification of the QC sample results,
- Verification of the identification of sample results (both positive hits and non-detects), and
- Preparation of a 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 when applicable:

- Holding times;
- Instrument tuning;
- Instrument calibrations;
- Blank results;
- Internal standard recovery results;
- Target compound identification;
- Chromatogram quality;
- Compound quantitation and reported detection limits;
- System performance; and
- Results verification.

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 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 8.1 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.

NYSDOH. Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006.

USEPA 2016. 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 September 2016.

USEPA 2017. National Functional Guidelines for Superfund Organic Methods Data Review, Office of Superfund Remediation and Technology Innovation, EPA-540-R-2017-002, dated January 2017.

MICHAEL D. BURKE, PG, CHMM, LEED AP

PRINCIPAL/VICE PRESIDENT

ENVIRONMENTAL ENGINEERING AND REMEDIATION

Mr. Burke is a geologist/environmental scientist whose practice involves site investigation and remediation, transactional due diligence, environmental site assessments, in-situ remedial technology, and manufactured gas plant (MGP) site characterization and remediation. His additional services include multi-media compliance audits, sub-slab depressurization system design, non-hazardous and hazardous waste management, emergency response, community air monitoring programs, environmental and geotechnical site investigations, and health and safety monitoring. He has experience with projects in the New York State Department of Environmental Conservation (NYSDEC) and New York State Brownfield Cleanup (NYS BCP) Programs; Inactive Hazardous Waste, and Spill Programs, and New York City Office of Environmental Remediation (OER) e-designated and New York City Voluntary Cleanup Program (NYC VCP) sites.

SELECTED PROJECTS

- 432 Rodney Street, NYS Brownfield Cleanup Program, Petroleum and Chlorinated Volatile Organic Compound Investigation and Remediation, Brooklyn, NY
- 563 Sacket Street, NYS Brownfield Cleanup Program Site, MGP Investigation, and Remediation, Brooklyn, NY
- New York University Tandon School of Engineering, Spill Investigation/Remediation Dual Phase Recovery, and Laser Fluorescence Investigation, Brooklyn, NY
- Former Watermark Locations, NYS Brownfield Cleanup Program, Chlorinated Volatile Organic Compound Investigation and Remediation; AS/SVE, Brooklyn, NY
- Urban Health Plan, Medical Building, NYS Brownfield Cleanup Program CVOC Investigation and Remediation, Bronx, NY
- Whitehead Realty Solvent Site, Inactive Hazardous Waste site, CVOC Investigation and Remediation, Brooklyn, NY
- Con Edison on Governors Island, Dielectric Fluid Spill, Investigation and Remediation, New York, NY
- West 17th Street Development, NYS Brownfield Cleanup Program, MGP Investigation and Remediation, New York, NY
- Montefiore Medical Center, Emergency Response, PCB Remediation, Bronx, NY
- New York University, 4 Washington Square Village Fuel Oil Remediation, New York, NY
- Residential Building at 82 Irving Place, Environmental Remediation, New York, NY
- 420 Kent Avenue, NYS Brownfield Cleanup Program, Brooklyn, NY
- 572 Eleventh Avenue, NYC VCP, New York, NY
- 537 Sackett Street, Gowanus Canal Due Diligence/MGP Site, Brooklyn, NY
- 431 Carroll Street, Gowanus Canal Due Diligence, Brooklyn, NY

EDUCATION

M.S., Environmental Geology
Rutgers University

B.S., Geological Sciences
Rutgers University

B.S., Environmental Science
Rutgers University

PROFESSIONAL REGISTRATION

Professional Geologist (PG) in NY

Certified Hazardous Materials Manager – CHMM No. 15998

LEED Accredited Professional (LEED AP)

OSHA Certification for Hazardous Waste Site Supervisor

OSHA 29 CFR 1910.120 Certification for Hazardous Waste Operations and Emergency Response

NJDEP Certification for Community Noise Enforcement

Troxler Certification for Nuclear Densometer Training

GERALD F. NICHOLLS, PE, CHMM

ASSOCIATE

ENVIRONMENTAL ENGINEERING & HAZARDOUS MATERIALS MANAGMENT

Mr. Nicholls' expertise includes management of remediation and site investigations, brownfield cleanups, remedial design, industrial hygiene, air monitoring and environmental health and safety projects including data collection, inspection and reporting for projects throughout New York and New Jersey. He works closely with various private, Department of Defense, state, commercial, industrial, and municipal clients, acting as a liaison between the client and project team.

As an Associate, Mr. Nicholls is responsible for supervising project staff; conducting technical review; maintaining quality control; budget forecasting and control; and managing the technical and financial aspects of active projects.

In 2019, Real Estate Weekly named Mr. Nicholls one of the Rising Stars of Real Estate.

SELECTED PROJECTS

- 140 6th Avenue, Sub-Membrane Depressurization System Design, Spill Remediation, Subslab Remediation and Monitoring Well Piping Design, Remediation Oversight, and Construction Administration, New York, NY
- 23-01 42nd Road, Phase I, Phase II Remedial Investigation, Remedial Action Work Plan, Sub-Membrane Depressurization System Design, Underground Storage Tank Closure and Remediation, Brownfield Cleanup Program, Remediation Oversight, Construction Administration, Long Island City, NY
- 23-10 Queens Plaza South, Phase I, Phase II Remedial Investigation, Remedial Action Work Plan, Sub-Membrane Depressurization System Design, Underground Storage Tank Closure and Remediation, Brownfield Cleanup Program, Remediation Oversight, Construction Administration, Long Island City, NY
- 170 Amsterdam Avenue, Remedial Action Work Plan, Voluntary Cleanup Program, Remediation Oversight, Construction Administration, New York, NY
- West 17th Street Development, DNAPL Assessment, DNAPL Recovery, Remedial Design, Closure through Brownfield Cleanup Program, Remediation Oversight, Bid Documents, ISS and Containment Wall Design, Construction Administration, New York, NY
- Surfactant Remediation Project, In-Situ Chemical Oxidation Design and Implementation and Site Closure, Margate City, NJ
- NYU Langone Medical Center, New Science Building, Remediation Oversight and Construction Administration, Voluntary Cleanup Program, New York, NY
- Gowanus Canal Northside, Demolition and Decommissioning of MOSF, Remediation Investigation, Brownfield Cleanup Program, Brooklyn, NY

EDUCATION

M.S., Environmental Engineering New Jersey Institute of Technology

B.S., Chemistry and Environmental Studies (Double Major) Ursinus College

PROFESSIONAL REGISTRATION

Professional Engineer (PE) in NY

Certified Hazardous Materials Manager (CHMM)

AFFILIATIONS

City of Jersey City Environmental Commission, Former Commission, Vice Chair and Chair

Alliance of Hazardous Materials Professionals (AHMP)

Academy of Hazardous Materials Managers (ACHMM), NJ Chapter

American Chemical Society

Association of NJ Environmental Commissions (ANJEC)

PATRICK T. FARNHAM, PE, LEED GA

PROJECT ENGINEER

ENVIRONMENTAL ENGINEERING

Mr. Farnham has experience in environmental, civil, and biological engineering. His expertise includes environmental quality engineering, soil and water remediation, solid waste engineering, hydrology, physical/chemical processes in wastewater treatment, and water and landscape engineering. Mr. Farnham's responsibilities have also included project management, air monitoring, air/water/soil sampling, construction oversight, waste characterization, emergency spill response, Phase I ESAs and Phase II ESIs, and waste disposal oversight.

Mr. Farnham was named as one of the 2017 Young Professional of Year Winners by the American Council of Engineering Companies.

SELECTED PROJECTS

- Hudson Yards Development, remediation oversight at former MGP, New York, NY
- Columbia University, Manhattanville Campus, remediation oversight and management, New York, NY
- 160 Leroy Street, remediation management (Voluntary Cleanup Program), New York, NY
- 140 Sixth Avenue, remediation oversight, former gas station, New York, NY
- Gowanus Canal Northside, remediation management (Brownfield Cleanup Program), Brooklyn, NY
- Peter Cooper Village/Stuyvesant Town, remediation oversight at former MGP, New York, NY
- 42 West Street, Residential Conversion, remediation oversight, Brooklyn, NY
- Public Safety Answering Center II, remediation oversight, Bronx, NY
- 855 Sixth Avenue, remediation oversight, New York, NY
- 261 Hudson Street, remediation oversight, New York NY
- 23-01 42nd Road, remediation oversight, Long Island City, NY
- 309 Gold Street, remediation oversight, Brooklyn, NY
- 535 4th Avenue, remediation oversight, Brooklyn, NY
- 2nd Avenue Subway (96th Street Station), community and worker safety air monitoring at former MGP, New York, NY
- 111 Leroy Street, Phase II ESI and RAWP Preparation (Voluntary Cleanup Program), New York, NY
- NYU Washington Square Campus, SPCC plan preparation and compliance oversight, New York, NY
- New York University, Tandon School of Engineering, SPCC compliance oversight, Brooklyn, NY
- Jacob K. Javits Center, New York, NY
- New York City School Construction Authority (NYCSCA), Various Projects, NY
- The Shops at Atlas Park, AS/SVE and SSDS monitoring and maintenance, Glendale, NY

EDUCATION

M. Eng., Civil and Environmental Engineering
Cornell University

B.S., Biological and Environmental Engineering
Cornell University

PROFESSIONAL REGISTRATION

Professional Engineer (PE) in NY

LEED Green Associate (LEED GA)

NISTM 3rd New York Storage Tank Conference

40-Hour OSHA HAZWOPER

OSHA 8-Hour Health & Safety Refresher

OSHA Confined Space Entry Training

AFFILIATIONS

Engineers Without Borders, New York Professionals Chapter, Vice President Emeritus

American Society of Civil Engineers (ASCE)

American Council of Engineering Companies

Emily G. Strake, CEP
Senior Project Chemist/ Risk Assessor

Human Health Risk Assessment
Chemical Data Validation

19 years in the industry ~ 6 years with Langan

Ms. Strake has eighteen 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, PADEP, DNREC, SWRCB, DTSC, NJDEP, 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 assessing potential adverse health effect to humans from exposure to hazardous contaminants in soil, sediment, groundwater, surface water, ambient and indoor air, and various types of animal, fish, and plant materials. She understands and applies environmental cleanup guidance and policies associated with multiple federal and state agencies. Additionally, she has broad experience in the development of preliminary remediation goals and site-specific action levels. She is proficient with the USEPA and state-modified Johnson and Ettinger Models for Subsurface Vapor Intrusion into Buildings, USEPA's Adult Lead Methodology, IEUBK Methodology, DTSC's Leadspread 7 and 8, evaluation of aerobic biodegradation potential using API's BioVapor Model, and statistical evaluation of data using USEPA's ProUCL software. In addition, Ms. Strake is experienced in presentation of risk information at public meetings.

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. She also has a broad range of environmental field experience and maintains current OSHA HAZWOPER certification.

Ms. Strake is experienced in auditing laboratory methodology 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.

Education

M.B.A., Business Administration
The University of Scranton

B.S., Chemistry
Cedar Crest College

Certification

Board Certified Environmental Professional (CEP) in Assessment

Memberships

Interstate Technology and Regulatory Council

Montgomery Township Environmental Advisory Committee Member, Term ending 1/1/2019.

Society for Risk Analysis

Training

40 hr. OSHA HAZWOPER Training/Nov 2002

8 hr. HAZWOPER Supervisor/June 2004

8 hr. OSHA HAZWOPER Refresher/Oct 2018

Publications/Presentations

Decision Making at Contaminated Sites: Issues and Options in Human Health Risk Assessment. Interstate Technology and Regulatory Council

Alternate Approaches for Act 2 Risk Assessments Using Site-Specific Information. Pennsylvania Brownfields Conference

Risk Assessment in Remediation
Montclair State University

LANGAN

Ms. Strake has several years' experience analyzing investigative samples, writing laboratory Standard Operating Procedures (SOPs), and managing all aspects of procedures and analyses for Optical Emission Spectrometry, X-Ray Fluorescence, Ignition analysis, and Atomic Absorption. Her experience also includes operating and performing routine instrument maintenance for GC/MS and IR. Ms. Strake has worked extensively on developing rapid soil characterization programs for PCB and pesticide analyses utilizing enzyme-linked immunosorbent assays, and was also involved in efforts to develop new instrumentation to quantify microbial nitrification of ammonium.

Selected Project Experience

Human Health Risk Assessment

- Major League Soccer's San Jose Earthquakes Stadium – Utilized heuristic soil gas model to calculate risk and hazard associated with inhalation of chlorinated solvents for the redevelopment of a public soccer stadium. Soil gas data was modeled assuming three soil stratum and site-specific soil, building, and exposure parameters. The Earthquakes' stadium opened in 2015.
- Completed a human health risk assessment to determine if exposure to asbestos fibers in dried sediment posed a potentially unacceptable risk to nearby residents. The health risk assessment considered the contribution of naturally occurring asbestos associated with serpentine rock. Soil background samples were used to derive the mean concentration of all polarized light microscopy (PLM) samples. Chrysotile was the only asbestos type found during the PLM analysis.
- Texas Instruments – Participated in a collaboration to develop comments to USEPA Region IX and the San Francisco Regional Water Quality Control Board regarding vapor intrusion at South Bay Superfund Sites. The focus of the response was to outline scientific and policy objections to EPA's recommended TCE interim short-term indoor air response action levels and guidelines, and to clarify the use of California-modified indoor air screening levels for assessing and responding to TCE and PCE subsurface vapor intrusion into indoor air.
- Confidential Client – derived cancer risk estimates associated with exposure to airborne asbestos fibers during construction of a NBA sports arena. A sensitive receptor zone, representing a 1,000 ft. radial diameter from the project site, was established to determine those receptors requiring quantitative risk evaluation. Risk-based ambient air quality standards were established for transmission electron microscopy (TEM) asbestos.
- Completed a human health risk assessment, including submission of a Memorandum on Exposure Scenarios and Assumptions (MESA), Pathways Analysis Report (PAR), and Baseline Human Health Risk Assessment (BHHRA) for a CERCLA site in Fair Lawn, New Jersey under USEPA Region 2 lead. The evaluation included assessment of potentially complete groundwater and surface water pathways for residents, industrial workers, recreators, utility workers, and construction workers. The risk assessment approach and conclusions received USEPA approval in 2018.
- Performed a baseline risk assessment for hypothetical future residents at a CERCLA site in Hagerstown, Maryland. The evaluation included evaluation of ingestion, dermal contact, and inhalation of chemicals in groundwater. Linear low dose cancer risk

was assessed as well as one-hit cancer risk, with specific focus on pesticides and PCBs.

- Confidential Client – Performed an exposure assessment associated with exposure to fiberglass/crystalline silica in broken acoustic tile. Supported the identification of analytical methodology for evaluation of silica on air filters.
- Golden Gate National Parks Conservancy – Peer reviewed a Preliminary Endangerment Assessment Report for the Battery East Trail. The assessment included a human health risk evaluation that estimated carcinogenic risk from exposure to PAHs and dioxin/furans in soil using toxic equivalency to benzo(a)pyrene and 2,3,7,8-TCDD.
- Performed a site-specific risk assessment for recreational land use at a CERCLA site in Santa Barbara County. The risk assessment derived incremental lifetime cancer risk estimates associated with PCBs evaluated as Aroclors in surface soil. The risk assessment approach and conclusions received multi-agency approval in 2017.
- Calculated a site-specific groundwater standard for indane on the basis of toxic analogy. A surrogate toxicity value approach was implemented due to limited availability of toxicological information related to indane. The site-specific standard was accepted by NJDEP in 2017.
- Delaware City Refinery - Performed comprehensive human health risk assessment for a petroleum refinery in Delaware City, Delaware under the RCRA program. The risk assessment was the basis for a thorough characterization and assessment of potential risks posed by site-specific conditions. Developed various human exposure scenarios by using both Federal and State-Specific guidance for soil, groundwater, and surface water exposure.
- DuPont - Worked as a key participant in the human health risk evaluation of mercury associated with legacy contamination of the South River located in Waynesboro, Virginia.
- Veteran's Affairs - Completed a human health risk evaluation of the potential future risk associated with inhalation of indoor air for the Veteran's Administration. Soil, soil gas, and groundwater samples were collected as part of the site characterization. Achieved DTSC approval of the risk assessment approach and conclusions.
- Santa Clara Landfill – Developed a human health risk assessment to characterize risk associated with exposure to landfill gas at the Santa Clara All Purpose Landfill. The risk assessment evaluated specific compounds in landfill gas, their concentrations, spatial patterns, and extent throughout the site, and assessed the potential for vapor intrusion associated with a proposed future redevelopment.
- Occidental Chemical – Completed multiple AOC-specific risk assessments utilizing and applying the guidance set forth by the DTSC's Human Health Risk Assessment Note 1 (Default Exposure Factors for Use in Risk Assessment), Note 3 (Recommended Methodology for Use of USEPA Regional Screening Levels), and Note 4 (Screening Level Human Health Risk Assessments).
- Exelon - Developed a human health risk assessment for a utility-owned former Manufactured Gas Plant (MGP) site in Pennsylvania, under Pennsylvania's Act 2 Program. Used ProUCL statistical

software to determine upper limits for full data sets and non-detect data. Conducted vapor intrusion modeling (via the Johnson & Ettinger model) and prepared vapor intrusion reports showing that risks to volatile organic compounds in soils and groundwater were not impacting indoor air quality.

- Avon - Completed a human health risk assessment for a redevelopment property located in Rye, New York. The objective of the evaluation was to characterize the risks associated with potential future human exposures to soil and groundwater affected by a release from the Site's former No. 2 fuel oil UST. The intended future use of the Site was a playground to be utilized by the general public for open play on commercial recreational equipment.
- Sunoco Refineries – Derived site-specific soil PRGs for lead using the EPA's adult lead model for two former Sunoco refineries. Achieved PADEP approval in May 2015. Completed receptor evaluations in accordance with USEPA risk assessment guidance to develop exposure parameters under current and reasonably anticipated future land use scenarios.
- Honeywell - Completed a focused human health risk evaluation of PAH contaminants for under NJDEP's Site Remediation Program. Applied a blended approach of qualitative risk characterization and quantitative risk calculation to propose closure of AOCs following the remedial investigation.
- Floreffe Terminal - Performed human health risk assessment for contamination resulting from a 3.9 million gallon diesel oil tank collapse along the Monongahela River. Evaluated potential impacts to human health via exposure to soil, groundwater, and surface water. Calculated site-specific standards for soil remediation.
- DOW Chemical - Calculated Medium Specific Concentrations for unregulated contaminants using the PADEP protocols to assist in the clean-up of a monomer tank explosion in Bristol, Pennsylvania. Selected appropriate surrogate toxicity data and evaluated novel on-site constituents by analogy.
- Ryder – Developed Alternative Direct Exposure Criteria for PAH-impacted fill material at a commercial facility. Site-specific soil screening levels for incidental ingestion of soil were calculated following a forward risk evaluation for current on-site receptors.
- Rohm and Haas - Prepared an Act 2 site-specific human health risk assessment for the oldest industrial facility in the United States, located in southeast Philadelphia. The objective of the risk assessment was to determine achievable possible future land-use options under Pennsylvania's Land Recycling Program. The risk assessment included evolution of multiple site-COPCs and constituent suites: VOCs, SVOCs, PCBs, pesticides, and metals (including lead). Evaluated the potential for indoor air inhalation through J&E modeling of soil gas and groundwater.
- Regency - Conducted vapor intrusion modeling for a dry cleaning facility in the Philadelphia area. Predictive modeling using the Johnson and Ettinger approach indicated that estimated contaminant levels would not adversely affect human receptors.

Chemical Data Quality

- Participated in a CERCLA site investigation; assessed the usability of sample results for numerous matrices including dust, sediment,

soils, and various aqueous matrices for a remedial investigation under the Contract Laboratory Program. Implemented an on-site pesticide immunoassay program to delineate soil contamination in real-time.

- Coordinated the collection of fish tissue samples and determined the validity of the analytical results associated with CERCLA and RCRA site characterizations. Assessed duck blood analytical results for the Connecticut Department of Energy and Environmental Protection Bureau of Natural Resources.
- Audited multiple accredited laboratories in New Jersey and Pennsylvania on behalf of clients using USEPA Guidance on Technical Audits and Related Assessments for Environmental Data Operations. The audits included full-suite USEPA and SW-846 methodology; and included reviewing staff experience and training records, equipment and facilities, policies, practices, procedures, and documentation for sample receipt, analysis, instrument maintenance, standard preparation, calibration and traceability, control charting, corrective actions, data reduction and review, report generation, and waste disposal.
- Reviewed and validated data packages for RCRA Facilities Investigation at a Philadelphia-area chemical site; issued data validation reports to project personnel and regulatory agencies. The reviews included evaluation of quarterly groundwater, soil, and soil vapor matrices. Participated in RCRA groundwater sampling, developed and executed the investigation's QAPP, and coordinated with the laboratory to schedule and perform field-sampling events.
- Completed Data Usability Summary Reports in accordance with NYSDEC DER-10 guidance for soil, groundwater, sediment surface water, soil gas, ambient air and indoor air analytical results.
- Acted as the Quality Assurance Officer for several long-term projects in Pennsylvania, Maryland, and New Jersey, Delaware, responsible for the achievement of all forms of QA/QC as it related to sampling, analysis, and data evaluation.

ATTACHMENT B
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	Analyte	MDL	RL	Units
VOC					
TO-15	Soil Vapor	1,1,1,2-Tetrachloroethane	0.059	0.1	ppbv
TO-15	Soil Vapor	1,1,1-Trichloroethane	0.084	0.1	ppbv
TO-15	Soil Vapor	1,1,2,2-Tetrachloroethane	0.048	0.1	ppbv
TO-15	Soil Vapor	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	0.096	0.1	ppbv
TO-15	Soil Vapor	1,1,2-Trichloroethane	0.043	0.1	ppbv
TO-15	Soil Vapor	1,1-Dichloroethane	0.083	0.1	ppbv
TO-15	Soil Vapor	1,1-Dichloroethylene	0.05	0.05	ppbv
TO-15	Soil Vapor	1,2,4-Trichlorobenzene	0.079	0.1	ppbv
TO-15	Soil Vapor	1,2,4-Trimethylbenzene	0.06	0.1	ppbv
TO-15	Soil Vapor	1,2-Dibromoethane	0.04	0.1	ppbv
TO-15	Soil Vapor	1,2-Dichlorobenzene	0.065	0.1	ppbv
TO-15	Soil Vapor	1,2-Dichloroethane	0.062	0.1	ppbv
TO-15	Soil Vapor	1,2-Dichloropropane	0.051	0.1	ppbv
TO-15	Soil Vapor	1,2-Dichlorotetrafluoroethane	0.098	0.1	ppbv
TO-15	Soil Vapor	1,3,5-Trimethylbenzene	0.054	0.1	ppbv
TO-15	Soil Vapor	1,3-Butadiene	0.038	0.1	ppbv
TO-15	Soil Vapor	1,3-Dichlorobenzene	0.067	0.1	ppbv
TO-15	Soil Vapor	1,3-Dichloropropane	0.031	0.1	ppbv
TO-15	Soil Vapor	1,4-Dichlorobenzene	0.06	0.1	ppbv
TO-15	Soil Vapor	1,4-Dioxane	0.083	0.1	ppbv
TO-15	Soil Vapor	2-Butanone	0.059	0.1	ppbv
TO-15	Soil Vapor	2-Hexanone	0.041	0.1	ppbv
TO-15	Soil Vapor	3-Chloropropene	0.076	0.1	ppbv
TO-15	Soil Vapor	4-Methyl-2-pentanone	0.085	0.1	ppbv
TO-15	Soil Vapor	Acetone	0.098	0.1	ppbv
TO-15	Soil Vapor	Acrolein	0.097	0.1	ppbv
TO-15	Soil Vapor	Acrylonitrile	0.079	0.1	ppbv
TO-15	Soil Vapor	Benzene	0.1	0.1	ppbv
TO-15	Soil Vapor	Benzyl chloride	0.054	0.1	ppbv
TO-15	Soil Vapor	Bromodichloromethane	0.034	0.1	ppbv
TO-15	Soil Vapor	Bromoform	0.049	0.1	ppbv
TO-15	Soil Vapor	Bromomethane	0.098	0.1	ppbv
TO-15	Soil Vapor	Carbon disulfide	0.094	0.1	ppbv
TO-15	Soil Vapor	Carbon tetrachloride	0.025	0.025	ppbv
TO-15	Soil Vapor	Chlorobenzene	0.056	0.1	ppbv
TO-15	Soil Vapor	Chloroethane	0.064	0.1	ppbv
TO-15	Soil Vapor	Chloroform	0.092	0.1	ppbv
TO-15	Soil Vapor	Chloromethane	0.049	0.1	ppbv
TO-15	Soil Vapor	cis-1,2-Dichloroethylene	0.048	0.05	ppbv
TO-15	Soil Vapor	cis-1,3-Dichloropropylene	0.041	0.1	ppbv
TO-15	Soil Vapor	Cyclohexane	0.086	0.1	ppbv
TO-15	Soil Vapor	Dibromochloromethane	0.049	0.1	ppbv
TO-15	Soil Vapor	Dichlorodifluoromethane	0.09	0.1	ppbv
TO-15	Soil Vapor	Ethyl acetate	0.068	0.1	ppbv
TO-15	Soil Vapor	Ethyl Benzene	0.069	0.1	ppbv
TO-15	Soil Vapor	Hexachlorobutadiene	0.085	0.1	ppbv
TO-15	Soil Vapor	Isopropanol	0.096	0.1	ppbv
TO-15	Soil Vapor	Isopropylbenzene	0.059	0.1	ppbv
TO-15	Soil Vapor	Methyl Methacrylate	0.031	0.1	ppbv
TO-15	Soil Vapor	Methyl tert-butyl ether (MTBE)	0.097	0.1	ppbv
TO-15	Soil Vapor	Methylene chloride	0.07	0.1	ppbv
TO-15	Soil Vapor	Naphthalene	0.097	0.1	ppbv
TO-15	Soil Vapor	n-Butylbenzene	0.054	0.1	ppbv
TO-15	Soil Vapor	n-Heptane	0.043	0.1	ppbv
TO-15	Soil Vapor	n-Hexane	0.08	0.1	ppbv
TO-15	Soil Vapor	n-Propylbenzene	0.093	0.1	ppbv
TO-15	Soil Vapor	o-Xylene	0.024	0.1	ppbv
TO-15	Soil Vapor	p- & m- Xylenes	0.143	0.1	ppbv
TO-15	Soil Vapor	p-Ethyltoluene	0.076	0.1	ppbv
TO-15	Soil Vapor	p-Isopropyltoluene	0.03	0.1	ppbv
TO-15	Soil Vapor	Propylene	0.042	0.1	ppbv
TO-15	Soil Vapor	sec-Butylbenzene	0.056	0.1	ppbv
TO-15	Soil Vapor	Styrene	0.059	0.1	ppbv
TO-15	Soil Vapor	tert-Butylbenzene	0.051	0.1	ppbv
TO-15	Soil Vapor	Tetrachloroethylene	0.049	0.1	ppbv
TO-15	Soil Vapor	Tetrahydrofuran	0.053	0.1	ppbv
TO-15	Soil Vapor	Toluene	0.059	0.1	ppbv
TO-15	Soil Vapor	trans-1,2-Dichloroethylene	0.079	0.1	ppbv
TO-15	Soil Vapor	trans-1,3-Dichloropropylene	0.092	0.1	ppbv
TO-15	Soil Vapor	Trichloroethylene	0.025	0.025	ppbv
TO-15	Soil Vapor	Trichlorofluoromethane (Freon 11)	0.076	0.1	ppbv
TO-15	Soil Vapor	Vinyl Acetate	0.062	0.1	ppbv
TO-15	Soil Vapor	Vinyl Bromide	0.096	0.1	ppbv
TO-15	Soil Vapor	Vinyl Chloride	0.044	0.05	ppbv

MDL - method detection limit
ppbv - parts per billion by volume
RL - reporting limit
VOC - volatile organic compounds

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	Equipment Blank Samples	Trip Blank Samples	MS/MSD Samples
Sub-Slab Soil Vapor - Temporary Points	Total VOCs	TO-15 Listed VOCs	USEPA TO-15	Ambient Temperature	Dedicated Tedlar bag	Analyze within 3 days of collection	NA	NA	NA	NA
Sub-Slab Soil Vapor - Permanent Points	Total VOCs	TO-15 Listed VOCs	USEPA TO-15	Ambient Temperature	6-Liter Summa Canister	Analyze within 30 days of collection	NA	NA	NA	NA
Indoor Air Samples	Total VOCs	TO-15 Listed VOCs	USEPA TO-15	Ambient Temperature	6-Liter Summa Canister	Analyze within 30 days of collection	NA	NA	NA	NA
Outdoor Air Sample	Total VOCs	TO-15 Listed VOCs	USEPA TO-15	Ambient Temperature	6-Liter Summa Canister	Analyze within 30 days of collection	NA	NA	NA	NA

Notes:
VOC - Volatile Organic Compound
USEPA - United States Environmental Protection Agency
MS/MSD - Matrix Spike/Matrix spike Duplicate
NA - Not Applicable

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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 EQuIS database.

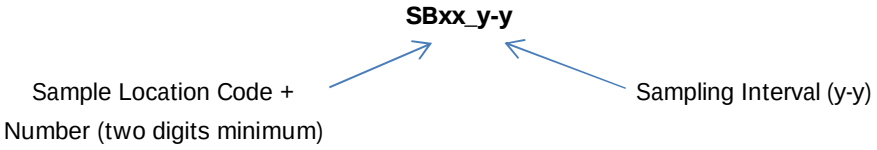
1.0 INVESTIGATION LOCATION CODES

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.

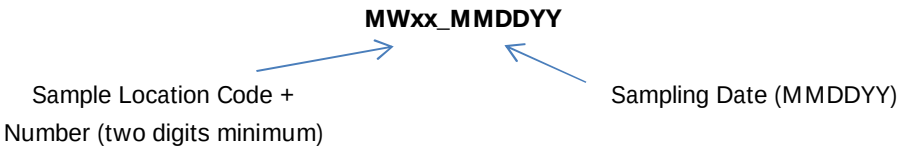
- **Soil/Sediment Samples:**



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

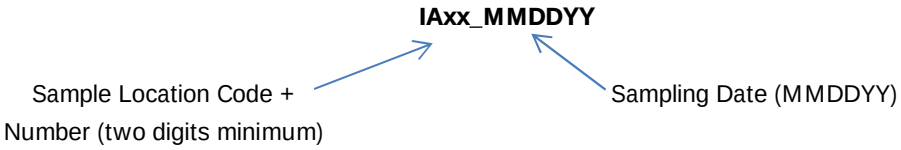
Sample Type	Sample Location Code	Sampling Depth or Interval (feet bgs or approx. elevation)	Sample Name
Endpoint Sampling			
Grab Soil Sample	EPSW01_N	5	EPSW01_N_5
	EPSW01_S	5	EPSW01_S_5
	EPSW01_E	5	EPSW01_E_5
	EPSW01_W	5	EPSW01_W_5
	EPB01	6	EPB01_6

- **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:**



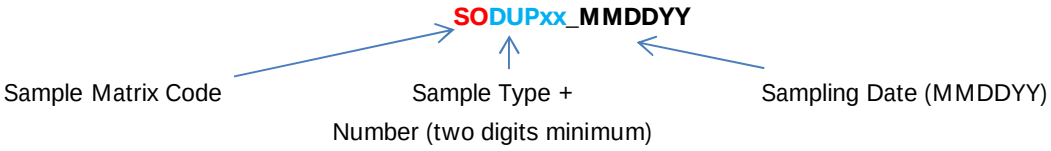
Sample Type	Sample Location Code	Date	Sample Name
Air Sample	IA01	02/21/2013	IA01_022113
Soil Vapor Sample	SV01	02/21/2013	SV01_022113
Vapor Extraction Well Sample	SVE01 (INLET/MIDPOINT/OUTLET)	02/21/2013	SVE01_IN_022113 SVE01_ MID_022113 SVE01_ OUT_022113

- **QA/QC Samples:**

Sample Matrix Codes

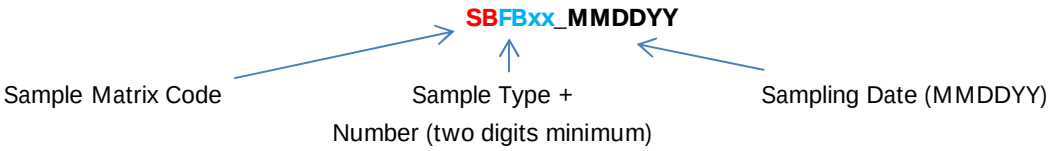
SO	Soil	AS	Air
SE	Sediment	SV	Soil Vapor
GW	Groundwater	SL	Sludge
SW	Surface Water	FP	Free Product

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

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)