INTERIM REMEDIAL MEASURES WORK PLAN

for

450 UNION STREET
BROOKLYN, NEW YORK
NYSDEC BCP No. C224219

Prepared for

450 Union LLC
c/o Pilot Real Estate Group LLC
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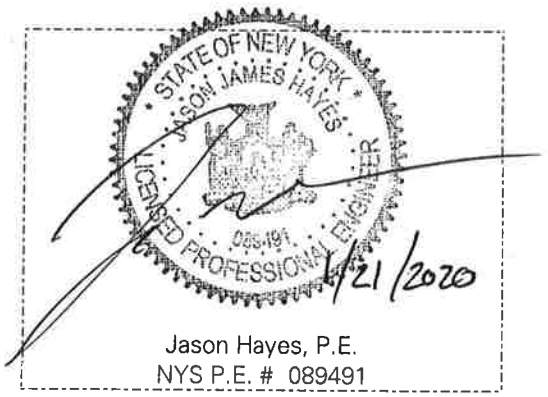
Langan Project No. 170301202

LANGAN

CERTIFICATION

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



Jason Hayes, P.E.
NYS P.E. # 089491

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1.0 INTRODUCTION

1.1 General

450 Union LLC c/o Pilot Real Estate Group (the Volunteer) entered into a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) on September 1, 2015, to investigate and remediate a 28,500-square-foot (0.65-acre) property located at 450 Union Street in the Gowanus Neighborhood of Brooklyn, New York (the site). The Volunteer is enrolled in the Brownfield Cleanup Program (BCP Site No. C224219) and is proposing to remediate the property for its intended use with regulatory oversight and guidance by the NYSDEC.

This Interim Remedial Measures Work Plan (IRMWP) was prepared to outline one proposed interim remedial measure (IRM) and includes the following:

- Installation of a new steel bulkhead/containment barrier with a hydrophilic water-stop installed at un-welded interlocking seams to serve as a subsurface containment/cut-off wall for coal tar-related dense non-aqueous phase liquid (DNAPL) migration onto the property from or into the Gowanus Canal/adjacent ecological receptor;
- Excavation and off-site disposal of excess soil/fill generated during construction of the new bulkhead/containment barrier.
- Documentation soil sampling and analysis, collected from the base and (where available) sidewalls of bulkhead/containment barrier excavations, to document residual soil/fill exceeding Title 6 of the New York Codes, Rules and Regulations (6 NYCRR) Part 375 Restricted Use Restricted-Residential (RURR) Soil Cleanup Objectives (SCOs);
- Backfill above the high-level relieving platform to the original grade using certified-clean fill meeting the lower of Part 375 RURR and Protection of Groundwater SCOs, or with virgin, native crushed stone, in accordance with DER-10;
- Restoration of the site cover consisting of asphalt, concrete pavement, and/or a minimum 2-foot-thick clean soil cover meeting the lower of Part 375 RURR and Protection of Groundwater SCOs above a demarcation barrier;
- Survey of excavations and the top of the site cover by a New York State Professional Land Surveyor; and
- Development and execution of a Construction Health and Safety Plan (CHASP), Community Air Monitoring Program (CAMP), and Soil and Sediment Erosion (SSE) plan for the protection of on-site workers and the nearby community during remediation and construction activities.

It is anticipated that the IRM will be completed in advance of completing the final remedy. Residual coal tar recovery not addressed by this IRMWP will be addressed in a forthcoming Remedial Action Work Plan (RAWP).

This IRMWP has been prepared in accordance with requirements of the New York State BCP and NYSDEC's May 2010 Division of Environmental Remediation (DER)-10 - Technical Guidance for Site Investigation and Remediation (May 2010). DER-10 defines an IRM as follows:

> ***"Interim remedial measure" or "IRM"*** *means activities to address both emergency and non-emergency site conditions, which can be undertaken without extensive investigation and evaluation, to prevent, mitigate or remedy environmental damage or the consequences of environmental damage attributable to a site, including, but not limited to, the following activities: construction of diversion ditches; collection systems; drum removal; leachate collection systems; construction of fences or other barriers; installation of water filters; provision of alternative water systems; the removal of source areas; or plume control.*

1.2 Site Description

The site is located at 450 Union Street in the Gowanus Neighborhood of Brooklyn, New York and is identified as Block 438, Lot 7 on the Brooklyn Borough Tax Map. The site encompasses an area of about 28,500 square feet (0.65 acres) and is bound by Union Street to the north; the Gowanus Canal to the east; Lot 3 (automobile and bus parking) to the south; and Bond Street, followed by residential buildings, to the west. A Site Location Map is provided as Figure 1.

Zoning for the site is characterized as an M2-1 Manufacturing District. The site is used as a private event space, art gallery, and restaurant with seasonal outdoor space and is improved with a one-story 9,880-square-foot structure (shared by the "Green Building" for private event space and the restaurant) and two ancillary storage sheds. A bulkhead, consisting of a 12-foot high headwall, supported by timber cribbing, separates the property from the Gowanus Canal. The property extents, site features, and interim remedial measures evaluated in this work plan are shown on the Figure 2 Site Plan.

1.3 Site History

1.3.1 Gowanus Canal History

The site is centered in a historically industrial and manufacturing area along the Gowanus Canal. In the 1840s, the canal was a natural estuary (Gowanus Creek) surrounded by farmland and refineries. In 1849, construction began to convert the estuary into a transportation system to promote industrial growth and commerce. Construction of the canal was completed by 1869,

and by 1870 the surrounding areas had become urbanized with manufactured gas plants, coal yards, and factories. As part of construction, land was artificially created by filling in parts of the original Gowanus Creek and construction of the existing bulkhead. According to a historical index map of Brooklyn, published in 1874 by J.B. Beers & Co., the site was partially located within the original Gowanus Creek. This, and its proximity to the Gowanus Canal, suggests it was subject to significant land filling of undocumented quality.

1.3.2 Environmental Site History

Prior to the Volunteer's involvement with the site, several investigations and reports were prepared:

1. *October 2001 Phase I Environmental Site Assessment (ESA), prepared by New York Petroleum & Drilling*
2. *June and July 2001 Phase II Subsurface Investigation Report, prepared by New York Petroleum & Drilling*
3. *February 2002 Due Diligence Review, prepared by AKRF, Inc. (AKRF)*
4. *May 2002 Phase II Site Investigation Report, prepared by AKRF*
5. *May 29, 2014 Phase I ESA, prepared by Langan Engineering, Environmental, Surveying, and Landscape Architecture, D.P.C. (Langan)*
6. *June 5, 2014 Phase II Environmental Site Investigation (ESI), prepared by Langan*
7. *June 25, 2014 Phase I ESA Report, prepared by Hillmann Consulting (Hillmann)*
8. *July 25, 2014 Subsurface Investigation Summary Letter, prepared by Hillmann*

After entering into a BCA with the NYSDEC, the following work plans and reports were prepared on behalf of the Volunteer:

9. *May 5, 2017 Remedial Investigation Report (RIR), prepared by Langan*
10. *February 16, 2017 Interim Remedial Measure Work Plan (IRMWP), prepared by Langan*
11. *March 26, 2019 Draft Construction Completion Report (CCR), prepared by Langan*
12. *April 5, 2019 Draft Remediation Action Work Plan (RAWP), prepared by Langan*[1]

The site was developed as early as 1886 for historical manufacturing and industrial operations that included coal and wood storage, granite works, die casting and electroplating, vehicle repair,

[1] In consultation with NYSDEC, the Volunteer has elected to perform one element of the remedy, bulkhead/containment barrier installation, under an IRMWP. The April 5, 2019 draft RAWP will be revised to remove the bulkhead/containment barrier remedy and will be resubmitted at a later date.

fuel storage/vehicle repair, and a foundry. The site is identified in department records as a Toxic Release Inventory Site, an Air Discharge Facility, and a Large Quantity Generator of hazardous waste. The Bayside Fuel Oil Company adjoins the site to the north and is classified as a Major Oil Storage Facility and Petroleum Bulk Storage Facility for containing six mounted tanks ranging in size from 1,000 gallons to 500,000 gallons with No. 2 fuel oil, diesel, and kerosene.

Subsurface investigations between 2001 and 2016 have identified the following and are shown on Figure 3:

- Coal tar impacts to native soil between 23 and 54 feet below grade surface (bgs) and accumulation of coal tar DNAPL within an on-site recovery well;
- A potential underground storage tank (UST) located during geophysical ground surveys and previously identified on historical Sanborn Fire Insurance Maps at the southeast corner of the Green Building. Petroleum impacts to soil associated with the potential UST were identified immediately around its location and up to 12 feet bgs;
- A hazardous lead soil hotspot near the center of the site, extending from surface grade to about 4 feet bgs; and
- A layer of historic fill (below the site cap) with concentrations of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, pesticides, and localized polychlorinated biphenyls (PCBs) above 6 NYCRR[2] Part 375 Unrestricted Use (UU) and Restricted Use Restricted-Residential (RRU) Soil Cleanup Objectives (SCOs).

1.4 Previous Remediation

An IRMWP was prepared to remediate the western three quarters of the site and regulate construction activities related to site improvements. The remedial measures identified in the IRMWP were subject to a public comment and review period and were subsequently approved by the NYSDEC on 16 February 2017. The IRM was implemented between 20 February and 3 May 2017 and was documented in the March 26, 2019 draft CCR. The 2017 IRM included:

- Excavation and off-site disposal of soil with hazardous concentrations of lead;
- Decommissioning and off-site disposal of a 550-gallon UST;
- Localized excavations into the existing site cover for installation of awning footings, planter beds, and tree pits and off-site disposal of excavated material;

[2] Title 6 of the Official Compilation of New York Codes, Rules, and Regulations (6 NYCRR) Part 375 Environmental Remediation Programs.

- Collection and analysis of confirmation soil samples following the hazardous lead soil and UST excavations and documentation soil samples following the awning footing, planter bed, and tree pit excavations; and
- Restoration of the site cover system with concrete, asphalt, and landscaped surfaces underlain by a high-visibility demarcation barrier.

Confirmation and documentation soil sampling results are summarized as follows:

- Confirmation soil sample results for the hazardous lead excavation indicate that residual concentrations of lead are below RRU SCOs and RCRA hazardous criteria;
- Confirmation soil sample results for the UST excavation did not contain VOC concentrations above UU or RRU SCOs. Detected SVOC concentrations are consistent with concentrations typically found in historic fill in New York City, including in historic fill present across the site.
- Documentation soil samples collected within the 0- to 4-foot interval of historic fill did not contain VOCs herbicides, pesticides, or PCBs above the Track 4 site-specific SCOs. Detected SVOC concentrations are typical of those found in historic fill. Metals were generally below Track 4 site-specific SCOs, except for one sample, collected near the center of the site, containing mercury at a concentration of 190 mg/kg. This area is capped by 2 feet of RCA and a 2-foot clean stone cover.

1.5 Site Geology

Two distinct geologic types (historic fill and native soils) were observed during the RI, and are described below in depth order (shallow to deep):

1.5.1 Historic Fill

The site is underlain by a layer of historic fill, predominately consisting of brown to grey, fine to coarse sand and silt with varying amounts of gravel, coal ash, brick, wood, glass, plastic, slag, and foam fragments. The depth of fill was variable, observed between about 8 and 14 feet bgs. The historic fill layer appeared shallowest near the western part of the site and thickest toward the southern part of the site.

1.5.2 Native Soils

The fill layer was underlain by brown, reddish-brown to grey, fine- to coarse-grained sand with varying amounts of silt, and gravel. Intermittent clay lenses ranging in thickness of about 8 inches to 22 feet were observed in the southern and eastern part of the site. A secondary deep confining

unit consisting of native silt deposits was identified starting at depths between about 38 and 48 feet and extend down to about 56 feet bgs.

1.5.3 Hydrogeological Conditions

According to synoptic depth-to-groundwater measurements, water was encountered between about 8.55 feet bgs (elevation[3] [el.] 3.63) to 7.95 (el. 3.93). Based on the well gauging results, and consistent with the surrounding area, groundwater appears to flow to the east-southeast toward the Gowanus Canal.

1.6 Contaminant Conditions

1.6.1 Historic Fill

The site has a layer of historic fill that extents from surface grade to about 14 feet bgs and contains concentrations of SVOCs, pesticides, and metals above background. PCBs were detected in one area only within surficial fill. PAHs[4] were detected in the majority of soil samples collected from historic fill at concentrations above 6 NYCRR Part 375 Unrestricted Use (UU) and/or RURR SCOs. Excluding samples collected from the UST area, total PAH concentrations were as high as 690 parts per million (ppm) in shallow historic fill. Similar PAHs detected in groundwater above NYSDEC Technical and Operational Guidance Series (TOGS) Ambient Water Quality Standards and Guidance Values (SGVs) for Class GA (drinking water) and may be attributable to historic fill material and/or known sources of coal tar in the vicinity of the site.

Several metals were detected in shallow fill material above UU and/or RRU SCOs and are attributed to historic fill quality and tidal washing from the Gowanus Canal. A localized area of shallow fill contained hazardous concentrations of lead, as determined by the Toxicity Characteristic Leaching Procedure (TCLP). The area was delineated to about 4 feet bgs during the RI and was removed during the 2017 IRM. The hazardous lead area did not appear to have impacted groundwater, based on dissolved metals concentrations.

1.6.2 Coal Tar-Contaminated Material

Coal tar-related VOCs and SVOCs were detected in soil borings advanced along the eastern perimeter of the site near the Gowanus Canal during the RI and geotechnical/environmental investigation. Impacted material was documented above and below observed shallow clay lenses between 23 and 54 feet bgs. PID measurements above background were generally detected at depths below 23 feet bgs, with the highest measurement (380.7 ppm) at around 27.5

[3] Elevations are in feet and referenced to the North American Vertical Datum of 1988 (NAVD88).
[4] Polycyclic Aromatic Hydrocarbons (PAHs) are a class of SVOCs produced by incomplete combustion, as defined as defined by the USEPA and Agency for Toxic Substances and Disease Registry (ATSDR).

feet bgs. The presence of coal tar was less frequent below 33 feet bgs and PID measurements below 40 feet bgs were generally between 1 and 20 ppm. Coal tar was not observed in the deepest soil boring interval (58 to 60 feet bgs). Based on the findings in this area, one on-site 2-inch-diameter recovery well was installed with a slotted PVC screen (40 and 50 feet bgs) and a sump (50 to 52 feet bgs).

Coal tar DNAPL was measured at about 42 feet bgs in the on-site recovery well on September 19, 2016, corresponding to about 10 feet of product that had accumulated in the well column (42 to 52 feet bgs). A sample of the coal tar DNAPL was collected on September 23, 2016 for fingerprint analysis and the results indicated that the material contained forensic signatures resembling coal tar/creosote. Findings of the soil borings and recovery well gauging suggest that coal tar is perched on top of and partially within a secondary confining layer/lens, starting at about 38 to 48 feet bgs.

1.7 Proposed Development

The proposed development is in the early stages of planning and may go through several iterations as the design is refined. At this time, it is contemplated that the end use of the property will likely be a mix of commercial, retail, residential, light manufacturing and/or community use. Until a redevelopment plan is finalized, the site may continue to be used for private event space, as an art gallery, and as a restaurant with seasonal outdoor space or other non-manufacturing, non-residential uses.

2.0 DESCRIPTION OF INTERIM REMEDIAL MEASURE

This IRMWP will facilitate installation of a new steel bulkhead/containment barrier in advance of an approved RAWP. The objective of the IRM is to prevent additional environmental impacts to site media (soil, groundwater, and soil vapor) and migration of on-site contaminants to off-site areas by installing a new steel bulkhead/containment barrier to serve as a subsurface containment barrier. The site cover will be restored with concrete, asphalt, or a clean soil cover where the cap is to be penetrated pursuant to this IRM. These tasks will facilitate future development and a comprehensive remediation.

2.1 Standards, Criteria, and Guidance and Remedial Action Objectives

In accordance with DER-10, Remedial Action Objectives (RAOs) are established to provide medium-specific objectives for the protection of public health and the environment and are developed based on contaminant-specific standards, criteria, and guidance (SCGs). The SCGs used to develop RAOs for this site include:

- NYSDEC Brownfield Cleanup Program Guide (draft 2004);
- NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation (2010);
- NYSDEC TOGS 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (1998);
- NYSDEC TOGS 5.1.8 New York State Stormwater Management Design Manual (2008);
- NYSDEC TOGS 5.1.10 New York Standards and Specifications for Erosion and Sediment Controls (2005);
- NYSDEC Commissioner Policy 51 (CP-51) Soil Cleanup Guidance (2010).
- NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (2006);
- 6 NYCRR Part 360 Solid Waste Management Facilities;
- 6 NYCRR Part 364 Waste Transporter Permits;
- 6 NYCRR Part 370 Hazardous Waste Management;
- 6 NYCRR Part 375 Environmental Remediation Programs;
- 40 CFR Part 261 Identification and Listing of Hazardous Waste;
- 29 CFR Part 1910.120 Hazardous Waste Operations and Emergency Response Standard; and
- 29 CFR Part 1926 Safety and Health Regulations for Construction.

The following RAOs were developed for this site and provide the basis of design for the interim remedial measure.

Soil RAOs

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

Groundwater RAOs

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.

RAOs for Environmental Protection

- Prevent the discharge of contaminants to surface water.
- Remove the source of ground or surface water contamination.

Soil Vapor RAOs

RAOs for Public Health Protection

- Prevent potential impacts to public health resulting from existing, or the potential for, soil vapor intrusion into the proposed building at the site.

2.2 Technical Description of the Proposed IRM

The proposed IRM includes replacing the current dilapidated timber bulkhead with a new bulkhead, which will serve as a contaminant containment barrier, along the eastern perimeter of the site. Once installed, the bulkhead/containment barrier will retard potential contaminant migration laterally between the site and the Gowanus Canal and vice versa. The following is a technical description of the proposed IRM:

- Installation of a new steel bulkhead/containment barrier with a hydrophilic water-stop installed at un-welded interlocking seams to serve as a subsurface containment/cut-off wall for coal tar DNAPL migration;
- Excavation and off-site disposal of excess soil/fill generated during construction of the new bulkhead/containment barrier.

- Documentation soil sampling and analysis, collected from the base and (where available) sidewalls of bulkhead/containment barrier excavations, to document residual soil/fill exceeding 6 NYCRR Part 375 RURR SCOs;
- Backfill above the high-level relieving platform to the original grade using certified-clean fill meeting the lower of Part 375 RURR and Protection of Groundwater SCOs, or with virgin, native crushed stone, in accordance with DER-10;
- Restoration of the site cover consisting of asphalt, concrete pavement, and/or a minimum 2-foot-thick clean soil cover meeting the lower of Part 375 RURR and Protection of Groundwater SCOs above a demarcation barrier;
- Survey of excavations and the top of the site cover by a New York State Professional Land Surveyor; and
- Development and execution of a CHASP, CAMP, and SSE plan for the protection of on-site workers and the nearby community during remediation and construction activities.

2.2.1 Bulkhead/Containment Barrier

The Volunteer will install the new bulkhead/containment barrier to serve as a containment/cut-off wall for coal tar DNAPL impacts. A high-level relieving platform design will be constructed and will require:

- Installation of a new watertight, steel sheet bulkhead/containment barrier to about 52 feet bgs (el. -40) along the eastern portion of the property bordering the Gowanus Canal. The steel sheeting will be driven into the secondary low-permeability silt and clay layers encountered at depths starting at 38 feet to 48 feet bgs in RI borings RGB-2 and RGB-1, respectively. The low-permeability layers extend down to 56 feet bgs. A hydrophilic water-stop will be installed within the interlocking seams from sheet toe (el. -40) up to the mean higher high water (MHHW), about 10 feet bgs (el. 2.5). The hydrophilic water-stop is designed to swell and seal voids on contact with water;
- Excavation of about 600 cubic yards of historic fill below the concrete platform to relieve earth-pressure forces against the steel sheet wall;
- Installation of a high-level relieving platform system, consisting of a pile-supported, reinforced concrete platform extending about 25 feet west from the bulkhead/containment barrier at a depth of about 4 feet bgs; and
- Backfilling on top of the concrete platform to bring the surrounding area(s) to grade, as needed.

The proposed IRM excavation and bulkhead/containment barrier installation area is shown on Figure 4. Waste characterization soil sampling will be performed to characterize the fill designated for disposal. Excavated historic fill will be managed, transported, and disposed of as a regulated solid waste. Waste haulers will be 6 NYCRR Part 364-permitted and appropriately placarded per NYS Department of Transportation (NYSDOT) requirements. A bulkhead design and construction work plan will be provided to USEPA for their approval as USEPA has jurisdiction over all waterfront installations along the Gowanus Canal.

The new bulkhead/containment barrier will be installed along the eastern 100-foot boundary of the site with returns at the north and south lot boundaries. The steel sheets will be equipped with a watertight sealant that is coal tar-resistant (Adeka Ultraseal or equivalent – Wadit Sealants will not be considered) between the interlocks and will act as a containment/cut-off wall.

2.2.2 Documentation Soil Sampling

Documentation soil samples will be collected in accordance with DER-10 guidance for every 900 square feet of excavation base and every 30 linear feet of sidewall excavation. Depending on the type of support of excavation system used, sidewall soil samples may not be collected because of inability to access sidewall soil. It is estimated that four documentation soil samples, plus QA/QC samples, will be collected to document residual soil quality.

Documentation soil samples, plus QA/QC samples, will be analyzed for Part 375 and Total Compound List (TCL)/Target Analyte List (TAL) list of VOCs, SVOCs, metals, PCBs, pesticides, herbicides, and metals (including hexavalent and trivalent chromium and cyanide). Proposed documentation soil sample locations are shown on Figure 5.

2.2.3 Excavation Backfill

After bulkhead/containment barrier excavations, backfill will be required to restore the eastern area to the surrounding grade to continue normal operations. The estimated quantity of backfill required for the IRM is 800 cubic yards (including 30 percent extra for compaction). To the extent that backfill will be placed directly on top of remaining site soil, a demarcation barrier (i.e., orange snow fence) will be placed between the remaining site soil exceeding Track 4 SCOs and the clean backfill to serve as a visual indicator of remedial excavation depths. If needed, excess site soil will be used in localized areas to raise the grade below the site cover, provided it is non-hazardous and not grossly-impacted, but will not be allowed for use in the final surface cover. Excavated material proposed for reuse as backfill will be in accordance with Section 3.8.

Imported backfill material will be Track 4-compliant soil, meeting the lower Part 375 RURR and Protection of Groundwater SCOs, or consist of other acceptable fill material such as virgin, clean

stone from a quarry or RCA. Imported fill will be screened and rejected if it contains solid waste such as brick, concrete, glass, ash, wood, or other debris. If RCA is imported, it will be from facilities conforming to 6 NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA and must contain less than 10 percent by weight passing a #80 sieve. RCA imported from compliant facilities will not require chemical testing, unless required by NYSDEC under its terms for operation of the facility. RCA material is not acceptable for, and will not be used as cover or drainage. Imported material will be screened and inspected for foreign material or indications of contamination prior to placement.

2.2.4 Site Cover System

The site cover will be maintained to allow for Restricted-Residential uses. The site cover currently consists of concrete building slabs, asphalt pavement, and/or a minimum 2-foot clean soil (meeting the lower of RURR and Protection of Groundwater SCOs) or virgin clean stone for landscaped areas or planter beds. The site cover will serve as an engineering control for the protection of human health by establishing an incomplete exposure pathway to remaining impacted soil. A demarcation layer (e.g., orange snow fencing) will be installed at the base of the excavation or between remaining soil and imported clean material. The site cover layout and details are presented on Figure 6.

3.0 INTERIM REMEDIAL MEASURES PROGRAM

The IRM described herein will be performed in accordance with applicable local, state and federal regulations and in general accordance with the schedule provided in Section 4. Proposed changes, delays or deviations will be promptly communicated to the NYSDEC. Potential worker and public exposure to site contaminants will be minimized by adhering to a site-specific HASP and CAMP, which are discussed in Sections 3.15 and 3.16. The CHASP and CAMP are included as Appendix A and Appendix B, respectively. Site Preparation

Site preparation will be completed by the Contractor prior to implementation of the proposed IRM and will include, but not be limited to, the establishment of work zones, mobilization of support facilities, construction of decontamination facilities, implementation of erosion control measures, and implementation of site security measures (i.e. erection of security fencing around work zones and staging areas). The Contractor will maintain soil erosion control and sediment control measures prior to the commencement of, and during work operations contained in the proposed IRMWP. The Contractor will obtain necessary permits prior to the commencement of any task included in the proposed IRMWP.

Prior to intrusive activities, Dig Safely New York (811) will be contacted by the Contractor a minimum of three business days in advance of the work. Dig Safely New York will be informed of the nature of the work and the intent to perform excavation activities at the site.

3.1 Remedial Activity Oversight

Langan staff will be on-site full time during implementation of the IRM. The IRM activities will be documented in periodic reports and in a CCR as described in Section 5.2.

3.2 Remedial Support Facilities

Prior to commencement of work at the site, temporary facilities and utilities will be installed on site to support the IRM. Construction fences will be maintained around the work area perimeter to control access. Sidewalks adjacent to the site will be controlled and maintained to protect pedestrians from truck traffic in and out of the site. Office and supply trailers will be set up on the site as required to support operations.

Mobilization and site preparation activities to be conducted by the Contractor include:

- Identifying the location of all aboveground and underground utilities (e.g., power, gas, water, sewer, telephone, etc.), equipment, and structures (as necessary to implement the IRM);
- Mobilizing necessary personnel, equipment, and materials to the site;

- Constructing a stabilized construction entrance as required to support equipment and truck ingress and egress;
- Constructing an equipment decontamination area for trucks, equipment, and personnel that come into contact with impacted materials during remedial activities;
- Installing erosion and sedimentation control measures; and
- Installing temporary fencing or other temporary barriers as required to limit unauthorized access to the areas where activities will be conducted.

Following completion of the work, the Contractor will demobilize all labor, equipment, and materials not required for execution of the final remedy.

3.3 Waste Characterization

Waste characterization samples will be collected from the material proposed for excavation and disposal during implementation of the IRM. Soil samples may be collected in situ prior to excavation or from temporary stockpiles. This activity will be coordinated and overseen by a representative of the Remedial Engineer (RE). Samples will be representative of the material requiring disposal at a frequency consistent with disposal facility requirements. Additional samples may be collected as needed to meet disposal requirements. The results of the waste characterization sampling may also inform whether the excavated soil is suitable for reuse as backfill in localized areas below the site cover, in accordance with Section 3.8.

Waste characterization samples will be submitted to a NYSDOH Environmental Laboratory Approval Program (ELAP)-approved laboratory for analysis in accordance with the QAPP provided in Appendix C. Waste characterization samples will be analyzed for parameters that are typically required by disposal facilities, including:

- 6 NYCRR Part 375/TCL/TAL VOCs, SVOCs, PCBs, pesticides, herbicides and metals;
- TCLP VOCs, SVOCs, pesticides, herbicides, and metals;
- Resource Conservation and Recovery Act (RCRA) characteristics, including ignitability, corrosivity, reactivity (sulfide and cyanide); and
- Total cyanide, and
- Paint filter analysis.

3.4 Soil Screening Methods

During IRM excavation, visual, olfactory and instrumental soil screening will be performed by a field engineer, geologist or scientist under the supervision of the RE. Visibly impacted material will be segregated and placed on polyethylene sheeting pending off-site disposal.

3.5 Soil Stockpiles

Soil stockpile areas generated during excavation will be constructed as necessary for staging of site soil, pending off-site removal. Separate stockpile areas will be constructed to avoid co-mingling materials of different soil types. All stockpile areas will meet the following minimum requirements:

- Individual stockpiles will not exceed 2,000 cubic yards.
- The excavated soil will be placed onto two layers of a minimum 8-mil low-permeability liner of sufficient strength and thickness to prevent puncture during use. Different material types will be segregated in separate stockpile areas.
- Equipment and procedures will be used to place and remove the soil that will minimize the potential to jeopardize the integrity of the liner.
- Stockpiles will be covered at 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 any rainwater that has drained off the soils, and to mitigate the potential for surface water run-on.
- Stockpiles will be inspected at a minimum once each week and after every storm event and any deficiencies will be promptly addressed. Any damaged tarps or coverings will be promptly replaced.
- Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by NYSDEC.

3.6 Material Load Out and Transport

Excavated material will be handled, transported, and disposed of by a licensed hauler in accordance with applicable 6 NYCRR Part 360 General Provisions, 6 NYCRR Part 364 Waste Transporter Permits regulations, and other applicable federal, state and local regulations. Non-hazardous historic fill and contaminated soil taken off site will be handled, at minimum, as a Municipal Solid Waste per 6 NYCRR Part 360-1.2. Historic fill and contaminated soil from the site are prohibited from being disposed of at Part 360-16 Registration Facilities (also known as Soil Recycling Facilities).

The waste removal contractor will provide the appropriate permits, certifications, and written commitments from disposal facilities to accept the material throughout the duration of the project. Waste manifests will be used to track the material that is transported off site. Haulers will be appropriately licensed and trucks will be properly placarded.

A representative for the RE will oversee the load-out of excavated material. After the loading of a container, dump truck, or trailer has been completed, the material will be transported to the approved off-site disposal facility. Loaded vehicles leaving the site will be appropriately lined, securely covered, and manifested in accordance with appropriate federal, state, local, and New York State Department of Transportation (NYSDOT) requirements (or other applicable transportation requirements). Loads containing wet material capable of producing free liquid will not be transported off site. A truck wash/cleaning area will be operated on site. The RE will be responsible for documenting that all outbound trucks are washed/cleaned at the truck wash before leaving the site until the interim remedial action is complete. Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site sediment tracking. Proposed in-bound and out-bound truck routes to the site are shown on Figure 7.

3.7 Material Disposal Off-site

The RE will review submittals for proposed disposal facilities before any materials leave the site to verify that the facility has the proper permits and to review their acceptance requirements. Waste characterization will be performed per Section 3.4. Sampling and analytical methods, sampling frequency, analytical results, and quality assurance/quality control (QA/QC) methods will be reported in the CCR. Waste characterization data available for soil/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 shall be provided before any material is transported. Proposed disposal facility documentation will be presented to the NYSDEC prior to disposal activities.

3.8 Material Reuse On-site

Soil excavated during interior or exterior trenching may be reused if the requirements in this section are met. Grossly-impacted or hazardous soil will not be reused. Reused soil placed beneath the site cover must be non-hazardous in accordance with the predetermined beneficial use determination, listed in 6 NYCRR § 360.12 and/or 360.13. If any of the waste materials specified are approved for an end-use specified in Section 360.12 and/or 360.13, it will not be considered a solid waste. Soil removed during implementation of the remedy or other purposes will not be reused within a soil cover layer or within landscaped areas. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the site is prohibited for reuse on site. Reuse of soil will be coordinated in advance with the NYSDEC case manager and will follow guidelines described in DER-10 Section 5.4(e).

3.9 Importation of Backfill and Clean Fill Material

Imported soils will meet the lower of the Part 375 RURR and Protection of Groundwater SCOs, as set forth in Table 375-6.8(b) of 6 NYCRR Part 375. Non-compliant soils will not be imported onto the site without prior approval by NYSDEC. Documentation from each facility will be obtained, including the facility name, address, state department permits, and site history, if necessary, in accordance with DER-10 5.4(e)6. Representative samples of imported material will be collected and analyzed based on import volume at a frequency consistent with DER-10 Table 5.4(e)10.

Backfill material will consist of clean fill or other acceptable fill material such as virgin stone from a quarry or RCA. If RCA is imported to the site, it will be from NYSDEC-permitted or registered facilities in compliance with 6 NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA. RCA imported from compliant facilities will not require chemical testing, unless required by NYSDEC under its terms for operation of the facility. RCA imported to the site must be derived from recognizable and uncontaminated concrete. RCA material is not acceptable for, and will not be used as cover material. RCA or virgin stone aggregates must contain less than 10 percent by weight passing a #80 sieve to be excluded from DER-10 sampling requirements. For restoration of localized planter beds, commercially available topsoil may be proposed for import without analytical testing when source facilities may not be feasible.

Prior to its placement, imported material will be screened for evidence of contamination (visual, olfactory and instrument). Material from industrial sites, spill sites, other environmental remediation sites or other potentially impacted sites will also not be imported to the site. The imported fill will not include solid waste including brick, concrete, glass, ash, wood, or other debris. Materials proposed for import onto the site will be reviewed by the RE and will be in compliance with provisions in this IRMWP prior to receipt.

3.10 Waste Liquid Management

Excess fluids are not expected to be generated during IRM excavations. If needed, liquids to be removed from the site, including dewatering fluids, will be handled, transported and disposed of in accordance with applicable local, state, and federal regulations. Discharge of liquids into the New York City sewer system will be addressed through an approved NYCDEP permit and conform to pre-treatment stipulations of that permit. Fluids not suitable for discharge to the NYCDEP sewer system may be collected, characterized, and managed off-site.

Untreated fluids will not be recharged back to the land surface or subsurface of the site. Discharge of water generated during remedial construction to surface waters (i.e. a local pond, stream or river) is prohibited without a SPDES permit.

3.11 Contingency Plan

If USTs or other previously unidentified structures are found during construction of the new bulkhead/containment barrier, they will be removed and sampling will be performed on new product, if encountered.

If encountered, USTs will be decommissioned and closed in conformance to the criteria defined in 6 NYCRR Part 613.9, NYSDEC CP-51, and other applicable NYSDEC UST closure requirements including and DER-10 Chapter 5.5.

3.12 Dust, Odor, Vapor and Nuisance Control Plan

This dust, odor, organic vapor and nuisance control plan was developed in accordance with the NYSDOH CAMP and Occupational Safety and Health Administration (OSHA) standards for construction (29 CFR 1926). Construction activities will be monitored for dust and odors by the RE's field inspector. Continuous monitoring on the perimeter of the work zones for odor, VOCs, and dust will 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 IRM activities. Two stationary air-monitoring stations will be set up at work area perimeters (one upwind and one downwind) during intrusive site work for continuous monitoring. Each station will include a PID and a DustTrak aerosol monitor or equivalent. A portable PID will be used to monitor the work zone and for periodic monitoring for VOCs. Action levels for the protection of the community and visitors are set forth in the CAMP.

3.12.1 Odor and Vapor Control

This odor control plan is capable of controlling emissions of nuisance odors off-site. Specific odor control methods to be used on a routine basis will include application of foam suppressants or tarps over odorous or VOC source areas, as needed. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of odor events and of other complaints about the project. Implementation of odor controls, including the halting of work, will be the responsibility of the RE, who is responsible for certifying the CCR. Application of odor controls is the responsibility of the Contractor.

All necessary means will be employed to prevent on- and off-site nuisances. At a minimum, procedures will include: (a) limiting the area of excavations; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances may include: (d)

use of chemical odorants in spray or misting systems; and, (e) use of staff to monitor odors in surrounding neighborhoods.

3.12.2 Dust Control

A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:

- Use of a dedicated water distribution system or an alternate source with suitable supply and pressure for use in dust control.
- Gravel may be used on earthen roadways to provide a clean and dust-free road surface.

On-site roads will be limited in total area to minimize the area required for water spraying.

3.12.3 Other Nuisances

A plan for rodent control will be developed and implemented by the Contractor before and during all bulkhead/containment barrier construction work. The rodent control plan will include the use of traps or typical commercial poisons and will be mindful of the impact on neighboring buildings and individuals, in accordance with NYC Department of Health and Mental Hygiene rodent control guide for property owners. A plan for noise control will be developed and utilized by the Contractor for IRM work and will conform, at a minimum, to NYCDEP noise control standards.

3.13 Sheeting and Shoring

Appropriate management of structural stability of on- and/or off-site structures during containment barrier construction activities will be performed by the Contractor. The Contractor is solely responsible for safe execution of all invasive and other work performed under this IRMWP and will be responsible for obtaining any local, state or federal permits or approvals that may be required to perform work under this IRMWP.

3.14 Construction Health and Safety Plan

The RE prepared a site-specific CHASP, which is provided as Appendix A. The CHASP specifically addresses health and safety requirements pertaining to site contamination and will apply to all remedial and construction-related work on site. Contractors operating on the site are required to adhere to their own plans that, at a minimum, meet the requirements of the CHASP. The CHASP 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 CHASP provides a mechanism for establishing on-site safe working conditions, safety organization, procedures, and personal protective equipment (PPE) requirements during the IRM.

The CHASP meets the requirements of 29 CFR 1910 and 29 CFR 1926 (which includes 29 CFR 1910.120 and 29 CFR 1926.65, respectively).

3.15 Community Air Monitoring Plan

Community air monitoring will be conducted in compliance with the NYSDOH Generic CAMP outlined below.

The CAMP includes real-time continuous monitoring for VOCs and particulates at the downwind perimeter of each designated work area when certain activities are in progress. Continuous monitoring is required for all ground intrusive activities and during demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, equipment mobilization, pre-excavations for preparation of the working surface, and construction of guide-walls necessary for accurate construction.

CAMP 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 and odors will be conducted during all ground intrusive activities by the RE's field inspector. The work zone is defined as the general area in which machinery is operating in support of IRM activities. A portable PID will be used within the work zone for periodic monitoring of VOCs during IRM activities. The site perimeter will be visually monitored for fugitive dust emissions.

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 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 activities will resume provided that 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, activities will be shut down.

The following actions will be taken based on visual dust observations:

- If the downwind particulate level is 100 micrograms per cubic meter (µg/m³) 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.

Concentrations detected above action levels observed in the CAMP will be reported to the NYSDEC and NYSDOH Project Managers and included in the daily report. In addition, a map showing the location of the downwind and upwind CAMP stations will be included in the daily report.

3.16 Site Cover Maintenance

The site cover consists of the building's concrete slabs, exterior asphalt pavement, and localized planter beds (minimum 2 feet thick). Portions of the site cover will be removed or damaged during implementation of the IRMWP. The site cover, where penetrated, will be restored with new asphalt or 2 feet of clean soil placed above a demarcation barrier (for landscaped areas). For restoration of localized planter beds, commercially available topsoil may be proposed for import without analytical testing when source facilities may not be feasible. The site cover will serve as an engineering control for the protection of human health by establishing an incomplete exposure pathway to remaining site soil.

4.0 SCHEDULE

The bulkhead/containment barrier will be installed prior to May of 2020. The Volunteer anticipates that the IRM implementation will take about 10 to 14 weeks from mobilization through complete installation of the bulkhead/containment barrier; therefore installation would begin immediately. Following completion of the IRM, the remainder of the site will be remediated at a future date under a NYSDEC-approved RAWP and CHASP. An IRM implementation schedule is provided in Appendix D.

4.1 Notification

The NYSDEC will be notified prior to the start of work to arrange a pre-construction meeting. The meeting attendees will include, at a minimum, the NYSDEC, Volunteer, Langan, and Contractor.

5.0 REPORTING

Upon completion of the IRM, a CCR will be prepared and submitted to the NYSDEC. The RE responsible for certifying all reports will be an individual licensed to practice engineering in the State of New York. Jason J. Hayes, P.E. of Langan will have this responsibility. Should Mr. Hayes become unable to fulfill this responsibility, another suitably qualified New York State professional engineer will take his place. All project reports will be submitted to the NYSDEC electronically as PDFs. Laboratory analytical data for documentation samples will be submitted in an electronic data deliverable (EDD) format that complies with the NYSDEC's electronic data standards.

5.1 Daily Reports

Daily reports will be prepared for the project file and for review by the NYSDEC Project Manager. Daily reports will include:

- An update of progress made during the reporting day;
- Locations of work and quantities of material imported and exported from the site;
- References to map for site activities;
- A summary of any and all complaints with relevant details (names, phone numbers);
- A summary of CAMP findings, including exceedances;
- An explanation of notable site conditions;
- Actions anticipated for the next reporting day; and
- A photograph log of the day's remedial activities.

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 IRMWP or other sensitive or time critical information; however, such conditions will also be included in the daily reports. Emergency conditions and changes to the IRMWP 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.

5.2 Construction Completion Report

A CCR will be prepared to document the IRM and submitted to the NYSDEC Project Manager within 90 days of completing the IRM. The CCR will be incorporated into and referenced in the FER for the site when issued. The CCR will provide the following information:

1. The RE will certify that:
    a. Data generated was useable and met the remedial requirements;
    b. The remedial work conformed to the IRMWP;
    c. Dust, odor, and vapor control measures were implemented during invasive work and conformed with the IRMWP;
    d. Remediation waste was transported and disposed in accordance with the IRMWP;
    e. Source approval and sampling of imported acceptable fill (not anticipated) was completed in a manner consistent with the methodology of the IRMWP;
2. Description of any problems encountered and their resolutions;
3. Description of changes in the IRM from the elements provided in the IRMWP and associated design documents and the reasons for them;
4. Description of deviations from the approved IRMWP, if any;
5. "As-built" drawings including remediation areas;
6. Listing of waste streams, quantity of materials disposed, and where they were disposed;
7. Description of source and quality of fill;
8. A tabular summary of all sampling results and all material characterization results and other sampling and chemical analysis performed as part of the IRM;
9. Written and photographic documentation of all remedial work performed under this remedy;
10. Copies of all the submitted progress reports;
11. Certifications, manifests, and bills of lading for excavated materials transported off-site;
12. An accounting of the destination of all material removed from the site, including excavated impacted soil, historic fill, solid waste, hazardous waste, non-regulated material, and fluids; and
13. Documentation associated with disposal of all material must also include records and approvals for receipt of the material. It will provide an accounting of the origin and chemical quality of all material imported onto the site.

FIGURES

LEGEND:

APPROXIMATE BROWNFIELD CLEANUP PROGRAM SITE BOUNDARY

1,500 0 750 1,500

SCALE IN FEET

GENERAL NOTES:

1. BASE MAP IS TAKEN FROM UNITED STATES GEOLOGICAL SURVEY (USGS) 7.5 MINUTE TOPOGRAPHIC MAPS FOR THE BROOKLYN, 1980 AND JERSEY CITY, 1982 QUADRANGLES.

LANGAN

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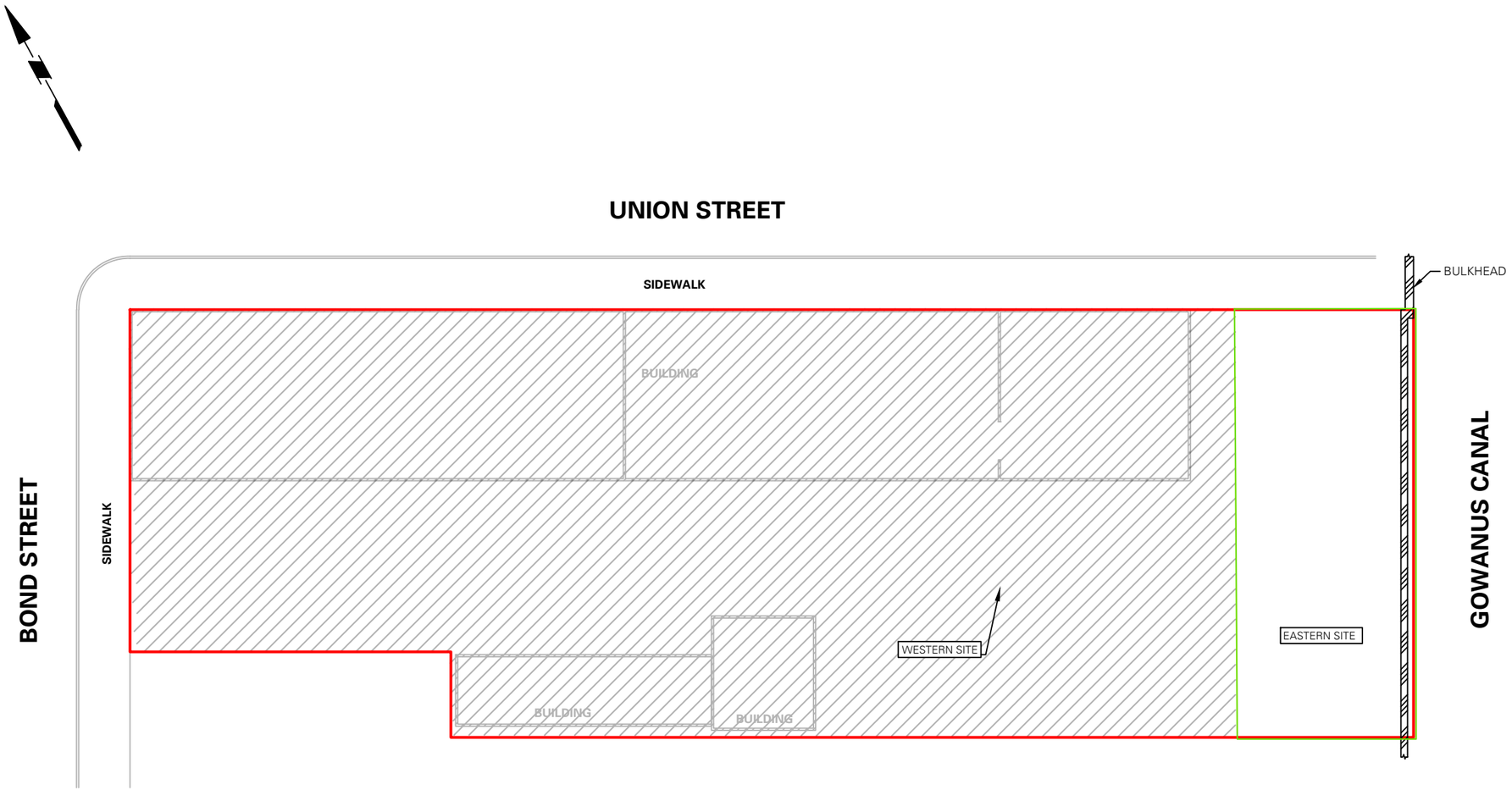
Project	450 UNION STREET BLOCK No. 438, LOT No. 7 BROOKLYN KINGS NEW YORK
Figure Title	SITE LOCATION MAP
Project No.	170301202
Date	11/25/2019
Drawn By	JD
Checked By	AT
Figure No.	1
Sheet	1 of 7

Filename: \\langan.com\data\NYC\data2\170301202\Cadd Data - 170301202\2D-DesignFiles\Environmental\IRMWP\Figure 1 - Site Location Map.dwg Date: 11/27/2019 Time: 10:39 User: jdonelan Style Table: Langan.stb Layout: SLM



LEGEND:

APPROXIMATE BROWNFIELD CLEANUP PROGRAM SITE BOUNDARY

APPROXIMATE BOUNDAY OF EASTERN PORTION OF SITE

GENERAL NOTES:

1. BASE MAP IS REFERENCED FROM SITE SURVEY, PREPARED BY BORO LAND SURVEYING, P.C., DATED MARCH 25, 2011.
2. ALL LOCATIONS ARE APPROXIMATE.

30 0 15 30

SCALE IN FEET

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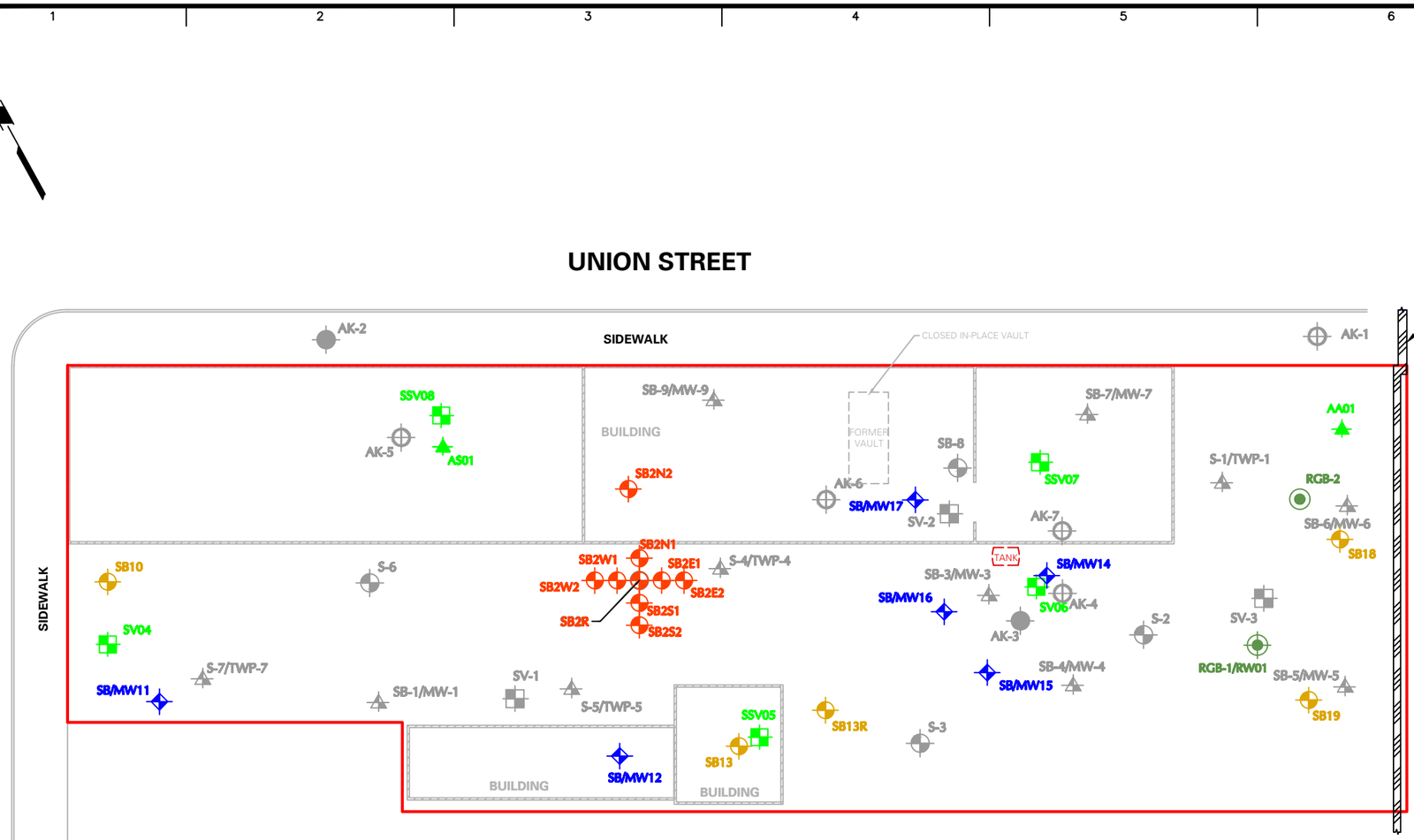
Project
450 UNION STREET
BLOCK No. 438, LOT No. 7
BROOKLYN
KINGS NEW YORK

Figure Title
SITE PLAN

Project No. 170201301
Date 11/25/2019
Drawn By JD
Checked By AT

Figure No. 2
Sheet 2 of 7

Filename: \\langan.com\data\NYC\data2\170301202\Cadd Data - 170301202\2D-DesignFiles\Environmental\IRMWP\Figure 2 - Site Plan_11.25.19.dwg Date: 11/27/2019 Time: 09:57 User: jdonelan Style Table: Langan.stb Layout: Site Plan



LEGEND:

- APPROXIMATE BROWNFIELD CLEANUP PROGRAM SITE BOUNDARY
- SB10 — RI SOIL BORING LOCATION (FEBRUARY 2016)
- SB2W1 — RI LEAD DELINEATION SOIL BORING LOCATION (FEBRUARY 2016)
- SB/MW11 — RI SOIL BORING/MONITORING WELL LOCATION (FEBRUARY 2016)
- RGB-2 — GEOTECHNICAL/ENVIRONMENTAL SOIL BORING LOCATION (JULY 2016)
- RGB-1/RW01 — GEOTECHNICAL/ENVIRONMENTAL SOIL BORING/RECOVERY WELL LOCATION (JULY 2016)
- SV04 — RI SOIL OR SUB-SLAB VAPOR SAMPLE LOCATION (FEBRUARY 2016)
  SV = SOIL VAPOR
  SSV = SUB-SLAB VAPOR
- AS01 — RI INDOOR/AMBIENT AIR SAMPLE LOCATION (FEBRUARY 216)
  AS = INDOOR AIR SAMPLE
  AA = AMBIENT AIR SAMPLE
- AK-4 — AKRF BORING LOCATION (APRIL 2002)
- AK-3 — AKRF BORING AND MONITORING WELL LOCATION (APRIL 2002)
- SB-8 — LANGAN BORING LOCATION (MAY 2014)
- SB-7/MW-7 — LANGAN BORING AND MONITORING WELL LOCATION (MAY 2014)
- SV-3 — LANGAN SOIL VAPOR SAMPLE LOCATION (MAY 2014)
- S-2 — HILLMAN BORING LOCATION (JULY 2014)
- S-5/TWP-5 — HILLMAN BORING AND MONITORING WELL LOCATION (JULY 2014)

GENERAL NOTES:

1. BASE MAP IS REFERENCED FROM SITE SURVEY, PREPARED BY BORO LAND SURVEYING, P.C., DATED MARCH 25, 2011.
2. SOIL BORING AND VAPOR SAMPLE LOCATIONS ARE APPROXIMATE. MONITORING WELLS WERE SURVEYED ON MARCH 9, 2016.
3. RI = REMEDIAL INVESTIGATION
4. LEAD DELINEATION BORINGS ARE SPACED ABOUT 5 FEET APART WITH THE EXCEPTION OF SB2N2.

30 0 15 30
SCALE IN FEET

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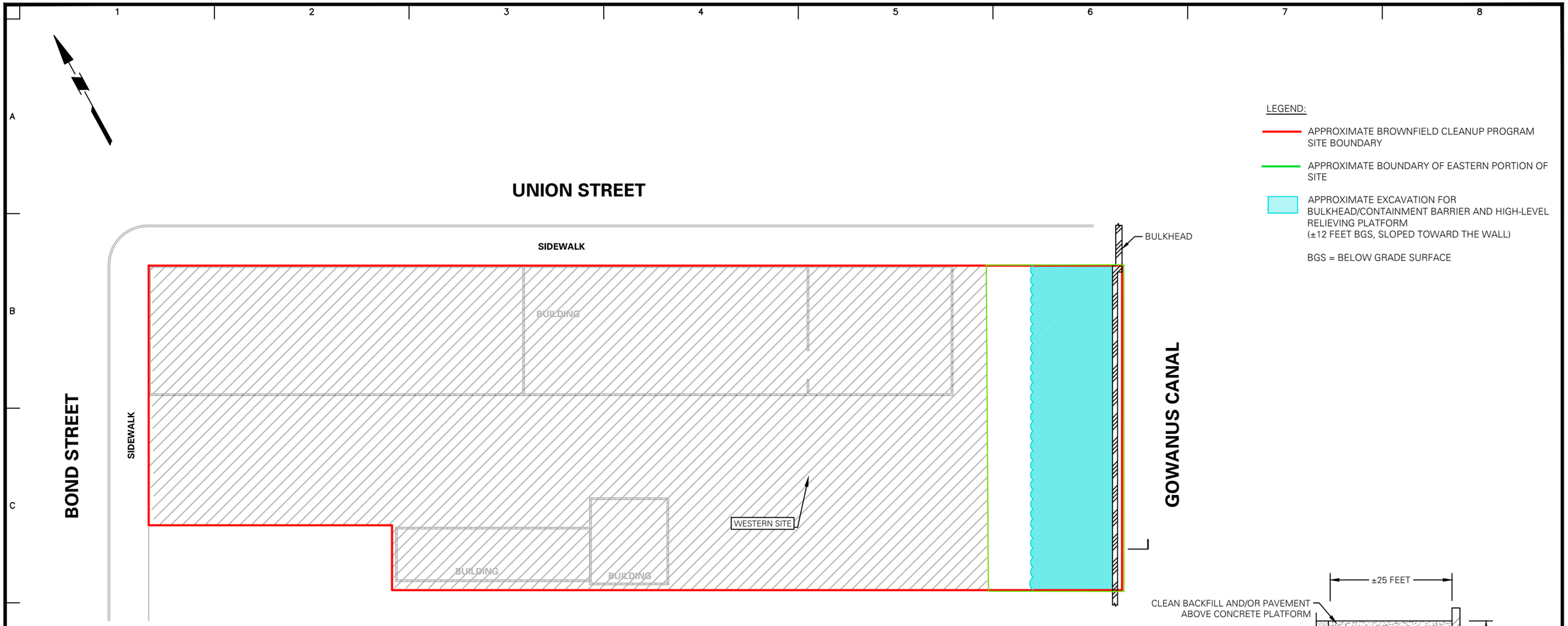
Project
450 UNION STREET
BLOCK No. 438, LOT No. 7
BROOKLYN
KINGS NEW YORK

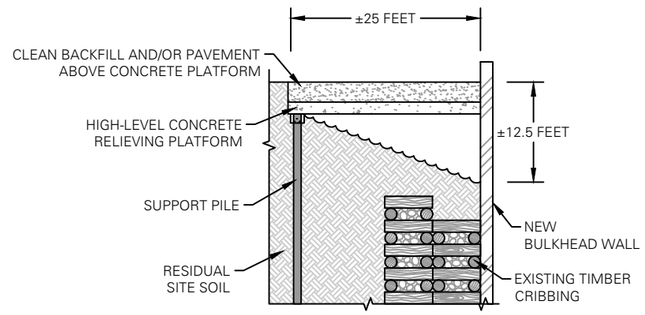
Figure Title
HISTORICAL SAMPLE LOCATION MAP

Project No. 170201301
Date 11/25/2019
Drawn By JD
Checked By AT

Figure No. 3
Sheet 3 of 7

Filename: \\langan.com\data\NYC\data2\170301202\Cadd Data - 170301202\2D-DesignFiles\Environmental\IRMWP\Figure 3 - Historical Sample Location Plan.dwg Date: 12/10/2019 Time: 13:44 User: atashji Style Table: Langan.stb Layout: Fig 3 - Sample Location Map





SECTION A: CONCEPTUAL HIGH-LEVEL RELIEVING PLATFORM SYSTEM FOR BULKHEAD WALL
(NOT TO SCALE)

GENERAL NOTES:

1. BASE MAP IS REFERENCED FROM SITE SURVEY, PREPARED BY BORO LAND SURVEYING, P.C., DATED MARCH 25, 2011.
2. ALL LOCATIONS ARE APPROXIMATE.
3. THE HIGH-LEVEL RELIEVING PLATFORM SYSTEM IS SHOWN FOR CONCEPTUAL PURPOSES ONLY AND IS NOT INTENDED FOR CONSTRUCTION.
4. EXISTING TIMBER CRIBBING IS SHOWN FOR REFERENCE AND SHOULD NOT BE CONSIDERED AN ACTUAL REPRESENTATION OF LOCATION AND SIZE.

30 0 15 30
SCALE IN FEET

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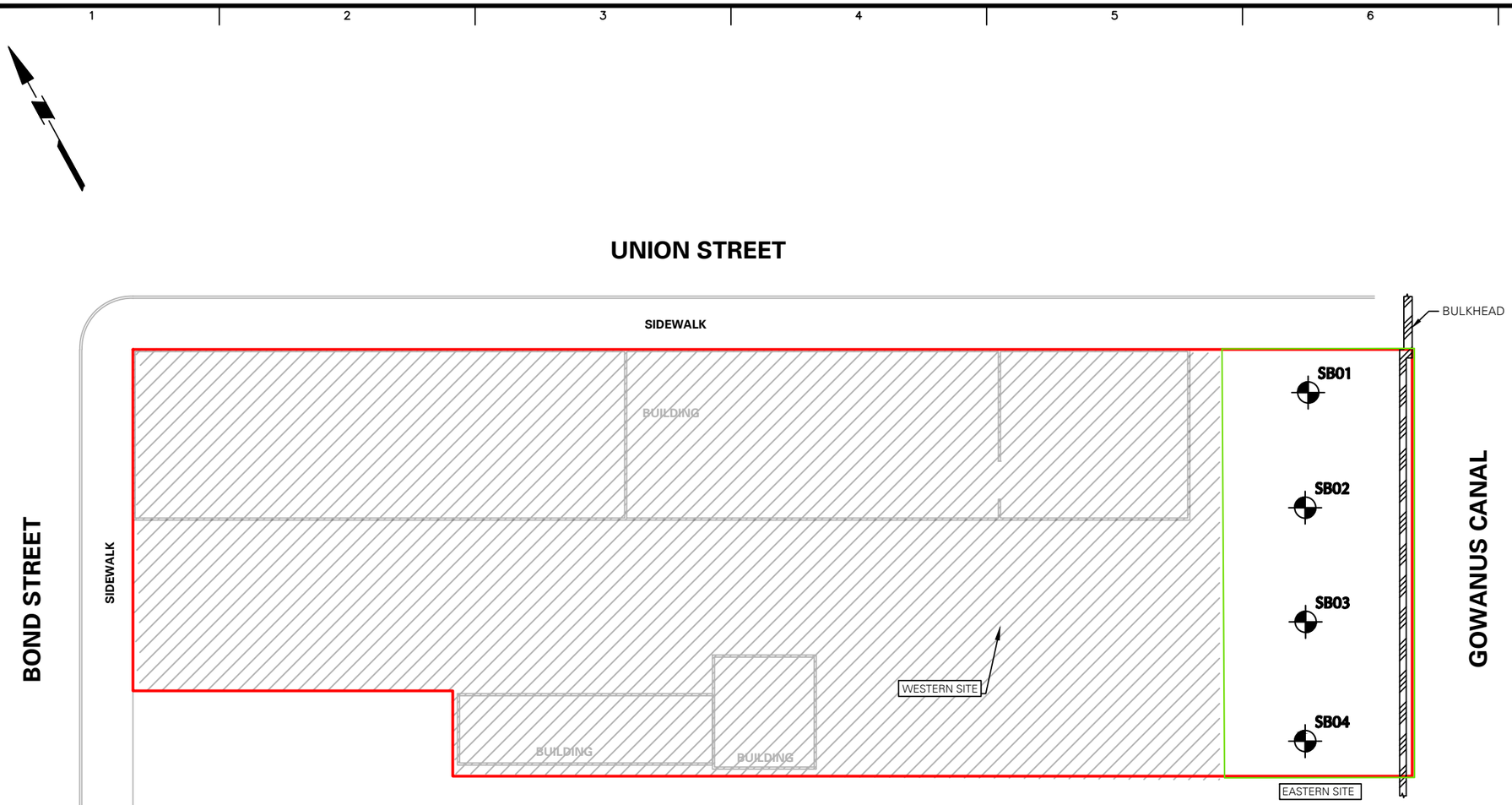
Project	450 UNION STREET BLOCK No. 438, LOT No. 7 BROOKLYN KINGS NEW YORK
Figure Title	PROPOSED EXCAVATION PLAN
Project No.	170201301
Date	11/25/2019
Drawn By	JD
Checked By	AT
Figure No.	4
Sheet	4 of 7

Filename: \\langan.com\data\NYC\data2\170301202\Cadd Data - 170301202\2D-DesignFiles\Environmental\IRMWP\Figure 4 - Proposed Excavation Plan.dwg Date: 12/10/2019 Time: 13:55 User: atashji Style Table: Langan.stb Layout: Figure 8 - Track 4



LEGEND:

APPROXIMATE BROWNFIELD CLEANUP PROGRAM SITE BOUNDARY

APPROXIMATE BOUNDAY OF EASTERN PORTION OF SITE

SB01 APPROXIMATE LOCATION OF DOCUMENTATION SOIL SAMPLE AT EXCAVATION BASE

GENERAL NOTES:

1. BASE MAP IS REFERENCED FROM SITE SURVEY, PREPARED BY BORO LAND SURVEYING, P.C., DATED MARCH 25, 2011.
2. ALL LOCATIONS ARE APPROXIMATE.
3. DOCUMENTATION SOIL SAMPLES WILL BE COLLECTED IN ACCORDANCE WITH DER-10 GUIDANCE FOR EVERY 900 SQUARE FEET OF EXCAVATION BASE AND EVERY 30 LINEAR FEET OF SIDEWALL EXCAVATION.
4. DEPENDING ON THE TYPE OF SUPPORT OF EXCAVATION SYSTEM USED, SIDEWALL SOIL SAMPLES MAY NOT BE COLLECTED BECAUSE OF INABILITY TO ACCESS SIDEWALL SOIL. ONLY BASE EXCAVATION DOCUMENTATION SAMPLES ARE SHOWN IN THE PLAN.

30 0 15 30
SCALE IN FEET

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Project
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BLOCK No. 438, LOT No. 7
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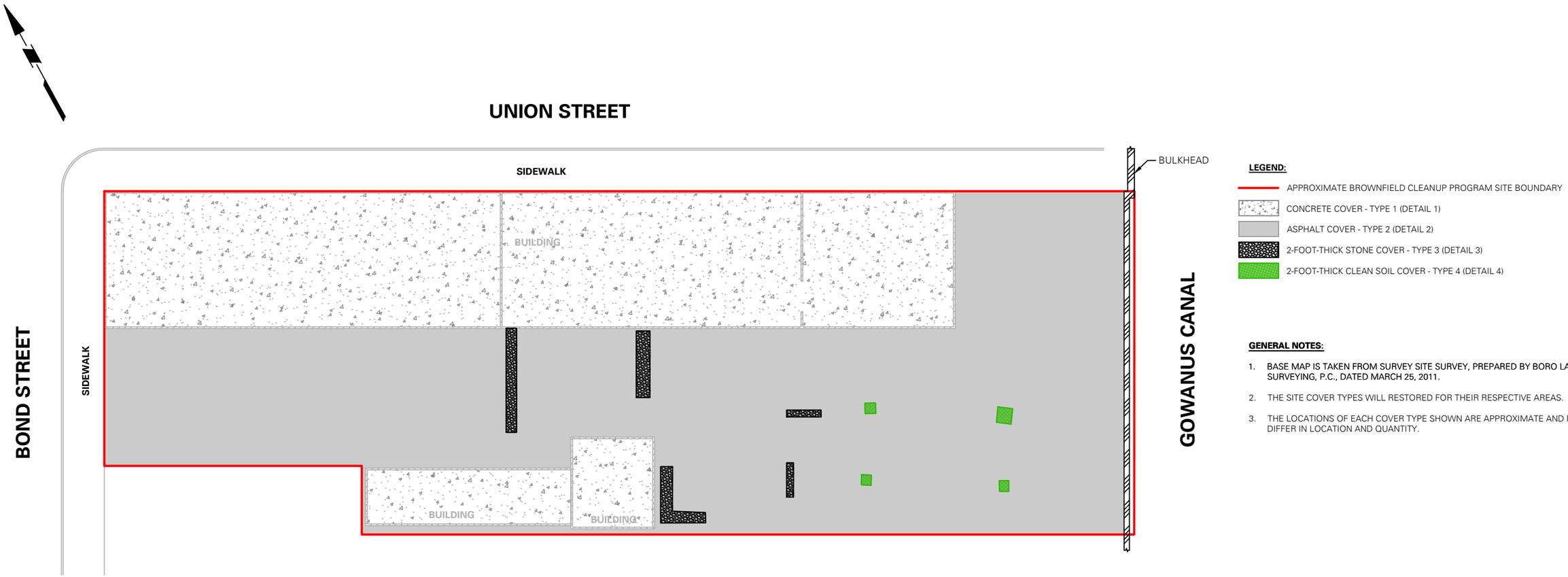
Figure Title
PROPOSED DOCUMENTATION SOIL SAMPLING PLAN

Project No. 170201301
Date 11/25/2019
Drawn By JD
Checked By AT

Figure No. 5
Sheet 5 of 7

Filename: \\langan.com\data\NYC\data2\170301202\Cadd Data - 170301202\2D-DesignFiles\Environmental\IRMWP\Figure 5 - Proposed Documentation Sample Plan.dwg Date: 12/10/2019 Time: 13:50 User: atashji Style Table: Langan.stb Layout: Site Plan

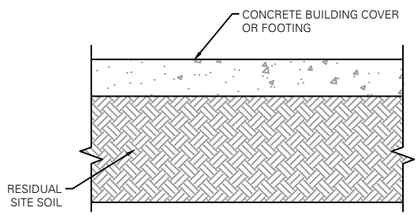


LEGEND:

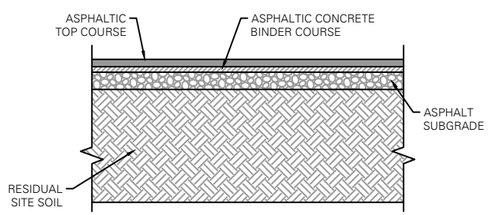
- APPROXIMATE BROWNFIELD CLEANUP PROGRAM SITE BOUNDARY
- CONCRETE COVER - TYPE 1 (DETAIL 1)
- ASPHALT COVER - TYPE 2 (DETAIL 2)
- 2-FOOT-THICK STONE COVER - TYPE 3 (DETAIL 3)
- 2-FOOT-THICK CLEAN SOIL COVER - TYPE 4 (DETAIL 4)

GENERAL NOTES:

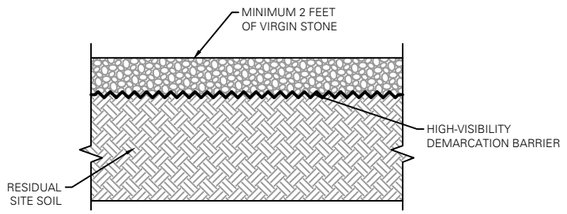
1. BASE MAP IS TAKEN FROM SURVEY SITE SURVEY, PREPARED BY BORO LAND SURVEYING, P.C., DATED MARCH 25, 2011.
2. THE SITE COVER TYPES WILL RESTORED FOR THEIR RESPECTIVE AREAS.
3. THE LOCATIONS OF EACH COVER TYPE SHOWN ARE APPROXIMATE AND MAY DIFFER IN LOCATION AND QUANTITY.



DETAIL 1: COVER TYPE 1 - TYPICAL CONCRETE COVER FOR BUILDING AND FOOTINGS
(NOT TO SCALE)

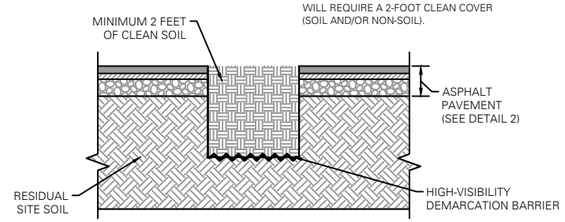


DETAIL 2: COVER TYPE 2 - TYPICAL ASPHALT COVER
(NOT TO SCALE)



DETAIL 3: COVER TYPE 3 - TYPICAL CLEAN STONE COVER
(NOT TO SCALE)

NOTE: DETAIL 3 ILLUSTRATES TYPICAL COVER CONSTRUCTION FOR LANDSCAPED AREAS. HOWEVER, ANY OTHER LOCATIONS THAT WILL NOT BE RESTORED WITH A SURFACE STRUCTURE WILL REQUIRE A 2-FOOT CLEAN COVER (SOIL AND/OR NON-SOIL).



DETAIL 4: COVER TYPE 4 - TYPICAL CLEAN SOIL COVER
(NOT TO SCALE)

30 0 15 30
SCALE IN FEET

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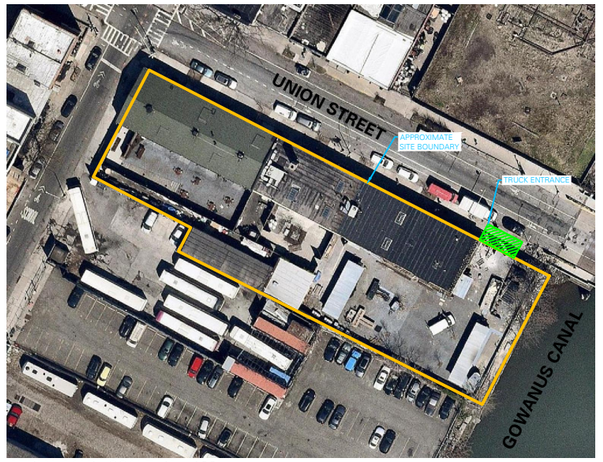
Project
450 UNION STREET
BLOCK No. 438, LOT No. 7
BROOKLYN
KINGS NEW YORK

Figure Title
SITE COVER CONDITIONS AND RESTORATION PLAN

Project No.	170201301
Date	11/25/2019
Drawn By	JD
Checked By	AT

Figure No. **6**
Sheet 6 of 7

Filename: \\langan.com\data\NYC\data2\170301202\Cadd Data - 170301202\2D-DesignFiles\Environmental\IRMWP\Figure 6 - Composite Covery System Plan.dwg Date: 12/10/2019 Time: 14:22 User: atashji Style Table: Langan.stb Layout: Figure 7 - Composite Cover



AERIAL MAP - SCALE: 1" = 100'

LEGEND:

- APPROXIMATE BCP SITE BOUNDARY
- PROPOSED TRUCK ROUTE

MAP KEY:

Local Truck Route
Trucks with an origin or destination for the purpose of delivery, loading or servicing within the respective Borough, shall only operate on designated local routes, except that an operator may operate on a non-designated street for the purpose of arriving at his/her destination. This shall be accomplished by leaving a designated truck route at the intersection that is nearest to their destination, proceeding by the most direct route, and then returning to the nearest designated truck route by the most direct route. If the operator has additional destinations in the same general area, he/she may proceed by the most direct route to his/her next destination without returning to a designated truck route, provided that the operator's next destination does not require that he/she cross a designated truck route.

Through Truck Route
Trucks having neither an origin nor a destination within the respective Borough shall restrict the operation of such vehicles to those street segments designated as Through Truck Routes.

Through Truck Route on Expressway

Through Truck Route on Tunnel

Exception 53' Trailers Allowed
For definition see information on reverse side.

Industrial Business Zones (IBZ)

Parks and Open Spaces

29A Highway Exit

Commercial Vehicles Prohibited

Low Vertical Clearance Area

GENERAL NOTES:

1. BASE MAP IS TAKEN FROM NEW YORK CITY DEPARTMENT OF TRANSPORTATION (NYCDOT) 2011-2012 NEW YORK CITY TRUCK ROUTE MAP

2500 0 1250 2500
SCALE IN FEET

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Project	450 UNION STREET BLOCK No. 438, LOT No. 7 BROOKLYN KINGS NEW YORK
Figure Title	TRUCK ROUTE MAP
Project No.	170201301
Date	11/25/2019
Drawn By	JD
Checked By	AT
Figure No.	7
Sheet	7 of 7

Filename: \\langan.com\data\NYC\data2\170301202\Cadd Data - 170301202\2D-DesignFiles\Environmental\IRMWP\Figure 7 - Truck Route Map.dwg Date: 11/27/2019 Time: 10:15 User: jdonelan Style Table: Langan.stb Layout: Figure 6 - Truck Route Map

TABLE

Table 1
Soil Cleanup Objectives

450 Union Street, Brooklyn, NY
BCP Project No. C224219
Langan Project No. 170301202

Parameter	6 NYCRR Part 375 Restricted Use Restricted-Residential
VOCs (mg/kg)	
1,1,1-Trichloroethane	100
1,1-Dichloroethane	26
1,1-Dichloroethene	100
1,2,4-Trimethylbenzene	52
1,2-Dichlorobenzene	100
1,2-Dichloroethane	3.1
1,3,5- Trimethylbenzene	52
1,3-Dichlorobenzene	49
1,4-Dichlorobenzene	13
1,4-Dioxane	13
Acetone	100
Benzene	4.8
Butylbenzene	100
Carbon tetrachloride	2.4
Chlorobenzene	100
Chloroform	49
cis-1,2-Dichloroethene	100
Ethylbenzene	41
Hexachlorobenzene	1.2
Methyl ethyl ketone	100
Methyl tert-butyl ether	100
Methylene chloride	100
n-Propylbenzene	100
sec-Butylbenzene	100
tert-Butylbenzene	100
Tetrachloroethene	19
Toluene	100
trans-1,2-Dichloroethene	100
Trichloroethene	21
Vinyl chloride	0.9
Xylene (mixed)	100
SVOCs (mg/kg)	
Acenaphthene	100
Acenapthylene	100
Anthracene	100
Benz(a)anthracene	1
Benzo(a)pyrene	1
Benzo(b)fluoranthene	1
Benzo(g,h,i)perylene	100
Benzo(k)fluoranthene	3.9
Chrysene	3.9
Dibenz(a,h)anthracene	0.33
Fluoranthene	100
Fluorene	100
Indeno(1,2,3-cd)pyrene	0.5
m-Cresol	100
Naphthalene	100
o-Cresol	100
p-Cresol	100
Pentachlorophenol	6.7
Phenanthrene	100
Phenol	100
Pyrene	100

Parameter	6 NYCRR Part 375 Restricted Use Restricted-Residential
Metals (mg/kg)	
Arsenic	16
Barium	400
Beryllium	72
Cadmium	4.3
Chromium, hexavalent	110
Chromium, trivalent	180
Copper	270
Lead	400
Manganese	2,000
Nickel	310
Selenium	180
Silver	180
Total Cyanide	27
Total Mercury	0.81
Zinc	10,000
PCBs/Pesticides (mg/kg)	
2,4,5-TP Acid (Silvex)	100
4,4'- DDD	13
4,4'-DDE	8.9
4,4'-DDT	7.9
Aldrin	0.097
alpha-BHC	0.48
beta-BHC	0.36
Chlordane (alpha)	4.2
delta-BHC	100
Dibenzofuran	59
Dieldrin	0.2
Endosulfan I	24
Endosulfan II	24
Endosulfan sulfate	24
Endrin	11
Heptachlor	2.1
Lindane	1.3
Polychlorinated biphenyls	1

Notes:
1. The Soil Cleanup Objectives (SCOs) are the Title 6 New York Codes, Rules, and Regulations (6 NYCRR) Part 375 Restricted Use Restricted-Residential SCOs.
2. VOC: volatile organic compound
3. SVOC: semivolatile organic compound
4. PCB: polychlorinated biphenyl
5. mg/kg: milligram per kilogram

APPENDIX A

CONSTRUCTION HEALTH AND SAFETY PLAN

LANGAN

CONSTRUCTION HEALTH AND SAFETY PLAN

FOR

450 UNION STREET
BROOKLYN, NEW YORK
NYSDEC BCP NO.: C224219

Prepared For

450 Union LLC
c/o Pilot Real Estate Group LLC
10 Glenville Street, 1st Floor
Greenwich, Connecticut 06831

Prepared By:

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

December 2019
Langan Project No. 170301202

LANGAN

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***** Items to be posted prominently on site, or made readily available to personnel.

1.0 INTRODUCTION

1.1 General

This CONSTRUCTION HEALTH AND SAFETY PLAN (CHASP) 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 450 Union Street (Brooklyn Tax Block 438, Lot 7) ("site"), Brooklyn, New York. This CHASP provides the minimum requirements for implementing site operations during remedial measure activities. All contractors performing work on this site shall implement their own CHASP that, at a minimum, adheres to this CHASP. The contractor is responsible for their own health and safety and that of their subcontractors. Langan personnel will implement this CHASP while onsite.

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

1.2 Site Location and Background

The site is located at 450 Union Street in the Gowanus neighborhood of Brooklyn, New York, and is identified as Brooklyn Tax Block 438, Lot 7. The site encompasses an area of about 28,500 square feet (0.65 acres), and is bound by Union Street to the north; the Gowanus Canal to the east; Lot 3 to the south (automobile and bus parking); and Bond Street to the west.

The site is used as a private event space, art gallery, and restaurant with seasonal outdoor seating and is improved with a one-story building (the "Green Building", encompassing an area of about 9,880 square feet) and includes two ancillary storage buildings. The exterior portion of the site contains an enclosed area with a bar for social events and storage areas. A bulkhead consisting of a 12-foot-high concrete wall supported by timber cribbing separates the property from the Gowanus Canal.

The site and surrounding area are located in an urban setting historically characterized by industrial and commercial development. Historic uses of the property have included the following:

- Coal and wood storage (1886 to 1928)
- Granite works (1915)

- Die casting and electroplating (1922)
- Vehicle repair (1918 to 1930)
- Fuel storage, vehicle repair and office (1931)
- Foundry (1930 to 2007)

The proposed project is in the early stages of master planning and may go through several iterations as the project is refined. At this time, it is contemplated that the end use of the property will likely be a mix of commercial, retail, residential, light manufacturing and/or community use. Remediation of the site will occur prior to or concurrently with proposed redevelopment.

1.3 Summary of Work Tasks

The general categories of work tasks being performed during implementation of the Interim Remedial Measures Work Plan (IRM) and bulkhead/containment barrier improvements include, but are not limited to:

1.3.1 Excavation of Debris and Shoreline Stabilization

Langan will observe debris removal associated with shoreline stabilization. These activities include excavation and stockpiling of bulkhead debris, excavation and grading to site soil for shoreline stabilization, and backfilling with gravel. Details of the scopes of work to be completed are provided within the July 2017 Removals and Temporary Shoreline Stabilization Work Plan.

The proposed work includes the excavation and removal of debris from the canal that was generated during a bulkhead collapse. Debris will be stockpiled on polyethylene sheeting and sampled for waste characterization. Site soils behind the damaged bulkhead will be excavated and graded in order to attain shoreline stabilization.

During construction, all soils and debris excavated or disturbed at the site will be either transported off site for disposal at an approved facility or reused on the subject property. Personnel conducting activities that will contact the impacted historic fill, petroleum impacted material or impacted groundwater shall abide to the provisions of this CHASP.

1.3.2 Soil Screening

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 volatile organic vapors (VOCs) above background when using a properly calibrated hand held photoionization detector (PID, or equivalent).

1.3.3 Soil Sampling

Soil samples for excavation endpoint or delineation sampling (along with QA/QC samples) may

be collected into laboratory-supplied batch-certified clean glassware and submitted to a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP).

1.3.4 Stockpiling

Potentially impacted soil may be stockpiled pending laboratory analysis and determining proper off-site disposal. Langan personnel will coordinate with the contractor in stockpiling soils in accordance with the Soil/Material Management Plan (SMMP).

1.3.5 Characterization of Excavated Material

When required by the IRMWP Langan personnel will characterize excavated soil or clean backfill in accordance with Langan standards.

1.3.6 Drum Sampling

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

1.3.7 Construction Activity Inspections and Observations

Langan will observe bulkhead/containment barrier construction activities including pipe pile and sheet pile driving, and concrete pouring performed by the contractor in accordance with the construction documents, IRMWP, and special inspection requirements administered by the New York City Department of Buildings. Materials used for bulkhead/containment barrier construction will be inspected by Langan for conformance to the design documents. Soil excavation will be required and handled by the contractor in accordance with all federal, state, and local laws. Off-site disposal of excavated material shall be pre-characterized and approved by the receiving facility prior to shipment. A log of material removed will be maintained by Langan employees.

1.3.8 Construction Dewatering

The contractor shall be responsible for handling contaminated dewatering fluids in accordance with federal, state and local regulations. Dewatering fluids are likely to be discharged to the Gowanus Canal after treatment and under an approved New York State Department of Environmental Conservation (NYSDEC) State Pollutant Discharge Elimination System (SPDES) permit. Alternatively, the contractor may provide containerized storage to allow for testing of groundwater prior to, and after, treatment and before disposal. If required, Langan field personnel may sample dewatering treatment system liquids from either a discharge standpipe or a storage tank. Dewatering samples will be submitted to an ELAP-certified laboratory for analysis.

1.3.8 Excavation Backfill

Areas of the site that were over-excavated may be backfilled to development grade (i.e., the

grade required to match the existing site elevation). Imported material will consist of clean granular fill that meets the lower of Title 6 of the New York Codes, Rules, and Regulations (6 NYCRR) Restricted Use Restricted-Residential (RRU) and Protection of Groundwater (PGW) Soil Cleanup Objectives (SCOs) or other acceptable fill material such as virgin stone from a permitted mine or quarry or RCA from a NYSDEC-registered facility in compliance with 6 NYCRR Part 360 registration and permitting requirements for the period of RCA acquisition. Imported RCA must be derived from recognizable and uncontaminated concrete. RCA is not acceptable for, and will not be used as, site cover or drainage material.

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 Nicole Rice and the Langan Geotechnical PM is Kenneth Huber, their responsibilities include:

- Ensuring that this CHASP 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 CHASP.

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 CHASP, updating CHASP as dictated by changing conditions, jobsite inspection results, etc. and approving changes to this CHASP.
- Assisting the HSO in the implementation of this CHASP and conducting Jobsite Safety Inspections and assisting with communication of results and correction of shortcomings found.
- Maintaining records on personnel (medical evaluation results, training and certifications, accident investigation results, etc.).

2.3 Langan Site Health & Safety Officer

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

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

2.4 Langan Field Team Leader Responsibilities

The Langan Field Team Leader (FTL) is to be determined prior to the start of construction activities. The Field Team Leader's responsibilities include:

- The management of the day-to-day site activities and implementation of this CHASP 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 CHASP 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 CHASP will be at least as stringent as this Langan CHASP. The contractor must be familiar with and abide by the requirements outlined in their own CHASP. A

contractor may elect to adopt Langan's CHASP as its own provided that it has given written notification to Langan, but where Langan's CHASP excludes provisions pertinent to the contractor's work (i.e., confined space entry); the contractor must provide written addendums to this CHASP. 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 USEPA has listed the canal as a Superfund Site and has performed remedial investigation activities within the canal area of the site's bulkhead. The USEPA has found that the canal's surface water is contaminated with BTEX and PAH compounds. The USEPA found the soft surface sediments to be contaminated with BTEX, PAHs, PCBs, and heavy metals. In some locations, the contamination was found to extend into the underlying native soils that were present before the canal was first dredged. The potential contaminants that might be encountered during the field activities and the exposure limits are listed in Table 2.A complete inventory of MSDS/SDS for chemical products used on site is included as Attachment E.

3.1 Specific Task Safety Analysis

3.1.1 Excavation of Debris and Shoreline Stabilization

Working near the water will pose potential drowning hazards due to slipping or falling into the Gowanus Canal. Potential adverse health effects are similar to slips, trips, and falls, and may also result in drowning. Good housekeeping at the site must be maintained at all times. Employees must be aware of the location of the water's edge and must either stay at least 5 feet away from

the water, or wear a personal floatation device approved by the US Coast Guard.

3.1.2 Soil Screening and Sampling

When conducting soil screening and collecting soil samples, Langan personnel will don chemical resistant gloves in addition to the standard personal protection equipment (PPE).

3.1.3 Stockpile Sampling

The 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).

3.1.4 Drum Sampling

Drilling fluid, rinse water, grossly-contaminated soils samples and cuttings may be containerized in 55-gallon drums for transport and disposal off site. Each drum must be labeled in accordance with the Langan Drum Labeling Standard Operating Procedure (SOP-#9). Langan may collect drum samples, as required, prior to off-site drum disposal. Samples will be placed into laboratory-supplied batch-certified clean glassware and submitted to a NYSDOH ELAP-certified laboratory.

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

3.1.4 Construction Dewatering

The contractor shall be responsible for handling all contaminated groundwater removed from the site in accordance with federal, state and local regulations; including any sampling, treatment and disposal. Dewatering discharge is likely to be to the Gowanus Canal after treatment and in accordance with a NYSDEC SPDES permit. Alternatively, the contractor may provide sufficient containerized storage to allow for testing of groundwater prior to and after treatment and before disposal.

If required, Langan may sample dewatering treatment system liquids from either a discharge standpipe or a storage tank. Prior to collecting the samples, Langan will don the necessary PPE including nitrile gloves and if necessary, facial splash guard. Samples may be collected from either the direct discharge standpipe or from a sample port or valve built into the storage tank. Sample ports and valves may only be sampled if they are accessible at ground level. Sampling from heights over 6 feet is prohibited unless Langan field personnel are fully accredited in fall protection and is wearing approved fall protection safety apparatus. The discharge samples will be submitted to an ELAP-certified laboratory for analysis in accordance with the work plan.

3.1.5 Construction Activity Inspection

The contractor will operate equipment used to install the caisson soil pilings and to pour concrete. Langan personnel will inspect in accordance with specification in the work plan and record the data the work plan requires. The installation of the caissons and concrete pours are to be done

exclusively by the contractor following their own health and safety specifications outlined in their CHASPs. 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.

3.2 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^{O}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^{O}F (37.6^{O}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^{O}F. If oral temperature still exceeds 99.6^{O}F (37.6^{O}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^{O}F (38.1^{O}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^{O} to 60^{O}F (10^{O} to 16.6^{O}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^{O}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^{O}F, or wind-chill less than 30^{O}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^{O}F) cannot return to work for 48 hours.

3.3.4 Noise

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

3.3.5 Hand and Power Tools

The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. All hand

and power tools should be inspected for health and safety hazards prior to use. If deemed unserviceable/un-operable, notify supervisor and tag equipment out of service. Ground Fault Circuit Interrupters (GFCIs) are required for all power tools requiring direct electrical service.

3.3.6 Slips, Trips and Fall Hazards

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

3.3.7 Utilities (Electrocution and Fire Hazards)

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

3.4 Biological Hazards

3.4.1 Animals

No animals are expected to be encountered during site operations.

3.4.2 Insects

Insects are not expected to be encountered during site operations.

3.5 Additional Safety Analysis

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-gallong 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 CHASP. For a HAZWOPER operation, training on the site must be for a minimum of 3 days. Specific issues that will be addressed include the hazards described in Section 3.0.

4.3 Tailgate Safety Briefings

Before starting work each day or as needed, the Langan HSO will conduct a brief tailgate safety

meeting to assist site personnel in conducting their activities safely. Tailgate meetings will be documented in Attachment H. Briefings will include the following:

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

5.0 MEDICAL SURVEILLANCE

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

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

6.0 PERSONAL PROTECTIVE EQUIPMENT

6.1 Levels of Protection

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

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

Level D Protection (as needed)

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

Level D Protection (Modified, as needed)

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

Level C Protection (as needed)

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

The action levels used in determining the necessary levels of respiratory protection and upgrading to Level C are summarized in Table 4. The written Respiratory Protection Program is maintained by the HSM and is available if needed. The monitoring procedures and equipment are outlined in Section 6.0 (when applicable).

6.2 Respirator Fit-Test

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

6.3 Respirator Cartridge Change-Out Schedule

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

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

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

7.0 AIR QUALITY MONITORING AND ACTIONS LEVELS

7.1 Monitoring During Site Operations

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

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

Subcontractors' air monitoring plans must be equal or more stringent as the Langan plan.

An air monitoring calibration log is provided in Attachment D of this CHASP.

7.1.1 Volatile Organic Compounds

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

7.1.2 Metals

Based upon the site historical fill, there is a potential for the soils to contain PAHs and metals. During invasive procedures which have the potential for creating airborne dust, such as excavation of dry soils, a real time airborne dust monitor such as a Mini-Ram should be used to monitor for air particulates. The HSO will monitor the employee breathing zone at least every 30 minutes, or whenever there is any indication that concentrations may have changed (appearance of visible dust) since the last measurement. If dust levels are observed to be greater than 0.100 mg/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 WORK ZONES AND DECONTAMINATION

8.1 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.

8.2 Contamination Zone

8.2.1 Personnel Decontamination Station

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

8.2.2 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.

8.2.3 Personnel Decontamination Sequence

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

8.2.4 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.

8.2.5 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.

8.2.6 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.

8.3 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.

8.4 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

8.5 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.

9.0 NEAREST MEDICAL ASSISTANCE

The address and telephone number of the nearest hospital:

Brooklyn Hospital Center
121 Dekalb Avenue
Brooklyn, NY
718-250-8000

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.

10.0 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.

11.0 SITE SECURITY

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

12.0 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.

13.0 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.

14.0 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.

15.0 EMERGENCY RESPONSE

15.1 General

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

15.2 Responsibilities

15.2.1 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.

15.2.2 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.

15.2.3 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.

15.3 Communications

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

15.4 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.

15.5 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.

15.6 Emergency Medical Treatment

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

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

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

15.7 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.

15.8 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.

15.9 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).

15.9.1 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.

15.10 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.

15.11 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.

15.12 Decontamination During Medical Emergencies

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

15.13 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.

15.14 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 CHASP, 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.

15.15 Emergency Equipment

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

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

15.16 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.

15.17 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.

16.0 RECORDKEEPING

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

16.1 Field Change Authorization Request

Any changes to the work to be performed that is not included in the CHASP 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.

16.2 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.

16.3 Onsite Log

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

16.4 Daily Safety Meetings ("Tailgate Talks")

Completed safety briefing forms will be maintained by the HSO.

16.5 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.

16.6 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 CHASP (Attachment E). Langan's written hazard communication program, in compliance with 29 CFR 1910.1200, is maintained by the HSM.

16.7 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.

17.0 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.

18.0 CHASP ACKNOWLEDGEMENT FORM

All Langan personnel and contractors will sign this CHASP Compliance Agreement indicating that they have become familiar with this CHASP 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 – 1.3.9	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 – 1.3.9	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 – 1.3.9	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 – 1.3.9	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 – 1.3.9	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 – 1.3.9	Noise	Excavation equipment, hand tools, drilling equipment.	Wear hearing protection; maintain safe distance from construction activities	Seek medical attention as required
1.3.1 – 1.3.9	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 – 1.3.9	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 – 1.3.9	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 – 1.3.9	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 – 1.3.9	1,2,4,5-Tetramethylbenzene	95-93-2	NA	NA NA	Groundwater Soil	inhalation, skin absorption, 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 flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	1,2,4,5-Tetrachlorobenzene Benzene tetrachloride s-Tetrachlorobenzene	95-94-3	PID	NA NA	Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin,	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	1,2,3-Trichlorobenzene Vic- Trichlorobenzene 1,2,6- Trichlorobenzene	87-61-6	PID	5 ppm NA	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	1,2,4-Trichlorobenzene Unsym-Trichlorobenzene 1,2,4-Trichlorobenzol 1,2,4,5-Trichlorbenzene	120-82-1	NA	NA NA	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 – 1.3.9	1,2,4-Trimethylbenzene	95-63-6	PID	NA NA	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 – 1.3.9	1,3,5-Trimethylbenzene Mesitylene sym-Trimethylbenzene	108-67-8	PID	NA NA	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 – 1.3.9	2,2,4-Trimethylpentane	540-84-1	PID	NA NA	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 – 1.3.9	2,3,4,6-Tetrachlorophenol Phenol,2,3,4,6-tetrachloro-	58-90-5	PID	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, respiratory system; dermatitis with vesiculation; Abdominal pain. Diarrhea. Headache. Dizziness. Vomiting. Weakness. Convulsions. Muscular spasms. Increased body temperature and sweating	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	o-Chlorophenol 2-Chlorophenol 2-Chloro-1-hydroxybenzene 2-Hydroxychlorobenzene	95-57-8	PID	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, respiratory system; dermatitis with vesiculation; Abnormal pain, drowsiness, weakness, convulsions	ye: 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 – 1.3.9	1.2-Dibromoethane Ethylene Dibromide Ethylene bromide Glycol dibromide	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 – 1.3.9	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
1.3.1 – 1.3.9	Allyl chloride 1-Chloro-2-propene 3-Chloropropene 3-Chloropropylene	107-05-1	PID	1 ppm 250 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, nose, mucous membrane; pulmonary edema; In Animals: liver, kidney injury	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	1,2-Dibromo-3-chloropropane	96-12-8	PID	NA NA	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	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 – 1.3.9	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 – 1.3.9	2,4-Dinitrotoluene 1-Methyl-2,4-dinitrobenzene 2,4-DNT Dinitrotoluol Methyldinitrobenzene	121-14-2	PID	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	2,6-Dinitrotoluene 2-Methyl-1,3-dinitrobenzene 2,6-DNT 2-methyl-1,3-dinitrobenzene 1-Methyl-2,6-dinitrobenzene 2,4-dinitromethylbenzene	606-20-2	PID	1.5 mg/m3	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	headache, weakness, nausea or dizziness, affect the nervous system causing fatigue, nausea, vomiting, drowsiness, and personality changes (irritability, anxiety, confusion and depression); shortness of breath and collapse. Can burn eyes and skin.	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	p-Diethylbenzene 1,4-Diethyl benzene	105-05-5	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, respiratory system; skin burns; in animals: central nervous system depression	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	p-Dichlorobenzene p-DCB 1,4-Dichlorobenzene para-Dichlorobenzene 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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	trans-1,4-Dichloro-2-butene	110-57-6	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, respiratory system	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	1,3-Dichlorobenzene 1,3-Dichlorobenzene; m-Dichlorobenzol; m-Phenylene dichloride	541-73-1	PID	NA NA	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 – 1.3.9	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 – 1.3.9	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 – 1.3.9	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
1.3.1 – 1.3.9	2,4-Dimethylphenol 2,4-Xylenol m-Xylenol 1-Hydroxy-2,4-dimethylbenzene 2,4-Dimethylphenol 4-Hydroxy-1,3-dimethylbenzene 4,6-Dimethylphenol 1,3-Dimethyl-4-hydroxybenze	105-67-9	NA	NA NA	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
1.3.1 – 1.3.9	2,4-Dichlorophenol	120-83-2	PID	NA NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact, in	irritation to the eyes, skin, mucous membrane, nose, throat, respiratory system; ingestion: burning sensation, abdominal pain, tremor, weakness, convulsion, labored breathing, shock or collapse	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	2,4,5-Trichlorophenoxyacetic acid 2,4,5-T	93-76-5	NA	10 mg/m^3 250 mg/m^3	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	in Animals: ataxia; skin irritation, acne-like rash; liver 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 – 1.3.9	2,4,5-Trichlorophenol 2,4,5-TCP 1-Hydroxy-2,4,5-trichlorobenzene	95-95-4	NA	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	Irritation to the eyes (Redness. Pain. Blurred vision), skin, mucous membrane; Abdominal pain. Diarrhea. Dizziness. Headache. Vomiting. Fatigue. Sweating.	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	2,4,6-Trichlorophenol	88-06-2	NA	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; Convulsions. Diarrhea. Dizziness. Headache. Shortness of breath. Vomiting. Weakness. Ataxia.	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	4-Isopropyltoulene 1-Methyl-4-(1-methylethyl)benzene 4-Isopropyltoluene; 4-Methylcumene; Paracymene 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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	2-Methylnaphthalene β-methylnaphthalene	91-57-6	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion or skin absorption, eye contact	irritation to the skin, eyes, mucous membranes and upper respiratory tract. It may also cause headaches, nausea, vomiting, diarrhea, anemia, jaundice, euphoria, dermatitis, visual disturbances, convulsions and comatose	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Acenaphthylene Cycopental(de)naphthalene, Acenaphthalene	208-96-8	PID	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	irritation to the skin, eyes, mucous membranes and upper respiratory tract	Eye: Irrigate immediately, seek medical attention immediately, Skin: Soap wash immediately, if redness or irritation develop, seek medical attention immediately Breathing: Move to fresh air Swallow: do not induce vomiting, seek medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	Acetophenone 1-phenylethanone Methyl phenyl ketone PhenylethaNA	98-86-2	NA	NA NA	Groundwater 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 – 1.3.9	Acetone Dimethyl ketone Ketone propane 2-Propanone	67-64-1	PID	1000 ppm 2500 ppm	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Acrolein Acraldehyde Acrylaldehyde Acrylic aldehyde Allyl aldehyde Propenal 2-Propenal	107-02-8	PID	0.1 ppm 2 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation eyes, skin, mucous membrane; decreased pulmonary function; delayed pulmonary edema; chronic respiratory disease	Eye: Irrigate immediately 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 – 1.3.9	Acrylonitrile Acrylonitrile monomer AN Cyanoethylene Propenenitrile 2-Propenenitrile VCN, Vinyl cyanide	107-13-1	PID	1 ppm 85 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; asphyxia; headache; sneezing; nausea, vomiting; lassitude (weakness, exhaustion), dizziness; skin vesiculation; scaling dermatitis; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Water wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Atrazine 2-Chloro-4-ethylamino-6-isopropylamino-s-triazine 6-Chloro-N-ethyl-N'- (1-methylethyl)-1,3,5-triazine-2,4-diamine	1912-24-9	NA	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation eyes, skin; dermatitis, sensitization skin; dyspnea (breathing difficulty), lassitude (weakness, exhaustion), incoordination, salivation; hypothermia; liver injury	Eye: Irrigate immediately Skin: Water wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Aldrin 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-endo-1,4-exo-5,8-dimethanonaphthalene HHDN Octalene	309-00-2	PID	0.25 ppm 5 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort); myoclonic jerks of limbs; clonic, tonic convulsions; coma; hematuria (blood in the urine), azotemia; [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 – 1.3.9	Azobenzene	103-33-3	NA	NA NA	Soil	inhalation, skin or eye contact, ingestion	Irritation to the skin, eyes, mucous membranes and upper respiratory tract, abdominal pain if ingested.	Eye: Irrigate immediately, seek medical attention immediately, Skin: Soap wash immediately, Breathing: Move to fresh air, refer to medical attention; Swallow: refer to medical attention
1.3.1 – 1.3.9	Anthracene	120-12-7	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to the skin, eyes, mucous membranes and upper respiratory tract, abdominal pain if ingested.	Eye: Irrigate immediately, seek medical attention immediately, Skin: Soap wash immediately, Breathing: Move to fresh air, refer to medical attention; Swallow: refer to medical attention
1.3.1 – 1.3.9	Benzaldehyde Benzoic aldehyde	100-52-7	NA	NA NA	Soil	inhalation, skin or eye contact, ingestion	irritation to the skin, eyes, mucous membranes and upper respiratory tract,	Eye: Irrigate immediately, seek medical attention immediately, Skin: Soap wash immediately, Breathing: Move to fresh air, refer to medical attention; Swallow: refer to medical attention

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	Benzidine ,4'-Bianiline 1,1'-Biphenyl-4,4'-diamine 4,4'-Biphenyldiamine, 4,4'-Diaminobiphenyl p-Diaminodiphenyl	92-87-5	NA	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	hematuria (blood in the urine); secondary anemia from hemolysis; acute cystitis; acute liver disorders; dermatitis; painful, irregular urination; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Chlorobromomethane Bromochloromethane CB CBM Fluorocarbon 1011 Halon® 1011 Methyl chlorobromide	74-97-5	PID	200 ppm 2000 ppm	Soil Vapor	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
1.3.1 – 1.3.9	Bromobenzene Monobromobenzene Phenyl bromide	108-86-1	PID	NA NA	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 – 1.3.9	Benzene Benzol Phenyl hydride	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	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
1.3.1 – 1.3.9	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 – 1.3.9	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	Benzo(g,h,i)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
1.3.1 – 1.3.9	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 – 1.3.9	Benzoic acid Carboxybenzene E210 Dracylic acid Phenylmethanoic acid Benzenecarboxylic acid	65-85-0	NA	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 – 1.3.9	Benzyl Alcohol Benzenemethanol Phenyl carbinol alpha-Hydroxytoluene Benzoyl alcohol Phenyl methanol	100-51-6	NA	NA NA	Groundwater Soil Vapor	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 – 1.3.9	Benzyl butyl phthalate Butyl benzyl phthalate	86-66-7	NA	NA NA	Groundwater Soil Vapor	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 – 1.3.9	Caprolactam Aminocaproic lactam epsilon-Caprolactam Hexahydro-2H-azepin-2-one 2-Oxohexamethyleneimine	105-60-2	NA	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation skin, eyes, respiratory system; epistaxis (nosebleed); dermatitis, skin sensitization; asthma; irritability, confusion, dizziness, headache; abdominal cramps, diarrhea, nausea, vomiting; liver, kidney injury	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.9	Benzyl chloride Chloromethylbenzene α-Chlorotoluene	100-44-7	PID	1 ppm 10 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation eyes, skin, nose; lassitude (weakness, exhaustion); irritability; headache; skin eruption; pulmonary edema	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 – 1.3.9	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 – 1.3.9	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 – 1.3.9	Carbazole 9-azafluorene Dibenzopyrrole Diphenylenimine diphenyleneimide	86-74-8	NA	NA NA	Soil	inhalation, skin absorption (liquid), skin and/or eye contact	irritation to eyes and skin, respiratory irritation	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.9	Chlordane Chlordan Chlordano 1,2,4,5,6,7,8,8-Octachloro-3a,4,7,7a-tetrahydro-4,7-methanoindane	57-74-9	NA	0.5 mg/m^3 100 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	Blurred vision; confusion; ataxia, delirium; cough; abdominal pain, nausea, vomiting, diarrhea; irritability, tremor, convulsions; anuria	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 – 1.3.9	Chloroform Methane trichloride Trichloromethane	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 – 1.3.9	Cis-Chlordane a-Chlordane cis-Chlordan CIS-CHLORDANE Chlordane cis-;Chlordane cis;ALPHA-CHLORDAN Chlordan, cis-;ALPHA-CHLORDANE ;alpha(cis)-chlordane α-chlordane solution	5102-71-9	NA	0.5 mg/m³ 100 mg/m³	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	Blurred vision; confusion; ataxia, delirium; cough; abdominal pain, nausea, vomiting, diarrhea; irritability, tremor, convulsions; anuria	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	trans-Chlordane gamma-Chlordane	5103-74-2	NA	0.5 mg/m³ 100 mg/m³	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	Blurred vision; confusion; ataxia, delirium; cough; abdominal pain, nausea, vomiting, diarrhea; irritability, tremor, convulsions; anuria	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Chrysene Benzo[a]phenanthrene 1,2-Benzphenanthrene	218-01-9	PID	0.2 mg/m³ 80 mg/m³ (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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	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
1.3.1 – 1.3.9	Diethyl phthalate DEP Diethyl ester of phthalic acid Ethyl phthalate	84-66-2	PID	NA NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation eyes, skin, nose, throat; headache, dizziness, nausea; lacrimation (discharge of tears); possible polyneuropathy, vestibular dysfunc; pain, numb, lassitude (weakness, exhaustion), spasms in arms & legs; In Animals: reproductive effects	Eye: Irrigate immediately Skin: Wash regularly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	1,2-Dichloroethylene 1,2-DCE cis-1,2-Dichloroethylene mixture of cis and trans Acetylene dichloride cis-Acetylene dichloride trans-Acetylene dichloride sym-Dichloroethylene cis- 1,2-Dichloroethene trans-1,2-Dichloroethylene, tDCE cDCE cis-1,2-Dichloroethene 1,1-dimethyl-;dimethyl 1,1-cyclohexane trans-1,2-Dichloroethene sym-Dichloroethylene	540-59-0	PID	200 ppm 4000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, respiratory system; central nervous system depression	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 – 1.3.9	1,2,3-Trichloropropane Allyl trichloride Glycerol trichlorohydrin Glyceryl trichlorohydrin Trichlorohydrin	96-18-4	PID	50 ppm 100 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, nose, throat; central nervous system depression; In Animals: liver, kidney injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	1,1-Dichloropropane Propylidene chloride	78-99-9	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, respiratory system; central nervous system depression	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	2,2-Dichloropropane	594-20-7	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, respiratory system; central nervous system depression	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 – 1.3.9	Propylene dichloride Dichloro-1,2-propane 1,2-Dichloropropane	78-87-5	PID	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]
1.3.1 – 1.3.9	trans-1,3-Dichloropropene	10061-02-6	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
1.3.1 – 1.3.9	Dieldrin HEOD 1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo exo-5,8-dimethanonaphthalene	60-57-1	PID	0.25 mg/m^3 50 mg/m^3	Groundwater Soil Water	inhalation, skin absorption, ingestion, skin and/or eye contact	headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort), sweating; myoclonic limb jerks; clonic, tonic convulsions; coma; [potential occupational carcinogen]; in animals: liver, kidney damage	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 – 1.3.9	Dioxane Diethylene dioxide Diethylene ether Dioxan p-Dioxane 1,4-Dioxane	123-91-1	PID	100 ppm 500 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; drowsiness, headache; nausea, vomiting; liver damage; kidney failure; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Water wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	m-Cresol 3-methylphenol meta-Cresol 3-Cresol m-Cresylic acid 1-Hydroxy-3-methylbenzene 3-Hydroxytoluene 3-Methylphenol	108-39-4	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 immediately
1.3.1 – 1.3.9	p-Chloro-m-cresol 2-Chloro-5-hydroxytoluene 4-Chloro-3-methylphenol 4-Chloro-m-cresol	59-50-7	NA	NA NA	Soil	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 immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	o-Cresol ortho-Cresol 2-Cresol o-Cresylic acid 1-Hydroxy-2-methylbenzene 2-Hydroxytoluene 2-Methyl phenol 2-Methylphenol	95-48-7	PID	5 ppm 250 pppm	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 immediately
1.3.1 – 1.3.9	p-Cresol para-Cresol 4-Cresol p-Cresylic acid 1-Hydroxy-4-methylbenzene 4-Hydroxytoluene 4-Methylphenol	106-44-5	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 immediately
1.3.1 – 1.3.9	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 – 1.3.9	1,2-Dichlorotetrafluoroethane 1,2-Dichlorotetrafluoroethane Dichlorotetrafluorethane 1,2-Dichloro-1,1,2,2-tetrafluoroethane Freon® 114 Genetron® 114 Halon® 242 Refrigerant 114	76-14-2	PID	1000 ppm 15000 ppm	Groundwater Soil Vapor	inhalation, skin and/or eye contact (liquid)	irritation respiratory system; asphyxia; cardiac arrhythmias, cardiac arrest; liquid: frostbite	Eye: Frostbite Skin: Frostbite Breathing: Respiratory support
1.3.1 – 1.3.9	2,4-D 2,3-Dichlorophenoxy acetic acid Hedonal Trinoxol	94-75-7	NA	10 mg/m³ 100 mg/m³	Soil Groundwater	inhalation, skin absorption, ingestion, skin and/or eye contact	lassitude (weakness, exhaustion), stupor, hyporeflexia, muscle twitching; convulsions; dermatitis; In Animals: liver, kidney injury	Eye:Irrigate immediately Skin:Soap wash promptly Breathing:Respiratory support Swallow:Medical attention immediately
1.3.1 – 1.3.9	2-Nitrophenol o-Nitrophenol 2-Hydroxynitrobenzene o-Hydroxynitrobenzene	88-75-5	NA	NA NA	Soil	ingestion, inhalation, skin and/or eye contact	Irritant to eyes, skin mucous membranes and respiratory system, Headache. Drowsiness. Nausea. Blue lips or fingernails. Blue skin. Confusion. Convulsions. Dizziness. Unconsciousness.	Eye: Irrigate promptly Skin: Wash regularly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	2-Nitroaniline o-Nitroaniline 1-Amino-2-nitrobenzene	88-74-4	NA	NA NA	Soil	ingestion, inhalation, skin and/or eye contact	Blue lips or finger nails. Blue skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Labored breathing. Unconsciousness.	Eye: Irrigate promptly Skin: Wash regularly 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 – 1.3.9	3-Nitroaniline m-Nitroaniline 1-Amino-3-nitrobenzene meta-Nitroaniline	99-09-2	NA	NA NA	Groundwater Soil	ingestion, inhalation, skin and/or eye contact	Blue lips or finger nails. Blue skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Labored breathing. Unconsciousness.	Eye: Irrigate promptly Skin: Wash regularly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	4-Nitroaniline p-Nitroaniline 1-Amino-4-nitrobenzene	100-01-6	PID	6 mg/m^3 300 mg/m^3	Groundwater Soil Vapor	ingestion, inhalation, skin and/or eye contact	Blue lips or finger nails. Blue skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Labored breathing. Unconsciousness.	Eye: Irrigate promptly Skin: Wash regularly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	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 – 1.3.9	4-Chloroaniline Chloroamionbenzene p-Chloroaniline	106-47-8	NA	NA NA	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to eyes, skin, respiratory; Blue lips or finger nails. Blue skin. Confusion. Convulsions. Dizziness. Headache. Nausea. Unconsciousness.	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	4-Chlorophenyl phenyl ether 4-Chlorodiphenyl ether	7005-72-3	NA	NA NA	Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Dinitro-o-cresol 2-Methyl-4,6-dinitrophenol 4,6-Dinitro-o-cresol 3,5-Dinitro-2-hydroxytoluen 4,6-Dinitro-2-methyl phenol DNC DNOC	534-52-1	NA	0.2 mg/m^3 5 mg/m^3	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	Sense of wellbeing; headache, fever, lassitude (weakness, exhaustion), profuse sweating, excess thirst, tachycardia, hyperpnea, cough, short breath, coma	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	4-Bromophenyl phenyl ether 4-Bromodiphenyl Ether PBDE 3 4-BDE	101-55-3	NA	NA NA	Soil	inhalation, absorption, ingestion	irritation to eyes, skin, respiratory, and digestion [potential occupational carcinogen]	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: 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 – 1.3.9	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	irritation to eyes, skin, respiratory, and digestion [potential occupational carcinogen]	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Dibenzofuran	132-64-9	NA	NA NA	Soil	inhalation, absorption	irritation to eyes, and skin	Eyes: Irrigate immediately Skin: Soap wash promptly.
1.3.1 – 1.3.9	Dimethyl phthalate dimethyl benzene-1,2-dicarboxylate	131-11-3	NA	5 mg/m^3 2000 mg/m^3	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, upper respiratory system; stomach pain	Eye: Irrigate promptly Skin: Wash regularly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Bis(2-chloroethyl)ether 2,2-Dichlorethyl ether 1,1-Oxybis(2-chloro)ethane Sym-Dichloroethyl ether Diethylene glycol dichloride	111-44-4	PID	15 ppm 100 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	Inhalation: Cough, sore throat, nausea, vomiting, burning sensation, labor breathing Irritation: Redness, pain Ingestion: Abdominal pain, nausea, vomiting, burning sensation	Eye: Irrigate immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Bis(2-chloroethoxy)methane Dichloroethylformal 2,2-Dichloroethylformal Di-2-chloroethyl formal	111-91-1	NA	NA NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	Toxic by inhalation and ingestion; Strong irritation	Eye: Irrigate 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 – 1.3.9	Bis-(2-chloroisopropyl) ether	108-60-1	NA	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, upper respiratory system, stomach	Eye: Irrigate immediately Skin: Wash regularly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Bis(2-ethylhexyl)phthalate Di-sec octyl phthalate DEHP Di(2-ethylhexyl)phthalate Octyl phthalate	117-81-7	NA	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 – 1.3.9	Dibutyl phthalate Di-n-butyl phthalate Butyl phthalate n-Butyl phthalate 1,2-Benzenedicarboxylic acid dibutyl ester o-Benzenedicarboxylic acid dibutyl ester DBP Palatinol C, Elaol Dibutyl-1,2-benzene-dicarboxylate	84-74-2	NA	5 mg/m^3 4000 mg/m^3	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, upper respiratory system, stomach	Eye: Irrigate immediately Skin: Wash regularly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Di-n-octyl phthalate Di-sec octyl phthalate DEHP, Di(2-ethylhexyl)phthalate, DOP, bis-(2-Ethylhexyl)phthalate, Octyl phthalate	117-84-0	NA	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	Dichlorodifluoromethane Difluorodichloromethane, Fluorocarbon 12, Freon® 12, Genetron® 12, Halon® 122, Propellant 12, Refrigerant 12	75-71-8	NA	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
1.3.1 – 1.3.9	4,4′-DDD Dichlorodiphenyldichloroethane 1,1'-(2,2-Dichloroethylidene)bis (4-chlorobenzene)	72-54-8	NA	NA NA	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 – 1.3.9	Ethanol Absolute alcohol Alcohol cologne spirit drinking alcohol ethane monoxide ethylic alcohol EtOH ethyl alcohol ethyl hydrate ethyl hydroxide ethylol grain alcohol hydroxyethane methylcarbinol	64 -17-5	PID	1000 ppm 3300 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose; headache, drowsiness, lassitude (weakness, exhaustion), narcosis; cough; liver damage; anemia; reproductive, teratogenic effects	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Fresh air Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	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 – 1.3.9	3,3'-Dichlorobenzidine 4,4'-Diamino-3,3'-dichlorobiphenyl Dichlorobenzidine base o,o'-Dichlorobenzidine 3,3'-Dichlorobiphenyl-4,4'-diamine 3,3'-Dichloro-4,4'-biphenyldiamine 3,3'-Dichloro-4,4'-diaminobiphenyl	91-94-1	NA	NA NA	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	Skin sensitization, dermatitis; headache, dizziness; caustic burns; frequent urination, dysuria; hematuria (blood in the urine); gastrointestinal upset; upper respiratory infection; [potential occupational carcinogen]	Eye: Irrigate immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Endosulfan sulfate 1,4,5,6,7,7-Hexachloro-5-norbornene-2,3-dimethanol, cyclic sulfate 6,7,8,9,10,10-hexachloro01,5,5a,9,9a-hexahydro-6,9-methano-2,4,3-benzodioxathiepin-3,3-dioxide	1031-07-8	NA	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	Hypersensitive to stimulation, sensation of prickling, tingling or creeping on skin. Headache, dizziness, nausea, vomiting, incoordination, tremor, mental confusion, hyperexcitable state. In severe cases: convulsions, seizures, coma and respiratory depression.	Eye: Irrigate 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 – 1.3.9	DDT 4,4-DDT p,p'-DDT Dichlorodiphenyltrichloroethane 1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane	50-29-3	NA	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 – 1.3.9	DDE 4,4-DDE 1,1-bis-(4-chlorophenyl)-2,2-dichloroethene Dichlorodiphenyldichloroethylene	72-55-9	NA	NA NA	Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	Oral ingestion of food is the primary source of exposure for the general population. Acute and chronic ingestion may cause nausea, vomiting, diarrhea, stomach pain, headache, dizziness, disorientation, tingling sensation, kidney damage, liver damage, convulsions, coma, and death. 4,4' DDE may cross the placenta and can be excreted in breast milk	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Endosulfan Benzoepin; Endosulphan; 6,7,8,9,10-Hexachloro-1,5,5a,6,9,9a-hexachloro-6,9-methano-2,4,3-benzo-dioxathiepin-3-oxide Thiodan	115-29-7	NA	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation skin; nausea, confusion, agitation, flushing, dry mouth, tremor, convulsions, headache; in animals: kidney, liver injury; decreased testis weight	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 – 1.3.9	Endosulfan I	959-98-8	NA	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation skin; nausea, confusion, agitation, flushing, dry mouth, tremor, convulsions, headache; in animals: kidney, liver injury; decreased testis weight	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Endosulfan II	33213-65-9	NA	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation skin; nausea, confusion, agitation, flushing, dry mouth, tremor, convulsions, headache; in animals: kidney, liver injury; decreased testis weight	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Endrin, 1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo,endo-5,8-dimethanonaphthalene; Hexadrin	72-20-8	NA	0.1 mg/m^3 2 mg/m^3	Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	epileptiform convulsions; stupor, headache, dizziness; abdominal discomfort, nausea, vomiting; insomnia; aggressiveness, confusion; drowsiness, lassitude (weakness, exhaustion); anorexia; in animals: liver damage	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 – 1.3.9	Endrin aldehyde	7421-93-4	NA	0.1 mg/m3 2 mg/m3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	epileptiform convulsions; stupor, headache, dizziness; abdominal discomfort, nausea, vomiting; insomnia; aggressiveness, confusion; drowsiness, lassitude (weakness, exhaustion); anorexia; in animals: liver damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Endrin ketone	53494-70-5	NA	0.1 mg/m3 2 mg/m3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	epileptiform convulsions; stupor, headache, dizziness; abdominal discomfort, nausea, vomiting; insomnia; aggressiveness, confusion; drowsiness, lassitude (weakness, exhaustion); anorexia; in animals: liver damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Ethyl ether Diethyl ether Diethyl oxide Ethyl oxide Ether Solvent ether	60-29-7	PID	400 ppm 1900 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, upper respiratory system; dizziness, drowsiness, headache, excited, narcosis; nausea, vomiting	Eye: Irrigate immediately Skin: Water 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 – 1.3.9	Ethyl benzene Ethylbenzene Ethylbenzol Phenylethane	100-40-4	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 – 1.3.9	Ethylene dichloride 1,2-Dichloroethane Ethylene chloride Glycol dichloride 1,2-DCA	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
1.3.1 – 1.3.9	p-Ethyltoluene 4-Ethyltoluene 1-ethyl-4-methyl-benzene	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
1.3.1 – 1.3.9	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 – 1.3.9	Fluorene	86-73-7	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.9	Heptachlor	76-44-8	NA	0.5 mg/m^3 35 mg/m^3	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	In animals: tremor, convulsions; liver damage; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Heptachlor epoxide 1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methano-1H-indene	1024-57-3	NA	0.5 mg/m^3 35 mg/m^3	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	In animals: tremor, convulsions; liver damage; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	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 – 1.3.9	alpha-Hexachlorocyclohexane alpha-BHC 1-alpha,2-alpha,3-beta,4-alpha,5-beta,6-beta-Hexachlorocyclohexane alpha-1,2,3,4,5,6-Hexachlorocyclohexane alpha-Benzenehexachloride	319-84-6	PID	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	Cough. Sore throat Diarrhea. Dizziness. Headache. Nausea. Vomiting. Tremors.	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	beta-Hexachlorocyclohexane beta-BHC β-1,2,3,4,5,6-hexachlorocyclohexane β-HCH β-Benzenehexachloride	319-85-7	PID	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	Cough. Sore throat Diarrhea. Dizziness. Headache. Nausea. Vomiting. Tremors.	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	delta-BHC delta-hexachlorocyclohexane	319-86-8	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 – 1.3.9	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	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 – 1.3.9	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 – 1.3.9	Hexachloroethane Carbon hexachloride Ethane hexachloride Perchloroethane	67-72-1	PID	1 ppm\ 300 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; In Animals: kidney damage; [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 – 1.3.9	Indeno(1,2,3-cd)pyrene	193-39-5	NA	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 – 1.3.9	Isophorone Isoacetophorone 3,5,5-Trimethyl-2-cyclohexenone 3,5,5-Trimethyl-2-cyclo-hexen-1-one	78-59-1	NA	25 ppm 200 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation eyes, nose, throat; headache, nausea, dizziness, lassitude (weakness, exhaustion), malaise (vague feeling of discomfort), narcosis; dermatitis; In Animals: kidney, liver damage	Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Diphenylamine Anilinobenzene DPA Phenylaniline, N-Phenylaniline N-Phenylbenzenamine NDPA	122-39-4	NA	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, mucous membrane; eczema; tachycardia, hypertension; cough, sneezing; methemoglobinemia; increased blood pressure, heart rate; proteinuria, hematuria (blood in the urine), bladder injury; In Animals: teratogenic effects	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 – 1.3.9	n-Nitrosodimethylamine Dimethylnitrosamine N,N-Dimethylnitrosamine DMNA N-Methyl-N-nitroso-methanamine NDMA N-Nitroso-N,N-dimethylamine	62-75-9	NA	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	nausea, vomiting, diarrhea, abdominal cramps; headache; fever; enlarged liver, jaundice; decreased liver, kidney, pulmonary function; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	N-Nitrosodi-n-propylamine Dipropylamine N-nitroso Dipropylnitrosamine N-Nitrosodipropylamine N,N-Dipropylnitrosamine Nitrosodipropylamine Di-n-propylnitrosoamine Di-N-propylnitrosamine DPN DPNA N-Nitroso-N-propyl-1-propanamine N-Nitrosodi-N-propylamine NDPA Propanamine N-nitroso-N-propyl- ;Propylamine N-nitroso-N-di- 2-Oxo-1,1-dipropylhydrazine	621-64-7	NA	NA NA	Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	nausea, vomiting, diarrhea, abdominal cramps; headache; fever; enlarged liver, jaundice; decreased liver, kidney, pulmonary function; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Isopropyl alcohol Carbinol IPA Isopropanol 2-Propanol sec-Propyl alcohol Rubbing alcohol	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 – 1.3.9	Lindane BHC HCH ã-Hexachlorocyclohexane gamma isomer of 1,2,3,4,5,6-Hexachlorocyclohexane	58-89-9	NA	0.5 mg/m³ 50 mg/m³	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; headache; nausea; clonic convulsions; resp difficulty; cyanosis; aplastic anemia; muscle spasm; in animals: liver, kidney damage	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Methoxychlor p,p'-Dimethoxydiphenyltrichloroethane DMDT Methoxy-DDT 2,2-bis(p-Methoxyphenyl)-1,1,1-trichloroethane 1,1,1-Trichloro-2,2-bis-(p-methoxyphenyl)ethane	72-43-5	NA	15 mg/m³ 5000 mg/m³	Groundwater Soil Vapor	inhalation, ingestion	fasciculation, trembling, convulsions; kidney, liver damage; [potential occupational carcinogen]	Skin: Soap wash Breathing: Fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.9	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
1.3.1 – 1.3.9	Methylcyclohexane Hexahydrotoluene Cyclohexylmethane Toluene hexahydride Methyl cyclohexane	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 – 1.3.9	Methyl *tert*-butyl ether MTBE Methyl tertiary-butyl ether Methyl t-butyl ether tert-Butyl methyl ether tBME tert-BuOMe	1634-04-4	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Methyl Chloride Chloromethane Monochloromethane	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 – 1.3.9	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	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
1.3.1 – 1.3.9	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 – 1.3.9	2-Chloronaphthalene	91.58-7	NA	NA MA	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, nose; skin	Eye: Irrigate immediately , Medical attention Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention
1.3.1 – 1.3.9	Naphthalene Naphthalin Tar camphor White tar	91-20-3	PID	50 mg/m³ 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 – 1.3.9	n-Butylbenzene	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 – 1.3.9	tert-Butylbenzene *t*-Butylbenzene 2-Methyl-2-phenylpropane Pseudobutylbenzene Phenyltrimethylmethane Dimethylethylbenzene 2-Phenyl-2-methylpropane (1,1-Dimethylethyl)benzene Trimethylphenylmethane	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 – 1.3.9	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	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
1.3.1 – 1.3.9	Nitrobenzene Essence of mirbane Nitrobenzol Oil of mirbane	98-95-3	NA	1 ppm 200 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin; anoxia; dermatitis; anemia; methemoglobinemia; In Animals: liver, kidney damage; testicular effects	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	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
1.3.1 – 1.3.9	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 – 1.3.9	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	Pyridine Azabenzene Azine	110-86-1	PID	5 ppm 1000 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes; headache, anxiety, dizziness, insomnia; nausea, anorexia; dermatitis; liver, kidney damage	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	1,1'-Biphenyl, Biphenyl, Phenyl benzene Diphenyl	92-52-4	NA	1 mg/m^3 100 mg/m^3	Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, throat; headache, nausea, lassitude (weakness, exhaustion), numb limbs; liver damage	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	Silvex 2-(2,4,5-Trichlorophenoxy)propionic acid Fenoprop	93-72-1	PID	NA NA	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
1.3.1 – 1.3.9	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 – 1.3.9	Tert-Butyl Alcohol Tertiary 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 – 1.3.9	1,1,1,2-Tetrachloroethane	630-20-6	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation eyes, skin; lassitude (weakness, exhaustion), restlessness, irregular respiration, muscle incoordination; In Animals: liver changes	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	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 – 1.3.9	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 – 1.3.9	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	4-Chlorotoluene p-Chlorotoluene 1-Chloro-4-methylbenzene p-Tolyl chloride	106-43-4	PID	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, mucous membrane; dermatitis; drowsiness, incoordination, anesthesia; cough; liver, kidney injury	ye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	o-Chlorotoluene 1-Chloro-2-methylbenzene 2-Chloro-1-methylbenzene 2-Chlorotoluene o-Tolyl chloride	95-49-8	PID	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, mucous membrane; dermatitis; drowsiness, incoordination, anesthesia; cough; liver, kidney injury	ye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	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 – 1.3.9	Toxaphene Chlorocamphene Octachlorocamphene Polychlorocamphene Chlorinated camphene	8001-35-2	PID	0.5 mg/m^3 200 mg/m^3	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, respiratory system; central nervous system, lungs, kidneys; may cause convulsive seizures	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 – 1.3.9	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 – 1.3.9	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 – 1.3.9	1,1,2-Trichloro-1,2,2-trifluoroethane Chlorofluorocarbon-113 CFC-113 Freon® 113 Genetron® 113 Halocarbon 113 Refrigerant 113 TTE	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; 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 – 1.3.9	Vinyl bromide Bromoethene Bromoethylene Monobromoethylene	593-60-2	NA	NA NA	Soil Vapor	inhalation, ingestion (liquid), skin and/or eye contact	irritation eyes, skin; dizziness, confusion, incoordination, narcosis, nausea, vomiting; liquid: frostbite; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	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
1.3.1 – 1.3.9	Vinyl acetate 1-Acetoxyethylene Ethenyl acetate Ethenyl ethanoate VAC Vinyl acetate monomer Vinyl ethanoate	108-05-4	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; hoarseness, cough; loss of smell; eye burns, skin blisters	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	Total PCBs Chlorodiphenyl (42% chlorine) Aroclor® 1242 PCB Polychlorinated biphenyl	53469-21-9	NA	0.5 mg/m³ 5 mg/m³	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
1.3.1 – 1.3.9	o-Xylenes 1,2-Dimethylbenzene ortho-Xylene o-Xylol	95-47-6	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 – 1.3.9	m-Xylenes 1,3-Dimethylbenzene m-Xylol Metaxylene	108-38-3	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 – 1.3.9	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	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 – 1.3.9	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 – 1.3.9	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	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 – 1.3.9	Aluminum	7429-90-5	NA	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 – 1.3.9	Antimony	7440-36-0	NA	0.5 mg/m^3 50 mg/m^3	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 – 1.3.9	Arsenic	NA	NA	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	Barium	10022-31-8	NA	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 – 1.3.9	Beryllium	7440-41-7	NA	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 – 1.3.9	Cadmium	7440-43-9	NA	0.005 mg/m^3 9 mg/m^3	Soil	inhalation, ingestion	pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]	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 – 1.3.9	Calcium	7440-70-2	NA	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 – 1.3.9	Chromium Hexavalent- Trivalent-	7440-47-3	NA	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 – 1.3.9	Cobalt	7440-48-4	NA	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 – 1.3.9	Copper	7440-50-8	NA	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	Cyanide	57-12-5	NA	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 – 1.3.9	Iron	7439-89-6	NA	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	Lead	7439-92-1	NA	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 – 1.3.9	Manganese	7439-96-5	NA	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 – 1.3.9	Magnesium	7439-95-4	NA	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 – 1.3.9	Mercury	7439-97-6	NA	0.1 mg/m^3 10 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria	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 – 1.3.9	Nickel	7440-02-0	NA	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
1.3.1 – 1.3.9	Potassium	7440-09-7	NA	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.

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	Selenium	7782-49-2	NA	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 – 1.3.9	Silver	7440-22-4	NA	0.01mg/ m^3 10 mg/m^3	Soil	inhalation, ingestion, skin and/or eye contact	blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance	Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.9	Sodium	7440-23-5	NA	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 – 1.3.9	Thallium	7440-28-0	NA	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 – 1.3.9	Vanadium	7440-62-2	NA	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 – 1.3.9	Zinc	7440-62-2	NA	15 mg/m³ 500 mg/m³	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.9	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

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
500 mg/m3

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	No respirator; no further action required
> 1 ppm but < 5 ppm for > 5 minutes	1. Temporarily discontinue all activities and evaluate potential causes of the excessive readings. If these levels persist and cannot be mitigated (i.e., by slowing drilling or excavation activities), contact HSO to review conditions and determine source and appropriate response action. 2. If PID readings remain above 1 ppm, temporarily discontinue work and upgrade to Level C protection. 3. If sustained PID readings fall below 1 ppm, downgrading to Level D protection may be permitted.
> 5 ppm but < 150 ppm for > 5 minutes	1. Discontinue all work; all workers shall move to an area upwind of the jobsite. 2. Evaluate potential causes of the excessive readings and allow work area to vent until VOC concentrations fall below 5 ppm. 3. Level C protection will continue to be used until PID readings fall below 1 ppm.
> 150 ppm	Evacuate the work area

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

TABLE 5
EMERGENCY NOTIFICATION LIST

ORGANIZATION	CONTACT	TELEPHONE
Local Police Department	NYPD	911
Local Fire Department	NYFD	911
Ambulance/Rescue Squad	NYFD	911
Hospital	Brooklyn Hospital Center	911 or 718-250-80000
Langan Incident / Injury Hotline		800-952-6426 ex 4699
Langan Project Manager	Nicole Rice Kenneth Hubert	724-601-2196 (cell) 631-525-6007 (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	Matt Horrigan	203-561-7480
National Response Center (NRC)		800-424-8802
Chemical Transportation Emergency Center (Chemtrec)		800-424-9300
Center for Disease Control (CDC)		404-639-3534
EPA (RCRA Superfund Hotline)		800-424-9346
TSCA Hotline		202-554-1404
Poison Control Center		800-222-1222

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

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

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

a For work levels of 250 kilocalories/hour.

b Calculate the adjusted air temperature (ta adj) by using this equation: ta adj ^{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

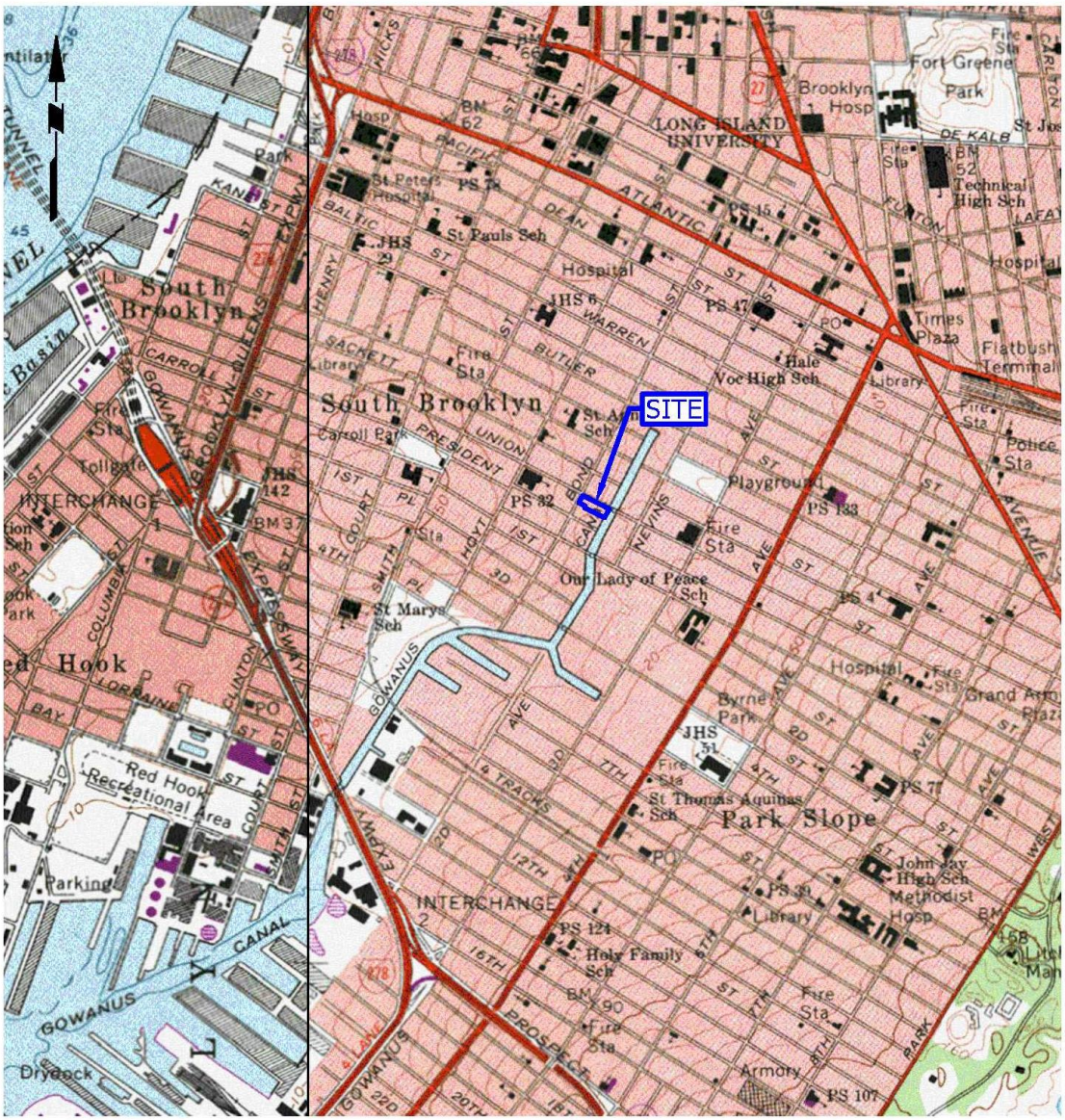
Note: Exposure to full sunshine can increase Heat Index values by up to 15 degrees F.

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



LEGEND:

BCP SITE BOUNDARY

GENERAL NOTES:

1. BASE MAP TAKEN FROM UNITED STATES GEOLOGICAL SURVEY (USGS) TOPOGRAPHIC MAPS FOR BROOKLYN AND JERSEY CITY QUADRANGLES.

LANGAN

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Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

Project	450 UNION STREET BLOCK No. 438, LOT No. 7 BROOKLYN NEW YORK
Figure Title	SITE LOCATION MAP
Project No.	170301202
Date	3/2/2016
Scale	1"=1500'
Drawn By / Checked By	PMM / NCR
Submission Date	–
Figure No.	1
Sheet	1 of 2

Filename: \\langan.com\data\NY\data2\170301202\Cadd Data - 170301202\2D-DesignFiles\Environmental\BCP RIR\Figure 1 - Site Location Map_BCP RIR.dwg Date: 3/18/2016 Time: 10:45 User: nrice Style Table: Langan.stb Layout: SLM

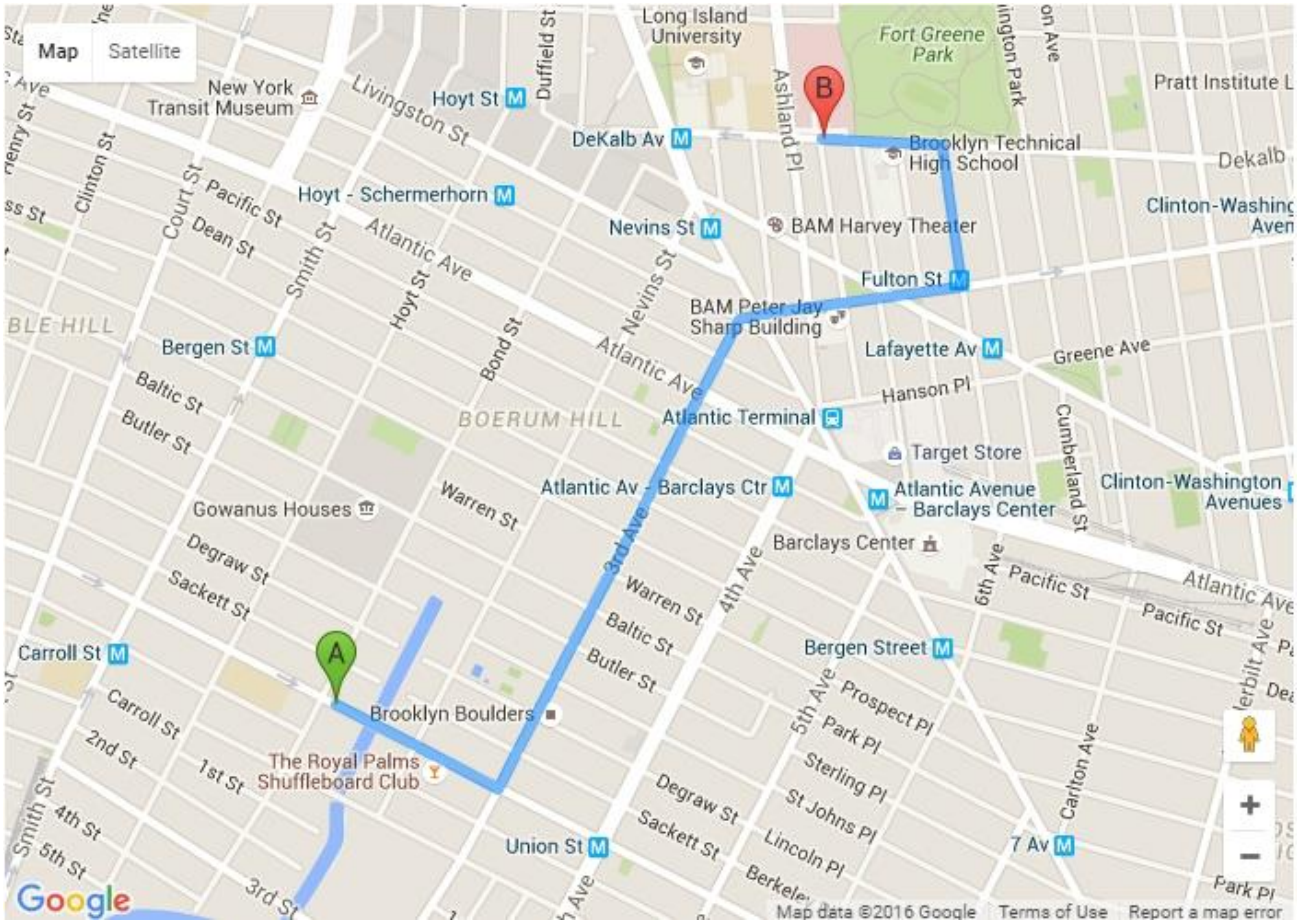
FIGURE 2
HOSPITAL ROUTE PLAN

Hospital Location: **Brooklyn Hospital Center**
121 Dekalb Avenue
New York, NY
718-250-8000

START: 450 Union Street, Brooklyn, NY

1. Head southeast on Union Street toward Nevins Street
2. Turn left at the 2nd cross street onto 3rd Avenue
3. Slight right onto Lafayette Avenue
4. Turn left onto South Portland Avenue
5. Turn left onto Dekalb Avenue, destination will be on the right.

END: Brooklyn Hospital Center, 121 Dekalb Avenue, 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 personal protective equipment (PPE).
- Maintain close contact with your buddy in the work zone
- Contaminated material will be contained in the Exclusion Zone (EZ).
- Report any unusual conditions.
- Work areas will be kept clear and uncluttered. Debris and other slip, trip, and fall hazards will be removed as frequently as possible.
- The number of personnel and equipment in the work zone will be kept to an essential minimum.
- Be alert to the symptoms of fatigue and heat/cold stress, and their effects on the normal caution and judgment of personnel.
- Conflicting situations which may arise concerning safety requirements and working conditions must be addressed and resolved quickly by the site HSO.

TOOLS AND HEAVY EQUIPMENT

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

ATTACHMENT B

DECONTAMINATION PROCEDURES

PERSONNEL DECONTAMINATION

LEVEL C DECONTAMINATION

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

LEVEL D DECONTAMINATION

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

EQUIPMENT DECONTAMINATION

GENERAL:

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

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

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

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

MONITORING EQUIPMENT:

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

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

RESPIRATORS:

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

ATTACHMENT C

EMPLOYEE EXPOSURE/ INJURY INCIDENT REPORT

EMPLOYEE INCIDENT/INJURY REPORT
LANGAN ENGINEERING & ENVIRONMENTAL SERVICES

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

Affected Employee Name: _____ Date: _____

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

EMPLOYEE INFORMATION (Person completing Form)

Employee Name: _____ Employee No: _____

Title: _____ Office Location: _____

Length of time employed or date of hire: _____

Mailing address: _____

_____

Sex: M ☐ F ☐ Birth date: _____

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

ACCIDENT INFORMATION

Project: _____ Project #: _____

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

Site location: _____

Incident Type: Possible Exposure ☐ Exposure ☐ Physical Injury ☐

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

Exact location incident occurred:

Describe work being done:_____

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

Describe in detail how the incident occurred:

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

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

List the names of other persons affected during this incident:

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

Weather conditions during incident:

MEDICAL CARE INFORMATION

Did affected employee receive medical care? Yes ☐ No ☐

If Yes, when and where was medical care received:

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

Length of stay at the facility?

Did the employee miss any work time? Yes ☐ No ☐ Undetermined ☐

Date employee last worked: Date employee returned to work:

Has the employee returned to work? Yes ☐ No ☐

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

If Yes, please describe:

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

If Yes, please describe:

HEALTH & SAFETY INFORMATION

Was the operation being conducted under an established site specific CONSTRUCTION CONSTRUCTION HEALTH AND SAFETY PLAN?
Yes ☐ No ☐ Not Applicable: ☐

Describe protective equipment and clothing used by the employee:

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

Employee Signature Date

Langan Representative Date

ATTACHMENT D

CALIBRATION LOG

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. CHASP available onsite for inspection?				
2. Health & Safety Compliance agreement (in CHASP) 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 CHASP?				
21. Are tools in good condition and properly used?				
22. Drilling performed in areas free from underground objects including utilities?				

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

Unsafe Acts: _____

_____

_____

_____

Notes: _____

_____

_____

_____

ATTACHMENT G

JOB SAFETY ANALYSIS FORM

LANGAN	Job Safety Analysis (JSA) Health and Safety
JSA TITLE: **JSA NUMBER:**	**DATE CREATED:** **CREATED BY**: **REVISION DATE:** **REVISED BY:**

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

PERSONAL PROTECTIVE EQUIPMENT REQUIRED: (PPE): ■ Required ☒ As Needed		
☐ Steel-toed boots	☐ Nitrile gloves	☐ Dermal Protection (Specify)
☐ Long-sleeved shirt	☐ Leather/ Cut-resistant gloves	☐ High visibility vest/clothing
☐ Safety glasses	☐Face Shield	☐ Hard hat
ADDITIONAL PERSONAL PROTECTIVE EQUIPMENT NEEDED (Provide specific type(s) or descriptions)		
☐ Air Monitoring:	☐ Respirators:	☐ Other:

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

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

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.

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
1. Transport equipment to work area	1. Back/strain 2. Slip/Trip/Falls 3. Traffic 4. Cuts/abrasions/contusions from equipment 5. 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
2. 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.
3. 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
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	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.

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
5. Unpack/Transport equipment to work area.	6. Back Strains 7. Slip/Trips/Falls 8. Cuts/Abrasions from equipment 9. 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).
6. Initial Site Arrival-Site Assessment	1. Traffic	1. Situational awareness (be alert of your surroundings). Secure area from through traffic.
7. Surface Water Sampling	1. Contaminated media. Skin/eye contact with biological agents and/or chemicals.	1. Wear appropriate PPE (Safety glasses, appropriate gloves). Review (M)SDS for all chemicals being.
8. Sampling from bridges	1. Struck by vehicles	1. Wear appropriate PPE (Safety Vest). Use buddy system and orange safety cones.
9. 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)
10. 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.
11. All activities	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual handling of materials	1. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	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	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: **Building Construction Oversight**

JSA Number: **JSA006-01**

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.

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
12. Transport equipment to work area	10. Back Strain 11. Slips/ Trips/ Falls 12. Traffic 13. Cuts/abrasions from equipment 14. 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)
13. Drilling/anchor bolt installation	2. Hazards associated with drilling, flying objects, heavy equipment, ground level hazards and dust 3. Slips/ Trips/ Falls 4. Hazards associated with concrete work	1. Maintain a safe distance from drilling operation / Wear proper PPE (hard hat, safety glasses, safety shoes, safety vest) 2. 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 / Wear the proper PPE (safety shoes) 3. Maintain a safe distance from pouring operation
14. Steel building erection	2. Overhead hazards, falling objects 3. Pinching/crushing hazards	1. Wear proper PPE (hard had, safety glasses, safety vest) / Be aware of overhead hazards and maintain a safe distance of at least 10 ft. 2. All personnel should make others aware of moving objects or their inten to move objects / Avoid areas where pinching and crushing hazards are possible
15. 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	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)	26. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 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: **Equipment Transportation and Set-Up**

JSA Number: **JSA012-01**

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.

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	15. Back Strain 16. Slips/ Trips/ Falls 17. Traffic 18. Cuts/abrasions from equipment 19. 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)
17. Moving equipment to its planned location	5. Pinch Hazard 6. Slips/ Trips/ Falls	4. Wear proper PPE (leather gloves) 5. 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	4. Pinch Hazard 5. Cuts/abrasions to knuckles/hands 6. Back Strain	3. Wear proper PPE (leather gloves) 4. Wear proper PPE (leather gloves) 5. Use proper lifting techniques / Use wheeled transport
19. 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	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

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
6. All activities (cont'd)	39. Heat Stress/ Cold Stress 40. Eye Injuries	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: **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.

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
20. Transport equipment to work area	20. Back Strain 21. Slips/ Trips/ Falls 22. Traffic 23. Cuts/abrasions from equipment 24. Contusions from dropped equipment	11. Use proper lifting techniques / Use wheeled transport 12. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 13. Wear proper PPE (high visibility vest or clothing) 14. Wear proper PPE (leather gloves, long sleeves) 15. Wear proper PPE (safety shoes)
21. Installation of piping from vapor wells to skid connections and from discharge pipping to effluent stack	7. Pinch fingers when connecting pipes 8. Slips/ Trips/ Falls 9. Machinery Hazards	6. Wear proper PPE (leather gloves) 7. 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 8. Wear proper PPE (safety vest) / Maintain safe distance from operating machinery
22. Remediation equipment installation	7. Back strain when lifting heavy equipment 8. Slips/ Trips/ Falls 9. Traffic	7. Use proper lifting techniques / Use wheeled transport / Minimize distance to vehicle 8. 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 9. Wear proper PPE (safety vest)
23. All activities	41. Slips/ Trips/ Falls 42. Hand injuries, cuts or lacerations during manual handling of materials 43. Foot injuries	47. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
4. All activities (cont'd)	44. Back injuries 45. Traffic 46. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 47. High Noise levels 48. Overhead hazards 49. Heat Stress/ Cold Stress 50. Eye Injuries	48. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 49. Wear Langan approved safety shoes 50. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 51. Wear high visibility clothing & vest / Use cones or signs to designate work area 52. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 53. Wear hearing protection 54. Wear hard hat / Avoid areas were overhead hazards exist. 55. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 56. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

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.

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
24. Transport equipment to work area	25. Back Strain 26. Slips/Trips/Falls 27. Traffic 28. Cuts/abrasions/contusions from equipment	10. Use proper lifting techniques / Use wheeled transport 11. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 12. Wear proper PPE (high visibility vest or clothing) 13. Wear proper PPE (leather gloves, long sleeves, safety shoes)
25. Earth Moving Equipment	10. Equipment running over employee	2. Ensure you have direct line of sight with operator of equipment; don't walk behind equipment; maintain a safe distance away from equipment. 3. Wear proper PPE (high vis vest/clothing)
26. Excavation	10. Excavation collapse 11. Confined space 12. Soil	2. 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. 3. Langan employees are not authorized to enter a confined space; 4. Soil and equipment is kept at least 2 feet from edge of excavation
27. 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
28. All activities	51. Slips/ Trips/ Falls 52. Hand injuries, cuts or lacerations during manual handling of materials 53. Foot injuries 54. Back injuries 55. Traffic 56. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.)	57. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 58. 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 59. Wear proper PPE (Langan approved safety shoes)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	57. High Noise levels 58. Overhead hazards 59. Heat Stress/ Cold Stress 60. Eye Injuries	60. 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 61. Wear high visibility clothing & vest / Use cones or signs to designate work area 62. 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 63. Wear hearing protection 64. Wear hard hat / Avoid areas were overhead hazards exist. 65. 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 66. 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: **Geotechnical Drilling**

JSA Number: **JSA014-01**

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.

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: Nomex (as needed)				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
29. Transport equipment to work area	29. Back Strain 30. Slips/ Trips/ Falls 31. Traffic 32. Cuts/abrasions from equipment 33. Contusions from dropped equipment	16. Use proper lifting techniques / Use wheeled transport 17. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 18. Wear proper PPE (high visibility vest or clothing) 19. Wear proper PPE (leather gloves, long sleeves) 20. Wear proper PPE (safety shoes)
30. Set-up HSA/SPT rig	11. Slips/ Trips/ Falls 12. Pinch Hazards 13. High noise levels 14. Clothing entanglement 15. Electrocution/falling equipment and debris from raising HSA/SPT rig mast 16. Carbon monoxide poisoning 17. HSA/SPT rig roll-over 18. HSA/SPT rig movement	9. 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 10. Wear proper PPE (leather gloves) 11. Wear proper PPE (hearing protection) 12. Wear proper attire for HSA/SPT rig (no loose clothing, strings, etc.) 13. Wear proper PPE (hard hats) / Be aware of locations at all times / Look up, down and around before raising mast / Check HSA/SPT drill rig mast for loose objects/debris before raising 14. Stand upwind of rig engine 15. Do not move rig with mast raising / Set stabilizers prior to raising mast / Inspect work area / If area appears unstable, the boring locations should be moved. 16. All field personnel should stay clear of rig while moving / Use a spotter when backing up the rig
31. Advance HSA/SPT rods, augers and casing below ground surface	13. Strain wrist/bruise palm 14. Pinched fingers 15. Back strain	10. Wear proper PPE (leather gloves) / Use proper technique for preparing rods / Use second person, if necessary 11. Wear proper PPE (leather gloves)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
32. Advance HSA/SPT rods, augers and casing below ground surface (cont'd)	16. Clothing entanglement 17. Carbon monoxide poisoning 18. Bruised/Broken toes/feet 19. High noise levels	12. Use proper lifting techniques / Obtain assistance if needed 13. Wear proper attire for HSA/SPT rig (no loose clothing, strings, etc.) 14. Stand upwind of the rig 15. Wear proper PPE (safety shoes) 16. Wear proper PPE (hearing protection)
33. Remove and open split spoon	2. Pinched fingers 3. Cuts/lacerations 4. Skin contact with contaminated soil and groundwater	1. Wear proper PPE (nitrile and leather gloves) 2. Wear proper PPE (leather gloves) 3. Wear proper PPE (nitrile gloves, safety glasses)
34. Repeat steps 3 and 4 until desired depth is reached	1. See steps 3 and 4	1. See steps 3 and 4
35. Remove HSA/SPT rods, augers and casing and place in storage rack	1. Clothing entanglement 2. Back strain 3. Pinched fingers 4. Carbon monoxide poisoning 5. High noise levels	1. Wear proper attire for HSA/SPT rig (no loose clothing, strings, etc.) 2. Use proper lifting techniques / Obtain assistance if needed 3. Wear proper PPE (leather gloves) 4. Stand upwind of rig engine 5. Wear proper PPE (hearing protection)
36. Tremie-grout borehole with a cement-bentonite grout mixture	1. Splash cement/bentonite grout on face/eyes 2. Back strain 3. Pinched fingers	1. Wear proper PPE (safety glasses) 2. Use proper lifting techniques / Obtain assistance if needed 3. Wear proper PPE (nitrile gloves, leather gloves)
37. Decontaminate equipment	1. Contact with potentially impacted material 2. Contact with sharp pieces of equipment	1. Wear proper PPE (safety glasses, nitrile gloves) 2. Wear proper PPE (leather gloves)
38. Patch soil boring location to return to pre-existing conditions (i.e. concrete, asphalt, grass)	1. Cuts/lacerations 2. Splashed concrete on face/eyes 3. Hammer fingers/hands when patching asphalt	1. Wear proper PPE (leather gloves) / Use scissors for cutting 2. Use proper PPE (safety glasses) 3. Be aware of hands/fingers during hammering / Wear proper PPE (leather gloves)
39. All activities	61. Slips/ Trips/ Falls 62. Hand injuries, cuts or lacerations during manual handling of materials 63. Foot injuries 64. Back injuries 65. Traffic 66. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 67. High Noise levels 68. Overhead hazards 69. Heat Stress/ Cold Stress 70. Eye Injuries	67. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 68. 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 69. Wear Langan approved safety shoes 70. 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 71. Wear high visibility clothing & vest / Use cones or signs to designate work area 72. 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 73. Wear hearing protection 74. Wear hard hat / Avoid areas were overhead hazards exist.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		75. 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 76. 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: Site Inspection
JSA Number: JSA024-01

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.

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
40. Jobsite Pre-briefing	34. None	14. Review JSA, SOP's, and discuss hazards that may be present and control measures for present hazards while on-site.
2. Working near railroads	1. Passing Trains. 2. Slip/Trips/Falls.	1. Wear reflective vest/ Stay away from tracks/ Do not cross tracks within 10 ft. of train car or when there is a train within view/listen for train horn. 2. Be aware of tripping hazards/ Follow good housekeeping procedures/ Mark significant hazards with spray paint or cones.
3. Walking around site	5. Uneven terrain 6. Wildlife: Stray animals, mice/rats, vectors (i.e. mosquitoes, bees, etc.) 7. Weather: Heat/cold stress 8. Slip/Trips/Falls 9. Foot injuries 10. Eye injuries	2. Pay attention to surrounding area (puddles, wet, frozen, uneven areas); Mark with cones or spray paint. 3. Use bug spray/ Avoid stray animals/Use repellant when needed. 4. Dress for the correct weather situation/ Use sunscreen or protective clothing in sunlight, layers in cold weather/ Drink plenty of fluids/ Take breaks when needed. 4. Be aware of tripping hazards/ Follow good housekeeping procedures/ Mark significant hazards with spray paint or cones. 5. Wear proper PPE (Langan approved safety shoes)/ Change wet socks during cold weather. 6. Wear proper PPE (safety glasses/goggles).
4. Working near road	1. Passing vehicles 2. Slip/Trips/Falls	1. Wear reflective vest/ Stay away from roadway/ Use buddy system/ Place signage or cones when needed. 2. Be aware of tripping hazards/ Follow good housekeeping procedures/ Mark significant hazards with spray paint or cones.
5. All activities	71. Slips/ Trips/ Falls 72. Hand injuries, cuts or lacerations during manual handling of materials 73. Foot injuries 74. Back injuries	77. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 78. 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

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	75. Traffic 76. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 77. High Noise levels 78. Overhead hazards 79. Heat Stress/ Cold Stress 80. Eye Injuries	79. Wear Langan approved safety shoes 80. 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 81. Wear high visibility clothing & vest / Use cones or signs to designate work area 82. 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 83. Wear hearing protection 84. Wear hard hat / Avoid areas were overhead hazards exist. 85. 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 86. 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

COMMUNITY AIR MONITORING PROGRAM

COMMUNITY AIR MONITORING PROGRAM

for

450 UNION STREET
BROOKLYN, NEW YORK
NYSDEC BCP NO.: C224219

Prepared For

450 Union LLC
c/o Pilot Real Estate Group LLC
10 Glenville Street, 1st Floor
Greenwich, Connecticut 06831

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

January 2020
Langan Project No. 170301202

LANGAN

1.0 Introduction

This site-specific community air monitoring program (CAMP) was prepared in general compliance with the New York State Department of Health (NYSDOH) Generic CAMP and is intended to mitigate potential exposures of sensitive receptors to nuisance odors and dust resulting from remedial excavations and potential coal-tar impacted materials. Based on environmental and geotechnical investigations performed to date, coal-tar impacts were documented in soil beginning at depths between about 23 feet and 54 below grade surface (bgs) in the eastern portion of the site. This CAMP is intended for implementation during the scope of the Interim Remedial Measures Work Plan (IRMWP), which includes driving sheet piles along the eastern property to about 52 feet bgs and remedial excavation to about 12.5 feet bgs and to support construction of a bulkhead/containment barrier. Accordingly, significant coal tar-impacted material is not expected to be encountered during the remedial excavation.

2.0 Community Air Monitoring

Monitoring for dust and odors will be conducted during all ground intrusive activities by the Field Team Leader (FTL). Continuous monitoring at the perimeter of the work zones for odor, volatile organic compounds (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 photoionization detector (PID) will be used to monitor the work zone and for periodic monitoring for VOCs during activities such as soil and groundwater sampling and soil excavation. The site perimeter will be monitored for fugitive dust emissions by visual observations as well as instrumentation measurements (if required). When required, particulate or dust will be monitored continuously with real-time field instrumentation that will meet, at a minimum, the performance standards from DER-10 Appendix 1B.

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

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

shutdown.

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

- If the downwind particulate level is 100 micrograms per cubic meter (µg/m³) 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/m³ 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/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.

3.0 Vapor Emission Response Plan

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

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

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

4.0 Major Vapor Emission

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work site, or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted or odor controls must be implemented, as described in Section 6. Relative to the site work, the nearest on-site commercial structure is the Pig Beach restaurant, about 20 feet away, and the nearest off-site commercial structure is the 501 Union Street event space, about 150 feet away (across Union Street). Pig Beach operates in the adjacent on-site building and uses a part of the exterior area as seasonal restaurant and event space. The IRMWP will be implemented during the winter when the outdoor restaurant and event space will not be in use.

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

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

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

5.0 Major Vapor Emission Response Plan

Upon activation, the following activities will be undertaken:

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

6.0 Vapor and Dust Suppression Techniques

Preventative measures for dust generation may include wetting site fill and soil, construction of an engineered construction entrance with gravel pad, use of 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, including Rusmar odor-control foam (RusFoam® OC AC645 or approved equivalent) or placing polyethylene sheeting or non-odorous soil over the odor or VOC source areas for short-term control of the odor and VOCs.

If odors develop and cannot otherwise be 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 using the discussed vapor suppression techniques, or where the release of nuisance odors cannot otherwise be avoided due to on-site conditions or close proximity to sensitive receptors, odor control may be achieved

by sheltering excavation and handling areas under tented containment structures equipped with appropriate air venting/filtering systems. If vapors and odors are generated that cannot be controlled, the need for excavation containment structures will be discussed with the NYSDEC and NYSDOH.

7.0 Monitoring of Nearby Occupied Structures

This section applies where structures within about 20 feet of the ground-intrusive work may be occupied during the planned remedial action. Where this condition exists, the following will be considered for incorporation into the CAMP:

- One of the CAMP monitoring stations will be placed between the remedial work area and nearest outside wall of the occupied structure. If site conditions warrant, a third station may be used to accomplish this task.
    - If 15-minute-average total VOC concentrations exceed 1 ppm above background near the outside wall or next to intake vents of the occupied structure, periodic VOC monitoring will be performed within the occupied structure.
    - If 15-minute-average total PM10 concentrations exceed 150 µg/m^3 above background near the outside wall or next to intake vents of the occupied structure, work activities will be temporarily suspended until suppression techniques are implemented and concentrations return to background.
- Where nuisances have developed during remedial work and cannot be corrected using the techniques described in Section 6, use of additional engineering controls may be considered, such as vapor/dust barriers or ventilation devices.
- Consideration should be given to scheduling or sequencing ground-intrusive activities during periods when potentially exposed populations may not be occupying the structure.

8.0 Reporting

A summary of CAMP findings, including triggered action levels, will be provided daily to the NYSDEC and NYSDOH project managers as part of daily reporting. In addition to a summary of CAMP findings, daily reports will include:

- An update of progress made during the reporting day;
- Locations of work and quantities of material imported and exported from the site;
- Locations of CAMP monitoring stations, soil stockpiles, and decontamination stations;
- References to map for site activities;
- A summary of any and all complaints with relevant details (names, phone numbers);

- An explanation of notable site conditions;
- Actions anticipated for the next reporting day; and
- Site photographs from the day's remedial activities.

Daily reports are not intended to be the mode of communication for notification to the NYSDEC or the NYSDOH of emergencies (accident, spill), requests for changes to the CAMP or the IRMWP, or other sensitive or time critical information; however, such conditions will also be included in the daily reports. Emergency conditions and changes to the CAMP or the IRMWP will be addressed directly to the NYSDEC and NYSDOH project managers via personal communication. If site conditions warrant, the remedial engineer may request to change from daily to weekly reports that include the above information.

APPENDIX C

QUALITY ASSURANCE PROJECT PLAN

LANGAN

QUALITY ASSURANCE PROJECT PLAN

for

450 UNION STREET
Brooklyn, New York

NYSDEC BCP Site No. C224219

Prepared for:

450 Union LLC
c/o Pilot Real Estate Group LLC
10 Glenville Street, 1st Floor
Greenwich, Connecticut 06831

Prepared By:

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

December 2019
Langan Project No: 170301202

LANGAN

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1.0 PROJECT DESCRIPTION

This Quality Assurance Project Plan (QAPP) was prepared on behalf of 450 Union LLC c/o Pilot Real Estate Group LLC (the Volunteer), for 450 Union Street (the Site) in Brooklyn, New York. A Site Location map is provided as Attachment A. The Volunteer entered into the New York State Brownfield Cleanup Program (BCP) under the Brownfield Cleanup Agreement (BCA) dated September 1, 2015 (BCP Site ID. C224219). A Site Location Map is provided in Attachment A. Additional site information and data collected previously by Langan and others is provided in the Interim Remedial Measures Work Plan (IRMWP).

This QAPP specifies the sampling procedures to be followed and the analytical methods to be used to ensure that data from the proposed investigation at the site are precise, accurate, representative, comparable, and complete.

1.2 Project Objectives

The scope of this IRMWP includes the following:

- Installation of a new steel bulkhead/containment barrier with a hydrophilic water-stop installed at un-welded interlocking seams to serve as a subsurface containment/cut-off wall for coal tar-related dense non-aqueous phase liquid (DNAPL) migration;
- Excavation and off-site disposal of excess soil/fill generated during construction of the new bulkhead/containment barrier.
- Documentation soil sampling and analysis, collected from the base and (where available) sidewalls of bulkhead/containment barrier excavations, to document residual soil/fill exceeding Title 6 of the New York Codes, Rules and Regulations (6 NYCRR) Part 375 Restricted Use Restricted-Residential (RURR) Soil Cleanup Objectives (SCOs);
- Backfill above the high-level relieving platform to the original grade using certified-clean fill meeting the lower of Part 375 RURR and Protection of Groundwater SCOs, or with virgin, native crushed stone, in accordance with DER-10; and
- Restoration of the site cover consisting of asphalt, concrete pavement, and/or a minimum 2-foot-thick clean soil cover meeting the lower of Part 375 RURR and Protection of Groundwater SCOs above a demarcation barrier.

The IRMWP includes collection of documentation soil samples following excavation beneath the concrete relieving platform, in accordance with Division of Environmental Remediation (DER)-10: Technical Guidance for Site Investigation and Remediation. The IRMWP also includes waste characterization sampling as part of soil disposal. This QAPP addresses sampling and analytical methods that will be necessary in support of the IRM goals. These objectives have been established to meet standards that will protect public health and the environment for the site.

1.3 Scope of Work

Implementation of the IRMWP will include handling of historic fill and other solid waste material during waste characterization and continuous screening of excavated material. Excavated soil will be sampled for laboratory analysis per disposal facility requirements, and visually examined, screened, and characterized to determine whether it is suitable for potential re-use onsite (pending waste characterization analytical sampling results) or will be transported to an approved off-site disposal facility. Dust, odors, and organic vapors will be managed by following a site-specific Health and Safety Plan (HASP) and through an established CAMP.

The following activities will be performed as part of the interim remedial action:

- Waste Characterization Soil Sampling – Soil samples for waste classification and disposal purposes will be collected prior to and/or during the remedial excavation. Soil samples will be collected at a frequency depending on the disposal facility requirements. Laboratory tests for characterization of a waste stream typically include all or a subset of the following list and will be determined by the facility's permit requirements: Total Petroleum Hydrocarbons (TPH); Target Compound List (TCL) volatile organic compounds (VOC) and semi-volatile organic compounds (SVOC); polychlorinated biphenyls (PCB); Target Analyte List (TAL) metals; pesticides and herbicides; the Resource Conservation and Recovery Act (RCRA) hazardous characteristics of ignitability, corrosivity, and reactivity; RCRA toxicity characteristic using the Toxic Characteristics Leaching Procedure (TCLP) for VOCs, SVOCs, metals, pesticides, and herbicides; Diesel Range Organics (DRO); and/or Gasoline Range Organics (GRO).
- Bulkhead/Containment Barrier Construction, Excavation, and Backfill – The bulkhead/containment barrier design will require excavation of contaminated historic fill beneath the high-level relieving platform. Documentation soil samples will be collected from the excavation base in accordance with DER-10. The concrete platform will cover the excavation. Backfill material will be placed on top of the platform to match the surrounding grade. The site cover will then be restored with an asphalt or concrete cover. Areas that are not capped by an impervious cover will be backfilled with a clean fill material in accordance with the IRMWP, consisting of 2-feet of clean fill for landscaped/planter areas per DER-10 5.4(e).

2.0 DATA QUALITY OBJECTIVES AND PROCESSES

Data Quality Objectives (DQOs) are qualitative and quantitative statements to help ensure that data of known and appropriate quality are obtained during the project. The overall project objective is to implement interim remedial measures for a portion of the site. The sampling program will provide for collection of soil samples to document soil/fill left in place and to confirm remedial performance in source contamination areas. DQOs for sampling activities are determined by evaluating five factors:

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

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

- **Precision** – an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Field sampling precision will be determined by analyzing coded duplicate samples and analytical precision will be determined by analyzing internal QC duplicates and/or matrix spike duplicates.
- **Accuracy** – a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern. For soil and groundwater samples, accuracy will be determined through the assessment of the analytical results of field blanks and trip blanks for each sample set. Analytical accuracy will be assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), internal standards, laboratory method blanks, instrument calibration, and the percent recoveries of matrix spike compounds added to selected samples and laboratory blanks. For soil vapor or air samples, analytical accuracy will be assessed by examining the percent recoveries that are added to each sample, internal standards, laboratory method blanks, and instrument calibration.
- **Representativeness** – expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is dependent upon the adequate design of the sampling program and will be satisfied by ensuring that the scope of work is followed and that specified sampling and analysis techniques are used. Representativeness in the laboratory is ensured by compliance to nationally-recognized

analytical methods, meeting sample holding times, and maintaining sample integrity while the samples are in the laboratory's possession. This is accomplished by following all applicable methods, laboratory-issued standard operating procedures (SOPs), the laboratory's Quality Assurance Manual, and this QAPP. The laboratory is required to be properly certified and accredited.

- **Completeness** – the percentage of measurements made which are judged to be valid. Completeness will be assessed through data validation. The QC objective for completeness is generation of valid data for at least 90 percent of the analyses requested.
- **Comparability** – expresses the degree of confidence with which one data set can be compared to another. The comparability of all data collected for this project will be ensured using several procedures, including standard methods for sampling and analysis as documented in the QAPP, using standard reporting units and reporting formats, and data validation.
- **Sensitivity** – the ability of the instrument or method to detect target analytes at the levels of interest. The project manager will select, with input from the laboratory and QA personnel, sampling and analytical procedures that achieve the required levels of detection.

3.0 PROJECT ORGANIZATION

The IRMWP objectives will be documented by Langan on behalf of 450 Union LLC c/o Pilot Real Estate Group LLC. Langan will oversee excavation and off-site disposal of historic fill generated during bulkhead construction. Langan will provide on-site field representatives to screen soil, collect remedial performance and site characterization soil samples, and implement a community air monitoring program (CAMP) in general accordance with New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan.

For the scope of work described in the IRMWP, sampling will be conducted by Langan, the analytical services will be performed by Alpha Analytical of Westborough, Massachusetts (NYSDOH ELAP certification number 11148). Data validation services will be performed by Emily Strake; resume attached (Attachment B).

Key contacts for this project are as follows:

Langan Technical Manager:	Mr. Albert Tashji, P.E. Telephone: (212) 479-5508 Fax: (212) 479-5444
Langan Project Manager:	Mrs. Mimi Raygorodetsky Telephone: (212) 479-5441
Langan Quality Assurance Officer (QAO):	Mr. Michael D. Burke, CHMM Telephone: (212) 479-5413
Data Validator and Program Quality Assurance Monitor:	Ms. Emily Strake Telephone: (212) 491-6526 Fax: (212) 479-5444
Laboratory Representative:	Alpha Analytical Ben Rao Telephone: (201) 812-2633

4.0 QUALITY ASSURANCE/QUALITY CONTROL OBJECTIVES FOR MEASUREMENT 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 for the remedial investigation at the Site. The sample set, chemical analysis results, and interpretations must be based on data that meet or exceed quality assurance objectives established for the Site. Quality assurance objectives are usually expressed in terms of accuracy or bias, sensitivity, completeness, representativeness, comparability, and sensitivity of analysis. Variances from the quality assurance objectives at any stage of the investigation will result in the implementation of appropriate corrective measures and an assessment of the impact of corrective measures on the usability of the data.

4.1 Precision

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

4.2 Accuracy

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

Accuracy in the field is assessed through the use of field blanks and through compliance to all sample handling, preservation, and holding time requirements. All field blanks should be non-detect when analyzed by the laboratory. Any contaminant detected in an associated field blank will be evaluated against laboratory blanks (preparation or method) and evaluated against field samples collected on the same day to determine potential for bias. Trip blanks are not required for non-aqueous matrices but are planned for non-aqueous matrices where high concentrations of VOCs are anticipated.

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

4.3 Representativeness

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary. Representativeness is dependent upon the adequate design of the sampling program and will be satisfied by ensuring that the scope of work is followed and that specified sampling and analysis techniques are used. This is performed by following applicable standard operating procedures (SOPs) and this QAPP. All field technicians will be given copies of appropriate documents prior to sampling events and are required to read, understand, and follow each document as it pertains to the tasks at hand.

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

4.4 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.

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

4.5 Comparability

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

4.6 Sensitivity

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

Field equipment will be used that can achieve the required levels of detection for analytical measurements in the field. In addition, the field sampling staff will collect and submit full volumes of samples as required by the laboratory for analysis, whenever possible. Full volume aliquots will help ensure achievement of the required limits of detection and allow for reanalysis if necessary. The concentration of the lowest level check standard in a multi-point calibration curve will represent the reporting limit.

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

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

5.0 SAMPLE COLLECTION AND FIELD DATA ACQUISITION PROCEDURES

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

5.1 Field Documentation Procedures

Field documentation procedures will include summarizing field observations in field books, tracking contractor progress of the interim remedial measures, logging documentation/confirmation soil samples collected, and proper sample labeling. These procedures are described in the following sections.

5.1.1 Field Data and Notes

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

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

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

- Project name and number
- Reasons for being on-site or taking the sample
- Date and time of activity
- Sample identification numbers
- Geographical location of sampling points with references to the site, other facilities or a map coordinate system. Sketches will be made in the field logbook when appropriate
- Physical location of sampling locations such as depth below ground surface
- Description of the method of sampling including procedures followed, equipment used and any departure from the specified procedures
- Description of the sample including physical characteristics, odor, etc.
- Readings obtained from health and safety equipment
- Weather conditions at the time of sampling and previous meteorological events that may affect the representative nature of a sample

- Photographic information including a brief description of what was photographed, the date and time, the compass direction of the picture and the number of the picture on the camera
- Other pertinent observations such as the presence of other persons on the site, actions by others that may affect performance of site tasks, etc.
- Names of sampling personnel and signature of persons making entries

5.1.2 Sample Labeling

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

5.2 Equipment Calibration and Preventative Maintenance

A photoionization detector (PID) will be used during the sampling activities to evaluate work zone action levels and screen soil during excavation/disposal and before collecting performance documentation samples. Field calibration and/or field checking of the PID will be the responsibility of the field team leader and the site HSO, and will be accomplished by following the procedures outlined in the operating manual for the instrument. An air monitor capable of measuring particulate matter up to 10 micrometers (µm) in diameter will be used to evaluate perimeter air quality resulting from the work. At a minimum, field calibration and/or field equipment checking will be performed once daily, prior to use. Field calibration will be documented in the field notebook. Entries made into the logbook regarding the status of field equipment will include the following information:

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

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

Off-site calibration and maintenance of field instruments will be conducted as appropriate throughout the duration of project activities. All field instrumentation, sampling equipment and accessories will be maintained in accordance with the manufacturer's recommendations and

specifications and established field equipment practice. Off-site calibration and maintenance will be performed by qualified personnel. A logbook will be kept to document that established calibration and maintenance procedures have been followed. Documentation will include both scheduled and unscheduled maintenance.

5.3 Sample Collection

Soil Samples

Soil samples will be visually classified and field screened using a PID to assess potential impacts from VOCs and for health and safety monitoring. Soil samples collected for analysis of VOCs will be collected using either EnCore® or Terra Core® sampling equipment. For analysis of non-volatile parameters, samples will be homogenized and placed into glass jars. After collection, all sample jars will be capped and securely tightened, and placed in iced coolers and maintained at 4°C ±2°C until they are transferred to the laboratory for analysis, in accordance with the procedures outlined in Section 5.4. Analysis and/or extraction and digestion of collected soil samples will meet the holding times required for each analyte as specified in Attachment D. In addition, analysis of collected soil sample will meet all quality assurance criteria set forth by this QAPP and DER-10.

Sample Field Blanks and Duplicates

Field blanks will be collected for quality assurance purposes at a rate of one per 20 investigative samples per matrix (soil and groundwater only). Field blanks will be obtained by pouring laboratory-demonstrated analyte-free water on or through a decontaminated sampling device following use and implementation of decontamination protocols. The water will be collected off of the sampling device into a laboratory-provided sample container for analysis. Field blank samples will be analyzed for the complete list of analytes on the day of sampling. Trip blanks will be collected for each sample shipment that includes VOC analysis.

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

5.4 Sample Containers and Handling

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

Soil samples collected in the field for laboratory analysis will be placed directly into the laboratory-supplied sample containers. Samples will then be placed and stored on-ice in laboratory provided coolers until shipment to the laboratory. The temperature in the coolers

containing samples and associated field blanks will be maintained at a temperature of 4°±2°C while on-site and during sample shipment to the analytical laboratory.

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

5.5 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 D.

5.6 Sample Shipment

5.6.1 Packaging

Soil sample containers will be placed in plastic coolers. Ice in Ziploc® bags (or equivalent) will be placed around sample containers. Cushioning material will be added around the sample containers if necessary. Chains-of-custody and other paperwork will be placed in a Ziploc® bag (or equivalent) and placed inside the cooler. The cooler will be taped closed and custody seals will be affixed to one side of the cooler at a minimum. If the samples are being shipped by an express delivery company (e.g. FedEx) then laboratory address labels will be placed on top of the cooler.

5.6.2 Shipping

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

- All efforts will be made to transport environmental samples to the laboratory within 24 hours from the time of collection by a laboratory-provided courier or express delivery company (e.g. FedEx) under the chain-of-custody protocols described in Section 5.9.
- Prior notice will be provided to the laboratory regarding when to expect shipped samples. If the number, type or date of shipment changes due to site constraints or program changes, the laboratory will be informed.

5.7 Decontamination Procedures

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

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

5.8 Residuals Management

Debris (e.g., paper, plastic and disposable PPE) will be collected in plastic garbage bags and disposed of as non-hazardous industrial waste. Debris is expected to be transported to a local municipal landfill for disposal.

Residual fluids (such as dewatering fluids) will be collected by pumping into a dedicated DOT-approved (or equivalent) vehicle for transport and off-site disposal. The residual fluids will be disposed of off-site in accordance with applicable federal and state regulations. Residual fluids such as decontamination water may be discharged to the ground surface, however, if gross contamination is observed, the residual fluids will be collected, stored, and transported similar purge water or other residual fluids.

5.9 Chain of Custody Procedures

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

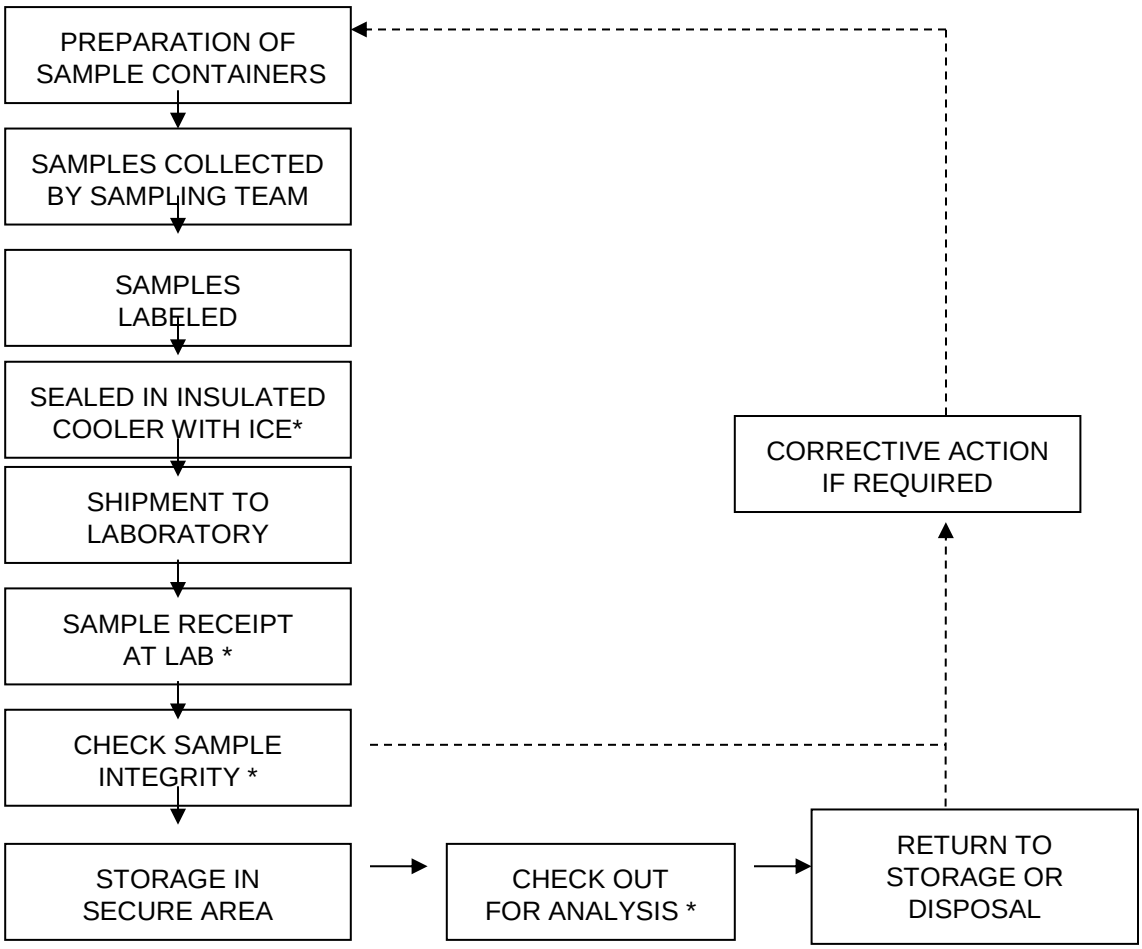
- Chain-of-custody will be initiated by the laboratory supplying the pre-cleaned and prepared sample containers. Chain-of-custody forms will accompany the sample containers.
- Following sample collection, the chain-of-custody form will be completed for the sample collected. The sample identification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

chain-of-custody form. Any necessary corrections will be made to the record with a single strike mark, dated, and initialed.

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

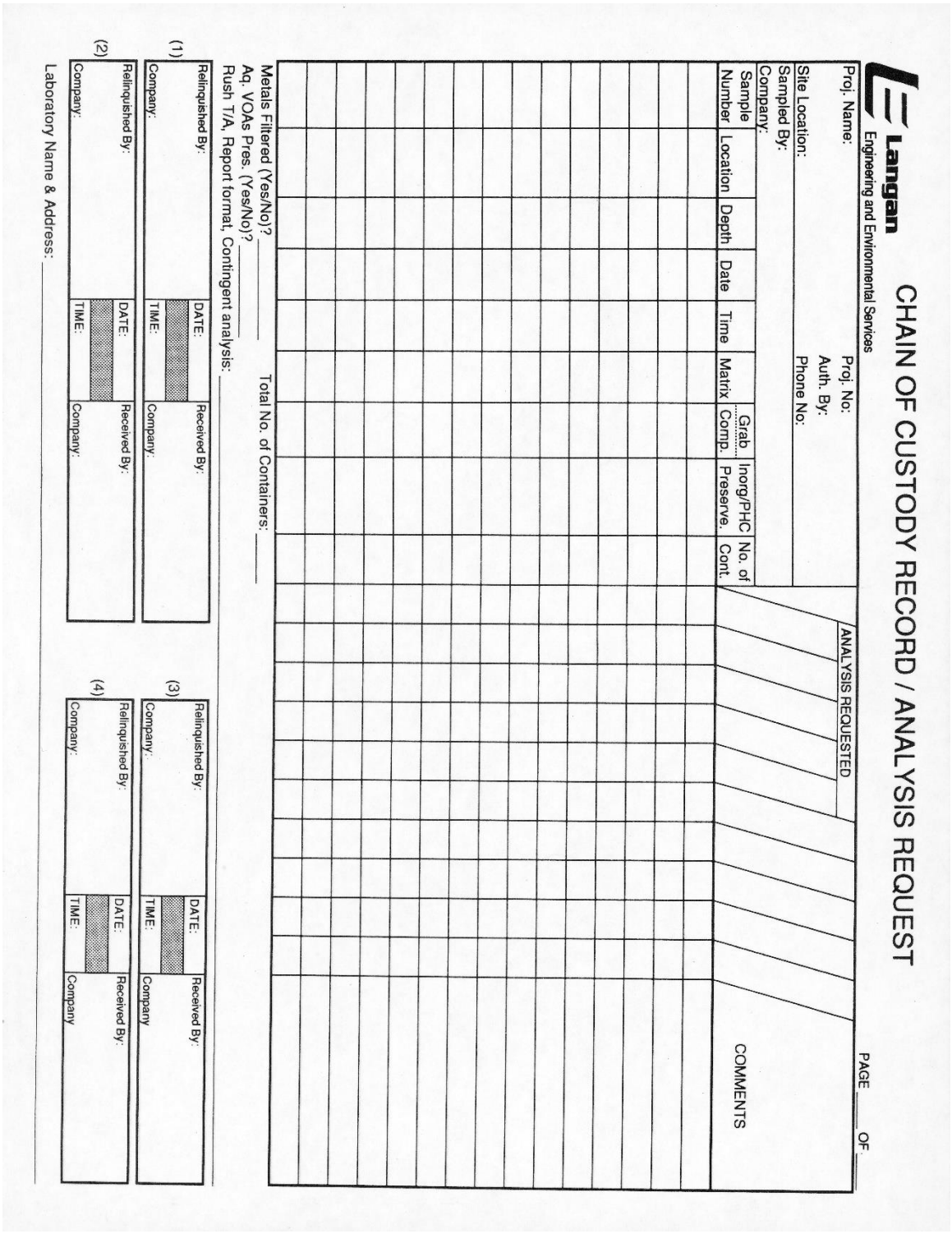
Samples will be packaged for shipment to the laboratory with the appropriate chain-of-custody form. A copy of the form will be retained by the sampling team for the project file and the original will be sent to the laboratory with the samples. Bills of lading will also be retained as part of the documentation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

Figure 5-1 Sample Custody



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

Figure 5.2 Sample Chain-of-Custody Form



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, the environmental consultant must be notified to discuss recommended courses of action and documentation of the issue must be included in the project file.

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

6.0 DATA REDUCTION, VALIDATION, AND REPORTING

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

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

6.1 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 ASCII format from the laboratory information management system (LIMS). If this cannot be accomplished, the consultant should be notified via letter of transmittal indicating that manual entry of data is required for a particular method of analysis. All EDDs must also undergo a QC check by the laboratory before delivery. The original data, tabulations, and electronic media are stored in a secure and retrievable fashion.

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

6.2 Data Validation

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

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

A DUSR will be prepared and reviewed by the QAO before issuance. The DUSR will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and COC procedures, and a summary assessment of precision, accuracy,

representativeness, comparability, and completeness for each analytical method. A detailed assessment of each SDG will follow. For each of the organic analytical methods, the following will be assessed:

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

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

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

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

- "U" - Not detected. The associated number indicates the approximate sample concentration necessary to be detected significantly greater than the level of the highest associated blank;

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

7.0 QUALITY ASSURANCE PERFORMANCE AUDITS AND SYSTEM AUDITS

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.

7.1 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 be performed.

7.2 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.

7.3 Formal Audits

Formal audits refer to any system or performance audit that is documented and implemented by the QA group. These audits encompass documented activities performed by qualified lead auditors to a written procedure or checklists to objectively verify that quality assurance requirements have been developed, documented, and instituted in accordance with contractual and project criteria. Formal audits may be performed on project and subcontractor work at various locations.

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

The Project Manager has overall responsibility to ensure that all corrective actions necessary to resolve audit findings are acted upon promptly and satisfactorily. Audit reports must be submitted to the Project Manager within fifteen days of completion of the audit. Serious deficiencies will be reported to the Project Manager within 24 hours. All audit checklists, audit

reports, audit findings, and acceptable resolutions are approved by the QAO prior to issue. Verification of acceptable resolutions may be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the QAO will close out the audit report and findings.

8.0 CORRECTIVE ACTION

8.1 Introduction

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

8.2 Procedure Description

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

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

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

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

Personnel assigned to quality assurance functions will have the responsibility to issue and control Corrective Action Request (CAR) Forms (Figure 12.1 or similar). The CAR identifies the out-of-compliance condition, reference document(s), and recommended corrective action(s) to be administered. The CAR is issued to the personnel responsible for the affected item or

activity. A copy is also submitted to the Project Manager. The individual to whom the CAR is addressed returns the requested response promptly to the QA personnel, affixing his/her signature and date to the corrective action block, after stating the cause of the conditions and corrective action to be taken. The QA personnel maintain the log for status of CARs, confirms the adequacy of the intended corrective action, and verifies its implementation. CARs will be retained in the project file for the records.

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

FIGURE 8.1

CORRECTIVE ACTION REQUEST

Number: _____ Date: _____

TO: _____

You are hereby requested to take corrective actions indicated below and as otherwise determined by you to (a) resolve the noted condition and (b) to prevent it from recurring. Your written response is to be returned to the project quality assurance manager by _____

CONDITION:

REFERENCE DOCUMENTS:

RECOMMENDED CORRECTIVE ACTIONS:

_____ _____ _____ _____ _____ _____

Originator Date Approval Date Approval Date

RESPONSE

CAUSE OF CONDITION

CORRECTIVE ACTION

(A) RESOLUTION

(B) PREVENTION

(C) AFFECTED DOCUMENTS

C.A. FOLLOWUP:

CORRECTIVE ACTION VERIFIED BY: _____ DATE:_____

9.0 REFERENCES

NYSDEC. Division of Environmental Remediation. DER-10/Technical Guidance for Site Investigation and Remediation, dated May 3, 2010.

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

Taylor, J. K., 1987. Quality Assurance of Chemical Measurements. Lewis Publishers, Inc., Chelsea, Michigan

USEPA, 1986. SW-846 "Test Method for Evaluating Solid Waste," dated November 1986. U.S. Environmental Protection Agency, Washington, D.C.

USEPA, 1987. Data Quality Objectives for Remedial Response Actions Activities: Development Process, EPA/540/G-87/003, OSWER Directive 9355.0-7- U.S. Environmental Protection Agency, Washington, D.C.

USEPA, 2012. ICP-AES Data Validation. SOP No. HW-2a, Revisions 15, dated December 2012, USEPA Region II.

USEPA, 2012. ICP-MS Data Validation. SOP No. HW-2b, Revisions 15, dated December 2012, USEPA Region II.

USEPA, 2012. Mercury and Cyanide Data Validation. SOP No. HW-2c, Revisions 15, dated December 2012, USEPA Region II.USEPA. Hazardous Waste Support Section. Analysis of Volatile Organic Compounds in Air Contained in Canisters by Method TO-15. SOP No. HW-31, Revision #6, dated June 2014.

ATTACHMENT A

SITE LOCATION MAP

LEGEND:

APPROXIMATE BROWNFIELD CLEANUP PROGRAM SITE BOUNDARY

1,500 0 750 1,500

SCALE IN FEET

GENERAL NOTES:

1. BASE MAP IS TAKEN FROM UNITED STATES GEOLOGICAL SURVEY (USGS) 7.5 MINUTE TOPOGRAPHIC MAPS FOR THE BROOKLYN, 1980 AND JERSEY CITY, 1982 QUADRANGLES.

LANGAN

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Project	450 UNION STREET BLOCK No. 438, LOT No. 7 BROOKLYN KINGS NEW YORK
Figure Title	SITE LOCATION MAP
Project No.	170301202
Date	11/25/2019
Drawn By	JD
Checked By	AT
Figure No.	1
Sheet	1 of 7

Filename: \\langan.com\data\NYC\data2\170301202\Cadd Data - 170301202\2D-DesignFiles\Environmental\IRMWP\Figure 1 - Site Location Map.dwg Date: 11/27/2019 Time: 10:39 User: jdonelan Style Table: Langan.stb Layout: SLM

ATTACHMENT B

RESUMES

EMILY STRAKE, CEP

SENIOR PROJECT CHEMIST / RISK ASSESSOR
HUMAN HEALTH RISK ASSESSMENT / CHEMICAL DATA VALIDATION

Ms. Strake has 20 years of environmental chemistry, risk assessment, auditing, and quality assurance experience. 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 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 broad experience in environmental data validation, focused on ensuring laboratory deliverables follow specific guidelines as described by regulatory agencies and the analytical methods employed. She is experienced in auditing laboratory and field-sampling activities for compliance with Quality Assurance Project Plans (QAPPs), the National Environmental Laboratory Accreditation Conference Standards Quality Systems manual, and applicable USEPA Guidance.

SELECTED PROJECTS

- Air Products and Chemicals, Edison, NJ
- Ametek, Sellersville, PA
- Burnt Timber, Alberta, Canada
- Delaware City Refinery, DE
- DOW Chemical, Various Locations
- DuPont South River, Waynesboro, VA
- East Cat Canyon Oil Field, Santa Maria, CA
- Fair Lawn Superfund Site, Fairlawn, NJ
- Floreffe Terminal, Pittsburgh, PA
- FONF Expansion/Sabre Park BCP, Niagara Falls, NY
- Former NPR-1 Remediation Project, Taft, CA
- Golden Gate National Parks Conservancy, San Francisco, CA
- H&H Burn Pit, Farrington, VA
- Hercules Santa Barbara Gas Plant, Montecito, CA
- Honeywell, Highland Park, NJ
- Hunters Point Shipyard, San Francisco, CA
- John Evans Superfund Site, Lansdale, PA
- Little Mill Creek, New Castle, DE
- Major League Soccer's San Jose Earthquakes Stadium, Santa Clara, CA
- Mannington Mills, Mannington, NJ
- Midway Village, Daly City, CA
- Morgans Point, Bermuda
- Occidental Chemical, Bakersfield, CA

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, Vice-Chair, Term ending 1/1/2022.

Society of Environmental Toxicology and Chemistry

TRAINING

40 hr. OSHA HAZWOPER Training/Nov 2002

8 hr. HAZWOPER Supervisor/June 2004

8 hr. OSHA HAZWOPER Refresher/Oct 2017

LANGAN

- PECO/Exelon, Various Locations
- 365 Bond Street Development, Brooklyn, NY
- Regency, Philadelphia, PA
- Rohm and Haas, Philadelphia, PA
- Ryder, Hartford, CT
- Santa Clara Landfill Site, San Jose, CA
- Sunoco Philadelphia (PES) Facility, Philadelphia, PA
- Texas Instruments, San Francisco, CA
- Veteran's Affairs, Palo Alto, CA
- Whitehead Realty - Former ACME Sites, Brooklyn, NY
- 55 Bank Street, White Plains, NY
- 268 West Street, New York, NY
- 300 Jackson Ave. RA/RI, Downingtown, PA
- 420 Kent Avenue, Brooklyn, NY
- 805-825 Atlantic Avenue, Brooklyn, NY
- 521-539 4th Ave, Brooklyn, NY
- 1525 Bedford Avenue, Brooklyn, NY
- 2420 - 2430 Amsterdam Avenue, New York, NY
- 3093 Broadway Phase I ESA, Oakland, CA

SELECTED PUBLICATIONS, REPORTS, AND PRESENTATIONS

PFAS Uncertainty in Exposure and Toxicity Information. Presented to the bipartisan Congressional PFAS Task Force

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 Faculty Coordinator

MIMI RAYGORODETSKY

SENIOR ASSOCIATE / VICE PRESIDENT

ENVIRONMENTAL ENGINEERING

Ms. Raygorodetsky sources and directs large, complex environmental remediation and redevelopment projects from the earliest stages of pre-development diligence, through the remediation/construction phase, to long-term operation and monitoring of remedial systems and engineering controls. She has a comprehensive understanding of federal, state and local regulatory programs and she uses this expertise to guide her clients through a preliminary cost benefit analysis to select the right program(s) given the clients' legal obligations, development desires and risk tolerance. She is particularly strong at integrating the requirements of selected programs and client development needs to develop and design targeted and streamlined diligence programs and remediation strategies. Ms. Raygorodetsky is also highly skilled in integrating remediation with construction on large urban waterfront projects, which tend to more complex than landside projects.

EDUCATION

B.A., Biology and Spanish Literature
Colby College

AFFILIATIONS

New York Women Executives in Real Estate (WX), Member

New York Building Congress, Council of Industry Women, Committee Member

New York City Brownfield Partnership, Founding Member and President

NYC Office of Environmental Remediation Technical Task Force, Committee Member

SELECTED PROJECTS

- 25 Kent Avenue, Due Diligence for Purchase of a Brownfields Location, Brooklyn, NY
- Ferry Point Waterfront Park, Redevelopment of a Former Landfill into a Park, Bronx, NY
- Battery Maritime Building (10 South Street), Phase I ESA, New York, NY
- Residential Development at 351-357 Broadway, Phase 1 ESA, New York, NY
- 450 Union Street, Phase I and Phase II Remediation (NYS DEC Brownfield Cleanup Program), New York, NY
- Echo Bay Center, NYS DEC Brownfield Cleanup Program, New York, NY
- 420 Kent Avenue, NYS DEC Brownfield Cleanup Program, Brooklyn, NY
- 416 Kent Avenue, NYS DEC Brownfield Cleanup Program, Brooklyn, NY
- 264 Fifth Avenue, Phase I ESA, New York, NY
- 262 Fifth Avenue, Phase I ESA, New York, NY
- ABC Blocks 25-27 (Mixed-Use Properties), Brownfield Cleanup Program, Long Island City, NY
- Residences at 100 Barrow Street, Phase I ESA, New York, NY
- Residences at 22-12 Jackson Avenue, Due Diligence for Building Sale, Long Island City, NY
- Residences at 2253-2255 Broadway, Phase I and Phase II Services, New York, NY
- Prince Point, Phase I ESA, Staten Island, NY
- 787 Eleventh Avenue (Office Building Renovation), Phase I UST Closure, New York, NY
- 218 Front Street/98 Gold Street, Planning and Brownfield Consulting, Brooklyn, NY
- Mark JCH of Bensonhurst, Phase I and HazMat Renovation, Brooklyn, NY
- 39 West 23rd Street, E-Designation Brownfield, New York, NY

- 250 Water Street, Phase I and Phase II Property Transaction, New York, NY
- 27-19 44th Drive, Residential Redevelopment, Long Island City, NY
- 515 West 42nd Street, E-Designation, New York, NY
- 310 Meserole Street, Due Diligence Property Purchase, Brooklyn, NY
- Former Georgetown Heating Plant, HazMat and Phase I ESA, Washington D.C.
- 80-110 Flatbush Avenue, Brooklyn, NY
- 132 East 23rd Street, New York, NY
- 846 Sixth Avenue, New York, NY
- Greenpoint Landing, Remediation/Redevelopment, Brooklyn, NY
- 711 Eleventh Avenue, Due Diligence/Owner's Representative, New York, NY
- Brooklyn Bridge Park, Pier 1, Waste Characterization and Remediation, Brooklyn, NY
- Post-Hurricane Sandy Mold Remediation, Various Private Homes, Far Rockaway, NY
- Brooklyn Bridge Park, One John Street Development, Pre-Construction Due Diligence and Construction Administration, Brooklyn, NY
- 7 West 21st Street, Brownfields Remediation, New York, NY
- 546 West 44th Street, Brownfields Remediation, New York, NY
- Post-Hurricane Sandy Mold Remediation, Various Private Homes, Nassau and Suffolk Counties, Long Island, NY
- 55 West 17th Street, Brownfield Site Support, New York, NY
- Pratt Institute, 550 Myrtle Avenue Renovations, Environmental Remediation, Brooklyn, NY
- 42-02 Crescent Street Redevelopment, Phase I and II Environmental, Long Island City, NY
- IAC Building (555 West 18th Street), New York, NY
- Retirement Communities on100-acre Parcels in ME, NJ, MA, CT, and NJ
- 363-365 Bond Street/400 Carroll Street, Brooklyn, NY
- 160 East 22nd Street, New York, NY
- 110 Third Avenue, New York, NY
- Lycee Francais (East 76th Street & York Avenue), New York, NY
- Winchester Arms Munitions Factory, New Haven, CT

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

- 227-14 North Conduit Avenue, Industrial Wastewater Compliance, Jamaica, NY
- 420 Kent Avenue, NYS Brownfield Cleanup Program, Brooklyn, NY
- 572 Eleventh Avenue, NYC VCP, New York, NY
- Monian Site A, OER E-Designated Site, New York, NY
- 537 Sackett Street, Gowanus Canal Due Diligence/MGP Site, Brooklyn, NY
- ABC Blocks 25, 26 and 27, NYS Brownfield Cleanup Program Sites, Long Island City, NY
- 432 Rodney Street, NYS Brownfield Cleanup Program, Petroleum and Chlorinated Volatile Organic Compound Investigation and Remediation, Brooklyn, NY
- 787 Eleventh Avenue, NYS Brownfield Cleanup Program Site, New York, NY
- President Street at Gowanus Canal, NYS Brownfield Cleanup Program Site, Brooklyn, NY
- 22-36 Second Avenue at Gowanus Canal, NYS Brownfield Cleanup Program Site, Brooklyn, NY
- 563 Sacket Street, NYS Brownfield Cleanup Program Site, MGP Investigation, and Remediation, Brooklyn, NY
- 156-162 Perry Street, NYS Brownfield Cleanup Program Site, New York, NY
- Christopher and Weehawken Streets, NYS Brownfield Cleanup Program, New York, NY
- Phelps Dodge Block 2529 (Lots 40, 50, and 45), Inactive Hazardous Waste Disposal Site, Maspeth NY
- 42-50 24th Street, NYS Brownfield Cleanup Program Site, Long Island City, NY
- Storage Deluxe (163 6th Street), OER E-Designation Site, New York, 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

- Prospect Park Redevelopment, Landfill Reclamation, Prospect Park, NJ
- 431 Carroll Street, Gowanus Canal Due Diligence, Brooklyn, NY
- 76 4th Street Property, Gowanus Due Diligence, Brooklyn, NY
- Foxgate/MREC, Due Diligence and Solid Waste Compliance, Central Islip, NY
- 175-225 3rd Street at Gowanus Canal, NYS Brownfield Cleanup Program, Brooklyn, NY
- New York University Tandon School of Engineering, Spill Investigation/Remediation Dual Phase Recovery, and Laser Fluorescence Investigation, Brooklyn, NY
- 2420-2430 Amsterdam Avenue, NYS Brownfield Cleanup Program/Board of Standards and Appeals Variance, New York, NY
- 170 Amsterdam Avenue, NYC VCP, New York, NY
- 538-540 Hudson Street, NYS Brownfield Cleanup Program (Former Gas Station), New York, NY
- 234 Butler Street, Gowanus Canal Due Diligence, Brooklyn, NY
- 550 Clinton Street, NYS Brownfield Cleanup Program E-Designation, Brooklyn, NY
- 111 Leroy Street, OER E-Designation Site, New York, NY
- 335 Bond Street, NYS Brownfield Cleanup Program, New York, NY
- Gowanus Canal Northside, NYS BCP Former Fuel Oil Terminal, Brooklyn, NY
- Multiple Buildings, Major Oil Storage Facility, Gowanus Canal Location, Brooklyn, NY
- 197-205 Smith Street at Gowanus Canal, MGP Due Diligence, Brooklyn, NY
- 450 Union Street at Gowanus Canal, NYS Brownfield Cleanup Program, Brooklyn, NY
- 86 Fleet Place, NYC VCP E-Designation, Brooklyn, NY
- New York University College of Nursing at 433 1st Avenue, NYS BCP, Bronx, NY
- Retail Building at 225 3rd Street, Brooklyn, NY
- 29-37 41st Avenue, NYS Brownfield Cleanup Program, Long Island City, NY
- 43-01 22nd Street, NYS Brownfield Cleanup Program, Long Island City, NY
- Compliance Audit for NYU at Washington Square Park, New York, NY
- Former Watermark Locations, NYS Brownfield Cleanup Program, Chlorinated Volatile Organic Compound Investigation and Remediation; AS/SVE, Brooklyn, NY
- Former Gas Station (1525 Bedford Avenue), Brooklyn, NY
- NYS Brownfield Cleanup Program at 514 West 24th Street, New York, NY
- Gowanus Canal Due Diligence at 76 4th Street, Brooklyn, NY
- Urban Health Plan, Medical Building, NYS Brownfield Cleanup Program CVOC Investigation and Remediation, Bronx, NY
- 420 East 54th Street, NYS Spill Closure, New York, NY
- Equity Residential at 160 Riverside Boulevard, NYS Spill Closure, New York, NY
- 357-359 West Street and 156 Leroy Street, NYC VCP, New York, NY
- Emergency Spill Response at 322 West 57th Street, Investigation and Closure, New York, NY

- Hurricane Sandy, Emergency Response at 21 West Street, New York, NY
- Hurricane Sandy, Emergency Response at 71 Pine Street, New York, NY
- Greenpoint Landing, NYC E-Designation, Brooklyn, NY
- 23-01 42nd Road, NYS Brownfield Cleanup Program, Long Island City, NY
- Greenpoint Waterfront Development, NYS Brownfield Cleanup Program, Brooklyn, NY
- 125th Street and Lenox Avenue, NYC VCP, New York, NY
- Whitehead Realty Solvent Site, Inactive Hazardous Waste site, CVOC Investigation and Remediation, Brooklyn, NY
- SunCap Property Group Environmental On-Call Consulting, Various Locations, Nationwide
- Consolidated Edison Company of New York, Underground Storage Tank On-Call Contract, Five Boroughs of New York City, NY
- Consolidated Edison Company of New York, Appendix B Spill Sites On-Call Contract, Five Boroughs of New York City, NY
- Meeker Avenue Plume Trackdown Site, Brooklyn, NY
- Distribution Facility, Superfund Redevelopment, Long Island City, NY
- Edison Properties, West 17th Street Development Site (Former MGP Site), New York, NY
- Con Edison on Governors Island, Dielectric Fluid Spill, Investigation and Remediation, New York, NY
- 144-150 Barrow Street, NYS Brownfield Cleanup Program, 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
- NYCSCA, Proposed New York City School Construction Sites, Five Boroughs of New York City, NY
- Con Edison, East 60th Street Generating Station, New York, NY
- Residential Building at 82 Irving Place, Environmental Remediation, New York, NY
- 1113 York Avenue, Storage Tank Closures, New York, NY
- Peter Cooper Village/Stuyvesant Town, Phase I ESA, New York, NY
- Superior Ink, Waste Characterization and Remedial Action Plans, New York, NY
- Bronx Mental Health Redevelopment Project, Phase I ESA, Bronx, NY
- 2950 Atlantic Avenue, Site Characterization Investigation, Brooklyn, NY
- Con Edison, East 74th Street Generating Station, Sediment Investigation, New York, NY
- Con Edison, First Avenue Properties, New York, NY
- Queens West Development Corp. Stage II, Long Island City, NY
- Article X Project Environmental Reviews, Various New York State Electrical Generation Sites, NY
- Poletti Generating Station, Astoria, NY
- Arthur Kill Generating Station, Staten Island, NY

- Distribution Facility, Phase I & Phase II ESA and Regulatory Compliance, Bohemia, NY
- Huntington Station Superfund Due Diligence, Huntington Station, NY
- Garvies Point Bulkhead, Glen Cove, NY
- Johnson & Hoffman Metal Stamping Facility, Environmental Compliance, Carle Place, NY
- Floral Park Storage Facility, Phase I and Phase II ESA
- Garden City Phase I ESAs at two sites, including part of a Superfund Site, Garden City, NY
- Huntington Station Storage Facility, Phase I and II ESA, Huntington Station, NY
- Trevor Day School, NYS Spill Site Expert Testimony, New York, NY

SELECTED PUBLICATIONS, REPORTS, AND PRESENTATIONS

Burke, M., Ciambruschini, S., Nicholls, G., Tashji, A., Vaidya, S., "Redeveloping a Remediated MGP Site", MGP Symposium 2019, Atlantic City, NJ.

ALBERT G. TASHJI, PE, LEED GA

PROJECT ENGINEER

ENVIRONMENTAL ENGINEERING

Mr. Tashji is an engineer with experience working on environmental projects. He has consulting experience conducting New York State Brownfield Cleanup Program (BCP) applications, investigations and remediation; New York City Department of Environmental Protection (NYCDEP) E-designated site investigation and remediation; Phase I and II Environmental Site Assessments; Underground Storage Tank (UST) permitting, removal, closure, and reporting; and soil vapor intrusion investigations. He has supported project design needs including submembrane depressurization systems and remedial site-cover designs. His field experience includes: subsurface investigations; soil, groundwater, and air sampling programs; monitoring well installations; waste characterizations; and subcontractor oversight.

SELECTED PROJECTS

- West 17th Street Development, New York, NY
- 4 Washington Square Village, New York University, New York, NY
- 140 Sixth Avenue, New York, NY
- 1095 Southern Boulevard, Bronx, NY
- Brooklyn Cultural District: Apartments (BCD:A), Brooklyn, NY
- Yonkers H&I Site, Yonkers, NY
- Gotham West Development, New York, NY
- Hudson Yards Development, New York, NY
- 491 Wortman Avenue, Brooklyn, NY
- 627 Smith Street, Brooklyn, NY
- 177 Harrison Avenue Private School Development, Brooklyn, NY
- Hastings-on-Hudson Tank Pull, Westchester, NY
- River Side Park, West 42nd Street, New York, NY
- Pier 57, West 15th Street, New York, NY
- Governor's Island Transformer Vault, Governor's Island, NY
- Con Edison, 2950 Atlantic Avenue, Brooklyn, NY
- Brooklyn College, Brooklyn, NY
- Remsen Avenue, Brooklyn, NY
- New York University (NYU) Housing, New York, NY
- South Street, Elizabeth, NJ
- Abraham Joshua Heschel School, New York, NY

SELECTED PUBLICATIONS, REPORTS, AND PRESENTATIONS

Burke, M., Ciambruschini, S., Nicholls, G., Tashji, A., Vaidya, S., "Redeveloping a Remediated MGP Site", MGP Symposium 2019, Atlantic City, NJ.

EDUCATION

M.E., Environmental Engineering
Manhattan College

B.E., Environmental Engineering
Manhattan College

PROFESSIONAL REGISTRATION

Professional Engineer (PE) in NY

LEED Green Associate (GA)

40-Hour OSHA HAZWOPER

10-Hour OSHA

AFFILIATIONS

American Society of Civil Engineers (ASCE)

US Green Building Council (USGBC)

ATTACHMENT C

LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

ATTACHMENT C

LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	CAS Number	Analyte	RL	MDL	Units
Volatile Organic Compounds						
EPA 8260C/5035	Solids/Soil	630-20-6	1,1,1,2-Tetrachloroethane	1	0.318	ug/kg
EPA 8260C/5035	Solids/Soil	71-55-6	1,1,1-Trichloroethane	1	0.1108	ug/kg
EPA 8260C/5035	Solids/Soil	79-34-5	1,1,2,2-Tetrachloroethane	1	0.1008	ug/kg
EPA 8260C/5035	Solids/Soil	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethan	20	0.274	ug/kg
EPA 8260C/5035	Solids/Soil	79-00-5	1,1,2-Trichloroethane	1.5	0.304	ug/kg
EPA 8260C/5035	Solids/Soil	75-34-3	1,1-Dichloroethane	1.5	0.0856	ug/kg
EPA 8260C/5035	Solids/Soil	75-35-4	1,1-Dichloroethene	1	0.262	ug/kg
EPA 8260C/5035	Solids/Soil	563-58-6	1,1-Dichloropropene	5	0.1414	ug/kg
EPA 8260C/5035	Solids/Soil	87-61-6	1,2,3-Trichlorobenzene	5	0.1476	ug/kg
EPA 8260C/5035	Solids/Soil	96-18-4	1,2,3-Trichloropropane	10	0.1626	ug/kg
EPA 8260C/5035	Solids/Soil	95-93-2	1,2,4,5-Tetramethylbenzene	4	0.1302	ug/kg
EPA 8260C/5035	Solids/Soil	120-82-1	1,2,4-Trichlorobenzene	5	0.1818	ug/kg
EPA 8260C/5035	Solids/Soil	95-63-6	1,2,4-Trimethylbenzene	5	0.1414	ug/kg
EPA 8260C/5035	Solids/Soil	96-12-8	1,2-Dibromo-3-chloropropane	5	0.396	ug/kg
EPA 8260C/5035	Solids/Soil	106-93-4	1,2-Dibromoethane	4	0.1744	ug/kg
EPA 8260C/5035	Solids/Soil	95-50-1	1,2-Dichlorobenzene	5	0.1532	ug/kg
EPA 8260C/5035	Solids/Soil	107-06-2	1,2-Dichloroethane	1	0.1134	ug/kg
EPA 8260C/5035	Solids/Soil	78-87-5	1,2-Dichloropropane	3.5	0.228	ug/kg
EPA 8260C/5035	Solids/Soil	108-67-8	1,3,5-Trimethylbenzene	5	0.1434	ug/kg
EPA 8260C/5035	Solids/Soil	541-73-1	1,3-Dichlorobenzene	5	0.135	ug/kg
EPA 8260C/5035	Solids/Soil	142-28-9	1,3-Dichloropropane	5	0.1452	ug/kg
EPA 8260C/5035	Solids/Soil	542-75-6	1,3-Dichloropropene, Total	1	0.1176	ug/kg
EPA 8260C/5035	Solids/Soil	542-75-6	1,3-Dichloropropene, Total	1	0.1176	ug/kg
EPA 8260C/5035	Solids/Soil	106-46-7	1,4-Dichlorobenzene	5	0.1384	ug/kg
EPA 8260C/5035	Solids/Soil	105-05-5	1,4-Diethylbenzene	4	0.1598	ug/kg
EPA 8260C/5035	Solids/Soil	123-91-1	1,4-Dioxane	100	14.42	ug/kg
EPA 8260C/5035	Solids/Soil	594-20-7	2,2-Dichloropropane	5	0.226	ug/kg
EPA 8260C/5035	Solids/Soil	78-93-3	2-Butanone	10	0.272	ug/kg
EPA 8260C/5035	Solids/Soil	591-78-6	2-Hexanone	10	0.666	ug/kg
EPA 8260C/5035	Solids/Soil	622-96-8	4-Ethyltoluene	4	0.124	ug/kg
EPA 8260C/5035	Solids/Soil	108-10-1	4-Methyl-2-pentanone	10	0.244	ug/kg
EPA 8260C/5035	Solids/Soil	67-64-1	Acetone	10	1.036	ug/kg
EPA 8260C/5035	Solids/Soil	107-02-8	Acrolein	25	8.06	ug/kg
EPA 8260C/5035	Solids/Soil	107-13-1	Acrylonitrile	10	0.514	ug/kg
EPA 8260C/5035	Solids/Soil	71-43-2	Benzene	1	0.118	ug/kg
EPA 8260C/5035	Solids/Soil	108-86-1	Bromobenzene	5	0.208	ug/kg
EPA 8260C/5035	Solids/Soil	74-97-5	Bromochloromethane	5	0.276	ug/kg
EPA 8260C/5035	Solids/Soil	75-27-4	Bromodichloromethane	1	0.1732	ug/kg
EPA 8260C/5035	Solids/Soil	75-25-2	Bromoform	4	0.236	ug/kg
EPA 8260C/5035	Solids/Soil	74-83-9	Bromomethane	2	0.338	ug/kg
EPA 8260C/5035	Solids/Soil	75-15-0	Carbon disulfide	10	1.102	ug/kg
EPA 8260C/5035	Solids/Soil	56-23-5	Carbon tetrachloride	1	0.21	ug/kg
EPA 8260C/5035	Solids/Soil	108-90-7	Chlorobenzene	1	0.348	ug/kg
EPA 8260C/5035	Solids/Soil	75-00-3	Chloroethane	2	0.316	ug/kg
EPA 8260C/5035	Solids/Soil	67-66-3	Chloroform	1.5	0.37	ug/kg
EPA 8260C/5035	Solids/Soil	74-87-3	Chloromethane	5	0.294	ug/kg
EPA 8260C/5035	Solids/Soil	156-59-2	cis-1,2-Dichloroethene	1	0.1428	ug/kg
EPA 8260C/5035	Solids/Soil	10061-01-5	cis-1,3-Dichloropropene	1	0.1176	ug/kg
EPA 8260C/5035	Solids/Soil	110-82-7	Cyclohexane	20	0.146	ug/kg
EPA 8260C/5035	Solids/Soil	124-48-1	Dibromochloromethane	1	0.1536	ug/kg
EPA 8260C/5035	Solids/Soil	74-95-3	Dibromomethane	10	0.1636	ug/kg
EPA 8260C/5035	Solids/Soil	75-71-8	Dichlorodifluoromethane	10	0.1908	ug/kg
EPA 8260C/5035	Solids/Soil	60-29-7	Ethyl ether	5	0.26	ug/kg
EPA 8260C/5035	Solids/Soil	100-41-4	Ethylbenzene	1	0.1274	ug/kg
EPA 8260C/5035	Solids/Soil	87-68-3	Hexachlorobutadiene	5	0.228	ug/kg
EPA 8260C/5035	Solids/Soil	98-82-8	Isopropylbenzene	1	0.1038	ug/kg
EPA 8260C/5035	Solids/Soil	79-20-9	Methyl Acetate	20	0.27	ug/kg
EPA 8260C/5035	Solids/Soil	108-87-2	Methyl cyclohexane	4	0.1546	ug/kg
EPA 8260C/5035	Solids/Soil	1634-04-4	Methyl tert butyl ether	2	0.0844	ug/kg
EPA 8260C/5035	Solids/Soil	75-09-2	Methylene chloride	10	1.104	ug/kg
EPA 8260C/5035	Solids/Soil	91-20-3	Naphthalene	5	0.1384	ug/kg
EPA 8260C/5035	Solids/Soil	104-51-8	n-Butylbenzene	1	0.1148	ug/kg
EPA 8260C/5035	Solids/Soil	103-65-1	n-Propylbenzene	1	0.1092	ug/kg
EPA 8260C/5035	Solids/Soil	95-49-8	o-Chlorotoluene	5	0.1598	ug/kg
EPA 8260C/5035	Solids/Soil	95-47-6	o-Xylene	2	0.1718	ug/kg
EPA 8260C/5035	Solids/Soil	179601-23-1	p/m-Xylene	2	0.1978	ug/kg
EPA 8260C/5035	Solids/Soil	106-43-4	p-Chlorotoluene	5	0.1328	ug/kg
EPA 8260C/5035	Solids/Soil	99-87-6	p-Isopropyltoluene	1	0.125	ug/kg
EPA 8260C/5035	Solids/Soil	135-98-8	sec-Butylbenzene	1	0.122	ug/kg
EPA 8260C/5035	Solids/Soil	100-42-5	Styrene	2	0.402	ug/kg
EPA 8260C/5035	Solids/Soil	75-65-0	tert-Butyl Alcohol	60	2.92	ug/kg
EPA 8260C/5035	Solids/Soil	98-06-6	tert-Butylbenzene	5	0.1354	ug/kg
EPA 8260C/5035	Solids/Soil	127-18-4	Tetrachloroethene	1	0.1402	ug/kg
EPA 8260C/5035	Solids/Soil	108-88-3	Toluene	1.5	0.1948	ug/kg
EPA 8260C/5035	Solids/Soil	156-60-5	trans-1,2-Dichloroethene	1.5	0.212	ug/kg
EPA 8260C/5035	Solids/Soil	10061-02-6	trans-1,3-Dichloropropene	1	0.1208	ug/kg
EPA 8260C/5035	Solids/Soil	110-57-6	trans-1,4-Dichloro-2-butene	5	0.392	ug/kg
EPA 8260C/5035	Solids/Soil	79-01-6	Trichloroethene	1	0.125	ug/kg
EPA 8260C/5035	Solids/Soil	75-69-4	Trichlorofluoromethane	5	0.388	ug/kg
EPA 8260C/5035	Solids/Soil	108-05-4	Vinyl acetate	10	0.1322	ug/kg
EPA 8260C/5035	Solids/Soil	75-01-4	Vinyl chloride	2	0.1174	ug/kg
EPA 8260C/5035	Solids/Soil	1330-20-7	Xylene (Total)	2	0.1718	ug/kg

ATTACHMENT C

LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	CAS Number	Analyte	RL	MDL	Units
Semivolatile Organic Compounds						
EPA 8270D	Solids/Soil	95-94-3	1,2,4,5-Tetrachlorobenzene	167	17.4348	ug/kg
EPA 8270D	Solids/Soil	120-82-1	1,2,4-Trichlorobenzene	167	19.1048	ug/kg
EPA 8270D	Solids/Soil	95-50-1	1,2-Dichlorobenzene	167	29.9932	ug/kg
EPA 8270D	Solids/Soil	541-73-1	1,3-Dichlorobenzene	167	28.724	ug/kg
EPA 8270D	Solids/Soil	106-46-7	1,4-Dichlorobenzene	167	29.1582	ug/kg
EPA 8270D	Solids/Soil	58-90-2	2,3,4,6-Tetrachlorophenol	167	33.734	ug/kg
EPA 8270D	Solids/Soil	95-95-4	2,4,5-Trichlorophenol	167	31.9972	ug/kg
EPA 8270D	Solids/Soil	88-06-2	2,4,6-Trichlorophenol	100.2	31.6632	ug/kg
EPA 8270D	Solids/Soil	120-83-2	2,4-Dichlorophenol	150.3	26.8536	ug/kg
EPA 8270D	Solids/Soil	105-67-9	2,4-Dimethylphenol	167	55.11	ug/kg
EPA 8270D	Solids/Soil	51-28-5	2,4-Dinitrophenol	801.6	77.822	ug/kg
EPA 8270D	Solids/Soil	121-14-2	2,4-Dinitrotoluene	167	33.4	ug/kg
EPA 8270D	Solids/Soil	606-20-2	2,6-Dinitrotoluene	167	28.6572	ug/kg
EPA 8270D	Solids/Soil	91-58-7	2-Chloronaphthalene	167	16.5664	ug/kg
EPA 8270D	Solids/Soil	95-57-8	2-Chlorophenol	167	19.7394	ug/kg
EPA 8270D	Solids/Soil	91-57-6	2-Methylnaphthalene	200.4	20.1736	ug/kg
EPA 8270D	Solids/Soil	95-48-7	2-Methylphenol	167	25.885	ug/kg
EPA 8270D	Solids/Soil	88-74-4	2-Nitroaniline	167	32.1976	ug/kg
EPA 8270D	Solids/Soil	88-75-5	2-Nitrophenol	360.72	62.792	ug/kg
EPA 8270D	Solids/Soil	91-94-1	3,3'-Dichlorobenzidine	167	44.422	ug/kg
EPA 8270D	Solids/Soil	106-44-5	3-Methylphenol/4-Methylphenol	240.48	26.1522	ug/kg
EPA 8270D	Solids/Soil	99-09-2	3-Nitroaniline	167	31.4962	ug/kg
EPA 8270D	Solids/Soil	534-52-1	4,6-Dinitro-o-cresol	434.2	80.16	ug/kg
EPA 8270D	Solids/Soil	101-55-3	4-Bromophenyl phenyl ether	167	25.4842	ug/kg
EPA 8270D	Solids/Soil	106-47-8	4-Chloroaniline	167	30.394	ug/kg
EPA 8270D	Solids/Soil	7005-72-3	4-Chlorophenyl phenyl ether	167	17.869	ug/kg
EPA 8270D	Solids/Soil	100-01-6	4-Nitroaniline	167	69.138	ug/kg
EPA 8270D	Solids/Soil	100-02-7	4-Nitrophenol	233.8	68.136	ug/kg
EPA 8270D	Solids/Soil	83-32-9	Acenaphthene	133.6	17.3012	ug/kg
EPA 8270D	Solids/Soil	208-96-8	Acenaphthylene	133.6	25.7848	ug/kg
EPA 8270D	Solids/Soil	98-86-2	Acetophenone	167	20.6746	ug/kg
EPA 8270D	Solids/Soil	120-12-7	Anthracene	100.2	32.565	ug/kg
EPA 8270D	Solids/Soil	1912-24-9	Atrazine	133.6	58.45	ug/kg
EPA 8270D	Solids/Soil	122-66-7	Azobenzene	167	16.032	ug/kg
EPA 8270D	Solids/Soil	100-52-7	Benzaldehyde	220.44	45.09	ug/kg
EPA 8270D	Solids/Soil	92-87-5	Benzidine	551.1	181.028	ug/kg
EPA 8270D	Solids/Soil	56-55-3	Benzo(a)anthracene	100.2	18.8042	ug/kg
EPA 8270D	Solids/Soil	50-32-8	Benzo(a)pyrene	133.6	40.748	ug/kg
EPA 8270D	Solids/Soil	205-99-2	Benzo(b)fluoranthene	100.2	28.1228	ug/kg
EPA 8270D	Solids/Soil	191-24-2	Benzo(ghi)perylene	133.6	19.6392	ug/kg
EPA 8270D	Solids/Soil	207-08-9	Benzo(k)fluoranthene	100.2	26.72	ug/kg
EPA 8270D	Solids/Soil	65-85-0	Benzoic Acid	541.08	169.004	ug/kg
EPA 8270D	Solids/Soil	100-51-6	Benzyl Alcohol	167	51.102	ug/kg
EPA 8270D	Solids/Soil	92-52-4	Biphenyl	380.76	38.744	ug/kg
EPA 8270D	Solids/Soil	111-91-1	Bis(2-chloroethoxy)methane	180.36	16.7334	ug/kg
EPA 8270D	Solids/Soil	111-44-4	Bis(2-chloroethyl)ether	150.3	22.6452	ug/kg
EPA 8270D	Solids/Soil	108-60-1	Bis(2-chloroisopropyl)ether	200.4	28.5236	ug/kg
EPA 8270D	Solids/Soil	117-81-7	Bis(2-Ethylhexyl)phthalate	167	57.782	ug/kg
EPA 8270D	Solids/Soil	85-68-7	Butyl benzyl phthalate	167	42.084	ug/kg
EPA 8270D	Solids/Soil	105-60-2	Caprolactam	167	50.768	ug/kg
EPA 8270D	Solids/Soil	86-74-8	Carbazole	167	16.2324	ug/kg
EPA 8270D	Solids/Soil	218-01-9	Chrysene	100.2	17.368	ug/kg
EPA 8270D	Solids/Soil	53-70-3	Dibenzo(a,h)anthracene	100.2	19.3052	ug/kg
EPA 8270D	Solids/Soil	132-64-9	Dibenzofuran	167	15.7982	ug/kg
EPA 8270D	Solids/Soil	84-66-2	Diethyl phthalate	167	15.4642	ug/kg
EPA 8270D	Solids/Soil	131-11-3	Dimethyl phthalate	167	35.07	ug/kg
EPA 8270D	Solids/Soil	84-74-2	Di-n-butylphthalate	167	31.6632	ug/kg
EPA 8270D	Solids/Soil	117-84-0	Di-n-octylphthalate	167	56.78	ug/kg
EPA 8270D	Solids/Soil	206-44-0	Fluoranthene	100.2	19.1716	ug/kg
EPA 8270D	Solids/Soil	86-73-7	Fluorene	167	16.2324	ug/kg
EPA 8270D	Solids/Soil	118-74-1	Hexachlorobenzene	100.2	18.704	ug/kg
EPA 8270D	Solids/Soil	87-68-3	Hexachlorobutadiene	167	24.4488	ug/kg
EPA 8270D	Solids/Soil	77-47-4	Hexachlorocyclopentadiene	477.62	151.302	ug/kg
EPA 8270D	Solids/Soil	67-72-1	Hexachloroethane	133.6	27.0206	ug/kg
EPA 8270D	Solids/Soil	193-39-5	Indeno(1,2,3-cd)Pyrene	133.6	23.2798	ug/kg
EPA 8270D	Solids/Soil	78-59-1	Isophorone	150.3	21.6766	ug/kg
EPA 8270D	Solids/Soil	91-20-3	Naphthalene	167	20.3406	ug/kg
EPA 8270D	Solids/Soil	98-95-3	Nitrobenzene	150.3	24.716	ug/kg
EPA 8270D	Solids/Soil	86-30-6	NitrosoDiPhenylAmine(NDPA)/DPA	133.6	19.0046	ug/kg
EPA 8270D	Solids/Soil	62-75-9	n-Nitrosodimethylamine	334	32.064	ug/kg
EPA 8270D	Solids/Soil	621-64-7	n-Nitrosodi-n-propylamine	167	25.7848	ug/kg
EPA 8270D	Solids/Soil	59-50-7	P-Chloro-M-Cresol	167	24.883	ug/kg
EPA 8270D	Solids/Soil	87-86-5	Pentachlorophenol	133.6	36.74	ug/kg
EPA 8270D	Solids/Soil	85-01-8	Phenanthrene	100.2	20.3072	ug/kg
EPA 8270D	Solids/Soil	108-95-2	Phenol	167	25.217	ug/kg
EPA 8270D	Solids/Soil	129-00-0	Pyrene	100.2	16.5998	ug/kg

ATTACHMENT C

LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	CAS Number	Analyte	RL	MDL	Units
Total Metals						
EPA 6010C	Solids/Soil	7429-90-5	Aluminum, Total	4	1.08	mg/kg
EPA 6010C	Solids/Soil	7440-36-0	Antimony, Total	2	0.152	mg/kg
EPA 6010C	Solids/Soil	7440-38-2	Arsenic, Total	0.4	0.0832	mg/kg
EPA 6010C	Solids/Soil	7440-39-3	Barium, Total	0.4	0.0696	mg/kg
EPA 6010C	Solids/Soil	7440-41-7	Beryllium, Total	0.2	0.0132	mg/kg
EPA 6010C	Solids/Soil	7440-43-9	Cadmium, Total	0.4	0.0392	mg/kg
EPA 6010C	Solids/Soil	7440-70-2	Calcium, Total	4	1.4	mg/kg
EPA 7196A	Solids/Soil	18540-29-9	Chromium, Hexavalent	0.8	0.16	mg/kg
EPA 6010C	Solids/Soil	7440-47-3	Chromium, Total	0.4	0.0384	mg/kg
EPA 6010C	Solids/Soil	7440-48-4	Cobalt, Total	0.8	0.0664	mg/kg
EPA 6010C	Solids/Soil	7440-50-8	Copper, Total	0.4	0.1032	mg/kg
EPA 9010C/9012A	Solids/Soil	57-12-5	Cyanide, Total	1	0.166	mg/kg
EPA 6010C	Solids/Soil	7439-89-6	Iron, Total	2	0.3612	mg/kg
EPA 6010C	Solids/Soil	7439-92-1	Lead, Total	2	0.1072	mg/kg
EPA 6010C	Solids/Soil	7439-95-4	Magnesium, Total	4	0.616	mg/kg
EPA 6010C	Solids/Soil	7439-96-5	Manganese, Total	0.4	0.0636	mg/kg
EPA 7471B	Solids/Soil	7439-97-6	Mercury, Total	0.08	0.016896	mg/kg
EPA 6010C	Solids/Soil	7440-02-0	Nickel, Total	1	0.0968	mg/kg
EPA 6010C	Solids/Soil	7440-09-7	Potassium, Total	100	5.76	mg/kg
EPA 6010C	Solids/Soil	7782-49-2	Selenium, Total	0.8	0.1032	mg/kg
EPA 6010C	Solids/Soil	7440-22-4	Silver, Total	0.4	0.1132	mg/kg
EPA 6010C	Solids/Soil	7440-23-5	Sodium, Total	80	1.26	mg/kg
EPA 6010C	Solids/Soil	7440-28-0	Thallium, Total	0.8	0.126	mg/kg
EPA 6010C	Solids/Soil	7440-62-2	Vanadium, Total	0.4	0.0812	mg/kg
EPA 6010C	Solids/Soil	7440-66-6	Zinc, Total	2	0.1172	mg/kg
Polychlorinated Biphenyls						
EPA 8082A	Solids/Soil	12674-11-2	Aroclor 1016	33.5	2.6465	ug/kg
EPA 8082A	Solids/Soil	11104-28-2	Aroclor 1221	33.5	3.0887	ug/kg
EPA 8082A	Solids/Soil	11141-16-5	Aroclor 1232	33.5	3.9262	ug/kg
EPA 8082A	Solids/Soil	53469-21-9	Aroclor 1242	33.5	4.1004	ug/kg
EPA 8082A	Solids/Soil	12672-29-6	Aroclor 1248	33.5	2.8274	ug/kg
EPA 8082A	Solids/Soil	11097-69-1	Aroclor 1254	33.5	2.7537	ug/kg
EPA 8082A	Solids/Soil	11096-82-5	Aroclor 1260	33.5	2.5527	ug/kg
EPA 8082A	Solids/Soil	37324-23-5	Aroclor 1262	33.5	1.6616	ug/kg
EPA 8082A	Solids/Soil	11100-14-4	Aroclor 1268	33.5	4.8575	ug/kg
EPA 8082A	Solids/Soil	1336-36-3	PCBs, Total	33.5	1.6616	ug/kg
Pesticides						
EPA 8081B	Solids/Soil	72-54-8	4,4'-DDD	0.007992	0.00285	mg/kg
EPA 8081B	Solids/Soil	72-55-9	4,4'-DDE	0.007992	0.001848	mg/kg
EPA 8081B	Solids/Soil	50-29-3	4,4'-DDT	0.014985	0.006427	mg/kg
EPA 8081B	Solids/Soil	309-00-2	Aldrin	0.007992	0.002814	mg/kg
EPA 8081B	Solids/Soil	319-84-6	Alpha-BHC	0.00333	0.000946	mg/kg
EPA 8081B	Solids/Soil	319-85-7	Beta-BHC	0.007992	0.00303	mg/kg
EPA 8081B	Solids/Soil	57-74-9	Chlordane	0.064935	0.026474	mg/kg
EPA 8081B	Solids/Soil	5103-71-9	cis-Chlordane	0.00999	0.002784	mg/kg
EPA 8081B	Solids/Soil	319-86-8	Delta-BHC	0.007992	0.001565	mg/kg
EPA 8081B	Solids/Soil	60-57-1	Dieldrin	0.004995	0.002498	mg/kg
EPA 8081B	Solids/Soil	959-98-8	Endosulfan I	0.007992	0.001888	mg/kg
EPA 8081B	Solids/Soil	33213-65-9	Endosulfan II	0.007992	0.002671	mg/kg
EPA 8081B	Solids/Soil	1031-07-8	Endosulfan sulfate	0.00333	0.001522	mg/kg
EPA 8081B	Solids/Soil	72-20-8	Endrin	0.00333	0.001365	mg/kg
EPA 8081B	Solids/Soil	7421-93-4	Endrin aldehyde	0.00999	0.003497	mg/kg
EPA 8081B	Solids/Soil	53494-70-5	Endrin ketone	0.007992	0.002058	mg/kg
EPA 8081B	Solids/Soil	76-44-8	Heptachlor	0.003996	0.001792	mg/kg
EPA 8081B	Solids/Soil	1024-57-3	Heptachlor epoxide	0.014985	0.004496	mg/kg
EPA 8081B	Solids/Soil	58-89-9	Lindane	0.00333	0.001489	mg/kg
EPA 8081B	Solids/Soil	72-43-5	Methoxychlor	0.014985	0.004662	mg/kg
EPA 8081B	Solids/Soil	8001-35-2	Toxaphene	0.14985	0.041958	mg/kg
EPA 8081B	Solids/Soil	5103-74-2	trans-Chlordane	0.00999	0.002637	mg/kg
Herbicides						
EPA 8151A	Solids/Soil	94-75-7	2,4-D	166.5	10.4895	ug/kg
EPA 8151A	Solids/Soil	93-76-5	2,4,5-T	166.5	5.1615	ug/kg
EPA 8151A	Solids/Soil	93-72-1	2,4,5-TP (Silvex)	166.5	4.4289	ug/kg

ATTACHMENT D

ANALYTICAL METHODS/QUALITY ASSURANCE SUMMARY TABLE

ATTACHMENT D

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	Ambient Air Samples	MS/MSD Samples
Soil	Total VOCs via PID	Part 375 + TCL VOCs + 10 TICs	EPA 8260C	Cool to 4°C	Two 40-ml VOC vials with 5ml H_2O, one with MeOH or 3 Encore Samplers (separate container for % solids)	14 days	1 per 20 samples (minimum 1)	1 per 20 samples (minimum 1)	1 per shipment of VOC samples	NA	1 per 20 samples
		Part 375 + TCL SVOCs + 20 TICs	EPA 8270D	Cool to 4°C	4 oz. amber glass jar	14 days extract, 40 days after extraction to analysis					
		Part 375 + TAL Metals	EPA 6010C, EPA 7470A, EPA 7196A, EPA 9014/9010C	Cool to 4°C	2 oz. amber glass jar	6 months, except mercury 28 days					
		Part 375 + TCL Pesticides	EPA 8081B	Cool to 4°C	4 oz. amber glass jar	14 days extract, 40 days after extraction to analysis					
		Part 375 + TCL Herbicides	EPA 8151A	Cool to 4°C	4 oz. amber glass jar	14 days extract					
		Part 375 + TCL PCBs	EPA 8082A	Cool to 4°C	4 oz. amber glass jar	14 days extract, 40 days after extraction to analysis					
		Grain Size	ASTM SM2540G	N/A	Quart Ziplock Bag	N/A	N/A	N/A	N/A	N/A	N/A
		Total Organic Carbon	EPA 9060, Lloyd Kahn (LK) Method	Cool to 4°C	4 oz. glass jar	28 days (EPA 9060); 14 days (LK)	N/A	N/A	N/A	N/A	N/A
		Sulfate (SO_4^{3-})	EPA 9038	Cool to 4°C	4 oz. glass jar	28 days to extract	N/A	N/A	N/A	N/A	N/A
		Nitrate (NO_3^{1-})	$SM4500NO_3$-F	Cool to 4°C	4 oz. amber glass jar	28 days	N/A	N/A	N/A	N/A	N/A
Product	N/A	Petrleum Hydrocarbon Identification (PHI)	EPA 8015D	Cool to 4°C	4 oz. amber glass jar	14 days extract, 40 days after extraction to analysis	N/A	N/A	N/A	N/A	N/A

Notes:
1. PID - Photoionization Detector
2. VOC - Volatile organic compound
3. PCB - Polychlorinated Biphenyl
4. EPA - Environmental Protection Agency
5. TCL - Target compound list
6. TAL - Target analyte list

ATTACHMENT E

SAMPLE NOMENCLATURE

SOP #01 – Sample Nomenclature

INTRODUCTION

The Langan Environmental Group conducts an assortment of site investigations where samples (Vapor, Solids, and Aqueous) are collected and submitted to analytical laboratories for analysis. The results of which are then evaluated and entered into a data base allowing quick submittal to the state regulatory authority (New York State Division of Environmental Conservation [NYSDEC]). In addition, Langan is linking their data management system to graphic and analytical software to enable efficient evaluation of the data as well as creating client-ready presentational material.

SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) is applicable to the general framework for labeling vapor, solid (soil) and aqueous (groundwater) samples that will be submitted for laboratory analysis. The nomenclature being introduced is designed to meet the NYSDEC EQuIS standard and has been incorporated into Langan software scripts to assist project personnel in processing the data. While this SOP is applicable to all site investigation; unanticipated conditions may arise which may require considerable flexibility in complying with this SOP. Therefore, guidance provided in this SOP is presented in terms of general steps and strategies that should be applied; but deviation from this SOP must be reported to the Project Manager (PM) immediately.

GENERAL SAMPLE IDENTIFICATION CONSIDERATIONS

Sample Labels

All sample ware must have a label. Recall that when you are using the Encore™ samples (see below); they are delivered in plastic lined foil bags. You are to label the bags[1]:

All other samples containers including Terra Cores™ must be labeled with laboratory provided self-adhesive labels.

Quick Breakdown of Sample Format

The general format for sample nomenclature is:

[1]Both Alpha and York laboratories permit the combining of the three Encore™ into a single bag. This may not be appropriate for all laboratories so please confirm with the labs themselves

LLNN_ID

Where

LL is a grouping of two (2) to four (4) letters signifying the sample media source. In older nomenclature SOPs this portion of the sample identification is commonly referred to as the *Sample Investigation Code*

NN represents a two digit number identifying the specific sample location or sample sequence number

_ ***(underscore)*** is required between the sample lettering and numeric identification and additional modifying data that determines the date of sampling or the depth of the sample interval

ID is a modifier specific to the sample type media (depth of soil sample or date of groundwater sample)

LL – Sample Investigation Code

Langan has devised a list of two to four letters to insure a quick ability to identify the sample investigation.

Code	Investigation
AA	Ambient Air
DS	Drum
EPB	Endpoint Location - Bottom (Excavation)
EPSW	Endpoint Location - Sidewall (Excavation)
FP	Free Product
IA	Indoor Air
IDW	Investigation Derived Waste (Soil Pile)
MW	Monitoring Well (Permanent)
SB	Soil Boring
SG	Staff Gauge (Stream Gauging)
SL	Sludge
SV	Soil Vapor Point
SVE	Soil Vapor Extraction Well
SW	Surface Water
TMW	Temporary Monitoring Well
TP	Test Pit (Excavated Material from Test Pit Not Associated With Sidewall or Bottom Samples)
WC	Waste Characterization Boring
COMP	Composite Sample
TB	Trip Blank (QA/QC Sampling – All Investigations)
FB	Field Blank (QA/QC Sampling – All Investigations)
DUP	Duplicate (QA/QC Sampling – All Investigations)

NN – Numeric Identifier

The two digit number that follows the sample investigation code (LL) identifies the specific sample based on the soil boring, monitoring well, endpoint or other location identification. For a subset of samples

where there is no specific location identifier, the two digit number is the sequence number for the sample submitted. For example, an aqueous sample from a monitoring well identified as MW-1 would have the sample investigation code of MW and the numeric identifier as 01. Note there is no hyphen. The same can be done for soil borings, a soil sample collected from soil boring 9 (SB-9) would be have the LLNN identification of SB09 (again, no hyphen).

Note however that there is a subset of samples related to laboratory analytical quality assurance, among these includes TB, FB, and DUP. On many investigations, the Scope will require multiple collections of these types of samples, therefore the numerical number represents the sequence sample count where the first sample is 01, the second sample is 02, and the third sample is 03 and so on.

_ Underscore
The underscore is required. It separates the investigation code and numeric identifier from the modifier specific to the sample itself. Note that every effort should be made to insure that the underscore is clear on the sample label and chain of custody (COC).

ID – Modifier Specific to Type Media
Each sample investigation code and numeric identifier is further modified by an ID specific to the sample type media. In general, soil samples (soil borings or endpoint samples) use an ID that indicates the depth at which the sample was taken. Aqueous samples (groundwater or surface water samples) are identified by the date the sample was collected. Other types of samples including quality control (TB, FB, and DUP), Vapor samples (AA, IA, SV or SVE), other soil type samples (IDW, sludge, free product, drum, and others) are also identified by a date. The following rules apply to the ID when using sample depth or sample date.

Sample Depth
The sample depth must be whole numbers (no fractions) separated by a hyphen. Thus for a soil sample collected from the soil boring SB-1 from a depth of 6 feet to 8 feet, the sample would be identified as:

SB01_6-8

Unfortunately, the NYSDEC EQuIS system does not accept fractions. Therefore, if your sample interval is a fraction of a foot (6.5-7.5), round up to the larger interval (6-8).

Sample Date
The sample date is always in the format of MMDDYY. Note that the year is two digits. Thus for a groundwater sample collected on July 1, 2015 from the monitoring well MW-1, the sample would be identified as:

MW01_070115

Special Cases
There are a couple of specific sample types that require further explanation.

Endpoint Sampling
End point sidewall samples are sometimes modified by magnetic direction (N, S, E, and W). For example, the first sidewall endpoint sample from the north wall of an excavation at a depth of 5 feet would be written as:

EPSW01_N_5

Again, note that the N in the identification refers to north and is separated from the prefix investigation code/numeric identifier and ID modifier suffix by underscores.

Vapor Extraction Well Sample
As with the sidewall endpoint samples, the sample name is altered by inserting a middle modifier between the prefix and suffix of the sample name. The middle modifier is used to identify the source of the sample (inlet sample port, midpoint sample port or outlet sample port). For example the midpoint port of the vapor extraction well number 1 sampled on July 1, 2015 would be written as;

SVE01_MID_070115

Matrix Spike and Matrix Spike Duplicate
On occasion, a Langan investigation will collect a sample to be used to provide the lab with a site specific medium to spike to determine the quality of the analytical method. This special case of sampling requires additional information to be used in the sample name, specifically, a suffix specifying whether the sample is the matrix spike (MS) or the matrix spike duplicate (MSD). In the following example, the sample is collected from soil boring number 1 at a depth of 2-4 feet. For the matrix spike sample:

SB01_2-4_MS

and for the matrix spike duplicate sample:

SB01_2-4_MSD

Multiple Interval Groundwater Sampling
Although not currently a common practice, low flow sampling facilitates stratigraphic sampling of a monitoring well. If the scope requires stratigraphic sampling then groundwater samples will be labeled with a lower case letter following the well number. For example, placing the pump or sampling tube at 10 feet below surface in MW01 on July 1, 2015 would require the sample to be labeled as:

MW01a_070115

While a second sample where the pump or tubing intake is placed at 20 feet would be labeled as:

MW01b_070115

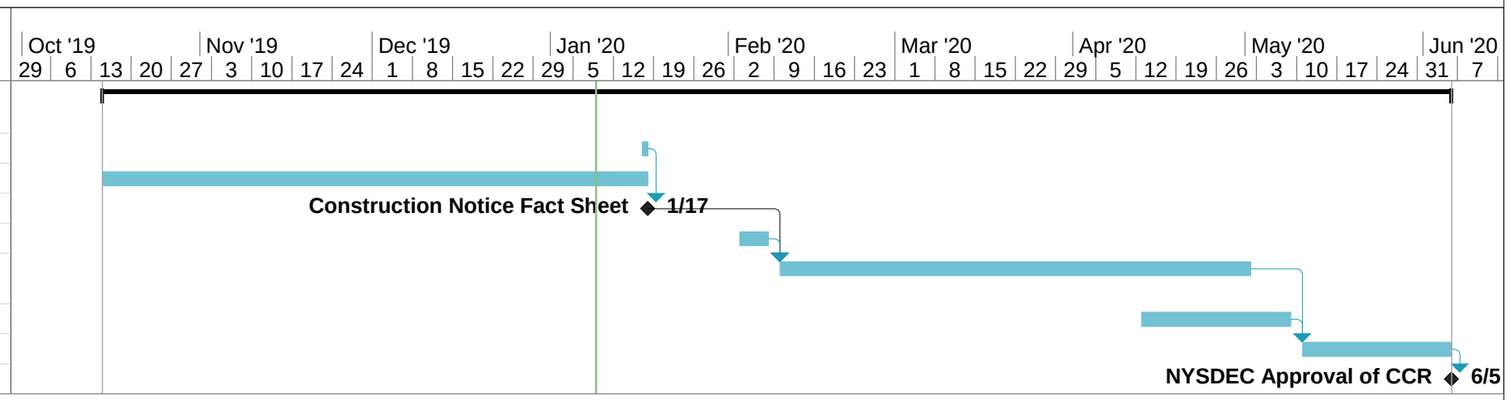
Note that it is important that you record what depth the intake for each sample represents in your field notes; as this information is going to be critical to interpreting the results.

APPENDIX D

IRM IMPLEMENTATION SCHEDULE

Interim Remedial Measures Schedule
450 Union Street, Brooklyn, NY 11231
NYSDEC BCP Site No. C224219
Langan Project No. 170301202

ID	Task Name	Duration	Start	Finish
1	**450 Union Street - Interim Remedial Measures**	**169 days**	**Tue 10/15/19**	**Fri 6/5/20**
2	IRMWP Approval	1 day	Fri 1/17/20	Fri 1/17/20
3	Contractor Biding, Award, and Permitting	13.8 wks	Tue 10/15/19	Fri 1/17/20
4	Construction Notice Fact Sheet	0 days	Fri 1/17/20	Fri 1/17/20
5	Contractor Mobilization	1 wk	Mon 2/3/20	Fri 2/7/20
6	Interim Remedial Measure Work Plan Implementation	3 mons	Mon 2/10/20	Fri 5/1/20
7	Construction Completion Report (CCR)	1 mon	Mon 4/13/20	Fri 5/8/20
8	NYSDEC Review of CCR	1 mon	Mon 5/11/20	Fri 6/5/20
9	NYSDEC Approval of CCR	0 days	Fri 6/5/20	Fri 6/5/20



Project: 450 Union Street
Date: Thu 1/9/20
NYSDEC BCP SIte No.: C22421

Task	Project Summary	Manual Task	Start-only	Deadline
Split	Inactive Task	Duration-only	Finish-only	Progress
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress
Summary	Inactive Summary	Manual Summary	External Milestone