SUPPLEMENTAL REMEDIAL INVESTIGATION WORK PLAN

for

514 UNION STREET Brooklyn, New York NYSDEC BCP Site No. C224318

Prepared for:

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CERTIFICATION

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

Hichael D. Brake

Michael D. Burke, PG, CHMM

1.0 INTRODUCTION

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan) prepared this Supplemental Remedial Investigation Work Plan (SRIWP) on behalf of Gowanus President Owner LLC (the Volunteer) for the site identified as 514 Union Street in the Gowanus neighborhood of Brooklyn, New York (the site). The site comprises two parcels, 514 Union Street and 305 Nevins Street. The Volunteer will implement the SRIWP for New York State Brownfield Cleanup Program (BCP) Site No. C224318 pursuant to the Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) executed on October 21, 2021. A BCA Amendment to add the Volunteer, Gowanus President Owner LLC, was executed on February 1, 2023, and a BCA Amendment to add the west-adjoining property, 305 Nevins Street, to the BCP site was executed on July 19, 2023.

A Remedial Investigation (RI) was conducted in September 2022, prior to the addition of 305 Nevins Street to the BCA, to investigate and characterize the nature and extent of environmental impacts and to provide sufficient information to evaluate remedial alternatives and threats to human health and the environment. A subsurface investigation was completed in June 2023 at 305 Nevins Street to collect preliminary subsurface analytical data to inform future remediation approaches. A supplemental remedial investigation (SRI) at 514 Union Street was conducted in October 2023 to supplement existing groundwater data to further characterize the nature and extent of chlorinated volatile organic compound (CVOC)-impacted groundwater at the site.

Three Interim Remedial Measures Work Plans (IRMWP) have been or, as of the date of this SRIWP, are being implemented:

- IRMWP No. 1 was implemented in September 2022 at the 514 Union Street parcel (Royal Palms Shuffleboard Club) to install a soil vapor intrusion (SVI) mitigation system, as documented in the NYSDEC-approved March 9, 2023 Construction Completion Report (CCR).
- IRMWP No. 2 to contain and stabilize a CVOC groundwater plume at 514 Union Street parcel is on-going. The injection program was completed in March 2023, as documented in the draft CCR No. 2 submitted to NYSDEC in June 2024. Post-remediation groundwater sampling is ongoing.
- IRMWP No. 3 is on-going at the 305 Nevins Street parcel to support in-situ groundwater remediation through installation of an air sparge, soil vapor extraction, vapor collection and submembrane depressurization system, to be documented in a forthcoming CCR No. 3.

A draft Remedial Investigation Report (RIR) was prepared and submitted to NYSDEC in January 2024. Following comments from NYSDEC, a revised draft RIR was submitted to NYSDEC in May 2024.

The objective of this SRIWP is to further investigate groundwater and soil data to delineate potential sources of on-site contaminants. This SRIWP was developed in accordance with the process and requirements of the BCP and the May 2010 Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10).

2.0 SITE BACKGROUND

2.1 Site Description

The site consists of two contiguous parcels: 514 Union Street (Block 440, Lot 12) and 305 Nevins Street (Block 440, Lot 9) on the block bound by Union Street to the north, 3rd Avenue to the east, President Street to the south, and Nevins Street to the west in the Gowanus neighborhood of Brooklyn, New York. The two parcels encompass about 19,400-square-foot (SF) and are improved with 17,000-SF one-story commercial building (514 Union Street) and a 2,400-SF two-story building (305 Nevins Street). 514 Union Street is occupied by the Royal Palms Shuffleboard Club and 305 Nevins Street is being renovated into a restaurant. A site location map is provided as Figure 1.

The south-adjoining parcel, 473 President Street, is in the NYSDEC BCP (BCP Site No. C224220). The east- and west-adjoining parcels, identified as President Street Portfolio, are also in the NYSDEC BCP (BCP Site No. C224309). Remedial Action Work Plan (RAWP) implementation at the C224220 and C224309 BCP sites is complete, including installation and commissioning of a remedial system consisting of air sparge, soil vapor extraction, vapor collection, and submembrane depressurization systems, which continue to operate to address CVOC impacts to groundwater and soil vapor. Surrounding properties include single- and multi-story buildings occupied by industrial, commercial, and residential occupants. The Gowanus Canal (a National Priorities List [NPL] site) is located about 280 feet west of the site. A site plan is provided as Figure 2.

According to New York City Planning Commission Zoning Map 16c, the site is in an M1-4/R6A and M1-4/R7A mixed manufacturing and residential district pursuant to Uniform Land Use Review Procedure (ULURP) and the Gowanus Neighborhood Rezoning (City Environmental Quality Review [CEQR] No. 19DCP157K). M1 districts typically include light industrial uses, such as woodworking shops, repair shops, and wholesale and storage facilities. Offices, hotels and most retail uses are also permitted in M1 districts.

2.2 Surrounding Property Land Use

The site is located in a mixed-use area with industrial, commercial, and residential buildings. The following is a summary of surrounding property uses:

| Direction | Adjoining Properties | Surrounding Properties |
|-----------|--|---|
| North | Union Street followed by multi-story residential buildings | Multi-story residential buildings, a coffee shop, vehicle repair shop, and various retail shops |
| East | Construction Site (NYSDEC BCP Site No.C224309) | Multi-story residential buildings, and a dog daycare facility |

| Direction | Adjoining Properties | Surrounding Properties | |
|-----------|---|-----------------------------------|--|
| South | Construction Site (NYSDEC BCP Site No.C224220) | Multi-story residential buildings | |
| \\/_a+ | Nevins Street followed by a construction site (NYSDEC BCP Site No. C224350) | Courague Const | |
| West | Construction Site (NYSDEC BCP Site No.C224309) | Gowanus Canal | |

Public infrastructure (storm drains, sewers, and underground utility lines) exists within the streets surrounding the site. A land use map showing the adjacent and surrounding properties is provided as Figure 3.

Land use within a half-mile radius includes residential, commercial, light industrial and institutional uses and park land. The nearest ecological receptor is the Gowanus Canal, which is located about 280 feet west of the site. Sensitive receptors, as defined in DER-10, located within a half-mile of the site include those listed below:

| Number | Name (Approximate distance from site) | Address |
|--------|---|--|
| 1 | Rivendell School (approximately 0.07 miles southeast) | 277 3 rd Avenue Brooklyn, NY 11215 |
| 2 | Thomas Greene Playground (approximately 0.11 miles northeast) | 225 Nevins Street, Brooklyn, NY 11217 |
| 3 | The Little Brooklyn Pre K Center (approximately 0.14 miles south) | 305-307 3 rd Avenue Brooklyn, NY 11215 |
| 4 | Our Lady of Peace D.C.C. (approximately 0.15 miles southeast) | 522 Carroll Street Brooklyn, NY 11215 |
| 5 | PS 372 The Children's School 512 Carroll Str (approximately 0.16 miles southeast) Brooklyn, NY 1 | |
| 6 | Bumble Bee Daycare (approximately 0.20 miles southeast) | 258 4 th Avenue Brooklyn, NY 11215 |
| 7 | Tiny Steps MB Daycare (approximately 0.20 miles southeast) | 256 4 th Avenue Brooklyn, NY 11215 |
| 9 | PS 32 Samuel Mills Sprole School (approximately 0.25 miles northwest) | 317 Hoyt Street Brooklyn, NY 11231 |
| 10 | Al-Madinah School (approximately 0.31 miles southeast) | 383 3 rd Avenue Brooklyn, NY 11215 |
| 11 | PS 133 William A. Butler (approximately 0.35 miles northeast) | 610 Baltic Street Brooklyn, NY 11217 |
| 12 | Kid's Care Daycare (approximately 0.35 miles northeast) | 281 1 st Street Brooklyn, NY 11215 |
| 13 | Sunflower Academy Child Care Center (approximately 0.36 miles southeast) | 238 5 th Avenue Brooklyn, NY 11215 |

| Number | Name (Approximate distance from site) | Address |
|--------|---|---|
| 14 | Metrokids Preschool | 382 Baltic Street |
| 14 | (approximately 0.37 miles northwest) | Brooklyn, NY 11201 |
| 16 | Kumon Math and Reading Center of Carroll Gardens | 337 Smith Street |
| 10 | (approximately 0.40 miles northwest) | Brooklyn, NY 11231 |
| 17 | Strong Place for Hope Day Care | 333 2 nd Street |
| ., | (approximately 0.40 miles southeast) | Brooklyn, NY 11215 |
| 18 | Regina's Daycare | 296 5 th Street |
| | (approximately 0.41 miles southeast) | Brooklyn, NY 11215 |
| 19 | Language Laughter Studio | 137 Nevins Street |
| | (approximately 0.42 miles northeast) | Brooklyn, NY 11217 |
| 20 | Hannah Senesh Community Day School | 342 Smith Street |
| | (approximately 0.42 miles west) | Brooklyn, NY 11231 |
| 21 | PS 58 The Carroll School | 330 Smith Street |
| | (approximately 0.43 miles northwest) | Brooklyn, NY 11231 |
| 22 | Cobble Hill School for American Studies | 347 Baltic Street Brooklyn, NY 11201 |
| | (approximately 0.44 miles northwest) | · · · · · · · · · · · · · · · · · · · |
| 23 | Ladybug Preschool | 413 Smith Street Brooklyn, NY 11231 |
| | (approximately 0.44 miles west) | 390 Butler Street |
| 24 | St. John's Kidz | |
| | (approximately 0.45 miles east) | Brooklyn, NY 11217 |
| 25 | Zusin Family Daycare | 323 3 rd Street |
| | (approximately 0.45 miles southeast) | Brooklyn, NY 11215 |
| 26 | Warren Street Center for Children and Families | 343 Warren Street |
| | (approximately 0.46 miles northwest) | Brooklyn, NY 11201 |
| 27 | Park Slope North Early Childhood Center | 71 Lincoln Place |
| | (approximately 0.47 miles east) | Brooklyn, NY 11217 |
| 29 | PS/MS 282 | 180 6 th Avenue |
| | (approximately 0.48 miles east) | Brooklyn, NY 11217 |
| | Holy Family - St. Thomas Aquinas Church | 249 9 th Street |
| 30 | (0.48 miles southeast) | Brooklyn, NY 11215 |
| | | |
| 31 | The Math and Science Exploratory School | 345 Dean Street |
| | (approximately 0.48 miles northeast) | Brooklyn, NY 11217 |
| 00 | Brooklyn High School of The Arts | 345 Dean Street |
| 32 | (approximately 0.48 miles northeast) | Brooklyn, NY 11217 |
| | Dublic Cabaal 20 | 450 Pacific Street |
| 33 | Public School 38 (approximately 0.48 miles northeast) | Brooklyn, NY 11217 |
| | (approximately 0.40 miles normeast) | |
| 34 | Open House Nursery School | 318 Warren Street |
| 34 | (approximately 0.50 miles northwest) | Brooklyn, NY 11201 |
| | Tiny Steps Daycare Center | 33 St Johns Place |
| 35 | (approximately 0.50 miles northeast) | Brooklyn, NY 11217 |
| Ì | (approximately 0.50 miles northeast) | DIOORIYII, INT 11217 |

2.3 Site Physical Conditions

2.3.1 Topography

According to the July 23, 2021 Architectural Survey by New York City Land Surveyors, PC, the Union Street sidewalk elevations (el) fronting the site range from about el 14¹ to el 10, sloping down from east to west. The topography of the surrounding area is generally flat, but gradually slopes down from east to west towards the Gowanus Canal.

2.3.2 Geology

According to the RI for 514 Union Street conducted by Langan from August 31 to September 12, 2022, subsurface investigation for 305 Nevins Street conducted by Langan from June 28 to 29, 2023, and soil sampling during the implementation of IRMWP No. 3 for 305 Nevins in August 2024, the site is underlain by fill, generally characterized as dark gray to brown, fine sand with varying amounts of gravel, silt, cobbles, concrete, coal fragments, coal ash, slag, glass, brick and organic fibers. Fill was observed below the concrete slab to depths ranging between 2 and 14 feet below grade surface (bgs). Fine-grained sand with varying amounts of silt and gravel was observed below the fill layer to the boring termination depths (10 to 56 feet bgs). Soil boring logs from the 305 Nevins IRMWP No. 3 are included as Attachment A of the October 22, 2024 IRMWP No. 3 Soil Sample Results Summary Report submitted to NYSDEC by Langan. Soil boring logs from investigations predating IRMWP No. 3 implementation are included in the May 1, 2024 revised draft RIR, submitted to NYSDEC by Langan.

Geological surface features (e.g., rock outcroppings) were not observed at the site. Soil and bedrock stratigraphy throughout Brooklyn typically consists of a layer of historic fill material that overlies glacial till, decomposed unconsolidated bedrock, and bedrock. United States Geological Survey (USGS) "Bedrock and Engineering Geologic Maps of New York County and Parts of Kings and Queens Counties, New York, and Parts of Bergen and Hudson Counties, New Jersey" indicate that bedrock underlying the site is part of the Hartland Formation. The Hartland Formation is comprised of mica schist and quartz-feldspar granulite, with localized intrusions of granite and pegmatite. According to previous environmental and geotechnical borings completed at the adjoining sites, the stratigraphy generally consists of fill underlain by brown sand with trace amounts of silt and gravel. Cobbles and boulders were encountered between about 40 and 90 feet bgs. Previous borings were advanced to a maximum depth of about 102 feet bgs. Bedrock was not encountered.

¹ Elevations herein are in feet and referenced to the North American Vertical Datum of 1988 (NAVD88).

2.3.3 Hydrogeology

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

Based on previous investigations, static groundwater elevation ranges from approximately 8.77 feet bgs on the Union Street sidewalk to 11.05 feet bgs in the southwestern part of the site. Typical groundwater flow direction is west-northwest toward the Gowanus Canal. Documented groundwater depth was about 1.5-2.5 feet below static groundwater levels during the September 2024 sampling event, coinciding with dewatering operations at the Fulton MGP.

Groundwater in New York City is not used as a potable water source.

2.3.4 Wetlands

Wetlands were evaluated by reviewing the National Wetlands Inventory and NYSDEC regulated wetlands map. There are no wetlands on the site. The nearest wetland is the Gowanus Canal, an estuarine and marine deepwater wetland, located about 280 feet west of the site.

2.4 Summary of Previous Environmental Investigations

Previous environmental investigations documented on-site impacts to soil, groundwater, and soil vapor.

An RI was conducted at 514 Union Street between August 31 and September 12, 2022 in accordance with the NYSDEC-approved July 28, 2022 Remedial Investigation Work Plan (RIWP) and NYSDEC-approved October 18, 2023 SRIWP. A subsurface investigation was conducted at 305 Nevins Street in June 2023. RI results are documented in the May 1, 2024 draft RIR and summarized below.

An SVI investigation was conducted at 305 Nevins Street on March 7, 2023, and a subsurface investigation was conducted at 305 Nevins Street between June 28 and 29, 2023. Investigation results are documented in the March 30, 2023 SVI Investigation Technical Memorandum, and August 21, 2023 Subsurface Investigation Report.

Soil sample analytical results collected during the September 2022 RI and October 2023 SRI at 514 Union Street and the June 2023 subsurface investigation at 305 Nevins Street are shown on Figure 4. Groundwater sample analytical results collected to date at the site, including quarterly groundwater data collected during the implementation of IRMWP No. 2 at 514 Union Street, and

the two adjoining BCP sites (473 President Street/BCP Site No. C224220 and President Street Portfolio/BCP Site No. C224309) are shown on Figures 5A and 5B.

Remedial Investigation and Supplemental Remedial Investigation Data, prepared by Langan

Trichloroethene (TCE) was detected in five shallow soil samples (0 to 2 feet bgs) advanced in the southern and eastern parts of the site, at concentrations above the Title 6 New York Codes, Rules, and Regulations (NYCRR) Part 375 Unrestricted Use (UU) Soil Cleanup Objectives (SCO) and TCE and/or cis-1,2-dichloroethene were detected at concentrations marginally above the UU SCO in two saturated soil samples.

A comprehensive groundwater sampling event was performed in January 2025. In the sample collected from MW08S screened at the shallow interval (between 6 and 16 feet bgs) in the southeastern part of the site, three CVOCs, including TCE (5,000 μ g/L), were detected at concentrations exceeding NYSDEC SGVs (5 μ g/L for TCE). In the collocated monitoring well MW08D screened in the intermediate interval (between 17 and 27 feet bgs), TCE was detected at 10 μ g/L. In intermediate groundwater wells MW05D and MW13D located downgradient of MW08S, TCE concentrations in groundwater were three orders of magnitude higher (20,000 μ g/L and 25,000 μ g/L). Further downgradient, in the three groundwater wells sampled in the northwestern part of the site which also have a deep-screened interval (between 30 and 50 feet bgs), TCE was detected at a maximum of concentration of 20,000 μ g/L in the shallow interval (MW16S), 23,000 μ g/L in the intermedial interval (MW18D), and 11 μ g/L (MW16DD) in the deep interval, indicating vertical delineation of TCE impacts.

2.5 Area of Concern

Based on site history and the findings of the previous studies, the area of concern (AOC) to be further investigated during the Supplemental RI is described below:

AOC 1: CVOC-Impacted Soil and Groundwater

CVOC-impacted soil, groundwater, and sub-slab vapor were identified during previous subsurface investigations at the site. Three IRMWPs were implemented to mitigate exposure to CVOC-impacted indoor air and/or to remediate CVOC-impacted groundwater at 514 Union Street and 305 Nevins Street. The extent of CVOC-impacted soil, groundwater, and sub-slab vapor has been assessed through previous investigation of AOC 1. CVOC-impacted groundwater and soil will be further assessed through implementation of this SRIWP.

3.0 SCOPE OF WORK

The objective of this SRIWP is to further investigate and characterize the nature and extent of contamination at and/or emanating from the brownfield site, per Environmental Conservation Law (ECL) Article 27, Title 14 (BCP). Proposed soil boring/monitoring well locations were located to sufficiently delineate potential on-site sources of observed CVOC-impacted groundwater and soil vapor. Soil and groundwater samples will be collected during the proposed SRI. The analytical parameters for each proposed sample are provided in Table 1. The field tasks are summarized below and discussed in more detail in the following sections.

- Advancement of 8 additional on-site soil borings, 3 soil borings to 20 feet below grade surface (bgs), 2 soil borings to 30 feet bgs, 3 soil borings to 35 feet bgs, and collection of soil samples for laboratory analysis of Part 375/Target Compound List (TCL) volatile organic compounds (VOC).
 - Soil samples collected from borings SB21 and SB25 will also be analyzed for Part 375/TCL semivolatile organic compounds (SVOC) to delineate SVOCs previously detected in borings SB16 and SB04, respectively.
 - As a contingency, if tar-like impacts are observed in any boring, a sample will be collected from the impacted interval, and interval immediate below the impacted interval for analysis of Part 375/TCL SVOCs.
- Installation and development of 11 groundwater monitoring wells, five screened at the shallow interval (about 7 to 17 feet bgs), four screened at the intermediate interval (about 17-27 feet bgs) and two screened at the deep interval (about 30-35 feet bgs).
- Installation of four sub-slab vapor (SSV) points, and collection of one sample from each location for analysis of VOCs by United States Environmental Protection Agency's (USEPA) Method TO-15.
- Collection of groundwater samples from new and existing on- and off-site groundwater monitoring wells for laboratory analysis of Part 375/TCL VOCs and SVOCs.

Modifications to this scope of work may be required: 1) due to refusal, site operations, equipment or other access restrictions; 2) in the event that unexpected contamination is detected and additional analytical data is needed; and 3) to adequately characterize and delineate subsurface impacts in compliance with the Brownfield Law, regulations and applicable investigation guidance documents (e.g., DER-10). Scope modifications due to refusal/borehole collapse will be coordinated with the NYSDEC Project Manager in real-time.

The field investigation will be completed in accordance with NYSDEC DER-10 Guidance and the procedures specified in the Construction Health and Safety Plan (CHASP) and the Quality Assurance Project Plan (QAPP) included as Appendices A and B, respectively. A Community Air Monitoring Plan (CAMP) will be implemented during this investigation (see Section 3.4.2 and Appendix C). CAMP exceedances, if any, will be reported separately to NYSDEC/NYSDOH by email or phone and will include corrective actions/proactive measures taken to address the exceedance/future exceedances.

The investigation will be performed when the business is closed. Any breaches in the building slab/finished wooden floor will be resealed and restored daily prior to business reopening. An exclusion zone will be implemented during investigation activities to mitigate any exposure to business cleaning staff.

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

| Personnel | Investigation Role | Contact Information |
|----------------------------|-------------------------|-----------------------------|
| Michael Burke, PG, CHMM | Qualified Environmental | Phone – 212-479-5413 |
| Langan | Professional | Email – mburke@langan.com |
| Jason Hayes, P.E., LEED AP | Engineer of Record | Phone – 212-479-5427 |
| Langan | Engineer of Record | Email – jahayes@langan.com |
| Paul McMahon, P.E. | Quality Assurance | Phone – 212-479-5451 |
| Langan | Officer | Email – pmcmahon@langan.com |
| Tony Moffa, CHMM, CSP | Langan Health & Safety | Phone – 215-491-6500 |
| Langan | Officer | Email – tmoffa@langan.com |
| William Bohrer, PG | Field Safety Officer | Phone – 410-984-3068 |
| Langan | Tield Safety Officer | Email – wbohrer@langan.com |
| Brad Koontz | Project Manager | Phone – 212-479-5625 |
| Langan | Froject ivialiagei | Email – bkoontz@langan.com |
| Caroline Devin | Field Team Leader | Phone – 212-479-5499 |
| Langan | Theid realificeader | Email – cdevin@langan.com |
| Joe Conboy | Program Quality | Phone - 212-479-5499 |
| Langan | Assurance Monitor | Email – jconboy@langan.com |

3.1 Soil Investigation

3.1.1 Soil Boring Advancement and Sampling

An environmental drilling subcontractor will advance seven on-site soil borings, three to 20 feet bgs (SB21, SB25, and SB23), two to 30 feet bgs (SB19 and SB24), and three to 35 feet bgs (SB20, SB22, and SB26), to further investigate a potential on-site source of CVOCs and further delineate SVOCs, and petroleum-related VOCs. Boring termination depths may be shallower if refusal is encountered. Soil will be screened continuously to the boring termination depth with a photoionization detector (PID) equipped with a 10.6 electron volt (eV) bulb and for visual and olfactory evidence of environmental impacts (e.g., staining and odor). Soil borings will be advanced with a Geoprobe 420M drill rig with 3-foot MarcoCore samplers. Soil sampling will be conducted as follows:

- From the unsaturated zone: one soil sample will be collected from each 3-foot macrocore from the interval exhibiting the greatest degree of impacts
- From the saturated zone: one soil sample will be collected every 6 feet from the interval exhibiting the greatest degree of impacts

• One soil sample will be collected from soil boring SB26 to vertically delineate petroleum-related impacts previously documented at SB03.

If impacts are not observed, sample collection will be biased towards shallow end of each interval.

Soil samples will be analyzed for Part 375-listed/TCL VOCs via USEPA Method 8260D. Samples collected from borings SB21 and SB25 will also be analyzed for Part 375/TCL SVOCs via USEPA Method 8270D to delineate SVOCs previously detected in borings SB16 and SB04, respectively.

As a contingency, if tar-like impacts are observed in any boring, a sample will be collected from the impacted interval, and interval immediate below the impacted interval, for analysis of Part 375/TCL SVOCs. Soil descriptions will be recorded in a field log. Boring logs will be presented in the revised RIR. A plan showing the proposed soil boring locations is included as Figure 6.

Quality assurance/quality control (QA/QC) procedures to be followed are described in the QAPP in Appendix B.

3.2 Groundwater Investigation

3.2.1 Monitoring Well Installation

Five borings will be converted to 11 permanent groundwater monitoring wells. Five monitoring wells (MW19S, MW20S, MW22S, MW24S, and MW25S) will be screened at the shallow interval (about 7 to 17 feet bgs), four (MW19D, MD20D, MW22D, and MW24D) will be screened at the intermediate interval (about 17 to 27 feet bgs) and two (MD20DD and MW22DD) will be screened at the deep interval (about 30 to 35 feet bgs). If a 30- to 35-foot screen is not feasible for any well screened at the deep interval due to refusal/borehole collapse, the well(s) will be screened no shallower than 27 to 32 feet bgs. Actual monitoring well screens will be set based on field observations to obtain vertical delineation of impacts. A plan showing the proposed well locations is included as Figure 6.

A summary of proposed, existing, and decommissioned wells installed at and around the site (inside 514 Union Street, 305 Nevins Street, 473 President Street, President Street Portfolio, and off-site sidewalk wells) are depicted on the following table.

NYSDEC BCP Site No. C224318

| Monitoring Well | Status | Monitoring Well | Status |
|-------------------|--|-------------------|----------|
| MW01 | Decommissioned | MW15D | Existing |
| MW02 | Decommissioned | MW16S (sidewalk) | Existing |
| MW03 | Decommissioned | MW16D (sidewalk) | Existing |
| MW04 | Decommissioned | MW16DD (sidewalk) | Existing |
| MW05S | Existing | MW17S | Existing |
| MW05D | Existing | MW17D | Existing |
| MW06S | Existing | MW17DD | Existing |
| MW06D | Existing | MW18S | Existing |
| MW07S | Existing | MW18D | Existing |
| MW07D | Existing | MW18DD | Existing |
| MW07DD (off-site) | Decommissioned | MW19S | Proposed |
| MW08S | Existing | MW19D | Proposed |
| MW08D | Existing | MW20S | Proposed |
| MW08DD (off-site) | Damaged during construction/decommissioned | MW20D | Proposed |
| MW09D | Decommissioned | MW20DD | Proposed |
| MW10D | Decommissioned | MW22S | Proposed |
| MW11S (off-site) | Damaged during construction/decommissioned | MW22D | Proposed |
| MW11D (off-site) | Decommissioned | MW22DD | Proposed |
| MW12S (sidewalk) | Existing | MW24S | Proposed |
| MW13D (sidewalk) | Existing | MW24D | Proposed |
| MW14S (sidewalk) | Existing | MW25S | Proposed |

Wells will be constructed with 3/4-inch diameter, threaded, flush-joint, polyvinyl chloride (PVC) casing and 0.01-inch slot, pre-pack (No. 2 sand) well screens (10 feet in length). A two-foot bentonite seal will be installed above the screen and the borehole annulus will be grouted to the surface. Following installation, the wells will be developed to agitate and remove fines. At least three well volumes will be evacuated from the wells during development prior to sampling.

The Volunteer will retain a New York State-licensed land surveyor to complete a monitoring well survey. The monitoring well survey requirements are further described in Section 3.2.3.

3.2.2 Groundwater Sampling and Analysis

One groundwater sample will be collected from each of the 11 new monitoring wells and existing on-site and off-site wells at 514 Union Street and 305 Nevins Street. The proposed groundwater samples from new monitoring wells are summarized in Table 1. Prior to sampling, one round of synoptic gauging for static water levels will be performed and the monitoring wells will be purged. Purging will consist of pumping, at a minimum, the stabilized drawdown volume plus the pump's tubing volume, and waiting until the physical and chemical parameters (e.g., temperature, dissolved oxygen, oxygen reduction potential, turbidity) stabilize within the ranges specified in the USEPA Low Stress Purging and Sampling Procedure for the Collection of Groundwater

Samples From Monitoring Wells, dated July 30, 1996, and 4th revision September 19, 2017. Samples will be collected with a peristaltic pump and dedicated polyethylene tubing. Development and purge water will be containerized for off-site disposal.

The groundwater samples will be collected in laboratory-supplied containers and will be sealed, labeled, and placed in an ice-chilled cooler (to maintain a temperature of about 4°C) for delivery to the laboratory. Groundwater samples will be analyzed using the latest USEPA methods for Part 375-listed/TCL VOCs and SVOCs by USEPA method 8260C and 8270C, respectively.

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

3.2.3 Monitoring Well Survey

The Volunteer will survey the vertical location of the monitoring wells, including ground surface elevation and casing elevation. This data will be used with the groundwater well gauging data to prepare a sample location plan and a groundwater contour map depicting the elevation of the water table across the site. Vertical control will be established by surveying performed relative to North American Vertical Datum of 1988 (NAVD88) by a New York State-licensed land surveyor. Elevations of the top of monitoring well casings and protective well casings will be surveyed to the nearest 0.01 foot. A synoptic gauging event will be performed to document static water levels. All accessible wells will be gauged during this event. Data for the monitoring well construction, location, and groundwater elevations will be submitted to NYSDEC in an EQuIS Electronic Data Deliverable (EDD) format.

3.3 Sub-Slab Vapor Investigation

3.3.1 Sub-Slab Vapor Point Installation

Four permanent sub-slab vapor points (Vapor Pins®) will be installed in accordance with the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006, with updates including the February 2024 update) (NYSDOH SVI Guidance). A plan showing the proposed sub-slab vapor sample locations is included as Figure 6. Sub-slab vapor points will be installed within the existing building directly beneath the concrete floor slab bottom using a hammer drill.

3.3.2 Sub-Slab Vapor Sampling and Analysis

Samples will be collected in general accordance with the NYSDOH SVI Guidance. The proposed sub-slab vapor samples are summarized in Table 1. A plan showing the proposed sub-slab vapor locations is included as Figure 6. Before collecting sub-slab vapor samples, a minimum of three vapor probe volumes (i.e., the volume of the sample implant and tubing) will be purged from each sample point at a rate of less than 0.2 liters per minute using a RAE Systems MultiRAE® meter. Samples will be collected within one day of installing vapor points. Purged sub-slab vapor will be monitored for VOCs with the MultiRAE® during this process.

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

After the integrity of each seal has been confirmed, sub-slab vapor will be collected over an 2-hour sampling period into laboratory-supplied, batch-certified clean 6-liter Summa[®] canisters with calibrated flow controllers. The samples will be analyzed for VOCs by USEPA Method TO-15.

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

3.4 Data Management and Validation

Data collected during the field investigation will be reduced and reviewed by the laboratory QA personnel, and a report on the findings will be tabulated in a standard format. The criteria used to identify and quantify the analytes will be those specified for the applicable methods in the USEPA SW-846 and subsequent updates. The data package provided by the laboratory will contain all items specified in the analytical methodology appropriate for the analyses to be performed and will 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. Table 1 summarizes the proposed samples and laboratory analyses.

The Analytical Services Protocol (ASP) Category B data packages and an 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 EQuISTM. 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.

Data validation will be performed in accordance with the USEPA Region 2 SOPs for data validation and USEPA's National Functional Guidelines for Organic and Inorganic Data Review. Samples collected to characterize material proposed for export and import will not be validated. Tier 1 data validation (the equivalent of USEPA's Stage 2A validation) will be performed to evaluate data quality. Tier 1 data validation is based on completeness and compliance checks of sample-related QC results, including:

- Holding times;
- Sample preservation;
- Blank results (method, trip, and field blanks);
- Surrogate recovery compounds and extracted internal standards (as applicable);
- laboratory control samples (LCS) and Laboratory Control Sample Duplicate (LCSD) recoveries and relative percent difference (RPDs);
- Laboratory duplicate RPDs; and

A data usability summary report (DUSR) will be prepared by the data validator and reviewed by the Quality Assurance Officer (QAO) before issuance. The DUSR will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain-of-custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method.

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
- "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.

Additional details on the DUSRs are provided in the QAPP in Appendix B.

3.5 Management of Investigation-Derived Waste

Soil cuttings generated during the investigation will be returned to the borehole unless:

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

permeability; or

• The soil cannot fit into the borehole.

Boreholes requiring disposal of drill cuttings will be filled with hydrated bentonite chips or clean sand and capped with asphalt or concrete. Excess investigation-derived waste (IDW), including soil cuttings, purged groundwater, and decontamination fluids, will be containerized in properly-labeled and sealed United Nations/Department of Transportation (UN/DOT)-approved 55-gallon drums and staged for future waste characterization and off-site disposal at a facility permitted to accept the waste. The drums will be staged in an area on-site, pending receipt of laboratory data and off-site disposal to an appropriate facility. The site will be secured during and after investigation to prevent public access to the site.

3.6 Air Monitoring

Air monitoring will be conducted for site workers and the community. Air monitoring results will be recorded in the field book during the investigation activities, downloaded from field instruments and summarized in daily reports.

3.6.1 Worker Air Monitoring

Air monitoring of the breathing zone will be performed periodically during drilling and sampling activities to document health and safety protection for the work team. VOCs will be monitored with a PID in accordance with the CHASP (Appendix A). If air monitoring during intrusive operations identifies the presence of VOCs, the field engineer will follow the guidelines outlined in the CHASP regarding action levels, permissible exposure, engineering controls, and personal protective equipment. If the VOC action level is exceeded, work will cease, and the work location will be evacuated. Monitoring will continue until the levels drops to permissible limits, at which point, work will resume with continued monitoring. If high levels persist, field activities will be halted and the work relocated to another area. If dust emissions are observed, work will stop and dust suppression measures (i.e., water spray) will be implemented. The investigation will be performed when the business is closed. Any breaches in the building slab/finished wooden floor will be resealed and restored daily prior to business reopening. An exclusion zone will be implemented during investigation activities to mitigate any exposure to business cleaning staff.

3.6.2 Community Air Monitoring Plan

In addition to air monitoring in the worker breathing zone, community air monitoring will be performed in compliance with the New York State Department of Health (NYSDOH) Generic CAMP during any intrusive work. The CAMP is included in Appendix C.

CAMP will consist of continuous monitoring for VOCs and dust emissions during ground-intrusive activities (i.e., monitoring well installation). Special Requirements, as included in Appendix C, will be adhered to for indoor work or occupied structures within 20 feet. Upwind concentrations will be measured at the start of each workday to establish background concentrations. VOCs and

dust emissions will be monitored at the downwind perimeter of the work zone, which will be established at a point on the site where the general public or site employees may be present. VOC monitoring will be conducted using real-time monitoring equipment. VOC community air monitoring requirements will be conducted until it is determined that the site is not a source of organic vapors. Dust emissions will be monitored using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM10) and capable of averaging a period of 15 minutes (or less) for comparison to the airborne particulate action level (e.g., DustTrak). If dust emissions are observed, work will stop and dust suppression measures will be used. The results will be presented in the daily reports. CAMP exceedances, if any, will be reported separately to NYSDEC/NYSDOH by email or phone and will include corrective actions/proactive measures taken to address the exceedance/future exceedances.

3.7 Green Remediation Standards

Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per the NYSDEC DER-31 Green Remediation Policy (DER-31). DER-31 requires the following green remediation/sustainability concepts be considered and/or implemented, to the extent feasible, during investigations:

- Increase energy efficiency/minimize total energy use and direct and indirect CO2/greenhouse gas (GHG) emissions to the atmosphere
- Reduce emissions of air pollutants
- Minimize habitat disturbance and create or enhance habitat or usable land
- Conserve natural resources such as soil and water; promote the sequestration of carbon through reforestation or afforestation
- Minimize fresh water consumption and maximize water reuse during daily operations and treatment processes
- Prevent long-term erosion, surface runoff, and off-site water quality impacts
- Prevent unintended soil compaction
- Minimize waste or implement beneficial use of materials that would otherwise be considered a waste
- Minimize equipment and truck idling and use sustainably produced biofuels to reduce discharges of pollutants and GHGs to the atmosphere
- Utilize clean diesel (new or retrofitted) equipment to reduce emissions to the atmosphere
- Minimize truck travel for disposal to save energy, reduce emissions, reduce localized noise, vibration, and wear and tear on roads
- Minimize use of heavy equipment to save energy and reduce emissions

During implementation of this SRIWP, the following elements will be implemented, to the extent feasible, to reduce greenhouse gas and other emissions:

- Use of Ultra Low Sulfur Diesel in vehicles and machinery by drilling contractor
- Use of diesel exhaust purifier scrubbers on machinery (drill rigs) by drilling contractor
- Minimization of idling of all vehicles (including construction equipment) in accordance with 6 NYCRR Part 217 Motor Vehicle Emissions, Subpart 217-3 Idling Prohibition for Heavy Duty Vehicles
- Reduction of materials consumption and off-site transport by reuse of non-impacted drilling spoils as backfill within the boring of origin and containerization of drilling spoils exhibiting visual, olfactory, and instrumental signs of contamination.

3.8 Qualitative Human Health Exposure Assessment

Based on the findings of the Supplemental RI, an updated Qualitative Human Health Exposure Assessment for the site will be conducted in accordance with Appendix 3B of the NYSDEC DER-10, Technical Guidance for Site Investigation and Remediation. The assessment will be submitted in the revised RIR.

4.0 REPORTING

4.1 Remedial Investigation Report

Following completion of the SRIWP implementation, findings and analytical data will be incorporated into the forthcoming revision to the draft RIR. The report will include:

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

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

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

4.2 Daily Reports

Daily reports will be submitted to NYSDEC and NYSDOH Project Managers by the end of each day following the reporting period and will include:

- An update of progress made during the reporting day
- Description and locations of work completed during the reporting day
- A summary of complaints with relevant details (names, phone numbers)
- A summary of CAMP findings, including exceedances
- An explanation of notable site conditions

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 SRIWP No. 2 or other sensitive or time critical information. However, such conditions must also be included in the daily reports.

Emergency conditions and changes to the SRIWP will be addressed directly to NYSDEC Project Manager via personal communication.

Daily Reports will include a description of daily activities and a map that identifies work areas. These reports will include a summary of CAMP results, odor and dust problems and corrective actions, and all complaints received from the public.

The NYSDEC-assigned project number will appear on all reports.

4.3 Monthly Reports

Monthly reports will be submitted to NYSDEC and NYSDOH Project Managers by the 10th of each month and will include:

- Activities relative to the site during the previous reporting period and those anticipated for the next reporting period, including a quantitative presentation of work performed (i.e., tons of material exported and imported, etc.)
- Description of approved activity modifications, including changes of work scope and/or schedule
- Sampling results received following internal data review and validation, as applicable
- An update of the remedial schedule including the percentage of project completion, unresolved delays encountered or anticipated that may affect the future schedule, and efforts made to mitigate such delays

4.4 Other Reporting

Photographs will be taken of all investigation activities and submitted to NYSDEC in digital format. Photos will illustrate remedial program elements and will be of acceptable quality. Representative photos will be provided of each contaminant source, source area and site structures during site investigation. Photos will be included in the daily reports as needed and a comprehensive collection of photos will be included in the Final Engineering Report.

Job-site record keeping for all remedial work will be appropriately documented. These records will be maintained on-site at all times during the project and be available for inspection by NYSDEC and NYSDOH staff.

5.0 SCHEDULE

The table below presents an anticipated schedule for the proposed Supplemental RI and reporting following the approval of the SRIWP. Implementation of the SRIWP is anticipated to start in the summer of 2025. If the schedules changes, it will be updated and submitted to the NYSDEC. The Supplemental RI is anticipated to begin within eight weeks of SRIWP approval. A start date will be communicated within five weeks of SRIWP approval.

| Milestone | Weeks from NYSDEC Approval of SRIWP | Estimated Duration (weeks) |
|--|---|-------------------------------|
| RI Mobilization | 8 | 8 |
| RI Field Investigation | 14 | 6 |
| Laboratory Analysis | 16 | 2 |
| Remedial Investigation Report Preparation and Submission to the NYSDEC | 26 | 10 |

The business owner has been notified of planned investigation. SRI implementation schedule will be coordinated with the business owner on a day-to-day basis. Work is planned to begin early in the morning, and terminate (including resealing/restoring the basement slab and finished floor surface) at least one hour before the business reopens each day.

TABLES

Table 1 Proposed Sample Summary Supplemental Remedial Investigation Work Plan

514 Union Street Brooklyn, NY NYSDEC BCP Site No. C224318 Langan Project No. 170361307

| | Langan Project No. 170361307 | | | | | | |
|-----|------------------------------|------|---|-----------------------------|--|--|--|
| No. | Sample Name | Туре | Proposed Sample/Screen Interval (feet bgs) | Analyses | | | |
| | Soil Samples | | | | | | |
| 1 | SB19_depth | | | | | | |
| 2 | SB19_depth | | | | | | |
| 3 | SB19_depth | | | | | | |
| 4 | SB19_depth | | | | | | |
| 5 | SB19_depth | | | | | | |
| 6 | SB19_depth | | | | | | |
| 7 | SB19_depth | | | | | | |
| 8 | SB20_depth | | | Part 375/TCL VOCs | | | |
| 9 | SB20_depth | | | | | | |
| 10 | SB20_depth | | | | | | |
| 11 | SB20_depth | | | | | | |
| 12 | SB20_depth | | 1-foot interval of greatest observed impacts every 3 feet in unsaturated zone, and every 6 feet in saturated zone, or top of each interval if impacts are not observed. If tar-like impacts are observed, a sample will be collected from the impacted interval, and immediately below the impacted interval for | | | | |
| 13 | SB20_depth | | | | | | |
| 14 | SB20_depth | Grab | | | | | |
| 15 | SB20_depth | Grab | | | | | |
| 16 | SB21_depth | | analysis of Part 375/TCL SVOCs | | | | |
| 17 | SB21_depth | | | | | | |
| 18 | SB21_depth | | | Part 375/TCL VOCs and SVOCs | | | |
| 19 | SB21_depth | | | | | | |
| 20 | SB21_depth | | | | | | |
| 21 | SB22_depth | | | | | | |
| 22 | SB22_depth | | | | | | |
| 23 | SB22_depth | | | | | | |
| 24 | SB22_depth | | | Port 275/TCL \/OCo | | | |
| 25 | SB22_depth | | | Part 375/TCL VOCs | | | |
| 26 | SB22_depth | | | | | | |
| 27 | SB22_depth | | | | | | |
| 28 | SB22_depth | | | | | | |

Table 1 Proposed Sample Summary Supplemental Remedial Investigation Work Plan

514 Union Street Brooklyn, NY NYSDEC BCP Site No. C224318 Langan Project No. 170361307

| No. | Sample Name | Туре | Proposed Sample/Screen Interval (feet bgs) | Analyses | | |
|-------|--------------|-------------|--|-----------------------------|--|--|
| 29 | SB23_depth | | 1-foot interval of greatest observed impacts every 3 feet in unsaturated zone, and every 6 feet in saturated zone, or top of each interval if impacts are not observed. If tar-like impacts are observed, a sample will be collected from the impacted interval, and immediately below the impacted interval for analysis of Part 375/TCL SVOCs | | | |
| 30 | SB23_depth | | | | | |
| 31 | SB23_depth | | | | | |
| 32 | SB23_depth | | | | | |
| 33 | SB23_depth | | | | | |
| 34 | SB24_depth | | | Part 375/TCL VOCs | | |
| 35 | SB24_depth | | | | | |
| 36 | SB24_depth | | | | | |
| 37 | SB24_depth | Grah | | | | |
| 38 | SB24_depth | Grab | | | | |
| 39 | SB24_depth | | | | | |
| 40 | SB24_depth | | | | | |
| 41 | SB25_depth | | | Part 375/TCL VOCs and SVOCs | | |
| 42 | SB25_depth | | | | | |
| 43 | SB25_depth | | | | | |
| 44 | SB25_depth | | | | | |
| 45 | SB25_depth | | | | | |
| 46 | SB26_depth | | First observed clean interval where petroleum-impacts are not observed. | Part 375/TCL VOCs | | |
| | SODUP01_date | | | | | |
| | SODUP02_date | Duplicate | TBD | | | |
| QA/QC | SODUP03_date | | | Part 375/TCL VOCs and SVOCs | | |
| QA/QC | SOFB01_date | | | Tart 3/3/TCL VOCS and 3VOCS | | |
| | SOFB02_date | Field Blank | N/A | | | |
| | SOFB03_date | | | | | |

Table 1 Proposed Sample Summary Supplemental Remedial Investigation Work Plan

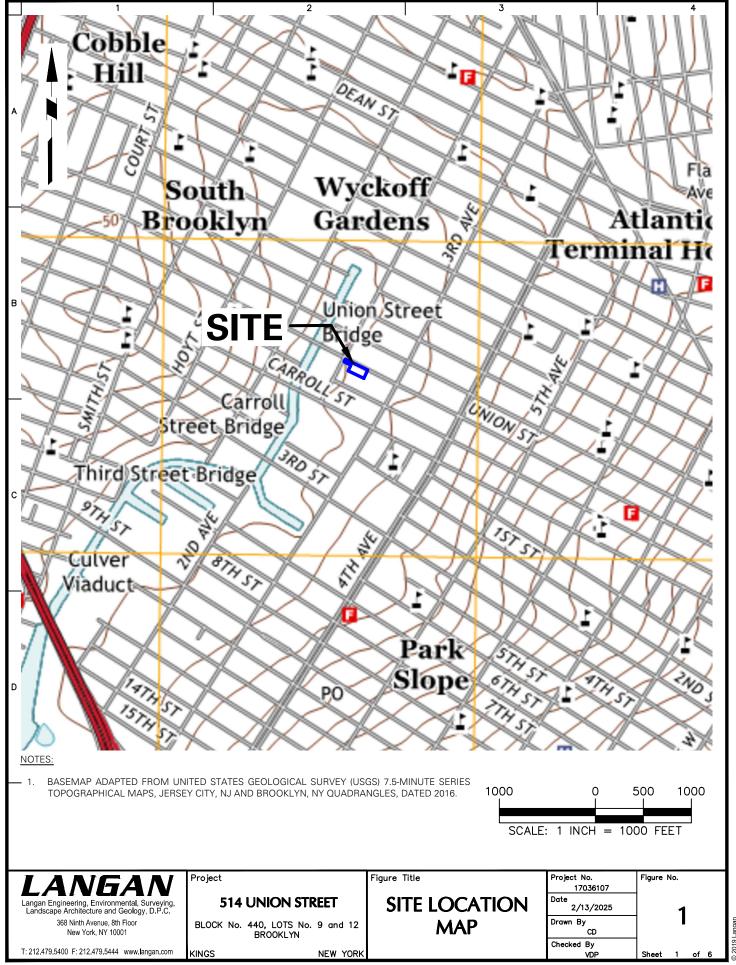
514 Union Street Brooklyn, NY NYSDEC BCP Site No. C224318 Langan Project No. 170361307

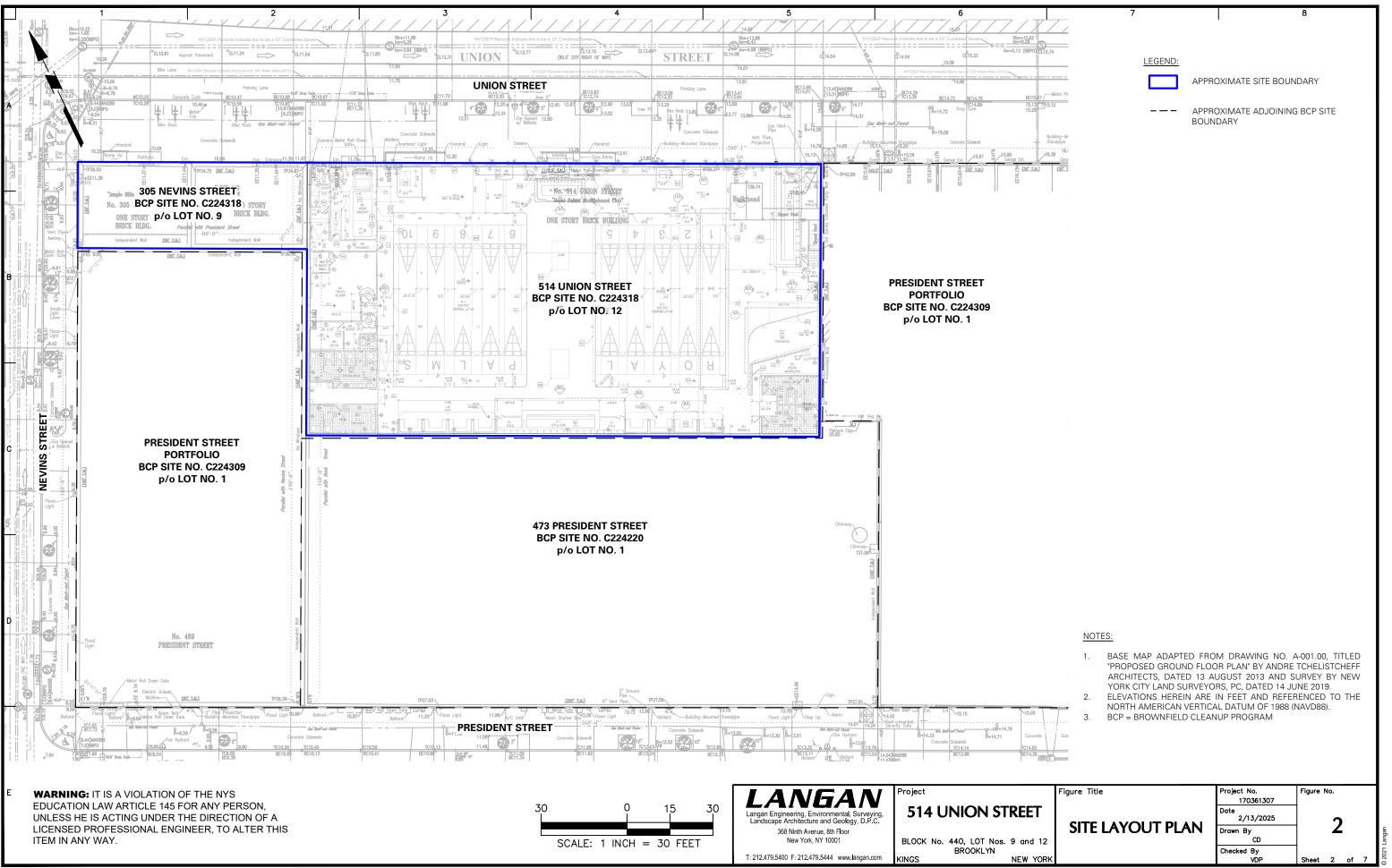
| No. | Sample Name | Туре | Proposed Sample/Screen Interval (feet bgs) | Analyses | | | | |
|-------|---------------------|-------------|--|-----------------------------|--|--|--|--|
| | Groundwater Samples | | | | | | | |
| 1 | MW19S_date | | Shallow (~7-17 feet bgs) | | | | | |
| 2 | MW19D_date | | Intermediate (~17-27 feet bgs) | | | | | |
| 3 | MW20S_date | | Shallow (~7-17 feet bgs) | | | | | |
| 4 | MW20D_date | | Intermediate (~17-27 feet bgs) | | | | | |
| 5 | MW20DD_date | | Deep (~30-35 feet bgs) | | | | | |
| 6 | MW22S_date | Low-Flow | Shallow (~7-17 feet bgs) | | | | | |
| 7 | MW22D_date | | Intermediate (~17-27 feet bgs) | Part 375/TCL VOCs and SVOCs | | | | |
| 8 | MW22DD_date | | Deep (~30-35 feet bgs) | rait 379/TCL VOCS and 3VOCS | | | | |
| 9 | MW24S_date | | Shallow (~7-17 feet bgs) | | | | | |
| 10 | MW24D_date | | Intermediate (~17-27 feet bgs) | | | | | |
| 11 | MW25S_date | | Shallow (~7-17 feet bgs) | | | | | |
| | GWDUP01_date | Duplicate | TBD | | | | | |
| QA/QC | WELL_date | MS/MSD | TBD | | | | | |
| QA/QC | GWFB01_date | Field Blank | N/A | | | | | |
| | GWTB01_date | Trip Blank | N/A | Part 375/TCL VOCs | | | | |
| | | | Sub-Slab Soil Vapor Samples | | | | | |
| 1 | SSV19_date | | | | | | | |
| 2 | SSV20_date | 2-hour | | | | | | |
| 3 | SSV24_date | | N/A | TO-15 VOCs | | | | |
| 4 | SSV25_date | | | | | | | |
| QA/QC | SSVDUP01_date | Duplicate | | | | | | |

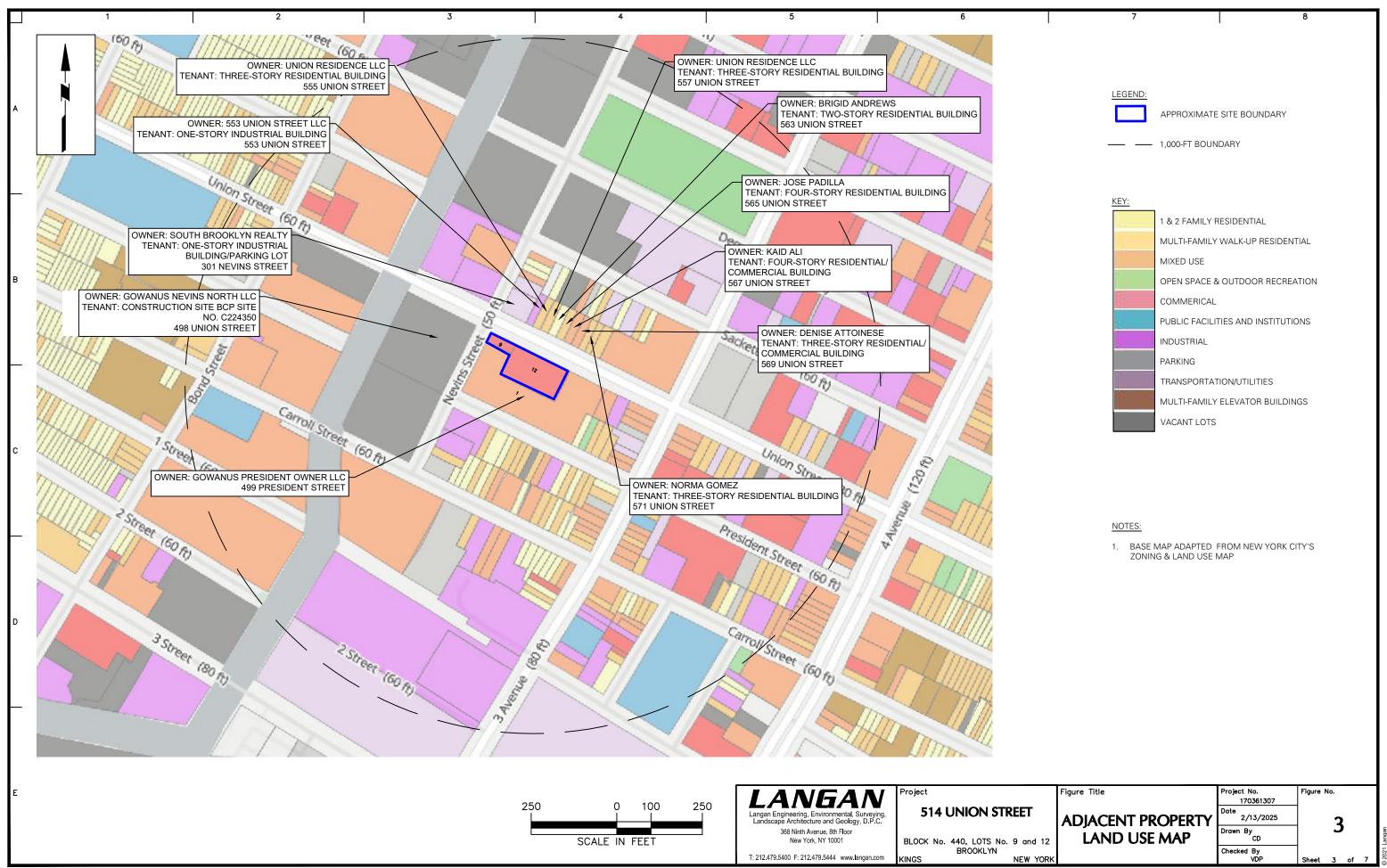
Notes:

- 1. Part 375 = New York State Department of Environmental Conservation (NYSDEC) Title 6 of the Official Compilation of New York Codes, Rules and Regulations (6 NYCRR) Part 375.
- 2. bgs = below grade surface
- 3. VOC = volatile organic compound
- 4. TCL = Target Compound List
- 5. QA/QC = quality assurance/quality control
- 6. TBD = to be determined
- 7. N/A = not applicable
- 8. MS/MSD = matrix spike/matrix spike duplicate
- 9. Well screen intervals will be determined in the field based on field observations

FIGURES







| Sample Date | 9/9/2022 | 9/9/2022 | | |
|-------------|----------|----------|--------------|----|
| | | | | ΑF |
| | 0.72 J | NE | | |
| | 120 | NE | SB07/MW0 | /D |
| <u>.</u> | | • | 7 | SC |
| | NE | NE | ─ | 30 |
| <u>.</u> | | • | SB14 | |
| | 89.1 | NE | | SC |
| | | | - | J(|

SB15 0-2

SB15 10-12

SB04_7-9

| VOCs | | |
|-----------------------|--------|----|
| Total Xylenes | 0.72 J | NE |
| Trichloroethene (TCE) | 120 | NE |
| SVOCs | | |
| Total SVOCs | NE | NE |
| Metals | | |
| Lead | 89.1 | NE |
| Mercury | 0.403 | NE |
| Zinc | 141 | NE |

Sample ID

| Sample ID | SB14_0-2 | SB14_7-8 |
|------------------------|-----------|-----------|
| Sample Date | 9/12/2022 | 9/12/2022 |
| VOCs | | |
| Trichloroethene (TCE) | 15 | NE |
| SVOCs | | |
| Benzo(a)anthracene | 5.2 | NE |
| Benzo(a)pyrene | 5.2 | NE |
| Benzo(b)fluoranthene | 6.2 | NE |
| Benzo(k)fluoranthene | 2.2 | NE |
| Chrysene | 5.4 | NE |
| Dibenz(a,h)anthracene | 0.73 J | NE |
| Indeno(1,2,3-cd)pyrene | 3.7 | NE |
| Metals | | |
| Copper | 51.8 | NE |
| Lead | 236 | NE |
| Mercury | 0.257 | NE |

213

Sample ID SB04 1-3

| 14.17 | Sample Date | 3/20/2021 | 3/20/2021 |
|--------------------------|-------------|-------------|-----------|
| VOCs | - 1 | | 1 |
| Trichloroethene (TCE) | | 140 | 12 |
| SVOCs | • | | |
| Benzo(a)anthracene | | 18 | 21 |
| Benzo(a)pyrene | | 14 | 16 |
| Benzo(b)fluoranthene | | 19 | 21 |
| Benzo(k)fluoranthene | | 5.8 | 7.1 |
| Chrysene | | 17 | 18 |
| 32 Dibenz(a,h)anthracene | | 2.1 | 2.4 |
| Indeno(1,2,3-cd)pyrene | | 9.7 | 10 |
| 0 Pesticides | | | |
| Total Pesticides | | ND | NA |
| Metals | | | |
| Cadmium | | 8.13 | NE |
| Lead | | 316 | 484 |
| Mercury | | 0.454 | 0.487 |
| 7inc | | <i>4</i> 51 | 144 |

| Sa | mple ID | SB08_0-2 | SB08_22.5-25.5 |
|------------------------|----------|----------|----------------|
| Sam | ple Date | 9/8/2022 | 9/8/2022 |
| VOCs | | | |
| Trichloroethene (TCE) | | 7 | NE |
| SVOCs | | | |
| Benzo(a)anthracene | | 3.2 | NE |
| Benzo(a)pyrene | | 3 | NE |
| Benzo(b)fluoranthene | | 3.9 | NE |
| Benzo(k)fluoranthene | | 1.1 | NE |
| Chrysene | | 3.1 | NE |
| Dibenz(a,h)anthracene | | 0.42 J | NE |
| Indeno(1,2,3-cd)pyrene | | 2.1 | NE |
| Metals | | | |
| Copper | | 69.7 | NE |
| Lead | | 560 | NE |
| Mercury | | 0.403 | NE |
| 7inc | | 226 | NF |

| Chim | TP43.60 | | | |
|-------------------------------------|-----------|----------------|-----------|------------|
| Sample ID | SB03_4-6 | SODUP01_032021 | SB03_9-11 | SB03_19-21 |
| Sample Date | 3/20/2021 | 3/20/2021 | 3/20/2021 | 3/20/2021 |
| VOCs | | | <u> </u> | |
| 1,2,4-Trimethylbenzene | ND | ND | ND | 260 J |
| 1,3,5-Trimethylbenzene (Mesitylene) | ND | ND | ND | 110 J |
| Benzene | ND | ND | NE | 7.8 J |
| Ethylbenzene | ND | ND | ND | 85 J |
| Naphthalene | ND | ND | ND | 42 J |
| n-Butylbenzene | ND | ND | ND | 16 J |
| n-Propylbenzene | ND | ND | ND | 36 J |
| Toluene | ND | ND | ND | 3.6 J |
| Total Xylenes | ND | ND | ND | 210 J |
| SVOCs | | | • | |
| Total SVOCs | NE | NA | ND | NA |
| Pesticides | | • | <u> </u> | |
| Total Pesticides | ND | NA | NA | NA |
| Metals | | • | <u>.</u> | |
| Copper | 97.7 | NA | NE | NA |
| Lead | 143 | NA | NE | NA |
| Mercury | 0.702 | NA | NE | NA |
| 7inc | 122 | NΙΛ | NE | NΙΛ |

SB14 SOIL BORING

LEGEND:

GENERAL NOTES:

- 1. BASE MAP TAKEN FROM DRAWING NO. A-001.00, TITLED "PROPOSED GROUND FLOOR PLAN" BY ANDRE TCHELISTCHEFF ARCHITECTS, DATED 13 AUGUST 2013, AND SURVEY BY NEW YORK CITY LAND SURVEYORS, PC, DATED 14 JUNE 2019.
- 2. ELEVATIONS HEREIN ARE IN FEET AND REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
- 3. LOCATIONS WERE MEASURED IN THE FIELD FROM FIXED SURVEYED STRUCTURES AND ARE APPROXIMATE.
- 4. SOIL ANALYTICAL RESULTS ARE COMPARED TO TITLE 6 OF THE NEW YORK CODES, RULES, AND REGULATIONS (6 NYCRR) PART 375 UNRESTRICTED USE (UU) AND RESTRICTED USE COMMERCIAL (RUC) SOIL CLEANUP OBJECTIVES
- 5. SOIL BORINGS WERE ADVANCED DURING THE SEPTEMBER 2022 REMEDIAL INVESTIGATION FOR 514 UNION STREET, THE JUNE 2023 SUBSURFACE INVESTIGATION FOR 305 NEVINS STREET, AND THE OCTOBER 2023 SUPPLEMENTAL REMEDIAL INVESTIGATION.
- 6. ONLY CONCENTRATIONS FOR COMPOUNDS EXCEEDING THE SOIL CLEANUP OBJECTIVES (SCOs) STATED IN NOTE 4 ARE SHOWN.
- 7. CONCENTRATIONS DETECTED ABOVE 6 NYCRR PART 375 UU SCOs ARE
- 8. CONCENTRATIONS DETECTED ABOVE 6 NYCRR PART 375 RUC SCOs ARE SHADED.
- 9. ALL VALUES ARE REPORTED IN MILLIGRAM PER KILOGRAM (mg/kg).
- 10.UU AND RUC SCOs ARE PRESENTED IN THE TABLE BELOW. 11. VOC = VOLATILE ORGANIC COMPOUND
- 12. SVOC = SEMIVOLATILE ORGANIC COMPOUND
- 13. ND = NOT DETECTED
- 14. NA = NOT APPLICABLE
- 15. NE = NO EXCEEDANCE ABOVE PART 375 UU OR CU SCOs 16.J = THE ANALYTE WAS POSITIVELY IDENTIFIED AND THE ASSOCIATED NUMERICAL VALUE IS THE APPROXIMATE CONCENTRATION OF THE
- ANALYTE IN THE SAMPLE. 17.BCP = BROWNFIELD CLEANUP PROGRAM

| Analyte | NYSDEC Part 375 Unrestricted Use SCOs | NYSDEC Part 375 Restricted Use Commercial SCOs |
|-------------------------------------|--|---|
| VOCs | | <u> </u> |
| Acetone | 0.05 | 500 |
| 1,2,4-Trimethylbenzene | 3.6 | 190 |
| 1,3,5-Trimethylbenzene (Mesitylene) | 8.4 | 190 |
| Benzene | 0.06 | 44 |
| Cis-1,2-Dichloroethene | 0.25 | 500 |
| Ethylbenzene | 1 | 390 |
| Naphthalene | 12 | 500 |
| n-Butylbenzene | 12 | 500 |
| n-Propylbenzene | 3.9 | 500 |
| Toluene | 0.7 | 500 |
| Total Xylenes | 0.26 | 500 |
| Trichloroethene (TCE) | 0.47 | 200 |
| SVOCs | | ! |
| 3 & 4 Methylphenol (m&p Cresol) | 0.33 | 500 |
| Acenaphthene | 20 | 500 |
| Benzo(a)anthracene | 1 | 5.6 |
| Benzo(a)pyrene | 1 | 1 |
| Benzo(b)fluoranthene | 1 | 5.6 |
| Benzo(k)fluoranthene | 0.8 | 56 |
| Chrysene | 1 | 56 |
| Dibenz(a,h)anthracene | 0.33 | 0.56 |
| Dibenzofuran | 7 | 350 |
| Fluoranthene | 100 | 500 |
| Fluorene | 30 | 500 |
| Indeno(1,2,3-cd)pyrene | 0.5 | 5.6 |
| Naphthalene | 12 | 500 |
| Phenanthrene | 100 | 500 |
| Pyrene | 100 | 500 |
| Pesticides | 1 | |
| 4,4'-DDD | 0.0033 | 92 |
| Metals | | |
| Arsenic | 13 | 16 |
| Cadmium | 2.5 | 9.3 |
| Chromium, Hexavalent | 1 | 400 |
| Copper | 50 | 270 |
| Lead | 63 | 1000 |
| Mercury | 0.18 | 2.8 |
| Nickel | 30 | 310 |
| Zinc | 109 | 10000 |

| PRESIDENT S' Benzo(a)pyrene | 3.6 | 91 |
|-----------------------------|------|------|
| Benzo(b)fluoranthene | 4.6 | 110 |
| Benzo(k)fluoranthene | 1.2 | 33 |
| Chrysene | 4.2 | 92 |
| Dibenz(a,h)anthracene | 0.51 | 12 |
| Dibenzofuran | NE | 38 |
| Fluoranthene | NE | 310 |
| Fluorene | NE | 42 |
| Indeno(1,2,3-cd)pyrene | 2.6 | 69 |
| Naphthalene | NE | 53 |
| Phenanthrene | NE | 320 |
| Pyrene | NE | 260 |
| Metals | | |
| Cadmium | NE | 5.77 |
| Copper | 214 | NE |
| | 404 | N.I. |

Sample ID

Sample Date

Landscape Architecture and Geology, D.P.C. 368 Ninth Avenue, 8th Floor New York, NY 10001

514 UNION STREET

BLOCK No. 440, LOTS No. 9 and 12 BROOKLYN

HISTORICAL SOIL SAMPLE **ANALYTICAL RESULTS MAP**

| Project No. | Figure | Νo | |
|-------------------|--------|----|---|
| 170361307 | | | |
| Date 8/4/2023 | | | / |
| Drawn By KC | | | |
| Checked By VDP | Shee | t | 4 |

Filename: \\langan.com\\data\\NY\\data\\170361301\Cadd Data - 170361301\SheetFiles\Environmental\\514 Union Street\SRIWP No. 2\Figure 4 - Soil Sample Analytical Results Map R3.dwg Date: 2/25/2025 Time: 14:05 User: cdevin Style Table: Langan.stb Layout: ANSID-SL

SB06_0-2

9/7/2022

ΝE

2.12 J

4,710

0.91

179

Sample ID

Sample Date

SB05 0-1

9/6/2022

NA

4.6

6.5

0.65

1.8

16.6

79.9

0.217

142

B05/MW05S/MW05D

514 UNION STREET

BCP SITE NO. C224318

LOT NO. 12

473 PRESIDENT STREET

BCP SITE NOX 0224220

"My NYC Bike Tour"

No. 473 PRESIDENT STREET

UNION STREET

Sample ID

Sample Date

Sample Name

Sample Depth

VOCs

SVOCs

Metals

Copper

Mercury

VOCs

SVOCs

Total VOCs

Chrysene

Metals

Arsenic

Copper

Mercury

Nickel

VOCs

Total VOCs

|Benzo(a)anthracene

Benzo(b)fluoranthene

Indeno(1,2,3-cd)pyrene

SVOCs

Chrysene

Pesticides

Metals

Mercury

VOCs Total VOCs

SVOCs

Chrysene

Phenanthrene Pesticides

4,4'-DDD

Total Metals

Benzo(a)anthracene

Benzo(b)fluoranthene Benzo(k)fluoranthene

Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene

Benzo(a)pyrene

Chrysene

Metals

Copper

Lead

Mercury

Metals

VOCs Total VOCs SVOCs

Benzo(a)anthracene Benzo(a)pyrene

Benzo(b)fluoranthene

Benzo(k)fluoranthene

Dibenz(a,h)anthracene

Indeno(1,2,3-cd)pyrene

Lead

Benzo(a)anthracene

Benzo(b)fluoranthene

Indeno(1,2,3-cd)pyrene

Benzo(a)pyrene

<u>Cis-1,2-Dichloroethene</u>

richloroethene (TCE)

Benzo(b)fluoranthene

Sample Name

Sample Depth

Sample Date

Sample Date

SB17

SB17 0-2

06/28/2023

0-2

ΝE

1.4

1.6

1.3

0.6

129

354

0.617

156

Sample ID SB01 3-5

ND

1.2 J

1.4 J

1.2 J

0.89 J

310 J 0.972

184 J

SB02 4-6

3/20/2021

ΝE

21

7.1

26

2.1

11

120

0.73

SB07_0-2

9/12/2022

3.3 2.9

3.3

3.1

0.39

75.6

229

Sample Date

Sample ID Sample Date

Sample Date 3/19/2021

SB18 0-2

06/28/2023

0-2

1.08

308

SB17

SODUP01 062823

06/28/2023

0-2

ΝE

1.1

1.3

0.51

134

420

0.615

172

SODUP02 032021

3/20/2021

1.43

2-6, 31 27, 10 F.R.P.

NE

SB02_7-9

3/20/2021

ND

NE

NE

NE

NE

NA

NE

SB07 17-20

9/9/2022

NE

ΝE

SB18 17-20

06/28/2023

17-20

ND

SB17 10.5-12.5

06/28/2023

10.5-12.5

NE

ND

ND

ND

ND

ND

13.3

NE

NE

ND

36.6

SB01 9-11

3/19/2021

NE

SB18 18-18.5

06/28/2023

18-18.5

2.4

NA

NΑ

NA

SB17 16-18

06/28/2023

ΝE

ND

ND

ND

ND

ND

NE

NE

305 NEVINS STREET

BCP SITE NO. C224318

SB17/MW17S/MW17D #

PRESIDENT STREET **PORTFOLIO**

BCP SITE NO.

C224309

VOCs

SVOCs

Acenaphthene

Benzo(a)anthracene

Trichloroethene (TCE)

3 & 4 Methylphenol (m&p Cresol)

BRICK &

LOT NO. 9 BRICK B

Independent Wall (80' T.M.) SB18/MW18S/MW18D

ND

16-18

SB18 23-25

06/28/2023

23-25

ND

ND

RY BLDG.

VOCs

Acetone

SVOCs

Metals

Lead

OME STORY BI

Mercury

Total SVOCs

Chromium, Hexavalent

Total VOCs

Benzo(a)anthracene

Benzo(b)fluoranthene

Benzo(k)fluoranthene

Dibenz(a,h)anthracene

Indeno(1,2,3-cd)pyrene

Benzo(a)pyrene

SVOCs

Chrysene

Metals

Arsenic

Mercury

Lead

SB07/MW07S/MW07D

SB16 0-2

9/12/2022

3.7

0.562

SB16 8.5-10

9/12/2022

NE

0.82 J

31

0.198

1,880

SBDUP01 090722

9/7/2022

0.052

2.34

5,550

1.02

SB05 19-20

9/6/2022

SB06/MW06S/MW06D

SB08/MW08S/MW08S

SB06_9-10.5

9/7/2022

NΕ

ΝE

NΕ

3 STORY BLDG. 3 STORY BL

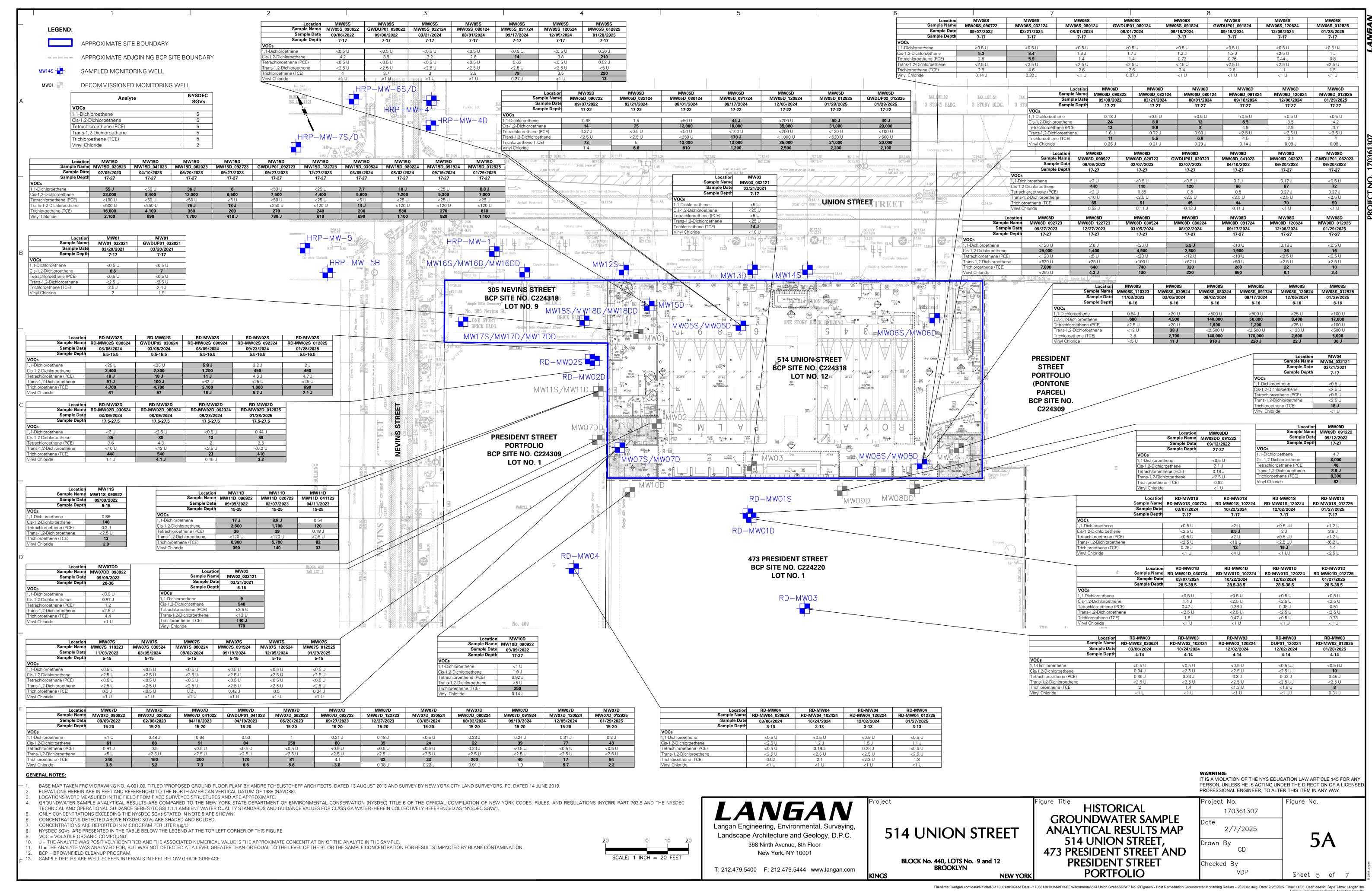
CL14.54

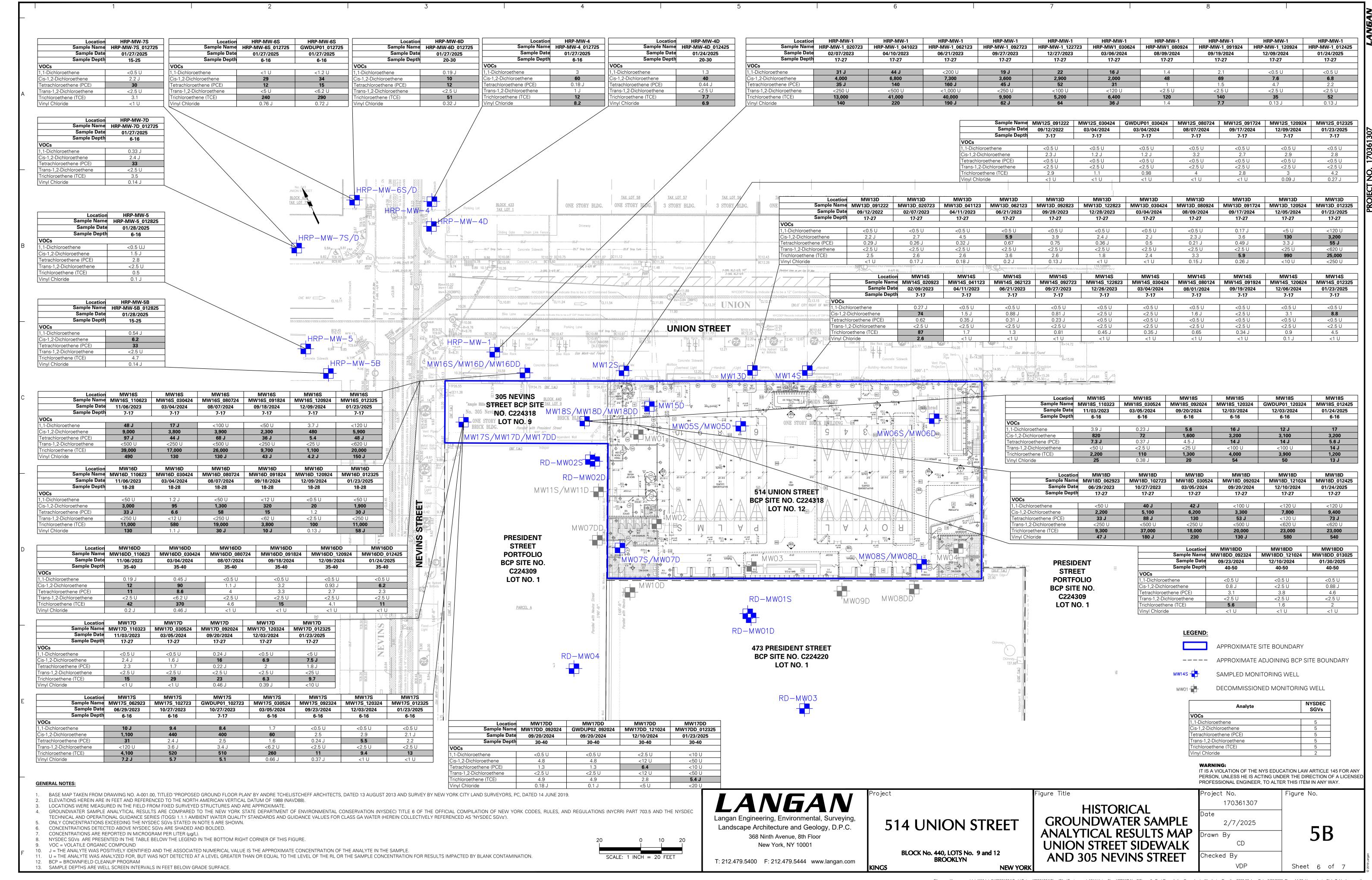
R=14.28

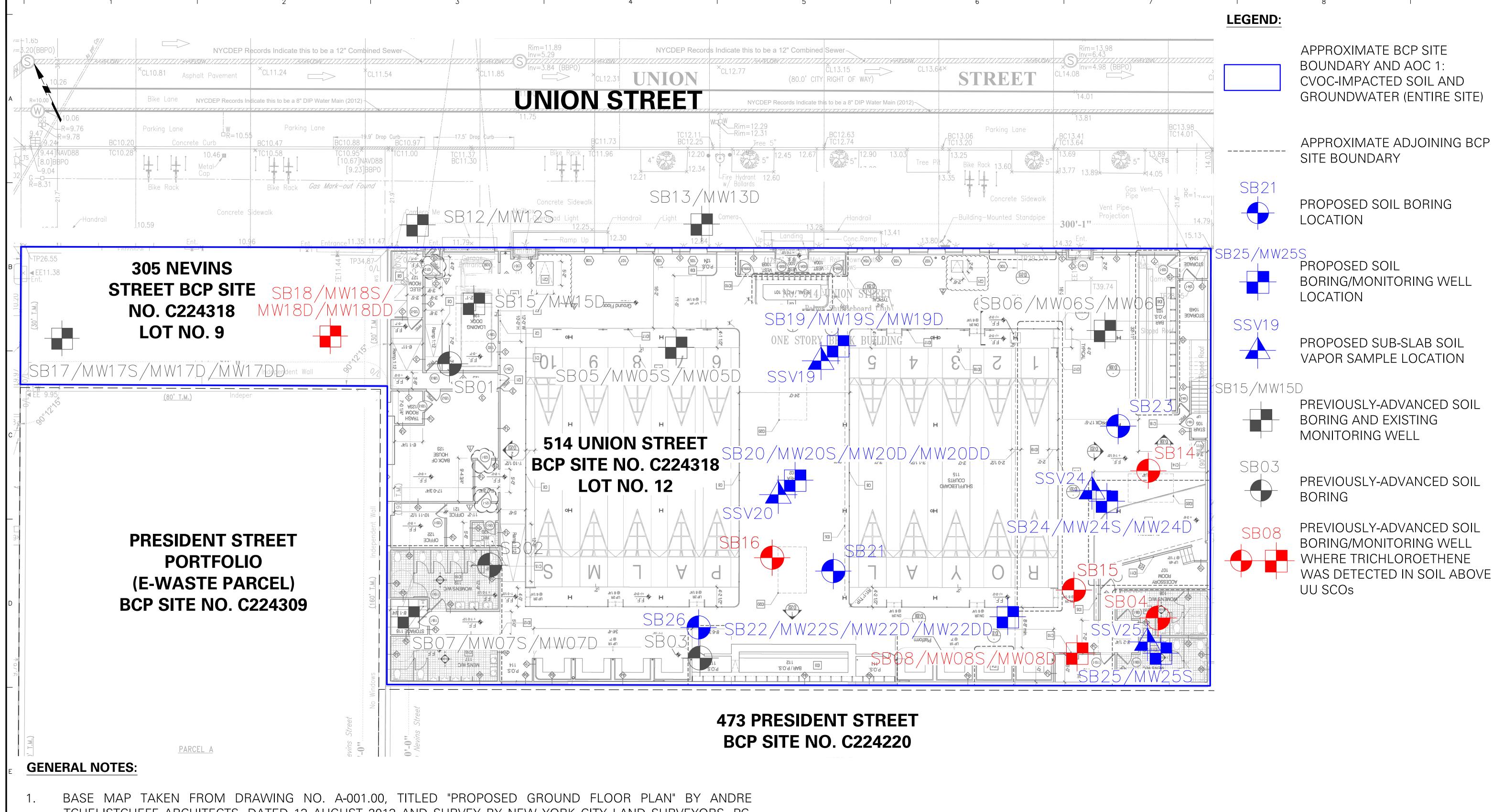
SB14

T: 212.479.5400 F: 212.479.5444 www.langan.com

NEW YORK







- TCHELISTCHEFF ARCHITECTS, DATED 13 AUGUST 2013 AND SURVEY BY NEW YORK CITY LAND SURVEYORS, PC, **DATED 14 JUNE 2019.**
- LOCATIONS OF EXISTING MONITORING WELLS WERE MEASURED IN THE FIELD FROM FIXED SURVEYED STRUCTURES AND ARE APPROXIMATE.
- UU = TITLE 6 OF THE NEW YORK CODES, RULES, AND REGULATIONS (6 NYCRR) PART 375 UNRESTRICTED USE (UU)
- SCO = SOIL CLEANUP OBJECTIVES
- BCP = BROWNFIELD CLEANUP PROGRAM
- AOC = AREA OF CONCERN
- CVOC = CHLORINATED VOLATILE ORGANIC COMPOUND



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514 UNION STREET

BLOCK No. 440, LOTS No. 9 and 12 BROOKLYN

AREA OF CONCERN AND PROPOSED SAMPLE LOCATION **PLAN**

170361307 07/09/2025 6 .∂rawn By CD Checked By

APPENDIX A CONSTRUCTION HEALTH AND SAFETY PLAN

CONSTRUCTION HEALTH AND SAFETY PLAN

FOR

514 UNION STREET 473 PRESIDENT STREET BROOKLYN, NEW YORK Brooklyn Borough Tax Parcel Block 440, Lots 1, 9 and 12

Prepared for

Gowanus President Owner LLC 400 West 59th Street New York, New York

Prepared by:

Langan Engineering, Environmental, Surveying
Landscape Architecture and Geology
360 West 31st Street, 8th Floor
New York, New York 10001

June 2024 Langan Project No. 170361303



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^{*} Items to be posted prominently on-site or made readily available to personnel.

1.0 INTRODUCTION

Langan Project No. 170361303

1.1 General

Brooklyn, New York

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 Code of Federal Regulation (CFR) 1910.120(b)(4), Hazardous Waste Operations and Emergency Response during anticipated site work for the development located at 514 Union Street, 532 Union Street, 469 President Street, and 473 President Street in the Gowanus neighborhood of Brooklyn, New York (the Site). The site is identified on the Brooklyn Borough Tax Map as Block 440, Lot 12, 21, 23 to 26, 47 and 48.

This CHASP provides the minimum requirements for implementing site operations during future remedial measures. All contractors performing work on this site must 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 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 consists of several parcels on Brooklyn Borough Tax Block 440: the E-Waste Parcel (former Lot 1) and the Pontone Parcel (former Lots 21, 23 to 26, 47 and 48). These two parcels are separated by former Lot 12, part of which is in the NYSDEC BCP (BCP Site No. C224220). The parcels including the BCP Site No. C224220 comprise the proposed redevelopment project. A lot merger application (RP-602) was approved by the New York City Department of Finance on 5 February 2020 to merge former Lots 1, 21, 23, to 26, 47, 48 and the portion of former Lot 12 that comprises BCP Site No. C224220 into new Lot 1. The over 48,000 square feet site is located in an urban area in the Gowanus neighborhood of Brooklyn, New York, and includes several buildings including a one-story brick building occupied by the Royal Palms Shuffleboard Club, an interconnected one- to three-story brick building occupied by a casket manufacturer and a storage warehouse. A site location map is included as Figure 1. The site has been occupied by commercial and industrial facilities since as early as 1886.

1.3 Summary of Work Tasks

1.3.1 Geophysical Investigation - Underground Utility Clearance Policy

Prior to the commencement of intrusive field activities (i.e., soil borings); Langan will follow the Langan Underground Utility Clearance Policy including retaining a geophysical consultant to conduct a geophysical survey using ground penetrating radar (GPR) and electromagnetic detection equipment. The objective of the survey will be to identify any underground storage tank (UST) structures, drains, underground utilities, and other subsurface anomalies that may be encountered during the investigation. During this time Langan personnel will inspect the site and confirm investigation locations are both accessible and free of potential utility or other known or suspected subsurface structures.

1.3.2 "Soft-Dig" Clearance of Borehole Locations

If there is no geophysical survey for utility clearance or the results of the geophysical survey are inconclusive at specific locations subject to intrusive work, or otherwise in compliance with Langan's Underground Utility Clearance Policy, the drilling contractor may "soft-dig" each proposed drilling location or a separate contractor may be retained to "soft-dig" the locations to confirm they are free of utilities or other known or suspected subsurface structures. The dimensions of each location should extend to a depth of 5-feet and be about 1.5 times the anticipated diameter of the borehole when drilled. Langan personnel will confirm that the "soft dig" activities are completed to these specifications.

1.3.3 Day Lighting Excavation and Soil Screening

Langan may retain an excavation contractor to daylight buried unidentified structures. The purpose of the daylighting is to confirm if these structures are subsurface structures of concern (USTs, utilities sewer lines, storm water drains, electrical, gas or other utility line as well as other artifacts pertinent to the work plan). The excavation contractor will contact the appropriate utility mark-out authority and make available to their staff the verification number and effective dates.

The excavation contractor will employ "soft dig" methods in accordance with the Langan Underground Utility Clearance Policy when excavating. Langan may screen excavated soil for visual, olfactory, and instrumental indicators suggestive of a potential chemical or petroleum release. Instrument screening for the presence of volatile organic compounds (VOC) may be performed with a duly calibrated photoionization detector (PID). Contractors will notify Langan personnel if they identify indications suggestive of a potential chemical or petroleum release. Contaminated material shall be handled, and property disposed in accordance with federal, state and city regulations, criteria, and guidelines.

1.3.4 Asbestos Abatement

Langan personnel will conduct site visits and record observations for subsequent reporting on asbestos abatement being completed by a 3rd party independent contractor. The work is being conducted independently of Langan supervision and Langan will not be entering areas undergoing abatement nor perform any monitoring activities. The contractor will perform all work and monitoring under their own CHASP following their own work plan.

1.3.5 Demolition of Exiting Structures

Langan will observe the demolition and removal of the existing structures. These activities include excavation and stockpiling of debris, excavation, and grading to site soil for stabilization, and backfilling with gravel. Details of the scopes of work are detailed in the Work Plan.

During construction, all soils and debris excavated or disturbed at the site will be either transported off site for disposal at an approved facility, stockpiled on polyethylene sheeting pending determination of the need to sample for disposal purposes or reused on the property. Personnel conducting activities will report to Langan when encountering impacted historic fill, petroleum impacted material or impacted groundwater and shall abide to the provisions of this CHASP.

1.3.6 Groundwater Investigation and Sampling

Existing or new groundwater monitoring wells may be sampled to evaluate groundwater quality. Groundwater samples will be collected in accordance with the Langan Low Flow Groundwater Sampling SOP (SOP #12). Groundwater samples will be submitted to an approved laboratory and analyzed for constituents as specified in the work plan.

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

1.3.7 Groundwater/Product Gauging

Langan may gauge one or more of the observation/monitoring wells to collect synoptic head data or determine the presence of product. When gauging, Langan may also survey head space VOCs within the well using a duly calibrated PID. When collected, gauging data will be based on the northernmost point at top of casing (TOC) using an interface probe (IP) capable of determining the presence of free product in the monitoring well as light non-aqueous phase liquid (LNAPL) at the top of the water column. If gauging for dense non-aqueous phase liquid

(DNAPL) at the base of the monitoring well, the IP may not be appropriate. The field engineer will coordinate with the project team to devise an alternative method to gauge the thickness of DNAPL at base of the well. Langan will decontaminate gauging equipment between wells as required by the work plan.

1.3.8 Product Bailing

Langan may remove free product from on-site monitoring wells as part of this HASP or subsequent SMP activities. Langan will may use a bailer, peristaltic pump or submersible as determined by the work plan. Langan will record the volume of product and groundwater recovered. Recovered product and groundwater will be drummed in accordance with procedures outlined in the work plan.

1.3.9 Groundwater Monitoring Well Development

New or existing groundwater monitoring wells may be developed in accordance with the method defined in the work plan.

1.3.10 Soil Vapor Point Installation and Sampling

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

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

1.3.11 Excavation and Soil Screening

Langan personnel will screen excavated material for visual, olfactory, and instrumental indicators suggestive of a potential chemical or petroleum release. Instrument screening for the presence of volatile organic compounds (VOC) may be performed with a duly calibrated Photoionization detector (PID). Contractors will excavate for utilities, foundation components and potential grading using heavy equipment and hand tools. Contractors will notify Langan personnel if they identify indications of a potential chemical or petroleum release. Contaminated material must be

handled, and property disposed in accordance with federal, state and city regulations, criteria, and guidelines.

1.3.12 Soil Screening

As part of future excavation activities, the Langan personnel will report when they have observed visual and olfactory indications of possible soil impact. Langan personnel will also report concentrations of VOCs or methane above background when using a properly calibrated handheld PID and flame ionization detector (FID), or equivalent.

1.3.13 Soil Sampling

Soil samples (waste characterization, excavation endpoint, delineation, or quality assurance/quality control [QA/QC]) may be collected during construction, as required. Langan personnel will coordinate with the contractor in sampling soil (in accordance with the Site Management Plan [SMP], where applicable). If stockpile soil sampling is required from above ground level, suitable excavation equipment (i.e., excavator, front end loader) should be used to collect the sample.

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

1.3.14 Endpoint/Delineation Soil Sampling

As part of the excavation activities, Langan may retain a drilling contractor to advance soil borings to a depth bgs specified in the work plan. If required, soil sampling will be completed to delineate suspected hazardous and/or source material areas, should hazardous materials be identified in soil analytical data. Boring locations will be based on the results of previous investigations and document review. The drilling contractor will contact the appropriate utility mark-out authority and make available to their drilling staff the verification number and effective dates. The borings may be filled with clean soil cuttings after samples are collected.

In addition to hazardous delineation, Langan will screen soil for visual, olfactory, and instrumental indicators suggestive of a potential petroleum release. Instrument screening for the presence of VOCs may be performed with a calibrated PID. Soil samples for excavation endpoint or delineation sampling (along with QA/QC samples) will be submitted to a NYSDOH ELAP-certified laboratory and analyzed accordance with work plan specifications.

1.3.15 Hot Spot Soil Excavation and Disposal

Source material and/or hazardous areas are to be excavated and the soil transported to an off-

site licensed disposal facility. Langan will observe the activities associated with the excavation and disposal of the source material and hazardous material hotspots. Langan personnel will coordinate with the excavator contractor so that the boundaries of the hotspot excavation correspond to with the approved disposal facilities instructions. Langan personnel are not to sign the hazardous waste manifests unless instructed by the Project Manager.

Hotspot soil excavation and disposal cannot commence until the air monitoring guidelines specified in Section 3.1.4 of this CHASP have been implemented and appropriate safety PPE is available.

1.3.16 Stockpiling

As part of future excavation activities, potentially impacted soil may be stockpiled pending laboratory analysis and determining proper off-site disposal. Visibly contaminated soil, if encountered, must be segregated, and stockpiled on at least 10 millimeters of plastic sheeting; reusable soil and fill must be segregated and stockpiled separately from unusable fill, concrete and other debris; the stockpiles must be kept covered with 6 millimeters thick plastic sheeting; the plastic sheeting covering the stockpiles must be anchored firmly in place by weights, stakes, or both; the Contractor must maintain the plastic sheeting.

1.3.17 Characterization of Excavated Material

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

1.3.18 Concrete Coring & Excavation

Langan will retain a contractor to remove portions of a raised wooden floor and core the underlying concrete slab at selected locations. Prior to the commencement of intrusive field activities (i.e., soil borings); the contractor will contact the appropriate utility mark-out authority and make available to their staff the verification number and effective dates. The contractor may be required to undertake minimal excavation to meet the design criteria of the work plan.

Langan will observe excavated soil for visual, olfactory, and instrumental indicators suggestive of a potential petroleum release. Instrument screening for the presence of volatile organic compounds (VOCs) may be performed with a duly calibrated photoionization detector (PID). Langan may collect soil samples if directed by the project manager or as part of the work plan. Soil samples will be submitted to a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory and analyzed in accordance with work plan specifications.

1.3.19 Injection/Monitoring Well Installation and Sampling

Langan may install injection/monitoring wells as specified in the RAWP. Langan will retain a drilling contractor to advance soil borings to a depth bgs specified in the work plan. Borings will be installed at the approximate locations indicated in Langan's work plan, and may be moved in the field based on utility clearance and accessibility. The drilling contractor will contact the appropriate utility mark-out authority and make available to their drilling staff the verification number and effective dates.

Langan personnel will screen soil for visual, olfactory, and instrumental indicators suggestive of a potential petroleum release. Instrument screening for the presence of VOCs may be performed with a calibrated PID. Langan personnel may collect soil samples from the proposed soil boring locations following the sampling plan outlined in the work plan.

Selected soil borings will be converted into injection or monitoring wells. Injection wells will be completed in accordance with the work plan based and following the completion program outlined in the in-situ groundwater treatment plan of the RAWP. Monitoring wells will be sampled in accordance with the work plan to evaluate groundwater quality during and after the in-situ groundwater treatment pilot test and final install/treatment. Groundwater samples will be collected in accordance with the Langan Low Flow Groundwater Sampling SOP (SOP #12). Groundwater samples will be submitted to a NYSDOH ELAP-certified laboratory and analyzed in accordance with work plan specifications. Borings not completed as injection or monitoring wells will be backfilled and abandoned in accordance with State and Local regulations.

1.3.20 In-Situ Groundwater Treatment

Langan proposes an in-situ treatment of contamination consisting of injecting remediation compounds into new or existing wells located in on the site. Langan will oversee the treatability/feasibility study and based on the data derived, design and document the installation and start-up of the in-situ groundwater treatment system.

1.3.21 Installation of Sub-Slab Depressurization (SSD) System

Langan will retain contractors to install the components of the proposed SSD system. Components include:

- Sub-slab piping;
- Above-ground piping; and
- Roof Mounted Blower.

As well electrical and structural components that will provide power or brace/support the SSD system components.

1.3.22 Sub-Slab Depressurization System Inspection

Once active, Langan will perform periodic inspections of the SSD system in accordance with work plan or site management plan (SMP) or as directed by the PM. Inspections will include:

- An assessment of the condition of the SSD system including the four roof-mounted components;
- Collection of vacuum and VOC readings at each of the permanent vapor monitoring points; and
- Collection of flow rate and VOC readings at the effluent at designated points sampling ports in the system.

All work will be duly documented in the O&M work logs and included as required in the O&M reports.

1.3.23 Air Sparge and Soil Vapor Extraction (AS/SVE) System

Langan will observe installation and subsequently operate, maintain, and monitor an AS/SVE system. AS/SVE system operations, maintenance & monitoring (OM&M) activities include system operation, site checks/inspections, routine (scheduled) or unscheduled maintenance, and system monitoring, optimization, and troubleshooting. During OM&M of the AS/SVE system soil vapor samples will be collected periodically to monitor the performance of the SVE system. The AS/SVE system consists of AS/SVE wells connected to a main AS/SVE header pipe that extends to a manifold closet. The header pipe connects to a vacuum blower and a moisture separator. A network of soil vapor monitoring points is located throughout the building to monitor the vacuum influence.

1.3.24 Support of Excavation (SOE)

Langan personnel will perform observational and inspection activities in support of excavation. These activities include drilling of soil pilings and tiebacks and other activities specified in the work plan.

1.3.25 Construction Activity Inspections and Observations

Langan will observe construction activities including the general oversight, observation of landscaping activities, and other select observation, project management, and supervision as

specified in the work plan or in accordance with the construction documents, or special inspection requirements administered by the New York City Department of Buildings. Materials used for construction will be inspected by Langan for conformance to the design documents.

1.3.26 Observation/Monitoring Well Plugging and Abandonment

At an unspecified future date, the observation/monitoring wells will be abandoned. Plugging and abandonment will be in accordance with federal and state requirements. Langan may retain a drilling contractor to complete the plugging and abandonment activities. The contractor will contact the appropriate utility mark-out authority and make available to their field staff the verification number and effective dates. Langan may observe the plugging and abandonment of one or more observation/monitoring wells to document that the plugging and abandonment activities were completed in accordance with the work plan and regulations.

1.3.27 QA/QC Sampling

Samples for quality assurance/quality control [QA/QC] may also be collected and submitted to an approved laboratory and analyzed in accordance with work plan specifications. Information regarding the QA/QC samples including required method of analysis may be included in the same COC as the soil samples unless otherwise instructed by the work plan.

1.3.28 Excavation Backfill

Areas of the site that were over-excavated may be backfilled to development grade (i.e., the grade required to complete construction of the foundation and sidewalk extension). Imported material should meet specifications defined in the work plan or consist of clean fill that meets the 6 New York Codes, Rules and Regulations (NYCRR) Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives (UU SCOs) or other acceptable fill material such as virgin stone from a permitted mine or quarry or recycled concrete aggregate (RCA), from a New York State Department of Environmental Conservation (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.

1.3.29 Decommissioning and Removal of Underground Storage Tank

If an underground storage tank (UST) is encountered, a UST decommissioning and removal contractor shall furnish all labor and materials, equipment and incidentals required for the proper decontamination, removal and closure of any UST in accordance with federal, state and local regulations. Langan personnel will monitor VOCs with a calibrated PID downwind from the UST

excavation and record the PID readings.

1.3.30 Construction Dewatering

Construction dewatering may be required, the dewatering 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 local sanitary sewer system after treatment and under approved regulatory 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.

1.3.31 Equipment Decontamination

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

1.3.32 Management of Investigative-Derived Waste

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

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

1.3.33 Drum Sampling

Langan personnel may collect drum samples, as required, prior to off-site drum disposal. Samples will be placed into laboratory-supplied batch-certified clean glassware and submitted to

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

1.3.34 Surveying

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

2.0 IDENTIFICATION OF KEY PERSONNEL/HEALTH AND SAFETY PERSONNEL

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

2.1 Langan Project Manager

The Langan Environmental Project Manager (PM) is Vinicius De Paula, his responsibilities include:

- Ensuring that this CHASP is developed, current, and approved prior to on-site activities.
- Ensuring that 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 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 the development of the CHASP, updating CHASP as dictated by changing conditions, job site 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.).

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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 field 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 maintain community air monitoring activities and instruct the responsible contractor to implement organic vapor or dust mitigation when necessary.
- Overseeing the implementation of activities specified in the IRMWP.

2.5 Contractor Responsibilities

The contractor must develop and implement their own CHASP for their employees, their subcontractors, and consultants. The contractor is responsible for their own health and safety and that of their subcontractors. Contractors operating on the site must designate their own FTL,

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HSO, and Health and Safety Manager (HSM). The contractor's CHASP will be at least as stringent as this 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 pertaining 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 of 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 adhere to all federal, state, and local regulatory requirements.

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSES

A Task-Hazard Analysis (Table 1) was completed for general construction hazards that may be encountered at the Site. The potential contaminants that might be encountered during the field activities and the exposure limits are listed in Table 2 complete inventory of MSDS/SDS for chemical products used on site is included in Attachment E.

3.1 Specific Task Safety Analysis

3.1.1 Geophysical Survey

Langan personnel are not permitted to operate or otherwise handle the geophysical equipment including any downhole geophysical equipment subsequently used to survey boreholes. When boring locations are surveyed with surface geophysical equipment, the locations of the borings as well as utilities and other artifacts that may interfere with the subsurface investigation are to be marked with indelible paint, flags, or color tape (when marking indoor locations that the client has specifically requested not be marked with indelible paint). This information must also be

added to the site map. When applying paint, proper PPE including at a minimum hand protection should be used.

3.1.2 "Soft Dig" Clearance of Borehole Locations

"Soft-Dig" clearance will be completed by the contractor. Langan personnel are not permitted to operate or otherwise handle the contractor's equipment. Langan will update the site map to include the locations of the cleared borehole locations as well as utilities and other artifacts that may interfere with the subsurface investigation.

3.1.3 Daylighting Test Pit

Excavation daylighting must abide by OSHA excavation standards (Part 1926.651) and conform to the Langan Underground Utility Clearance Policy. Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. Sampling the soil requires the donning of chemical resistant gloves in addition to the standard PPE. Langan personnel are not to operate excavation equipment. This task is to be completed by the excavation contractor.

3.1.4 Indoor Drilling and Excavation

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

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

The OSHA Time Weighted Average (TWA) Permissible Exposure Limit (PEL) for CO from 50 to 35 parts per million (ppm). Langan will monitor CO with a suitable monitoring device. If CO

levels exceed 5 ppm, Langan will instruct contractors to begin mitigation measures. These measures are at a minimum:

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

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

3.1.5 Building Demolition

Langan will not be entering demolition areas nor perform any monitoring activities. The contractor will perform all work and monitoring under their own CHASP following their own work plan.

3.1.6 Soil Investigation and Sampling

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

3.1.7 Groundwater Investigation and Sampling

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

1.3.8 Groundwater/Product Gauging

Gauging product requires additional safety considerations including the presence of VOCs and protection of both field cloths and property. Langan will monitor air for VOCs using a duly calibrated PID. Langan will don protective clothing including Tyvek® over-cloths, as necessary. To protect property, Langan will work set a plastic barrier to protect floors or protect landscaping and use absorbent pads as necessary to collect pooled product. If sampling for PFAS from the same well, Langan will complete the product check first, if the well can be

sampled without including product, Langan will remove the Tyvek® material from the well head vicinity.

3.1.9 Product Recovery Well Bailing

Langan may bail free product from monitoring wells. Free product bailing requires the donning of TyvekTM suits, TyvekTM boots and chemical resistant gloves in addition to the standard PPE and cut resistant gloves when cutting sampling-tubing to length. In addition, Langan will place plastic sheeting around the recovery well head to control spillage during product recovery. Langan will also keep on hand and readily available product absorbing pads to use as needed.

3.1.10 Electrical Pumps

Langan may use an electric pump to collect product from the recovery wells or to sample groundwater. Langan will inspect the electric pump and control box prior to use and specifically note the condition of the electrical connectors, pump, control box and the electrical cord. The electrical connection must be a grounded and connect to the power source using a functional three prong grounded plug. The power source must be a Ground Fault Circuit Interrupter (GFI or GFCI) receptacle.

3.1.11 Groundwater Monitoring Well Development

Well development requires the donning of hand protection against chemical exposure and physical abrasion. Langan is encouraged to don chemical resistant gloves over (leather) work gloves in addition to the standard PPE. In addition, Langan is to don cut resistant gloves when cutting high density polyethylene-tubing (HDPT) to length. .

3.1.12 – Site Control During Sidewalk Groundwater Sampling

Langan will establish work zones to protect pedestrian sidewalk traffic when sampling monitoring wells set in the public sidewalk right-of-way. The distance, size and shape of the work zone must be based on conditions specific to the well location. Distances between zone boundaries should be sufficient to allow room for the necessary operations, provide adequate distances to prevent the spread of contaminants, and eliminate the possibility of injury due to explosion or fire. The controls established are considered temporary and not to be left in place after the work at the well has been completed for the day.

3.1.13 Concrete Coring & Excavation

Langan personnel are not permitted to operate or otherwise handle the contractor equipment.

All electrical equipment and cords must be visually inspected. If the equipment housing appears damage or the electrical cords worn, they must be removed from use and replaced before the designated task continues. The contractor will use a Ground Fault Interrupter Circuit (GFIC) as a safety precaution.

3.1.14 Installation of Sub-Slab Depressurization (SSD) System

Unless specifically permitted by the work plan, Langan will not assist the contractor in installing components of the SSD system. Langan will observe and record pertinent information as required by the work plan. Langan employees are required to have completed fall protection training before completing any work from heights including roof work.

3.1.15 Operations and Maintenance

Langan will don standard PPE including hand and hearing protection when performing remedial system operations and maintenance activities. When and where necessary, Langan will implement lock-out/tag-out protocols. Waste generated during operations and maintenance will be contained as specified in this CHASP and in the work plan. As required, Langan may sample drums generated as specified in this HASP and the work plan. Specific Safety Data Sheets (SDS) for chemical and consumables related to the operations and maintenance of the SSD system will be kept in the CHASP Attachment I with the Operations and Maintenance manual (on-site).

3.1.16 Vapor Investigation and Sampling

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

3.1.17 Excavation and Soil Screening

Langan personnel will observe excavation and SOE activities including the general oversight, observation of landscaping activities, and other select observation project management and supervision as specified in the work plan or in accordance with the construction documents, or special inspection requirements administered by the DOB. Materials used for construction may be inspected by Langan personnel for conformance to the design documents. Prior to entering excavation, Langan personnel will ensure that excavation shoring conforms to proper shoring/sloping techniques, at a minimum that soil and equipment is kept at least 2 feet from the edge of the excavation, that there is no water in the excavation, and that a competent

person has inspected excavation prior to allow persons to enter. When entering excavation via a ladder, Langan personnel will only use ladders that are properly situated in accordance with the Ladder section of the CHASP.

3.1.18 Soil Screening and Sampling

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

3.1.19 Lead Hazardous Delineation and Excavation for Disposal

Lead delineation sampling requires additional precautions to mitigate lead exposure. Langan will monitor indoor dust using air-dust monitoring equipment (DustTrak[™] 2 or equivalent). The dust monitoring equipment should be equipped with an alarm. The primary alarm should be set for 49 milligrams per cubic meter (mg/m³) above the 15-minute average background. The secondary alarm may be set for 247 mg/m³.

If the primary alarm activates during work, the PM notified, and dust control measures should be implemented, and all workers should don half face respirator with HEPA dust filters to continue to work. Dust control measures include applying a fine water spray wet all surfaces in the work area to dampen dust and activating ventilation. Workers can remove half respirators when air borne dust concentrations return to background. If dust mitigation does not lower dust concentrations and dust levels continue to climb, all work should cease when dust concentrations exceed 247 mg/m³ and the PM should be notified.

3.1.20 Stockpile Sampling

The Langan personnel are not to scale or 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).

3.1.21 Construction Dewatering

If required, Langan may sample dewatering treatment system liquids from either the direct discharge standpipe or from a sample port or valve built into the storage tank, Langan will don the necessary PPE including nitrile gloves and if necessary, facial splash guard. 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.

3.1.22 Construction Activity Inspection

Langan personnel will conduct inspections as specified in the work plan. Langan may record the data the work plan requires. All future repair work to the engineering controls will be done exclusively by the contractor following their own health and safety specifications outlined in their HASPs. Other activities assigned to Langan as part of work activities are limited to inspection and observations as specified in the SMP or future work pans. Langan personnel are not to operate or assist in the operation of equipment used in construction activities unless defined as part of an inspection or observation in the work plan.

3.1.23 Support of Excavation

Langan engineers may complete additional tasks following the work plan specifications for support of excavation (SOE) actives. These tasks are to be completed donning standard PPE. Langan engineers should compile a job safety analysis for specific tasks as necessary.

3.1.24 Installation and Operation of Injection Well Network

Specifically trained contractors are to install and operate the injection network. This includes operating heavy equipment, assembling required parts and the operation of the system during injection activities. Langan personnel are there only to observe and record the data required in the work plan. Assemblage of injection well parts, operation of drilling and injection equipment as well as system operations are to be done exclusively by the contractor following their own health and safety specifications outlined in their CHASP.

3.1.25 In-Situ Residual Groundwater Treatment – Design and Implementation

The Contractor is responsible for the procurement, management, handling, and applications of all in-situ products. Langan personnel will observe and record pertinent information as the contractor applies groundwater treatment as required by the work plan or directed by the PE. Langan must don appropriate chemical resistant clothing including at a minimum, gloves when working in close proximity with the oxidizing chemicals. In addition, Langan must ensure that contractor takes the necessary precautionary actions to prevent and uncontrolled in-situ product releases, and in the unlikely event of a release, ensure that contractor takes the necessary health and safety measures including to mitigate the release and report the event in accordance to applicable Federal, State and local regulations.

Langan personnel are not to operate contractor. These tasks are to be completed by the

contractor.

3.1.26 In-situ Chemical Oxidation Application

Langan must don appropriate chemical resistant clothing including at a minimum, gloves when working in close proximity with the oxidizing chemicals.

3.1.27 Drum Sampling

Drilling fluid, rinse water, grossly contaminated soil samples, and cuttings will be containerized in 55-gallon drums for disposal off-site. Each drum must be labeled in accordance with the Langan Drum Labeling Standard Operating Procedure (SOP09). Sampling drums requires the donning of work gloves when opening the drums and chemical resistant gloves when sampling in addition to standard PPE.

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

3.2 Radiation Hazards

No radiation hazards are known or expected at the site.

3.3 Physical Hazards

Physical hazards, which may be encountered during site operations for this project, are detailed in Table 1.

3.3.1 Explosion

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

3.3.2 Heat Stress

The use of Level C protective equipment, or greater, may create heat stress. Monitoring of personnel wearing personal protective clothing should commence when the ambient temperature is 72°F or above. Table 6 presents the suggested frequency for such monitoring. Monitoring frequency should increase as ambient temperature increases or as slow recovery rates are observed. Refer to 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 must 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 spasms 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. <u>This is a life-threatening</u> <u>condition</u>.

<u>Do not</u> 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 a similar device to measure the oral temperature at the end of the work period (before drinking). If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period. A worker cannot return to work after a rest period until their oral temperature is below 99.6°F. If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following cycle by one-third. Do not permit a worker to wear a semi-permeable or impermeable garment when oral temperature exceeds 100.6°F (38.1°C).

<u>Prevention of Heat Stress</u> - 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 illnesses. 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.

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- 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 equal the amount of water lost in sweat, i.e., eight fluid ounces (0.23 liters) of water must be ingested for every eight ounces (0.23 kilograms [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:
 - o Maintain water temperature 50° to 60°F (10° to 16.6°C).
 - o Provide small disposal cups that hold about four ounces (0.1 liters).
 - Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.
 - O 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 called frostbite.

- **Hypothermia** Hypothermia is defined as a decrease in the patient core temperature below 96°F. The body temperature is normally maintained by a combination of central (brain and spinal cord) and peripheral (skin and muscle) activity. Interference with any of these mechanisms can result in hypothermia, even in the absence of what normally is considered a "cold" ambient temperature. Symptoms of hypothermia include shivering, apathy, listlessness, sleepiness, and unconsciousness.
- **Frostbite** Frostbite is both a general and medical term given to areas of local cold injury. Unlike systemic hypothermia, frostbite rarely occurs unless the ambient temperatures are less than freezing and usually less than 20°F. Symptoms of frostbite are a sudden blanching or whitening of the skin; the skin has a waxy or white appearance and is firm to the touch; tissues are cold, pale, and solid.

<u>Prevention of Cold-Related Illness</u> - 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 an enclosed, heated environment on or adjacent to the site.
- Assure the availability of dry changes of clothing.
- Assure the availability of warm drinks.
- Start (oral) temperature recording at the job site:
- At the FSO or Field Team Leader's discretion when suspicion is based on changes in a worker's performance or mental status.
- At a worker's request.
- As a screening measure, two times per shift, under unusually hazardous conditions (e.g., wind-chill less than 20°F, or wind-chill less than 30°F with precipitation).
- As a screening measure whenever anyone worker on the site develops hypothermia.

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

3.3.4 Noise

Work 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 the 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.

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3.3.7 Utilities (Electrocution and Fire Hazards)

3.3.7.1 Utility Clearance

The possibility of encountering underground utilities poses fire, explosion, and electrocution hazards. All excavation work will be preceded by a review of available utility drawings and by notification of the subsurface work to N.Y. One –Call–Center.

3.3.7.2 Lockout-Tagout

The potential adverse effects of electrical hazards include burns, arc flashes, and electrocution, which could result in serious injury including death. Therefore, there is a procedure that establishes the requirements for the lockout/tag out (LOTO) of energy isolating devices in accordance with the OSHA electrical lockout and tagging requirements as specified in 29CFR1910.147 and 29 CFR 1926.417. This procedure will be used to ensure that all machines and equipment are isolated from potentially hazardous energy. If possible, equipment that could cause injury due to unexpected energizing, start-up, or release of stored energy will be locked/tagged, before field personnel performs work activities.

The facility owner/operator/representative is to be the authorized person that will initiate and perform the LOTO in accordance with applicable rules and practices. Inerting of electrical power sources is to be completed by an authorized and licensed electrician. Langan personnel will follow LOTO protocols and practices including adding a separate lock/signature to the LOTO chain in accordance with said protocols and practices.

SPECIAL NOTE: Project personnel will assume that all electrical equipment at the surface, subsurface, and overhead locations are energized until equipment has been designated and confirmed as de-energized by a utility company representative. Langan will notify the designated utility representative prior to working adjacent to this equipment and will verify that the equipment is energized or de-energized in the vicinity of the work location. No project work shall be performed by Langan personnel or subcontractors near energized electrical lines or equipment.

The FTL shall accompany the designated facility owner/operator/representative or authorized/licensed electrician in surveying to locate and identify all energy-isolating devices. Langan will note which switches, valves or other isolating devices are used for inerting the equipment and how they are set assuring LOTO. The lockout/tagout procedure involves, but is not limited to, electricity, motors, steam, natural gas, compressed air, hydraulic systems, digesters, sewers, etc.

3.3.8 Adequate Lighting

Indoor or night activities must be done under adequate lighting conditions. The Langan field engineer must be able to clearly see the equipment, all controls and have sufficient lighting to detail color labels. Battery operated lights are sufficient provided they cast a wide enough field to provide the required lighting and there are back-up batteries and emergency flashlights available. Electrically powered lights are suitable provided the electrical source is equipped with a ground fault interrupt circuit (GFIC) and the extensions cords are visually inspected and not used if they show cracked or missing insulation. If a generator is supplying the electricity, it must be outdoors and properly vented.

3.3.9 Physical Hazard Considerations for Material Handling

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

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

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

3.3.10 Hearing Conservation

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

3.3.11 Open Water

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

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

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

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

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

- The number of work locations where there is a danger of falling into water.
- The distance to each of those locations.

- Water temperature and currents.
- Other hazards such as, but not limited to, rapids, dams, and water intakes.

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

3.4 Biological Hazards

3.4.1 Animals

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

3.4.2 Insects

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

3.4.3 Plants

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

3.4.4 Mold

This section is restricted to subsurface investigations where sampling soil, groundwater, soil or sub-slab vapor or ambient air in an indoor environment with slight to moderate mold impact. Mold exposure symptoms include nasal stuffiness, eye irritation, or wheezing.

The Langan field engineer is required to don a ½ face respirator with a minimum p-100 particulate filter and Tyvek™ type overclothing before entering mold impacted indoor work area. The Langan field engineer must be medically cleared and have been properly fitted for a respirator before donning one.

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3.5

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3.5.1 Presence of Non-Aqueous Phase Liquids (NAPL)

Additional Safety Analysis

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

At a minimum, a PID should be used to monitor for VOCs when NAPL is observed. If NAPL is expected to be observed in an excavation or enclosed area, air monitoring must be started using calibrated air monitoring equipment designed to sound an audio alarm when atmospheric concentrations of VOC are within 10% of the LEL. In normal atmospheric oxygen concentrations, the LEL monitoring may be done with a Wheatstone bridge/catalytic bead type sensor (i.e., MultiRAE). However, in oxygen-depleted atmospheres (confined space), only an LEL designed to work in low-oxygen environments may be used. Best practices require that the LEL monitoring unit be equipped with a long sniffer tube to allow the LEL unit to remain outside the UST excavation.

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

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

3.6 Job Safety Analysis

A Job Safety Analysis (JSA) is a process to identify existing and potential hazards associated with each job or task so these hazards can be eliminated, controlled, or minimized. A JSA will be performed at the beginning of each workday, 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/tasks 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 fieldwork 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.

5.1 Mercury Monitoring

Langan includes medical monitoring for mercury during the initial baseline and annual physical.

5.2 Coronavirus

General Preventative Measures

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

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

Construction Trailers

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

Communication

Construction Health & Safety Plan 514 & 542 Union Street 469 & 473 President Street Brooklyn, New York Langan Project No. 170361303

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

Sick/III Workers

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

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. Directly 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.

Human exposure to contaminants found in the subsurface can occur through three primary routes:

- Inhalation of gases, vapors, dust, or mists is a common route of exposure. Chemicals can enter and irritate the airways and the lungs. They can become deposited in the airways or can be absorbed through the lungs into the bloodstream.
- Direct contact of contaminants with the skin or eyes is a common route of exposure. Some substances are absorbed through the skin and can enter the bloodstream. Broken, cut, or cracked skin will allow substances to enter the body more easily.

Ingestion or swallowing of food, drink, or other substances is the third route of exposure.
 Chemicals that get in or on food, utensils, or hands can be ingested. Substances can be absorbed into the blood.

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.

<u>Level D Protection (as needed)</u>

- 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 side shields or chemical splash goggles
- Safety boots/shoes (toe-protected)
- Disposable chemical-resistant boot covers.
- Coveralls (poly-coated 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 High-Efficiency Particulate Air (HEPA) filter. Langan Project No. 170361303

- 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 must be 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 to comply with 29 CFR 1910.134. The respirator cartridge change-out schedule for this project is as follows:

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

Respirators must not be stored at the end of the shift with contaminated cartridges left on. Cartridges must 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 may be collected and used to provide data to determine when exclusion zones need to be established and when certain levels of personal protective equipment

are required. For all instruments, there are Site-specific action-level criteria that 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 may be conducted for methane and VOCs. A MultiRAE LEL/Oxygen (O2) meter and FID will be used to monitor the LEL of methane, and a PID and/or FID will be used to monitor concentrations of VOCs at personnel breathing-zone height. Air monitoring will be the responsibility of the HSO or designee. Air monitoring may be conducted during intrusive activities associated with the completion of excavation, debris removal, and soil grading. All manufacturers' instructions for instrumentation and calibration will be available onsite.

Subcontractors' air monitoring plans must be equal to or more stringent than 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 may occur during intrusive work in the Areas of Concern (AOCs). Colorimetric Indicator Tubes for benzene may be used as a backup for the PID if measurements remain above background monitor every 2 hours. The HSO will monitor the employee's 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 Polycyclic Aromatic Hydrocarbons (PAHs) and metals. During invasive procedures which have the potential for creating airborne dust, such as excavation of dry soils, a real-time airborne dust monitor such as a Mini-Ram may be used to monitor for air particulates. The HSO will monitor the employee's 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 milligrams per cubic meter (mg/m³) or visible dust is observed for longer than 15 minutes or if the site PPE is upgraded to Level C, the HSO will begin monitoring

the site perimeter at a location downwind of the AOC every 30 minutes in addition to the employee breathing zone. Instrument action levels for dust monitoring are provided in Table 4.

7.1.3 Methane

During soil excavation or other intrusive activities, direct reading air monitoring may be performed in the excavation area to determine exposure to workers. Monitoring with an LEL/O2 meter and FID may occur during intrusive work in the AOCs. The HSO will monitor the employee's breathing zone at least hourly during intrusive activities. If LEL levels are observed above 20% the professional engineer (PE) or their designee will stop work and evacuate the area; warn others; and determine source of readings and take corrective actions. The Contractor will be responsible for mitigating explosive gas levels.

7.2 Monitoring Equipment Calibration and Maintenance

Instrument calibration must be documented and included in a dedicated safety and health logbook or on separate calibration pages of the field book. All instruments must 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 responses.

All instruments must be operated in accordance with the manufacturers' specifications. Manufacturers' literature, including an operation 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, dust, and methane will be established prior to intrusive activities within the AOC at an upwind location. A notation of BKD levels will be referenced in the daily monitoring log. BKD levels are a function of prevailing conditions. BKD levels will be taken in an appropriate upwind location as determined by the HSO.

Table 4 lists the instrument action levels.

8.0 COMMUNITY AIR MONITORING PROGRAM

Community air monitoring may be conducted in compliance with local standards. If conducted, Langan will implement the generic CAMP outlined below amended to comply with local conditions or standards:

Monitoring for dust and odors will be conducted during all ground intrusive activities by the FTL. Continuous monitoring of the perimeter of the work zones for odor, VOCs, and dust may be required for all ground intrusive activities such as soil excavation and handling activities. The

work zone is defined as the general area in which machinery is operating in support of remediation activities. A portable PID will be used to monitor the work zone and for periodic monitoring for VOCs during activities such as soil and groundwater sampling and soil excavation. The site perimeter will be monitored for fugitive dust emissions by visual observations as well as instrumentation measurements (if required). When required, particulate or dust will be monitored continuously with real-time field instrumentation that will meet, at a minimum, the local standards or, default to the performance standards below:

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

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

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

- If the downwind particulate level is 100 micrograms per cubic meter (µg/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 particulate matter less than 10 microns (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 reevaluation 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.

8.1 Dust Suppression Techniques

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

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

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

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

9.0 WORK ZONES AND DECONTAMINATION

9.1 Site Control

Work zones are intended to control the potential spread of contamination throughout the site and to assure that only authorized individuals are permitted into potentially hazardous areas.

Any person working in an area where the potential for exposure to site contaminants exists will only be allowed access after providing the HSO with proper training and medical documentation.

Exclusion Zone (EZ) - All activities which may involve exposure to site contaminants, hazardous materials, and/or conditions should be considered an EZ. Decontamination of field equipment will also be conducted in the Contaminant Reduction Zone (CRZ) which will be located on the perimeter of the EZ. The EZ and the CRZ will be 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 must be determined by the HSO allowing adequate space for the activity to be completed, field members, and emergency equipment.

9.2 Contamination Zone

9.2.1 Personnel Decontamination Station

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

9.2.2 Minimization of Contact with Contaminants

During the 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 another physical contact with contamination as PPE is intended to minimize accidental contact. This may minimize the degree of decontamination required and the generation of waste materials from site operations.

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

9.2.3 Personnel Decontamination Sequence

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

9.2.4 Emergency Decontamination

If circumstances dictate that contaminated clothing cannot be readily removed, then remove gross contamination and wrap injured personnel with clean garments/blankets to avoid contaminating other personnel or transporting equipment. If the injured person can be moved, he/she will be decontaminated by site personnel as described above before emergency responders handle the victim. If the person cannot be moved because of the extent of the injury (a back or neck injury), provisions must 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 exists, such as with open excavation, this area will be covered with polyethylene sheeting to eliminate any potential inhalation hazards. All emergency personnel should be immediately informed of the injured person's condition, and potential contaminants, and provided with all pertinent data.

9.2.5 Hand-Held Equipment Decontamination

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

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

9.2.6 Heavy Equipment Decontamination

All heavy equipment and vehicles arriving at the work site will be free from contamination from offsite sources. Any vehicles arriving to work that are suspected of being impacted will not be permitted on the work site. Potentially contaminated heavy equipment will not be permitted to leave the EZ unless it has been thoroughly decontaminated and visually inspected by the HSO or his designee.

9.3 Support Zone

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

9.4 Communications

The following communications equipment will be utilized as appropriate.

 Telephones - A cellular telephone will be located with the HSO for communication with the HSM and emergency support services/facilities. Hand Signals - Hand signals must be used by field teams, along with the buddy system.
 The entire field team must 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 your partner's wrists or place both hands | Leave immediately without | |
| around the waist | debate | |
| Hands on top of head | Need assistance | |
| Thumbs up | OK; I am all right; I understand | |
| Thumbs down | No; negative | |
| Simulated "stick" break with fists | Take a break; stop work | |

9.5 The Buddy System

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

- Provide his/her partner with assistance.
- Observe his/her partner for signs of chemical or heat exposure.
- Periodically check the integrity of his/her partner's PPE.
- Notify the HSO or other site personnel if emergency service is needed.

10.0 NEAREST MEDICAL ASSISTANCE

The address and telephone number of the nearest hospital:

New York-Presbyterian Brooklyn Methodist Hospital 506 6th Street Brooklyn, New York 718-780-3000

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

11.0 STANDING ORDERS/SAFE WORK PRACTICES

The standing orders, which consist of a description of safe work practices that must always be followed while on-site by Langan employees and contractors, are shown in Attachment A. The

site HSO and FTL each have the responsibility for enforcing these practices. The standing orders will be posted prominently at the site or are made available to all personnel at all times. Those who do not abide by these safe work practices will be removed from the site.

12.0 SITE SECURITY

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

13.0 UNDERGROUND UTILITIES

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

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

14.0 SITE SAFETY INSPECTION

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

15.0 HAND AND POWER TOOLS

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

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16.0 EMERGENCY RESPONSE

16.1 General

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff is essential. Specific elements of emergency support procedures that are addressed in the following subsections include communications, local emergency support units, and preparation for medical emergencies, first aid for injuries incurred on site, record keeping, and emergency site evacuation procedures. In case of emergency, in addition to 911, call <u>WorkCare - Incident Intervention®</u> at 1-888-479-7787 to report their injuries. For all other communications, contact the Langan Incident Hotline at **973-560-4699** as soon as possible.

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

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

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

An incident reporting form is included in Attachment C.

16.2 Responsibilities

16.2.1 Health and Safety Officer (HSO)

The HSO is responsible for ensuring that all personnel are evacuated safely, and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. The HSO is responsible for ensuring the HSM is 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 limit.

16.2.2 Emergency Coordinator

The HSO or their designated alternate will serve as the Emergency Coordinator. The Emergency Coordinator is responsible for ensuring that all personnel are evacuated safely, and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. They are also responsible for ensuring the HSM is 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 must locate emergency phone numbers and identify hospital routes prior to beginning work on the sites. The Emergency Coordinator must make necessary arrangements to be prepared for any emergencies that could occur.

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

16.2.3 Site Personnel

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

16.3 Communications

Once an emergency situation has been stabilized, the injured Langan personnel should contact <u>WorkCare - Incident Intervention®</u> at 1-888-479-7787 to report their injuries. For all other communications, contact the Langan Incident Hotline at **973-560-4699** as soon as possible.

16.4 Local Emergency Support Units

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

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

16.5 Pre-Emergency Planning

Langan will communicate directly with administrative personnel from the emergency room at the hospital 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 each site vehicle.

16.6 Emergency Medical Treatment

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

First Aid Kit: Contractor Vehicles
 Emergency Eye Wash: Contractor Vehicles

During the site safety briefing, project personnel will be informed of the location of the first aid station(s) that has been set up. Some injuries, such as severe cuts and lacerations or burns, may require immediate treatment. First-aid instructions provided from off-site 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. 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, an emergency may develop. Emergencies can be characterized as injury or acute chemical exposure to personnel, fire or explosion, environmental release, or hazardous weather conditions.

16.8 Emergency Site Evacuation Routes and Procedures

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

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

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

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

Under no circumstances will incoming visitors be allowed to proceed to the area of concern once an emergency evacuation has been implemented. Visitors or other persons present in the area of the emergency must be instructed to evacuate the area. The FTL will ensure that access roads are not obstructed and will remain on-site to provide stand-by assistance upon the arrival of emergency personnel.

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

16.8.1 Designated Assembly Locations

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

16.8.2 Accounting for Personnel

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

16.9 Fire Prevention and Protection

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

16.9.1 Fire Prevention

Fires will be prevented by adhering to the following precautions:

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

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

16.10 Significant Vapor Release

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

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

16.11 Overt Chemical Exposure

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

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

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

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

16.12 Decontamination during Medical Emergencies

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

16.13 Adverse Weather Conditions

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

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

- Potential for electrical storms.
- Earthquakes.
- Other major incidents.

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

16.14 Spill Control and Response

All small spills/environmental releases must 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 of. 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 must have spill kits on them with enough material to contain and absorb the worst-case spill from that vehicle. All vehicles and equipment must be inspected prior to being 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 must 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 the 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 field personnel must notify the project manager when they observe a spill or encounter conditions suggesting one might have occurred.

16.15 Emergency Equipment

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

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

16.16 Restoration and Salvage

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

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

16.17 Documentation

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

17.0 SPECIAL CONDITIONS

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

17.1 Scope

The guideline applies to the specific projects identified within this document. Additional provisions will be addressed in each Site-Specific Health and Safety Plan (CHASP), as needed.

17.2 Responsibilities

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

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

17.3 Procedures

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

17.3.1 Ladders

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

17.3.1.1 Ladder Use

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

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

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

17.3.1.2 Portable Ladders

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

17.3.1.3 Step Stools

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

17.3.1.4 Extension Ladders

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

17.3.1.5 Inspection

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

17.3.2 First Aid/Cardiopulmonary Resuscitation (CPR)

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

17.3.2.1 Emergency Procedures

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

17.3.2.2 First Aid Supplies

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

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

17.3.3 Hydrogen Sulfide

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

17.3.3.1 Characteristics

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

17.3.3.2 Health Effects

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

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

17.3.3.3 Protective Clothing and Equipment

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

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

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

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

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

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

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

17.3.3.4 Emergency and First Aid Procedures

Eye and Face Exposure

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

Skin Exposure

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

Breathing

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

Safety Precautions

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

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

17.3.4 Fire Protection/Extinguishers

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

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

17.3.5 Overhead lines

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

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

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

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

17.3.5.1 Vehicle and Equipment Clearance

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

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

- If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 ft. If the voltage is higher than 50kV, the clearance must be increased to 4 inches for every 10 kV over that voltage.
- If insulating barriers are installed to prevent contact with the lines, and if the barriers are rated for the voltage of the line being guarded and are not a part of or an attachment to the vehicle or its raised structure, the clearance may be reduced to a distance within the designed working dimensions of the insulating barrier.

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

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

17.3.6 Trade Secret

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

17.3.7 Bloodborne Pathogens

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

17.3.7.1 Training

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

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

- An accessible copy of the regulatory text of 29 CFR 1910.1030 and an explanation of its contents.
- A general explanation of the epidemiology and symptoms of bloodborne diseases.
- An explanation of the modes of transmission of bloodborne pathogens.
- An explanation of Langan's exposure control plan and how the employee can obtain a copy of the written plan.
- An explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials.
- An explanation of the use and limitations of personal protective equipment (PPE) to prevent and reduce exposure.
- Information on the types, proper use, location, removal, handling, and disposal of PPE.

- An explanation of the basis for the selection of PPE.
- Information on the hepatitis B vaccine, including information on its efficacy, safety, method of administration, the benefits of being vaccinated, and that the vaccine and vaccination will be offered free of charge.
- Information on the appropriate actions to take and persons to contact in an emergency involving blood or other potentially infectious materials.
- An explanation of the procedure to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available.
- Information on the post-exposure evaluation and determining whether the employer is required to provide for the employee following an exposure incident.
- An explanation of the signs and labels and/or color coding required by paragraph 29 CFR 1910.1030(g)(1); and
- An opportunity for interactive questions and answers with the person conducting the training session.

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

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

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

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

Work practice controls must be used to eliminate or minimize employee exposure, if applicable. Since Langan employees will have occupational exposure only during the rendering of first aid,

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personnel protective equipment will be utilized to reduce or minimize exposure. PPE that could be available to Langan personnel when administering first aid includes safety glasses, gloves, and Tyvek suits or sleeves. PPE and first aid kits will be provided to employees at no cost to them.

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

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

Langan will make available the hepatitis B vaccine and vaccination series to all employees who have occupational exposure, and post-exposure evaluation and follow-up to all employees who have had an exposure incident. These services will be available to the employee at no cost to them through a medical provider.

17.3.7.2 Recordkeeping

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

Training records will include the following:

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

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

All records will be made available upon request to employees, the Assistant Secretary of Labor for Occupational Safety and Health, and the Director of the National Institute for Occupational

Safety and Health Director of OSHA for examination and copying. Medical records must have written consent from the employee before releasing.

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

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

18.0 RECORDKEEPING

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

18.1 Field Change Authorization Request

Any changes to the work to be performed that are 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.

18.2 Medical and Training Records

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

18.3 Onsite Log

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

18.4 Daily Safety Meetings ("Tailgate Talks")

Completed safety briefing forms will be maintained by the HSO.

18.5 Exposure Records

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

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18.6 Hazard Communication Program/MSDS-SDS

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

18.7 Documentation

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

18.7.1 Accident and Injury Report Forms

18.7.1.1 Accident/Incident Report

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

18.7.1.2 First Aid Treatment Record

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

18.7.1.3 OSHA Form 300

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

19.0 CONFINED SPACE ENTRY

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

20.0 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 |
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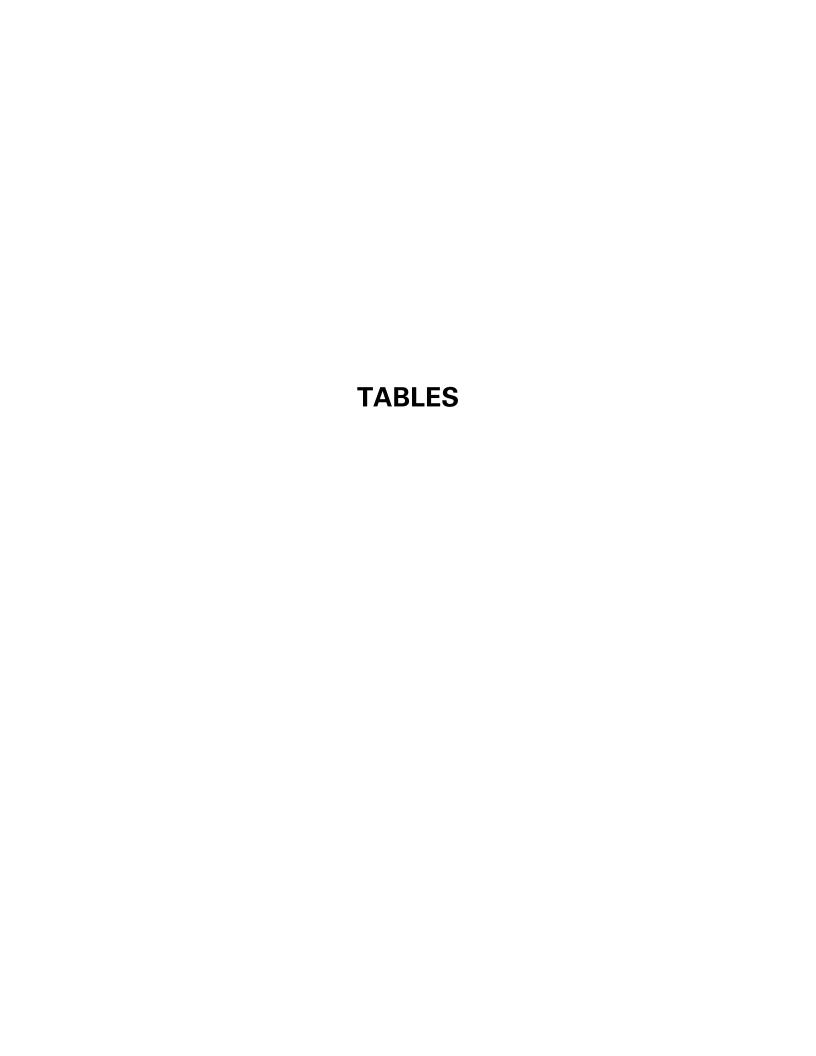


TABLE 1 TASK HAZARD ANALYSES

| Task | Hazard | Description | Control Measures | First Aid |
|-------------------|--|---|--|--|
| 1.3.1 – 1.3.34 | 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 – 1.3.34 | 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 – 1.3.34 | 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 – 1.3.34 | 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 – 1.3.34 | 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 – 1.3.34 | Noise | Excavation equipment, hand tools, drilling equipment. | Wear hearing protection; maintain safe distance from construction activities | Seek medical attention as required |
| 1.3.1 – 1.3.34 | 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 – 1.3.34 | Underground/ overhead utilities | Excavation equipment, drill rig auger contacts 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 – 1.3.34 | 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 – 1.3.34 | 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 – 1.3.34 | 1,1,2-Trichloro-1,2,2- trifluoroethane Chlorofluorocarbon-113 CFC-113 Freon® 113 Genetron® 113 Halocarbon 113 Refrigerant 113 TTE Frigen 113 TR Freon TF Trichlorotrifluoroethane | 76-13-1 | PID | 1000 ppm 2000 ppm | Groundwater Soil Vapor | inhalation, ingestion, skin and/or eye contact | irritation skin, throat, drowsiness, dermatitis; central nervous system depression; dizziness, tremor, asphyxia, unconsciousness, cardiac arrhythmias, cardiac arrest; liquid: frostbite. In animals: cardiac arrhythmias, narcosis, | Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | 1,1,2-Trichloroethane 1,1,2-TCA 1,1,2-Trichloroethane 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 – 1.3.34 | 1,1'-Biphenyl 1,1-Biphenyl Biphenyl Phenyl benzene Diphenyl | 92-52-4 | None | 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 |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|--|---------------|----------------------|-------------------|---------------------------------|---|--|--|
| 1.3.1 – 1.3.34 | 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 – 1.3.34 | 1,2,4,5-Tetrachlorobenzene Benzene Tetrachloride | 95-94-3 | PID | None None | Soil | Inhalation, skin, eyes, ingestion | Cough | Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | 1,2,4-Trichlorobenzene Unsym-Trichlorobenzene 1,2,4-Trichlorobenzol | 120-82-1 | NA | None None | Groundwater Soil Vapor | inhalation, skin absorption, ingestion, skin and/or eye contact | irritation eyes, skin, mucous membrane; In Animals: liver, kidney damage; possible teratogenic effects | Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | 1,2,4-Trimethylbenzene | 95-63-6 | PID | None None | Groundwater Soil Vapor | inhalation, ingestion, skin and/or eye contact | irritation to the eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid) | Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|--|--|----------------------|------------------------|---------------------------------------|---|--|--|
| 1.3.1 – 1.3.34 | 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 – 1.3.34 | 1,2-Dichloroethane Ethylene dichloride 1,2-DCA DCE[1] Ethane dichloride Dutch liquid, Dutch oil Freon 150 Glycol dichloride | 107-06-2 | PID | 1 ppm 50 ppm | Groundwater Soil Vapor | inhalation, ingestion, skin absorption, skin and/or eye contact | irritation to the eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen] | Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | 1,2-Dichloroethene 1,2-Dichloroethylene 1,2-DCE trans-1,2-Dichloroethylene Total 1,2-Dichloroethene cis-1,2-Dichloroethylene mixture of cis and trans Acetylene dichloride cis-Acetylene dichloride sym-Dichloroethylene cis-1,2-Dichloroethene cDCE 1,1-dimethyl-;dimethyl1,1- cyclohexane sym-Dichloroethylene Dichloroethylene Dichloroethylenes trans-1 2-Dichloroethene | 159-59-2 156-60-5 156-60-2 540-59-0 | PID | 200 ppm 4000 ppm | Groundwater Soil Vapor | inhalation, ingestion, skin and/or eye contact | Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation | Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|---------------|----------------------|----------------------|---------------------------------|---|--|---|
| 1.3.1 – 1.3.34 | 1,3,5-Trimethylbenzene Mesitylene sym-Trimethylbenzene | 108-67-8 | PID | None None | Groundwater Soil Vapor | inhalation, ingestion, skin and/or eye contact | irritation to the eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid) | Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | 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 – 1.3.34 | 1,3-Dichlorobenzene m-Dichlorobenzol; m-Phenylene dichloride m-dichlorobenzene | 541-73-1 | PID | None None | Groundwater Soil Vapor | inhalation, skin absorption, ingestion, skin and/or eye contact | irritation to the eyes, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen] | Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|--|---------------|----------------------|--------------------|---------------------------------|---|---|--|
| 1.3.1 – 1.3.34 | 1,4-Dichlorobenzene para- Dichlorobenzene p-Dichlorobenzene 1,4-Dichlorobenzene 1,4-DCB para-Dichlorobenzene p-Dichlorobenzene p-DCB PDB Paramoth Para crystals Paracide Dichlorocide | 106-46-7 | PID | 75 ppm 150 ppm | Groundwater Soil Vapor | inhalation, skin absorption, ingestion, skin and/or eye contact | irritation to the eyes, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen] | Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | 1,4-Dioxane 1,4-Dioxacyclohexane [1,4]Dioxane p-Dioxane [6]-crown-2 Diethylene dioxide Diethylene ether Dioxan Dioxane 1,4-Dioxane | 123-91-1 | PID | 100 ppm 500 ppm | Groundwater Soil Vapor | Inhalation, ingestion, skin and/or eye contact | Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | 2-(N- Methylperfluorooctanesulfona mido)acetic acid N-MeFOSAA N-methylperfluorooctane sulfonamidoacetic acid 2-(N-methyl-perfluorooctane sulfonamido) acetic acid Glycine N- [(heptadecafluorooctyl)sulfonyl] -N-methyl- N-methyl perfluorooctane- sulfonamidoacetic acid NMeFOSAA MeFOSAA | 2355-31- 9 | NA | NA NA | Groundwater | inhalation, skin or eye contact, ingestion | irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|--|---------------|----------------------|-------------------|---------------------------------------|---|---|--|
| 1.3.1 – 1.3.34 | 2,2,4-Trimethylpentane Isooctane | 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 – 1.3.34 | 2,4,5-Trichlorophenoxyacetic acid 2,4,5-T Trioxone | 93-76-5 | NA | 10 ppm 250 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 |
| 1.3.1 – 1.3.34 | 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 | None | 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 |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|--|---------------|----------------------|------------------------|---------------------------------------|---|--|---|
| 1.3.1 – 1.3.34 | 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 – 1.3.34 | 2-Chloroethylvinyl ether 2-Chloroethyl Vinyl Ether (2-Chloroethoxye)ethane Ethene (2-chloroethoxy)- 2-Vinyloxyethyl chloride Vinyl 2-chloroethyl ether | 110-75-8 | PID | NA NA | Groundwater Soil Vapor | inhalation, skin absorption, ingestion, skin and/or eye contact | inhalation, skin absorption, ingestion, skin and/or eye contact; Can cause headache, nausea, and vomiting | Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | 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 – 1.3.34 | 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 – 1.3.34 | 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 – 1.3.34 | 4,4'-DDD Dichlorodiphenyldichloroethan e 1,1'-(2,2-Dichloroethylidene)bis (4-chlorobenzene) p,p'-DDD | 72-54-8 | None | 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 – 1.3.34 | 4-Isopropyltoulene 1-Methyl-4-(1- methylethyl)benzene 4-Isopropyltoluene; 4-Methylcumene; 1-Methyl-4-isopropylbenzene Dolcymene Camphogen Paracymene Cymene p-Cymene p-Isopropyltoluene | 99-87-6 | PID | NA NA | Soil Groundwater Vapor | inhalation, skin absorption, ingestion, skin and/or eye contact | irritation to the eyes, skin, mucous membrane; dermatitis; headache, narcosis, coma | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|--|---------------|----------------------|---|---------------------------------|---|--|--|
| 1.3.1 – 1.3.34 | 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 – 1.3.34 | 4-Nitroaniline p-Nitroaniline 1-Amino-4-nitrobenzene | 100-01-6 | NA | 6 mg/m ³ 300 mg/m ³ | Soil | inhalation, ingestion, skin and/or eye contact | Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Remove to fresh air Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Acenaphthene 1,2-Dihydroacenaphthylene 1,8-Ethylenenaphthalene peri-Ethylenenaphthalene Naphthyleneethylene Tricyclododecapentaene | 83-32-9 | PID | NA NA | Soil | inhalation, ingestion, skin and/or eye contact, | irritation to the skin, eyes, mucous membranes and upper respiratory tract; If ingested, it can cause vomiting | Eye: Irrigate immediately Skin: Soap wash immediately, if redness or irritation develop, seek medical attention immediately Breathing: Move to fresh air Swallow: do not induce vomiting, seek medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|--|---------------|----------------------|----------------------------|---------------------------------|---|--|---|
| 1.3.1 – 1.3.34 | Acenaphthylene Cycopental(de)naphthalene, Acenaphthalene | 208-96-8 | PID | NA NA | Soil | inhalation, ingestion, skin and/or eye contact | irritation to the skin, eyes, mucous membranes and upper respiratory tract | Eye: Irrigate immediately, seek medical attention immediately, Skin: Soap wash immediately, if redness or irritation develop, seek medical attention immediately Breathing: Move to fresh air Swallow: do not induce vomiting, seek medical attention immediately |
| 1.3.1 – 1.3.34 | Acetone Dimethyl ketone Ketone propane 2-Propanone | 67-64-1 | PID | 1000 ppm 2500 ppm | Groundwater Soil | inhalation, ingestion, skin and/or eye contact | irritation to the eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis | Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|---------------|----------------------|--|---------------------------------|---|---|---|
| 1.3.1 – 1.3.34 | Acetophenone 1-phenylethanone Methyl phenyl ketone Phenylethanone | 98-86-2 | None | 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 immediately |
| 1.3.1 – 1.3.34 | Alpha-Chlordane Alpha Chlordane a-Chlordane | 5103-71- 9 | None | 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 |
| 1.3.1 – 1.3.34 | Aluminum | 7429-90- 5 | None | 0.5 mg/m3 50 mg/m3 | Soil | inhalation, skin and/or eye contact | irritation to the eyes, skin, respiratory system | Eye: Irrigate immediately Breathing: Fresh air |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|--------------|----------------|----------------------|---|---------------------------------------|---|---|---|
| 1.3.1 – 1.3.34 | Anthracene | 120-12-7 | PID | 0.2 mg/m³ 80 mg/m³ (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 – 1.3.34 | Antimony | 7440-36- 0 | None | 0.5 mg/m³ 50 mg/m³ | 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 – 1.3.34 | Aroclor 1248 | 12672- 26-6 | None | 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 |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|--------------|----------------|----------------------|-------------------------|---------------------------------|---|---|---|
| 1.3.1 – 1.3.34 | Aroclor 1254 | 11097- 69-1 | None | 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 – 1.3.34 | Aroclor 1260 | 11096- 82-5 | None | 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 – 1.3.34 | Aroclor 1268 | 11100- 14-4 | None | 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 – 1.3.34 | Arsenic | NA | None | 0.5 mg/m³ 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 – 1.3.34 | Barium | 10022- 31-8 | None | 0.5 mg/m³ 50 mg/m³ | 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 – 1.3.34 | Benzene Benzol Phenyl hydride Alkyl benzene isomers | 71-43-2 | PID | 3.19 mg/m³ 1,595 mg/mg³ | 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 – 1.3.34 | Benzo(a)anthracene Benzanthracene Benzanthrene 1,2-Benzanthracene Benzo[b]phenanthrene Tetraphene | 56-55-3 | PID | 0.2 mg/m³ 80 mg/m³ (Coal Pitch Tar) | Groundwater Soil | inhalation, skin or eye contact, ingestion | dermatitis, bronchitis, [potential occupational carcinogen] | Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|--|---------------|----------------------|---|---------------------------------|---|---|--|
| 1.3.1 – 1.3.34 | Benzo(a)pyrene | 50-32-8 | PID | 0.2 mg/m³ 80 mg/m³ (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 – 1.3.34 | Benzo(b)fluoranthene | 205-99-2 | PID | mg/m³ 80 mg/m³ (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 – 1.3.34 | Benzo(g,h,i)perylene Benzo(ghi)perylene | 191-24-2 | PID | 0.2 mg/m³ 80 mg/m³ (Coal Pitch Tar) | Soil | inhalation, skin or eye contact, ingestion | NA | Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|--|---------------|----------------------|---|---------------------------------|---|--|---|
| 1.3.1 – 1.3.34 | Benzo(k)fluoranthene | 207-08-9 | PID | 0.2 mg/m³ 80 mg/m³ (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 – 1.3.34 | Benzoic acid Carboxybenzene E210 Dracylic acid Phenylmethanoic acid Benzenecarboxylic acid Benzoic acid isomer | 65-85-0 | None | NA NA | Groundwater Soil Vapor | inhalation, skin or eye contact, ingestion | irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs | Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air |
| 1.3.1 – 1.3.34 | Benzyl butyl phthalate Butyl benzyl phthalate Butylbenzylphthalate | 86-66-7 | None | 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 – 1.3.34 | Beryllium | 7440-41- 7 | None | 0.002 mg/m³ 4 mg/m³ | 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 – 1.3.34 | Beta-Endosulfan Beta Endosulfan Endosulfan II (beta) Endosulfan II | 33213- 65-9 | None | None | 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: imme Skin: imme Breat Resp supp Swal atten imme |
| 1.3.1 – 1.3.34 | Bis(2-ethylhexyl)phthalate Bis(2-Ethylhexyl) Phthalate Di-sec octyl phthalate DEHP Di(2-ethylhexyl)phthalate Octyl phthalate bis(2-ethylexyl)phthalate | 117-81-7 | None | 5 mg/m ³ 5000 mg/m ³ | Groundwater Soil Vapor | inhalation, ingestion, skin and/or eye contact | irritation to the eyes, mucous membrane; in animals: liver damage; teratogenic effects; [potential occupational carcinogen | Eye: Irrigate immediately Breathing: Respiratory support Swallow: Medical attention immediately | |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|--|---------------|----------------------|----------------------------------|---------------------------------|---|--|---|
| 1.3.1 – 1.3.34 | BTEX Benzene, Toluene, Ethylbenzene M-Xylene, O- Xylene And P-Xylene; BTEX I; BTEX II; BTEX Mixture I; BTEX Mixture II; BTEX Stock Standard Total BTEX | NA | PID | 3.19 mg/m³ 1,595 mg/mg³ | 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 – 1.3.34 | Cadmium | 7440-43- 9 | None | 0.005 mg/m³ 9 mg/m³ | 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 |
| 1.3.1 – 1.3.34 | Calcium | 7440-70- 2 | None | NA | Groundwater Soil | inhalation, ingestion, skin and/or eye contact | irritation to the eyes, skin, upper resp tract; ulcer, perforation nasal septum; pneumonitis; dermatitis | Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|--|---------------|----------------------|--|---------------------------------------|---|---|---|
| 1.3.1 – 1.3.34 | Carbazole 9-azafluorene Dibenzopyrrole Diphenylenimine diphenyleneimide | 86-74-8 | None | 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 – 1.3.34 | 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 – 1.3.34 | 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 – 1.3.34 | Chlordane Chlordan Chlordano 1,2,4,5,6,7,8,8-Octachloro- 3a,4,7,7a-tetrahydro-4,7- methanoindane Total Chlordane | 57-74-9 | None | 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 – 1.3.34 | Chloroform Methane trichloride Trichloromethane Chloro-3-methyl phenol | 67-66-3 | None | 50 ppm 500 ppm | Groundwater Soil | inhalation, skin absorption, ingestion, skin and/or eye contact | irritation to the eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [potential occupational carcinogen] | Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Chromium Total Chromium Chromium, Total | 7440-47- 3 | None | 1.0 mg/m³ 250 mg/m³ | 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 – 1.3.34 | 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 |
| 1.3.1 – 1.3.34 | cis-1,2-Dichloroethylene cis-1,2-Dichloroethene | 156-59-2 | NA | NA NA | Groundwater Soil Vapor | inhalation, ingestion, skin and/or eye contact | Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|---------------|----------------------|---|---------------------------------|---|--|---|
| 1.3.1 – 1.3.34 | Cis-Chlordane Cic-Chlordane a-Chlordane alpha Chlordane alpha-chlordane cis-Chlordan CIS-CHLORDANE Chlordane cis-;Chlordane cis-;Chlordane cis-;ALPHA-CHLORDAN Chlordan, cis-ALPHA-CHLORDANE alpha(cis)-chlordane | 5102-71- 9 | None | 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 – 1.3.34 | Cobalt | 7440-48- | None | 0.1mg/m 3 20 mg/m ³ | Soil | inhalation, ingestion, skin and/or eye contact | Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function; weight loss; dermatitis; diffuse nodular fibrosis; resp hypersensitivity, asthma | Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Copper | 7440-50- 8 | None | 1.0 mg/m³ 100 mg/m³ | 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 – 1.3.34 | Cumene Cumol Isopropylbenzene 2-Phenyl propane 1-methylethy Ibenzene Isopropyl Benzene | 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 |
| 1.3.1 – 1.3.34 | Cyanide | 57-12-5 | None | 5 mg/m ³ 25 mg/m ³ | Groundwater Soil | inhalation, ingestion, skin and/or eye contact | Exposure to cyanide can cause weakness, headaches, confusion, dizziness, fatigue, anxiety, sleepiness, nausea and vomiting. Breathing can speed up then become slow and gasping. Coma and convulsions also occur. If large amounts of cyanide have been absorbed by the body, the person usually collapses and death can occur very quickly. Long-term exposure to lower levels of cyanide can cause skin and nose irritation, itching, rashes and thyroid changes. | Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|---------------|----------------------|---|---------------------------------------|---|---|--|
| 1.3.1 – 1.3.34 | 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 – 1.3.34 | DDE 4,4-DDE 4,4'-DDE 1,1-bis-(4-chlorophenyl)-2,2- dichloroethene Dichlorodiphenyldichloroethyle ne p,p'-DDE | 72-55-9 | None | 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 – 1.3.34 | DDT 4,4-DDT 4,4'-DDT p,p'-DDT Dichlorodiphenyltrichloroethan e 1,1,1-Trichloro-2,2-bis(p- chlorophenyl)ethane | 50-29-3 | None | 1 mg/m ³ 500 mg/m ³ | 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 |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|--|---------------|----------------------|---|---------------------------------------|---|---|---|
| 1.3.1 – 1.3.34 | Dibenz(a,h)anthracene Dibenzo(a,h)anthracene Dibenzo[a,h]anthracene | 53-70-3 | PID | 0.2 mg/m³ 80 mg/m³ (Coal Pitch Tar) | Groundwater Soil | inhalation, absorption, ingestion, consumption | irritation to eyes, skin, respiratory, and digestion [potential occupational carcinogen] | Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support PID Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Dibenzofuran | 132-64-9 | None | NA NA | Soil | inhalation, absorption | irritation to eyes, and skin | Eyes: Irrigate immediately Skin: Soap wash promptly. |
| 1.3.1 – 1.3.34 | 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 Di-n-butylphthalate | 84-74-2 | None | 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 – 1.3.34 | Dichlorodifluoromethane Difluorodichloromethane, Fluorocarbon 12 Freon 12 Freon® 12 Genetron® 12 Halon® 122 Propellant 12 Refrigerant 12 Dichlorodifluromethane | 75-71-8 | None | 1000 pp, 15,000 ppm | Groundwater Soil Vapor | inhalation, skin and/or eye contact (liquid) | dizziness, tremor, asphyxia, unconsciousness, cardiac arrhythmias, cardiac arrest; liquid: frostbite | Eye: Frostbite Skin: Frostbite Breathing: Respiratory support |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|----------------|----------------------|------------------------------|---------------------------------|---|---|--|
| 1.3.1 – 1.3.34 | 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/m³ 50 mg/m³ | 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 |
| 1.3.1 – 1.3.34 | 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 – 1.3.34 | Diethyl phthalate DEP Diethyl ester of phthalic acid Ethyl phthalate Diethylphthalate | 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 |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|--|---------------|----------------------------------|----------------------------|---------------------------------------|---|--|---|
| 1.3.1 – 1.3.34 | Endrin aldehyde | 7421-93- 4 | None | 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 – 1.3.34 | Ethane Dicarbane AETHAN Bimethyl Dimethyl etano Ethan Ethyl hydride Methylmethane R 170 R 170 (hydrocarbon) UN 1035 UN 1035 UN 1961 | 74-84-0 | PID with 11.7 or 11.8 Lamp | 100 ppm 2100 ppm | Groundwater Soil Vapor | inhalation, skin and/or eye contact | Frostbite, asphyxiant | Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support seek medical attention immediately |
| 1.3.1 – 1.3.34 | 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 – 1.3.34 | 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 – 1.3.34 | Ethyl benzene Ethylbenzene Ethylbenzol Phenylethane | 100-41-4 | PID | 435 mg/m³ 3,472 mg/m³ | 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 – 1.3.34 | 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 |
| 1.3.1 – 1.3.34 | Fluoranthene Benzo(j,k)fluorene | 206-44-0 | PID | 0.2 mg/m³ 80 mg/m³ (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 – 1.3.34 | Fluorene | 86-73-7 | PID | 0.2 mg/m³ 80 mg/m³ (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 attenti |
| 1.3.1 – 1.3.34 | Fuel Oil No. 2 | 68476- 30-2 | PID | NA NA | Groundwater Soil Vapor | inhalation, ingestion, skin and/or eye contact | irritation to the eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid) | Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | gamma-Chlordane Gamma Chlordane y-Chlordane | 5566-34- 7 | None | 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 – 1.3.34 | 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 – 1.3.34 | Helium | 7440-59- 7 | Helium Detector | NA NA | NA | inhalation | dizziness, headache, and nausea | Breathing: Respiratory support |
| 1.3.1 – 1.3.34 | Heptachlor | 76-44-8 | None | 0.5 mg/m³ 35 mg/m³ | 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 – 1.3.34 | Heptachlor epoxide 1,4,5,6,7,8,8-Heptachloro- 3a,4,7,7a-tetrahydro-4,7- methano-1H-indene | 1024-57- 3 | None | 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 |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|----------------|----------------------|---|---------------------------------------|---|--|--|
| 1.3.1 – 1.3.34 | 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 |
| 1.3.1 – 1.3.34 | Hexavalent Chromium Chromium VI Chromium, Hexavalent | 18540- 29-9 | None | 1.0 mg/m³ 250 mg/m³ | 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 – 1.3.34 | Indeno(1,2,3-cd)pyrene Indeno(1,2,3-c,d)Pyrene Indeno[1,2,3-cd]Pyrene | 193-39-5 | None | 0.2 mg/m³ 80 mg/m³ (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 – 1.3.34 | Iron | 7439-89- 6 | None | 10 mg/m³ 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 – 1.3.34 | Isopropyl alcohol Iso-Propyl Alcohol Carbinol IPA Isopropanol 2-Propanol sec-Propyl alcohol Rubbing alcohol Isopropylalcohol | 67-63-0 | PID | 400 ppm 2000 ppm | Groundwater Soil Vapor | inhalation, ingestion, skin and/or eye contact | irritation to the eyes, nose, throat; drowsiness, dizziness, headache; dry cracking skin; in animals: narcosis | Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Lead | 7439-92- 1 | None | 0.050 mg/m ³ 100 mg/m ³ | Groundwater Soil | inhalation, ingestion, skin and/or eye contact | lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation to the eyes; hypertension | Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Magnesium | 7439-95- 4 | None | 15 mg/m³ 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 – 1.3.34 | Manganese | 7439-96- 5 | None | 5 mg/m ³ 500 mg/m ³ | Groundwater Soil | inhalation, ingestion | aerosol is irritating to the respiratory tract | Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|---------------|----------------------|-----------------------------|---------------------------------|---|--|---|
| 1.3.1 – 1.3.34 | m-Cresol 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 – 1.3.34 | Mercury | 7439-97- 6 | None | 0.1 mg/m³ 10 mg/m³ | 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 |
| 1.3.1 – 1.3.34 | Methane Tetrahydridocarbon Carbane Marsh Gas Natural Gas Carbon tetrahydride Hydrogen carbide | 74-82-8 | PID | NA NA | Groundwater Soil Vapor | inhalation, skin and/or eye contact (liquid) | dizziness, confusion, excitation, asphyxia; liquid: frostbite | Eye: Frostbite Skin: Frostbite Breathing: Respiratory support |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|---------------|----------------------|------------------------------|---------------------------------|---|--|--|
| 1.3.1 – 1.3.34 | Methoxychlor 4,4'-Methoxychlor p,p'- Dimethoxydiphenyltrichloroeth ane 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 | None | 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 – 1.3.34 | Methyl Bromide Bromomethane Monobromomethane | 74-83-9 | PID | 20 ppm 250 ppm | Soil Groundwater Vapor | inhalation, skin absorption (liquid), skin and/or eye contact (liquid) | irritation to the eyes, skin, respiratory system; muscle weak, incoordination, visual disturbance, dizziness; nausea, vomiting, headache; malaise (vague feeling of discomfort); hand tremor; convulsions; dyspnea (breathing difficulty); skin vesiculation; liquid: frostbite; [potential occupational carcinogen] | Eye: Irrigate immediately (liquid) Skin: Water flush immediately (liquid) Breathing: Respiratory support |
| 1.3.1 – 1.3.34 | Methyl Chloride Chloromethane Monochloromethane Refrigerant-40 R-40 | 74-87-3 | NA | 100 ppm 2000 ppm | Groundwater Soil | inhalation, skin and/or eye contact | dizziness, nausea, vomiting; visual disturbance, stagger, slurred speech, convulsions, coma; liver, kidney damage; liquid: frostbite; reproductive, teratogenic effects; [potential occupational carcinogen] | Eye: Frostbite Skin: Frostbite Breathing: Respiratory support |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|---------------|----------------------|------------------------|---------------------------------|---|---|--|
| 1.3.1 – 1.3.34 | Methyl chloroform Chlorothene 1,1,1-Trichloroethane 1,1,1-Trichloroethane- (stabilized) 1,1,1-TCA 1,1,1-Trichbroethane 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 – 1.3.34 | Methyl methacrylate Methacrylate monomer Methyl ester of methacrylic acid Methyl-2-methyl-2-propenoate | 80-62-6 | PID | 100 ppm 1000 ppm | Groundwater Soil Vapor | inhalation, ingestion, skin and/or eye contact | irritation eyes, skin, nose, throat; dermatitis | Eye: Irrigate immediately Skin: Water wash immediately Breathing: Fresh air Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Methyl <i>tert</i> -butyl ether MTBE Methyl tertiary-butyl ether Methyl t-butyl ether tert-Butyl methyl ether tBME tert-BuOMe Methyl tert butyl ether | 1634-04- 4 | PID | NA NA | Groundwater Soil Vapor | inhalation, ingestion, skin and/or eye contact | irritation to the eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid) | Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|-----------------------------|----------------------|------------------------|---------------------------------|---|---|--|
| 1.3.1 – 1.3.34 | Methylcyclohexane Methyl cyclohexane Methylcyclohexane Hexahydrotoluene Cyclohexylmethane Toluene hexahydride | 108-87-2 | PID | 500 ppm 1200 ppm | Soil Vapor | inhalation, ingestion, skin and/or eye contact | irritation to the eyes, skin, nose, throat; dizziness, drowsiness; in animals: narcosis | Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Methylene Chloride Dichloromethane Methylene dichloride | 75-09-2 | PID | 25 ppm 2300 ppm | Groundwater Soil Vapor | inhalation, skin absorption, ingestion, skin and/or eye contact | irritation to the eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numb, tingle limbs; nausea; [potential occupational carcinogen] | Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Molybdenum | 7439-98- 7 | NA | NA NA | Groundwater Soil Vapor | inhalation, skin absorption, ingestion, skin and/or eye contact | irritation to the eyes, skin, nose, respiratory system | Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | m-Xylenes 1,3-Dimethylbenzene m-Xylol Metaxylene | 108-38-3 179601- 23-1 | PID | 100 ppm 900 ppm | Groundwater Soil Vapor | inhalation, skin absorption, ingestion, skin and/or eye contact | irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis | Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|---------------|----------------------|------------------------------------|---------------------------------|---|--|---|
| 1.3.1 – 1.3.34 | Naphthalene Naphthalin Tar camphor White tar | 91-20-3 | PID | 50 mg/m ³ 250 ppm | Groundwater Soil Vapor | inhalation, skin absorption, ingestion, skin and/or eye contact | irritation to the eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; hematuria (blood in the urine); dermatitis, optical neuritis | Eye: Irrigate immediately Skin: Molten flush immediately/solid- liquid soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | n-Butylbenzene Butylbenzene 1-phenylbutane | 104-51-8 | PID | NA NA | Groundwater Soil Vapor | inhalation, ingestion, skin and/or eye contact | irritation to the eyes, skin; dry nose, throat; headache; low blood pressure, tachycardia, abnormal cardiovascular system stress; central nervous system, hematopoietic depression; metallic taste; liver, kidney injury | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | N-ethyl perfluorooctane sulfonamido acetic acid NEtFOSAA N-ethyl perfluorooctane sulfonamido acetic acid (N- EtFOSAA) N- Ethylperfluorooctanesulfonami de N-Ethyl Perfluorooctanesulfonamidoac etic Acid N-ethyl perfluorooctane- sulfonamidoacetic acid N-Ethyl-N- [(heptadecafluorooctyl)sulphon yl]glycine | 2991-50- 6 | NA | None None | Groundwater | inhalation, skin or eye contact, ingestion | irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|--|--|----------------------|--|---------------------------------|---|---|---|
| 1.3.1 – 1.3.34 | n-Hexane Hexane, Hexyl hydride, normal-Hexane | 110-54-3 | PID | 500 ppm 1100 ppm | Groundwater Soil Vapor | inhalation, ingestion, skin and/or eye contact | irritation to the eyes, nose; nausea, headache; peripheral neuropathy: numb extremities, muscle weak; dermatitis; dizziness; chemical pneumonitis (aspiration liquid) | Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Nickel | 7440-02- 0 | None | NA 10 mg/m ³ | 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 – 1.3.34 | Nitrate | 14797- 55-8 | None | NA NA | Groundwater Soil | inhalation, skin and/or eye contact | irritation to the eyes, skin, mucous membrane | Eye: Irrigate immediately Skin: Soap wash Breathing: Fresh air |
| 1.3.1 – 1.3.34 | Nitrite dioxidonitrate | 14797- 65-0 | None | NA NA | Groundwater | NA | NA | NA |
| 1.3.1 – 1.3.34 | 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 |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|--|----------------------|-------------------------|---------------------------------|---|---|---|
| 1.3.1 – 1.3.34 | Non-Flammable Gas Mixture CALGAS (Equipment Calibration Gas: Oxygen Isobutylene Nitrogen | 7782-44- 7 115-11-7 7727-37- 9 | PID | NA/NA NA/NA NA/NA | NA | inhalation | dizziness, headache, and nausea | Breathing: Respiratory support |
| 1.3.1 – 1.3.34 | n-Propylbenzene Isocumene Propylbenzene 1-Phenylpropane 1-Propylbenzene Phenylpropane Propylbenzene-n | 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 – 1.3.34 | 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 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 immediatelyethylp hhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhh |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|----------------------------|----------------------|--------------------|---------------------------------|---|---|--|
| 1.3.1 – 1.3.34 | o-Xylenes 1,2-Dimethylbenzene ortho-Xylene o-Xylol | 95-47-6 179601- 23-1 | PID | 100 ppm 900 ppm | Soil Vapor | inhalation, skin absorption, ingestion, skin and/or eye contact | irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis | Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | 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 – 1.3.34 | p-Diethylbenzene 1,4-Diethylbenzene 1,4-Diethyl benzene | 105-05-5 | PID | None None | 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 |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|--|---------------|----------------------|--------------|---|---|---|--|
| 1.3.1 – 1.3.34 | Perfluorobutanesulfonic acid FC-98 Nonaflate Nonafluorobutanesulphonic acid Perfluorobutanesulfonic Acid Perfluorobutane sulfonate PFBS | 375-73-5 | NA | None None | Groundwater | inhalation, skin or eye contact, ingestion | irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Perfluorobutanoic Acid Heptafluorobutyric acid Heptafluorobutanoic acid Perfluorobutyric acid PFBA | 375-22-4 | NA | None None | Groundwater | inhalation, skin or eye contact, ingestion | irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Perfluorodecanoic acid PFDA | 335-76-2 | NA | None None | Perfluorohe ptanesulfoni c acid Groundwater | inhalation, skin or eye contact, ingestion | irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Perfluoroheptane sulfonic Acid Perfluoroheptane sulfonate Perfluoroheptanesulfonic acid PFHpS | 375-92-8 | NA | None None | Groundwater | inhalation, skin or eye contact, ingestion | irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|---------------|----------------------|--------------|---------------------------------|---|---|--|
| 1.3.1 – 1.3.34 | Perfluoroheptanoic acid Perfluoroheptanoic acid Tridecafluoroheptanoic acid PFHpA | 375-85-9 | NA | None None | Groundwater | inhalation, skin or eye contact, ingestion | irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Perfluorohexanesulfonic Acid perfluorohexanesulfonate perfluorohexanesulfonic acid Perfluorohexane-1- sulphonic acid PFHxS | 355-46-4 | NA | None None | Groundwater | inhalation, skin or eye contact, ingestion | irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Perfluorohexanoic Acid PFHxA | 307-24-4 | NA | None None | Groundwater | inhalation, skin or eye contact, ingestion | irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Perfluoronoanoic Acid Perfluorononanoic Acid PFNA perfluoro-n-nonanoic acid perfluorononanoate | 375-95-1 | NA | None None | Groundwater | Groundwater | inhalation, skin or eye contact, ingestion; strong acid | 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 – 1.3.34 | Perfluorooctanesulfonamide Erfluoroctylsulfonamide Perfluorooctane sulfonamide Heptadecafluorooctanesulphon amide Perfluorooctanesulfonic acid amide Deethylsulfluramid FC-99 PFOSA FOSA | 754-91-6 | NA | NA NA | Groundwater | inhalation, skin or eye contact, ingestion | irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Perfluorooctanesulfonic Acid PFOS | 1763-23- 1 | NA | None None | Groundwater | inhalation, skin or eye contact, ingestion | irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Perfluorooctanoic Acid PFOA pentadecafluorooctanoic acid perfluorooctanoate perfluorocaprylic acid | 335-67-1 | NA | None None | Groundwater | inhalation, skin or eye contact, ingestion | irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Perfluoropentanoic Acid PFPeA | 2706-90- 3 | NA | None None | Groundwater | inhalation, skin or eye contact, ingestion | irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|---------------|----------------------|---|---------------------------------------|---|---|---|
| 1.3.1 – 1.3.34 | Perfluorotetradecanoic Acid PFTA | 376-06-7 | NA | None None | Groundwater | inhalation, skin or eye contact, ingestion | irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Perfluoroundecanoic Acid PFUnA PFUnDA Perfluoroundecanoic Acid Henicosafluoroundecanoic Acid | 2058-94- 8 | NA | None None | Groundwater | inhalation, skin or eye contact, ingestion | irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | p-Ethyltoluene 4-Ethyltoluene 1-ethyl-4-methyl-benzene 1-methyl-4-ethylbenzene | 622-96-8 | NA | NA NA | Soil | ingestion, skin and/or eye contact | irritation to the eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Phenanthrene | 85-01-8 | PID | 0.2 mg/m³ 80 mg/m³ (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 – 1.3.34 | 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 – 1.3.34 | Phosphorus Orthophosphate | 14265- 44-2 | NA | 1 mg/m ³ 200 mg/m ³ | 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 – 1.3.34 | Potassium | 7440-09- 7 | None | NA NA | Soil | inhalation, skin absorption, ingestion, skin and/or eye contact inhalation, ingestion, skin and/or eye contact | eye: Causes eye burns. Skin: Causes skin burns. Reacts with moisture in the skin to form potassium hydroxide and hydrogen with much heat. ingestion: Causes gastrointestinal tract burns. inhalation: May cause irritation of the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema. Causes chemical burns to the respiratory tract. inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema. | Eyes: Get medical aid immediately Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Ingestion: If victim is conscious and alert, give 2-4 full cups of milk or water. Get medical aid immediately. inhalation: Get medical aid immediately. |
| 1.3.1 – 1.3.34 | Propylene Propene Methyl ethylene | 115-07-1 | PID | NA NA | Vapor | inhalation, skin absorption, ingestion, skin and/or eye contact | irritation to the eyes, nose, throat, skin burns asphyxiation | 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 – 1.3.34 | p-Xylenes 1,4-Dimethylbenzene para-Xylene p-Xylol | 106-42-3 | PID | 100 ppm 900 ppm | Groundwater Soil Vapor | inhalation, skin absorption, ingestion, skin and/or eye contact | irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis | Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Pyrene benzo[def]phenanthrene | 129-00-0 | PID | 0.2 mg/m³ 80 mg/m³ (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 – 1.3.34 | sec-Butylbenzene 2-phenylbutane | 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 – 1.3.34 | Selenium | 7782-49- 2 | None | 1 mg/m ³ 0.2 mg/m ³ | Soil | inhalation, ingestion, skin and/or eye contact | irritation to the eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; in animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage | Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Silver | 7440-22- 4 | None | 0.01 mg/ 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 – 1.3.34 | Sodium | 7440-23- 5 | None | NA NA | Groundwater Soil | ion, ingestion, skin and/or eye contact | sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen] | Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|--|----------------|----------------------|--------------------|---------------------------------------|---|---|--|
| 1.3.1 – 1.3.34 | Sodium 1H,1H,2H,2H- perfluorooctanesulfonate 2-(Perfluorohexyl)ethane-1- sulfonic Acid Sodium Salt ,3,4,4,5,5,6,6,7,7,8,8,8- Tridecafluoro-1-octanesulfonic Acid Sodium Salt; Sodium 1H,1H,2H,2H- perfluoro-1-[1,2-13C2]-octane sulfonate (6:2) Sodium Salt; 3,3,4,4,5,5,6,6,7,7,8,8,8- Tridecafluorooctane-1-sulfonic Acid Sodium Salt; 3,3,4,4,5,5,6,6,7,7,8,8,8- Tridecafluorooctanesulfonic Acid Sodium Salt; 3,3,4,4,5,5,6,6,7,7,8,8,8- Tridecafluorooctanesulfonic Acid Sodium Salt; 6:2 FTS Impurity: Sodium 1H, 1H, 2H, 2H- Perfluorooctane Sulfonic (6:2) Sodium 1H,1H,2H,2H- Perfluorooctane Sulfonate (6:2) | 27619- 94-9 | NA | None None | Groundwater | inhalation, skin or eye contact, ingestion | irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | 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 – 1.3.34 | Sulfate | 14808- 79-8 | None | NA NA | Groundwater Soil | inhalation, skin and/or eye contact | irritation to the eyes, skin, mucous membrane | Eye: Irrigate immediately Skin: Soap wash Breathing: Fresh air |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|---------------|----------------------|------------------------|---------------------------------------|---|---|---|
| 1.3.1 – 1.3.34 | Tert-Butyl Alcohol Tertiary Butyl Alcohol Tert-Butanol Butyl alcohol 2-Methyl-2-propanol Trimethyl carbinol TBA | 75-65-0 | PID | 100 ppm 1600 ppm | Groundwater Soil Vapor | inhalation, ingestion, skin and/or eye contact | irritation to the eyes, skin, nose, throat; drowsiness, narcosis | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | tert-Butylbenzene t-Butylbenzene 2-Methyl-2-phenylpropane Pseudobutylbenzene | 98-06-6 | PID | 10 ppm NA | Groundwater Soil Vapor | inhalation, ingestion, skin and/or eye contact | eye, skin irritation; dry nose, throat; headaches; low blood pressure, tachycardia; abnormal cardiovascular system; central nervous system depression; hematopoietic depression | Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | 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 – 1.3.34 | 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 |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|---------------|----------------------|-----------------------------|---------------------------------------|---|---|--|
| 1.3.1 – 1.3.34 | Tetrahydrofuran Diethylene oxide 1,4-Epoxybutane Tetramethylene oxide THF | 109-99-9 | PID | 200 ppm 2000 ppm | Groundwater Soil Vapor | inhalation, skin and/or eye contact, ingestion | irritation to the eyes, upper respiratory system; nausea, dizziness, headache, central nervous system depression | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immedi |
| 1.3.1 – 1.3.34 | Thallium | 7440-28- 0 | None | 0.1 mg/m³ 15 mg/m³ | Groundwater Soil | inhalation, skin absorption, ingestion, skin and/or eye contact | nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peri neuritis, tremor; retrosternal (occurring behind the sternum) tightness, chest pain, pulmonary edema; convulsions, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | 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 |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|----------------|----------------------|-------------------------|---------------------------------------|---|--|--|
| 1.3.1 – 1.3.34 | Total PCBs Chlorodiphenyl (42% chlorine) Aroclor® 1242 PCB Polychlorinated biphenyl | 53469- 21-9 | None | 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 – 1.3.34 | Total Petroleum Hydrocarbons TPH | 143-07-7 | 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 – 1.3.34 | 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 – 1.3.34 | Trans-1,2-Dichloroethene trans-1,2-Dichloroethylene tDEC trans-Acetylene dichloride | 156-60-5 | PID | 200 ppm 4000 ppm | Groundwater Soil Vapor | inhalation, ingestion, skin and/or eye contact | Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation | Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|---------------|----------------------|------------------------------|---------------------------------|---|--|---|
| 1.3.1 – 1.3.34 | Trichloroethylene Trichloroetheneylenes 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 – 1.3.34 | Trichlorofluoromethane Fluorotrichloromethane Freon® 11 Monofluorotrichloromethane Refrigerant 11 Trichloromonofluoromethane Freon 11 | 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 – 1.3.34 | Trivalent Chromium Chromium III Chromium, Trivalent | NA | None | 1.0 mg/m³ 250 mg/m³ | Groundwater Soil | inhalation absorption ingestion | irritation to eye, skin, and respiratory | Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately |

| Task | Contaminant | CAS Number | Monitoring Device | PEL/ IDLH | Source of Concentration on Site | Route of Exposure | Symptoms | First Aid |
|-------------------|---|---------------|----------------------|-----------------------------|---------------------------------|---|---|--|
| 1.3.1 – 1.3.34 | Vanadium | 7440-62- 2 | None | 0.1 mg/m3 15 mg/m3 | Groundwater Soil | inhalation, skin absorption, ingestion, skin and/or eye contact | nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peri neuritis, tremor; retrosternal (occurring behind the sternum) tightness, chest pain, pulmonary edema; convulsions, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs | Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | 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 – 1.3.34 | 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 – 1.3.34 | Volatile Organic Compounds VOCs | NA | 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 wash promptly Breathing: Respiratory support Swallow: Medical attention immediately |
| 1.3.1 – 1.3.34 | Zinc | 7440-62- 2 | None | mg/m ³ 500 mg/m ³ | Groundwater Soil | inhalation | chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function | Breathing: Respiratory support` |

EXPLANATION OF ABBREVIATIONS

PID = Photoionization Detector

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

IDLH = Immediately Dangerous to Life and Health

ppm = part per million

mg/m³ = milligrams per cubic meter

500 mg/m³

TABLE 3 SUMMARY OF MONITORING EQUIPMENT

| Instrument | Operation Parameters |
|--------------------------|---|
| Photoionization | Hazard Monitored: Many organic and some inorganic gases and vapors. |
| Detector (PID) | 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 | Hazard Monitored: Combustible gases and vapors. |
| Indicator (CGI) | 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 | Hazard Monitored: Many organic gases and vapors (approved areas only). |
| Detector (FID) with | Application: In survey mode, detects the concentration of many organic gases and |
| Gas Chromatography | vapors. In gas chromatography (GC) mode, identifies and measures specific compounds. |
| Option | In survey mode, all the organic compounds are ionized and detected at the same time. In |
| (i.e., Foxboro Organic | GC mode, volatile species are separated. |
| Vapor Analyzer (OVA)) | 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) | Hazard Monitored: Many gases and vapors. |
| Spectrophotometer | 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 | Hazard Monitored: Specific gas and vapors. |
| Colorimetric Indicator | Application: Measures concentration of specific gases and vapors. |
| Tube | 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 specific for the chemical species in question. |
| | General Care/Maintenance: Moisten sponge before use; check the function switch; |
| 0 5 11 11 | change the battery when needed. |
| Gamma Radiation | Hazard Monitored: Gamma Radiation. |
| Survey Instrument | 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 parts per million (ppm) ¹ | No respirator needed; no further action |
| >5ppm but = 15 ppm at the perimeter of the work area</td <td> Work temporarily halted and monitoring continues. If instantaneous readings decrease below 5 ppm above background, work activities will resume with continued monitoring </td> | Work temporarily halted and monitoring continues. If instantaneous readings decrease below 5 ppm above background, work activities will resume with continued monitoring |
| >5ppm but = 25 ppm at the downwind perimeter of the hot zone</td <td> Work activities will be halted. Source of vapors identified. Corrective actions taken to abate emissions. Continued monitoring. Workers will don appropriate respirators and work can resume if vapor levels 200 feet downwind or the hot zone or half the distance to the nearest potential receptor or residential or commercial structure, whichever is less – but in no case less than 20 feet – is below 5 ppm above background for the 15-minute average </td> | Work activities will be halted. Source of vapors identified. Corrective actions taken to abate emissions. Continued monitoring. Workers will don appropriate respirators and work can resume if vapor levels 200 feet downwind or the hot zone or half the distance to the nearest potential receptor or residential or commercial structure, whichever is less – but in no case less than 20 feet – is below 5 ppm above background for the 15-minute average |
| >25ppm at the parameter of the hot zone | Activities will shut down |

| Particulate Monitoring Action Levels | Action Required | | |
|---|---|--|--|
| Background to 100 micrograms per cubic meter | No further action | | |
| (μg/m³)², no dust observed | | | |
| Background to 100 µg/m³, dust observed | Dust suppression must be employed. | | |
| leaving the work area | | | |
| 100 to 150 μg/m³ at the downwind parameter of | Work activities will be halted. | | |
| the hot zone | Source of dust identified. | | |
| | Dust suppression activities initiated. | | |
| | Corrective actions taken to abate | | |
| | emissions. | | |
| | Continued monitoring. | | |
| | Workers will don appropriate respirators. | | |
| | Work can resume provided that dust | | |
| | suppression measures and other controls | | |
| | are successful in reducing the downwind | | |
| | PM10 concentration to within 150 μg/m³ of | | |
| | the upwind level and in preventing visible | | |
| | dust migration. | | |
| >150 µg/m³ at the parameter of the hot zone | Activities will shut down | | |

VOC concentrations are 15-minute averages above site background (upwind parameter)
 Particulate concentrations are 15-minute averages above site background (upwind parameter)

TABLE 5 EMERGENCY NOTIFICATION LIST

| ORGANIZATION | CONTACT | TELEPHONE |
|---|--|--------------------------------|
| Local Police Department | | 911 |
| Local Fire Department | | 911 |
| Ambulance/Rescue Squad | | 911 |
| Hospital | New York-Presbyterian Brooklyn Methodist Hospital | 911 or 718-780-3000 |
| Langan Incident Hotline | | 800-952-6426 extension 4699 |
| Medical Treatment Hotline | WorkCare™ | 911 or 888-449-7757 |
| Langan Environmental Project Manager | Vinicius De Paula | 914-803-7130 (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 | Jesse Wark | 646-738-8993 |
| National Response Center (NRC) | | 800-424-8802 |
| Chemical Transportation Emergency Center (Chemtrec) | | 800-424-9300 |
| Center for Disease Control (CDC) | | 404-639-3534 |
| EPA (RCRA Superfund Hotline) | | 800-424-9346 |
| TSCA Hotline | | 202-554-1404 |
| Poison Control Center | | 800-222-1222 |

Immediately following an injury, unless immediate emergency medical treatment is required, the injured employee must contact <u>WorkCare</u> - Incident Intervention® at 888-449-7787.

For all other incidents or near misses, unless emergency response is required, either the employee or a coworker must contact the Langan Incident Hotline at 973-560-4699.

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

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

a For work levels of 250 kilocalories/hour.

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

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

TABLE 7 HEAT INDEX

ENVIRONMENTAL TEMPERATURE (Fahrenheit)

| | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 105 | 110 | 115 | 120 |
|----------------------|----|----|----|-----|--------|----------|------------|-----|-----|-----|-----|
| RELATIVE HUMIDITY | | | | | ADDADE | NT TEMPE | D ATI IDE* | | | | |
| | | | | | | | | | | | |
| 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 |

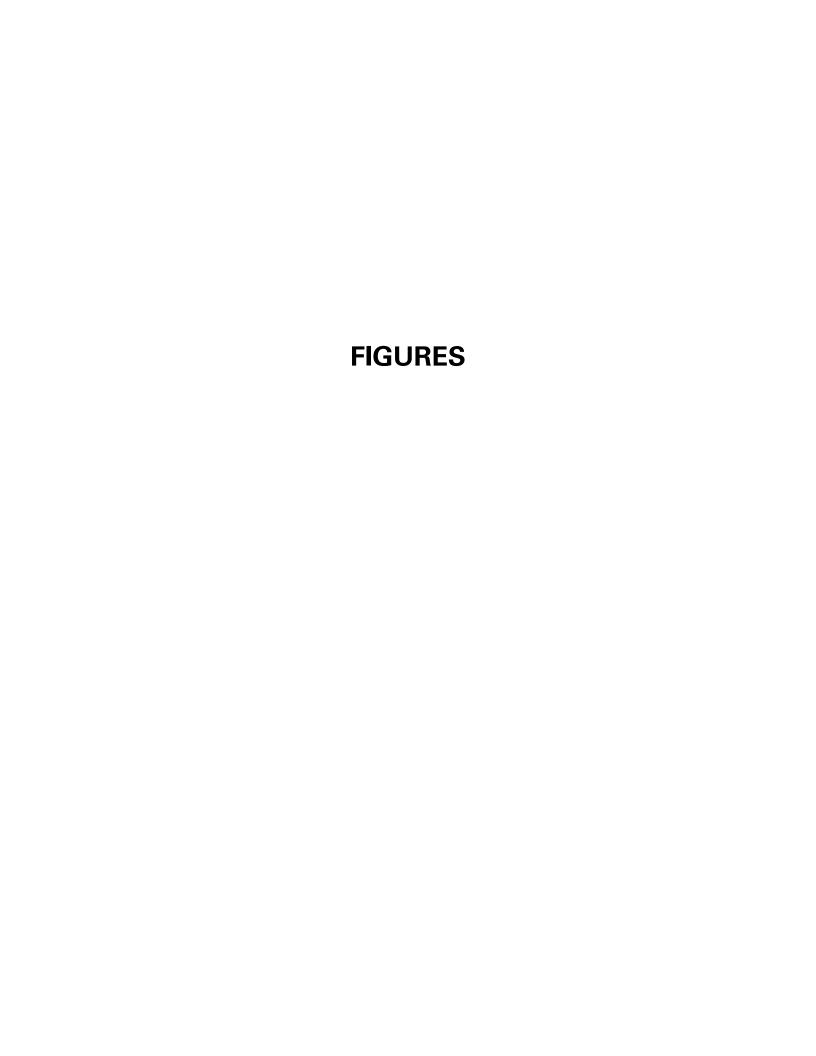


FIGURE 1 SITE LOCATION MAP

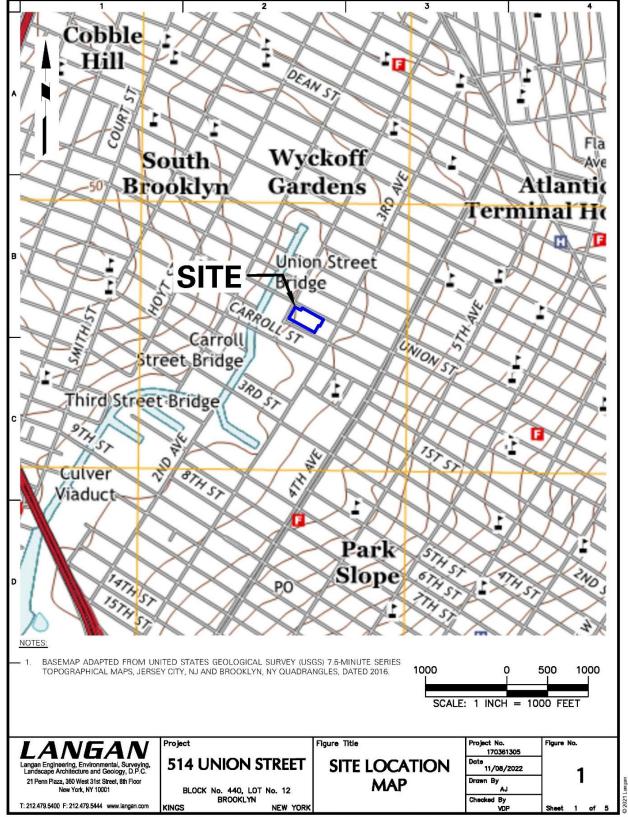


FIGURE 2 HOSPITAL ROUTE PLAN

Hospital Location: New York-Presbyterian Brooklyn Methodist

Hospital

506 6th Street

Brooklyn, New York

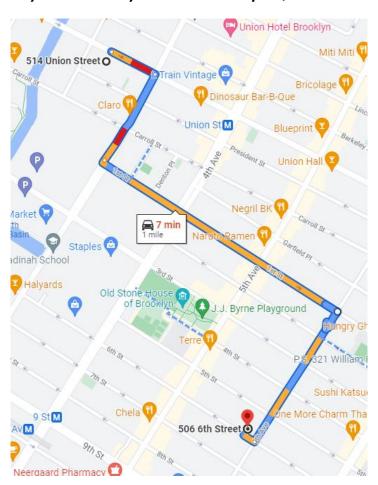
718-780-3000

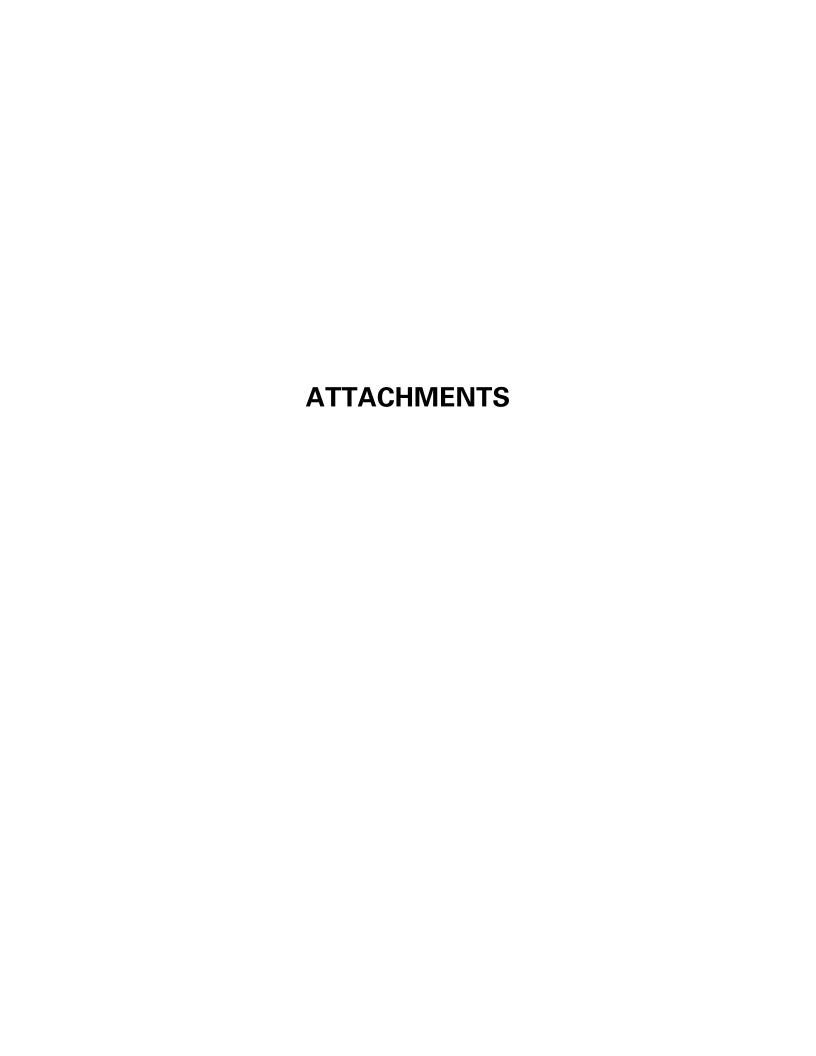
START: 514 Union Street, Brooklyn, New York

1. Head southeast on Union Street toward 3rd Ave

- 2. Turn right at the 1st cross street onto 3rd Ave
- 3. Turn left onto 1st St
- 4. Turn right onto 6th Ave
- 5. Turn right onto 6th St, destination will be on the right.

END: New York-Presbyterian Brooklyn Methodist Hospital, 506 6th Street, Brooklyn, NY





ATTACHMENT A STANDING ORDERS

STANDING ORDERS

GENERAL

- No smoking, eating, or drinking in this work zone.
- Upon leaving the work zone, personnel will thoroughly wash their hands and face.
- Minimize contact with contaminated materials through proper planning of work areas and decontamination areas, and by following proper procedures. Do not place equipment on the ground. Do not sit on contaminated materials.
- No open flames in the work zone.
- Only properly trained and equipped personnel are permitted to work in potentially contaminated areas.
- Always use the appropriate level of 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 carry 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 ensure 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 signal operator 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 | Scrub outer boots, outer gloves, and chemical-re- sistant splash suit with decon solution or detergent ar water. Rinse off using copious amounts of water. |
| Station 3: | Outer Boot and Glove Removal | 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 oute gloves and boot covers donned, joints taped, and worker returns to duty. |
| Station 5: | Boot, Gloves and Outer Garment Removal | Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic. |
| Station 6: | Face piece Removal | Face piece is removed (avoid touching face with fingers). Face piece deposited on plastic sheets. |
| Station 7: | Field Wash | Hands and face are thoroughly washed. Shower as soon as possible. |
| | | |

LEVEL D DECONTAMINATION

| Station 1: | Equipment Drop | 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 | Scrub outer boots, outer gloves and chemical-re- sistant splash suit with decon solution or detergent and water. Rinse off using copious amounts of water. |
| Station 3: | Outer Boot and Glove Removal | Remove outer boots and gloves. Deposit in container with plastic liner. |
| Station 4: | Boot, Gloves and Outer Garment Removal | Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic. |
| Station 5: | Field Wash | 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, backhoes 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 bucket, tub, or other containers. 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 many 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 of 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: | | | | | Da | ite: | | |
|-------------------------|--------|---------------------|--------------|-----------------|----------|---------|----|-----------|
| Incident type: | | Injury Near Miss | | Report O Other: | | ury | | |
| EMPLOYEE INFOR | MATION | (Person comp | leting Form) | | | | | |
| Employee Name: _ | | | | _ | En | nployee | | No: |
| Title: | | | | | Office | | | Location: |
| Length of | | time | | | or | date | of | hire: |
| Mailing | | | | | | | | address: |
| Sex: M F F | | | | | esidence | /cell | | phone: |
| ACCIDENT INFORM | | | | | Pro | oject | | #: |
| Date & time of incid | ent: | | | Time | work | started | & | ended: |
| Site | | | | | | | | location: |

| Names o | of person | (s) who witr | nessed the | incider _ | nt: | | | | | | |
|----------|-----------|--------------|------------|--------------|--------|-------|--------|--------|---------|----------|------------|
| Exact | | | location | ı | | | incic | lent | | | occurred: |
| Describe | e work be | ing done: | | | | | | | | | |
| Describe | e what | t affected | d empl | oyee | was | doing | prior | to | the | incident | occurring: |
| Describe | Э | in | detail | | how | | the | | inciden | t | occurred: |
| Nature | of | the | incident | (List | t the | ķ | parts | of | the | body | affected): |
| Person(s | s) to | whom | the | inc | cident | was | re | ported | (Time | e and | Date): |
| List | the | names | of | other | perso | ons | affec: | ted | during | this | incident: |

| Weath | er | conc | itions | | d | uring | | incident: |
|---------|----------------|-------------------|-------------|--------------|------------|-------------|----------|-----------|
| MEDIC | CAL CARE INF | FORMATION | | | | | | |
| Did aft | ected employ | ee receive medica | l care? | Yes | | No 🗌 | | |
| | If Yes, | when, | and | where | was | medical | care | received: |
| | Provide | name | of | facility | (I | nospital, | clinic, | etc.): |
| | Length | of | c | stay | at | | the | facility. |
| | — | OI | | otay | at | | tile | raciiity. |
| Did th | e employee m | iss any work time | Yes 🗌 | No 🗌 | Undeterr | mined 🗌 | | |
| Date e | mployee last v | worked: | | | Date | employee | returned | to work: |
| Has th | e employee re | eturned to work? | Yes 🗌 | No 🗌 | | | | |
| Does 1 | he employee l | have any work lim | itations or | restrictions | from the i | njury? : Ye | es 🗌 | No 🗌 |
| | lf | Ye | S, | | plea | ase | | describe: |
| | | | | | | | | |

| Was the operation being conducted under an established site-specific Health and Safety Plan? Yes No Not Applicable: | | | | | |
|--|--|--|--|--|--|
| Describe protective equipment and clothing used by the employee: | | | | | |
| | | | | | |
| | | | | | |
| Did any limitations in safety equipment or protective | e clothing contribute to or affect exposure/injury? If so, | | | | |
| explain: | | | | | |
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| | | | | | |
| Employee Signature | Date | | | | |
| | | | | | |
| | | | | | |
| Langan Representative | Date | | | | |

ATTACHMENT D CALIBRATION LOG

| DATE:PRO | OJECT: |
|----------|--------|
|----------|--------|

CALIBRATION LOG

| Date & Time | Inst Type | Inst # | Media | Initial Reading | Span # | Calibrate Reading | Performed By: |
|----------------|--------------|--------|-------|--------------------|--------|----------------------|---------------|
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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 Sheets (MSDS) or Safety Data Sheets (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 o | of the following: A: Acceptable NA : Not Applicable D : Deficiency | |
| | | |

| | Α | 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 logbook? | | | | |
| 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. | | | |
|---|--|--|--|
| 25. Evidence that drilling operator is responsible for the | | | |
| | | | |
| | | | |
| 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? | | | |
| | | | |

ATTACHMENT G JOB SAFETY ANALYSIS FORM

| LANGAN | | Safety Analysis (JSA) ealth and Safety | | | | |
|--|---------------------------------------|---|--|--|--|--|
| JSA TITLE: | | DATE CREATED: CREATED BY: | | | | |
| JSA NUMBER: | | 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 REQ | UIRED: (PPE): Required | | | | | |
| ☐ Steel-toed boots | ☐ Nitrile gloves | ☐ Dermal Protection (Specify) | | | | |
| ☐ Long-sleeved shirt | ☐ Leather/ Cut-resistant glove | es | | | | |
| ☐ Safety glasses | ☐ Face Shield | ☐ Hard hat | | | | |
| ADDITIONAL PERSONAL PROTECTIVE EQU | JIPMENT NEEDED (Provide specific type | e(s) or descriptions) | | | | |
| ☐ Air Monitoring: | ☐ Respirators: | ☐ Other: | | | | |
| ☐ Dermal Protection: | ☐ Cartridges: | ☐ Other: | | | | |
| | | | | | | |
| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE OR CORRECTIVE ACTION | | | | |
| 1. | 1. | 1a. 1b. | | | | |

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

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

JSA Title: COVID-19 Awareness – Site Work

JSA Number: JSA046-00

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last-Minute Risk Assessment.



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

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

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

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

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

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

| Print Name | Sign Name | <u>Date</u> | | | |
|--------------|-----------|-------------|--|--|--|
| Prepared by: | | | | | |
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| Reviewed by: | | | | | |
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JSA Title: Environmental Sampling

JSA Number: JSA021-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last-Minute Risk Assessment.



- <u>S</u> Stop, what has changed?
- $\underline{\mathbf{T}}$ **Think** about the task
- <u>E</u> *Evaluate* potential hazards
- P Plan safe approach
- <u>S</u> Start task / Stop & regroup

| PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed): | | | | | |
|---|---|--|-------|---|--------------------------------|
| | | | ss 2) | | ☐ Hearing Protection |
| | ☐ Safety Goggles | ☐ Face Shield | | | ☐ PVC Gloves |
| ☐ Leather Gloves | ☐ Cut Resist. Gloves | ☐ Fall Protection | | | ☐ Rubber Boots |
| | | ☐ Traffic Cones/Si | gns | ☐ Life Vest/Jacket | |
| ☐ Other: Tyvek Sleeves | | | | | |
| JOB STEPS | POTENTIAL HAZ | ARDS | | PREVENTATIVE / CORRE | CTIVE ACTION |
| Drive to sample location | Rough/Off Road terrain | | | ttention to road conditions such | n as road erosion, unprotected |
| 2. Sample Collection (Walking) | Slip/Trips/Falls Back strains Wildlife (Insects, Stray anim Poisonous vegetation | Minimize distance to sample area/ Plan route and check surf- carrying heavy equipment/ Locate safest access point/ Follow | | access point/ Follow good ant below grade hazards (holes, ar foot protection with ankle ed transport/ Obtain assistance weight when evaluating what is ce of wildlife. Do not approach tellant when needed/ Use bug | |
| 3. Sample Collection (Water) | Drowning Hazards Chemical burns (when adding preservative to sample) Back Strains Ergonomic issues Slip/Trips/Falls | | | Sleeves) ed transport/ Obtain assistance weight when evaluating what is | |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|---|---|---|
| JOB STEPS 4. All activities | Slips/ Trips/ Falls Hand injuries, cuts, or lacerations during manual handling of materials Foot injuries Back injuries Traffic Wildlife: Stray dogs, Mice/rats, Vectors (i.e., mosquitoes, bees, etc.) High Noise levels | Minimize distance to sample area/ Plan route and check surface prior to carrying heavy equipment/ Locate safest access point/ Follow good housekeeping procedures/ Mark significant below grade hazards (holes, trenches) with spray paint or cones/ Wear foot protection with ankle support and gripping soles/ Avoid standing water or slippery terrain. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery, or dirty objects before handling / Wear leather/ cut-resistant gloves Wear Langan approved safety shoes 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 |
| | 8. Overhead hazards 9. Heat Stress/ Cold Stress 10. Eye Injuries | Wear high visibility clothing & vest / Use cones or signs to designate work area 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 Wear hearing protection Wear hard hat / Avoid areas where overhead hazards exist. 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 |
| Additional items. | | 10. Wear safety glasses |
| | | |
| Additional Items identified while in the field. | | |
| (Delete row if not needed.) | | |

| Print Name | Sign Name | <u>Date</u> |
|--------------|-----------|-------------|
| Prepared by: | | |
| | | |
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| | | |
| Reviewed by: | | |
| | | _ |

JSA Title: Subsurface Investigation

JSA Number: JSA030-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last-Minute Risk Assessment.

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



- <u>S</u> Stop, what has changed?
- $\underline{\mathbf{T}}$ **Think** about the task
- E Evaluate potential hazards
- P Plan safe approach
- S Start task / Stop & regroup

| EROONALT ROTEOTIVE Each MENT (Required of to be worn as needed). | | | | | | | |
|--|----------|---|---|----------------------------------|--|---|----------------|
| | □ Long | Sleeves | | ıss 2) | | | |
| | Safet | y Goggles | ☐ Face Shield | | | ☐ Nitrile Gloves | ☐ PVC Gloves |
| | □ Cut F | Resist. Gloves | ☐ Fall Protection | | | ☐ Fire Resistant Clothing | ☐ Rubber Boots |
| ☐ Insect/Animal Repellent | ☐ Ivy B | locker/Cleaner | ☐ Traffic Cones/Si | gns | | ☐ Life Vest/Jacket | |
| ☑ Other: Dielectric Overshoes, Sur | n Block | | | | | | |
| JOB STEPS | | POTENTIAL | HAZARDS | | | PREVENTATIVE / CORRE | CTIVE ACTION |
| 3. Slip/Trip/F 4. Traffic 5. Cuts/abra equipmen | | Slip/Trip/Falls Traffic | 4. Wear proper PPE (leather gloves, long sleeves, Langan approved s | | | clothing) sleeves, Langan approved safety | |
| 6. Traffic 1. Hit by moving vehicle | | 1. | Use tra | ffic cones and signage/ Use High | visibility traffic vests and clothing/ | | |
| 7. Field Work (drilling, resistivity and inspection) | testing, | Biological Haza snakes, poisonous animals Heat stress/injuries Cold Stress/injuries High Energy Tran Underground Utilis Electrical (soil res | plants, and other sleeve shirt and long pants/ Use insect repellant as necessary/ Be tall grass, bushes, woods, and other areas where ticks may live/ leaving garbage on site to prevent attracting animals/ Identify and contact with poisonous plants/Beware of rats, snakes, or stray an ansmission Lines where ticks may live/ leaving garbage on site to prevent attracting animals/ Identify and contact with poisonous plants/Beware of rats, snakes, or stray an water/ take regulations. | | repellant as necessary/ Beware of eas where ticks may live/ Avoid cting animals/ Identify and avoid frats, snakes, or stray animals. It plenty of water/ take regular ke regular breaks. Insmission lines/ position by PSE&G from the | | |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|---|---|--|
| 8.All activities | Slips/ Trips/ Falls Hand injuries, cuts, or lacerations | Call one-call service before performing intrusive field work/ Review utility mark-outs and available utility drawings (with respect to proposed work locations)/ Follow Underground Utility Guidelines See AGI Sting R1 operating manual for specific concerns during operating instrument Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards. |
| | during manual handling of materials 3. Foot injuries 4. Back injuries 5. Traffic | Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery, or dirty objects before handling / Wear leather/ cut-resistant gloves. Wear Langan approved safety shoes. |
| | 6. Wildlife: Stray dogs, Mice/rats, Vectors (i.e., mosquitoes, bees, etc.)7. High Noise levels8. Overhead hazards | 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 |
| | Heat Stress/ Cold Stress Eye Injuries | 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 where overhead hazards exist. 15. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress. |
| Additional items. | | 16. Wear safety glasses |
| | | |
| Additional Items identified while in the field. | | |
| (Delete row if not needed.) | | |

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

JSA Title: Field Sampling JSA Number: JSA022-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last-Minute Risk Assessment.



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

| PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed): | | | | | |
|--|---|--------------------|--|---|---|
| | | ☐ Safety Vest (Cla | ass 2) | | |
| | ☐ Safety Goggles | ☐ Face Shield | | | ☐ PVC Gloves |
| | ☐ Cut Resist. Gloves | ☐ Fall Protection | | ☐ Fire Resistant Clothing | ☐ Rubber Boots |
| ☐ Insect/Animal Repellent | ☐ Ivy Blocker/Cleaner | | igns | ☐ Life Vest/Jacket | |
| Other: | | | | | |
| JOB STEPS | POTENTIAL HAZ | ARDS | | PREVENTATIVE / CORRE | ECTIVE ACTION |
| Unpack/Transport equipment to work area. | 7. Back Strains 8. Slip/Trips/Falls 9. Cuts/Abrasions from equipm 10.Contusions from dropped eq | | 7. Minimize houseke cones. 8. Wear pro | per lifting techniques/Use wheeled e distance to work area/Unobstruct eping procedures. Mark slip/trip/fa oper PPE (leather gloves, long sle oper PPE (Langan approved safe | eted path to work area/follow good all hazards with orange safety |
| 10.Initial Site Arrival-Site Assessment | | | 5. Situation through | nal awareness (be alert of your su traffic. | rroundings). Secure area from |
| 11.Surface Water Sampling | Contaminated media. Skin/eye contact with biological agents and/or chemicals. | | | propriate PPE (Safety glasses, ap for all chemicals being. | ppropriate gloves). Review |
| 12.Sampling from bridges | Struck by vehicles | | 1. Wear ap cones. | propriate PPE (Safety Vest). Use | buddy system and orange safety |
| 13. Icing of Samples/ Transporting coolers/equipment from work area. | 11. Back Strains12. Slips/Trips/Falls13. Cuts/Abrasions from equipr14. Pinch/Crushing Hazards. | nent | transp 18. Have u 19. Wear p 20. Wear p | nobstructed path from work area. roper PPE (Leather gloves, long s roper PPE (Leather gloves, long s | Aware of surroundings. sleeves) sleeves) |
| 14. Site Departure | Contaminated PPE/Vehicle | | | inated PPE should be disposed of secure storage in trunk. Wash ha | on-site. Remove boots and soiled ands promptly. |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|---|--|---|
| 15. All activities | Slips/ Trips/ Falls Hand injuries, cuts, or lacerations during manual handling of materials Foot injuries Back injuries His Wildlife: Stray dogs, Mice/rats, Vectors (i.e., mosquitoes, bees, etc.) High Noise levels Overhead hazards Heat Stress/ Cold Stress Eye Injuries | Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery, or dirty objects before handling / Wear leather/ cut-resistant gloves Wear Langan approved safety shoes 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 Wear high visibility clothing & vest / Use cones or signs to designate work area. 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. Wear hearing protection Wear hard hat / Avoid areas where overhead hazards exist. 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. |
| Additional items. | | 26. Wear safety glasses |
| Additional Items identified while in the field. | | |
| (Delete row if not needed.) | | |

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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. Prior to the start of any work "TAKE 5" and conduct a Last-Minute Risk Assessment.



- <u>S</u> Stop, what has changed?
- $\underline{\mathbf{T}}$ **Think** about the task
- **P** <u>E</u> **Evaluate** potential hazards
 - P Plan safe approach
 - S Start task / Stop & regroup

| PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed): | | | | | |
|---|---|-------------------|---|---|--|
| | | | ass 2) | | |
| | ☐ Safety Goggles | ☐ Face Shield | | ☐ Nitrile Gloves | ☐ PVC Gloves |
| | ☐ Cut Resist. Gloves | ☐ Fall Protection | | ☐ Fire Resistant Clothing | ☐ Rubber Boots |
| ☐ Insect/Animal Repellent | ☐ Ivy Blocker/Cleaner | ☐ Traffic Cones/S | igns | ☐ Life Vest/Jacket | |
| ☐ Other: | | | | | |
| | | | | | |
| JOB STEPS | POTENTIAL HAZA | ARDS | | PREVENTATIVE / CORRE | CTIVE ACTION |
| 16.Transport equipment to work area | 12.Slips/ Trips/ Falls 13.Traffic | | Use proper lifting techniques / Use wheeled transport. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures. Wear proper PPE (high visibility vest or clothing) Wear proper PPE (leather gloves, long sleeves) Wear proper PPE (safety shoes) | | |
| 17.Moving equipment to its planned location | 6. Pinch Hazard7. Slips/ Trips/ Falls | | 2. Be awa | oroper PPE (leather gloves) are of potential trip hazards / Prac lures / Mark significant below-grad afety cones or spray paint | |
| 18.Equipment Set-up | 7. Pinch Hazard8. Cuts/abrasions to knuckles/hands.9. Back Strain | | 2. Wear | proper PPE (leather gloves) proper PPE (leather gloves) oper lifting techniques / Use whee | eled transport |
| 19. All activities | 21. Slips/ Trips/ Falls 22. Hand injuries, cuts, or lacera manual handling of materials 23. Foot injuries 24. Back injuries 25. Traffic 26. Wildlife: Stray dogs, Mice/ramosquitoes, bees, etc.) | 5 | proced 28. Inspect fingers objects | re of potential trip hazards / Follor lures/ Mark significant hazards. for jagged/sharp edges, and roug away from pinch points / Wipe of s before handling / Wear leather/ of angan approved safety shoes. | gh or slippery surfaces / Keep if greasy, wet, slippery, or dirty |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|---|--|--|
| 4. All activities (cont'd) Additional items. | 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 where overhead hazards exist. 35. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress. 36. Wear safety glasses |
| Additional Items identified while in the field. | | |
| (Delete row if not needed.) | | |

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JSA Title: 55-gallon Drum Sampling

JSA Number: JSA043-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last-Minute Risk Assessment.



- **<u>S</u> Stop**, what has changed?
- $\underline{\mathbf{T}}$ **Think** about the task
- P <u>E</u> **Evaluate** potential hazards
 - P Plan safe approach
 - <u>S</u> Start task / Stop & regroup

| PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed): | | | | | |
|---|--|------------------------------------|--|--|--|
| | | | ss 2) | | ☐ Hearing Protection |
| | | | | | ☑ PVC Gloves |
| □ Leather Gloves | ☐ Cut Resist. Gloves | ☐ Fall Protection | | ☐ Fire Resistant Clothing | ☐ Rubber Boots |
| ☐ Insect/Animal Repellent | ☐ Ivy Blocker/Cleaner | ☐ Traffic Cones/Si | gns | ☐ Life Vest/Jacket | |
| Other: All Drums are required to | be labeled. Langan employees do no | t open or move undocu | mented drums | or unlabeled drums without proper pro | oject manager authorization. |
| JOB STEPS | POTENTIAL HAZA | ARDS | | PREVENTATIVE / CORREC | CTIVE ACTION |
| 20.Unpack/Transport equipment to work area. 21.Open Drums | 18. Cuts/Abrasions from equipment 4. Contusions from dropped equipment 12. 1. Hand Injuries, cuts or lacerations when untightening drum locking bolt, removing drum lid | | Minimize distance to work area/Unobstructed path to work area/follow good housekeeping procedures. Mark slip/trip/fall hazards with orange safety cones. | | |
| | Pressure from drums. | | 2. Open | mallet and non-sparking tools/wrer drum slowly to relieve pressure. W correct gloves; and over garments | Vear proper PPE: face shield and |
| 22.Collecting Soil/Fluid Sample | 8. Irritation to eye from vapor, so splashing.9. Irritation to exposed skin | oil dust, or | and when appropria filter) | oper eye protection including safet in necessary, splash guard. If dust ate safety breathing gear (1/2 mas oper skin protection including nitrile | t or vapor phase is present, wear k or full face mask with correct |
| 23.Closing Drums | Hand Injuries, cuts or untightening drum locking bolt, strap, or removing lid. | lacerations when removing drum lid | fingers av | or jagged/sharp edges, and rough way from pinch points / Wipe off gr efore handling / Wear leather/ cut- nallet and non-sparking tools/wrer | reasy, wet, slippery, or dirty resistant gloves. Use non- |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|---|---|--|
| 24.Moving Drums | Hand Injuries, cuts or lacerations when untightening drum locking bolt, removing drum lid strap, or removing lid. Back Strains | Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery, or dirty objects before handling / Wear leather/ cut-resistant gloves. Use non-metallic mallet and non-sparking tools/wrenches. Use proper lifting techniques/Use wheeled transport. |
| 25. All activities Additional items. | 31. Slips/ Trips/ Falls 32. Hand injuries, cuts, or lacerations during manual handling of materials 33. Foot injuries 34. Back injuries 35. Traffic 36. Wildlife: Stray dogs, Mice/rats, Vectors (i.e., mosquitoes, bees, etc.) 37. High Noise levels 38. Overhead hazards 39. Heat Stress/ Cold Stress 40. Eye Injuries | 37. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards. 38. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery, or dirty objects before handling / Wear leather/ cut-resistant gloves. 39. Wear Langan approved safety shoes. 40. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible. 41. Wear high visibility clothing & vest / Use cones or signs to designate work area. 42. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed. 43. Wear hearing protection 44. Wear hard hat / Avoid areas where overhead hazards exist. 45. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress. 46. Wear safety glasses |
| Additional Items identified while in the field. | | |
| (Delete row if not needed.) | | |

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JSA Title: Direct-Push Soil Borings

JSA Number: JSA004-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last-Minute Risk Assessment.



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

| PERSONAL PROTECTIVE EQUIPMENT REQUIRED: | | | | | |
|---|--|--|---|--|----------------|
| | | | ıss 2) | | |
| | ☐ Safety Goggles | ☐ Face Shield | | | □ PVC Gloves |
| | | ☐ Fall Protection | | ☐ Fire Resistant Clothing | ☐ Rubber Boots |
| ☐ Insect/Animal Repellent | ☐ Ivy Blocker/Cleaner | ☐ Traffic Cones/Si | gns | ☐ Life Vest/Jacket | |
| Other: Half-face respirator, d | lust cartridges, PID (if applicable) | | | | |
| JOB STEPS POTENTIAL HAZARDS | | PREVENTATIVE / CORRECTIVE ACTION | | | |
| 26.Move equipment to work site | 19.Back strain when lifting equip 20.Slips/ Trips/ Falls while movin 21.Traffic (if applicable) 22.Pinched fingers or running ov GeoProbe set-up. 23.Overturn drilling rig while tran dock on flat-bed tow truck | back)/ Use wheeled transport for heavy equipment / Get assistance whandling loads greater than 50 lbs. / Minimize distance to vehicle 14. Use proper lifting technique (use legs for bending and lifting and not the back) / Use wheeled transport for heavy equipment / Get assistance when handling loads greater than 50 lbs. / Minimize distance to vehicle Have unobstructed path to vehicle or collection point / Do not lift/walk boxes that are heavy/difficult to lift 15. Wear high visibility safety vests or clothing / Exercise caution 16. Wear proper PPE (cut-resistant gloves) / Stay alert, be aware of geoprobe rig at all times | | equipment / Get assistance when nimize distance to vehicle or bending and lifting and not the vequipment / Get assistance so. / Minimize distance to vehicle / ollection point / Do not lift/walk with sing / Exercise caution / Stay alert, be aware of at-bed tow truck / Emergency ransport on the flat-bed truck / All ay from the flat-bed truck during | |
| 27.Calibration of monitoring equipment | 10.Skin or eye contact with calibitation of the second state of the second seco | | 8. Wear proper PPE (safety glasses/ goggles) 9. Wear proper PPE (leather gloves) | | |
| 28.Set-up GeoProbe rig | 10. Geoprobe rig movemen | | All field personnel should stay clear of the GeoProbe rig while moving / Use a spotter when backing up the GeoProbe | | |
| 29.Advance GeoProbe rods below ground surface to desired depth 4. Underground utilities 5. High noise levels | | | subsurface soil borings to a mini oper PPE (hearing protection) | mum of 5 feet below grade. | |
| 30. Remove and open acetate liner. | 41. Pinched fingers while remov | noving macrocore. 1. Wear proper PPE (nitrile gloves, cut-resistant or leather gloves) 2. Wear proper PPE (cut-resistant or leather gloves) | | | |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|---|---|--|
| Remove and open acetate liner (cont'd) | 42. Cuts/lacerations when cutting acetate liner open. 43. Exposure to hazardous vapors 44. Skin contacts with contaminated soil | Do not place face over acetate liner when opening / Monitor hazardous vapors in air with PID / Upgrade PPE as necessary based on levels contained in the Health and Safety Plan Wear proper PPE (nitrile gloves) |
| 31. Sample Collections a) Monitor parameters. b) Prepare sample containers and labels | Contacts with contaminated soil. Contact with potentially contaminated soil. Lacerations from broken sample bottles Back strain while transporting full coolers. Internal exposure to contaminants and metals through inhalation of dust Slips/ Trips/ Falls | Use monitoring devices / Wear proper PPE (safety glasses, nitrile gloves) Do not over-tighten bottle caps / Handle bottles safely to prevent breakage. Use proper lifting techniques / Do not lift heavy loads without assistance. Avoid creating dust / If necessary, wear a half mask respirator with applicable dust cartridge / Inspect respirator for damage and cleanliness prior to use / Clean respirator after each use and store in a clean, secure location. Be alert / Follow good housekeeping procedures |
| 32. Remove excess soil from acetate liner and place in 55-gallon drum (IF NOT PERFORMED BY LANGAN, REMOVE!) | Cuts/lacerations from acetate liner Pinched fingers/hand while opening/closing drum. Skin contacts with contaminated soil Soil debris in eyes | Wear proper PPE (cut-resistant or leather gloves) Wear proper PPE (cut-resistant or leather gloves) Wear proper PPE (nitrile gloves) Wear proper PPE (safety glasses) |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|--|--|---|
| 8. Transport drums to central | Back, arm or shoulder strain from moving drums. | 47. Use drum cart for moving drums / Use proper lifting techniques / Do not lift |
| staging location (IF NOT PERFORMED BY LANGAN, REMOVE!) | Pinch fingers/hand in drum cart when moving drums. | heavy loads without assistance. 48. Wear proper PPE (cut-resistant or leather gloves) |
| 2 4(3) 4(1, 1(2)113 (2)) | Pinch fingers/hand when operating lift-gate on vehicle. | 49. Wear proper PPE (cut-resistant or leather gloves) |
| | Contact with potentially contaminated groundwater when moving improperly sealed drums. | 50. Wear proper PPE (nitrile gloves underneath work gloves) |
| | 5. Slips when moving drums. | 51. Follow good housekeeping procedures / Ensure route to move drum and storage space is free from obstructions. |
| | 6. Drop drum on feet/toes | 52. Wear proper PPE (safety shoes) / Work in a safe manner to prevent dropped drum |
| 9. All activities | 1. Slips/ Trips/ Falls | Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards. |
| | Hand injuries, cuts, or lacerations during manual handling of materials | 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. Foot injuries | Wear Langan approved safety shoes. |
| | 4. Back injuries | 4. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible. |
| | 5. Traffic | 5. Wear high visibility clothing & vest / Use cones or signs to designate work area. |
| | Wildlife: Stray dogs, Mice/rats, Vectors (i.e., mosquitoes, bees, etc.) | Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed. |
| | 7. High Noise levels | 7. Wear hearing protection |
| | 8. Overhead hazards | 8. Wear hard hat / Avoid areas where overhead hazards exist. |
| | 9. Heat Stress/ Cold Stress | 9. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress. |
| 9. All activities (cont'd) | 10. Eye Injuries | 10. Wear safety glasses |
| Additional items. | | |
| | | |
| Additional Items identified while in the field. | | |
| (Delete row if not needed.) | | |
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JSA Title: Geophysical Investigation

JSA Number: JSA023-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last-Minute Risk Assessment.



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

| PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed): | | | | | |
|---|--|---|--------|---|----------------|
| | | | iss 2) | | |
| | ☐ Safety Goggles | ☐ Face Shield | | | ☐ PVC Gloves |
| | □ Cut Resist. Gloves | ☐ Fall Protection | | ☐ Fire Resistant Clothing | ☐ Rubber Boots |
| ☐ Insect/Animal Repellent | ☐ Ivy Blocker/Cleaner | ☐ Traffic Cones/Si | igns | ☐ Life Vest/Jacket | |
| □ Other: | | | | | |
| JOB STEPS POTENTIAL HAZARDS | | PREVENTATIVE / CORRECTIVE ACTION | | | |
| 33. Transport equipment to work area | 25.Slip/Trip/Falls 19. M | | 19. Mi | se proper lifting techniques/Use wheeled transport nimize distance to work area/unobstructed path to work by good housekeeping procedures | |
| | 27.Cuts/abrasions/contusions fro | | | t or clothing) | |
| 34.Supervision of subcontractor and all other activities | 12.Slip/Trips/Falls 13.Hand injuries 14.Foot injuries 15.Back injuries/Strains 16.Traffic 17.Wildlife a. Wildlife b. Mice/rats c. Vectors (i.e., mosquitoes, b.) 7. Heat/Cold Stress | 10. Be aware of potential trip hazards/follow good housekeeping procedures/mark significant below-grade hazards (i.e., holes, trenches, wires, ropes) with safety cones or spray paint. 11. Wear proper PPE (leather gloves)/watch wear you place your hands/inspect material or equipment for jagged, rough, or slippery surfaces/ watch for pinch points/ wipe off slippery, wet, or dirty items prior to handling. 12. Wear proper PPE (Langan approved safety shoes)/ Be aware of | | azards (i.e., holes, trenches, nint. vatch wear you place your gged, rough, or slippery lippery, wet, or dirty items prior d safety shoes)/ Be aware of system when lifting/ use ts and vests)/ use cones if work area. s for the presence of wildlife. | |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|---|---|--|
| | | sunlight or layer clothing in cold weather)/ drink plenty of fluids/ take regular breaks. |
| 35. All activities | 45. Slips/ Trips/ Falls 46. Hand injuries, cuts, or lacerations during manual handling of materials 47. Foot injuries 48. Back injuries 49. Traffic 50. Wildlife: Stray dogs, Mice/rats, Vectors (i.e., mosquitoes, bees, etc.) 51. High Noise levels 52. Overhead hazards 53. Heat Stress/ Cold Stress 54. Eye Injuries | 53. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards. 54. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery, or dirty objects before handling / Wear leather/ cut-resistant gloves. 55. Wear Langan approved safety shoes. 56. 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. 57. Wear high visibility clothing & vest / Use cones or signs to designate work area. 58. 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. 59. Wear proper hearing protection. 60. Wear hard hat / Avoid areas where overhead hazards exist. 61. 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. 62. Wear safety glasses |
| Additional items. | | |
| Additional Items identified while in the field. | | |
| (Delete row if not needed.) | | |

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JSA Title: Groundwater Sampling

JSA Number: JSA008-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last-Minute Risk Assessment.



- <u>S</u> *Stop,* what has changed?
- $\underline{\mathbf{T}}$ **Think** about the task
- <u>E</u> Evaluate potential hazards
- P Plan safe approach
- S Start task / Stop & regroup

| PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed): | | | | | |
|---|--|--|-----------|--------------------------------------|----------------------------------|
| | | | iss 2) | | |
| | ☐ Safety Goggles | ☐ Face Shield | | ☑ Nitrile Gloves | ☐ PVC Gloves |
| | ☐ Cut Resist. Gloves | | | ☐ Fire Resistant Clothing | ☐ Rubber Boots |
| ☐ Insect/Animal Repellent | ☐ Ivy Blocker/Cleaner | ☐ Traffic Cones/Si | gns | ☐ Life Vest/Jacket | |
| | l Protection, PID | | | | |
| JOB STEPS | POTENTIAL HAZA | ARDS | | PREVENTATIVE / CORRE | ECTIVE ACTION |
| 36.Transport equipment to | Back Strain | | | oper lifting techniques / Use whe | |
| work area | 2. Slips/ Trips/ Falls | | | ze distance to work area / Have ι | inobstructed path to work area / |
| | 3. Traffic | | | good housekeeping procedures. | alathia a |
| | 4. Cuts/abrasions from equipm5. Contusions from dropped ed | | | proper PPE (high visibility vest or | |
| | 3. Contasions from Gropped ed | quipment 4. Wear proper PPE (leather gloves, long sleeves) 5. Wear proper PPE (safety shoes) | | sieeves) | |
| 37. Remove well cover | 18.Scrape knuckles/hand | | | | |
| | 19.Strain wrist/bruise palm | | | a hammer, tap the end of the wre | nch to loosen grip of bolts. |
| | 20.Pinch fingers or hand | 5. Wear proper PPE (leather gloves) | | | |
| 38. Remove well cap and lock | | I can pops from pressure. 5. Remove cap slowly to relieve pressure / Do not place face over | | | |
| | 12. Exposure to hazardous | | | | |
| | through inhalation or dermal et al. Scrape knuckles/hand | exposure | | llow actions prescribed in the CH | • • • |
| | 14. Strain write/bruise palm | 1 | gloves | | ASI / Wear proper i i L (mille |
| | The Grant Wiley States Paint | | | oroper PPE (leather gloves) | |
| | | 8. Using hammer, tap the end of the wrench to loosen grip | | ch to loosen grip | |
| 39. Measure head-space | Exposure to hazardous substances through | | 1. Do not | place face over well when collec | ting measurement |
| vapor levels | inhalation | | | | |
| 40. Remove dedicated tubing | | | | proper PPE (nitrile gloves, Tyvek | sleeves) |
| (if necessary) | inhalation or dermal exposur | | | | |
| 41. Set-up plastic sheeting for | 2. Tubing swings around after1. Lacerations when cutting plan | | 1 Hee ea | sissors to cut plastic sheeting / Cu | t motions should always be away |
| work site around the well | 1. Lacerations when cutting pie | asiio siieeiiiig. | | odv and bodv parts | i motions should always be away |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|------------------------------|--|---|
| 42. Measure depth to water | 1 | Wear proper PPE (nitrile gloves) |
| | | Wear proper PPE (leather gloves) |
| | Pinch fingers or hand in water level instrument | |
| 43. Calibrate monitoring | Skin or eye contact with calibration chemicals | Wear proper PPE (safety glasses, nitrile gloves) |
| equipment | Pinch fingers or hand in monitoring equipment | Wear proper PPE (leather gloves) / Avoid pinch points |
| 44. Install sampling pump in | Hand injuries during installation of pump | Wear proper PPE (leather gloves, nitrile gloves) |
| well | Lacerations when cutting tubing. | Use safety tubing cutter. |
| | 3 | Use proper lifting techniques. |
| | 4. Physical hazards associated with manual lifting | 4. Use proper lifting techniques / Use wheeled transport for heavy |
| | of heavy equipment. | equipment. |
| | Back strain from starting generator. | 5. Use arm when starting generator / Do not over-strain if generator does |
| | Burns from hot exhaust from generator. | not start. |
| | 7. Electrical shock from improper use of | 6. Do not touch generator near exhaust / Use proper handle to carry / Allow |
| | generator and pump | generator to cool down before moving. |
| | Contaminated water spray from loose | 7. Properly plug in pump to generator / Do not allow the pump or generator |
| | connections | to contact water / Check for breaks in the cord. |
| | | 8. Check all tubing connections to ensure they are tight and secure |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|--|---|--|
| 10. Purge water | Contact with potentially contaminated groundwater. Back strain from lifting buckets of water Tripping potential on sample discharge lines and pump electric lines | Wear proper PPE (safety glasses, nitrile gloves) Use proper lifting techniques / Use wheeled transport. Organize discharge of electric line to keep out of way as much as possible / Mark potential tripping hazards with caution tape or safety cones |
| 11. Sample water collection | Contact with potentially contaminated groundwater through dermal exposure. Contact with and burns from acid used for sample preservation. Tripping potential on sample discharge lines and pump electric lines Lacerations from broken sample bottles Back strain when transporting coolers full of collected samples. Slips/ Trips/ Falls | Wear proper PPE (safety glasses, nitrile gloves) Wear proper PPE (safety glasses, nitrile gloves) / Ensure sample bottle lids are secure before use and after sample collection. Organize line to keep out of the way as much as possible / Mark potential tripping hazards with caution tape or safety cones. Do not over-tighten bottle caps / Handle bottles safely to prevent breakage / Wrap glass bottles in bubble wrap, if possible Use proper lifting techniques / Use wheeled transport / Seek assistance if coolers weight exceeds 50lbs. / Minimize distance to vehicle. Have unobstructed path to vehicle or collection point / Follow good housekeeping procedures / Do not lift/walk with coolers that are too heavy/difficult to lift |
| 12. Remove pump and pack up equipment | Back strain when removing pump or lifting heavy equipment | Use proper lifting technique / Use wheeled transport for heavy equipment |
| 13. Replace well cap and lock | Scrape fingers/hand Strain wrist/bruise palm | Wear proper PPE (leather gloves) Using hammer, tap the end of the well cap to tighten grip |
| 14. Replace well cover | Scrape knuckles/hand Strain write/bruise palm. Pinch fingers or hand | Wear proper PPE (leather gloves) Using hammer, tap the end of the wrench to tighten the grip of the bolts. Wear proper PPE (leather gloves) |
| 15. Transport drums to disposal staging location | Back, arm or shoulder strain from moving drums. Pinch hazard Contact with potentially contaminated groundwater when moving improperly sealed drums. Slips/ Trips/ Falls when moving drum. Drop drum on feet/toes | Use drum cart for moving drums / Use proper lifting techniques / Obtain assistance, if needed Wear proper PPE (leather gloves) Wear proper PPE (nitrile gloves under leather gloves) / Properly seal drum to prevent leak. Ensure route to move drum to storage space is dry and free from obstructions. Wear proper PPE (safety shoes) |
| 16. Place used PPE in designated disposal drum | Pressure build-up inside drum Pinch hazard | Remove cap from bung hole in drum to relieve pressure. Wear proper PPE (leather gloves) |
| 17. Decontaminate equipment | Splashing water/soap from decontamination Contact with potentially contaminated groundwater through dermal exposure. Electrical shock from broken electric cords | Wear proper PPE (safety glasses) Wear proper PPE (safety glasses, dermal protection) Properly plug in pump to generator / Do not allow the pump or generator to contact water / Check for breaks in the cord |
| 18. All activities | 55. Slips/ Trips/ Falls 56. Hand injuries, cuts, or lacerations during manual handling of materials 57. Foot injuries 58. Back injuries 59. Traffic 60. Wildlife: Stray dogs, Mice/rats, Vectors (i.e., mosquitoes, bees, etc.) | 63. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards. 64. 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. 65. Wear Langan approved safety shoes. |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|--|--|--|
| Additional items. | 61. High Noise levels 62. Overhead hazards 63. Heat Stress/ Cold Stress 64. Eye Injuries | 66. 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. 67. Wear high visibility clothing & vest / Use cones or signs to designate work area. 68. 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. 69. Wear hearing protection 70. Wear hard hat / Avoid areas where overhead hazards exist. 71. 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. 72. Wear safety glasses |
| Additional Items identified while in the field. (Delete row if not needed.) | | |
| | | |

| Print Name | Sign Name | <u>Date</u> | | | |
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| Reviewed by: | Reviewed by: | | | | |
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JSA Title: Well Installation JSA Number: JSA019-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last-Minute Risk Assessment.



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

| PERSONAL PROTECTIVE EQUIPMENT REQUIRED: | | | | | |
|---|---|--|----------|--|----------------|
| | | | ass 2) | | |
| | ☐ Safety Goggles | ☐ Face Shield | | ☑ Nitrile Gloves | ☐ PVC Gloves |
| | ☐ Cut Resist. Gloves | ☐ Fall Protection | | ☐ Fire Resistant Clothing | ☐ Rubber Boots |
| ☐ Insect/Animal Repellent | ☐ Ivy Blocker/Cleaner | ☐ Traffic Cones/Si | igns | ☐ Life Vest/Jacket | |
| Other: PID, Tyvek sleeves | | | | | |
| JOB STEPS | POTENTIAL HAZ | ARDS | | PREVENTATIVE / CORRE | ECTIVE ACTION |
| 45.Move equipment to work site | 28.Back strain when lifting equip 29.Slips/ Trips/ Falls while movin 30.Traffic (if applicable) 31.Pinched fingers or running ov GeoProbe set-up. 32.Overturn drilling rig while trandock on flat-bed tow truck | puipment. 22. Use proper lifting technique (use legs for bending back)/ Use wheeled transport for heavy equipment handling loads greater than 50 lbs. / Minimize of back) / Use proper lifting technique (use legs for bending back) / Use wheeled transport for heavy equipment when handling loads greater than 50 lbs. / Minimize that the unobstructed path to vehicle or collection boxes that are heavy/difficult to lift 24. Wear high visibility safety vests or clothing / Expression of the unique (use legs for bending back) / Use wheeled transport for heavy equipment back) / Use wheeled transport | | requipment / Get assistance when nimize distance to vehicle or bending and lifting and not the y equipment / Get assistance s. / Minimize distance to vehicle / billection point / Do not lift/walk with ing / Exercise caution / Stay alert, be aware of at-bed tow truck / Emergency ransport on the flat-bed truck/ All | |
| 46.Calibration of monitoring equipment | 21.Skin or eye contact with calib 22.Pinch fingers in monitoring ed | | | Wear proper PPE (safety glasses Wear proper PPE (leather gloves | 3) |
| 18. Set-up GeoProbe rig | 15. Geoprobe rig movement | | Use a sp | d personnel should stay clear of the otter when backing up the GeoPi | robe |
| Advance GeoProbe rods below ground surface to desired depth | Underground utilities High noise levels | ground utilities 9. Clean all subsurf | | Ill subsurface soil borings to a min Vear proper PPE (hearing protect | |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|---|--|---|
| 20. Remove and open acetate liner.5. Remove and open acetate liner (cont'd) | 65. Pinched fingers while removing macrocore. 66. Cuts/lacerations when cutting acetate liner open. 67. Exposure to hazardous vapors 68. Skin contacts with contaminated soil | Wear proper PPE (nitrile gloves, cut-resistant or leather gloves) Wear proper PPE (cut-resistant or leather gloves) Do not place face over acetate liner when opening / Monitor hazardous vapors in air with PID / Upgrade PPE as necessary based on levels contained in the Health and Safety Plan Wear proper PPE (nitrile gloves) |
| 6. Remove excess soil from acetate liner and place in 55-gallon drum (IF NOT PERFORMED BY LANGAN, REMOVE!) | 5. Cuts/lacerations from acetate liner 6. Pinched fingers/hand while opening/closing drum. 7. Skin contacts with contaminated soil 8. Soil debris in eyes | 5. Wear proper PPE (cut-resistant or leather gloves) 6. Wear proper PPE (cut-resistant or leather gloves) 7. Wear proper PPE (nitrile gloves) 8. Wear proper PPE (safety glasses) |
| 7. Attach hollow-stem augers to the GeoProbe rig; Advance augers and attach. additional augers until desired depth is reached | Strain wrist/bruise palm Pinched fingers Back Strain Clothing entanglement Carbon monoxide poisoning Bruise toes/foot High noise levels Skin contacts with contaminated soil | Wear proper PPE (cut-resistant or leather gloves) Wear proper PPE (cut-resistant or leather gloves) Use proper lifting techniques. Wear proper work attire(no loose clothing/strings) Properly ventilate work area Wear proper PPE (safety shoes) Wear proper PPE (hearing protection) Wear proper PPE (Tyvek sleeves, nitrile gloves) |
| 8. Install monitoring well | Pinched fingers Lacerations/abrasions Back Strain | Wear proper PPE (cut-resistant or leather gloves) Wear proper PPE (cut-resistant or leather gloves) Use proper lifting techniques |
| Tremie-grout annulus space above bentonite seal | Back strain Pinched fingers | Use proper lifting techniques. Wear proper PPE (cut-resistant or leather gloves) |
| Install flush-mount monitoring well pad | Splashed concrete. Pinched fingers Cuts/lacerations | Wear proper PPE (safety glasses) Wear proper PPE (cut-resistant or leather gloves) Wear proper PPE (cut-resistant or leather gloves) |
| 11. Decontaminate equipment | Splashing water/soap Contact with potentially contaminated groundwater/soil through dermal exposure. Electrical shock from broken electric cords | Wear proper PPE (safety glasses) Wear proper PPE (safety glasses, dermal protection) Properly plug in pump to generator / Do not allow the pump or generator to contact water / Check for breaks in the cord |
| 12. Transport drums to central staging location (IF NOT PERFORMED BY LANGAN, REMOVE!) | Back, arm or shoulder strain from moving drums. Pinch fingers/hand in drum cart when moving drums. Pinch fingers/hand when operating lift-gate on vehicle. Contact with potentially contaminated groundwater when moving improperly sealed drums. | 73. Use drum cart for moving drums / Use proper lifting techniques / Do not lift heavy loads without assistance. 74. Wear proper PPE (cut-resistant or leather gloves) 75. Wear proper PPE (cut-resistant or leather gloves) 76. Wear proper PPE (nitrile gloves underneath work gloves) |
| | 11. Slips when moving drums. 12. Drop drum on feet/toes | 77. Follow good housekeeping procedures / Ensure route to move drum and storage space is free from obstructions. 78. Wear proper PPE (safety shoes) / Work in a safe manner to prevent dropped drum |

| POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|---|---|
| Slips/ Trips/ Falls Hand injuries, cuts, or lacerations during manual handling of materials Foot injuries Back injuries Traffic Wildlife: Stray dogs, Mice/rats, Vectors (i.e., mosquitoes, bees, etc.) High Noise levels Overhead hazards Heat Stress/ Cold Stress Eye Injuries | Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery, or dirty objects before handling / Wear leather/ cut-resistant gloves. Wear Langan approved safety shoes. 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. Wear high visibility clothing & vest / Use cones or signs to designate work area. 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. Wear hearing protection Wear hard hat / Avoid areas where overhead hazards exist. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress. |
| | 20. Wear safety glasses |
| | |
| | Slips/ Trips/ Falls Hand injuries, cuts, or lacerations during manual handling of materials Foot injuries Back injuries Traffic Wildlife: Stray dogs, Mice/rats, Vectors (i.e., mosquitoes, bees, etc.) High Noise levels Overhead hazards Heat Stress/ Cold Stress |

| Print Name | Sign Name | <u>Date</u> |
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JSA Title: Monitoring Well Development

JSA Number: JSA026-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last-Minute Risk Assessment.

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



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

| | | ⊠ Safety Vest (Cla | ISS Z) | ⊠ Hard Hat | ☐ Hearing Protection | |
|---|--|---|--|--|---|--|
| | ☐ Safety Goggles | | | | ☐ PVC Gloves | |
| □ Leather Gloves | | Cut Resist. Gloves | | ☐ Fire Resistant Clothing | ☐ Rubber Boots | |
| ☐ Insect/Animal Repellent | ☐ Ivy Blocker/Cleaner | ☐ Traffic Cones/Si | gns | ☐ Life Vest/Jacket | | |
| | | • | | | · | |
| | | | | | | |
| JOB STEPS | POTENTIAL F | HAZARDS | | PREVENTATIVE / CORRECTIVE ACTION | | |
| 47.Transport equipment to work | 34.Slips/Trips/Falls 35.Traffic | 34.Slips/Trips/Falls 35.Traffic 36.Cuts/Abrasions/Contusions from | | se proper lifting techniques/ Use when lifting equipment. nimize distance from work area/ nd vehicle/ Follow good housekee ear high-visibility vest or clothing/ signage if needed. ear proper PPE (leather gloves, loes). | unobstructed path to collection eping procedures. (Exercise caution/ Use traffic | |
| 48.Measure depth of water | ture depth of water 23.Exposure to hazardous substances 24.Pinched fingers | | 21. W | ear proper PPE (Nitrile gloves, S ear proper PPE (cut-resistant glo | | |
| 49.Install Tremie pipe in the monitoring well and connect to water source. | o (pinched fingers/hand 17. Back strain from pipe. | Hand injuries during installation (pinched fingers/hands). Back strain from holding Tremie pipe. | | ear proper PPE (Nitrile gloves/cu se proper lifting techniques/ Use the eater than 80 feet. Issure all those connections are tiged and safety glasses). | | |
| 50.Install pump in to well. a. Connect pump to sample to b. Lower pump to desired dewell. c. Connect sample tubing to cell. d. Connect pump to power sell. | pth in 9. Back strain 10. Electric shock 11. Exhaust gases to the strain | from generator | (Nitrile ar 12. Pr depths g generato 13. Er preformir | ear proper PPE when installing p nd cut-resistant gloves)/ Use tubi oper lifting techniques/ Two pers reater than 80 feet/ Use buddy w r)/Use wheeled transport. Isure equipment is (LO/TO: locken ing any electrical connections/ Insure generator is properly grounder | ng cutter. onnel when installing pump at hen lifting heavy loads (pump, ed out/tagged out) prior to pect wires for frays or | |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|---|---|---|
| (generator) e. Turn on power source (generator) | | 14. Position generator so that exhaust is flowing away from work area. 15. Do not touch exhaust or any hot part of generator/ Allow equipment time to cool down prior to carrying/ Use proper PPE (long sleeves, leather gloves) |
| 51. Develop monitoring well. a. Jet water into well using Tremie pipe. b. Turn pump on and adjust to desired flow rate. c. Surge pump up and down well to remove sediment from screen. d. Containerize all purge water from well. | 69. Hand injuries 70. Face injuries 71. Contaminated spray from water | 79. Wear proper PPE (cut-resistant gloves and nitrile gloves). 80. Wear proper PPE (face shield and safety glasses)/do not stand over well opening. 81. Wear proper PPE (Face shield and safety goggles)/Tyvek over garments/ Ensure all connections are secure and tight/ Tubing outlet is contained in an overflow container. |
| 52. Drum staging area. | Back, Arm, and shoulder strain. Pinch points Cross contamination Slip/Trips/Falls | Use proper lifting techniques/ Use drum carts when moving drums/ use buddy system for moving of drums if needed/Move drums shortest distance needed. Keep fingers and feet away from pinch points/ Use proper PPE (cut-resistant gloves, Langan approved safety shoes) Use proper PPE (Nitrile gloves, Tyvek sleeves) Ensure pathway is clear prior to moving equipment/ Mark all hazards/ Use additional person as a spotter if needed. |
| 53. Equipment pack-up | Back Strains Slips/Trips/Falls Traffic Cuts/Abrasions/Contusions from equipment. | Use proper lifting techniques/ Use wheeled transport/ use buddy system when lifting equipment. Minimize distance from work area/ Unobstructed path to collection points and vehicle/ Follow good housekeeping procedures. Wear high-visibility vest or clothing/Exercise caution/ Use traffic cones or signage if needed. Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes). |
| 54. All activities | Slips/ Trips/ Falls Hand injuries, cuts, or lacerations during manual handling of materials Foot injuries Back injuries Traffic Wildlife: Stray dogs, Mice/rats, Vectors (i.e., mosquitoes, bees, etc.) High Noise levels Overhead hazards Heat Stress/ Cold Stress Eye Injuries | Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery, or dirty objects before handling / Wear leather/ cut-resistant gloves Wear Langan approved safety shoes 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 Wear high visibility clothing & vest / Use cones or signs to designate work area 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 Wear hearing protection Wear hard hat / Avoid areas where overhead hazards exist. Wear proper attire for weather conditions (sunscreen or protective clothing) |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|---|-------------------|--|
| | | in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 10. Wear safety glasses. |
| Additional items. | | |
| Additional Items identified while in the field. | | |
| (Delete row if not needed.) | | |

| Print Name | Sign Name | <u>Date</u> | | | |
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JSA Title: Groundwater/Product Purging/Sampling with Bailer

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

□ Long Sleeves

inhalation

Lacerations when cutting plastic

sheeting/absorbent pads.

JSA Number: JSA053

☐ Safety Shoes

vapor levels

sheeting/absorbent pads

59. Set-up plastic

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last-Minute Risk Assessment.

Job Safety Analysis (JSA) Health and Safety

Use scissors to cut plastic sheeting/absorbent pads / Cut motions should

always be away from body and body parts



- **<u>S</u> Stop**, what has changed?
- T Think about the task
- E Evaluate potential hazards
- P Plan safe approach

S - Start task / Stop & regroup

| | 5 | | <i>)</i> | | |
|--|--|-------------------|---|--|---|
| | | | | ☑ Nitrile Gloves | ☑ PVC Gloves |
| □ Leather Gloves | ☐ Cut Resist. Gloves | ☐ Fall Protection | | | ☐ Rubber Boots |
| ☐ Insect/Animal Repellent | ☐ Ivy Blocker/Cleaner | | gns | ☐ Life Vest/Jacket | |
| ☑ Other: Tyvek sleeves, Dermal Protection, PID, absorbent pads | | | | | |
| JOB STEPS | POTENTIAL HAZARDS | | PREVENTATIVE / CORRECTIVE ACTION | | |
| 55.Transport equipment to work area | 6. Back Strain 7. Slips/ Trips/ Falls 8. Traffic 9. Cuts/abrasions from equipm 10. Contusions from dropped ed | | 7. MinimizerFollow8. Wear p9. Wear p | oper lifting techniques / Use whee ze distance to work area / Have ur good housekeeping procedures. Proper PPE (high visibility vest or coroper PPE (leather gloves, long soroper PPE (safety shoes) | nobstructed path to work area / |
| 56. Remove well cover | 25.Scrape knuckles/hand 26.Strain wrist/bruise plan 27.Pinch fingers or hand | | 7. Using | proper PPE (leather gloves) a hammer, tap the end of the wrer proper PPE (leather gloves) | nch to loosen grip of bolts. |
| 57. Remove well cap and lock | 19. Well can pops from pressure. 20. Exposure to hazardous substances through inhalation or dermal exposure 21. Scrape knuckles/hand 22. Pinch points 23. Strain write/bruise palm | | when of protect 10. Use did and fol gloves 11. Wear p. 12. Using | rect air monitoring/reading instrum low actions prescribed in the CHA) proper PPE (leather gloves) hammer, tap the end of the wrenct | y glasses, face shield, hand ent (i.e., PID) / Be familiar with SP / Wear proper PPE (nitrile |
| 58. Measure head-space | 2. Exposure to hazardous sub | stances through | 2. Do not | place face over well when collecti | ing measurement |

□ Safety Vest (Class 2)

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|-----------------------------------|--|---|
| for work site around the well | | |
| 60. Lower Bailer sleeve into well | Repetitive motion injury (pulled arm/back muscles) Dehydration | 7. Take breaks while lowering bailer into well/ Use a mechanical device to lower bailer into well/ Rotate employees (take turns conducting the manual labor portion) 8. Take breaks and drink water. |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|--|--|--|
| 7. Purge/Sample water/product collection | Contact with potentially contaminated groundwater or product through dermal exposure Contact with and burns from acid used for sample preservation Tripping potential on sampling lanyard Lacerations from broken sample bottles Back strain when transporting coolers full of collected samples. Slips/ Trips/ Falls | Wear proper PPE (safety glasses, nitrile gloves, safety shield, Tyvek) Ensure sample bottle lids are secure before use and after sample collection Organize lanyard to keep out of the way as much as possible / Mark potential tripping hazards with caution tape or safety cones Do not over-tighten bottle caps / Handle bottles safely to prevent breakage / Wrap glass bottles in bubble wrap, if possible Use proper lifting techniques / Use wheeled transport / Seek assistance if coolers weight exceeds 50lbs. / Minimize distance to vehicle. Have unobstructed path to vehicle or collection point / Follow good housekeeping procedures / Do not lift/walk with coolers that are too heavy/difficult to lift |
| 8. Retrieval of bailer | Repetitive motion injury (pulled arm/back muscles) Dehydration | 9. Take breaks while retrieving bailer out of the well/ Use a mechanical device to raise bailer out of well/ Rotate employees (take turns conducting the manual labor portion) 10. Take breaks and drink water. |
| Pack-up equipment | Back strain when removing or lifting heavy equipment | 2. Use proper lifting technique / Use wheeled transport for heavy equipment |
| 10. Replace well cap and lock | Scrape fingers/hand Strain wrist/bruise palm | Wear proper PPE (leather gloves) Using hammer, tap the end of the well cap to tighten grip |
| 11. Replace well cover | Scrape knuckles/hand Strain write/bruise palm. Pinch fingers or hand | 4. Wear proper PPE (leather gloves) 5. Using hammer, tap the end of the wrench to tighten the grip of the bolts. 6. Wear proper PPE (leather gloves) |
| Place used PPE in designated disposal drum | Pressure build-up inside drum Pinch hazard | Remove cap from bung hole in drum to relieve pressure. Wear proper PPE (leather gloves) Product drums may require additional spill protection/electrical grounding, check local regulations |
| 13. Decontaminate equipment | 4. Splashing water/soap from decontamination5. Contact with potentially contaminated groundwater through dermal exposure. | 4. Wear proper PPE (safety glasses)5. Wear proper PPE (safety glasses, dermal protection) |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|--|---|--|
| 14. All activities Additional items. | 79. Slips/ Trips/ Falls 80. Hand injuries, cuts, or lacerations during manual handling of materials 81. Foot injuries 82. Back injuries 83. Traffic 84. Wildlife: Stray dogs, Mice/rats, Vectors (i.e., mosquitoes, bees, etc.) 85. High Noise levels 86. Overhead hazards 87. Heat Stress/ Cold Stress 88. Eye Injuries | 83. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards. 84. 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. 85. Wear Langan approved safety shoes. 86. 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. 87. Wear high visibility clothing & vest / Use cones or signs to designate work area. 88. 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. 89. Wear hearing protection 90. Wear hard hat / Avoid areas where overhead hazards exist. 91. 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. 92. Wear safety glasses |
| Additional Items identified while in the field. (Delete row if not needed.) | | |

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

JSA Title: Test Pits JSA Number: JSA016-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

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



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

| | | | ass 2) | | |
|-------------------------------------|---|--------------------|---|--|--|
| | ☐ Safety Goggles | ☐ Face Shield | | ☐ Nitrile Gloves | ☐ PVC Gloves |
| | ☐ Cut Resist. Gloves | ☐ Fall Protection | | ☐ Fire Resistant Clothing | ☐ Rubber Boots |
| ☐ Insect/Animal Repellent | ☐ Ivy Blocker/Cleaner | ☐ Traffic Cones/Si | igns | ☐ Life Vest/Jacket | |
| ☐ Other: | | | | | |
| | | | | | |
| JOB STEPS | POTENTIAL HAZ | ARDS | | PREVENTATIVE / CORRE | CTIVE ACTION |
| 61.Transport equipment to work area | 37.Back Strain 38.Slips/ Trips/ Falls 39.Traffic 40.Cuts/abrasions from equipme 41.Contusions from dropped equ | | 7. Minimi Follow 8. Wear p 9. Wear p | oper lifting techniques / Use whee ze distance to work area / Have un good housekeeping procedures proper PPE (high visibility vest or o proper PPE (leather gloves, long so proper PPE (safety shoes) | nobstructed path to work area / |
| 62.Digging Test Pit | 28.Back Strain 29.Unstable walls of excavation | | 9. Observat leas | ve proper digging technique. Ensu t 2 feet from edge of excavation. ate test pit in a stepped manor. | re spoil pile and equipment are |
| 63. All activities | 89. Slips/Trips/ Falls 90. Hand injuries, cuts, or lacerations during manual handling of materials 91. Foot injuries 92. Back injuries 93. Traffic 94. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 95. High Noise levels 96. Overhead hazards 97. Heat Stress/ Cold Stress 98. Eye Injuries | | 94. Inspect fingers objects 95. Wear L 96. Use pro load w assista 97. Wear h area 98. Be awa Do not | re of potential trip hazards / Follow lures/ Mark significant hazards for jagged/sharp edges, and roug away from pinch points / Wipe of selections before handling / Wear leather/ cangan approved safety shoes oper lifting techniques / Consider leather when evaluating what is safe ance when possible igh visibility clothing & vest / Use of are of surroundings at all times, incomproach stray dogs / Carry/use when needed. | h or slippery surfaces / Keep f greasy, wet, slippery or dirty cut-resistant gloves and location, task repetition, and or unsafe to lift / Obtain cones or signs to designate work cluding the presence of wildlife/ |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|---|-------------------|---|
| | | 99. Wear hearing protection 100. Wear hard hat / Avoid areas where overhead hazards exist. 101. 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. 102. Wear safety glasses |
| 3. All activities (cont'd) | | |
| Additional items. | | |
| Additional Items identified while in the field. | | |
| (Delete row if not needed.) | | |

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JSA Title: Excavation Oversight

JSA Number: JSA041-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

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



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

| TEROGRAP I ROTEOTIVE Earth incit in Incidence of to be worn as needed. | | | | | |
|--|---|---|---|---|---|
| | | Safety Vest (Classification) Safety Vest (Classificat | ass 2) | | |
| | ☐ Safety Goggles | ☐ Face Shield | | | ☐ PVC Gloves |
| □ Leather Gloves | □ Cut Resist. Gloves | ☐ Fall Protection | | ☐ Fire Resistant Clothing | ☐ Rubber Boots |
| ☐ Insect/Animal Repellent | ☐ Ivy Blocker/Cleaner | ☐ Traffic Cones/S | igns | ☐ Life Vest/Jacket | |
| ☐ Other: | | | | | |
| JOB STEPS | POTENTIAL HAZA | ARDS | | PREVENTATIVE / CORRE | CTIVE ACTION |
| 64. Transport equipment to work area | 42. Back Strain 43. Slips/Trips/Falls 44. Traffic 45. Cuts/abrasions/contusions f | rom equipment | 32. M ar 33. W | se proper lifting techniques / Use vinimize distance to work area / Ha ea / Follow good housekeeping profer PPE (high visibility ves ear proper PPE (leather gloves, lo | ve unobstructed path to work rocedures st or clothing) |
| 65.Earth Moving Equipment | 30. Equipment running over emp 31.Swing radius of equipment 32.Site constraints 33.Line of Fire incidents 34.Crushing hazards | lloyee | 23. Er 24. Do 25. M 26. Us 27. Co 28. Do 29. Ex 30. Si | nsure you have direct line of sight on't walk behind equipment; aintain a safe distance away from se spotters to communicate with e ompetent person onsite esignate/cone-off swing radius of excavator bucket grounded while conut-down equipment prior to collecter proper PPE (high vis vest/clot | with operator of equipment; equipment. equipment operator equipment bllecting samples cting samples |
| 66.Excavation | 24. Excavation collapse25. Confined space26. Soil | | 13. Use pr situate inspec 14. Langa 15. Soil ar | roper shoring/benching/sloping ted and in excavation; no water in excava- ted excavation prior to allow empl on employees are not authorized to and equipment is kept atleast 2 feet | chniques; Ladder is properly vation; competent person has oyees to enter. o enter a confined space; from edge of excavation |
| 67.Excavated soil | Hazardous substances | | | per equipment to monitor excava ot exceed PEL's for contaminates | ted soil for contaminates; ensure: Wear proper PPE |
| 68. All activities | 99. Slips/ Trips/ Falls | | 103.Be aw | are of potential trip hazards / Follo | |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|--|---|---|
| Additional items. | 100. Hand injuries, cuts or lacerations during manual handling of materials 101. Foot injuries 102. Back injuries 103. Traffic 104. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 105. High Noise levels 106. Overhead hazards 107. Heat Stress/ Cold Stress 108. Eye Injuries | 104. 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 105. Wear proper PPE (Langan approved safety shoes) 106. 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 107. Wear high visibility clothing & vest / Use cones or signs to designate work area 108. 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 109. Wear hearing protection 110. Wear hard hat / Avoid areas were overhead hazards exist. 111. 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 112. Wear safety glasses |
| Additional Items identified while in the field. (Delete row if not needed.) | | |
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JSA Title: General Construction Activities

JSA Number: JSA010-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.



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

| PERSONAL PROTECTIVE EQU | DIPMENT (Required or to be wor | n as needed): | | | |
|---|---|-------------------|--|---|---|
| | | | ass 2) | | |
| | ☐ Safety Goggles | | | | ☐ PVC Gloves |
| | ☐ Cut Resist. Gloves | ☐ Fall Protection | | ☐ Fire Resistant Clothing | ☐ Rubber Boots |
| ☐ Insect/Animal Repellent | ☐ Ivy Blocker/Cleaner | | igns | ☐ Life Vest/Jacket | |
| Other: | | | | | |
| JOB STEPS | POTENTIAL HAZA | ARDS | | PREVENTATIVE / CORRE | CTIVE ACTION |
| 69.Transport equipment to work area | 46.Back Strain 47.Slips/ Trips/ Falls 48.Traffic | | 12. Minimiz | oper lifting techniques / Use when ze distance to work area / Have u good housekeeping procedures | • |
| | 49. Cuts/abrasions from equipme | ant . | | proper PPE (high visibility vest or | clothing) |
| | 50. Contusions from dropped equ | | | proper PPE (leather gloves, long | |
| | | • | 15. Wear p | proper PPE (safety shoes) | , |
| 70.Installation of piping from vapor wells to skid connections and fro mdischarge pipping to effluent stack | 35. Pinch fingers when connecting 36. Slips/ Trips/ Falls 37. Machinery Hazards | ng pipes | 12. Be awa proced with sa | proper PPE (leather gloves) are of potential trip hazards / Pradures / Mark significant below-gradures / Mark significant below-gradurety cones or spray paint proper PPE (safety vest) / Maintainery | de hazards (i.e. holes, trenches) |
| 71.Remediation equipment installation | 27. Back strain when lifting 28. Slips/ Trips/ Falls 29. Traffic | heavy equipment | to vehi 14. Be awa proced with sa 15. Wear p | cle are of potential trip hazards / Prac lures / Mark significant below-gra ufety cones or spray pain proper PPE (safety vest) | de hazards (i.e. holes, trenches) |
| 72. All activities | 109.Slips/ Trips/ Falls 110.Hand injuries, cuts or lacera manual handling of material 111.Foot injuries 112.Back injuries | | proced 114.Inspec fingers | are of potential trip hazards / Folk lures/ Mark significant hazards t for jagged/sharp edges, and rou away from pinch points / Wipe of s before handling / Wear leather/ | gh or slippery surfaces / Keep ff greasy, wet, slippery or dirty |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|---|---|--|
| 4. All activities (cont'd) | 113.Traffic 114.Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 115.High Noise levels 116.Overhead hazards 117.Heat Stress/ Cold Stress 118.Eye Injuries | 115. Wear Langan approved safety shoes 116. 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 117. Wear high visibility clothing & vest / Use cones or signs to designate work area 118. 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 119. Wear hearing protection 120. Wear hard hat / Avoid areas were overhead hazards exist. 121. 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 122. Wear safety glasses |
| Additional items. | | |
| | | |
| Additional Items identified while in the field. | | |
| (Delete row if not needed.) | | |

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JSA Title: Ladder Use JSA Number: JSA056

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.



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

| PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed): | | | | | |
|---|--|---------------------|---|---|---|
| | ☐ Long Sleeves | ☐ Safety Vest (Cla | ss 2) | ☐ Hard Hat | ☐ Hearing Protection |
| | ☐ Safety Goggles | ☐ Face Shield | | ☐ Nitrile Gloves | ☐ PVC Gloves |
| ☐ Leather Gloves | ☐ Cut Resist. Gloves | | | ☐ Fire Resistant Clothing | ☐ Rubber Boots |
| ☐ Insect/Animal Repellent | ☐ Ivy Blocker/Cleaner | ☐ Traffic Cones/Sig | gns | ☐ Life Vest/Jacket | |
| Other: | | | | | |
| JOB STEPS | POTENTIAL HAZA | ARDS | | PREVENTATIVE / CORREC | CTIVE ACTION |
| 73. Use of Ladders and Inspection of Ladders Before Use | Ladders (portable, fixed) Rolling or pinching objects Sharp objects | | we 36. Us | spect all ladders for structural defe eight restrictions, non painted surfa se the correct type and size of ladd on not use metal or wooden ladder | ler to safely work. |
| 74. Use of Ladder(s) | 38. Ladders (portable, fixed) 39. Elevated work platform or stat 40. Slippery surfaces (water, ice, 41. Rolling or pinching objects 42. Sharp objects 43. Poor Housekeeping 44. Repetitive motion or other erg 45. Airborne dust | snow) | 32. Maintai 33. Insure hazard 34. Never of the state of | in three points of contact when as | cending and descending ladders. obstructions and tripping cending or descending a ladder. u or tool belts. Extension ladders ding that is being accessed and rom moving or falling. loyee needs to climb the ladder asion ladder, for every 4' of rise, |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|--------------------|---|---|
| 75. All activities | 119.Slips/ Trips/ Falls 120.Hand injuries, cuts or lacerations during manual handling of materials 121.Foot injuries 122.Back injuries 123.Eye Injuries | Use the proper ladder for the job at all times. The belt buckle may never extend past either rail on the side of the ladder. Do not climb higher than the second tread from the top on a stepladder or the third rung Before ascending or descending a ladder, wait until other workers have completely cleared the ladder. Do not stand directly below a person who is climbing or descending a ladder to avoid falling objects. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves Wear proper PPE (Langan approved safety shoes) 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 Wear high visibility clothing & vest / Use cones or signs to designate work area Wear hard hat / Avoid areas were overhead hazards exist. 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 Wear safety glasses |

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JSA Title: Mechanical Connection Oversight

JSA Number: JSA027-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

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



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

| | | | iss 2) | | |
|----------------------------|---|--------------------|---|---|-------------------------------------|
| | ☐ Safety Goggles | | | | ☐ PVC Gloves |
| | | ☐ Fall Protection | | ☐ Fire Resistant Clothing | ☐ Rubber Boots |
| ☐ Insect/Animal Repellent | ☐ Ivy Blocker/Cleaner | ☐ Traffic Cones/Si | gns | ☐ Life Vest/Jacket | |
| ☐ Other: | | | | | |
| | | | | | |
| JOB STEPS | POTENTIAL HAZA | ARDS | | PREVENTATIVE / CORRE | ECTIVE ACTION |
| 76.Transport equipment to | 51.Back Strain | | 16. Use pr | oper lifting techniques / Use whee | eled transport |
| work area | 52.Slips/ Trips/ Falls | | | ze distance to work area / Have u | inobstructed path to work area / |
| | 53.Traffic | 4 | | good housekeeping procedures | alathia a\ |
| | 54. Cuts/abrasions from equipme 55. Contusions from dropped equ | | | proper PPE (high visibility vest or proper PPE (leather gloves, long s | |
| | 33.30masions from Gropped equ | | | proper PPE (Langan approved sa | |
| 77. Piping and connections | 13. Pinch Hazard | | | proper PPE (leather gloves) | , |
| | 14. Cuts/abrasions to knucl | kles/hands | | proper PPE (leather gloves or cut | |
| | 15. Back Strain | | | oper lifting techniques / Use whee | |
| | 16. High pressure water sp | ray | | e connections are tight and secure fety glasses) | e/ Wear proper PPE (face shield |
| 78. All activities | 124. Slips/ Trips/ Falls | | | are of potential trip hazards / Follo | ow good housekeeping |
| | 125. Hand injuries, cuts or lacera | tions during | | ures/ Mark significant hazards | g |
| | manual handling of material | s | | | r slippery surfaces / Keep fingers |
| | 126. Foot injuries | | away from pinch points / Wipe off greasy, wet, slippery or dirty objects | | |
| | 127.Back injuries 128.Traffic | | before handling / Wear leather and/or cut-resistant gloves 133. Wear Langan approved safety shoes | | |
| | 129. Wildlife: Stray dogs, Mice/ra | ts Vactors (i.a. | | | load location, task repetition, and |
| | mosquitoes, bees, etc.) | 10, 1001010 (1.0. | | eigh / Obtain assistance when po | |
| | 130.High Noise levels | | | | cones or signs to designate work |
| | 131. Overhead hazards | | area | | |
| | 132. Heat Stress/ Cold Stress | | | | of wildlife/ Do not approach stray |
| | I 133 Eve Injuries | | l animal | s / Carry or use animal renellant / | / Lise hud spray when needed |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|---|-------------------|---|
| | | 137.Wear proper PPE (hearing protection) 138.Wear hard hat / Avoid areas were overhead hazards exist. 139.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 140. Wear safety glasses |
| Additional items. | | |
| Additional Items identified while in the field. | | |
| (Delete row if not needed.) | | |

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JSA Title: Soil Sampling from Excavator Bucket

JSA Number: JSA057

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.



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

| PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed): | | | | | |
|---|-----------------------|-----------------------|---------------------------|----------------------|--|
| | ☐ Long Sleeves | | | ☐ Hearing Protection | |
| | | ☐ 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 |
|--|---|---|
| 79. Drive to site and/or sample location. | 56. Rough/Off-Road terrain;57. Low-light or other hazardous environmental conditions. | Pay attention to road conditions such as road erosion, unprotected embankments, and soft road conditions; Ensure vehicle is properly equipped and outfitted for the terrain and all environmental conditions. |
| 80. Initial Site Arrival Site Assessment. | Unsafe driving conditions including personnel walking within driving areas, open excavation or pits, steep slopes etc.; Biological hazards (snakes, poison oak, bees). | Maintain situational awareness upon arriving to the work site (be alert of your surroundings). Secure the work area from through traffic. |
| 81. Unpack and transport equipment to work area. | Back Strains; Slip/Trips/Falls; Cuts/Abrasions from equipment; Contusions from dropped equipment. | Use proper lifting techniques and use wheeled transport; Minimize distance to work area and create unobstructed path to work area. Follow good housekeeping procedures. Mark slip/trip/fall hazards with orange safety cones and/or caution tape; Wear proper PPE (gloves, long sleeves, etc.); Wear proper PPE (Langan-approved safety shoes, hardhat, etc.). |
| 82. Earth Moving Equipment. | Equipment striking, crushing, running over employee etc. | Place traffic cones and use caution tape to clearly delineate the excavators front and rear swing radius. Do not enter the excavators or other heavy equipment swing radius/travel paths while in operation; Ensure all employees working in the vicinity of the excavator/heavy equipment maintain direct line of sight with the operator at all times; don't walk behind equipment or within the operators blind spots; maintain a safe distance away from the equipment; Designate one employee as the "spotter" to communicate with the excavator operator, and establish a shut-down signal that, when |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|---|---|--|
| 92 Joing of Samples 9 | 4. Pagk Strains | sounded, instructs the excavator operator to freeze/stop all movement of the equipment; Direct operator to completely power down the excavator before approaching (i.e. breaking the swing radius plane) the excavator bucket to collect a sample; Direct the operator keep the equipment completely powered-down until all employees are at a safe distance, and it is safe to continue work. The designated spotter should be the only person directing the operator to power the equipment back on. Conduct a planned pause anytime there is a change in procedure or before beginning a new task; Wear proper PPE (high vis vest/clothing). |
| 83. Icing of Samples & Transporting coolers/equipment from work area. | Back Strains Slips/Trips/Falls Cuts/Abrasions from equipment Pinch/Crushing Hazards. | Drain coolers of water. Use proper lifting techniques. Use wheeled transport whenever possible; Plan for and utilize a safe and unobstructed path of travel to and from work area. Maintain situational awareness when traveling to and from work area; Wear proper PPE (Leather gloves, long sleeves); Wear proper PPE (Leather gloves, long sleeves, hard hat, Langan approved safety shoes). |
| 84. Excavated soil. | Hazardous substances. | Use proper equipment to monitor excavated soil for contaminates; Ensure levels do not exceed PEL's for contaminates; Wear proper PPE. |
| 85. Changing site conditions. | Stockpiles and/or excavations/trenches/pits creating unsafe paths of travel. Unforeseen conditions | Take time to plan out stockpile, excavation, trench, and/or test pit locations, ensuring that the planned work will not create unsafe conditions or paths of travel once performed; Maintain situational awareness throughout the work day (be alert of the evolving site conditions); If stockpile, excavation, trench, and/or test pit locations create pinch points, site constraints, or unsafe paths of travel or other unsafe site conditions, stop work immediately and direct the excavator operator to correct the unsafe conditions by moving stockpiles, backfilling excavations, trenches, and/or test pits etc.; Use stop work and conduct a planned pause to address changed site conditions. |
| 86. All activities. | Slips/ Trips/ Falls; Hand injuries, cuts or lacerations during manual handling of materials; Foot injuries; Back injuries; Traffic; Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.); High Noise levels; Overhead hazards; Heat Stress/ Cold Stress; Eye Injuries. | Be aware of potential trip hazards. Follow good housekeeping procedures. Mark significant hazards; 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 proper PPE (leather/ cut-resistant gloves); Wear proper PPE (Langan approved safety shoes); 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; Wear high visibility clothing & vest / Use cones or signs to designate work area; |

| JOB STEPS | РОТЕ | NTIAL HAZARDS | | PREVENTA | TIVE / CORRECTIVE ACTION |
|--------------|------|---------------|----------------|--|---|
| | | | 7. 8. 9. | Do not approach stray do spray when needed; Wear hearing protection; Wear hard hat / Avoid are Wear proper attire for we clothing in sunlight, layers | s at all times, including the presence of wildlife. gs. Carry/use dog/animal repellant. Use bug eas were overhead hazards exist; ather conditions (sunscreen or protective s for cold weather). Drink plenty of fluids to avoid as necessary to avoid heat/cold stress; |
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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. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.



- <u>S</u> Stop, what has changed?
- $\underline{\mathbf{T}}$ **Think** about the task
- **P** <u>E</u> **Evaluate** potential hazards
 - P Plan safe approach
 - S Start task / Stop & regroup

| PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed): | | | | | |
|---|-----------------------|--|-----|----------------------------------|----------------|
| | | | | | |
| | ☐ Safety Goggles | ☐ Face Shield | | | ☐ PVC Gloves |
| | ☐ Cut Resist. Gloves | ☐ Fall Protection | | ☐ Fire Resistant Clothing | □ Rubber Boots |
| | ☐ Ivy Blocker/Cleaner | | gns | ☐ Life Vest/Jacket | |
| ☐ Other: | | | | | |
| | | | | | |
| JOB STEPS | POTENTIAL HAZ | HAZARDS PREVENTATIVE / CORRECTIVE ACTION | | | |
| 87. Jobsite Pre-briefing | 58.None | | | eview JSA, SOP's, and discuss ha | |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|------------------------|--|---|
| Working near railroads | Passing Trains. Slip/Trips/Falls. | 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. Be aware of tripping hazards/ Follow good housekeeping procedures/ Mark significant hazards with spray paint or cones. |
| 3. Walking around site | 17. Uneven terrain 18. Wildlife: Stray animals, mice/rats, vectors (i.e. mosquitoes, bees, etc.) 19. Weather: Heat/cold stress 20. Slip/Trips/Falls 21. Foot injuries 22. Eye injuries | Pay attention to surrounding area (puddles, wet, frozen, uneven areas); Mark with cones or spray paint. Use bug spray/ Avoid stray animals/Use repellant when needed. 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. Be aware of tripping hazards/ Follow good housekeeping procedures/ Mark significant hazards with spray paint or cones. Wear proper PPE (Langan approved safety shoes)/ Change wet socks during cold weather. Wear proper PPE (safety glasses/goggles). |
| Working near road | Passing vehicles Slip/Trips/Falls | Wear reflective vest/ Stay away from roadway/ Use buddy system/ Place signage or cones when needed. Be aware of tripping hazards/ Follow good housekeeping procedures/ Mark significant hazards with spray paint or cones. |
| 5. All activities | 134. Slips/ Trips/ Falls 135. Hand injuries, cuts or lacerations during manual handling of materials 136. Foot injuries 137. Back injuries 138. Traffic 139. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 140. High Noise levels 141. Overhead hazards 142. Heat Stress/ Cold Stress 143. Eye Injuries | 141.Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 142.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 143.Wear Langan approved safety shoes 144.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 145.Wear high visibility clothing & vest / Use cones or signs to designate work area 146. 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 147.Wear hearing protection 148.Wear hard hat / Avoid areas were overhead hazards exist. 149.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 150. Wear safety glasses |
| Additional items. | | |

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

| Print Name | Sign Name | <u>Date</u> | | | |
|--------------|--------------|-------------|--|--|--|
| Prepared by: | Prepared by: | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| Reviewed by: | | | | | |
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LANGAN

JSA Title: Tieback Testing JSA Number: JSA036-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

Job Safety Analysis (JSA) Health and Safety



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

| PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed): | | | | | |
|---|---|--------------------|--|---|--------------------------------|
| | | | ass 2) | | ☐ Hearing Protection |
| | ☐ Safety Goggles | ☐ Face Shield | | ☐ Nitrile Gloves | ☐ Rubber Gloves |
| □ Leather Gloves | ☐ Cut Resist. Gloves | ☐ Fall Protection | | ☐ Fire Resistant Clothing | ☐ Rubber Boots |
| ☐ Insect/Animal Repellent | ☐ Ivy Blocker/Cleaner | ☐ Traffic Cones/Si | igns | ☐ Life Vest/Jacket | ☐ Air Monitoring |
| Other: | | | | | |
| JOB STEPS | POTENTIAL HAZA | ARDS | | PREVENTATIVE / CORRE | CTIVE ACTION |
| 88.Transport equipment to work site | 59. Back Strain 60. Slips/ Trips/ Falls 61. Traffic 62. Cuts/Abrasions/Contusions from equipment | | Use proper lifting techniques/ Use wheeled transport Minimize distance to work area/ Have unobstructed path to work area/ Follow good housekeeping procedures/ Mark tripping hazards with spray paint or cones. Wear proper PPE (high visibility vest or clothing) Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes) | | |
| 89.Check calibration curve for the testing equipment | 1. No hazards | | | | |
| 90.Alignment of hydraulic ram by contractor | 46.Hand injuries(pinch points) 47.Equipment fall hazard (2 to 3 ft. drop) 48.Airborne objects | | gloves 43. Stay av 44. Wear p | • | |
| 91.Conduct proof or performance test | Hand injuries (pinch points) Airborne objects from Hydrau | lic ram | (leathe | ingers and hands away from pinch or gloves) away to safe side of the shoring b ne tieback pocket)/ Wear proper P | eam (opposite side of the beam |

| JOB STEPS | POTENTIAL HAZARDS | PREVENTATIVE / CORRECTIVE ACTION |
|---|--|---|
| 92.Conduct Lift-Off test 6. All activities | Hand injuries (pinch points) Airborne objects (splintered wedges) Slips/ Trips/ Falls | Keep fingers and hands away from pinch point areas/ Wear proper PPE (leather gloves) Wear proper PPE (safety glasses) at all times/ Stand to safe side of the shoring beam (opposite side of the beam from the tieback pocket) Be aware of tripping hazards/ Follow good housekeeping procedures/ |
| 6. All activities | Silps/ Trips/ Falls Hand injuries, cuts or lacerations during manual handling of materials Foot injuries Back injuries Traffic Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) High Noise levels Overhead hazards Heat or cold injuries Eye Injuries | Mark significant hazards with caution tape, cones, or spray paint 152. 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 or cut-resistant gloves 153. Wear proper PPE (Langan approved safety shoes) 154. Use proper lifting techniques/ Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to life / Obtain assistance when possible 155. Wear high visibility clothing & vest/ Use cones or signs to designate work area 156. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray animals/ Carry and use animal repellant when needed/ Use bug spray when needed 157. Wear hearing protection 158. Wear hard hat/ Avoid areas were overhead hazards exist. 159. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather)/ Drink plenty of fluids to avoid dehydration/ Take breaks as necessary to avoid heat or cold stress 10. Wear safety glasses |
| Additional items. | | |
| | | |

| Print Name | Sign Name | <u>Date</u> | |
|----------------------|-----------|-------------|--|
| Prepared by: | | | |
| Antonio R. Mencarini | | | |
| Scott A. Walker | | | |
| | | | |
| Reviewed by: | | | |
| | | | |
| | | | |
| | | | |
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| | | | |

ATTACHMENT H TAILGATE SAFETY BRIEFING FORM

LANGAN TAILGATE SAFETY BRIEFING

| Date: | lime: | |
|---------------------------------------|--|-----------|
| Leader: | Location: | |
| Work Task: | | |
| | | |
| SAFETY TOPICS | (provide some detail of discussion | points) |
| Chemical Exposure Hazards and Cont | rol: | |
| Physical Hazards and Control: | | |
| Air Monitoring: | | |
| PPE: | | |
| Communications: Safe Work Practices: | | |
| Emergency Response: | | |
| Hospital/Medical Center Location: | | |
| Phone Nos.: | | _ |
| Other: | | |
| | P (the issues, responsibilities, due dat | |
| | | |
| | <u>ATTENDEES</u> | |
| PRINT NAME | COMPANY | SIGNATURE |

APPENDIX B QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN

for

514 UNION STREET Brooklyn, New York NYSDEC BCP Site No. C224318

Prepared For:

Gowanus President Owner LLC 400 West 59th Street New York, New York 10019

Prepared By:

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. 368 Ninth Avenue, 8th Floor New York, New York 10001



February 2025 Langan Project No. 170361307

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1.0 PROJECT DESCRIPTION

1.1 Introduction

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan) prepared this Quality Assurance Project Plan (QAPP) on behalf of Gowanus President Owner LLC (the Volunteer) for the property at 514 Union Street, Brooklyn, New York (the site). The Volunteer was accepted into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) to investigate and remediate the site pursuant to the NYSDEC Brownfield Cleanup Agreement (BCA) executed on October 21, 2021. The site was assigned BCP Site No. C224318. A BCA Amendment to add the Volunteer, Gowanus President Owner LLC, was executed on February 1, 2023, and a BCA Amendment to add the west-adjoining property, 305 Nevins Street, to the BCP site was executed on July 19, 2023.

The site consists of two contiguous parcels: 514 Union Street (Block 440, Lot 12) and 305 Nevins Street (Block 440, Lot 9) on the block bound by Union Street to the north, 3rd Avenue to the east, President Street to the south, and Nevins Street to the west in the Gowanus neighborhood of Brooklyn, New York. The two parcels and encompass an about 19,400-square-foot (SF) area improved with an about 17,000-SF one-story commercial building (514 Union Street) and an about 2,400-SF two-story building (305 Nevins Street). The 514 Union Street parcel (514 Union Street) is occupied by the Royal Palms Shuffleboard Club and the 305 Nevins Street parcel is vacant.

This Quality Assurance Project Plan (QAPP) specifies analytical methods and evaluation procedures to be used to ensure that data from the proposed Supplemental Remedial Investigation (SRI)) at the site are precise, accurate, representative, comparable, and complete.

1.2 Project Objectives

The SRIWP proposes further investigation of groundwater and soil to delineate potential sources of on-site contaminants at the 514 Union Street parcel.

1.3 Scope of Work

The scope of work is described in detail in the SRIWP. The SRIWP includes the following tasks:

- Development and implementation of a site-specific Construction Health and Safety Plan (CHASP) for the protection of on-site workers, tenants, and the community during remediation;
- Advance seven soil borings to either 20 or 30 feet below grade surface (bgs);
- Collect samples every 3 feet from the interval exhibiting the greatest degree of impacts from the unsaturated zone, and collect one soil sample every 6 feet from the interval exhibiting the greatest degree of impacts from the saturated zone;

- Convert six soil borings to install and develop six permanent monitoring wells.
- Collection of groundwater samples from existing and newly installed monitoring wells plus QA/QC samples for laboratory analysis
- Survey and gauge monitoring wells to establish groundwater elevations and evaluate flow direction.

A plan showing the proposed sample locations is included as Figure 7 of the SRIWP.

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 quality of the data must be sufficient to fulfill the overall objective of the RI. The overall objective is to investigate and characterize the nature and extent of environmental impacts at and emanating from the site and to provide sufficient information to evaluate remedial alternatives, as required. The RIWP specifies the intended use of the data, the required constituents of interest, limits of detection, level of data assessment, and data deliverables. All data shall be defined as definitive data.

The DQO process is an iterative process where various options for implementing a project are explored, dissected, and recombined. The feasibility and costs of various options are estimated, and then the most advantageous option is selected and developed into project work plans that will be implemented.

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 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. Sampling accuracy will be determined through the assessment of the analytical results of equipment blanks and trip blanks (organic analysis of aqueous matrices only) 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.

- 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, instrument calibrations, 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.

The above objectives are discussed in detail in Section 4.0.

3.0 PROJECT ORGANIZATION

Langan will arrange data analysis and reporting tasks related to the site sampling. The analytical services will be performed by an Environmental Laboratory Approval Program (ELAP)-certified laboratory. Data validation services will be performed by approved data validation contractor(s).

The required sampling will be conducted by Langan; the analytical services will be performed by Pace Analytical Services, LLC. of Westborough, Massachusetts (NYSDOH ELAP certification number 11148). Data validation services will be performed by Joseph Conboy of Langan.

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

| Personnel | Investigation Role | Contact Information |
|----------------------------|-------------------------|------------------------------------|
| Michael Burke, PG, CHMM | Qualified Environmental | Phone – 212-479-5413 |
| Langan | Professional | Email – <u>mburke@langan.com</u> |
| Jason Hayes, P.E., LEED AP | Engineer of Record | Phone – 212-479-5427 |
| Langan | Lingilieer of Necord | Email – jahayes <u>@langan.com</u> |
| Paul McMahon, P.E. | Quality Assurance | Phone – 212-479-5451 |
| Langan | Officer | Email – pmcmahon@langan.com |
| Tony Moffa, CHMM, CSP | Langan Health & Safety | Phone – 215-491-6500 |
| Langan | Officer | Email – <u>tmoffa@langan.com</u> |
| William Bohrer, PG | Field Safety Officer | Phone – 410-984-3068 |
| Langan | Tield Safety Officer | Email – <u>wbohrer@langan.com</u> |
| Brad Koontz | Project Manager | Phone – 212-479-5625 |
| Langan | 1 Toject Ivianagei | Email – bkoontz@langan.com |
| Caroline Devin | Field Team Leader | Phone – 212-479-5499 |
| Langan | Tield realli Leadel | Email – cdevin <u>@langan.com</u> |
| Joe Conboy | Program Quality | Phone – 212-479-5499 |
| Langan | Assurance Monitor | Email – <u>jconboy@langan.com</u> |

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) 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 to evaluate the engineering controls on the site. The sample set, chemical analysis results, and interpretations must be based on data that meet or exceed quality assurance objectives established for the site. Quality assurance objectives are usually expressed in terms of precision, accuracy or bias, representativeness, completeness, 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 5x the reporting limit (RL) meet the precision criteria if the absolute difference is less than $\pm 2x$ the RL for soil or $\pm 1x$ for groundwater. For results greater than 5x the RL, the acceptance criteria is a relative percent difference (RPD) of $\le 50\%$ (soil) or $\le 30\%$ (groundwater). RLs and method detection limits (MDL) are provided in Attachment B.

4.2 Accuracy

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

Accuracy in the field is assessed through the use of field blanks and through compliance with 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 will be considered for non-aqueous matrices where high concentrations of volatile organic compounds (VOCs) are anticipated based on field screening.

NYSDEC BCP Site No. C224318

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 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 analytical methods, laboratory-issued SOPs, the laboratory's Quality Assurance Manual, and this QAPP. The laboratory is required to be properly certified and accredited.

4.4 Completeness

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

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

Soil 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 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 by:

- Using identified standard methods for both sampling and analysis phases of this project;
- Requiring traceability of all analytical standards and/or source materials to the U.S. Environmental Protection Agency (USEPA) or National Institute of Standards and Technology (NIST);
- Requiring that all calibrations be verified with an independently prepared standard from a source other than that used for calibration (if applicable);
- Using standard reporting units and reporting formats including the reporting of QC data;
- Performing a complete data validation on documentation sampling analytical results, including the use of data qualifiers in all cases where appropriate; and
- Requiring that all validation qualifiers be used any time an analytical result is used for any purpose.

These steps will ensure all future users of either the data or the conclusions drawn from them will be able to judge the comparability of these data and conclusions.

4.6 Sensitivity

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

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

Analytical methods and quality assurance parameters associated with the sampling program are presented in Attachment C. The frequency of associated field blanks and duplicate samples will be based on the recommendations listed in the May 2010 Division of Environmental Remediation

(DER) Technical Guidance for Site Investigation and Remediation (DER-10) and as described in Section 5.3.

5.0 SAMPLING PROGRAM

Groundwater sampling will be conducted in accordance with the established NYSDEC protocols contained in DER-10/Technical Guidance for Site Investigation and Remediation (May 2010) and title 6 of the New York Codes Rules and Regulations Part 375.

The following sections describe procedures to be followed for specific tasks.

5.1 Field Documentation Procedures

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(s)
- Date and time of activity
- Sample identification number(s)
- 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

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

5.1.2 Sample Labeling

Each sample collected will be assigned a unique identification number and abbreviation in accordance with the sample nomenclature guidance provided in the following table and the Standard Operating Procedure provided in Attachment D.

| Sample Nomenclature Summary | | |
|-----------------------------|-------------------------|--|
| AA | Ambient Air | |
| DUP | Field Duplicate | |
| EA | Effluent Air | |
| FB Field Blank | | |
| IA | Indoor Air | |
| MW | Monitoring Well | |
| SB | Soil Boring | |
| SSV | Sub-slab Vapor | |
| TB Trip Blank | | |
| (#-#) Depth Interval | | |
| MMDDYY | MMDDYY Date of Sampling | |

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

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

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

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

5.3 Sample Collection

5.3.1 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 En Core® or Terra Core® sampling equipment. For analysis of non-volatile parameters, samples will be homogenized and placed into glass jars. Samples will be collected with unused sterile sampling scoops or spoons and homogenized in unused sterile

polyethylene zipper bags. 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 Sections 5.4 and 5.6. Analysis and/or extraction and digestion of collected soil samples will meet the holding times required for each analyte as specified in Attachment C. In addition, analysis of collected soil samples will meet all quality assurance criteria set forth by this QAPP and DER-10.

5.3.2 Groundwater Samples

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

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

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

5.3.2 Sample Field Blanks and Duplicates

Field blanks will be collected for quality assurance purposes at a rate of one per 20 soil and groundwater investigation samples per analysis. For per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane, field blanks will be collected at a frequency of one per day per matrix. 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.

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

5.4 Sample Containers and Handling

Certified, commercially clean sample containers will be obtained from the analytical laboratory. Sample bottle 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.

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 C.

5.6 Sample Shipment

5.6.1 Packaging

Groundwater sample containers will be placed in plastic coolers. Ice in Ziploc® bags (or equivalent) will be placed around sample containers. Cushioning material will be added around

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

5.6.2 Shipping

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

- All environmental samples will be transported to the laboratory by a laboratory-provided courier under the chain-of-custody protocols described in Section 5.10.
- 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 CHASP included in Appendix E of IRMWP No.2. 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 personal protective equipment) will be collected in plastic garbage bags and disposed of as non-hazardous industrial waste. Decontamination and fluids will be placed in UN/Department of Transportation (DOT) approved fluid drums with closed tops. All drums will be properly labeled, sealed, and characterized as necessary.

Waste characterization samples will be collected from groundwater proposed for disposal during implementation of the RAWP. Samples will be analyzed per disposal facility requirements.

This activity will be coordinated and overseen by a representative of the RE. Samples will be representative of the material requiring disposal and will occur at a frequency consistent with disposal facility requirements.

Waste characterization samples will be submitted to a NYSDOH ELAP-approved laboratory for analysis in accordance with the QAPP provided in Appendix G. Waste characterization samples will be analyzed for parameters that are typically required by disposal facilities. The following list is provided for planning purposes and may not reflect the analyses performed for waste characterization:

• Resource Conservation and Recovery Act (RCRA) characteristics, including ignitability, corrosivity, and reactivity (sulfide and cyanide);

Samples will be collected in accordance with the selected disposal facility's requirements and will be collected to be representative of the material requiring disposal at a frequency consistent with disposal facility requirements. It is anticipated that all drummed material will be transported off-site and disposed of at a permitted facility.

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:

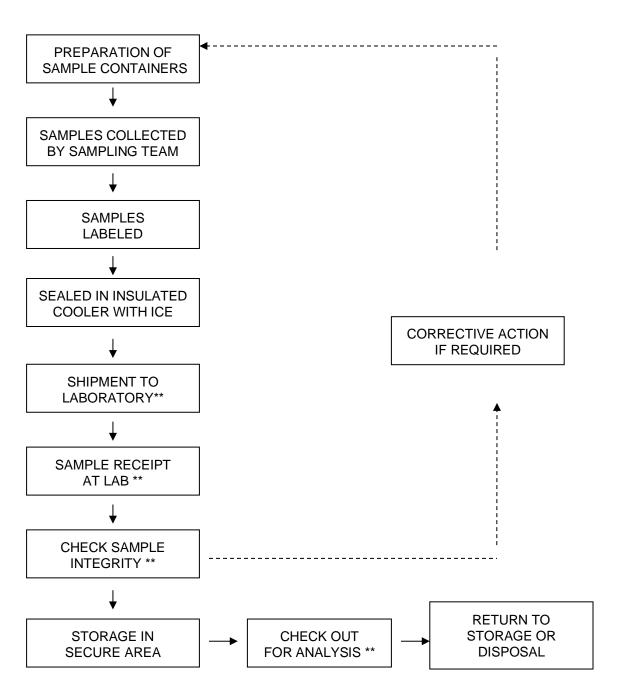
- Chain-of-custody will be initiated by the laboratory supplying the pre-cleaned and prepared sample containers. Chain-of-custody forms will accompany the sample containers.
- Following sample collection, the chain-of-custody form will be completed for the sample collected. The sample identification 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.

When samples are collected, 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 an example chain-of-custody form is included as Figure 5.2.

Figure 5.1 Sample Custody



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

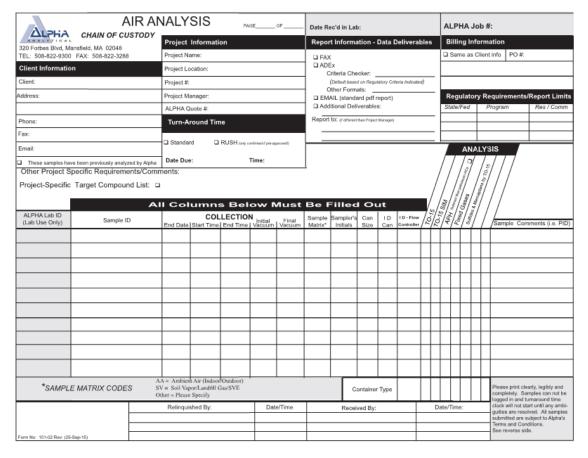


Figure 5.2 Sample Chain-of-Custody Form

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

6.1 Introduction

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

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

6.2 Data Reduction

The 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 $^{\text{TM}}$. To avoid transcription errors, data will be loaded directly into the ASCII format from the LIMS. If this cannot be accomplished, the consultant should be notified via letter of transmittal indicating that manual entry of data is required for a particular method of analysis. All EDDs must also undergo a QC check by the laboratory before delivery. The original data, tabulations, and electronic media are stored in a secure and retrievable fashion.

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

6.3 Data Validation

Data validation will be performed in accordance with the USEPA Region 2 SOPs for data validation and USEPA's National Functional Guidelines for Organic and Inorganic Data Review. Samples collected to characterize material proposed for export and import will not be validated. Tier 1 data validation (the equivalent of USEPA's Stage 2A validation) will be performed to evaluate data quality. Tier 1 data validation is based on completeness and compliance checks of sample-related QC results, including:

- Holding times;
- Sample preservation;
- Blank results (method, trip, and field blanks);
- Surrogate recovery compounds and extracted internal standards (as applicable);
- LCS and LCSD recoveries and RPDs;
- Laboratory duplicate RPDs; and

A DUSR will be prepared by the data validator and reviewed by the Quality Assurance Officer (QAO) before issuance. The DUSR will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain-of-custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method.

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
- "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.

6.4 Reporting

Upon receipt of validated analytical results, NYSDEC format EDDs, compatible with EQuIS[™], will be prepared and submitted to the NYSDEC.

7.0 QUALITY ASSURANCE, PERFORMANCE, AND SYSTEM AUDITS

7.1 Introduction

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

7.2 System Audits

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

7.3 Performance Audits

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

7.4 Formal Audits

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

Audit reports will be written by auditors who have performed the site audit after gathering and evaluating all data. Items, activities, and documents determined by lead auditors to be in noncompliance shall be identified at exit interviews conducted with the involved management. Non-compliances will be logged, and documented through audit findings, which are attached to

and are a part of the integral audit report. These audit-finding forms are directed to management to satisfactorily resolve the noncompliance in a specified and timely manner.

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

8.0 CORRECTIVE ACTION

8.1 Introduction

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

8.2 Procedure Description

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

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

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

Project management and staff, such as field investigation teams, remedial response planning personnel, and laboratory groups, monitor on-going work performance in the normal course of daily responsibilities. Work may be audited at the sites, laboratories, or contractor locations.

Activities, or documents ascertained to be noncompliant with quality assurance requirements will be documented. Corrective actions will be mandated through audit finding sheets attached to the audit report. Audit findings are logged, maintained, and controlled by the Task Manager.

Personnel assigned to quality assurance functions will have the responsibility to issue and control Corrective Action Request (CAR) Forms (Figure 9.1 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

| 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

- 1. NYSDEC. Division of Environmental Remediation. DER-10/Technical Guidance for Site Investigation and Remediation, dated May 3, 2010.
- 2. NYSDOH. Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006, updated May 2017.
- 3. USEPA, 2014. "Test Method for Evaluating Solid Waste," Update V dated July 2014 U.S. Environmental Protection Agency, Washington, D.C.
- 4. USEPA, 2016. Region II Standard Operating Procedure (SOP) #HW-34, "Trace Volatile Data Validation" (September 2016, Revision 1), USEPA Hazardous Waste Support Section. USEPA Region II
- 5. USEPA, 2016. Region II SOP #HW-33A, "Low/Medium Volatile Data Validation" (September 2016, Revision 1), USEPA Hazardous Waste Support Section. USEPA Region II
- 6. USEPA, 2016. Region II SOP #HW-35A, "Semivolatile Data Validation" (September 2016, Revision 1), USEPA Hazardous Waste Support Section. USEPA Region II
- 7. USEPA, 2016. Region II SOP #HW-36A, "Pesticide Data Validation" (October 2016, Revision 1), USEPA Hazardous Waste Support Section. USEPA Region II
- 8. USEPA, 2015. Region II SOP #HW-37A, "PCB Aroclor Data Validation" (June 2015, Revision 0), USEPA Hazardous Waste Support Section. USEPA Region II
- 9. USEPA 2015. Region II SOP #HW-3a, "ICP-AES Data Validation" (July 2015, Revision 0), USEPA Hazardous Waste Support Section. USEPA Region II
- 10. USEPA, 2016. Region II SOP #HW-3b, "ICP-MS Data Validation" (September 2016, Revision 1), USEPA Hazardous Waste Support Section. USEPA Region II
- 11. USEPA, 2016. Region II SOP #HW-3c, "Mercury and Cyanide Data Validation" (September 2016, Revision 1), USEPA Hazardous Waste Support Section. USEPA Region II
- 12. USEPA 2017. National Functional Guidelines for Superfund Organic Methods Data Review, Office of Superfund Remediation and Technology Innovation, EPA-540-R-2017-002, January 2017.
- USEPA 2017b. National Functional Guidelines for Superfund Inorganic Methods Data Review, Office of Superfund Remediation and Technology Innovation, EPA-540-R-201 7-001, January 2017.

ATTACHMENT A RESUMES

MICHAEL D. BURKE, PG, CHMM, LEED AP

SENIOR PRINCIPAL/SENIOR VICE PRESIDENT

ENVIRONMENTAL ENGINEERING AND REMEDIATION

Mr. Burke is a geologist/environmental scientist with 26 years of experience, 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 multimedia 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

AFFILIATIONS

New York State Council of Professional Geologists – Board of Directors

LANGAN

MICHAEL D. BURKE, PG, CHMM, LEED AP

- 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

New York Building Congress

– Energy Committee

- 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
- Con Edison, Underground Storage Tank On-Call Contract, Five Boroughs of New York City, NY
- Con Edison, Construction Inspections On-Call Contract, Five Boroughs of New York City, NY
- Con Edison, 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, 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

MICHAEL D. BURKE, PG, CHMM, LEED AP

- 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
- 320 West Fordham Road, Bronx, NY
- Bedford Union Armory, NYS Brownfield Cleanup Program, Brooklyn, 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.

JASON J. HAYES, PE, LEED AP

PRINCIPAL/VICE PRESIDENT

ENVIRONMENTAL ENGINEERING

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

SELECTED PROJECTS

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



EDUCATION

M.S., Environmental Engineering Columbia University

B.S., Chemistry, Environmental Toxicology (Business Administration minor) Humboldt State University

PROFESSIONAL REGISTRATION

Professional Engineer (PE) in NY

LEED Accredited Professional (LEED AP)

Troxler Certification for Nuclear Densometer Training

OSHA 40-Hour HAZWOPER

OSHA HAZWOPER Site Supervisor

AFFILIATIONS

US Green Building Council, NYC Chapter, Communications Committee

Urban Land Institute (ULI), member

Commercial Real Estate Development Associations (NAIOP), member

LANGAN

JASON J. HAYES, PE, LEED AP

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

SELECTED PUBLICATIONS, REPORTS, AND PRESENTATIONS

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

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

NYC Brownfield Partnership, member

Waterfront Development Technical Course – Presented on Impacted Waterfront Planning Considerations

PAUL MCMAHON, PE

ASSOCIATE

ENVIRONMENTAL ENGINEERING

Mr. McMahon is an environmental engineer working in the NY Metro area. He has experience with projects in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP), Voluntary Cleanup Program (VCP) and Spill Programs, and New York City Office of Environmental Remediation (NYCOER) "E" Designated and VCP sites. His field experience includes conducting Phase II Environmental Site Investigations (ESI), remedial investigations, and indoor air quality analysis Investigations, and performing remediation oversight. Mr. McMahon's most recent experience includes the preparation of investigation reports and investigation work plans, management of NYSDEC BCP remediation projects and NYSDEC spill remediation projects, design of submembrane depressurization systems, and development of remediation work plans.

SELECTED PROJECTS

- 55 Bank Street, NYSDEC BCP Site Remediation Project Management, White Plains, NY
- 23-01 42nd Road, NYSDEC BCP Site Remediation Oversight and Project Management, Long Island City, NY
- 23-10 Queens Plaza South, NYSDEC BCP Remedial Investigation Report, Interim Remedial Measures Work Plan, and Remediation Project Management, Long Island City, NY
- Brooklyn Navy Yard Dock 72, Management of Environmental Oversight in Accordance with NYSDEC VCP Site Management Plan, Brooklyn, NY
- Purves Street Development, Tall Residential Building, Phase II ESI/NYSDEC BCP Remedial Investigation, Remedial Action Work Plan, and Site Remediation Project Management, Long Island City, NY
- 27-21 44th Drive, NYSDEC BCP Site Remediation Project Management, Long Island City, NY
- NYU Tandon School of Engineering, NYSDEC Spill Investigation and Remediation Project Management, Brooklyn, NY
- Parcel B West, East Harlem, Affordable Housing Development, NYSDEC BCP Remedial Investigation, Remedial Action Work Plan, and Site Remediation Project Management, New York, NY
- 267-273 West 87th Street, NYSDEC BCP Remedial Investigation and Remedial Action Work Plan, and Site Remediation Project Management, New York, NY
- DuPont-Stauffer Landfill, NYSDEC Superfund Site, Site Management Plan Compliance, Newburgh, NY
- 190 Riverside Drive, Fuel Oil Spill Emergency Response, Site Investigation, and Remediation, New York, NY
- 473 President Street, NYSDEC BCP Remedial Investigation, Interim Remedial Measures, Project Management, Brooklyn, NY



EDUCATION

M.E., Environmental Engineering Manhattan College

B.S., Civil Engineering Washington University in St. Louis

PROFESSIONAL REGISTRATION

Professional Engineer (PE) in NY

10-Hour OSHA

40-Hour OSHA HAZWOPER

PAUL MCMAHON, PE

- 175-225 3rd Street, NYSDEC BCP Remedial Investigation, Project Management, Brooklyn, NY
- 322 West 57th Street, Sheffield Building Oversight of Emergency Spill Response, New York, NY
- Hudson Yards Terra Firma and Hudson Yards Platform, Construction Oversight and Community Air Monitoring Program, New York, NY
- Columbia University Manhattanville Redevelopment, Remediation Oversight and Community Air Monitoring Program, New York, NY

ANTHONY MOFFA, JR., ASP, CHMM, COSS, CSP

ASSOCIATE

CORPORATE HEALTH AND SAFETY MANAGER

Anthony is Langan's Corporate Health & Safety Manager and is responsible for managing health and safety compliance in all Langan office locations. He has 29 years of experience in the health and safety field. He is responsible for ensuring compliance with all federal and state occupational health and safety laws and development and implementation of corporate health and safety policies. His responsibilities include reviewing and updating Langan's Corporate Health and Safety Program and assisting employees in the development of site specific Health & Safety Plans. He maintains and manages health and safety records for employees in all Langan office locations including medical evaluations, respirator fit testing, and Hazardous Waste Operations and Emergency Response training. He is also responsible for documentation and investigation of work-related injuries and incidents and sharing this information with employees to assist in the prevention of future incidents. He is also the chairman of the Corporate Health & Safety Committee and Health & Safety Leadership Team that meet periodically throughout the year. He is responsible for coordinating and providing health and safe training to Langan employees. He was formerly the Environmental, Health and Safety Coordinator at a chemical manufacturer. His experience included employee hazard communications, development of material safety data sheets for developed products, respirator fit testing and conducting required Occupational Health & Safety Association and Department of Transportation training.



EDUCATION

B.S., Physics West Chester University

PROFESSIONAL REGISTRATION

Associate Safety Professional (ASP)

Certified Hazardous Material Manager (CHMM)

Certified Occupational Safety Specialist (COSS)

Certified Safety Professional (CSP)

AFFILIATIONS

Pennsylvania Chamber of Business & Industry

Chemical Council of New Jersey

New Jersey Business & Industry Association

American Society of Safety Professionals

WILLIAM BOHRER, PG

SENIOR PROJECT GEOLOGIST

GEOLOGIST

Mr. Bohrer is an experienced geologist responsible for managing Langan's environmental standards and Health and Safety compliance for projects throughout New York City. His services include dissemination of environmental protocols, troubleshooting at project sites, in-house/field training, and maintenance of quality standards across the environmental discipline. Mr. Bohrer has a diverse and extensive background in geophysics, hydrogeology, mining and petroleum, and geotechnical engineering. He has developed conceptual site models for public, industrial and commercial facilities nationwide.

SELECTED PROJECTS

- NYU Poly 122 Johnson Street, Brooklyn, NY
- Con Edison of New York at Governor's Island, NY, NY
- 535 4th Avenue, Brooklyn, NY
- 27 Wooster Street, New York, NY
- 42 West Street, Brooklyn, NY
- 455 West 19th Street, New York, NY
- Kings Plaza Mall, Brooklyn, NY
- Hudson Yards "Terra Firma," New York, NY
- Hudson Yards, Platform Special Inspection, New York, NY
- PSAC II, Bronx, NY
- 595-647 Smith Street, Brooklyn, NY
- New York University, 7-13 Washington Square North Investigation, New York, NY
- NYU 4 Washington Square Village, New York, NY
- 125th Street and Lenox Avenue, New York, NY
- Sullivan Street Development, New York, NY
- Hudson Crossing II, New York, NY
- New York Aquarium, Shark Tank & Animal Care Facility, Brooklyn, NY
- 209-219 Sullivan Street, New York, NY
- 261 Hudson Street, New York, NY
- 460 Washington Street, New York, NY
- 552 West 24th Street, New York, NY
- Brooklyn Bridge Park Pier 1, New York, NY
- International Leadership Bronx Charter School, Bronx, NY
- 203 East 92nd Street, New York, NY
- HighLine 28-29, New York, NY
- 539 Smith Street Bulkhead, Brooklyn, NY
- Willets Point, Corona, NY
- Plume Migration and Fracture Flow Aquifer Investigation, Brunswick, MD
- Plume Migration and Fracture Flow Aquifer Investigation, Fallston, MD
- Emergency Response Site Investigation & Remediation, Wappingers Falls, NY
- Emergency Response Site Investigation & Remediation, Allentown, PA



EDUCATION

Post Graduate Studies in Geophysics Cornell University

B.S., Geology Tufts University

PROFESSIONAL REGISTRATION

Professional Geologist (PG) in NY

40 Hour OSHA HazWOPER

OSHA Construction Safety & Health

OSHA Supervisory Certification Credential (TWIC)

Transportation Worker Identification

NYS DEC- Protecting New York's Natural Resources with Better Construction Site Management

AFFILIATIONS

American Association of Petroleum Geologists

National Groundwater Association

Geological Society of America

LANGAN

WILLIAM BOHRER, PG

- Emergency Response Site Investigation & Remediation, Shamokin, PA
- Bermuda International Airport, Jet Fuel Release Investigation, Bermuda
- Little Missouri River Basin, Geotechnical Site Evaluation (Horizontal Drilling Pipeline Install), ND
- Seismic Susceptibility Evaluation (Class 2 Injection Wells), Litchfield, OH
- Bedrock Mapping, Bradford and Sullivan Counties, PA
- Soil Solidification, Carteret, NJ

PA Council of Professional Geologists

BRAD KOONTZ, LEED GA

PROJECT ENGINEER

ENVIRONMENTAL ENGINEERING

Mr. Koontz is an environmental engineer with over 4 years of experience in soil/groundwater data analysis, remedial investigations, EHASP preparation, tailgate safety talks, daily field inspection, preparation of daily reports, photo documentation of work, compliance with contract documents, compliance with construction documents, review/approve contractor submittals, review means and methods, review/comment on project schedule, suggest alternative methods to expedite schedule, and geotechnical borings.

SELECTED PROJECTS

- Con Edison Central Construction, Various Locations, New York, NY
- NYCDDC DSNY Staten Island District 1/3 Garage, Staten Island, NY
- 264 East 7th Street, New York NY
- 175-225 3rd Street, Brooklyn, NY
- President Street Properties, Brooklyn, NY
- 10-37 Beach 21st Street, Far Rockaway, NY
- 805-825 Atlantic Avenue, Brooklyn, NY
- Empire State Development/NYS Homes and Community Renewal Vital Brooklyn, Alafia Affordable Housing Development, Brooklyn, NY
- Lyra, 414 & 445 Gerard Avenue, Bronx, NY
- · Alley Pond Environmental Center, Queens, NY
- 520 Fifth Avenue, New York, NY
- Archer Tower Development, Jamaica, NY
- 2 Ingraham Street, Brooklyn NY
- 251 West 28th Street, New York, NY
- NYCHA Farragut Houses, Brooklyn, NY
- 59-02 Borden Avenue, Maspeth, NY
- Brooklyn Navy Yard Dry-Dock, Brooklyn, NY
- Brooklyn Navy Yard Building 127, Brooklyn, NY
- Brooklyn Navy Yard Building 20, Brooklyn, NY
- 80-100 Flatbush Avenue, Brooklyn, NY
- 122 Fifth Avenue, New York, NY
- Willets Point Redevelopment, Flushing, NY
- Walt Disney Headquarters, 4 Hudson Square, New York, NY
- Fufillment Center, Melville, NY
- 30-25 Queens Boulevard, Long Island City, NY
- 320 West 31st Street, New York, NY
- Animal Medical Center, New York, NY
- 53 Pearl Street, Brooklyn, NY
- 300 Huntington Street, Brooklyn, NY
- Whitehead Realty, Acme Sites, Brooklyn, NY
- 514 Union Street, Brooklyn, NY
- Purves Street Development, Long Island City, NY
- NYCSCA Primary School 105. Bronx. NY
- NYCSCA High School 497Q, Queens, NY



EDUCATION

B.S., Environmental Engineering (Civil Engineering Minor) University of Delaware

PROFESSIONAL REGISTRATION

LEED Green Associate (LEED GA)

40-Hour HAZWOPER

OSHA 10-Hour

BRAD KOONTZ, LEED GA

- 121 Leroy Street, New York, NY
- Atlas Park, Goldfish Swim School, Glendale, NY
- 182 East 94th Street, New York NY
- The William Vale, Brooklyn, NY
- New York Botanical Garden, Permeability Testing, Bronx, NY
- 126 Nassau Street, New York, NY
- 45-24 Pearson Street, Long Island City, NY
- 805-825 Atlantic Avenue, Brooklyn, NY
- 2420 Amsterdam Avenue, New York, NY
- 627 Smith Street, Brooklyn, NY
- Hudson Yards Plaza, New York, NY
- 62 Hanson Place, Brooklyn, NY
- 66 North 6th Street, Brooklyn, NY
- 44-30 Purves Street, Queens, NY
- 111 North 12th Street, Brooklyn, NY
- 451 Tenth Avenue, New York, NY

CAROLINE DEVIN

SENIOR STAFF ENGINEER

ENVIRONMENTAL ENGINEERING

Ms. Devin is a senior staff environmental engineer with over three years of experience in environmental consulting in the New York metropolitan area. Ms. Devin has a background in construction monitoring, daily field inspections, environmental site assessments, remedial investigations, sample collection, report writing, and vapor mitigation system design, installation and management.

SELECTED PROJECTS

- 473 President Street and President Street Portfolio, Construction Oversight and Remedial Systems, Vapor Collection Installation Oversight and Reporting, Brooklyn NY
- 514 Union Street, Vapor Mitigation System Installation and Indoor Air Sampling, SMD System Inspections, Brooklyn, NY
- 305 Nevins Street, Air Sparge, SVE and SMD System Installation Oversight and Management, Brooklyn, NY
- Mayer Malbin Sites, Phase I Due Diligence Reporting, Phase II Investigation Reporting and Management, Queens, NY
- 805-825 Atlantic Avenue, SMD Inspections and Sampling, Quarterly Groundwater Sampling with Passive Diffusion, Periodic Review Reporting (PRR), Brooklyn, NY
- Gowanus Canal Northside, Remedial Construction Oversight and Management, Brooklyn, NY
- 175 Fifth Avenue Flatiron Building Renovation, NYCOER Compliance, Air Quality/Noise Reporting Flatiron Building Renovation, New York, NY
- 175-225 Third Street, SMD Inspections, Grossly Contaminated Materials Investigation and Reporting, Brooklyn, NY
- 250 Water Street, Remedial Delineation Investigation and Oversight, New York, NY
- 27-01 Jackson Avenue, Remedial Oversight Support, Quarterly Groundwater Monitoring Reports, Long Island City, NY
- 26-32 Jackson Avenue, NY, Remedial Oversight Support, Long Island City
- West Fordham Road, Phase II Investigation and Reporting, Bronx, NY
- 159 Boerum Street, Remedial Oversight Support, Brooklyn, NY
- Staten Island Ballpark, Remedial Oversight Support, Staten Island, NY
- East Adams Redevelopment, Due Diligence Phase I Inspection, Remedial Investigation and Reporting, Syracuse, NY
- 23-15 44th Road, Long Island City, NY

SELECTED PUBLICATIONS, REPORTS, AND PRESENTATIONS

Tentori, Wang, Devin, Richardson "Treatment of Anaerobic Digester Liquids via Membrane Biofilm Reactors: Simultaneous Aerobic Methanotrophy and Nitrogen Removal".



EDUCATION

B.S., Environmental Engineering Cornell University

PROFESSIONAL REGISTRATION

10-Hour OSHA

40-Hour OSHA HAZWOPER

JOSEPH CONBOY

SENIOR STAFF CHEMIST

ENVIRONMENTAL ENGINEERING

Joseph has 7 years of experience in environmental consulting, specializing in chemical data validation, data quality assessments, data usability evaluations, and EQuIS database management.

SELECTED PROJECTS

- 23-30 Borden Avenue, Long Island City, NY
- 25-01 Queens Plaza North, Long Island City, NY
- 37-11 30th Street, Long Island City, NY
- 266 West 96th Street, New York, NY
- 414 Gerard Avenue, Bronx, NY
- 445 Gerard Avenue, Bronx, NY
- 475 Bay Street, Staten Island,
- 538-544 Hudson Street, New York, NY
- 805-825 Atlantic Avenue, Brooklyn, NY
- 1400 Ferris Place, Bronx, NY
- 1607 Surf Avenue, Coney Island, NY
- 1900 River Road, Burlington, NJ
- 2447 Third Avenue, New York, NY
- ABC Block 27, Long Island City, NY
- American Dream Meadowlands, East Rutherford, NJ
- Bedford Armory, Brooklyn, NY
- Former Ballantine Brewery, Newark, NJ
- Former Curtiss-Wright Facility, Wood-Ridge, NJ
- Former Duane Marine Site, Perth Amboy, NJ
- Former Perth Amboy Gas Works, Perth Amboy, NJ
- Former Plessey Dynamics Site, Hillside, NJ
- Former MGP Site, Wildwood, NJ
- Gowanus Canal Northside, Brooklyn, NY
- JCP&L Union Beach District Office, Keyport, NJ
- K-8 School, New Brunswick, NJ
- Linden Terminal, Linden, NJ
- Paulsboro Packaging Site, Paulsboro, NJ
- President Street Properties, New York, NY
- Suffolk Street, New York, NY
- Willets Point, Queens, NY



EDUCATION

B.S., Chemistry Rowan University

ATTACHMENT B LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS



Langan Engineering & Environmental

TCL Volatiles - EPA 8260D/5035 High&Low (SOIL)

Holding Time: 14 days

Container/Sample Preservation: 1 - 1 Vial MeOH/2 Vial Water

| | | | | | LCS | | MS | | Duplicate | Surrogate | 1 |
|----------------------------|-------------|-----|-------|-------|----------|---------|----------|--------|-----------|-----------|---|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | RPD | Criteria | |
| Methylene chloride | 75-09-2 | 5 | 2.29 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | 01100110 | |
| 1,1-Dichloroethane | 75-34-3 | 1 | 0.145 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| Chloroform | 67-66-3 | 1.5 | 0.14 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| Carbon tetrachloride | 56-23-5 | 1 | 0.23 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| 1,2-Dichloropropane | 78-87-5 | 1 | 0.125 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| Dibromochloromethane | 124-48-1 | 1 | 0.14 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| 1,1,2-Trichloroethane | 79-00-5 | 1 | 0.267 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| Tetrachloroethene | 127-18-4 | 0.5 | 0.196 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| Chlorobenzene | 108-90-7 | 0.5 | 0.127 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| Trichlorofluoromethane | 75-69-4 | 4 | 0.695 | ug/kg | 70-139 | 30 | 70-139 | 30 | 30 | | |
| 1,2-Dichloroethane | 107-06-2 | 1 | 0.257 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| 1,1,1-Trichloroethane | 71-55-6 | 0.5 | 0.167 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| Bromodichloromethane | 75-27-4 | 0.5 | 0.109 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| trans-1,3-Dichloropropene | 10061-02-6 | 1 | 0.273 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| cis-1,3-Dichloropropene | 10061-01-5 | 0.5 | 0.158 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| 1,3-Dichloropropene, Total | 542-75-6 | 0.5 | 0.158 | ug/kg | | | | 30 | 30 | | |
| 1,1-Dichloropropene | 563-58-6 | 0.5 | 0.159 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| Bromoform | 75-25-2 | 4 | 0.246 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 0.5 | 0.166 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| Benzene | 71-43-2 | 0.5 | 0.166 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| Toluene | 108-88-3 | 1 | 0.543 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| Ethylbenzene | 100-41-4 | 1 | 0.141 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| Chloromethane | 74-87-3 | 4 | 0.932 | ug/kg | 52-130 | 30 | 52-130 | 30 | 30 | | |
| Bromomethane | 74-83-9 | 2 | 0.581 | ug/kg | 57-147 | 30 | 57-147 | 30 | 30 | | |
| Vinyl chloride | 75-01-4 | 1 | 0.335 | ug/kg | 67-130 | 30 | 67-130 | 30 | 30 | | |
| Chloroethane | 75-00-3 | 2 | 0.452 | ug/kg | 50-151 | 30 | 50-151 | 30 | 30 | | |
| 1,1-Dichloroethene | 75-35-4 | 1 | 0.238 | ug/kg | 65-135 | 30 | 65-135 | 30 | 30 | | |
| trans-1,2-Dichloroethene | 156-60-5 | 1.5 | 0.137 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| Trichloroethene | 79-01-6 | 0.5 | 0.137 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| 1,2-Dichlorobenzene | 95-50-1 | 2 | 0.144 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| 1,3-Dichlorobenzene | 541-73-1 | 2 | 0.148 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| 1,4-Dichlorobenzene | 106-46-7 | 2 | 0.171 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| Methyl tert butyl ether | 1634-04-4 | 2 | 0.201 | ug/kg | 66-130 | 30 | 66-130 | 30 | 30 | | |
| p/m-Xylene | 179601-23-1 | 2 | 0.56 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| o-Xylene | 95-47-6 | 1 | 0.291 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| Xylene (Total) | 1330-20-7 | 1 | 0.291 | ug/kg | | | | 30 | 30 | | |
| cis-1,2-Dichloroethene | 156-59-2 | 1 | 0.175 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| 1,2-Dichloroethene (total) | 540-59-0 | 1 | 0.137 | ug/kg | | | | 30 | 30 | | |
| Dibromomethane | 74-95-3 | 2 | 0.238 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| Styrene | 100-42-5 | 1 | 0.196 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | |
| Dichlorodifluoromethane | 75-71-8 | 10 | 0.915 | ug/kg | 30-146 | 30 | 30-146 | 30 | 30 | | |
| Acetone | 67-64-1 | 10 | 4.811 | ug/kg | 54-140 | 30 | 54-140 | 30 | 30 | | |







Page: 2

Langan Engineering & Environmental

TCL Volatiles - EPA 8260D/5035 High&Low (SOIL)

Holding Time: 14 days

Container/Sample Preservation: 1 - 1 Vial MeOH/2 Vial Water

| Analyte | CAS # | RL | MDL | Units | LCS Criteria | LCS RPD | MS Criteria | MS RPD | Duplicate RPD | Surrogate Criteria | | |
|-----------------------------|------------|-----|--------------|---------------------------------------|-----------------|--|----------------|--------|------------------|---|---|--|
| Carbon disulfide | 75-15-0 | 10 | 4.55 | ug/kg | 59-130 | 30 | 59-130 | 30 | 30 | Ciiteiia | | |
| 2-Butanone | 78-93-3 | 10 | 2.22 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| Vinyl acetate | 108-05-4 | 10 | 2.15 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| 4-Methyl-2-pentanone | 108-10-1 | 10 | 1.28 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| 1,2,3-Trichloropropane | 96-18-4 | 2 | 0.127 | ug/kg | 68-130 | 30 | 68-130 | 30 | 30 | | | |
| 2-Hexanone | 591-78-6 | 10 | 1.18 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| Bromochloromethane | 74-97-5 | 2 | 0.205 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| 2,2-Dichloropropane | 594-20-7 | 2 | 0.202 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| 1,2-Dibromoethane | 106-93-4 | 1 | 0.279 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| 1,3-Dichloropropane | 142-28-9 | 2 | 0.167 | ug/kg | 69-130 | 30 | 69-130 | 30 | 30 | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 0.5 | 0.132 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| Bromobenzene | 108-86-1 | 2 | 0.145 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| n-Butylbenzene | 104-51-8 | 1 | 0.167 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| sec-Butylbenzene | 135-98-8 | 1 | 0.146 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| tert-Butylbenzene | 98-06-6 | 2 | 0.118 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| o-Chlorotoluene | 95-49-8 | 2 | 0.191 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| p-Chlorotoluene | 106-43-4 | 2 | 0.108 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| 1,2-Dibromo-3-chloropropane | 96-12-8 | 3 | 0.998 | ug/kg | 68-130 | 30 | 68-130 | 30 | 30 | | | |
| Hexachlorobutadiene | 87-68-3 | 4 | 0.169 | ug/kg | 67-130 | 30 | 67-130 | 30 | 30 | | | |
| Isopropylbenzene | 98-82-8 | 1 | 0.109 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| p-Isopropyltoluene | 99-87-6 | 1 | 0.109 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| Acrylonitrile | 107-13-1 | 4 | 1.15 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| n-Propylbenzene | 103-65-1 | 1 | 0.171 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| 1,2,3-Trichlorobenzene | 87-61-6 | 2 | 0.322 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| 1,2,4-Trichlorobenzene | 120-82-1 | 2 | 0.272 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| 1,3,5-Trimethylbenzene | 108-67-8 | 2 | 0.193 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| 1,2,4-Trimethylbenzene | 95-63-6 | 2 | 0.334 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| 1,4-Dioxane | 123-91-1 | 80 | 35.1 | ug/kg | 65-136 | 30 | 65-136 | 30 | 30 | | | |
| 1,4-Diethylbenzene | 105-05-5 | 2 | 0.177 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| 4-Ethyltoluene | 622-96-8 | 2 | 0.384 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| 1,2,4,5-Tetramethylbenzene | 95-93-2 | 2 | 0.191 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| Ethyl ether | 60-29-7 | 2 | 0.341 | ug/kg | 67-130 | 30 | 67-130 | 30 | 30 | | + | |
| trans-1,4-Dichloro-2-butene | 110-57-6 | 5 | 1.42 | ug/kg | 70-130 | 30 | 70-130 | 30 | 30 | | | |
| 1,2-Dichloroethane-d4 | 17060-07-0 | † | 1115 | ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ | 1 .0 100 | | , 0 130 | | | 70-130 | | |
| 2-Chloroethoxyethane | 2,000 0, 0 | | <u> </u> | 1 | 1 | | | | | 1 2 2 2 2 2 2 | | |
| Toluene-d8 | 2037-26-5 | | <u> </u> | 1 | 1 | | | | | 70-130 | | |
| 4-Bromofluorobenzene | 460-00-4 | | | 1 | 1 | | | | | 70-130 | | |
| Dibromofluoromethane | 1868-53-7 | | 1 | 1 | | 1 | | | | 70-130 | 1 | |
| | 1000 00 7 | | | 1 | | 1 | | | | 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | | |
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Langan Engineering & Environmental

NYTCL Semivolatiles - EPA 8270E (SOIL)

Holding Time: 14 days

Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

| | <u> </u> | Τ | Г | | LCS | Ī | MS | 1 | Duplicate | Surrogate | 1 |
|--------------------------------|-----------|--------|---------|----------|----------|---------|----------|--------|-----------|-----------|---|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | RPD | Criteria | |
| Acenaphthene | 83-32-9 | 133.6 | 17.3012 | ug/kg | 31-137 | 50 | 31-137 | 50 | 50 | Ciiteiia | |
| 1,2,4-Trichlorobenzene | 120-82-1 | 167 | 19.1048 | ug/kg | 38-107 | 50 | 38-107 | 50 | 50 | | |
| Hexachlorobenzene | 118-74-1 | 100.2 | 18.704 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Bis(2-chloroethyl)ether | 111-44-4 | 150.3 | 22.6452 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| 2-Chloronaphthalene | 91-58-7 | 167 | 16.5664 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| 1,2-Dichlorobenzene | 95-50-1 | 167 | 29.9932 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| 1,3-Dichlorobenzene | 541-73-1 | 167 | 28.724 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| 1,4-Dichlorobenzene | 106-46-7 | 167 | 29.1582 | ug/kg | 28-104 | 50 | 28-104 | 50 | 50 | | |
| 3,3'-Dichlorobenzidine | 91-94-1 | 167 | 44.422 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| 2,4-Dinitrotoluene | 121-14-2 | 167 | 33.4 | ug/kg | 40-132 | 50 | 40-132 | 50 | 50 | | |
| 2,6-Dinitrotoluene | 606-20-2 | 167 | 28.6572 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Fluoranthene | 206-44-0 | 100.2 | 19.1716 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| 4-Chlorophenyl phenyl ether | 7005-72-3 | 167 | 17.869 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| 4-Bromophenyl phenyl ether | 101-55-3 | 167 | 25.4842 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Bis(2-chloroisopropyl)ether | 108-60-1 | 200.4 | 28.5236 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Bis(2-chloroethoxy)methane | 111-91-1 | 180.36 | 16.7334 | ug/kg | 40-117 | 50 | 40-117 | 50 | 50 | | |
| Hexachlorobutadiene | 87-68-3 | 167 | 24.4488 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Hexachlorocyclopentadiene | 77-47-4 | 477.62 | 151.302 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Hexachloroethane | 67-72-1 | 133.6 | 27.0206 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Isophorone | 78-59-1 | 150.3 | 21.6766 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Naphthalene | 91-20-3 | 167 | 20.3406 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Nitrobenzene | 98-95-3 | 150.3 | 24.716 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| NitrosoDiPhenylAmine(NDPA)/DPA | 86-30-6 | 133.6 | 19.0046 | ug/kg | 36-157 | 50 | 36-157 | 50 | 50 | | |
| n-Nitrosodi-n-propylamine | 621-64-7 | 167 | 25.7848 | ug/kg | 32-121 | 50 | 32-121 | 50 | 50 | | |
| Bis(2-Ethylhexyl)phthalate | 117-81-7 | 167 | 57.782 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Butyl benzyl phthalate | 85-68-7 | 167 | 42.084 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Di-n-butylphthalate | 84-74-2 | 167 | 31.6632 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Di-n-octylphthalate | 117-84-0 | 167 | 56.78 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Diethyl phthalate | 84-66-2 | 167 | 15.4642 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Dimethyl phthalate | 131-11-3 | 167 | 35.07 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Benzo(a)anthracene | 56-55-3 | 100.2 | 18.8042 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Benzo(a)pyrene | 50-32-8 | 133.6 | 40.748 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Benzo(b)fluoranthene | 205-99-2 | 100.2 | 28.1228 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Benzo(k)fluoranthene | 207-08-9 | 100.2 | 26.72 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Chrysene | 218-01-9 | 100.2 | 17.368 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Acenaphthylene | 208-96-8 | 133.6 | 25.7848 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Anthracene | 120-12-7 | 100.2 | 32.565 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Benzo(ghi)perylene | 191-24-2 | 133.6 | 19.6392 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Fluorene | 86-73-7 | 167 | 16.2324 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Phenanthrene | 85-01-8 | 100.2 | 20.3072 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Dibenzo(a,h)anthracene | 53-70-3 | 100.2 | 19.3052 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Indeno(1,2,3-cd)Pyrene | 193-39-5 | 133.6 | 23.2798 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
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File: PM1 Page: 2

Langan Engineering & Environmental

NYTCL Semivolatiles - EPA 8270E (SOIL)

Holding Time: 14 days

Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

| | | T | 1 | | LCS | | MS | | Duplicate | Surrogate | | |
|-------------------------------|-------------------------|--------|---------|-------------|----------|---------|----------|------------|-----------|-----------|--|--|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | RPD | Criteria | | |
| Pyrene | 129-00-0 | 100.2 | 16.5998 | ug/kg | 35-142 | 50 | 35-142 | 50 | 50 | Criteria | | |
| Biphenyl | 92-52-4 | 380.76 | 21.71 | ug/kg | 37-127 | 50 | 37-127 | 50 | 50 | | | |
| 4-Chloroaniline | 106-47-8 | 167 | 30.394 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | | |
| 2-Nitroaniline | 88-74-4 | 167 | 32.1976 | ug/kg | 47-134 | 50 | 47-134 | 50 | 50 | | | |
| 3-Nitroaniline | 99-09-2 | 167 | 31.4962 | ug/kg | 26-129 | 50 | 26-129 | 50 | 50 | | | |
| 4-Nitroaniline | 100-01-6 | 167 | 69.138 | ug/kg | 41-125 | 50 | 41-125 | 50 | 50 | | | |
| Dibenzofuran | 132-64-9 | 167 | 15.7982 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | | |
| 2-Methylnaphthalene | 91-57-6 | 200.4 | 20.1736 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | | |
| Acetophenone | 98-86-2 | 167 | 20.6746 | ug/kg | 14-144 | 50 | 14-144 | 50 | 50 | | | |
| 2,4,6-Trichlorophenol | 88-06-2 | 100.2 | 31.6632 | ug/kg | 30-130 | 50 | 30-130 | 50 | 50 | | | |
| P-Chloro-M-Cresol | 59-50-7 | 167 | 24.883 | ug/kg | 26-103 | 50 | 26-103 | 50 | 50 | | | |
| 2-Chlorophenol | 95-57-8 | 167 | 19.7394 | ug/kg | 25-102 | 50 | 25-102 | 50 | 50 | | | |
| 2,4-Dichlorophenol | 120-83-2 | 150.3 | 26.8536 | ug/kg | 30-130 | 50 | 30-130 | 50 | 50 | | | |
| 2,4-Dimethylphenol | 105-67-9 | 167 | 55.11 | ug/kg | 30-130 | 50 | 30-130 | 50 | 50 | | | |
| 2-Nitrophenol | 88-75-5 | 360.72 | 62.792 | ug/kg | 30-130 | 50 | 30-130 | 50 | 50 | | | |
| 4-Nitrophenol | 100-02-7 | 233.8 | 68.136 | ug/kg | 11-114 | 50 | 11-114 | 50 | 50 | | | |
| 2,4-Dinitrophenol | 51-28-5 | 801.6 | 77.822 | ug/kg | 4-130 | 50 | 4-130 | 50 | 50 | | | |
| 4,6-Dinitro-o-cresol | 534-52-1 | 434.2 | 80.16 | ug/kg | 10-130 | 50 | 10-130 | 50 | 50 | | | |
| Pentachlorophenol | 87-86-5 | 133.6 | 36.74 | ug/kg | 17-109 | 50 | 17-109 | 50 | 50 | | | |
| Phenol | 108-95-2 | 167 | 25.217 | ug/kg | 26-90 | 50 | 26-90 | 50 | 50 | | | |
| 2-Methylphenol | 95-48-7 | 167 | 25.885 | ug/kg | 30-130. | 50 | 30-130. | 50 | 50 | | | |
| 3-Methylphenol/4-Methylphenol | 106-44-5 | 240.48 | 26.1522 | ug/kg | 30-130 | 50 | 30-130 | 50 | 50 | | | |
| 2,4,5-Trichlorophenol | 95-95-4 | 167 | 31.9972 | ug/kg | 30-130 | 50 | 30-130 | 50 | 50 | | | |
| Benzoic Acid | 65-85-0 | 541.08 | 169.004 | ug/kg | 10-110 | 50 | 10-110 | 50 | 50 | | | |
| Benzyl Alcohol | 100-51-6 | 167 | 51.102 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | | |
| Carbazole | 86-74-8 | 167 | 16.2324 | ug/kg | 54-128 | 50 | 54-128 | 50 | 50 | | | |
| 1,4-Dioxane | 123-91-1 | 25.05 | 7.682 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | | |
| 2-Fluorophenol | 367-12-4 | | | | | | | | | 25-120 | | |
| Phenol-d6 | 13127-88-3 | | | | | | | | | 10-120 | | |
| Nitrobenzene-d5 | 4165-60-0 | | | | | | | | | 23-120 | | |
| 2-Fluorobiphenyl | 321-60-8 | | | | | | | | | 30-120 | | |
| 2,4,6-Tribromophenol | 118-79-6 | | | | | | | | | 10-136 | | |
| 4-Terphenyl-d14 | 1718-51-0 | | | | | | | | | 18-120 | | |
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Langan Engineering & Environmental

TCL Pesticides - EPA 8081B (SOIL)

Holding Time: 14 days

Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

| | | | | | LCS | | MS | | Duplicate | Surrogate | |
|------------------------------|----------------|--------|----------|----------|----------|---------|----------|--------|-----------|-----------|--|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | RPD | Criteria | |
| Delta-BHC | 319-86-8 | 1.6008 | 0.31349 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| Lindane | 58-89-9 | 0.667 | 0.298149 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| Alpha-BHC | 319-84-6 | 0.667 | 0.189428 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| Beta-BHC | 319-85-7 | 1.6008 | 0.60697 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| Heptachlor | 76-44-8 | 0.8004 | 0.358846 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| Aldrin | 309-00-2 | 1.6008 | 0.563615 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| Heptachlor epoxide | 1024-57-3 | 3.0015 | 0.90045 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| Endrin | 72-20-8 | 0.667 | 0.27347 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| Endrin aldehyde | 7421-93-4 | 2.001 | 0.70035 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| Endrin ketone | 53494-70-5 | 1.6008 | 0.412206 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| Dieldrin | 60-57-1 | 1.0005 | 0.50025 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| 4,4'-DDE | 72-55-9 | 1.6008 | 0.370185 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| 4,4'-DDD | 72-54-8 | 1.6008 | 0.570952 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| 4,4'-DDT | 50-29-3 | 1.6008 | 1.28731 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| Endosulfan I | 959-98-8 | 1.6008 | 0.378189 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| Endosulfan II | 33213-65-9 | 1.6008 | 0.534934 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| Endosulfan sulfate | 1031-07-8 | 0.667 | 0.317492 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| Methoxychlor | 72-43-5 | 3.0015 | 0.9338 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| Toxaphene | 8001-35-2 | 30.015 | 8.4042 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| cis-Chlordane | 5103-71-9 | 2.001 | 0.557612 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| trans-Chlordane | 5103-74-2 | 2.001 | 0.528264 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| Chlordane | 57-74-9 | 13.34 | 5.30265 | ug/kg | 30-150 | 30 | 30-150 | 50 | 50 | | |
| 2,4,5,6-Tetrachloro-m-xylene | 877-09-8 | | | <u> </u> | | | | | | 30-150 | |
| Decachlorobiphenyl | 2051-24-3 | | | | | | | | | 30-150 | |
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Langan Engineering & Environmental

Herbicides -EPA 8151A (SOIL)

Holding Time: 14 days

Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

| | | | | | LCS | | MS | | Duplicate | Surrogate Criteria | |
|-------------------------|------------|----------|-----------|-------|----------|---------|----------|--|-----------|-----------------------|--------------|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | RPD | Criteria | |
| 2,4-D | 94-75-7 | 0.1665 | 0.0104895 | mg/kg | 30-150 | 30 | 30-150 | 30 | 30 | | |
| 2,4-D 2,4,5-T | 93-76-5 | 0.1665 | 0.0051615 | mg/kg | 30-150 | 30 | 30-150 | 30 | 30 | | |
| 2,4,5-TP (Silvex) DCAA | 93-72-1 | 0.1665 | 0.0044289 | mg/kg | 30-150 | 30 | 30-150 | 30 | 30 | | |
| DCAA | 19719-28-9 | | | | | | | | | 30-150 | |
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Langan Engineering & Environmental

TCL PCBs - EPA 8082A (SOIL)

Holding Time: 365 days

Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

| Analyte | CAS # | RL | MDL | Units | LCS Criteria | LCS RPD | MS Criteria | MS RPD | Duplicate RPD | Surrogate Criteria | |
|------------------------------|---------------------|----|----------|----------|-----------------|----------|----------------|--------|------------------|-----------------------|---|
| Aroclor 1016 | 12674-11-2 | 50 | 4.44 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | Cilteria | |
| Aroclor 1221 | 11104-28-2 | 50 | 5.01 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Aroclor 1232 | 11141-16-5 | 50 | 10.6 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | + |
| Aroclor 1242 | 53469-21-9 | 50 | 6.74 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Aroclor 1248 | 12672-29-6 | 50 | 7.5 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Aroclor 1254 | 11097-69-1 | 50 | 5.47 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Aroclor 1260 | 11096-82-5 | 50 | 9.24 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Aroclor 1262 | 37324-23-5 | 50 | 6.35 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Aroclor 1268 | 11100-14-4 | 50 | 5.18 | ug/kg | 40-140 | 50 | 40-140 | 50 | 50 | | |
| PCBs, Total | 1336-36-3 | 50 | 4.44 | ug/kg | | | | 50 | 50 | | |
| 2,4,5,6-Tetrachloro-m-xylene | 877-09-8 | | | | | | | | | 30-150 | |
| Decachlorobiphenyl | 2051-24-3 | | | | | | | | | 30-150 | |
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Langan Engineering & Environmental

METALS by 6010D (SOIL)

| | | | | | LCS | | MS | | Duplicate | Surrogate | Holding | |
|------------------|--------------------|----------|--------------|-------|----------|--|--------------|--|-----------|--------------|----------|--------------------------------------|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | RPD | Criteria | Time | Container |
| Aluminum, Total | 7429-90-5 | 4 | 1.3 | mg/kg | 80-120 | | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Antimony, Total | 7440-36-0 | 2 | 1.54 | mg/kg | 80-120 | | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Arsenic, Total | 7440-38-2 | 0.4 | 0.1728 | mg/kg | 80-120 | | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Barium, Total | 7440-39-3 | 0.4 | 0.0424 | mg/kg | 80-120 | | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Beryllium, Total | 7440-41-7 | 0.2 | 0.022 | mg/kg | 80-120 | | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Cadmium, Total | 7440-43-9 | 0.4 | 0.022 | mg/kg | 80-120 | | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Calcium, Total | 7440-70-2 | 4 | 2.268 | mg/kg | 80-120 | | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Chromium, Total | 7440-47-3 | 0.4 | 0.3392 | mg/kg | 80-120 | | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Cobalt, Total | 7440-48-4 | 0.8 | 0.0992 | mg/kg | 80-120 | | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Copper, Total | 7440-50-8 | 0.4 | 0.0908 | mg/kg | 80-120 | | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Iron, Total | 7439-89-6 | 2 | 0.42 | mg/kg | 80-120 | | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Lead, Total | 7439-92-1 | 2 | 0.0952 | mg/kg | 80-120 | | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Magnesium, Total | 7439-95-4 | 4 | 0.652 | mg/kg | 80-120 | | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Manganese, Total | 7439-96-5 | 0.4 | 0.2144 | mg/kg | 80-120 | | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Nickel, Total | 7440-02-0 | 1 | 0.3232 | mg/kg | 80-120 | | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Potassium, Total | 7440-09-7 | 100 | 20.28 | mg/kg | 80-120 | | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Selenium, Total | 7782-49-2 | 0.8 | 0.1316 | mg/kg | 80-120 | 1 | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Silver, Total | 7440-22-4 | 0.2 | 0.1192 | mg/kg | 80-120 | | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Sodium, Total | 7440-23-5 | 80 | 42.4 | mg/kg | 80-120 | | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Thallium, Total | 7440-28-0 | 0.8 | 0.3608 | mg/kg | 80-120 | 1 | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Vanadium, Total | 7440-62-2 | 0.4 | 0.0604 | mg/kg | 80-120 | 1 | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
| Zinc, Total | 7440-66-6 | 2 | 0.2424 | mg/kg | 80-120 | | 75-125 | 20 | 20 | | 180 days | Metals Only-Glass 60mL/2oz unpreserv |
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Langan Engineering & Environmental

METALS by 7471B (SOIL)

| Analista | CAS # | RL | MDL | llaite | LCS | LCC DDD | MS | MC DDD | Duplicate | Surrogate Criteria | Holding Time | Container |
|----------------|-----------|------|---------|--------|----------|---------|----------|--------|-----------|-----------------------|-----------------|-------------------------------------|
| Analyte | CAS # | | | Units | Criteria | LCS RPD | Criteria | MS RPD | <u> </u> | Criteria | 11me | Container |
| Mercury, Total | 7439-97-6 | 0.08 | 0.05216 | mg/kg | 80-120 | | 80-120 | 20 | 20 | | 28 days | Metals Only-Glass 60mL/2oz unpreser |
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Langan Engineering & Environmental

WETCHEM (SOIL)

| Auglista | CAS # | - DI | MDI | Unite | LCS | I CC PPP | MS | MC DDD | Duplicate | Mathad | Holding | Comtain au |
|----------------------|------------|----------|----------|-------|--------------|--------------|----------|--|-----------|--|---------|---------------------------------|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | RPD | Method | Time | Container |
| Chromium, Hexavalent | 18540-29-9 | 0.8 | 0.16 | mg/kg | 80-120 | 20 | 75-125 | 20 | 20 | 7196A | 30 days | 1 - Glass 120ml/4oz unpreserved |
| Cyanide, Total | 57-12-5 | <u> </u> | 0.212 | mg/kg | 80-120 | 35 | 75-125 | 35 | 35 | 9010C/9012B | 14 days | 1 - Glass 250ml/8oz unpreserved |
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Langan Engineering & Environmental

NY PFAAs via EPA 1633 (SOIL)

Holding Time: 90 days

Container/Sample Preservation: 1 - Plastic 8oz unpreserved

| | | | | | LCS | | MS | | Duplicate | Surrogate | | |
|--|-------------|-----|--------|-------|----------|---------|----------|--------|-----------|-----------|---|--|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | RPD | Criteria | | |
| Perfluorobutanoic Acid (PFBA) | 375-22-4 | 0.8 | 0.028 | ng/g | 70-140 | 30 | 70-140 | 30 | 30 | | | |
| Perfluoropentanoic Acid (PFPeA) | 2706-90-3 | 0.4 | 0.0384 | ng/g | 60-150 | 30 | 60-150 | 30 | 30 | | | |
| Perfluorobutanesulfonic Acid (PFBS) | 375-73-5 | 0.2 | 0.02 | ng/g | 65-145 | 30 | 65-145 | 30 | 30 | | | |
| 1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS) | 757124-72-4 | 0.8 | 0.0776 | ng/g | 60-150 | 30 | 60-150 | 30 | 30 | | | |
| Perfluorohexanoic Acid (PFHxA) | 307-24-4 | 0.2 | 0.0152 | ng/g | 65-140 | 30 | 65-140 | 30 | 30 | | | |
| Perfluoropentanesulfonic Acid (PFPeS) | 2706-91-4 | 0.2 | 0.0264 | ng/g | 55-160 | 30 | 55-160 | 30 | 30 | | | |
| Perfluoroheptanoic Acid (PFHpA) | 375-85-9 | 0.2 | 0.012 | ng/g | 65-145 | 30 | 65-145 | 30 | 30 | | | |
| Perfluorohexanesulfonic Acid (PFHxS) | 355-46-4 | 0.2 | 0.02 | ng/g | 60-150 | 30 | 60-150 | 30 | 30 | | | |
| Perfluorooctanoic Acid (PFOA) | 335-67-1 | 0.2 | 0.0264 | ng/g | 70-150 | 30 | 70-150 | 30 | 30 | | | |
| 1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS) | 27619-97-2 | 0.8 | 0.148 | ng/g | 55-200 | 30 | 55-200 | 30 | 30 | | | |
| Perfluoroheptanesulfonic Acid (PFHpS) | 375-92-8 | 0.2 | 0.0448 | ng/g | 65-155 | 30 | 65-155 | 30 | 30 | | | |
| Perfluorononanoic Acid (PFNA) | 375-95-1 | 0.2 | 0.0128 | ng/g | 70-155 | 30 | 70-155 | 30 | 30 | | | |
| Perfluorooctanesulfonic Acid (PFOS) | 1763-23-1 | 0.2 | 0.0312 | ng/g | 65-160 | 30 | 65-160 | 30 | 30 | | | |
| Perfluorodecanoic Acid (PFDA) | 335-76-2 | 0.2 | 0.0352 | ng/g | 70-155 | 30 | 70-155 | 30 | 30 | | | |
| 1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS) | 39108-34-4 | 0.8 | 0.2592 | ng/g | 70-150 | 30 | 70-150 | 30 | 30 | | | |
| Perfluorononanesulfonic Acid (PFNS) | 68259-12-1 | 0.2 | 0.0296 | ng/g | 55-140 | 30 | 55-140 | 30 | 30 | | | |
| N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA | 2355-31-9 | 0.2 | 0.0856 | ng/g | 65-155 | 30 | 65-155 | 30 | 30 | | | |
| Perfluoroundecanoic Acid (PFUnA) | 2058-94-8 | 0.2 | 0.0128 | ng/g | 70-155 | 30 | 70-155 | 30 | 30 | | | |
| Perfluorodecanesulfonic Acid (PFDS) | 335-77-3 | 0.2 | 0.0144 | ng/g | 40-155 | 30 | 40-155 | 30 | 30 | | | |
| Perfluorooctanesulfonamide (FOSA) | 754-91-6 | 0.2 | 0.0104 | ng/g | 70-140 | 30 | 70-140 | 30 | 30 | | | |
| N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA) | 2991-50-6 | 0.2 | 0.044 | ng/g | 65-165 | 30 | 65-165 | 30 | 30 | | 1 | |
| Perfluorododecanoic Acid (PFDoA) | 307-55-1 | 0.2 | 0.0208 | ng/g | 70-150 | 30 | 70-150 | 30 | 30 | | | |
| Perfluorotridecanoic Acid (PFTrDA) | 72629-94-8 | 0.2 | 0.016 | ng/g | 65-150 | 30 | 65-150 | 30 | 30 | | | |
| Perfluorotetradecanoic Acid (PFTA) | 376-06-7 | 0.2 | 0.024 | ng/g | 65-150 | 30 | 65-150 | 30 | 30 | | | |
| 2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Pro | 13252-13-6 | 0.8 | 0.0384 | ng/g | 70-145 | 30 | 70-145 | 30 | 30 | | | |
| 4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA) | 919005-14-4 | 0.8 | 0.0296 | ng/g | 70-160 | 30 | 70-160 | 30 | 30 | | | |
| Perfluorododecane Sulfonic Acid (PFDoDS) | 79780-39-5 | 0.2 | 0.0216 | ng/g | 25-160 | 30 | 25-160 | 30 | 30 | | | |
| 9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF30 | 756426-58-1 | 0.8 | 0.0296 | ng/g | 70-150 | 30 | 70-150 | 30 | 30 | | | |
| 11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-F | 763051-92-9 | 0.8 | 0.04 | ng/g | 45-160 | 30 | 45-160 | 30 | 30 | | | |
| N-Methyl Perfluorooctane Sulfonamide (NMeFOSA) | 31506-32-8 | 0.2 | 0.0264 | ng/g | 70-155 | 30 | 70-155 | 30 | 30 | | | |
| N-Ethyl Perfluorooctane Sulfonamide (NEtFOSA) | 4151-50-2 | 0.2 | 0.0216 | ng/g | 70-140 | 30 | 70-140 | 30 | 30 | | | |
| N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE) | 24448-09-7 | 2 | 0.1216 | ng/g | 70-140 | 30 | 70-140 | 30 | 30 | | | |
| N-Ethyl Perfluorooctanesulfonamido Ethanol (NEtFOSE) | 1691-99-2 | 2 | 0.0816 | ng/g | 70-135 | 30 | 70-135 | 30 | 30 | | | |
| Perfluoro-3-Methoxypropanoic Acid (PFMPA) | 377-73-1 | 0.4 | 0.0168 | ng/g | 30-140 | 30 | 30-140 | 30 | 30 | | | |
| Perfluoro-4-Methoxybutanoic Acid (PFMBA) | 863090-89-5 | 0.4 | 0.024 | ng/g | 60-150 | 30 | 60-150 | 30 | 30 | | | |
| Perfluoro(2-Ethoxyethane)Sulfonic Acid (PFEESA) | 113507-82-7 | 0.4 | 0.0464 | ng/g | 70-140 | 30 | 70-140 | 30 | 30 | | + | |
| Nonafluoro-3,6-Dioxaheptanoic Acid (NFDHA) | 151772-58-6 | 0.4 | 0.0824 | ng/g | 60-155 | 30 | 60-155 | 30 | 30 | | + | |
| 3-Perfluoropropyl Propanoic Acid (3:3FTCA) | 356-02-5 | 1 | 0.092 | ng/g | 45-130 | 30 | 45-130 | 30 | 30 | | + | |
| 2H,2H,3H,3H-Perfluorooctanoic Acid (5:3FTCA) | 914637-49-3 | 5 | 0.236 | ng/g | 60-130 | 30 | 60-130 | 30 | 30 | | + | |
| 3-Perfluoroheptyl Propanoic Acid (7:3FTCA) | 812-70-4 | 5 | 0.3656 | ng/g | 60-150 | 30 | 60-150 | 30 | 30 | | + | |
| Perfluoro[13C4]Butanoic Acid (MPFBA) | NONE | | | 3/3 | | 1 | | | | 8-130 | + | |
| Perfluoro[13C5]Pentanoic Acid (M5PFPEA) | NONE | | 1 | 1 | 1 | | | | | 35-130 | + | |







Langan Engineering & Environmental

NY PFAAs via EPA 1633 (SOIL)

Holding Time: 90 days

Container/Sample Preservation: 1 - Plastic 8oz unpreserved

| | | | | | LCS | | MS | | Duplicate | Surrogate | |
|--|--------------|----|-----|-------|----------|---------|----------|--------|-----------|-----------|---|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | RPD | Criteria | |
| Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS) | NONE | | | | | | | | | 40-135 | |
| 1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4. | NONE | | | | | | | | | 40-165 | |
| Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA) | NONE | | | | | | | | | 40-130 | |
| Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA) | NONE | | | | | | | | | 40-130 | |
| Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS) | NONE | | | | | | | | | 40-130 | |
| Perfluoro[13C8]Octanoic Acid (M8PFOA) | NONE | | | | | | | | | 40-130 | |
| 1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6: | NONE | | | | | | | | | 40-215 | |
| Perfluoro[13C9]Nonanoic Acid (M9PFNA) | NONE | | | | | | | | | 40-130 | |
| Perfluoro[13C8]Octanesulfonic Acid (M8PFOS) | NONE | | | | | | | | | 40-130 | |
| Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA) | NONE | | | | | | | | | 40-130 | |
| 1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8: | NONE | | | | | | | | | 40-275 | |
| N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (| NONE | | | | | | | | | 40-135 | |
| Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA) | NONE | | | | | | | | | 40-130 | |
| Perfluoro[13C8]Octanesulfonamide (M8FOSA) | NONE | | | | | | | | | 40-130 | |
| N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5 | NONE | | | | | | | | | 40-150 | |
| Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA) | NONE | | | | | | | | | 40-130 | |
| Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA) | NONE | | | | | | | | | 20-130 | |
| 2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-13(| NONE | | | | | | | | | 40-130 | |
| N-Methyl-d3-Perfluoro-1-Octanesulfonamide (d3-NMeFOSA) | NONE | | | | | | | | | 10-130 | |
| N-Ethyl-d5-Perfluoro-1-Octanesulfonamide (d5-NEtFOSA) | NONE | | | | | | | | | 10-130 | |
| 2-(N-Methyl-d3-Perfluoro-1-Octanesulfonamido)ethan-d4-ol | 1265205-95-5 | | | | | | | | | 20-130 | |
| 2-(N-Ethyl-d5-Perfluoro-1-Octanesulfonamido)ethan-d4-ol (d | NONE | | | | | | | | | 15-130 | |
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Langan Engineering & Environmental

TCL Volatiles - EPA 8260D (WATER)

Holding Time: 14 days

Container/Sample Preservation: 3 - Vial HCl preserved

| | | | | | LCS | | MS | | Duplicate | Surrogate | |
|----------------------------|-------------|-----|--------|-------|----------|---------|----------|--------|-----------|-----------|---|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | RPD | Criteria | |
| Methylene chloride | 75-09-2 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| 1,1-Dichloroethane | 75-34-3 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| Chloroform | 67-66-3 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| Carbon tetrachloride | 56-23-5 | 0.5 | 0.134 | ug/l | 63-132 | 20 | 63-132 | 20 | 20 | | |
| 1,2-Dichloropropane | 78-87-5 | 1 | 0.137 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| Dibromochloromethane | 124-48-1 | 0.5 | 0.149 | ug/l | 63-130 | 20 | 63-130 | 20 | 20 | | |
| 1,1,2-Trichloroethane | 79-00-5 | 1.5 | 0.5 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| Tetrachloroethene | 127-18-4 | 0.5 | 0.181 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| Chlorobenzene | 108-90-7 | 2.5 | 0.7 | ug/l | 75-130 | 20 | 75-130 | 20 | 20 | | |
| Trichlorofluoromethane | 75-69-4 | 2.5 | 0.7 | ug/l | 62-150 | 20 | 62-150 | 20 | 20 | | |
| 1,2-Dichloroethane | 107-06-2 | 0.5 | 0.132 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| 1,1,1-Trichloroethane | 71-55-6 | 2.5 | 0.7 | ug/l | 67-130 | 20 | 67-130 | 20 | 20 | | |
| Bromodichloromethane | 75-27-4 | 0.5 | 0.192 | ug/l | 67-130 | 20 | 67-130 | 20 | 20 | | |
| trans-1,3-Dichloropropene | 10061-02-6 | 0.5 | 0.164 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| cis-1,3-Dichloropropene | 10061-01-5 | 0.5 | 0.144 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| 1,3-Dichloropropene, Total | 542-75-6 | 0.5 | 0.144 | ug/l | | | | 20 | 20 | | |
| 1,1-Dichloropropene | 563-58-6 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| Bromoform | 75-25-2 | 2 | 0.65 | ug/l | 54-136 | 20 | 54-136 | 20 | 20 | | |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 0.5 | 0.167 | ug/l | 67-130 | 20 | 67-130 | 20 | 20 | | |
| Benzene | 71-43-2 | 0.5 | 0.159 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| Toluene | 108-88-3 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| Ethylbenzene | 100-41-4 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| Chloromethane | 74-87-3 | 2.5 | 0.7 | ug/l | 64-130 | 20 | 64-130 | 20 | 20 | | |
| Bromomethane | 74-83-9 | 2.5 | 0.7 | ug/l | 39-139 | 20 | 39-139 | 20 | 20 | | |
| Vinyl chloride | 75-01-4 | 1 | 0.0714 | ug/l | 55-140 | 20 | 55-140 | 20 | 20 | | |
| Chloroethane | 75-00-3 | 2.5 | 0.7 | ug/l | 55-138 | 20 | 55-138 | 20 | 20 | | |
| 1,1-Dichloroethene | 75-35-4 | 0.5 | 0.169 | ug/l | 61-145 | 20 | 61-145 | 20 | 20 | | |
| trans-1,2-Dichloroethene | 156-60-5 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| Trichloroethene | 79-01-6 | 0.5 | 0.175 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| 1,2-Dichlorobenzene | 95-50-1 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| 1,3-Dichlorobenzene | 541-73-1 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| 1,4-Dichlorobenzene | 106-46-7 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| Methyl tert butyl ether | 1634-04-4 | 2.5 | 0.166 | ug/l | 63-130 | 20 | 63-130 | 20 | 20 | | |
| p/m-Xylene | 179601-23-1 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| o-Xylene | 95-47-6 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| Xylene (Total) | 1330-20-7 | 2.5 | 0.7 | ug/l | | | | 20 | 20 | | |
| cis-1,2-Dichloroethene | 156-59-2 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| 1,2-Dichloroethene (total) | 540-59-0 | 2.5 | 0.7 | ug/l | | | | 20 | 20 | | |
| Dibromomethane | 74-95-3 | 5 | 1 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | |
| 1,2,3-Trichloropropane | 96-18-4 | 2.5 | 0.7 | ug/l | 64-130 | 20 | 64-130 | 20 | 20 | | |
| Acrylonitrile | 107-13-1 | 5 | 1.5 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | 1 |
| Styrene | 100-42-5 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | + |







Langan Engineering & Environmental

TCL Volatiles - EPA 8260D (WATER)

Holding Time: 14 days

Container/Sample Preservation: 3 - Vial HCl preserved

| Analyte | CAS # | | T | | LCS Criteria | | MS | | Duplicate | Surrogate | | |
|-----------------------------|------------|-----|--------------|--|-----------------|--|----------|--------|-----------|--|--------------|--|
| | | RL | MDL | Units | | LCS RPD | Criteria | MS RPD | RPD | Criteria | | |
| Dichlorodifluoromethane | 75-71-8 | 5 | 1 | ug/l | 36-147 | 20 | 36-147 | 20 | 20 | | | |
| Acetone | 67-64-1 | 5 | 1.46 | ug/l | 58-148 | 20 | 58-148 | 20 | 20 | 1 | | |
| Carbon disulfide | 75-15-0 | 5 | 1 | ug/l | 51-130 | 20 | 51-130 | 20 | 20 | | | |
| 2-Butanone | 78-93-3 | 5 | 1.94 | ug/l | 63-138 | 20 | 63-138 | 20 | 20 | | | |
| Vinyl acetate | 108-05-4 | 5 | 1 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | 1 | | |
| 4-Methyl-2-pentanone | 108-10-1 | 5 | 1 | ug/l | 59-130 | 20 | 59-130 | 20 | 20 | | | |
| 2-Hexanone | 591-78-6 | 5 | 1 | ug/l | 57-130 | 20 | 57-130 | 20 | 20 | | | |
| Bromochloromethane | 74-97-5 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | | |
| 2,2-Dichloropropane | 594-20-7 | 2.5 | 0.7 | ug/l | 63-133 | 20 | 63-133 | 20 | 20 | | | |
| 1,2-Dibromoethane | 106-93-4 | 2 | 0.65 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | 1 | | |
| 1,3-Dichloropropane | 142-28-9 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 2.5 | 0.7 | ug/l | 64-130 | 20 | 64-130 | 20 | 20 | | | |
| Bromobenzene | 108-86-1 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | | |
| n-Butylbenzene | 104-51-8 | 2.5 | 0.7 | ug/l | 53-136 | 20 | 53-136 | 20 | 20 | | | |
| sec-Butylbenzene | 135-98-8 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | | |
| ert-Butylbenzene | 98-06-6 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | | |
| o-Chlorotoluene | 95-49-8 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | | |
| o-Chlorotoluene | 106-43-4 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | | |
| L,2-Dibromo-3-chloropropane | 96-12-8 | 2.5 | 0.7 | ug/l | 41-144 | 20 | 41-144 | 20 | 20 | | | |
| Hexachlorobutadiene | 87-68-3 | 2.5 | 0.7 | ug/l | 63-130 | 20 | 63-130 | 20 | 20 | | | |
| Isopropylbenzene | 98-82-8 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | | |
| p-Isopropyltoluene | 99-87-6 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | | |
| n-Propylbenzene | 103-65-1 | 2.5 | 0.7 | ug/l | 69-130 | 20 | 69-130 | 20 | 20 | | | |
| 1,2,3-Trichlorobenzene | 87-61-6 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | 1 | | |
| 1,2,4-Trichlorobenzene | 120-82-1 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | | |
| 1,3,5-Trimethylbenzene | 108-67-8 | 2.5 | 0.7 | ug/l | 64-130 | 20 | 64-130 | 20 | 20 | 1 | | |
| 1,2,4-Trimethylbenzene | 95-63-6 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | | |
| L ₁ 4-Dioxane | 123-91-1 | 250 | 60.8 | ug/l | 56-162 | 20 | 56-162 | 20 | 20 | 1 | | |
| 1,4-Diethylbenzene | 105-05-5 | 2 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | 1 | | |
| 4-Ethyltoluene | 622-96-8 | 2 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | | |
| 1,2,4,5-Tetramethylbenzene | 95-93-2 | 2 | 0.542 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | † | | |
| Ethyl ether | 60-29-7 | 2.5 | 0.7 | ug/l | 59-134 | 20 | 59-134 | 20 | 20 | | | |
| trans-1,4-Dichloro-2-butene | 110-57-6 | 2.5 | 0.7 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | | |
| 1,2-Dichloroethane-d4 | 17060-07-0 | 2.3 | 5. , | ug/1 | 70 130 | | , 0 130 | 20 | | 70-130 | | |
| Toluene-d8 | 2037-26-5 | + | | | + | | | | | 70-130 | | |
| 4-Bromofluorobenzene | 460-00-4 | | | 1 | + | - | | | | 70-130 | | |
| Dibromofluoromethane | 1868-53-7 | 1 | | | 1 | | | | | 70-130 | | |
| Distribution | 1000 33 7 | | | 1 | 1 | | | | | 70 130 | | |
| | | 1 | | | 1 | 1 | | | | | | |
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Langan Engineering & Environmental

NYTCL Semivolatiles - EPA 8270E (RVT) (WATER)

Holding Time: 7 days

Container/Sample Preservation: 2 - Amber 100ml unpreserved

| | | Γ | 1 | Τ | LCS | | MS | 1 | Duplicate | Surrogato | |
|--------------------------------|-----------|----|-------|-------|----------|---------|--------|--------|-----------|-----------------------|---|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | | MS RPD | RPD | Surrogate Criteria | |
| Acenaphthene | 83-32-9 | 2 | 0.403 | ug/l | 37-111 | 30 | 37-111 | 30 | 30 | Criteria | + |
| 1,2,4-Trichlorobenzene | 120-82-1 | 5 | 0.977 | ug/l | 39-98 | 30 | 39-98 | 30 | 30 | | + |
| Hexachlorobenzene | 118-74-1 | 2 | 0.452 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| Bis(2-chloroethyl)ether | 111-44-4 | 2 | 0.392 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| 2-Chloronaphthalene | 91-58-7 | 2 | 0.35 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| 1,2-Dichlorobenzene | 95-50-1 | 2 | 0.329 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | + | + |
| 1,3-Dichlorobenzene | 541-73-1 | 2 | 0.315 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| 1,4-Dichlorobenzene | 106-46-7 | 2 | 0.391 | ug/l | 36-97 | 30 | 36-97 | 30 | 30 | | + |
| 3,3'-Dichlorobenzidine | 91-94-1 | 5 | 1.85 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| 2,4-Dinitrotoluene | 121-14-2 | 5 | 0.541 | ug/l | 48-143 | 30 | 48-143 | 30 | 30 | | + |
| 2,6-Dinitrotoluene | 606-20-2 | 5 | 0.845 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| Fluoranthene | 206-44-0 | 2 | 0.411 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| 4-Chlorophenyl phenyl ether | 7005-72-3 | 2 | 0.386 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| 4-Bromophenyl phenyl ether | 101-55-3 | 2 | 0.244 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| Bis(2-chloroisopropyl)ether | 108-60-1 | 2 | 0.403 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| Bis(2-chloroethoxy)methane | 111-91-1 | 5 | 0.842 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| Hexachlorobutadiene | 87-68-3 | 2 | 0.355 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| Hexachlorocyclopentadiene | 77-47-4 | 20 | 1.23 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| Hexachloroethane | 67-72-1 | 20 | 0.203 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| Isophorone | 78-59-1 | 5 | 0.862 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| Naphthalene | 91-20-3 | 2 | 0.542 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| Nitrobenzene | 98-95-3 | 2 | 0.205 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| NitrosoDiPhenylAmine(NDPA)/DPA | 86-30-6 | 2 | 0.924 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| n-Nitrosodi-n-propylamine | 621-64-7 | 5 | 0.906 | ug/l | 29-132 | 30 | 29-132 | 30 | 30 | 1 | + |
| Bis(2-Ethylhexyl)phthalate | 117-81-7 | 3 | 1.42 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | 1 | + |
| Butyl benzyl phthalate | 85-68-7 | 5 | 2.61 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| Di-n-butylphthalate | 84-74-2 | 5 | 0.957 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| Di-n-octylphthalate | 117-84-0 | 5 | 2.26 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | |
| Diethyl phthalate | 84-66-2 | 5 | 0.765 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | |
| Dimethyl phthalate | 131-11-3 | 5 | 0.916 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | |
| Benzo(a)anthracene | 56-55-3 | 2 | 0.323 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| Benzo(a)pyrene | 50-32-8 | 2 | 0.368 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| Benzo(b)fluoranthene | 205-99-2 | 2 | 0.533 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | |
| Benzo(k)fluoranthene | 207-08-9 | 2 | 0.621 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | † † | † |
| Chrysene | 218-01-9 | 2 | 0.222 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | † | † |
| Acenaphthylene | 208-96-8 | 2 | 0.315 | ug/l | 45-123 | 30 | 45-123 | 30 | 30 | | 1 |
| Anthracene | 120-12-7 | 2 | 0.467 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| Benzo(ghi)perylene | 191-24-2 | 2 | 0.369 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | 1 |
| Fluorene | 86-73-7 | 2 | 0.439 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | 1 |
| Phenanthrene | 85-01-8 | 2 | 0.419 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | 1 |
| Dibenzo(a,h)anthracene | 53-70-3 | 2 | 0.286 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | + |
| Indeno(1,2,3-cd)Pyrene | 193-39-5 | 2 | 0.484 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | † |







Langan Engineering & Environmental

NYTCL Semivolatiles - EPA 8270E (RVT) (WATER)

Holding Time: 7 days

Container/Sample Preservation: 2 - Amber 100ml unpreserved

| | | T | ī | T | LCS | | MS | | Duplicate | Surrogate | |
|-------------------------------|----------------------|----|-------|----------|----------|---------|-----------|------------|-----------|--|---|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | | Criteria | |
| Pyrene | 129-00-0 | 2 | 0.407 | ug/l | 26-127 | 30 | 26-127 | 30 | 30 | Criteria | |
| Biphenyl | 92-52-4 | 2 | 0.196 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | 1 | |
| 4-Chloroaniline | 106-47-8 | 5 | 0.468 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | 1 | |
| 2-Nitroaniline | 88-74-4 | 5 | 1.03 | ug/l | 52-143 | 30 | 52-143 | 30 | 30 | | |
| 3-Nitroaniline | 99-09-2 | 5 | 1.16 | ug/l | 25-145 | 30 | 25-145 | 30 | 30 | 1 | |
| 4-Nitroaniline | 100-01-6 | 5 | 1.45 | ug/l | 51-143 | 30 | 51-143 | 30 | 30 | 1 | |
| Dibenzofuran | 132-64-9 | 2 | 0.401 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | 1 | |
| 2-Methylnaphthalene | 91-57-6 | 2 | 0.372 | ug/l | 40-140 | 30 | 40-140 | 30 | 30 | | |
| Acetophenone | 98-86-2 | 5 | 0.917 | ug/l | 39-129 | 30 | 39-129 | 30 | 30 | | |
| 2,4,6-Trichlorophenol | 88-06-2 | 5 | 2.09 | ug/l | 30-130 | 30 | 30-130 | 30 | 30 | | |
| P-Chloro-M-Cresol | 59-50-7 | 2 | 0.606 | ug/l | 23-97 | 30 | 23-97 | 30 | 30 | | |
| 2-Chlorophenol | 95-57-8 | 2 | 0.653 | ug/l | 27-123 | 30 | 27-123 | 30 | 30 | | |
| 2,4-Dichlorophenol | 120-83-2 | 5 | 1.7 | ug/l | 30-130 | 30 | 30-130 | 30 | 30 | | |
| 2,4-Dimethylphenol | 105-67-9 | 5 | 2.04 | ug/l | 30-130 | 30 | 30-130 | 30 | 30 | | |
| 2-Nitrophenol | 88-75-5 | 10 | 1.95 | ug/l | 30-130 | 30 | 30-130 | 30 | 30 | | |
| 4-Nitrophenol | 100-02-7 | 10 | 1.42 | ug/l | 10-80 | 30 | 10-80 | 30 | 30 | | |
| 2,4-Dinitrophenol | 51-28-5 | 20 | 5.42 | ug/l | 20-130 | 30 | 20-130 | 30 | 30 | | |
| 4,6-Dinitro-o-cresol | 534-52-1 | 10 | 2.31 | ug/l | 20-164 | 30 | 20-164 | 30 | 30 | | |
| Pentachlorophenol | 87-86-5 | 10 | 2.51 | ug/l | 9-103 | 30 | 9-103 | 30 | 30 | | |
| Phenol | 108-95-2 | 5 | 0.35 | ug/l | 12-110 | 30 | 12-110 | 30 | 30 | | |
| 2-Methylphenol | 95-48-7 | 5 | 2.31 | ug/l | 30-130 | 30 | 30-130 | 30 | 30 | | |
| 3-Methylphenol/4-Methylphenol | 106-44-5 | 5 | 1.39 | ug/l | 30-130 | 30 | 30-130 | 30 | 30 | | |
| 2,4,5-Trichlorophenol | 95-95-4 | 5 | 2.07 | ug/l | 30-130 | 30 | 30-130 | 30 | 30 | | |
| Benzoic Acid | 65-85-0 | 50 | 2.62 | ug/l | 10-164 | 30 | 10-164 | 30 | 30 | | |
| Benzyl Alcohol | 100-51-6 | 2 | 0.381 | ug/l | 26-116 | 30 | 26-116 | 30 | 30 | | |
| Carbazole | 86-74-8 | 2 | 0.309 | ug/l | 55-144 | 30 | 55-144 | 30 | 30 | | |
| 2-Fluorophenol | 367-12-4 | | | <u> </u> | | | | | | 21-120 | |
| Phenol-d6 | 13127-88-3 | | | | | | | | | 10-120 | |
| Nitrobenzene-d5 | 4165-60-0 | | | | | | | | | 23-120 | |
| 2-Fluorobiphenyl | 321-60-8 | | | | | | | | | 15-120 | |
| 2,4,6-Tribromophenol | 118-79-6 | | | | | | | | | 10-120 | |
| 4-Terphenyl-d14 | 1718-51-0 | | | | | | | | | 41-149 | |
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Langan Engineering & Environmental

NYTCL Semivolatiles -EPA 8270E-SIM (RVT) (WATER)

Holding Time: 7 days

Container/Sample Preservation: 2 - Amber 100ml unpreserved

| | | T | I | | LCS | 1 | MS | <u> </u> | Duplicate | Surrogate | | 1 |
|------------------------|---------------------|-----|--------|--|--------------|--|--|----------|-----------|--|---|---|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | | Criteria | | |
| Acenaphthene | 83-32-9 | 0.1 | 0.0235 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | Griceria | | |
| 2-Chloronaphthalene | 91-58-7 | 0.2 | 0.0227 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| Fluoranthene | 206-44-0 | 0.1 | 0.0272 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| Hexachlorobutadiene | 87-68-3 | 0.5 | 0.02 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| Naphthalene | 91-20-3 | 0.1 | 0.0245 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| Benzo(a)anthracene | 56-55-3 | 0.1 | 0.0295 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| Benzo(a)pyrene | 50-32-8 | 0.1 | 0.024 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| Benzo(b)fluoranthene | 205-99-2 | 0.1 | 0.0272 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| Benzo(k)fluoranthene | 207-08-9 | 0.1 | 0.0338 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| Chrysene | 218-01-9 | 0.1 | 0.031 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| Acenaphthylene | 208-96-8 | 0.1 | 0.0205 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| Anthracene | 120-12-7 | 0.1 | 0.0239 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| Benzo(ghi)perylene | 191-24-2 | 0.1 | 0.0237 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| Fluorene | 86-73-7 | 0.1 | 0.0255 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| Phenanthrene | 85-01-8 | 0.1 | 0.0392 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| Dibenzo(a,h)anthracene | 53-70-3 | 0.1 | 0.0235 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| Indeno(1,2,3-cd)Pyrene | 193-39-5 | 0.1 | 0.022 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| Pyrene | 129-00-0 | 0.1 | 0.0425 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| 2-Methylnaphthalene | 91-57-6 | 0.1 | 0.0277 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| Pentachlorophenol | 87-86-5 | 0.8 | 0.0565 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | _ | |
| Hexachlorobenzene | 118-74-1 | 0.8 | 0.0134 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| Hexachloroethane | 67-72-1 | 0.8 | 0.0224 | ug/l | 40-140 | 40 | 40-140 | 40 | 40 | | | |
| 2-Fluorophenol | 367-12-4 | 0.0 | 0.0221 | ug/1 | 10 110 | 10 | 10 110 | 10 | 10 | 21-120 | _ | |
| Phenol-d6 | 13127-88-3 | | | | | | | | | 10-120 | | |
| Nitrobenzene-d5 | 4165-60-0 | | | | | | | | | 23-120 | | |
| 2-Fluorobiphenyl | 321-60-8 | | | | + | | | | | 15-120 | | |
| 2,4,6-Tribromophenol | 118-79-6 | | | | + | | | 1 | | 10-120 | | |
| 4-Terphenyl-d14 | 1718-51-0 | | | | + | | - | 1 | | 41-149 | | |
| + Telphenyi uli | 1710 31 0 | | | | + | | | 1 | | 71 173 | | |
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Langan Engineering & Environmental

TCL Pesticides - EPA 8081B (RVT) (WATER)

Holding Time: 7 days

Container/Sample Preservation: 2 - Amber 100ml unpreserved

| | | T | | | LCS | | MS | | Duplicate | Surrogate | | |
|------------------------------|--------------------|--------------|--------|-------|----------|--------------|----------|----------|-----------|--|---|--|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | | RPD | Criteria | | |
| Delta-BHC | 319-86-8 | 0.014 | 0.0059 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| Lindane | 58-89-9 | 0.014 | 0.0049 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| Alpha-BHC | 319-84-6 | 0.014 | 0.0048 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| Beta-BHC | 319-85-7 | 0.02 | 0.0141 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| Heptachlor | 76-44-8 | 0.014 | 0.0047 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| Aldrin | 309-00-2 | 0.014 | 0.0051 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| Heptachlor epoxide | 1024-57-3 | 0.014 | 0.0045 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| Endrin | 72-20-8 | 0.029 | 0.0082 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| Endrin aldehyde | 7421-93-4 | 0.03 | 0.0178 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| Endrin ketone | 53494-70-5 | 0.029 | 0.0138 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| Dieldrin | 60-57-1 | 0.029 | 0.0043 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| 4,4'-DDE | 72-55-9 | 0.029 | 0.01 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| 4,4'-DDD | 72-54-8 | 0.029 | 0.0101 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| 4,4'-DDT | 50-29-3 | 0.029 | 0.0134 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| Endosulfan I | 959-98-8 | 0.014 | 0.0047 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| Endosulfan II | 33213-65-9 | 0.029 | 0.0084 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| Endosulfan sulfate | 1031-07-8 | 0.029 | 0.0065 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| Methoxychlor | 72-43-5 | 0.143 | 0.0141 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| Toxaphene | 8001-35-2 | 0.2 | 0.0942 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| cis-Chlordane | 5103-71-9 | 0.02 | 0.0068 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| trans-Chlordane | 5103-74-2 | 0.02 | 0.011 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| Chlordane | 57-74-9 | 0.143 | 0.098 | ug/l | 30-150 | 20 | 30-150 | 30 | 30 | | | |
| 2,4,5,6-Tetrachloro-m-xylene | 877-09-8 | | | | | | | | | 30-150 | | |
| Decachlorobiphenyl | 2051-24-3 | | | | | | | | | 30-150 | | |
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Langan Engineering & Environmental

Herbicides -EPA 8151A (WATER)

Holding Time: 7 days

Container/Sample Preservation: 2 - Amber 1L unpreserved

| Analyte | CAS # | RL | MDL | Units | LCS Criteria | LCS RPD | MS Critoria | MS RPD | Duplicate | Surrogate Criteria | |
|---------------------------------------|---------------------|--------------|----------|--|--|--|----------------|--|-----------|--|--------------|
| 2 4-D | 94-75-7 | 10 | 0.498 | ug/l | 30-150 | 25 | 30-150 | 25 | 25 | Cilleila | + |
| 2,4-D 2,4,5-T 2,4,5-TP (Silvex) | 93-76-5 | 2 | 0.531 | ug/l | 30-150 | 25 | 30-150 | 25 | 25 | | + |
| 2 4 5-TD (Silvey) | 93-72-1 | 2 | 0.539 | ug/l | 30-150 | 25 | 30-150 | 25 | 25 | | + |
| DCAA | 19719-28-9 | | 0.559 | ug/i | 30-130 | 23 | 30-130 | 23 | 25 | 30-150 | + |
| DCAA | 19/19-20-9 | | + | - | | | | - | | 30-130 | + |
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Langan Engineering & Environmental

TCL PCBs - EPA 8082A (RVT) (WATER)

Holding Time: 365 days

Container/Sample Preservation: 2 - Amber 100ml unpreserved

| | 000 # | | MDI | | LCS | I GG DDD | MS | MC DDD | Duplicate | Surrogate | |
|------------------------------|--------------------|------------------|--------------|----------|----------|--------------|--------------|--------------|-----------|-----------|---|
| Analyte | CAS # | RL 0.071 | MDL | Units | Criteria | LCS RPD | | MS RPD | | Criteria | |
| Aroclor 1016 | 12674-11-2 | 0.071 | 0.0128 | ug/l | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Aroclor 1221 | 11104-28-2 | 0.071 | 0.0153 | ug/l | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Aroclor 1232 | 11141-16-5 | 0.071 | 0.0153 | ug/l | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Aroclor 1242 | 53469-21-9 | 0.071 | 0.0153 | ug/l | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Aroclor 1248 | 12672-29-6 | 0.071 | 0.0153 | ug/l | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Aroclor 1254 | 11097-69-1 | 0.071 | 0.0153 | ug/l | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Aroclor 1260 | 11096-82-5 | 0.071 | 0.0153 | ug/l | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Aroclor 1262 | 37324-23-5 | 0.071 | 0.0153 | ug/l | 40-140 | 50 | 40-140 | 50 | 50 | | |
| Aroclor 1268 | 11100-14-4 | 0.071 | 0.0153 | ug/l | 40-140 | 50 | 40-140 | 50 | 50 | | |
| PCBs, Total | 1336-36-3 | 0.071 | 0.0153 | ug/l | | | | 50 | 50 | | |
| 2,4,5,6-Tetrachloro-m-xylene | 877-09-8 | | | | | | | | | 30-150 | |
| Decachlorobiphenyl | 2051-24-3 | | | | | | | | | 30-150 | |
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Langan Engineering & Environmental

METALS by 6020B (WATER)

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|-------------------------------------|---------------------|--------|-----------|-------|-----------------|--------------|------------------------|--------|------------------|-----------|------------------|----------------------------------|
| Analyte | CAS # | RL | MDL | Units | LCS Criteria | LCS RPD | MS | MS RPD | Duplicate RPD | Surrogate | Holding | Container |
| Aluminum, Dissolved | 7429-90-5 | 0.01 | 0.00327 | mg/l | 80-120 | LC3 KPD | Criteria 75-125 | 20 | 20 | Criteria | Time 180 days | 1 - Plastic 500ml HNO3 preserved |
| Aluminum, Total | 7429-90-5 | 0.01 | 0.00327 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Antimony, Total | 7429-90-3 | 0.004 | 0.00327 | mg/l | 80-120 | | 75-125 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Antimony, Total Antimony, Dissolved | 7440-36-0 | 0.004 | 0.000429 | mg/l | 80-120 | 1 | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Arsenic, Total | 7440-38-2 | 0.0005 | 0.000429 | mg/l | 80-120 | + | 75-125 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Arsenic, Total Arsenic, Dissolved | 7440-38-2 | 0.0005 | 0.000165 | mg/l | 80-120 | + | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Barium, Dissolved | 7440-39-3 | 0.0005 | 0.000103 | mg/l | 80-120 | + | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| • | 7440-39-3 | 0.0005 | 0.000173 | | 80-120 | 1 | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Barium, Total | | | | mg/l | | | | | | | , | |
| Beryllium, Total | 7440-41-7 | 0.0005 | 0.000107 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Beryllium, Dissolved | 7440-41-7 | 0.0005 | 0.000107 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Cadmium, Dissolved | 7440-43-9 | 0.0002 | 0.0000599 | mg/l | 80-120 | ļ | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Calcium, Dissolved | 7440-70-2 | 0.1 | 0.0394 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Cadmium, Total | 7440-43-9 | 0.0002 | 0.0000599 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Chromium, Dissolved | 7440-47-3 | 0.001 | 0.000178 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Calcium, Total | 7440-70-2 | 0.1 | 0.0394 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Cobalt, Dissolved | 7440-48-4 | 0.0005 | 0.000163 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Chromium, Total | 7440-47-3 | 0.001 | 0.000178 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Copper, Dissolved | 7440-50-8 | 0.001 | 0.000384 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Cobalt, Total | 7440-48-4 | 0.0005 | 0.000163 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Copper, Total | 7440-50-8 | 0.001 | 0.000384 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Iron, Dissolved | 7439-89-6 | 0.05 | 0.0191 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Lead, Dissolved | 7439-92-1 | 0.001 | 0.000343 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Iron, Total | 7439-89-6 | 0.05 | 0.0191 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Magnesium, Dissolved | 7439-95-4 | 0.07 | 0.0242 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Lead, Total | 7439-92-1 | 0.001 | 0.000343 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Manganese, Dissolved | 7439-96-5 | 0.001 | 0.00044 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Magnesium, Total | 7439-95-4 | 0.07 | 0.0242 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Manganese, Total | 7439-96-5 | 0.001 | 0.00044 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | · |
| Nickel, Dissolved | 7440-02-0 | 0.002 | 0.000556 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Potassium, Dissolved | 7440-09-7 | 0.1 | 0.0309 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Nickel, Total | 7440-02-0 | 0.002 | 0.000556 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Selenium, Dissolved | 7782-49-2 | 0.005 | 0.00173 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Potassium, Total | 7440-09-7 | 0.1 | 0.0309 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Selenium, Total | 7782-49-2 | 0.005 | 0.00173 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Silver, Dissolved | 7440-22-4 | 0.0004 | 0.000163 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Silver, Total | 7440-22-4 | 0.0004 | 0.000163 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Sodium, Dissolved | 7440-23-5 | 0.5 | 0.0293 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Thallium, Dissolved | 7440-28-0 | 0.001 | 0.000143 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Sodium, Total | 7440-23-5 | 0.5 | 0.0293 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Thallium, Total | 7440-28-0 | 0.001 | 0.000143 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Vanadium, Dissolved | 7440-62-2 | 0.005 | 0.00115 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Vanadium, Total | 7440-62-2 | 0.005 | 0.00157 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| vanaalan, rotai | Place Note that the | | | | | | | | | | 100 days | T Tradic Douth Throb preserved |







File: PM18699-1
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Langan Engineering & Environmental

METALS by 6020B (WATER)

| A1. 4 | 010 # | | MDI | | LCS | I CC PPP | MS | MC DDD | Duplicate | Surrogate | Holding Time | O a material and |
|-----------------|--------------------|------|----------|-------|--------------|--|----------|------------|-----------|-----------|-----------------|----------------------------------|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | RPD | Criteria | Time | Container |
| Zinc, Dissolved | 7440-66-6 | 0.01 | 0.00341 | mg/l | 80-120 | ļ | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
| Zinc, Total | 7440-66-6 | 0.01 | 0.00341 | mg/l | 80-120 | 1 | 75-125 | 20 | 20 | | 180 days | 1 - Plastic 500ml HNO3 preserved |
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Langan Engineering & Environmental

METALS by 7470A (WATER)

| | | | T | | LCS | T | MS | | Duplicate | Surrogate | Holdina | |
|--------------------|-----------|--------|-----------|----------|--------------|----------|----------|--------|-----------|------------|-----------------|----------------------------------|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | RPD | Criteria | Holding Time | Container |
| Mercury, Total | 7439-97-6 | 0.0002 | 0.0000915 | mg/l | 80-120 | | 75-125 | 20 | 20 | - CITCOITE | 28 days | 1 - Plastic 500ml HNO3 preserved |
| Mercury, Dissolved | 7439-97-6 | 0.0002 | 0.0000915 | mg/l | 80-120 | 1 | 75-125 | 35 | 35 | | 28 days | 1 - Plastic 500ml HNO3 preserved |
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Langan Engineering & Environmental

WETCHEM (WATER)

| | | | | | LCS | | MS | | Duplicate | | Holding | |
|----------------------|--------------------|-------|--------|-------|----------|---------|----------|--|-----------|-------------|----------|----------------------------------|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | | | Method | Time | Container |
| Chromium, Hexavalent | 18540-29-9 | 0.01 | 0.003 | mg/l | 85-115 | 20 | 85-115 | 20 | 20 | 7196A | 24 hours | 1 - Plastic 500ml unpreserved |
| Cyanide, Total | 57-12-5 | 0.005 | 0.0018 | mg/l | 85-115 | 20 | 80-120 | 20 | 20 | 9010C/9012B | 14 days | 1 - Plastic 250ml NaOH preserved |
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Page: 1

Langan Engineering & Environmental

1,4 Dioxane via EPA 8270E-SIM (WATER)

Holding Time: 7 days

Container/Sample Preservation: 2 - Amber 250ml unpreserved

| | | | | | LCS | | MS | | Duplicate RPD | Surrogate | |
|---------------------|-----------------------|-----|------|--|--------------|--------------|----------|--|------------------|-----------|---|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | RPD | Criteria | |
| 1,4-Dioxane | 123-91-1 | 150 | 33.9 | ng/l | 40-140 | 30 | 40-140 | 30 | 30 | | |
| 1,4-Dioxane-d8 | 17647-74-4 | | | | | | | | | 15-110 | |
| 1,4-Dioxane-d8 (IS) | 17647-74-4 | | | ng/l | | | | | | | |
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Langan Engineering & Environmental

NY PFAAs via EPA 1633 (WATER)

Holding Time: 28 days

Container/Sample Preservation: 2 - Plastic 500ml unpreserved

| | | <u> </u> | | | LCS | | MS | | Duplicate | Surrogate | |
|--|-------------|----------|-------|-------|----------|---------|----------|--------|-----------|-----------|---|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | RPD | Criteria | |
| Perfluorobutanoic Acid (PFBA) | 375-22-4 | 6.4 | 0.528 | ng/l | 70-140 | 30 | 70-140 | 30 | 30 | Criteria | + |
| Perfluoropentanoic Acid (PFPeA) | 2706-90-3 | 3.2 | 0.36 | ng/l | 65-135 | 30 | 65-135 | 30 | 30 | 1 | |
| Perfluorobutanesulfonic Acid (PFBS) | 375-73-5 | 1.6 | 0.4 | ng/l | 60-145 | 30 | 60-145 | 30 | 30 | | |
| 1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS) | 757124-72-4 | 6.4 | 0.912 | ng/l | 70-145 | 30 | 70-145 | 30 | 30 | | |
| Perfluorohexanoic Acid (PFHxA) | 307-24-4 | 1.6 | 0.248 | ng/l | 70-145 | 30 | 70-145 | 30 | 30 | | † |
| Perfluoropentanesulfonic Acid (PFPeS) | 2706-91-4 | 1.6 | 0.208 | ng/l | 65-140 | 30 | 65-140 | 30 | 30 | | † |
| Perfluoroheptanoic Acid (PFHpA) | 375-85-9 | 1.6 | 0.24 | ng/l | 70-150 | 30 | 70-150 | 30 | 30 | | † |
| Perfluorohexanesulfonic Acid (PFHxS) | 355-46-4 | 1.6 | 0.136 | ng/l | 65-145 | 30 | 65-145 | 30 | 30 | | + |
| Perfluorooctanoic Acid (PFOA) | 335-67-1 | 1.6 | 0.264 | ng/l | 70-150 | 30 | 70-150 | 30 | 30 | | |
| 1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS) | 27619-97-2 | 6.4 | 4.816 | ng/l | 65-155 | 30 | 65-155 | 30 | 30 | | † |
| Perfluoroheptanesulfonic Acid (PFHpS) | 375-92-8 | 1.6 | 0.2 | ng/l | 70-150 | 30 | 70-150 | 30 | 30 | | + |
| Perfluorononanoic Acid (PFNA) | 375-95-1 | 1.6 | 0.264 | ng/l | 70-150 | 30 | 70-150 | 30 | 30 | | |
| Perfluorooctanesulfonic Acid (PFOS) | 1763-23-1 | 1.6 | 0.264 | ng/l | 55-150 | 30 | 55-150 | 30 | 30 | | |
| Perfluorodecanoic Acid (PFDA) | 335-76-2 | 1.6 | 0.208 | ng/l | 70-140 | 30 | 70-140 | 30 | 30 | | |
| 1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS) | 39108-34-4 | 6.4 | 1.224 | ng/l | 60-150 | 30 | 60-150 | 30 | 30 | | |
| Perfluorononanesulfonic Acid (PFNS) | 68259-12-1 | 1.6 | 0.2 | ng/l | 65-145 | 30 | 65-145 | 30 | 30 | | |
| N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA | 2355-31-9 | 1.6 | 0.48 | ng/l | 50-140 | 30 | 50-140 | 30 | 30 | | |
| Perfluoroundecanoic Acid (PFUnA) | 2058-94-8 | 1.6 | 0.176 | ng/l | 70-145 | 30 | 70-145 | 30 | 30 | | |
| Perfluorodecanesulfonic Acid (PFDS) | 335-77-3 | 1.6 | 0.136 | ng/l | 60-145 | 30 | 60-145 | 30 | 30 | | |
| Perfluorooctanesulfonamide (FOSA) | 754-91-6 | 1.6 | 0.096 | ng/l | 70-145 | 30 | 70-145 | 30 | 30 | | |
| N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA) | 2991-50-6 | 1.6 | 0.48 | ng/l | 70-145 | 30 | 70-145 | 30 | 30 | | |
| Perfluorododecanoic Acid (PFDoA) | 307-55-1 | 1.6 | 0.216 | ng/l | 70-140 | 30 | 70-140 | 30 | 30 | | |
| Perfluorotridecanoic Acid (PFTrDA) | 72629-94-8 | 1.6 | 0.184 | ng/l | 65-140 | 30 | 65-140 | 30 | 30 | | |
| Perfluorotetradecanoic Acid (PFTA) | 376-06-7 | 1.6 | 0.16 | ng/l | 60-140 | 30 | 60-140 | 30 | 30 | | |
| 2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Pro | 13252-13-6 | 6.4 | 1.6 | ng/l | 70-140 | 30 | 70-140 | 30 | 30 | | |
| 4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA) | 919005-14-4 | 6.4 | 0.376 | ng/l | 65-145 | 30 | 65-145 | 30 | 30 | | |
| Perfluorododecane Sulfonic Acid (PFDoDS) | 79780-39-5 | 1.6 | 0.24 | ng/l | 50-145 | 30 | 50-145 | 30 | 30 | | |
| 9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3) | 756426-58-1 | 6.4 | 0.44 | ng/l | 70-155 | 30 | 70-155 | 30 | 30 | | |
| 11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-F | 763051-92-9 | 6.4 | 0.448 | ng/l | 55-160 | 30 | 55-160 | 30 | 30 | | |
| N-Methyl Perfluorooctane Sulfonamide (NMeFOSA) | 31506-32-8 | 1.6 | 0.224 | ng/l | 60-150 | 30 | 60-150 | 30 | 30 | | |
| N-Ethyl Perfluorooctane Sulfonamide (NEtFOSA) | 4151-50-2 | 1.6 | 0.352 | ng/l | 65-145 | 30 | 65-145 | 30 | 30 | | |
| N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE) | 24448-09-7 | 16 | 1.304 | ng/l | 70-145 | 30 | 70-145 | 30 | 30 | | |
| N-Ethyl Perfluorooctanesulfonamido Ethanol (NEtFOSE) | 1691-99-2 | 16 | 1.104 | ng/l | 70-135 | 30 | 70-135 | 30 | 30 | | |
| Perfluoro-3-Methoxypropanoic Acid (PFMPA) | 377-73-1 | 3.2 | 0.248 | ng/l | 55-140 | 30 | 55-140 | 30 | 30 | | |
| Perfluoro-4-Methoxybutanoic Acid (PFMBA) | 863090-89-5 | 3.2 | 0.36 | ng/l | 60-150 | 30 | 60-150 | 30 | 30 | | |
| Perfluoro(2-Ethoxyethane)Sulfonic Acid (PFEESA) | 113507-82-7 | 3.2 | 0.328 | ng/l | 70-140 | 30 | 70-140 | 30 | 30 | | |
| Nonafluoro-3,6-Dioxaheptanoic Acid (NFDHA) | 151772-58-6 | 3.2 | 0.544 | ng/l | 50-150 | 30 | 50-150 | 30 | 30 | | |
| 3-Perfluoropropyl Propanoic Acid (3:3FTCA) | 356-02-5 | 8 | 0.536 | ng/l | 65-130 | 30 | 65-130 | 30 | 30 | | |
| 2H,2H,3H,3H-Perfluorooctanoic Acid (5:3FTCA) | 914637-49-3 | 40 | 4.256 | ng/l | 70-135 | 30 | 70-135 | 30 | 30 | | |
| 3-Perfluoroheptyl Propanoic Acid (7:3FTCA) | 812-70-4 | 40 | 3.184 | ng/l | 50-145 | 30 | 50-145 | 30 | 30 | | |
| Perfluoro[13C4]Butanoic Acid (MPFBA) | NONE | | | | | | | | | 5-130 | |
| Perfluoro[13C5]Pentanoic Acid (M5PFPEA) | NONE | | | | | | | | | 40-130 | |







File: PM1869 Page: 2

Langan Engineering & Environmental

NY PFAAs via EPA 1633 (WATER)

Holding Time: 28 days

Container/Sample Preservation: 2 - Plastic 500ml unpreserved

| | | | | | LCS | | MS | | Duplicate | Surrogate | |
|--|----------------------|----|--------------|----------|--------------|---------|----------|--|-----------|-----------|--|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | RPD | Criteria | |
| Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS) | NONE | | | | | | | | | 40-135 | |
| 1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4. | NONE | | | | | | | | | 40-200 | |
| Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA) | NONE | | | | | | | | | 40-130 | |
| Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA) | NONE | | | | | | | | | 40-130 | |
| Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS) | NONE | | | | | | | | | 40-130 | |
| Perfluoro[13C8]Octanoic Acid (M8PFOA) | NONE | | | | | | | | | 40-130 | |
| 1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6: | NONE | | | | | | | | | 40-200 | |
| Perfluoro[13C9]Nonanoic Acid (M9PFNA) | NONE | | | | | | | | | 40-130 | |
| Perfluoro[13C8]Octanesulfonic Acid (M8PFOS) | NONE | | | | | | | | | 40-130 | |
| Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA) | NONE | | | | | | | | | 40-130 | |
| 1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8: | NONE | | | | | | | | | 40-300 | |
| N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (| NONE | | | | | | | | | 40-170 | |
| Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA) | NONE | | | | | | | | | 30-130 | |
| Perfluoro[13C8]Octanesulfonamide (M8FOSA) | NONE | | | | | | | | | 40-130 | |
| N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5 | NONE | | | | | | | 1 | | 25-135 | |
| Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA) | NONE | | | | | | | | | 10-130 | |
| Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA) | NONE | | | | | | | | | 10-130 | |
| 2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-13(| NONE | | | | | | | | | 40-130 | |
| N-Methyl-d3-Perfluoro-1-Octanesulfonamide (d3-NMeFOSA) | NONE | | | | | | | | | 10-130 | |
| N-Ethyl-d5-Perfluoro-1-Octanesulfonamide (d5-NEtFOSA) | NONE | | | | | | | | | 10-130 | |
| 2-(N-Methyl-d3-Perfluoro-1-Octanesulfonamido)ethan-d4-ol | 1265205-95-5 | | | | | | | | | 10-130 | |
| 2-(N-Ethyl-d5-Perfluoro-1-Octanesulfonamido)ethan-d4-ol (d. | NONE | | | | | | | | | 10-130 | |
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| | Disease Nata disease | | | | 1 | I | | | | | |







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Langan Engineering & Environmental

Volatile Organics in Air: TO-15 (AIR)

Holding Time: 30 days

Container/Sample Preservation: 1 - Generic Air Can for Bottleorder

| | | | I | | LCS | | MS | | Duplicate | Surrogate | |
|----------------------------|------------|-----|--------|-------|----------|---------|----------|--------|-----------|-----------|--|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | RPD | Criteria | |
| 1,1,1-Trichloroethane | 71-55-6 | 0.2 | 0.0614 | ppbV | 70-130 | | Griceria | 25 | 25 | Griceria | |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 0.2 | 0.052 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,1,2-Trichloroethane | 79-00-5 | 0.2 | 0.0582 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,1-Dichloroethane | 75-34-3 | 0.2 | 0.0568 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,1-Dichloroethene | 75-35-4 | 0.2 | 0.0568 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,2,3-Trimethylbenzene | 526-73-8 | 0.2 | 0.0576 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,2,4-Trichlorobenzene | 120-82-1 | 0.2 | 0.1 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,2,4-Trimethylbenzene | 95-63-6 | 0.2 | 0.0577 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,2,4,5-Tetramethylbenzene | 95-93-2 | 0.2 | 0.135 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,2-Dibromoethane | 106-93-4 | 0.2 | 0.0544 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,2-Dichlorobenzene | 95-50-1 | 0.2 | 0.0619 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,2-Dichloroethane | 107-06-2 | 0.2 | 0.0787 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,2-Dichloropropane | 78-87-5 | 0.2 | 0.0631 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,3,5-Trimethylbenzene | 108-67-8 | 0.2 | 0.06 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,3-Butadiene | 106-99-0 | 0.2 | 0.0619 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,3-Dichlorobenzene | 541-73-1 | 0.2 | 0.0777 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,4-Dichlorobenzene | 106-46-7 | 0.2 | 0.0826 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,4-Dioxane | 123-91-1 | 0.2 | 0.0538 | ppbV | 70-130 | | | 25 | 25 | | |
| 2,2,4-Trimethylpentane | 540-84-1 | 0.2 | 0.0692 | ppbV | 70-130 | | | 25 | 25 | | |
| 2-Butanone | 78-93-3 | 0.5 | 0.099 | ppbV | 70-130 | | | 25 | 25 | | |
| 2-Hexanone | 591-78-6 | 0.2 | 0.0912 | ppbV | 70-130 | | | 25 | 25 | | |
| 2-Methylthiophene | 554-14-3 | 0.2 | 0.0622 | ppbV | 70-130 | | | 25 | 25 | | |
| 3-Methylthiophene | 616-44-4 | 0.2 | 0.0634 | ppbV | 70-130 | | | 25 | 25 | | |
| 3-Chloropropene | 107-05-1 | 0.2 | 0.086 | ppbV | 70-130 | | | 25 | 25 | | |
| 2-Ethylthiophene | 872-55-9 | 0.2 | 0.0612 | ppbV | 70-130 | | | 25 | 25 | | |
| 4-Ethyltoluene | 622-96-8 | 0.2 | 0.0554 | ppbV | 70-130 | | | 25 | 25 | | |
| Acetone | 67-64-1 | 1 | 0.515 | ppbV | 40-160 | | | 25 | 25 | | |
| Benzene | 71-43-2 | 0.2 | 0.0643 | ppbV | 70-130 | | | 25 | 25 | | |
| Benzyl chloride | 100-44-7 | 0.2 | 0.0939 | ppbV | 70-130 | | | 25 | 25 | | |
| Benzothiophene | 95-15-8 | 0.5 | 0.273 | ppbV | 70-130 | | | 25 | 25 | | |
| Bromodichloromethane | 75-27-4 | 0.2 | 0.0689 | ppbV | 70-130 | | | 25 | 25 | | |
| Bromoform | 75-25-2 | 0.2 | 0.0596 | ppbV | 70-130 | | | 25 | 25 | | |
| Bromomethane | 74-83-9 | 0.2 | 0.0547 | ppbV | 70-130 | | | 25 | 25 | | |
| Carbon disulfide | 75-15-0 | 0.2 | 0.0465 | ppbV | 70-130 | | | 25 | 25 | | |
| Carbon tetrachloride | 56-23-5 | 0.2 | 0.0686 | ppbV | 70-130 | | | 25 | 25 | | |
| Chlorobenzene | 108-90-7 | 0.2 | 0.0516 | ppbV | 70-130 | | | 25 | 25 | | |
| Chloroethane | 75-00-3 | 0.2 | 0.0649 | ppbV | 70-130 | | | 25 | 25 | | |
| Chloroform | 67-66-3 | 0.2 | 0.0552 | ppbV | 70-130 | | | 25 | 25 | | |
| Chloromethane | 74-87-3 | 0.2 | 0.0576 | ppbV | 70-130 | | | 25 | 25 | | |
| cis-1,2-Dichloroethene | 156-59-2 | 0.2 | 0.0595 | ppbV | 70-130 | | | 25 | 25 | | |
| cis-1,3-Dichloropropene | 10061-01-5 | 0.2 | 0.0674 | ppbV | 70-130 | | | 25 | 25 | | |
| Cyclohexane | 110-82-7 | 0.2 | 0.0728 | ppbV | 70-130 | | | 25 | 25 | | |







Date Created: 02/18/25 Created By: Ben Rao File: PM18700-1 Page: 2

Langan Engineering & Environmental

Volatile Organics in Air: TO-15 (AIR)

Holding Time: 30 days

Container/Sample Preservation: 1 - Generic Air Can for Bottleorder

| | | | <u> </u> | | LCS | | MS | | Duplicate | Surrogate | |
|--|-------------|------|----------|-------|----------|---------|----------|--------|-----------|-----------|---|
| Analyte | CAS # | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | RPD | Criteria | |
| Dibromochloromethane | 124-48-1 | 0.2 | 0.0566 | ppbV | 70-130 | | Giicoiia | 25 | 25 | Gricoria | 1 |
| Dichlorodifluoromethane | 75-71-8 | 0.2 | 0.0757 | ppbV | 70-130 | | | 25 | 25 | | |
| Ethyl Alcohol | GCDAI06 | 5 | 1.74 | ppbV | 40-160 | | | 25 | 25 | | |
| Ethyl Acetate | 141-78-6 | 0.5 | 0.297 | ppbV | 70-130 | | | 25 | 25 | | |
| Ethylbenzene | 100-41-4 | 0.2 | 0.0575 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,1,2-Trichloro-1,2,2-Trifluoroethane | 76-13-1 | 0.2 | 0.0506 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,2-Dichloro-1,1,2,2-tetrafluoroethane | 76-14-2 | 0.2 | 0.0504 | ppbV | 70-130 | | | 25 | 25 | | |
| Hexachlorobutadiene | 87-68-3 | 0.2 | 0.0607 | ppbV | 70-130 | | | 25 | 25 | | |
| iso-Propyl Alcohol | 67-63-0 | 1 | 0.272 | ppbV | 40-160 | | | 25 | 25 | | |
| Methylene chloride | 75-09-2 | 0.5 | 0.125 | ppbV | 70-130 | | | 25 | 25 | | |
| 4-Methyl-2-pentanone | 108-10-1 | 0.5 | 0.19 | ppbV | 70-130 | | | 25 | 25 | | |
| Methyl tert butyl ether | 1634-04-4 | 0.2 | 0.045 | ppbV | 70-130 | | | 25 | 25 | | |
| Methyl Methacrylate | 80-62-6 | 0.5 | 0.226 | ppbV | 40-160 | | | 25 | 25 | | |
| p/m-Xylene | 179601-23-1 | 0.4 | 0.125 | ppbV | 70-130 | | | 25 | 25 | | |
| o-Xylene | 95-47-6 | 0.2 | 0.0621 | ppbV | 70-130 | | | 25 | 25 | | |
| Xylene (Total) | 1330-20-7 | 0.2 | 0.0621 | ppbV | | | | 25 | 25 | | |
| Heptane | 142-82-5 | 0.2 | 0.0828 | ppbV | 70-130 | | | 25 | 25 | | |
| n-Heptane | 142-82-5 | 0.2 | 0.0828 | ppbV | 70-130 | | | 25 | 25 | | |
| n-Hexane | 110-54-3 | 0.2 | 0.0743 | ppbV | 70-130 | | | 25 | 25 | | |
| Propylene | 115-07-1 | 0.5 | 0.135 | ppbV | 70-130 | | | 25 | 25 | | |
| Styrene | 100-42-5 | 0.2 | 0.0596 | ppbV | 70-130 | | | 25 | 25 | | |
| Tetrachloroethene | 127-18-4 | 0.2 | 0.0627 | ppbV | 70-130 | | | 25 | 25 | | |
| Thiophene | 110-02-1 | 0.2 | 0.052 | ppbV | 70-130 | | | 25 | 25 | | |
| Tetrahydrofuran | 109-99-9 | 0.5 | 0.117 | ppbV | 70-130 | | | 25 | 25 | | |
| Toluene | 108-88-3 | 0.2 | 0.0867 | ppbV | 70-130 | | | 25 | 25 | | |
| trans-1,2-Dichloroethene | 156-60-5 | 0.2 | 0.0755 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,2-Dichloroethene (total) | 540-59-0 | 0.2 | 0.0595 | ppbV | | | | 25 | 25 | | |
| trans-1,3-Dichloropropene | 10061-02-6 | 0.2 | 0.0783 | ppbV | 70-130 | | | 25 | 25 | | |
| 1,3-Dichloropropene, Total | 542-75-6 | 0.2 | 0.0674 | ppbV | | | | 25 | 25 | | |
| Trichloroethene | 79-01-6 | 0.2 | 0.0548 | ppbV | 70-130 | | | 25 | 25 | | |
| Trichlorofluoromethane | 75-69-4 | 0.2 | 0.0787 | ppbV | 70-130 | | | 25 | 25 | | |
| Vinyl acetate | 108-05-4 | 1 | 0.323 | ppbV | 70-130 | | | 25 | 25 | | |
| Vinyl bromide | 593-60-2 | 0.2 | 0.0722 | ppbV | 70-130 | | | 25 | 25 | | |
| Vinyl chloride | 75-01-4 | 0.2 | 0.0582 | ppbV | 70-130 | | | 25 | 25 | | |
| Naphthalene | 91-20-3 | 0.19 | 0.059 | ppbV | 70-130 | | | 25 | 25 | | |
| Propane | 74-98-6 | 0.5 | 0.152 | ppbV | 70-130 | | | 25 | 25 | | |
| Acrylonitrile | 107-13-1 | 0.5 | 0.0894 | ppbV | 70-130 | | | 25 | 25 | | |
| Acrolein | 107-02-8 | 0.5 | 0.149 | ppbV | 60-113 | | | 25 | 25 | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 0.2 | 0.0508 | ppbV | 70-130 | | | 25 | 25 | | |
| Isopropylbenzene | 98-82-8 | 0.2 | 0.0621 | ppbV | 70-130 | | | 25 | 25 | | |

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. (Soil/Solids only)

Please Note that the information provided in this table is subject to change at anytime at the discretion of Pace Analytical Services.



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Date Created: 02/18/25



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Volatile Organics in Air: TO-15 (AIR)

Holding Time: 30 days

Container/Sample Preservation: 1 - Generic Air Can for Bottleorder

| Analyte | CAS# | RL | MDL | Units | LCS Criteria | LCS RPD | MS Criteria | MS RPD | Duplicate RPD | Surrogate Criteria | | |
|-----------------------------|------------|-----|--|-------|-----------------|----------|----------------|--------|------------------|-----------------------|--|--|
| 1,2,3-Trichloropropane | 96-18-4 | 0.2 | 0.0575 | ppbV | 70-130 | LCO KI D | Criteria | 25 | 25 | Citteria | | |
| Acetonitrile | 75-05-8 | 0.2 | 0.101 | ppbV | 70-130 | | | 25 | 25 | | | |
| Bromobenzene | 108-86-1 | 0.2 | 0.0579 | ppbV | 70-130 | | | 25 | 25 | | | |
| Chlorodifluoromethane | 75-45-6 | 0.2 | 0.0463 | ppbV | 70-130 | | | 25 | 25 | | | |
| Dichlorofluoromethane | 75-43-4 | 0.2 | 0.112 | ppbV | 70-130 | <u> </u> | | 25 | 25 | | | |
| Dibromomethane | 74-95-3 | 0.2 | 0.0598 | ppbV | 70-130 | • | | 25 | 25 | | | |
| Pentane | 109-66-0 | 0.2 | 0.113 | ppbV | 70-130 | | | 25 | 25 | | | |
| Octane | 111-65-9 | 0.2 | 0.0676 | ppbV | 70-130 | | | 25 | 25 | | | |
| Tertiary-Amyl Methyl Ether | 994-05-8 | 0.2 | 0.0672 | ppbV | 70-130 | | | 25 | 25 | | | |
| o-Chlorotoluene | 95-49-8 | 0.2 | 0.0761 | ppbV | 70-130 | | | 25 | 25 | | | |
| p-Chlorotoluene | 106-43-4 | 0.2 | 0.0765 | ppbV | 70-130 | | | 25 | 25 | | | |
| 2,2-Dichloropropane | 594-20-7 | 0.2 | 0.0429 | ppbV | 70-130 | | | 25 | 25 | | | |
| 1,1-Dichloropropene | 563-58-6 | 0.2 | 0.0593 | ppbV | 70-130 | | | 25 | 25 | | | |
| Isopropyl Ether | 108-20-3 | 0.2 | 0.0631 | ppbV | 70-130 | | | 25 | 25 | | | |
| Ethyl-Tert-Butyl-Ether | 637-92-3 | 0.2 | 0.0731 | ppbV | 70-130 | | | 25 | 25 | | | |
| 1,2,3-Trichlorobenzene | 87-61-6 | 0.2 | 0.0738 | ppbV | 70-130 | | | 25 | 25 | | | |
| Ethyl ether | 60-29-7 | 0.2 | 0.0853 | ppbV | 70-130 | | | 25 | 25 | | | |
| n-Butylbenzene | 104-51-8 | 0.2 | 0.0536 | ppbV | 70-130 | <u> </u> | <u> </u> | 25 | 25 | | | |
| sec-Butylbenzene | 135-98-8 | 0.2 | 0.0547 | ppbV | 70-130 | | | 25 | 25 | | | |
| tert-Butylbenzene | 98-06-6 | 0.2 | 0.0551 | ppbV | 70-130 | | | 25 | 25 | | | |
| 1,2-Dibromo-3-chloropropane | 96-12-8 | 0.2 | 0.0624 | ppbV | 70-130 | | | 25 | 25 | | | |
| p-Isopropyltoluene | 99-87-6 | 0.2 | 0.0567 | ppbV | 70-130 | | | 25 | 25 | | | |
| n-Propylbenzene | 103-65-1 | 0.2 | 0.0633 | ppbV | 70-130 | | | 25 | 25 | | | |
| 1,3-Dichloropropane | 142-28-9 | 0.2 | 0.0536 | ppbV | 70-130 | | | 25 | 25 | | | |
| Methanol | 67-56-1 | 5 | 3.029 | ppbV | 70-130 | | | 25 | 25 | | | |
| Acetaldehyde | 75-07-0 | 2.5 | 1.73 | ppbV | 70-130 | | | 25 | 25 | | | |
| Butane | 106-97-8 | 0.2 | 0.08 | ppbV | 70-130 | | | 25 | 25 | | | |
| Nonane (C9) | 111-84-2 | 0.2 | 0.0737 | ppbV | 70-130 | | | 25 | 25 | | | |
| Decane (C10) | 124-18-5 | 0.2 | 0.0697 | ppbV | 70-130 | | | 25 | 25 | | | |
| Undecane | 1120-21-4 | 0.2 | 0.0709 | ppbV | 70-130 | | | 25 | 25 | | | |
| Indane | 496-11-7 | 0.2 | 0.0591 | ppbV | 70-130 | | | 25 | 25 | | | |
| Indene | 95-13-6 | 0.2 | 0.0711 | ppbV | 70-130 | | | 25 | 25 | | | |
| 1-Methylnaphthalene | 90-12-0 | 1 | 0.264 | ppbV | 70-130 | | | 25 | 25 | | | |
| Dodecane (C12) | 112-40-3 | 0.2 | 0.0891 | ppbV | 70-130 | | | 25 | 25 | | | |
| Butyl Acetate | 123-86-4 | 0.5 | 0.208 | ppbV | 70-130 | | | 25 | 25 | | | |
| tert-Butyl Alcohol | 75-65-0 | 0.5 | 0.132 | ppbV | 70-130 | | | 25 | 25 | | | |
| 2-Methylnaphthalene | 91-57-6 | 1 | 0.259 | ppbV | 70-130 | | | 25 | 25 | | | |
| 1,2-Dichloroethane-d4 | 17060-07-0 | | | | | | | | | 70-130 | | |
| Toluene-d8 | 2037-26-5 | | | | 1 | | | | | 70-130 | | |
| Bromofluorobenzene | 460-00-4 | | <u> </u> | | 1 | | | | | 70-130 | | |
| | | | | | | | | | | | | |
| | | | | | 1 | | | | | | | |







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Volatile Organics in Air by TO-15 SIM (AIR)

Holding Time: 30 days

Container/Sample Preservation: 1 - Generic Air Can for Bottleorder

| | | | | | LCS | <u> </u> | MS | | Duplicate | Surrogate | Τ |
|----------------------------|------------|------|--------|-------|----------|----------|----------|--------|-----------|-----------|----------|
| Analyte | CAS# | RL | MDL | Units | Criteria | LCS RPD | Criteria | MS RPD | RPD | Criteria | |
| 1,1,1-Trichloroethane | 71-55-6 | 0.02 | 0.0059 | ppbV | 70-130 | 25 | Criteria | 25 | 25 | Criteria | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 0.02 | 0.01 | ppbV | 70-130 | 25 | | 25 | 25 | | <u> </u> |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 0.02 | 0.0067 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| 1,1,2-Trichloroethane | 79-00-5 | 0.02 | 0.0097 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| 1,1-Dichloroethane | 75-34-3 | 0.02 | 0.0086 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| 1,1-Dichloroethene | 75-35-4 | 0.02 | 0.0077 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| 1,2,4-Trimethylbenzene | 95-63-6 | 0.02 | 0.0076 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| 1,2-Dibromoethane | 106-93-4 | 0.02 | 0.0091 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| 1,2-Dichlorobenzene | 95-50-1 | 0.02 | 0.0062 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| 1,2-Dichloroethane | 107-06-2 | 0.02 | 0.0083 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| 1,2-Dichloropropane | 78-87-5 | 0.02 | 0.0083 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| 1,3,5-Trimethylbenzene | 108-67-8 | 0.02 | 0.0096 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| 1,3-Butadiene | 106-99-0 | 0.02 | 0.0106 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| 1,3-Dichlorobenzene | 541-73-1 | 0.02 | 0.0077 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| 1,4-Dichlorobenzene | 106-46-7 | 0.02 | 0.0075 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| 1,4-Dioxane | 123-91-1 | 0.1 | 0.0344 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| 2,2,4-Trimethylpentane | 540-84-1 | 0.2 | 0.037 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| 2-Hexanone | 591-78-6 | 0.2 | 0.0354 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| 3-Chloropropene | 107-05-1 | 0.2 | 0.0327 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| 4-Ethyltoluene | 622-96-8 | 0.02 | 0.0099 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| Benzene | 71-43-2 | 0.1 | 0.0298 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| Benzyl chloride | 100-44-7 | 0.1 | 0.0332 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| Bromodichloromethane | 75-27-4 | 0.02 | 0.0074 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| Bromoform | 75-25-2 | 0.02 | 0.0111 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| Bromomethane | 74-83-9 | 0.02 | 0.0094 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| Carbon disulfide | 75-15-0 | 0.2 | 0.0316 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| Carbon tetrachloride | 56-23-5 | 0.02 | 0.011 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| Chlorobenzene | 108-90-7 | 0.1 | 0.0258 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| Chloroethane | 75-00-3 | 0.1 | 0.0395 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| Chloroform | 67-66-3 | 0.02 | 0.0071 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| Chloromethane | 74-87-3 | 0.2 | 0.0756 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| cis-1,2-Dichloroethene | 156-59-2 | 0.02 | 0.0102 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| trans-1,2-Dichloroethene | 156-60-5 | 0.02 | 0.009 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| 1,2-Dichloroethene (total) | 540-59-0 | 0.02 | 0.009 | ppbV | | | | 25 | 25 | | |
| cis-1,3-Dichloropropene | 10061-01-5 | 0.02 | 0.0118 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| 1,3-Dichloropropene, Total | 542-75-6 | 0.02 | 0.0115 | ppbV | | | | 25 | 25 | | |
| Cyclohexane | 110-82-7 | 0.2 | 0.0313 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| Dibromochloromethane | 124-48-1 | 0.02 | 0.008 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| Dichlorodifluoromethane | 75-71-8 | 0.2 | 0.0499 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| Ethyl Alcohol | GCDAI06 | 5 | 1.35 | ppbV | 40-160 | 25 | | 25 | 25 | | |
| Ethyl Acetate | 141-78-6 | 0.5 | 0.323 | ppbV | 70-130 | 25 | | 25 | 25 | | |
| Ethylbenzene | 100-41-4 | 0.02 | 0.0085 | ppbV | 70-130 | 25 | | 25 | 25 | | |







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Langan Engineering & Environmental

Volatile Organics in Air by TO-15 SIM (AIR)

Holding Time: 30 days

Container/Sample Preservation: 1 - Generic Air Can for Bottleorder

| Analysta | CAS # | DI | MDI | Unito | LCS | LCC PPD | MS | MC DDD | Duplicate | Surrogate | | |
|--|--------------------|----------------|--------|-----------|-----------------|-------------|--------------|-----------|-----------|-----------|---|--|
| Analyte | CAS # | RL 0.05 | MDL | Units | Criteria 70,120 | LCS RPD | Criteria | MS RPD | RPD | Criteria | | |
| 1,1,2-Trichloro-1,2,2-Trifluoroethane | 76-13-1 | | 0.0083 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| 1,2-Dichloro-1,1,2,2-tetrafluoroethane | 76-14-2 | 0.05 | 0.0064 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| Methylene chloride | 75-09-2 | 0.5 | 0.11 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| Methyl tert butyl ether | 1634-04-4 | 0.2 | 0.0261 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| Naphthalene | 91-20-3 | 0.05 | 0.021 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| p/m-Xylene | 179601-23-1 | 0.04 | 0.018 | ppbV | 70-130 | 25 | ļ | 25 | 25 | | | |
| o-Xylene | 95-47-6 | 0.02 | 0.0087 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| Heptane | 142-82-5 | 0.2 | 0.0313 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| n-Hexane | 110-54-3 | 0.2 | 0.0471 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| Propylene | 115-07-1 | 0.5 | 0.167 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| Styrene | 100-42-5 | 0.02 | 0.0079 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| Tetrachloroethene | 127-18-4 | 0.02 | 0.0074 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| Tetrahydrofuran | 109-99-9 | 0.5 | 0.142 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| Toluene | 108-88-3 | 0.1 | 0.0166 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| trans-1,3-Dichloropropene | 10061-02-6 | 0.02 | 0.0115 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| Trichloroethene | 79-01-6 | 0.02 | 0.006 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| 1,2,4-Trichlorobenzene | 120-82-1 | 0.05 | 0.0146 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| Trichlorofluoromethane | 75-69-4 | 0.05 | 0.0092 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| Vinyl acetate | 108-05-4 | 1 | 0.286 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| Vinyl bromide | 593-60-2 | 0.2 | 0.0431 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| Hexachlorobutadiene | 87-68-3 | 0.05 | 0.011 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| iso-Propyl Alcohol | 67-63-0 | 1 | 0.249 | ppbV | 40-160 | 25 | | 25 | 25 | | | |
| Vinyl chloride | 75-01-4 | 0.02 | 0.0088 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| Acrylonitrile | 107-13-1 | 0.5 | 0.162 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| n-Butylbenzene | 104-51-8 | 0.2 | 0.0319 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| sec-Butylbenzene | 135-98-8 | 0.2 | 0.0266 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| Isopropylbenzene | 98-82-8 | 0.2 | 0.0299 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| Xylene (Total) | 1330-20-7 | 0.02 | 0.0087 | ppbV | | | | 25 | 25 | | | |
| p-Isopropyltoluene | 99-87-6 | 0.2 | 0.0366 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| Acetone | 67-64-1 | 1 | 0.539 | ppbV | 40-160 | 25 | 1 | 25 | 25 | | | |
| 2-Butanone | 78-93-3 | 0.5 | 0.132 | ppbV | 70-130 | 25 | 1 | 25 | 25 | | | |
| 4-Methyl-2-pentanone | 108-10-1 | 0.5 | 0.191 | ppbV | 70-130 | 25 | | 25 | 25 | | | |
| 1,2,3-Trichlorobenzene | 87-61-6 | 0.05 | 0.0223 | ppbV | 70-130 | 25 | 1 | 25 | 25 | | | |
| Acrolein | 107-02-8 | 0.05 | 0.0387 | ppbV | 60-113 | 25 | 1 | 25 | 25 | | | |
| 1,2-Dichloroethane-d4 | 17060-07-0 | 1 | 1 222 | 1.6.2. | 1 | 1 | | | | 70-130 | | |
| Toluene-d8 | 2037-26-5 | † | 1 | | 1 | 1 | 1 | | | 70-130 | | |
| Bromofluorobenzene | 460-00-4 | + | | | + | 1 | | | | 70-130 | + | |
| | 755 55 7 | | | | | | | | | 7 0 150 | | |
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ATTACHMENT C

ANALYTICAL METHODS/ QUALITY ASSURANCE SUMMARY TABLE

ATTACHMENT C

ANALYTICAL METHODS/QUALITY ASSURANCE SUMMARY TABLE

| Matrix Type | Field Parameters | Laboratory Parameters | Analytical Methods | Sample Preservation | Sample Container Volume and Type | Sample Hold Time | Field Duplicate Samples | Field Blank Samples | Media Blank Samples | Equipment Blank Samples | Trip Blank Samples | Ambient Air Samples | MS/MSD Samples | | | |
|-----------------------|--|---------------------------------|---|---|---|--|---------------------------------|---------------------------------|------------------------|----------------------------|----------------------------------|---------------------------------|---------------------|----------|-------------|----|
| | | Part 375 + TCL VOCs | EPA 8260C | Cool to 4°C | Two 40-ml VOC vials with 5ml H ₂ O, one with MeOH or 3 En Core Samplers (separate container for % solids) | 14 days | | | | | | | | | | |
| | | Part 375 + TCL SVOCs | EPA 8270D | Cool to 4°C | 4 oz. amber glass jar | 14 days extract, 40 days after extraction to analysis | | | | | | | | | | |
| | | Part 375 + TAL Metals + Cyanide | EPA 6010C, EPA 7470A, EPA 7196A, EPA 9014/9010C | Cool to 4°C | 2 oz. amber glass jar | 6 months, except mercury 28 days | | | | NA | | | | | | |
| Soil | Total VOCs via PID | Part 375 + TCL Pesticides | EPA 8081B | Cool to 4°C | 4 oz. amber glass jar | 14 days extract, 40 days after extraction to analysis | 1 per 20 samples (minimum 1) | 1 per 20 samples (minimum 1) | NA | | NA | NA | 1 per 20 samples | | | |
| | | Part 375 + TCL PCBs | EPA 8082A | Cool to 4°C | 4 oz. amber glass jar | 14 days extract, 40 days after extraction to analysis | | | | | | | | | | |
| | | NYSDEC List PFAS | EPA 537 Modified | Cool to 4°C | 8 oz. HDPE jar | 14 days to extract, 28 days after extraction to analysis | | | | 1 per day | | | | | | |
| | | 1,4-Dioxane | 8270 SIM | Cool to 4°C | 4 oz. amber glass jar | 14 days extract, 40 days after extraction to analysis | | | | NA | | | | | | |
| | | Part 375 + TCL VOCs | EPA 8260C | Cool to 4°C; HCl to pH <2;no headspace | Three 40-mL VOC vials with Teflon®-lined cap | Analyze within 14 days of collection | | | | | | | | | | |
| | | Part 375 + TCL SVOCs | EPA 8270D | Cool to 4°C | Two 1-Liter amber glass | 7 days to extract, 40 days after extraction to analysis | | | | | | | | | | |
| | | Part 375 + TAL Metals | EPA 6010C, EPA 7470A | HNO ₃ | 250 ml plastic | 6 months, except Mercury 28 days | | | | | | | | | | |
| | | Hexavalent Chromium | EPA 7196A | Cool to 4°C | 250 ml plastic | 24 hours | | | | NA | | | | | | |
| Groundwater | Temperature, Turbidity, pH, ORP, Conductivity, DO | Cyanide | SM 4500 C/E | NaOH plus 0.6g ascorbic acid | 250 ml plastic | 14 days | 1 per 20 samples (minimum 1) | 1 per 20 samples (minimum 1) | NA | | 1 per shipment of VOC samples | NA | 1 per 20 samples | | | |
| | | Part 375 + TCL Pesticides | EPA 8081B | Cool to 4°C | Two 1-Liter Amber Glass for | 7 days to extract, 40 days after extraction to analysis | | | | | | | | | | |
| | | PCBs | EPA 8082A | Cool to 4°C | Pesticides/PCB | 7 days to extract, 40 days after extraction to analysis | | | | | | | | | | |
| | | PFAS | EPA 1633 Modified | Cool to 4°C | Two 250 mL HDPE | 14 days to extract, 40 days after extraction to analysis | | | | 1 per day | | | | | | |
| | | 1,4-dioxane | 8270 SIM | Cool to 4°C | One 1 -Liter Amber Glass | 7 days to extract, 40 days after extraction to analysis | | | | NA | | | | | | |
| Soil Vapor | Total VOCs, Oxygen, LEL, CO, and H ₂ S, with MultiGas Meter | TO 4E Linux d VOC- | TO 45 | Applicate Towns | 2.7-Liter Summa Canister | Analyze within 30 days of | 1 per 20 samples (minimum 1) | NA | NA | NA | N/A | 1 per 10 samples | NA | | | |
| Ambient/Indoor Air | Total VOCs via PID | TO-15 Listed VOCs | TO-15 | Ambient Temperature | 6-Liter Summa Canister | collection | | | | NA | NA | NA | NA | NA NA | (minimum 1) | NA |
| Soil Vapor | Mercury Vapor via Jerome J405 | Mercury Vapor | EPA 6009 | Ambient Temperature | Glass Sorbent Tube containing one section of 200 mg Hopcalite | Analyze within 30 days of collection | 1 per 20 samples (minimum 1) | NA | 3 per set | NA | NA | 1 per 10 samples (minimum 1) | NA | | | |

ATTACHMENT D

SAMPLE NOMENCLATURE STANDARD OPERATING PROCEDURE

06/30/2015

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 bags¹:



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:

¹Both 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 Page 1 of 4

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 |
| ТВ | 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 Page 2 of 4

06/30/2015

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

SOP #01: Sample Nomenclature_V01.1

06/30/2015

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.

ATTACHMENT E PFAS SAMPLING PROTOCOL



SAMPLING, ANALYSIS, AND ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)

Under NYSDEC's Part 375 Remedial Programs

April 2023





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ERRATA SHEET for

SAMPLING, ANALYSIS, AND ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) Under NYSDEC's Part 375 Remedial Programs Issued January 17, 2020

| Citation and Page Number | Current Text | Corrected Text | Date |
|--|--|--|-----------|
| Title of Appendix I, page 32 | Appendix H | Appendix I | 2/25/2020 |
| Document Cover, page 1 | Guidelines for Sampling and Analysis of PFAS | Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs | 9/15/2020 |
| Data Assessment and Application to Site Cleanup Page 3 | Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published | Until such time as Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published | 3/28/2023 |
| Water Sample Results Page 3 | PFOA and PFOS should be further assessed and considered as potential contaminants of concern in groundwater or surface water if PFOA or PFOS is detected in any water sample at or above 10 ng/L (ppt) and is determined to be attributable to the site, either by a comparison of upgradient and downgradient levels, or the presence of soil source areas, as defined below. | NYSDEC has adopted ambient water quality guidance values for PFOA and PFOS. Groundwater samples should be compared to the human health criteria of 6.7 ng/l (ppt) for PFOA and 2.7 ng/l (ppt) for PFOS. These guidance values also include criteria for surface water for PFOS applicable for aquatic life, which may be applicable at some sites. Drinking water sample results should be compared to the NYS maximum contaminant level (MCL) of 10 ng/l (ppt). Analysis to determine if PFOA and PFOS concentrations are attributable to the site should include a comparison between upgradient and downgradient levels, and the presence of soil source areas, as defined below. | 3/28/2023 |
| Soil Sample Results Page 3 | Soil cleanup objectives for PFOA and PFOS have been proposed in an upcoming revision to 6 NYCRR Part 375-6. Until SCOs are in effect, the following are to be used as guidance values: | NYSDEC will delay adding soil cleanup objectives for PFOA and PFOS to 6 NYCRR Part 375-6 until the PFAS rural soil background study has been completed. Until SCOs are in effect, the following are to be used as guidance values: | 3/28/2023 |
| Protection of Groundwater Page 3 | PFOA (ppb) 1.1 PFOS (ppb) 3.7 | PFOA (ppb) 0.8 PFOS (ppb) 1.0 | 3/28/2023 |



| Citation and Page Number | Current Text | Corrected Text | Date |
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| Footnote 2 Page 3 Testing for Imported Soil Page 4 | The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/re mediation_hudson_pdf/techsupp doc.pdf). If the concentrations of PFOA and PFOS in leachate are at or above 10 ppt (the Maximum | The Protection of Groundwater values are based on the above referenced ambient groundwater guidance values. Details on that calculation are available in the following document, prepared for the February 2022 proposed changes to Part 375 (https://www.dec.ny.gov/docs/remediation_hudson_pdf/part375techsupport.pdf). The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf). If the concentrations of PFOA and PFOS in leachate are at or above the ambient water quality guidance values for groundwater, then the soil is not | 3/28/2023 |
| Routine Analysis, page 9 | Contaminant Levels established for drinking water by the New York State Department of Health), then the soil is not acceptable. "However, laboratories analyzing environmental samplesPFOA and PFOS in | "However, laboratories analyzing environmental samplesPFOA and PFOS in drinking water by EPA Method 537, 537.1, ISO 25101, or Method | 9/15/2020 |
| 1.6. | drinking water by EPA Method 537, 537.1 or ISO 25101." | 533." | |
| Additional Analysis, page 9, new paragraph regarding soil parameters | None | "In cases where site-specific cleanup objectives for PFOA and PFOS are to be assessed, soil parameters, such as Total Organic Carbon (EPA Method 9060), soil pH (EPA Method 9045), clay content (percent), and cation exchange capacity (EPA Method 9081), should be included in the analysis to help evaluate factors affecting the leachability of PFAS in site soils." | 9/15/2020 |



| Citation and Page Number | Current Text | Corrected Text | Date |
|---|--|--|-----------|
| Data Assessment and Application to Site Cleanup Page 10 | Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFAS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Target levels for cleanup of PFAS in other media, including biota and sediment, have not yet been established by the DEC. | Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Preliminary target levels for cleanup of PFOA and PFOS in other media, including biota and sediment, have not yet been established by the DEC. | 9/15/2020 |
| Water Sample Results Page 10 | PFAS should be further assessed and considered as a potential contaminant of concern in groundwater or surface water () If PFAS are identified as a contaminant of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10. | PFOA and PFOS should be further assessed and considered as potential contaminants of concern in groundwater or surface water () If PFOA and/or PFOS are identified as contaminants of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10. | 9/15/2020 |



| Citation and Page Number | Current Text | Corrected Text | Date |
|------------------------------------|--|--|-----------|
| Soil Sample Results, page 10 | "The extent of soil contamination for purposes of delineation and remedy selection should be determined by having certain soil samples tested by Synthetic Precipitation Leaching Procedure (SPLP) and the leachate analyzed for PFAS. Soil exhibiting SPLP results above 70 ppt for either PFOA or PFOS (individually or combined) are to be evaluated during the cleanup phase." | "Soil cleanup objectives for PFOA and PFOS will be proposed in an upcoming revision to 6 NYCRR Part 375-6. Until SCOs are in effect, the following are to be used as guidance values." [Interim SCO Table] "PFOA and PFOS results for soil are to be compared against the guidance values listed above. These guidance values are to be used in determining whether PFOA and PFOS are contaminants of concern for the site and for determining remedial action objectives and cleanup requirements. Site-specific remedial objectives for protection of groundwater can also be presented for evaluation by DEC. Development of site-specific remedial objectives for protection of groundwater will require analysis of additional soil parameters relating to leachability. These additional analyses can include any or all the parameters listed above (soil pH, cation exchange capacity, etc.) and/or use of SPLP. As the understanding of PFAS transport improves, DEC welcomes proposals for site-specific remedial objectives for protection of groundwater. DEC will expect that those may be dependent on additional factors including soil pH, aqueous pH, % organic carbon, % Sand/Silt/Clay, soil cations: K, Ca, Mg, Na, Fe, Al, cation exchange capacity, and anion exchange capacity. Site-specific remedial objectives should also consider the dilution attenuation factor (DAF). The NJDEP publication on DAF can be used as a reference: https://www.nj.gov/dep/srp/guidance/rs/daf.pdf." | 9/15/2020 |

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| Citation and Page | Current Text | Corrected Text | Date |
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| Number | Garront Toxt | Corrobina Toxi | Date |
| Testing for Imported Soil Page 11 | Soil imported to a site for use in a soil cap, soil cover, or as backfill is to be tested for PFAS in general conformance with DER-10, Section 5.4(e) for the PFAS Analyte List (Appendix F) using the analytical procedures discussed below and the criteria in DER-10 associated with SVOCs. If PFOA or PFOS is detected in any sample at or above 1 µg/kg, then soil should be tested by SPLP and the leachate analyzed for PFAS. If the SPLP results exceed 10 ppt for either PFOA or PFOS (individually) then the source of backfill should be rejected, unless a site-specific exemption is provided by DER. SPLP leachate criteria is based on the Maximum Contaminant Levels proposed for drinking water by New York State's Department of Health, this value may be updated based on future Federal or State promulgated regulatory standards. Remedial parties have the option of analyzing samples concurrently for both PFAS in soil and in the SPLP leachate to minimize project delays. Category B deliverables should be submitted for backfill samples, though a DUSR is not required. | Testing for PFAS should be included any time a full TAL/TCL analyte list is required. Results for PFOA and PFOS should be compared to the applicable guidance values. If PFOA or PFOS is detected in any sample at or above the guidance values then the source of backfill should be rejected, unless a site-specific exemption is provided by DER based on SPLP testing, for example. If the concentrations of PFOA and PFOS in leachate are at or above 10 ppt (the Maximum Contaminant Levels established for drinking water by the New York State Department of Health), then the soil is not acceptable. PFOA, PFOS and 1,4-dioxane are all considered semi-volatile compounds, so composite samples are appropriate for these compounds when sampling in accordance with DER-10, Table 5.4(e)10. Category B deliverables should be submitted for backfill samples, though a DUSR is not required. | 9/15/2020 |



| Citation and Page Number | Current Text | Corrected Text | Date |
|---|---|---|-----------|
| Footnotes | None | ¹ TOP Assay analysis of highly contaminated samples, such as those from an AFFF (aqueous film-forming foam) site, can result in incomplete oxidation of the samples and an underestimation of the total perfluoroalkyl substances. ² The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the soil cleanup objective for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf). | 9/15/2020 |
| Additional Analysis, page 9 | In cases soil parameters, such as Total Organic Carbon (EPA Method 9060), soil | In cases soil parameters, such as Total Organic Carbon (Lloyd Kahn), soil | 1/8/2021 |
| Appendix A, General Guidelines, fourth bullet | List the ELAP-approved lab(s) to be used for analysis of samples | List the ELAP- certified lab(s) to be used for analysis of samples | 1/8/2021 |
| Appendix E, Laboratory Analysis and Containers | Drinking water samples collected using this protocol are intended to be analyzed for PFAS by ISO Method 25101. | Drinking water samples collected using this protocol are intended to be analyzed for PFAS by EPA Method 537, 537.1, 533, or ISO Method 25101 | 1/8/2021 |
| Water Sample Results Page 9 | "In addition, further assessment of water may be warranted if either of the following screening levels are met: a. any other individual PFAS (not PFOA or PFOS) is detected in water at or above 100 ng/L; or b. total concentration of PFAS (including PFOA and PFOS) is detected in water at or above 500 ng/L" | Deleted | 6/15/2021 |

| Citation and | Current Text | Corrected Text | Date |
|---------------------------------------|---|--|-----------|
| Page Number | Current Text | Corrected Text | Date |
| Routine Analysis, Page XX | Currently, New York State Department of Health's Environmental Laboratory Approval Program (ELAP) criteria set forth in the DER's laboratory guidelines for PFAS in non-potable water and solids (Appendix H - Laboratory Guidelines for Analysis of PFAS in Non-Potable Water and Solids). | Deleted | 5/31/2022 |
| Analysis and Reporting, Page XX | As of October 2020, the United States Environmental Protection Agency (EPA) does not have a validated method for analysis of PFAS for media commonly analyzed under DER remedial programs (non-potable waters, solids). DER has developed the following guidelines to ensure consistency in analysis and reporting of PFAS. | Deleted | 5/31/2022 |
| Routine Analysis, Page XX | LC-MS/MS analysis for PFAS using methodologies based on EPA Method 537.1 is the procedure to use for environmental samples. Isotope dilution techniques should be utilized for the analysis of PFAS in all media. | EPA Method 1633 is the procedure to use for environmental samples. | |
| Soil Sample Results, Page XX | Soil cleanup objectives for PFOA and PFOS will be proposed in an upcoming revision to 6 NYCRR Part 375-6 | Soil cleanup objectives for PFOA and PFOS have been proposed in an upcoming revision to 6 NYCRR Part 375-6 | |
| Appendix A | "Include in the text LC-MS/MS for PFAS using methodologies based on EPA Method 537.1" | "Include in the textEPA Method 1633" | |
| Appendix A | "Laboratory should have ELAP certification for PFOA and PFOS in drinking water by EPA Method 537, 537.1, EPA Method 533, or ISO 25101" | Deleted | |
| Appendix B | "Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1" | "Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633" | |



| Citation and Page Number | Current Text | Corrected Text | Date |
|---|--|--|------|
| Appendix C | "Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1" | "Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633" | |
| Appendix D | "Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1" | "Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633" | |
| Appendix G | | Updated to include all forty PFAS analytes in EPA Method 533 | |
| Appendix H | | Deleted | |
| Appendix I | Appendix I | Appendix H | |
| Appendix H | "These guidelines are intended to be used for the validation of PFAS analytical results for projects within the Division of Environmental Remediation (DER) as well as aid in the preparation of a data usability summary report." | "These guidelines are intended to be used for the validation of PFAS using EPA Method 1633 for projects within the Division of Environmental Remediation (DER)." | |
| Appendix H | "The holding time is 14 days" | "The holding time is 28 days" | |
| Appendix H, Initial Calibration | "The initial calibration should contain a minimum of five standards for linear fit" | "The initial calibration should contain a minimum of six standards for linear fit" | |
| Appendix H, Initial Calibration | Linear fit calibration curves should have an R ² value greater than 0.990. | Deleted | |
| Appendix H, Initial Calibration Verification | Initial Calibration Verification Section | Deleted | |
| Appendix H | secondary Ion Monitoring Section | Deleted | |
| Appendix H | Branched and Linear Isomers Section | Deleted | |



Sampling, Analysis, and Assessment of Perand Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs

Objective

New York State Department of Environmental Conservation's Division of Environmental Remediation (DER) performs or oversees sampling of environmental media and subsequent analysis of PFAS as part of remedial programs implemented under 6 NYCRR Part 375. To ensure consistency in sampling, analysis, reporting, and assessment of PFAS, DER has developed this document which summarizes currently accepted procedures and updates previous DER technical guidance pertaining to PFAS.

Applicability

All work plans submitted to DEC pursuant to one of the remedial programs under Part 375 shall include PFAS sampling and analysis procedures that conform to the guidelines provided herein.

As part of a site investigation or remedial action compliance program, whenever samples of potentially affected media are collected and analyzed for the standard Target Analyte List/Target Compound List (TAL/TCL), PFAS analysis should also be performed. Potentially affected media can include soil, groundwater, surface water, and sediment. Based upon the potential for biota to be affected, biota sampling and analysis for PFAS may also be warranted as determined pursuant to a Fish and Wildlife Impact Analysis. Soil vapor sampling for PFAS is not required.

Field Sampling Procedures

DER-10 specifies technical guidance applicable to DER's remedial programs. Given the prevalence and use of PFAS, DER has developed "best management practices" specific to sampling for PFAS. As specified in DER-10 Chapter 2, quality assurance procedures are to be submitted with investigation work plans. Typically, these procedures are incorporated into a work plan, or submitted as a stand-alone document (e.g., a Quality Assurance Project Plan). Quality assurance guidelines for PFAS are listed in Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS.

Field sampling for PFAS performed under DER remedial programs should follow the appropriate procedures outlined for soils, sediments, or other solids (Appendix B), non-potable groundwater (Appendix C), surface water (Appendix D), public or private water supply wells (Appendix E), and fish tissue (Appendix F).

QA/QC samples (e.g. duplicates, MS/MSD) should be collected as specified in DER-10, Section 2.3(c). For sampling equipment coming in contact with aqueous samples only, rinsate or equipment blanks should be collected. Equipment blanks should be collected at a minimum frequency of one per day per site or one per twenty samples, whichever is more frequent.



Analysis and Reporting

The investigation work plan should describe analysis and reporting procedures, including laboratory analytical procedures for the methods discussed below. As specified in DER-10 Section 2.2, laboratories should provide a full Category B deliverable. In addition, a Data Usability Summary Report (DUSR) should be prepared by an independent, third-party data validator. Electronic data submissions should meet the requirements provided at: https://www.dec.ny.gov/chemical/62440.html.

DER has developed a *PFAS Analyte List* (Appendix G) for remedial programs to understand the nature of contamination at sites. It is expected that reported results for PFAS will include, at a minimum, all the compounds listed. If lab and/or matrix specific issues are encountered for any analytes, the DER project manager, in consultation with the DER chemist, will make case-by-case decisions as to whether certain analytes may be temporarily or permanently discontinued from analysis at each site. As with other contaminants that are analyzed for at a site, the *PFAS Analyte List* may be refined for future sampling events based on investigative findings.

Routine Analysis

EPA Method 1633 is the procedure to use for environmental samples. Reporting limits for PFOA and PFOS in aqueous samples should not exceed 2 ng/L. Reporting limits for PFOA and PFOS in solid samples should not exceed 0.5 μg/kg. Reporting limits for all other PFAS in aqueous and solid media should be as close to these limits as possible. If laboratories indicate that they are not able to achieve these reporting limits for the entire *PFAS Analyte List*, site-specific decisions regarding acceptance of elevated reporting limits for specific PFAS can be made by the DER project manager in consultation with the DER chemist. Data review guidelines were developed by DER to ensure data comparability and usability (Appendix H - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids).

Additional Analysis

Additional laboratory methods for analysis of PFAS may be warranted at a site, such as the Synthetic Precipitation Leaching Procedure (SPLP) and Total Oxidizable Precursor Assay (TOP Assay).

In cases where site-specific cleanup objectives for PFOA and PFOS are to be assessed, soil parameters, such as Total Organic Carbon (Lloyd Kahn), soil pH (EPA Method 9045), clay content (percent), and cation exchange capacity (EPA Method 9081), should be included in the analysis to help evaluate factors affecting the leachability of PFAS in site soils.

SPLP is a technique used to determine the mobility of chemicals in liquids, soils and wastes, and may be useful in determining the need for addressing PFAS-containing material as part of the remedy. SPLP by EPA Method 1312 should be used unless otherwise specified by the DER project manager in consultation with the DER chemist.

Impacted materials can be made up of PFAS that are not analyzable by routine analytical methodology. A TOP Assay can be utilized to conceptualize the amount and type of oxidizable PFAS which could be liberated in the environment, which approximates the maximum concentration of perfluoroalkyl substances that could be generated if all polyfluoroalkyl substances were oxidized. For example, some polyfluoroalkyl substances may degrade or transform to form perfluoroalkyl substances (such as PFOA or PFOS), resulting in an increase in perfluoroalkyl substance concentrations as contaminated groundwater moves away from a source. The TOP Assay converts, through oxidation, polyfluoroalkyl substances (precursors) into perfluoroalkyl substances that can be detected by routine analytical methodology. ¹

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¹ TOP Assay analysis of highly contaminated samples, such as those from an AFFF (aqueous film-forming foam) site, can result in incomplete oxidation of the samples and an underestimation of the total perfluoroalkyl substances.



Commercial laboratories have adopted methods which allow for the quantification of targeted PFAS in air and biota. The EPA's Office of Research and Development (ORD) is currently developing methods which allow for air emissions characterization of PFAS, including both targeted and non-targeted analysis of PFAS. Consult with the DER project manager and the DER chemist for assistance on analyzing biota/tissue and air samples.

Data Assessment and Application to Site Cleanup

Until such time as Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Preliminary target levels for cleanup of PFOA and PFOS in other media, including biota and sediment, have not yet been established by the DEC.

Water Sample Results

NYSDEC has adopted ambient water quality guidance values for PFOA and PFOS. Groundwater samples should be compared to the human health criteria of 6.7 ng/l (ppt) for PFOA and 2.7 ng/l (ppt) for PFOS. These human health criteria should also be applied to surface water that is used as a water supply. This guidance also includes criteria for surface water for PFOS applicable for aquatic life, which may be applicable at some sites. Drinking water sample results should be compared to the NYS maximum contaminant level (MCL) of 10 ng/l (ppt). Analysis to determine if PFOA and PFOS concentrations are attributable to the site should include a comparison between upgradient and downgradient levels, and the presence of soil source areas, as defined below.

If PFOA and/or PFOS are identified as contaminants of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.

Soil Sample Results

NYSDEC will delay adding soil cleanup objectives for PFOA and PFOS to 6 NYCRR Part 375-6 until the PFAS rural soil background study has been completed. Until SCOs are in effect, the following are to be used as guidance values:

| Guidance Values for | | |
|--|------------|------------|
| Anticipated Site Use | PFOA (ppb) | PFOS (ppb) |
| Unrestricted | 0.66 | 0.88 |
| Residential | 6.6 | 8.8 |
| Restricted Residential | 33 | 44 |
| Commercial | 500 | 440 |
| Industrial | 600 | 440 |
| Protection of Groundwater ² | 0.8 | 1.0 |

PFOA and PFOS results for soil are to be compared against the guidance values listed above. These guidance values are to be used in determining whether PFOA and PFOS are contaminants of concern for the site and for determining remedial action objectives and cleanup requirements. Site-specific remedial objectives for protection of groundwater can also be presented for evaluation by DEC. Development of site-specific remedial objectives for protection of groundwater will require analysis of additional soil parameters relating to leachability. These

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² The Protection of Groundwater values are based on the above referenced ambient groundwater guidance values. Details on that calculation are available in the following document, prepared for the February 2022 proposed changes to Part 375 (https://www.dec.ny.gov/docs/remediation_hudson_pdf/part375techsupport.pdf). The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).



additional analyses can include any or all the parameters listed above (soil pH, cation exchange capacity, etc.) and/or use of SPLP.

As the understanding of PFAS transport improves, DEC welcomes proposals for site-specific remedial objectives for protection of groundwater. DEC will expect that those may be dependent on additional factors including soil pH, aqueous pH, % organic carbon, % Sand/Silt/Clay, soil cations: K, Ca, Mg, Na, Fe, Al, cation exchange capacity, and anion exchange capacity. Site-specific remedial objectives should also consider the dilution attenuation factor (DAF). The NJDEP publication on DAF can be used as a reference: https://www.nj.gov/dep/srp/guidance/rs/daf.pdf.

Testing for Imported Soil

Testing for PFAS should be included any time a full TAL/TCL analyte list is required. Results for PFOA and PFOS should be compared to the applicable guidance values. If PFOA or PFOS is detected in any sample at or above the guidance values then the source of backfill should be rejected, unless a site-specific exemption is provided by DER based on SPLP testing, for example. If the concentrations of PFOA and PFOS in leachate are at or above the ambient water quality guidance values for groundwater, then the soil is not acceptable.

PFOA, PFOS and 1,4-dioxane are all considered semi-volatile compounds, so composite samples are appropriate for these compounds when sampling in accordance with DER-10, Table 5.4(e)10. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.



Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS

The following guidelines (general and PFAS-specific) can be used to assist with the development of a QAPP for projects within DER involving sampling and analysis of PFAS.

General Guidelines in Accordance with DER-10

- Document/work plan section title Quality Assurance Project Plan
- Summarize project scope, goals, and objectives
- Provide project organization including names and resumes of the project manager, Quality Assurance Officer (QAO), field staff, and Data Validator
 - The QAO should not have another position on the project, such as project or task manager, that involves project productivity or profitability as a job performance criterion
- List the ELAP certified lab(s) to be used for analysis of samples
- Include a site map showing sample locations
- Provide detailed sampling procedures for each matrix
- Include Data Quality Usability Objectives
- List equipment decontamination procedures
- Include an "Analytical Methods/Quality Assurance Summary Table" specifying:
 - Matrix type
 - o Number or frequency of samples to be collected per matrix
 - Number of field and trip blanks per matrix
 - Analytical parameters to be measured per matrix
 - o Analytical methods to be used per matrix with minimum reporting limits
 - o Number and type of matrix spike and matrix spike duplicate samples to be collected
 - Number and type of duplicate samples to be collected
 - o Sample preservation to be used per analytical method and sample matrix
 - o Sample container volume and type to be used per analytical method and sample matrix
 - o Sample holding time to be used per analytical method and sample matrix
- Specify Category B laboratory data deliverables and preparation of a DUSR

Specific Guidelines for PFAS

- Include in the text that sampling for PFAS will take place
- Include in the text that PFAS will be analyzed by EPA Method 1633
- Include the list of PFAS compounds to be analyzed (*PFAS Analyte List*)
- Include the laboratory SOP for PFAS analysis
- List the minimum method-achievable Reporting Limits for PFAS
 - o Reporting Limits should be less than or equal to:
 - Aqueous -2 ng/L (ppt)
 - Solids $-0.5 \mu g/kg \text{ (ppb)}$
- Include the laboratory Method Detection Limits for the PFAS compounds to be analyzed
- Include detailed sampling procedures
 - o Precautions to be taken
 - Pump and equipment types
 - Decontamination procedures
 - Approved materials only to be used
- Specify that regular ice only will be used for sample shipment
- Specify that equipment blanks should be collected at a minimum frequency of 1 per day per site for each matrix

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Appendix B - Sampling Protocols for PFAS in Soils, Sediments and Solids

General

The objective of this protocol is to give general guidelines for the collection of soil, sediment and other solid samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Containers

Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in to contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, TeflonTM) materials including sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel spoon
- stainless steel bowl
- steel hand auger or shovel without any coatings

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Sampling is often conducted in areas where a vegetative turf has been established. In these cases, a pre-cleaned trowel or shovel should be used to carefully remove the turf so that it may be replaced at the conclusion of sampling. Surface soil samples (e.g. 0 to 6 inches below surface) should then be collected using a pre-cleaned, stainless steel spoon. Shallow subsurface soil samples (e.g. 6 to ~36 inches below surface) may be collected by digging a hole using a pre-cleaned hand auger or shovel. When the desired subsurface depth is reached, a pre-cleaned hand auger or spoon shall be used to obtain the sample.

When the sample is obtained, it should be deposited into a stainless steel bowl for mixing prior to filling the sample containers. The soil should be placed directly into the bowl and mixed thoroughly by rolling the material into the middle until the material is homogenized. At this point the material within the bowl can be placed into the laboratory provided container.



Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at $4 \pm 2^{\circ}$ Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A soil log or sample log shall document the location of the sample/borehole, depth of the sample, sampling equipment, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.



Appendix C - Sampling Protocols for PFAS in Monitoring Wells

General

The objective of this protocol is to give general guidelines for the collection of groundwater samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation hudson pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, TeflonTM) materials including plumbers tape and sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel inertia pump with HDPE tubing
- peristaltic pump equipped with HDPE tubing and silicone tubing
- stainless steel bailer with stainless steel ball
- bladder pump (identified as PFAS-free) with HDPE tubing

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Monitoring wells should be purged in accordance with the sampling procedure (standard/volume purge or low flow purge) identified in the site work plan, which will determine the appropriate time to collect the sample. If sampling using standard purge techniques, additional purging may be needed to reduce turbidity levels, so samples contain a limited amount of sediment within the sample containers. Sample containers that contain sediment may cause issues at the laboratory, which may result in elevated reporting limits and other issues during the sample preparation that can compromise data usability. Sampling personnel should don new nitrile gloves prior to sample collection due to the potential to contact PFAS containing items (not related to the sampling equipment) during the purging activities.



Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at $4 \pm 2^{\circ}$ Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Collect one equipment blank per day per site and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Additional equipment blank samples may be collected to assess other equipment that is utilized at the monitoring well
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A purge log shall document the location of the sample, sampling equipment, groundwater parameters, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.



Appendix D - Sampling Protocols for PFAS in Surface Water

General

The objective of this protocol is to give general guidelines for the collection of surface water samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation hudson pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, TeflonTM) materials including sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

stainless steel cup

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Where conditions permit, (e.g. creek or pond) sampling devices (e.g. stainless steel cup) should be rinsed with site medium to be sampled prior to collection of the sample. At this point the sample can be collected and poured into the sample container.

If site conditions permit, samples can be collected directly into the laboratory container.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).



Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at $4 \pm 2^{\circ}$ Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Collect one equipment blank per day per site and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A sample log shall document the location of the sample, sampling equipment, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.



Appendix E - Sampling Protocols for PFAS in Private Water Supply Wells

General

The objective of this protocol is to give general guidelines for the collection of water samples from private water supply wells (with a functioning pump) for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Drinking water samples collected using this protocol are intended to be analyzed for PFAS by EPA Method 537, 537.1, 533, or ISO Method 25101. The preferred material for containers is high density polyethylene (HDPE). Precleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, TeflonTM) materials (e.g. plumbers tape), including sample bottle cap liners with a PTFE layer.

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Locate and assess the pressure tank and determine if any filter units are present within the building. Establish the sample location as close to the well pump as possible, which is typically the spigot at the pressure tank. Ensure sampling equipment is kept clean during sampling as access to the pressure tank spigot, which is likely located close to the ground, may be obstructed and may hinder sample collection.

Prior to sampling, a faucet downstream of the pressure tank (e.g., washroom sink) should be run until the well pump comes on and a decrease in water temperature is noted which indicates that the water is coming from the well. If the homeowner is amenable, staff should run the water longer to purge the well (15+ minutes) to provide a sample representative of the water in the formation rather than standing water in the well and piping system including the pressure tank. At this point a new pair of nitrile gloves should be donned and the sample can be collected from the sample point at the pressure tank.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).



Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at $4 \pm 2^{\circ}$ Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- If equipment was used, collect one equipment blank per day per site and a minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers.
- A field reagent blank (FRB) should be collected at a rate of one per 20 samples. The lab will provide a FRB bottle containing PFAS free water and one empty FRB bottle. In the field, pour the water from the one bottle into the empty FRB bottle and label appropriately.
- Request appropriate data deliverable (Category B) and an electronic data deliverable
- For sampling events where multiple private wells (homes or sites) are to be sampled per day, it is acceptable to collect QC samples at a rate of one per 20 across multiple sites or days.

Documentation

A sample log shall document the location of the private well, sample point location, owner contact information, sampling equipment, purge duration, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate and available (e.g. well construction, pump type and location, yield, installation date). Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

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Appendix F - Sampling Protocols for PFAS in Fish

This appendix contains a copy of the current SOP developed by the Division of Fish and Wildlife (DFW) entitled "General Fish Handling Procedures for Contaminant Analysis" (Ver. 8). This SOP should be followed when collecting fish for contaminant analysis. Note, however, that the Bureau of Ecosystem Health will not be supplying bags or tags. All supplies are the responsibility of the collector

Procedure Name: General Fish Handling Procedures for Contaminant Analysis

Number: FW-005

Purpose: This procedure describes data collection, fish processing and delivery of fish collected for contaminant monitoring. It contains the chain of custody and collection record forms that should be used for the collections.

Organization: Environmental Monitoring Section

Bureau of Ecosystem Health

Division of Fish and Wildlife (DFW)

New York State Department of Environmental Conservation (NYSDEC)

625 Broadway

Albany, New York 12233-4756

Version: 8

Previous Version Date: 21 March 2018

Summary of Changes to this Version: Updated bureau name to Bureau of Ecosystem Health. Added direction to list the names of all field crew on the collection record. Minor formatting changes on chain of custody and collection records.

Originator or Revised by: Wayne Richter, Jesse Becker

Date: 26 April 2019

Quality Assurance Officer and Approval Date: Jesse Becker, 26 April 2019

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

GENERAL FISH HANDLING PROCEDURES FOR CONTAMINANT ANALYSES

- A. Original copies of all continuity of evidence (i.e., Chain of Custody) and collection record forms must accompany delivery of fish to the lab. A copy shall be directed to the Project Leader or as appropriate, Wayne Richter. All necessary forms will be supplied by the Bureau of Ecosystem Health. Because some samples may be used in legal cases, it is critical that each section is filled out completely. Each Chain of Custody form has three main sections:
 - 1. The top box is to be filled out <u>and signed</u> by the person responsible for the fish collection (e.g., crew leader, field biologist, researcher). This person is responsible for delivery of the samples to DEC facilities or personnel (e.g., regional office or biologist).
 - 2. The second section is to be filled out <u>and signed</u> by the person responsible for the collections while being stored at DEC, before delivery to the analytical lab. This may be the same person as in (1), but it is still required that they complete the section. Also important is the **range of identification numbers** (i.e., tag numbers) included in the sample batch.
 - 3. Finally, the bottom box is to record any transfers between DEC personnel and facilities. Each subsequent transfer should be **identified**, **signed**, **and dated**, until laboratory personnel take possession of the fish.
- B. The following data are required on <u>each</u> Fish Collection Record form:
 - 1. Project and Site Name.
 - 2. DEC Region.
 - 3. All personnel (and affiliation) involved in the collection.
 - 4. Method of collection (gill net, hook and line, etc.)
 - 5. Preservation Method.
- C. The following data are to be taken on <u>each</u> fish collected and recorded on the **Fish Collection Record** form:
 - 1. Tag number Each specimen is to be individually jaw tagged at time of collection with a unique number. Make sure the tag is turned out so that the number can be read without opening the bag. Use tags in sequential order. For small fish or composite samples place the tag inside the bag with the samples. The Bureau of Ecosystem Health can supply the tags.
 - 2. Species identification (please be explicit enough to enable assigning genus and species). Group fish by species when processing.
 - 3. Date collected.
 - 4. Sample location (waterway and nearest prominent identifiable landmark).
 - 5. Total length (nearest mm or smallest sub-unit on measuring instrument) and weight (nearest g or

- smallest sub-unit of weight on weighing instrument). Take all measures as soon as possible with calibrated, protected instruments (e.g. from wind and upsets) and prior to freezing.
- 6. Sex fish may be cut enough to allow sexing or other internal investigation, but do not eviscerate. Make any incision on the right side of the belly flap or exactly down the midline so that a left-side fillet can be removed.

D. General data collection recommendations:

- 1. It is helpful to use an ID or tag number that will be unique. It is best to use metal striped bass or other uniquely numbered metal tags. If uniquely numbered tags are unavailable, values based on the region, water body and year are likely to be unique: for example, R7CAY11001 for Region 7, Cayuga Lake, 2011, fish 1. If the fish are just numbered 1 through 20, we have to give them new numbers for our database, making it more difficult to trace your fish to their analytical results and creating an additional possibility for errors.
- 2. Process and record fish of the same species sequentially. Recording mistakes are less likely when all fish from a species are processed together. Starting with the bigger fish species helps avoid missing an individual.
- 3. If using Bureau of Ecosystem Health supplied tags or other numbered tags, use tags in sequence so that fish are recorded with sequential Tag Numbers. This makes data entry and login at the lab and use of the data in the future easier and reduces keypunch errors.
- 4. Record length and weight as soon as possible after collection and before freezing. Other data are recorded in the field upon collection. An age determination of each fish is optional, but if done, it is recorded in the appropriate "Age" column.
- 5. For composite samples of small fish, record the number of fish in the composite in the Remarks column. Record the length and weight of each individual in a composite. All fish in a composite sample should be of the same species and members of a composite should be visually matched for size.
- 6. Please submit photocopies of topographic maps or good quality navigation charts indicating sampling locations. GPS coordinates can be entered in the Location column of the collection record form in addition to or instead for providing a map. These records are of immense help to us (and hopefully you) in providing documented location records which are not dependent on memory and/or the same collection crew. In addition, they may be helpful for contaminant source trackdown and remediation/control efforts of the Department.
- 7. When recording data on fish measurements, it will help to ensure correct data recording for the data recorder to call back the numbers to the person making the measurements.
- E. Each fish is to be placed in its own individual plastic bag. For small fish to be analyzed as a composite, put all of the fish for one composite in the same bag but use a separate bag for each composite. It is important to individually bag the fish to avoid difficulties or cross contamination when processing the fish for chemical analysis. Be sure to include the fish's tag number inside the bag, preferably attached to the fish with the tag number turned out so it can be read. Tie or otherwise secure the bag closed. The Bureau of Ecosystem Health will supply the bags. If necessary, food grade bags may be procured from a suitable vendor (e.g., grocery store). It is preferable to redundantly label each bag with a manila tag tied between the knot and the body of the bag. This tag should be labeled with the project name, collection location, tag number, collection date, and fish species. If scales are collected, the scale envelope should be labeled with

the same information.

- F. Groups of fish, by species, are to be placed in one large plastic bag per sampling location. The Bureau of Ecosystem Health will supply the larger bags. The or otherwise secure the bag closed. Label the site bag with a manila tag tied between the knot and the body of the bag. The tag should contain: project, collection location, collection date, species and tag number ranges. Having this information on the manila tag enables lab staff to know what is in the bag without opening it.
- G. Do not eviscerate, fillet or otherwise dissect the fish unless specifically asked to. If evisceration or dissection is specified, the fish must be cut along the exact midline or on the right side so that the left side fillet can be removed intact at the laboratory. If filleting is specified, the procedure for taking a standard fillet (SOP PREPLAB 4) must be followed, including removing scales.
- H. Special procedures for PFAS: Unlike legacy contaminants such as PCBs, which are rarely found in day to day life, PFAS are widely used and frequently encountered. Practices that avoid sample contamination are therefore necessary. While no standard practices have been established for fish, procedures for water quality sampling can provide guidance. The following practices should be used for collections when fish are to be analyzed for PFAS:

No materials containing Teflon.

No Post-it notes.

No ice packs; only water ice or dry ice.

Any gloves worn must be powder free nitrile.

No Gore-Tex or similar materials (Gore-Tex is a PFC with PFOA used in its manufacture).

No stain repellent or waterproof treated clothing; these are likely to contain PFCs.

Avoid plastic materials, other than HDPE, including clipboards and waterproof notebooks.

Wash hands after handling any food containers or packages as these may contain PFCs.

Keep pre-wrapped food containers and wrappers isolated from fish handling. Wear clothing washed at least six times since purchase.

Wear clothing washed without fabric softener.

Staff should avoid cosmetics, moisturizers, hand creams and similar products on the day of sampling as many of these products contain PFCs (Fujii et al. 2013). Sunscreen or insect repellent should not contain ingredients with "fluor" in their name. Apply any sunscreen or insect repellent well downwind from all materials. Hands must be washed after touching any of these products.

- I. All fish must be kept at a temperature <45° F (<8° C) immediately following data processing. As soon as possible, freeze at -20° C \pm 5° C. Due to occasional freezer failures, daily freezer temperature logs are required. The freezer should be locked or otherwise secured to maintain chain of custody.
- J. In most cases, samples should be delivered to the Analytical Services Unit at the Hale Creek field station. Coordinate delivery with field station staff and send copies of the collection records, continuity of evidence forms and freezer temperature logs to the field station. For samples to be analyzed elsewhere, non-routine collections or other questions, contact Wayne Richter, Bureau of Ecosystem Health, NYSDEC, 625 Broadway, Albany, New York 12233-4756, 518-402-8974, or the project leader about sample transfer. Samples will then be directed to the analytical facility and personnel noted on specific project descriptions.
- K. A recommended equipment list is at the end of this document.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION DIVISION OF FISH AND WILDLIFE FISH COLLECTION RECORD

| page of | f |
|---------|---|
|---------|---|

| Project and S | Site Name | | | | | | | L | DEC Region |
|---------------------------------------|--------------------------|----------------|---------------|-------------------|---------|-------------------------------|-----------|----------|------------|
| Collections 1 | made by (include all | crew) | | | | | | | |
| Sampling M | ethod: □Electrofishi | ng □Gill netti | ng □Trap | netting Trawling | Seining | g □Anglin | g Other | | |
| Preservation | Method: □Freezing | □Other | | Notes | (SWFD | B survey nu | ımber): | | |
| FOR LAB USE ONLY- LAB ENTRY NO. | COLLECTION OR TAG NO. | SPECIES | DATE TAKEN | LOCATION | AGE | SEX &/OR REPROD. CONDIT | LENGTH (| WEIGHT (| REMARKS |
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richter: revised 2011, 5/7/15, 10/4/16, 3/20/17; becker: 3/23/17, 4/26/19

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION CHAIN OF CUSTODY

| I,(Print Name) | , of | (Drive Dr. 1 | collected the |
|---|--------------------------|------------------------------------|--------------------|
| (Print Name) | | (Print Business Address) | |
| following on(Date) | , 20 from | (Water Body) | |
| in the vicinity of | (Landmark Village | a Pond atc.) | |
| Town of | | | |
| Item(s) | | | |
| Said sample(s) were in my possessi collection. The sample(s) were place | | | |
| Environmental Conservation on | • | - | tate Department of |
| | | | |
| Signat | ture | Da | ate |
| I, | , received the al | bove mentioned sample(s) on the | date specified |
| and assigned identification number(| s) | to t | the sample(s). I |
| have recorded pertinent data for the | sample(s) on the attach | ned collection records. The sampl | e(s) remained in |
| my custody until subsequently trans | ferred, prepared or ship | oped at times and on dates as atte | sted to below. |
| | | | |
| Signatur | re | Date | |
| SECOND RECIPIENT (Print Name) | TIME & DATE | PURPOSE OF TRANSF | FER |
| SIGNATURE | UNIT | | |
| THIRD RECIPIENT (Print Name) | TIME & DATE | PURPOSE OF TRANSF | ER |
| SIGNATURE | UNIT | | |
| FOURTH RECIPIENT (Print Name) | TIME & DATE | PURPOSE OF TRANSF | FER |
| , | | | |
| SIGNATURE | UNIT | | |
| RECEIVED IN LABORATORY BY (Print Name) | TIME & DATE | REMARKS | |
| SIGNATURE | UNIT | | |
| LOGGED IN BY (Print Name) | TIME & DATE | ACCESSION NUMBER | RS |
| SIGNATURE | UNIT | | |
| | | | |

richter: revised 21 April 2014; becker: 23 March 2017, 26 April, 2019

NOTICE OF WARRANTY

By signature to the chain of custody (reverse), the signatory warrants that the information provided is truthful and accurate to the best of his/her ability. The signatory affirms that he/she is willing to testify to those facts provided and the circumstances surrounding the same. Nothing in this warranty or chain of custody negates responsibility nor liability of the signatories for the truthfulness and accuracy of the statements provided.

HANDLING INSTRUCTIONS

On day of collection, collector(s) name(s), address(es), date, geographic location of capture (attach a copy of topographic map or navigation chart), species, number kept of each species, and description of capture vicinity (proper noun, if possible) along with name of Town and County must be indicated on reverse.

Retain organisms in manila tagged plastic bags to avoid mixing capture locations. Note appropriate information on each bag tag.

Keep samples as cool as possible. Put on ice if fish cannot be frozen within 12 hours. If fish are held more than 24 hours without freezing, they will not be retained or analyzed.

Initial recipient (either DEC or designated agent) of samples from collector(s) is responsible for obtaining and recording information on the collection record forms which will accompany the chain of custody. This person will seal the container using packing tape and writing his signature, the time and the date across the tape onto the container with indelible marker. Any time a seal is broken, for whatever purpose, the incident must be recorded on the Chain of Custody (reason, time, and date) in the purpose of transfer block. Container then is resealed using new tape and rewriting signature, with time and date.

EQUIPMENT LIST

| Scale or balance of appropriate capacity for the fish to be collected. |
|---|
| Fish measuring board. |
| Plastic bags of an appropriate size for the fish to be collected and for site bags. |
| Individually numbered metal tags for fish. |
| Manila tags to label bags. |
| Small envelops, approximately 2" x 3.5", if fish scales are to be collected. |
| Knife for removing scales. |
| Chain of custody and fish collection forms. |
| Clipboard. |
| Pens or markers. |
| Paper towels. |
| Dish soap and brush. |
| Bucket. |
| Cooler. |
| Ice. |
| Duct tape. |
| |
| |



Appendix G – PFAS Analyte List

| Group | Chemical Name | Abbreviation | CAS Number |
|------------------------------------|--|--------------|-------------|
| | Perfluorobutanesulfonic acid | PFBS | 375-73-5 |
| | Perfluoropentanesulfonic acid | PFPeS | 2706-91-4 |
| | Perfluorohexanesulfonic acid | PFHxS | 355-46-4 |
| Perfluoroalkyl | Perfluoroheptanesulfonic acid | PFHpS | 375-92-8 |
| sulfonic acids | Perfluorooctanesulfonic acid | PFOS | 1763-23-1 |
| | Perfluorononanesulfonic acid | PFNS | 68259-12-1 |
| | Perfluorodecanesulfonic acid | PFDS | 335-77-3 |
| | Perfluorododecanesulfonic acid | PFDoS | 79780-39-5 |
| | Perfluorobutanoic acid | PFBA | 375-22-4 |
| | Perfluoropentanoic acid | PFPeA | 2706-90-3 |
| | Perfluorohexanoic acid | PFHxA | 307-24-4 |
| | Perfluoroheptanoic acid | PFHpA | 375-85-9 |
| Daufteranaalloid | Perfluorooctanoic acid | PFOA | 335-67-1 |
| Perfluoroalkyl carboxylic acids | Perfluorononanoic acid | PFNA | 375-95-1 |
| carboxylic acids | Perfluorodecanoic acid | PFDA | 335-76-2 |
| | Perfluoroundecanoic acid | PFUnA | 2058-94-8 |
| | Perfluorododecanoic acid | PFDoA | 307-55-1 |
| | Perfluorotridecanoic acid | PFTrDA | 72629-94-8 |
| | Perfluorotetradecanoic acid | PFTeDA | 376-06-7 |
| | Hexafluoropropylene oxide dimer acid | HFPO-DA | 13252-13-6 |
| Per- and | 4,8-Dioxa-3H-perfluorononanoic acid | ADONA | 919005-14-4 |
| Polyfluoroether | Perfluoro-3-methoxypropanoic acid | PFMPA | 377-73-1 |
| carboxylic acids | Perfluoro-4-methoxybutanoic acid | PFMBA | 863090-89-5 |
| | Nonafluoro-3,6-dioxaheptanoic acid | NFDHA | 151772-58-6 |
| El., () | 4:2 Fluorotelomer sulfonic acid | 4:2-FTS | 757124-72-4 |
| Fluorotelomer sulfonic acids | 6:2 Fluorotelomer sulfonic acid | 6:2-FTS | 27619-97-2 |
| Sullottic acids | 8:2 Fluorotelomer sulfonic acid | 8:2-FTS | 39108-34-4 |
| | 3:3 Fluorotelomer carboxylic acid | 3:3 FTCA | 356-02-5 |
| Fluorotelomer | 5:3 Fluorotelomer carboxylic acid | 5:3 FTCA | 914637-49-3 |
| carboxylic acids | 7:3 Fluorotelomer carboxylic acid | 7:3 FTCA | 812-70-4 |
| | Perfluorooctane sulfonamide | PFOSA | 754-91-6 |
| Perfluorooctane | N-methylperfluorooctane sulfonamide | NMeFOSA | 31506-32-8 |
| sulfonamides | N-ethylperfluorooctane sulfonamide | NEtFOSA | 4151-50-2 |
| Perfluorooctane | N-methylperfluorooctane sulfonamidoacetic acid | N-MeFOSAA | 2355-31-9 |
| sulfonamidoacetic acids | N-ethylperfluorooctane sulfonamidoacetic acid | N-EtFOSAA | 2991-50-6 |
| Perfluorooctane | N-methylperfluorooctane sulfonamidoethanol | MeFOSE | 24448-09-7 |
| sulfonamide ethanols | N-ethylperfluorooctane sulfonamidoethanol | EtFOSE | 1691-99-2 |
| | | Lii OOL | 1001-00-2 |



| Group | Chemical Name | Abbreviation | CAS Number |
|----------------------|---|--------------|-------------|
| | 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F-53B Major) | 9CI-PF3ONS | 756426-58-1 |
| Ether sulfonic acids | 11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor) | 11CI-PF3OUdS | 763051-92-9 |
| | Perfluoro(2-ethoxyethane) sulfonic acid | PFEESA | 113507-82-7 |



Appendix H - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids

General

These guidelines are intended to be used for the validation of PFAS using EPA Method 1633 for projects within the Division of Environmental Remediation (DER). Data reviewers should understand the methodology and techniques utilized in the analysis. Consultation with the end user of the data may be necessary to assist in determining data usability based on the data quality objectives in the Quality Assurance Project Plan. A familiarity with the laboratory's Standard Operating Procedure may also be needed to fully evaluate the data. If you have any questions, please contact DER's Quality Assurance Officer, Dana Barbarossa, at dana.barbarossa@dec.ny.gov.

Preservation and Holding Time

Samples should be preserved with ice to a temperature of less than 6°C upon arrival at the lab. The holding time is 28 days to extraction for aqueous and solid samples. The time from extraction to analysis for aqueous samples is 28 days and 40 days for solids.

| Temperature greatly exceeds 6°C upon arrival at the lab* | Use professional judgement to qualify detects and non-detects as estimated or rejected |
|--|--|
| Holding time exceeding 28 days to extraction | Use professional judgement to qualify detects and non-detects as estimated or rejected if holding time is grossly exceeded |

^{*}Samples that are delivered to the lab immediately after sampling may not meet the thermal preservation guidelines. Samples are considered acceptable if they arrive on ice or an attempt to chill the samples is observed.

Initial Calibration

The initial calibration should contain a minimum of six standards for linear fit and six standards for a quadratic fit. The relative standard deviation (RSD) for a quadratic fit calibration should be less than 20%.

The low-level calibration standard should be within 50% - 150% of the true value, and the mid-level calibration standard within 70% - 130% of the true value.

| %RSD >20% | J flag detects and UJ non detects |
|-----------|-----------------------------------|
|-----------|-----------------------------------|

Continuing Calibration Verification

Continuing calibration verification (CCV) checks should be analyzed at a frequency of one per ten field samples. If CCV recovery is very low, where detection of the analyte could be in question, ensure a low level CCV was analyzed and use to determine data quality.

| CCV recovery <70 or >130% | J flag results |
|--|-----------------|
| 22, 122, 11, 12, 12, 12, 12, 12, 12, 12, | c 11mg 100 m100 |



Blanks

There should be no detections in the method blanks above the reporting limits. Equipment blanks, field blanks, rinse blanks etc. should be evaluated in the same manner as method blanks. Use the most contaminated blank to evaluate the sample results.

| Blank Result | Sample Result | Qualification |
|------------------|--|----------------------------------|
| Any detection | <reporting limit<="" td=""><td>Qualify as ND at reporting limit</td></reporting> | Qualify as ND at reporting limit |
| Any detection | >Reporting Limit and >10x the blank result | No qualification |
| >Reporting limit | >Reporting limit and <10x blank result | J+ biased high |

Field Duplicates

A blind field duplicate should be collected at rate of one per twenty samples. The relative percent difference (RPD) should be less than 30% for analyte concentrations greater than two times the reporting limit. Use the higher result for final reporting.

| RPD >30% | Apply J qualifier to parent sample |
|----------|------------------------------------|
|----------|------------------------------------|

Lab Control Spike

Lab control spikes should be analyzed with each extraction batch or one for every twenty samples. In the absence of lab derived criteria, use 70% - 130% recovery criteria to evaluate the data.

| Recovery <70% or >130% (lab derived | Apply J qualifier to detects and UJ qualifier to |
|-------------------------------------|--|
| criteria can also be used) | non detects |

Matrix Spike/Matrix Spike Duplicate

One matrix spike and matrix spike duplicate should be collected at a rate of one per twenty samples. Use professional judgement to reject results based on out of control MS/MSD recoveries.

| Recovery <70% or >130% (lab derived criteria can also be used) | Apply J qualifier to detects and UJ qualifier to non detects of parent sample only |
|--|--|
| RPD >30% | Apply J qualifier to detects and UJ qualifier to non detects of parent sample only |

Extracted Internal Standards (Isotope Dilution Analytes)

Problematic analytes (e.g. PFBA, PFPeA, fluorotelomer sulfonates) can have wider recoveries without qualification. Qualify corresponding native compounds with a J flag if outside of the range.

| Recovery <50% or >150% | Apply J qualifier |
|---|-------------------|
| Recovery <25% or >150% for poor responding analytes | Apply J qualifier |
| Isotope Dilution Analyte (IDA) Recovery <10% | Reject results |

25



Signal to Noise Ratio

The signal to noise ratio for the quantifier ion should be at least 3:1. If the ratio is less than 3:1, the peak is discernable from the baseline noise and symmetrical, the result can be reported. If the peak appears to be baseline noise and/or the shape is irregular, qualify the result as tentatively identified.

Reporting Limits

If project-specific reporting limits were not met, please indicate that in the report along with the reason (e.g. over dilution, dilution for non-target analytes, high sediment in aqueous samples).

Peak Integrations

Target analyte peaks should be integrated properly and consistently when compared to standards. Ensure branched isomer peaks are included for PFAS where standards are available. Inconsistencies should be brought to the attention of the laboratory or identified in the data review summary report.

APPENDIX C COMMUNITY AIR MONITORING PLAN

New York State Department of Health Generic Community Air Monitoring Plan

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

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

Community Air Monitoring Plan

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

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

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

VOC Monitoring, Response Levels, and Actions

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

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

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

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

Particulate Monitoring, Response Levels, and Actions

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

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

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

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

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

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

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

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