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Remedial Investigation Work Plan

Schmuckler's Dry Cleaners Off-Site [Site No. C360088A], New Rochelle, New York

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ASP	
BCP	Brownfield Cleanup Program (BCP)
bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CAMP	Community Air Monitoring Plan
cis-1,2-DCE	cis-1,2-Dichloroethylene
cVOC	Chlorinated Volatile Organic Compound
CSM	Conceptual Site Model
COPC	Constituent of Potential Concern
DUSR	Data Usability Summary Report
DOT	Department of Transportation
DO	Dissolved Oxygen
DER	Division of Environmental Remediation
EDD	Electronic Data Deliverable
ELAP	Environmental Laboratory Approval Program
ft	feet/foot
FS	Feasibility Study
GRA	General Response Actions
GPS	Global Positioning System
HASP	Health and Safety Plan
ID	Inner Diameter
IDW	Investigation Derived Waste
LNAPL	Light Non-Aqueous Phase Liquid
MS	Matrix Spike
MSD	Matrix Spike Duplicate
$\mu g/m^3$	micrograms per cubic meter
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
ml/min	milliliters per minute
ng/L	nanograms per liter
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NAD	North American Datum
NAVD	North American Vertical Datum
OD	Outside Diameter
PCE	Tetrachloroethylene
PFAS	Per-and Polyfluoroalkyl Substances
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctanesulfonic Acid
PPE	Personal Protective Equipment
PID	Photoionization Detector
PVC	Polyvinyl Chloride
QHHEA	Qualitative Human Health Exposure Assessment
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RAO	Remedial Action Objectives
RI	Remedial Investigation
RIR	Remedial Investigation Report

RQD	Rock Quality Designation
SCO	Soil Cleanup Objective
SIM	Selected Ion Monitoring
SOP	Standard Operating Procedure
SVE	Soil Vapor Extraction
SVOC	Semi-volatile Organic Compound
SV	Soil Vapor
SVI	Soil Vapor Intrusion
TCL	Target Compound List
TCE	Trichloroethylene
USEPA	United States Environmental Protection Agency
VC	Vinyl Chloride
VOC	Volatile Organic Compound
WA	Work Assignment
WP	Work Plan

1. Background and Project Objectives

1.1 Site Setting

The Former Schmuckler's Dry Cleaners Brownfield Cleanup Program (BCP) site (#C360088) is located at 358-364 North Avenue in the City of New Rochelle, Westchester County, New York. NYSDEC has established that the BCP presents a significant threat to the public health or environment and has required completion of an off-site investigation. The off-site portion of the BCP, consisting of multiple commercial and mixed-use properties, has been assigned the Site Number C360088A. The overall extent of the off-site investigation area is shown in **Figure 1**.

1.2 Background

The BCP site consists of a partial two-story/part one-story commercial building on a 0.21-acre parcel identified as the street addresses 358 through 364 North Avenue, New Rochelle, New York. The current property owner is HNJ Realty, LLC. Schmuckler's Dry Cleaners began operating at the site in 1914. Historically, Schmuckler's Dry Cleaners operated on the first floor and in the basement of the building. Currently, the first floor of the building is being rented by United Community Center of Westchester and Comfort Homes & Property Management, LLC. The second floor of the building provides professional space including: a Spa, Taxi Company, HNJ Realty Office and a financial company (Soderberg, 2015).

According to a historic records review, the BCP site was developed as early as 1891 with two residential-use buildings. The property was subsequently redeveloped with a multi-tenant two-story commercial building around 1914. Additions were made to the building around 1937, prior to 1987, and a final addition in 1987 (Soderberg, 2015).

Properties along North Avenue are predominantly occupied for commercial use, with some maintaining residential apartments above. Commercial uses dominate properties within one block east and west of North Avenue. Beyond this one block area, residences are the prevailing land-use (Soderberg, 2015).

1.2.1 Site Geology and Hydrogeology

The site is underlain by fill which is underlain by glacial till and sediments (silty-clay with sand and gravel). The bedrock surface, comprised of highly weathered schist and quartzite, is between 9 and 13 feet (ft) below ground surface (bgs) at the BCP site. Historic bedrock logs describe limited recovery from coring activities as voids and attribute these voids to structural and lithological discontinuity.

A groundwater flow survey has been conducted at the BCP site as well as bedrock surface elevation map for the bedrock encountered during the installation of the monitoring well network. The information collected strongly suggests that groundwater in this vicinity is traveling to the southeast of the BCP site (Soderberg, 2015).

Groundwater was encountered between 9 to 12 ft bgs at the BCP site. Only two overburden wells installed within the BCP site have produced water, therefore a groundwater flow direction in overburden soils has not been determined. However, as presented in the Soderberg document, it is assumed that it flows similarly to the bedrock groundwater.

No surface water bodies are located on, adjoining, or proximate to the BCP site. Ferris Creek and The Long Island Sound are located approximately 3,250 feet to the east/southeast of the BCP site. According to Freshwater Wetland, National Wetland Inventory, Westchester Wetlands and Tidal Wetlands data available on the Westchester County GIS System, there are no regulated wetlands on or adjoining the subject property (Soderberg, 2015).

1.2.2 Identified Contaminants of Potential Concern

Based on investigations to date at the BCP site, the primary contaminants of concern are petroleum-related volatile organic compounds (VOCs) in soils, groundwater, sub-slab vapor, and soil gas; chlorinated VOCs (cVOCs) in soil, groundwater, sub-slab vapor, and soil gas; and semi-volatile organic compounds (SVOCs) in groundwater. In 2020, per-and polyfluoroalkyl substances (PFAS) compounds were also detected in groundwater. The following summary is based on information provided in the *Draft Comprehensive Remedial Investigation Report for HNJ Realty LLC. for Schmucklers Cleaners, 358-364 North Avenue, New Rochelle, NY, Site No.: C360088, Index No.: A3-0542-0306* (Soderberg, 2015).

1.2.2.1 Groundwater

Light non-aqueous phase liquid (LNAPL) was observed in groundwater, at a maximum of 6-inches thick, under much of the on-site building slab. Petroleum-based VOCs and SVOCs were detected in the bedrock aquifer at concentrations above groundwater standards. For VOCs, a total maximum benzene, toluene, ethylbenzene, xylene (BTEX) concentration of 722 micrograms per liter (µg/L) was detected in downgradient bedrock well MW-6. Additionally, eleven individual SVOCs were detected over groundwater standards in off-site bedrock well MW-6. Groundwater contamination is most concentrated underneath the on-site building slab, with petroleum-based VOC and SVOC contaminants and LNAPL extending off-site in the bedrock downgradient/southeast direction. The maximum detected concentrations of tetrachloroethylene (PCE) and trichloroethylene (TCE) were 830,000 µg/L and 58,000 µg/L, respectively in a groundwater grab sample collected at boring B-8/GW-4 beneath the former dry cleaning equipment room. In total, 25 individual VOCs were detected in groundwater samples exceeding NYS Class GA groundwater standards.

In August 2015 an *in situ* pilot test was performed to assess potential remedial effectiveness of an enhanced biological product which resulted in the decrease of PCE and increase of degradation products, as well as the decrease in SVOC concentrations. The pilot test was expanded in 2017 to include injections in five wells in the on-site basement and yard. Concentrations of VOCs decreased as a result of the 2017 injection but have since rebounded and remain above groundwater standards. Groundwater detections above NYS Class GA groundwater standards associated with sampling conducted in July 2022 were observed at on-site monitoring well MW-11, located in the vicinity of the former dry cleaning equipment room, and include: PCE (6.7 µg/L) and cis-1,2-dichloroethylene (cis-1,2-DCE; 45.4 µg/L).

PFAS compounds detected in groundwater at the site in January 2020 included perfluorooctanesulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) at maximum concentrations of 533 nanograms per liter (ng/L) and 57 ng/L, respectively, at on-site monitoring well MW-3. PFOA and PFOS detections at upgradient monitoring well BW-1 were below the current PFAS groundwater guidelines (NYSDEC, 2022) of 10 ng/L. Furthermore, while both PFOA and PFOS were detected at downgradient monitoring well BW-2, only PFOA was reported slightly above the current PFAS guidelines.

1.2.2.2 Soil

Detections of PCE in soil sampled within the on-site building exceeded the Unrestricted Use and Protection of Groundwater Soil Cleanup Objectives (SCOs) of 1.3 milligrams per kilogram (mg/kg) with a maximum detected concentration of 210 mg/kg observed beneath the former dry cleaning equipment room. Detections exceeding the Protection of Groundwater SCOs were predominantly detected in soils downgradient of the former dry cleaning equipment room and include: TCE (1.3 mg/kg), cis-1,2 dichloroethene (cis-1,2-DCE; 3 mg/kg) n-propylbenzene (16 mg/kg), m+p xylenes (15 mg/kg), ethylbenzene (6.6 mg/kg), 1,3,5-trimethylbenzene (63 mg/kg), and 1,2,4-trimethylbenzene (99 mg/kg). There is no indication of off-site soil contamination.

1.2.2.3 Soil Vapor

Based on the observed on-site sub-slab soil vapor concentrations in 2007 of PCE (787,000 micrograms per cubic meter [$\mu g/m^3$]), TCE (15,200 $\mu g/m^3$), cis-1,2-DCE (46,000 $\mu g/m^3$), and vinyl chloride (VC; 34 $\mu g/m^3$) a soil vapor extraction (SVE) system was installed and operated as an Interim Remedial Measure (IRM) in 2008 through 2013. Detections of both PCE (91 $\mu g/m^3$) and TCE (13.4 $\mu g/m^3$) were also detected in soil gas outside of the building near the location of a former drywell during the 2007 sampling. Benzene (37 $\mu g/m^3$), toluene (126 $\mu g/m^3$), ethylbenzene (85 $\mu g/m^3$), xylene (555 $\mu g/m^3$), 1,3,5-trimethylbenzene (3 $\mu g/m^3$), and 1,2,4-trimethylbenzene (14 $\mu g/m^3$) were also detected in sub-slab vapor and soil gas during the 2007 sampling.

1.2.3 Project Objectives

The primary objective of this Remedial Investigation (RI), is to evaluation the nature and extent of contamination potentially migrating off-site and downgradient of the BCP site, and, if necessary, to develop remedial alternatives. Investigation activities will include soil vapor intrusion (SVI) sampling at up to seven mixed use properties (with the potential sampling of soil gas should building access be problematic), installation and development of three shallow (overburden/weathered bedrock) and four bedrock monitoring wells, collection and analysis of groundwater, soil, and soil vapor, and a location survey. Submittals will include a work plan (WP), a RI Report (RIR), and a Feasibility Study (FS) Report.

2. Remedial Investigation

2.1 General

The RI activities discussed in this Work Plan include the following:

- SVI Sampling:
  - Sampling at up to eight mixed use properties: 342 North Avenue, 346 North Avenue, 350 North Avenue (two separate structures), 354 North Avenue, 366 North Avenue, 15 May Street, 11 Burling Lane, and 17 May Street (**Figure 2**)
  - Collection of a minimum of one sub-slab/indoor air pairs at each building located within each identified parcel (see **Figure 2** for approximate sample count at each parcel)
  - Collection of one ambient air (outdoor) and one field duplicate sample per sampling event (assumed three events total)
  - Should access to properties be problematic, soil gas sampling will be conducted in the vicinity of the abovementioned properties. For the purposes of budgeting, up to seven soil gas sampling locations will be sampled.
- Well installation:
  - Three overburden/weathered bedrock monitoring wells (assumed to be approximately 20 ft bgs). Each overburden/weathered bedrock monitoring well will be screened to center, to the extent practical, groundwater (10 ft screens are assumed)
  - Four bedrock wells to an approximate termination depth of 75 ft bgs (10 ft screens are assumed). Bedrock well screen placement to be determined based on results of geophysical logging and packer testing
  - Geophysical logging will be conducted at the four bedrock monitoring wells following drilling
  - Packer testing will be conducted at the four bedrock monitoring wells following geophysical logging. Utilizing the results of geophysical logging, up to three packer intervals will be tested at each of the four wells with samples collected and analyzed for VOCs
  - All drilling will be overseen by a Ramboll geologist.
- Development of each of the seven newly installed monitoring wells
- Gauging, purging, and sampling of seven newly installed and up to three existing monitoring wells utilizing low-flow methodology (10 wells total)
  - Samples from each of the monitoring wells will be analyzed for VOCs, SVOCs, PFAS, and 1,4-dioxane.
- Soil samples will be collected at 4 ft intervals at each of the three overburden/weathered bedrock monitoring well locations from identified glacial sediments/weathered bedrock to the top of groundwater (an assumed interval of 4 to 12 ft bgs) during drilling (approximately nine intervals total)
- Each of the nine soil samples will be analyzed for VOCs and SVOCs. A location/elevation survey will be conducted and will include newly installed monitoring wells and, if necessary, the locations of soil gas sample locations.

Related activities will include a utility locating survey by a private contractor, Community Air Monitoring Plan (CAMP) monitoring during drilling/well installation, characterization and disposal of investigation derived waste (IDW), and data validation.

A Generic Health & Safety Plan (HASP) is included as **Attachment 1** and outlines procedures that will be undertaken to protect Ramboll personnel, subcontractor personnel and visitors from potential hazards that may exist as a result of the field work performed at the Site during implementation of the RI.

The New York State Department of Health (NYSDOH) CAMP is provided as **Attachment 2** and provides for the monitoring of volatile organics and particulates (with action levels) during the performance of intrusive activities (i.e., soil borings, bedrock drilling, well installation).

A Generic Quality Assurance Project Plan (QAPP) included as **Attachment 3** provides quality assurance/quality control (QA/QC) criteria for the sampling and analyses of environmental media from the Site. The QAPP will assist in the generation of data of a known and acceptable level of precision and accuracy. The QAPP has been prepared in accordance with DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC, May 2010). Laboratory analysis of per- and polyfluoroalkyl substance (PFAS) compounds will follow the *Sampling, Analysis and Assessment of Per- and Polyfluoroalkyl Substance (PFAS) Under NYSDEC's Part 375 Remedial Programs* (November 2022) by NYSDEC (NYSDEC PFAS Guidance).

During drilling, well development and well sampling activities, special consideration for the avoidance of PFAS containing materials will be observed. Similar to procedures identified in the New York State Department of Environmental Conservation (NYSDEC) PFAS Guidance, appropriate PFAS free clothing and PPE will be utilized during well installation. A thorough review of materials brought to the Site will be performed to eliminate PFAS containing materials.

An RI report will be prepared that includes a qualitative human health exposure assessment (QHHEA). A fish and wildlife assessment will not be conducted due to the urban setting of the site and lack of vegetation or nearby wildlife habitats.

The following details the activities to be completed as part of the RI.

2.1.1 Utility Clearance

UDig NY will be contacted by the subcontractor prior to invasive work to locate utilities at the Site prior to initiating the field program. It should be noted that UDig NY will only coordinate location of utilities for those companies subscribing to the service. Furthermore, the utilities will only identify the locations of subsurface lines on public property and rights-of-way. To minimize the potential for damaging of subsurface utilities, a private utility locator will be contracted to identify potential subsurface structures in the vicinity of each boring location and, if necessary, each soil vapor boring location.

2.1.2 Vapor Intrusion Sampling

Sub-slab and indoor air sampling will be conducted at up to eight mixed use properties in the vicinity of the BCP site, as shown in **Figure 2**. The NYSDEC will coordinate access/permissions with the respective property owners at each identified address. If property access is granted, vapor intrusion sampling is intended to be conducted during the 2023-20244 heating season (November 15, 2023 to March 31, 2024). To the extent practical, sampling at each of the accessible properties will be scheduled within the same timeframe. Depending on the condition of the bottom floor at each property (assumed to be basement level), a minimum of one sub-slab/indoor air sample pair will be collected. A contingency for a first-floor indoor air sample is included based on field observations. Additionally, one ambient air sample (outdoor) will be collected during each sampling event..

Samples will be collected using the procedures outlined in the NYSDOH document entitled *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* dated October 2006 (NYSDOH, 2006). Each of the samples will be collected using a laboratory-supplied, certified clean, pre-evacuated, 6-liter canister, and a flow controller calibrated to draw air over a 24-hour period for residential properties and an 8-hour period for commercial properties. Prior to initiation of sample collection, a building survey will be conducted to identify any conditions that may interfere with sampling. The inspection should note as described in Section 2.11 of the NYSDOH soil vapor intrusion guidance the type of structure, floor layout, air flows, construction characteristics including foundation cracks and utilities, the presence of garages, recent renovations, mechanical equipment, the use or storage of petroleum products, and recent use of products containing volatile chemicals. Additionally, odors, portable vapor monitoring equipment readings (e.g., photoionization detectors [PIDs], ppbRAE, etc.), and descriptions of products that could potentially interfere with sampling should be documented. A sample collection field form and an inspection questionnaire are provided in **Attachment 4**. Standard operating procedures (SOPs) for each of the components below are provided in **Attachment 5**.

The following provides additional details on anticipated building scenarios and sample procedures.

2.1.2.1 Sub-Slab Sampling Procedures

Sub-slab sampling will be completed consistent with Section 2.7.2 of the NYSDOH Soil Vapor Intrusion Guidance. Temporary sampling points will be installed through the concrete slab of the lowest level of the building (i.e., slab on grade or full basement construction). Sampling points will be in a central location on the floor away from foundation footings, floor penetrations or cracks, and sub-slab utilities. Prior to sampling, tracer gas testing will be performed to check the integrity of the probe seal. The sampling rate will be consistent with that of the indoor air sample and will be maintained by laboratory-supplied, constant-differential, low-volume flow controllers. Samples will be collected in laboratory-supplied, batch certified clean, pre-evacuated, 6-liter canisters over the same time duration as the associated indoor air sample. Procedures for sub-slab sample collection are as follows:

- Laboratory or food grade inert tubing (e.g., polyethylene, Teflon®, etc.) of appropriate size (1/8-inch to 1/4-inch diameter) will be inserted through the hole drilled into the slab. The tubing inlet will be installed not more than 2-inches below the building slab. The annular space between the hole and tubing will be sealed with a non-VOC containing and non-shrinking material (e.g., permagum grout, beeswax, etc.).
- Following installation, the tubing will be purged of one to three volumes (i.e. volume of sample probe and tubing) prior to tracer gas testing at a rate no greater than 0.2 liters per minute.
- Prior to sampling, tracer gas testing will be performed at each sub-slab sample location following the procedures outline in the below section.
- Tubing will then be connected to the appropriate canister and samples collected over a 24-hour (residential) or 8-hour (commercial) period at a sampling rate no greater than 0.2 liters per minute. Vacuum readings of the canisters will be recorded prior to and upon completion of sample collection as well as sample identification and flow controller identification numbers. Documentation of sample conditions as detailed in Section 2 of the NYSDOH Soil Vapor Intrusion Guidance should be completed including historic and current storage and use of volatile chemicals, use of heating and air conditioning systems, floor

plan sketches, outdoor plot sketches, weather conditions, and any other pertinent observations.
- Following removal, holes will be filled with Geocel 3300® polyurethane caulk, or similar.

Vacuum readings of the canisters prior to and upon completion of sample collection will be recorded along with sample identification and flow controller identification numbers.

2.1.2.2 Tracer Gas Test Procedures

Tracer gas testing is used as a QA/QC measure to check the integrity of the sub-slab vapor probe seal. As outlined in Section 2.7.5 of the NYSDOH Soil Vapor Intrusion Guidance, the atmosphere around the immediate vicinity of the probe will be enriched with a tracer gas (e.g., helium). The tracer gas will be enclosed in a shroud (e.g., plastic pail, cardboard box) around the sample probe until a sufficient concentration is reached (>50%). After tracer gas has sufficiently saturated the shroud, one to three volumes (i.e., the volume of the sample probe and tube) will be purged prior to sampling to ensure the sample collected is representative. A sample of soil vapor from the sampling probe is then extracted at a rate no greater than 0.2 liters per minute into a Tedlar® bag (or equivalent) and measured with a portable monitoring device for the presence of a high concentration of the tracer (>10%).

High concentrations of tracer gas in the sample indicates that the surface seal of the sample probe in not sufficient and requires improvement. Once a tracer gas concentration of <10% or non-detect is achieved, sub-slab sampling procedures may proceed. Due to the use of temporary probes, tracer gas testing will be conducted at all sub-slab sampling locations.

2.1.2.3 Indoor Air Sampling Procedures

Indoor air sampling will be completed consistent with Section 2.7.3 of the NYSDOH Soil Vapor Intrusion Guidance. Indoor air samples will be collected in laboratory-supplied, individually certified clean, pre-evacuated, 6-liter canisters over the same time duration as the associated sub-slab sample. The sampling rate will be consistent with that of the sub-slab sample and will be maintained by laboratory-supplied, constant-differential, low-volume flow controllers. Indoor air samples will be co-located with the sub slab sample on the lowest level of the structure. Placement of indoor air sample locations for each anticipated building construction is based on the update to the NYSDOH soil vapor intrusion guidance dated February 2008 and is as follows:

- Slab-on-grade: one sample on first floor at a height approximately three feet above the floor.
- Crawl space: one sample within crawl space and one sample on the lowest living space (e.g., first floor) at a height of approximately three feet above the floor.
- Full basement: one sample from the basement at approximately three feet above the floor.

Vacuum readings of the canisters prior to and upon completion of sample collection will be recorded along with sample identification and flow controller identification numbers. Documentation of sample conditions as detailed in Section 2 of the NYSDOH Soil Vapor Intrusion Guidance shall also be completed including historic and current storage and use of volatile chemicals, product inventory of sources of volatile chemical, use of heating and air conditioning systems, floor plan sketches, outdoor plot sketches, weather conditions, and any other pertinent observations.

2.1.2.4 Ambient Air Sampling Procedures

Ambient air sampling will be conducted simultaneously with indoor air and sub-slab samples for the same time duration and using the same flow rate. Samples will be collected in laboratory-supplied, individually certified clean, pre-evacuated, 6-liter canisters with the flow rate controlled by laboratory-supplied, constant-differential, low-volume flow controllers. Samples will be placed upwind of the buildings being sampled. Vacuum readings of the canisters prior to and upon completion of sample collection, sample identification, flow controller identification numbers, outdoor plot sketches, weather conditions, and other pertinent observations will be recorded.

2.1.2.5 Sample Analysis

Sample canisters will be delivered to an Environmental Laboratory Approval Program (ELAP) certified laboratory under routine chain-of-custody protocols. Samples will be analyzed for United States Environmental Protection Agency (USEPA) Method TO-15. The analytical laboratory will be required to provide a data deliverable that meets the requirements of the most-current NYSDEC ASP Category B package in effect at the time of analysis. **Table 1** provides a summary of analytical parameters and associated methods, number of samples and QA/QC.

2.1.2.6 Data Evaluation and Reporting

Results will be evaluated to assess the potential for Site-related contaminants of concern (COCs) to intrude into indoor air within the off-Site properties. The interpretation of the results will be based on the NYSDOH Soil Vapor/Indoor Air Decision Matrices updated in May 2017 and other pertinent information as outlined in Section 3.4 of the NYSDOH Soil Vapor Intrusion Guidance. A report containing validated data will be submitted to the NYSDEC and NYSDOH that will consist of the following:

- Sampling program overview
- Sampling and analytical methods
- Field forms
- QA/QC results and discussion
- Laboratory reports, data sheets, and chain of custody forms
- Results and discussion
- Data evaluation
- Conclusions and recommendations

Ramboll will summarize the results in separate tables for each property sampled within two weeks of receipt of validated test results and provide to NYSDEC and NYSDOH.

2.1.3 Soil Vapor Sampling

In the event that access is not obtained to one or more of the aforementioned properties, soil vapor (SV) samples will be collected from up to seven locations located in the public right of way outside of the identified properties (**Figure 1**). SV samples will be collected from approximately 8 ft below grade or 1 ft above the water table using temporary sampling points advanced using direct push methodology. Each direct push advanced SV point will be constructed with a 6-inch long, stainless steel, braided screen implant attached to tubing. The annular space around the probe will be filled with 60-100 mesh glass beads or clean sand to approximately 1 foot above the implant probe. A hydrated granular bentonite seal will be placed above the glass beads to surface grade to prevent ambient air infiltration. Each SV point will be captured using a hand-held global positioning system (GPS) by Ramboll personnel.

The SV samples will be collected from each location using individually-certified canisters. Helium tracer gas will also be used to verify that there is no leakage through the surface seal (consistent with **Section 2.1.2.2**). The samples will be collected in individually-certified SUMMA canisters at a rate of 0.2 L/min maximum for a period of up to 2 hours. For QA/QC purposes one ambient air sample, one duplicate sample will be collected for analysis. The samples will be analyzed using TO-15. **Table 1** provides a summary of analytical parameters and associated methods, number of samples and QA/QC.

2.1.4 Overburden Monitoring Well Drilling and Installation

Three overburden groundwater monitoring wells will be advanced through weathered bedrock to the top of competent bedrock (assumed to be approximately 20 ft bgs), as shown on **Figure 1**, using hollow-stem auger drilling methods. At each drilling location, the upper 5 ft of the boring will be advanced using hand clearing methods if drilling is conducted within 5 ft of known or suspected utilities.

Soil samples will be collected continuously to the base of the boring using standard split barrel sampling methods. Upon retrieval, each soil sample will be described for: 1) percent recovery; 2) soil type; 3) color; 4) moisture content; 5) texture; 6) grain size and shape; 7) consistency; 8) evidence of staining or other chemically-related impacts; and 9) any other relevant observations. In addition, headspace screening of soil will be performed with a PID to allow evaluation of the bulk volatile organic concentration of each soil sample. Screening will be performed in approximate 2-ft intervals unless observations warrant deviation. This descriptive information will be recorded on a soil boring log form.

A representative portion of each soil sample interval will be placed in a re-sealable plastic (e.g., Ziploc® or equivalent) bag and screened with a PID. If necessary, the bag will be labeled with the boring number and interval sampled and soil will be allowed to warm prior to screening. PID screening will consist of placing the tip of the sample probe, attached to the PID, into the bag to measure the headspace for organic vapors.

A soil sample will be collected from each boring in 4 ft intervals and submitted to the laboratory for analysis (approximately nine intervals/soil samples total). Each VOC sample will be selected for laboratory analysis based on PID readings or other observations suggestive of impacts, with the highest PID reading being selected for analysis, if observed. Should no PID readings or evidence suggestive of impacts be observed, the sample will be collected from the mid-point of each interval. Each soil sample will be analyzed for Target Compound List (TCL) VOCs utilizing USEPA Method 8260C and SVOCs utilizing USEPA Method 8270D. **Table 1** provides a summary of analytical parameters and associated methods, number of samples and associated QA/QC samples.

Each overburden monitoring well will be constructed with 2-inch diameter, 10 ft in length, 0.010-inch slotted polyvinyl chloride (PVC) well screen, flush-threaded to appropriate lengths of 2-inch diameter PVC riser casing necessary to bring the top of the well to grade. The well heads will be completed with flush-mounted, roadbox covers within a concrete pad.

Drilling equipment used for the well installation will be decontaminated between locations. A decontamination pad will be built at a location identified by the NYSDEC.

2.1.5 Bedrock Monitoring Well Drilling

Four bedrock borings will be advanced using 6.25-inch hollow stem augers to the top of bedrock (approximately 20 ft bgs). Subsurface soil samples will be collected continuously for descriptive purposes and to confirm the depth to bedrock. Once bedrock is encountered, a temporary 4-inch inner diameter (ID) steel casing will be driven or spun into the top of bedrock. Once the steel casing is set, each borehole will be advanced to approximately 75 ft bgs using air rotary drilling methodology.

Because each bedrock boring will be drilled utilizing rotary drilling methods, no bedrock cores will be collected. However, and to the extent practical, basic bedrock unit information will be obtained from bedrock cuttings retrieved at the surface. Boreholes will remain open to accommodate geophysical logging and packer testing. To the extent practical, logging and packer testing will be scheduled immediately following the drilling at each borehole in an effort to minimize the potential for vertical contaminant migration.

2.1.6 Geophysical Logging of Bedrock Monitoring Wells

Geophysical logging will be performed at each of the four bedrock monitoring wells (**Figure 2**). The primary purpose of the geophysical logging is to aid in the identification of water-transmitting fractures within the open boreholes through the evaluation of borehole diameter, fluid characteristics, rock type, and vertical flow (including, to the extent possible, direction [i.e., upward or downward] and magnitude. The geophysical logging will be conducted by a qualified subcontractor under the supervision of a Ramboll geologist. The geophysical suite will include the following:

- Natural gamma
- Electromagnetic induction
- Fluid temperature/conductivity
- Mechanical caliper
- Acoustic televiewer
- Acoustic caliper
- Optical televiewer
- Heat-pulse flowmeter (assumes intervals to be tested under ambient and dynamic conditions)

The geophysical logs will be reviewed in real time with survey results provided to Ramboll within one day of the completion of each boring. A geophysical logging report for inclusion in the RI Report. Geophysical logging results will be used to determine the packer testing intervals as well as to aid in the identification of well screen placement at each of the four bedrock monitoring well locations.

2.1.7 Packer Testing of Bedrock Monitoring Wells

Following the completion of geophysical logging, packer testing will be conducted at up to three select 10-ft intervals at each of the four bedrock borings (**Figure 2**). A packer system, consisting of a slotted drop pipe with an affixed upper inflatable packer, will be installed in the borehole. The packer interval will be evacuated of one packer volume using a submersible pump or dedicated bailer. Following groundwater evacuation, the interval will be allowed to recharge with recharge rates recorded (to the extent practical). Following recharge, one groundwater grab sample will be collected from the packer interval and analyzed for VOCs utilizing USEPA Method 8260C (**Table 1**).

If the packer interval is purged dry, a groundwater grab sample will be collected once sufficient volume has recovered. If sufficient volume has not recovered in the packer interval after 30 minutes, a groundwater sample will not be collected, the packer string will be removed, and the next interval will be accessed.

2.1.8 Bedrock Monitoring Well Installation

Following the completion of packer testing and geophysical logging at the four bedrock boring locations, bedrock monitoring wells will be constructed at each of the four locations with screen placement biased towards specific areas identified during geophysical logging and packer testing. Prior to completing bedrock monitoring wells, Ramboll will obtain NYSDEC agreement on the intended placement of each well's screened interval.

Each bedrock well will be constructed with a 10-foot length of 2-inch inside diameter Schedule 40 PVC 0.010-inch slot well screen flush-threaded to 2-inch inside diameter Schedule 40 PVC riser of sufficient length to bring the top of the well to grade. A sand pack compatible with a 0.010-inch slot screen will be emplaced in the annular space around the well screen extending 2 feet above the top of the screen. A 2 to 3-foot bentonite seal will be installed on top of the sand pack and hydrated with potable water if necessary. If necessary accommodations will be made to seal the bottom of the boring below the screened interval utilizing bentonite or cement/bentonite grout. Remaining annular space will be filled with cement/bentonite grout through a tremie pipe to the ground surface and, subsequently, the temporary 4-inch ID steel casing will be pulled. The well heads will be completed as flush mounts enclosed in a concrete pad. Sand pack and bentonite seal thickness may be altered to accommodate field observations.

2.1.9 Monitoring Well Development

Well development will commence no sooner than 48 hours after well installation. Each of the seven newly installed monitoring wells will be developed by surging and purging the well using a bailer or pump, as appropriate, to remove the fine-grained material which may have settled within the well and to provide hydraulic communication with the surrounding formation. Up to five well volumes will be removed as part of this process. Groundwater parameters will be measured and recorded prior to development, after removal of each well volume during development, and at the conclusion of development. Parameters will include turbidity, pH, temperature, specific conductance and dissolved oxygen (DO). Water levels will be measured prior to and at the conclusion of development. During well development, stability will be established as three consecutive readings as outlined below.

- Temperature (±10%)
- pH (±10%)
- Specific conductivity (±10%)
- DO (±10%)
- Turbidity (±10%)

If measurement stability is not achieved, purging will be considered complete and cease after five well volumes have been removed.

2.1.10 Groundwater Sampling

One set of groundwater samples will be collected from the seven newly installed and up to three existing monitoring wells (BW-1, BW-2, and BW-4) as shown on **Figure 1**. Monitoring wells will be left to equilibrate a minimum of seven days following well development before sampling occurs.

Prior to the collection of groundwater samples, groundwater levels will be measured to the nearest 0.01 foot, from each of the 10 monitoring wells to be sampled, using an electronic water level probe. The water level measurements will be recorded from a reference point to be marked on each well casing.

Groundwater samples will be collected with portable bladder pumps utilizing low-flow methods. The pump intake will be set at the center of each well screen. The wells will be purged at a flow rate of 100 to 250 milliliters per minute (ml/min) and water quality parameters will be monitored. Drawdown will be limited to equal to or less than 0.3 ft. The samples will be collected once the water quality measurements have stabilized as outlined below:

- Temperature ± 3% of measurement
- pH ± 0.1 pH units
- Specific conductance ± 3% of measurement
- Redox ±10 mV
- DO ±10% of measurement
- Turbidity ± 10% of measurement

If a stable groundwater level cannot be maintained at a yield of at least 100 ml/min, the well will be dewatered to the intake of the pump and water will be allowed to recover and the groundwater sample will be collected.

Samples collected from each of the 10 aforementioned monitoring wells will be analyzed for TCL VOCs utilizing USEPA Method 8260C, SVOCs utilizing USEPA Method 8270D, PFAS utilizing USEPA Method 1633, and 1,4-dioxane utilizing USEPA Method 8270 selected ion monitoring (SIM). **Table 1** provides a summary of analytical parameters and associated methods, number of samples and associated QA/QC samples.

2.1.11 Air Monitoring

Consistent with the CAMP provided as Appendix 1A of NYSDEC's Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10) (NYSDEC 2010), air monitoring will be conducted during advancement of drilling/soil boring activity. Two monitoring stations will be set up for this activity, one to be located upwind and one to be located downwind of the drilling location. The specific location of the equipment will be based on wind direction and the location of the potential exposure populations at the time the field activities are completed. Furthermore, for drilling/soil boring activity occurring within 20 ft of a potentially exposed population or occupied structure, NYSDEC's "Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures" will be followed.

CAMP data will be downloaded from the instruments and provided to NYSDOH following the completion of the well installation portion of the scope. Any identified exceedances of action levels will be reported to NYSDEC and NYSDOH the same day or next business day if after hours along with information documenting the reason for exceedance, correction measures implemented, if needed, and a statement pertaining to the effectiveness of the corrective measure, if implemented. A copy of the CAMP monitoring guidance and CAMP "Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures" are included as **Attachment 2**.

2.1.12 Sample Analysis and Data Validation

Table 1 provides a summary of the environmental media to be sampled, analytical parameters and associated methods, number of samples and associated QA/QC samples.

The collected samples will be shipped to a ELAP-certified laboratory designated by NYSDEC for this project. Ramboll personnel will coordinate with the laboratory to arrange for the sample containers and associated shipping. The laboratory will provide an analytical data package that is consistent with the requirements of NYS ASP Category B. In addition, the laboratory will submit analytical data as an Electronic Data Deliverable (EDD) in the NYSDEC format.

Laboratory generated analytical data, except for waste characterization sample results, will be validated in accordance with the QAPP and a data usability summary report (DUSR) conforming to Appendix 2B of DER-10 will be prepared.

2.1.13 Decontamination

Decontamination will take place at the NYSDEC arranged location. It is assumed that water will be accessible via the public water supply (hydrants) and power will not be available for use. Water generated will need to be contained for off-site disposal. A temporary decontamination pad will be used for decontamination of drilling equipment prior to demobilization. Decontamination (other than drilling equipment) will be completed using a PFAS free and non-phosphate detergent (*e.g.* alconox® or liquinox®) bucket wash and potable water rinse. The drilling rig(s) wheels/treads will be decontaminated prior to demobilization.

2.1.14 Survey

A location and elevation survey of the seven newly installed monitoring wells and up to three existing monitoring wells will be conducted following the completion of sampling activitiesand will include documentation of horizontal location and vertical elevation of new and existing monitoring wells (grade and top of PVC).

The survey will be completed by a New York State-licensed surveyor. Horizontal datum will be referenced to North American Datum (NAD) 83 (2007) New York State Plane Eastern Zone and vertical datum to North American Vertical Datum (NAVD) 88. Elevation will be surveyed to 0.01-foot accuracy.

2.1.15 IDW Management

IDW, including personal protective equipment (PPE), tubing, excess soil samples, soil/rock cuttings, decontamination rinsates, well development water, and well purge water will be placed in Department of Transportation (DOT)-approved 55-gallon drums and staged at a NYSDEC arranged location. Materials will be segregated by media for characterization (see **Table 1**) and disposal. The soil and water will be transported to a regulated facility for disposal based on the waste characterization results. The PPE and other material used will be disposed as solid waste. Ramboll will contract with a waste disposal company to develop the waste profile and associated manifest documents in addition to transportation and disposal of the materials.

3. Remedial Investigation Report

Data obtained during the RI field investigation identified in this scope of work will be evaluated and used to develop the RIR. The RIR will outline field activities that were completed and include tables and figures summarizing the data collected. Conclusions based on this data will be provided and may include the following components based on the information generated:

- ***Site Description:*** This will include a discussion of current use of the Site.
- ***Site Investigation Summary:*** This section will describe the activities completed as part of the RI and include deviations or modifications to the RI WP.
- ***Site Hydrogeology:*** A detailed description of the subsurface soil and bedrock characteristics and occurrence of groundwater will be provided (including the results of geophysical logging and packer testing). A groundwater flow map will be included.
- ***Nature and Extent of Contamination:*** This section will include a discussion of the presence of constituents detected and those that are detected at concentrations above regulatory criteria. The latter will be identified as constituents of potential concern (COPC).
    - ***Soil:*** Detected constituents in soil samples will be compared to 6 NYCRR Part 375 Commercial and Industrial Use SCOs (NYSDEC, 2006).
    - ***Groundwater:*** The detected constituents in groundwater will be compared to Class GA water quality standards and guidance values as compiled in *Technical and Operational Guidance Series 1.1.1* (NYSDEC, 1998) and associated addenda. Detected PFAS will be compared to the screening levels as presented in *Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS)* (NYSDEC, 2022) or the most recent document.
    - ***Soil Vapor:*** The concentrations of constituents detected in soil vapor will be evaluated in accordance with the NYSDOH document, *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* dated October 2006 and associated updates (NYSDOH, 2006).
- ***Conceptual Site Model (CSM)*** – The existing CSM will be updated based on the findings of the RI and will include a discussion of the nature of the source(s) and migration pathways based on the site history and data collected.
- ***Qualitative Human Health Exposure Assessment (QHHEA)*** – A QHHEA will be developed to discuss the potential for current and future exposures to humans based on activities that may be completed at the Site.
- ***Summary and Conclusions:*** This section will present a summary of the COPCs identified and their respective concentrations. Data gaps will be presented if identified. Similarly, Remedial Action Objectives (RAOs) will be presented.

4. Feasibility Study

4.1 General

A FS will be conducted to develop, screen and evaluate applicable remedial alternatives for the Site in order to present sufficient information for decision makers to compare alternatives and select a remedy. The completion of the FS will be in accordance with DER-10 (NYSDEC, 2010).

The FS will be developed in two steps:

- Development of remedial alternatives
- Detailed analysis of remedial alternatives

The FS will be documented in the FS Report. The following describes the steps to be completed for the FS.

4.1.1 Development of Remedial Alternatives

The first step in the FS is the development, of a range of remedial alternatives that are protective of public health and the environment. The development of alternatives will be completed in accordance with DER-10 (NYSDEC, 2010) and includes the following steps:

- Development of RAOs
- Development of general response actions (GRAs)
- Identification of volumes or areas of media to be addressed
- Identification and screening of remedial technologies and process options
- Evaluation of process options
- Assembly of remedial alternatives

A total of up to four alternatives will be developed. The screening of remedial technologies will be presented in tabular format alone. Consistent with DER-10 (NYSDEC, 2010), one alternative will be the no action alternative, and one alternative will represent restoration of the Site to pre-disposal conditions. The remaining two alternatives will be developed based on the anticipated future use of the Site and media that are found to be impacted. Media of concern to be addressed in this FS are VOCs, SVOCs, PFAS, and 1,4-dioxane in groundwater, VOCs and SVOCs in soil, and VOCs in soil vapor. Ecological concerns will not need to be addressed given the location of the Site. A description of each alternative will be prepared as part of the assembly of remedial alternatives.

4.1.2 Detailed Analysis of Alternatives

The objective of this step is to evaluate the remedial alternatives and present sufficient information for selection of a remedy.

The alternatives will be evaluated based on specific regulatory requirements, technical, cost, and institutional considerations. The detailed analysis will consist of an assessment of each alternative against the evaluation criteria described below. The detailed analysis will also include a comparative evaluation identifying the relative performance of each alternative against the criteria. In accordance with DER-10 Section 4.2, the following criteria will be used to evaluate the alternatives in detail:

- Overall protection of human health and the environment
- Compliance with Standards, Criteria and Guidance (SCGs)s
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume of contamination through treatment
- Short term impact and effectiveness
- Implementability
- Cost effectiveness
- Land Use

One alternative will be identified which is preferred over the others. In accordance with DER-10, the preferred alternatives must be protective of human health and the environment and must address promulgated standards and criteria that are directly applicable or are relevant and appropriate. The recommended alternative will be documented in the FS Report.

4.1.3 Feasibility Study Report

An FS report will be prepared to document the FS process. Consistent with DER-10, the following the FS report will be formatted as follows:

1. Introduction
2. Site Description and History
3. Summary of Remedial Investigation and Exposure Assessment
4. Development of Remedial Alternatives
    - Development of RAOs
    - Development of GRAs
    - Identification, screening and evaluation of remedial technologies and process options
    - Assembly of remedial alternatives
5. Detailed Analysis of Remedial Alternatives
6. Recommended Alternative

5. References

Soderberg, John V., 2015. Draft Comprehensive Remedial Investigation Report for HNJ Realty LLC. for Schmucklers Cleaners, 358-364 North Avenue, New Rochelle, NY, Site No.: C360088, Index No.: A3-0542-0306. September, 2015.

NYSDEC, 1998. Division of Water Technical and Operational Guidance Series (TOGS) – *Ambient Water Quality Standards and Guidance Values and Ground Water Effluent Guidelines* (TOGS 1.1.1). June 1998.

NYSDEC. 1999. *Part 703 Surface and Ground Water Quality Standards and Ground Water Effluent Limitations: 6 NYCRR 702. New York Code of Rules and Regulations (NYCRR)*. August 4, 1999.

NYSDEC. 2006. *6 NYCRR Part 375: Remedial Program Soil Cleanup Objectives (SCOs).* December 2006.

NYSDEC, 2009. *CP-43: Groundwater Monitoring Well Decommissioning Policy*. November 3, 2009.

NYSDEC, 2010. *Technical Guidance for Site Investigation and Remediation (DER-10)*. Division of Environmental Remediation. May 3, 2010.

NYSDEC. 2022. *Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS)*. November 2022.

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

TABLES

Table 1
Sample Analysis and QA/QC Summary
Schmuckler's Dry Cleaners Off-Site RI/FS
New Rochelle, NY

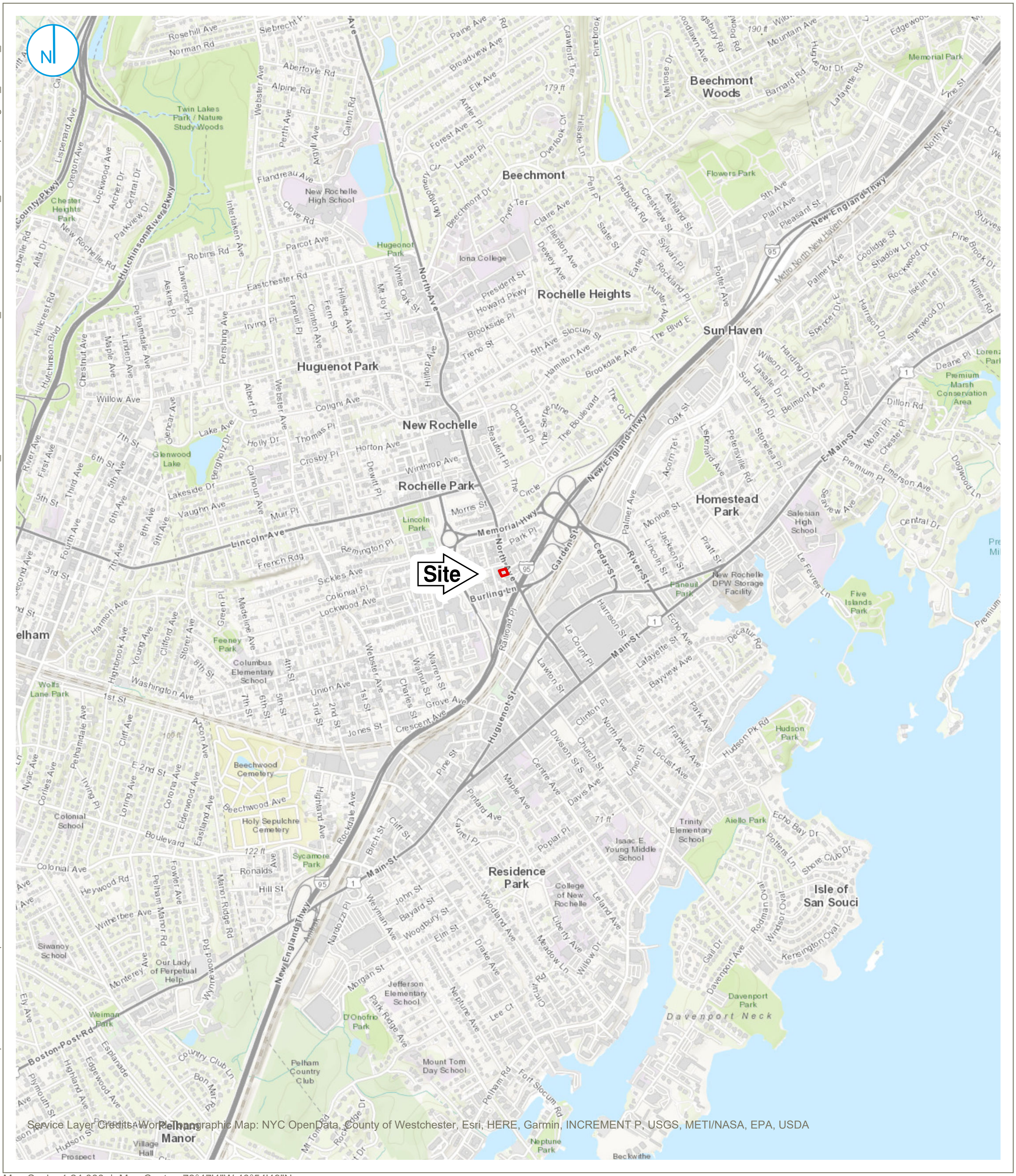
Task	Matrix	Analyses	Method	Number of Primary Samples	Ambient Blank	Equipment Blank	Field Duplicate	MS	MSD	Estimated Total Number of Samples	Deliverable	Validated (Y/N)
SVI Samples (SV Samples - Optional)	**Air**	VOCs	USEPA Method TO-15	35 (7)	3 (1)		3 (1)			38 (8)	Category B	Y
Task	**Matrix**	**Analyses**	**Method**	**Number of Primary Samples**	**Trip Blank**	**Equipment Blank**	**Field Duplicate**	**MS**	**MSD**	**Estimated Total Number of Samples**	**Deliverable**	**Validated (Y/N)**
Overburden Soil Samples	**Soil**	TCL Volatiles + 10	USEPA Method 8260C	9	3		1	1	1	15	Category B	Y
		Semivolatiles	USEPA Method 8270D	9			1	1	1	12		
Packer Testing Groundwater Samples	**Water**	TCL Volatiles + 10	USEPA Method 8260C	12	4	2	1	1	1	21	Category B	Y
Groundwater Samples	**Water**	TCL Volatiles + 10	USEPA Method 8260C	10	3	2	1	1	1	18	Category B	Y
		Semivolatiles	USEPA Method 8270D	10		2	1	1	1	15		
		PFAS	USEPA Method 1633	11[1]		2	1	1	1	5		
		1,4 Dioxane	USEPA Method 8270 SIM	10		2	1	1	1	15		
Waste Characterization Sampling	**Soil**	TCLP Method 1311		1						1	Category A	N
		TCLP Volatiles	USEPA Method 8260C	1						1		
		TCLP Semivolatiles	USEPA Method 8270D	1						1		
		TCLP Pesticides	USEPA Method 8080	1						1		
		TCLP Chlorinated Herbicides	USEPA Method 8150	1						1		
		TCLP Metals	USEPA Method 6010C/9014	1						1		
		TCL PCBs	USEPA Method 8082	1						1		
		PFAS	USEPA Method 1633	1						1		
		1,4 Dioxane	USEPA Method 8270	1						1		
		Corrosivity	USEPA Method 1110	1						1		
		Ignitability	USEPA Method 1030	1						1		
		Reactivity	USEPA Method 9010/9030	1						1		
	Water	TCL Volatiles	USEPA Method 8260C	1						1	Category A	N
		TCL Semivolatiles	USEPA Method 8270D	1						1		
		TCL Pesticides	USEPA Method 8081B	1						1		
		TCL PCBs	USEPA Method 8082	1						1		
		TCL Chlorinated Herbicides	USEPA Method 8150	1						1		
		PFAS	USEPA Method 1633	1						1		
		1,4 Dioxane	USEPA Method 8270	1						1		
		Corrosivity	USEPA Method 1110	1						1		
		Ignitability	USEPA Method 1030	1						1		
		Reactivity	USEPA Method 9010/9030	1						1		

Notes:
[1] - One PFAS sample to be collected from identified potable water source prior to drilling. No QA/QC sampling associated with this sample.

FIGURES

I:\NYS-DEC.1087815\GIS\Schmucklers_Cleaners\PRO\Schmucklers_Cleaners.aprx\Figure_01-Site_Location

PROJECT: 1940103368 | DATED: 3/14/2023 | DESIGNER: SSOULE



Map Scale: 1:24,000 | Map Center: 73°47'4"W 40°54'49"N

KEY MAP (not to scale)

0 1,000 2,000 Feet

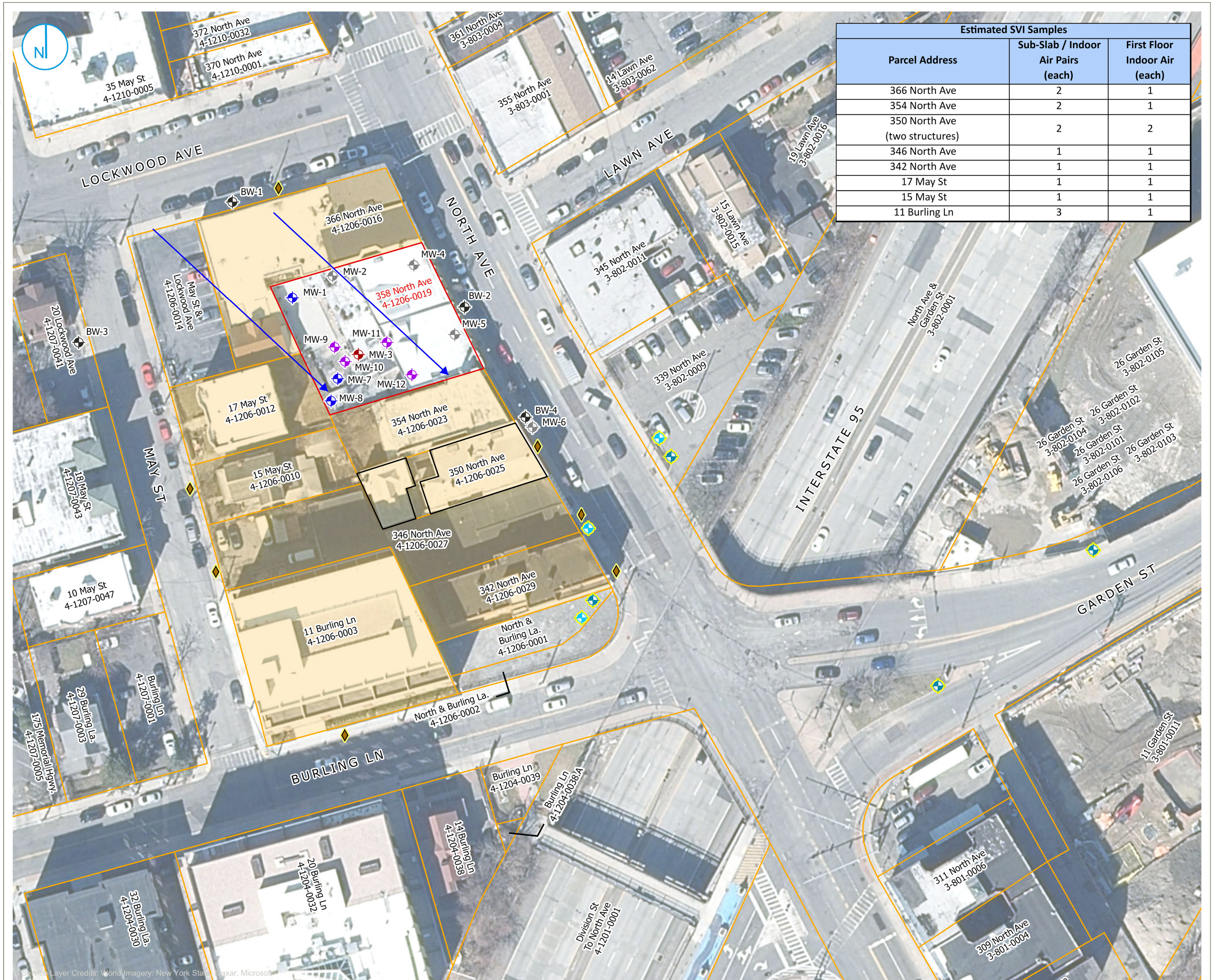
SITE LOCATION

Schmucklers Cleaners
NYSDEC Site #C360088
358-364 North Avenue
New Rochelle, New York

FIGURE 01

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.
A RAMBOLL COMPANY

RAMBOLL



Estimated SVI Samples		
Parcel Address	Sub-Slab / Indoor Air Pairs (each)	First Floor Indoor Air (each)
366 North Ave	2	1
354 North Ave	2	1
350 North Ave (two structures)	2	2
346 North Ave	1	1
342 North Ave	1	1
17 May St	1	1
15 May St	1	1
11 Burling Ln	3	1

Proposed Shallow Monitoring Well (Approximately 15 ft bgs)
Proposed Deep Monitoring Well (Approximately 75 ft bgs)
Proposed Soil Vapor Sampling Location (Optional)

Existing Monitoring Wells
Viable Existing Monitoring Well
Non-Viable Existing Monitoring Well
Bedrock Monitoring Well
Application Monitoring Well
New Pilot Study Monitoring Well
Anticipated Groundwater Flow Direction
Site Tax Parcel
Other Tax Parcel
Approximate Building Outline
Parcels Identified for SVI Sampling

Notes
- All existing monitoring wells were placed based on existing figures as survey data was not available.
- Tax parcels from Westchester County GIS, July 15, 2022.

0 30 60 Feet

SAMPLING LOCATION PLAN

Schmucklers Cleaners
NYSDEC Site #C360088
358-364 North Avenue
New Rochelle, New York

FIGURE 02

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.
A RAMBOLL COMPANY

I:\NYS-DEC.1087815\GIS\Schmucklers_Cleaners\PRO\Schmucklers_Cleaners\Schmucklers_Cleaners.aprx\Figure_02-Sampling_Location_Plan

PROJECT: 1940103368 | DATED: 11/30/2023 | DESIGNER: SSOULE

ATTACHMENT 1
GENERIC HASP

Intended for

NYS DEC Standby Contract D009810

Document type

Health & Safety Plan

Date

October 2020

NYSDEC STANDBY CONTRACT D009810 HEALTH & SAFETY PLAN

RAMBOLL Bright ideas. Sustainable change.

NYSDEC STANDBY CONTRACT D009810
HEALTH & SAFETY PLAN

Project name	**NYSDEC Standby Contract**
Project no.	**Click or tap here to enter text.**
Document type	**Health & Safety Plan**
Version	**[0.1]**
Date	**October 10, 2020**
Prepared by	**Drew Walier**
Checked by	**Deborah Wright**
Approved by	**Jeffrey Parsons, CIH**

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CONTENTS

List of Appendices

REVISION SUMMARY

Revision Date	**Description of Changes** (Section title or number – description)	**Reason for Change** (individual name or title, company / agency name, document reference and date)

PREFACE

This document describes the minimum anticipated protective measures necessary for worker health and safety during the activities associated with this project. Ramboll employees and subcontractors must read and understand the contents of this document. We do not intend the contents of this document to cover all situations that may arise nor to waive any provisions specified in Federal, State, and local regulations or site owner / contractor health and safety requirements. During this project, if any task occurs that is not covered in this Project Safety Plan, the individual responsible for that task will inform Ramboll's Corporate Health & Safety Department. Site personnel affected by the new activity and its associated hazards must ensure that they follow necessary safety procedures and use appropriate protective equipment.

Subcontractors are accountable for the health and safety of employees. No requirements or provisions within this plan shall be construed by subcontractors as an assumption by Ramboll or the New York State Department of Environmental Conservation of their legal responsibilities as an employee

1. INTRODUCTION

This Health & Safety Plan (HASP) has been developed to outline the minimum requirements to be met by O'Brien & Gere Engineers, Inc., a Ramboll company (Ramboll) employees, subcontractors, and visitors while performing activities outlined herein and on any Work Assignment conducted that is associated with the New York State Department of Environmental Conservation (NYSDEC) Standby Engineering Services Contract D009810. This HASP is intended to provide general guidance related to potential activities that may be conducted during execution of assigned Work Assignments.

This HASP describes the responsibilities, training requirements, protective equipment and safety procedures necessary to minimize the risk of injury, fires, explosion, chemical spills and material damage incidents related to project activities. This HASP incorporates by reference the Occupational Safety and Health Administration (OSHA) regulations contained in 29CFR1910 and 29CFR1926, and Ramboll America's Health, Safety, and Security Manual.

The requirements and guidelines in this HASP are based on a review of the potential scope of work and an evaluation anticipated on-site hazards. This HASP or task specific Job Safety Analysis (JSA) will be reviewed with site personnel and will be available on-site. Ramboll employees, subcontractors, and visitors will report to the onsite Ramboll Site Safety Leader (SSL) in matters of health and safety. While the SSL is responsible for overseeing compliance with this HASP and stopping work when necessary, the Project Manager is responsible for implementation of this HASP into daily site activities.

Ramboll employees and subcontractors must review this safety plan and/or task specific JSA prior to beginning work and sign the ***Pre-Work Briefing Form (Appendix 1)***.

1.1 Covered Personnel

This HASP is specifically intended for Ramboll employees, subcontractors, and visitors who will be conducting activities within the defined scope of work in specified areas of the site. Ramboll will inform site personnel of identified safety and health hazards as outlined in this HASP. Ramboll employees, subcontractors, and visitors are responsible for complying with government regulations, site owner policies and this HASP as it relates to their scope of work. This HASP may be provided to interested third parties for informational purposes. Each Work Assignment will have a supplemental Job Safety Analysis (JSA) that will be prepared by the project team and must be reviewed by all relevant personnel. The **JSA** is included as **Appendix 2**.

1.2 HASP Review & Modification

Future actions that may be conducted as a result of the Standby Contract and unexpected conditions that may be encountered may require the modification of this HASP. The SSL will recommend modifications to this HASP, and the Ramboll Health & Safety Specialist or Manager will have the responsibility of approving them. Modifications to this HASP shall be documented on the Revision Summary page.

This HASP may be modified for new or additional scopes of work by directly revising this HASP and saving a revised copy or by developing a supplemental JSA **(Appendix 2)**, or equivalent document acceptable to Ramboll. JSAs may modify requirements outlined in this HASP as necessary to safely perform new work activities.

1.3 Scope of Work

The New York State Department of Environmental Conservation (NYSDEC) has contracted Ramboll to offer standby services. Ramboll will be given Work Assignments which may consist of one or more of the following Work Elements.

- Site Characterization
- Remedial Investigation/Feasibility Study
- Remedial Design
- Remedial Action/Construction Management
- QA/QC
- Interim Remedial Measures
- Site Management
- Soil Vapor Intrusion Investigations

Field activities that may be required to complete the Work Elements include, but are not limited to:

- Sampling of environmental media (soil, groundwater, air, soil vapor, surface water, sediment)
- Air monitoring
- Drilling
- Well installation
- Excavation
- Drum, water, and/or soil removal
- O&M of remedial systems

1.4 Project Personnel

The following are key project personnel with respect to Ramboll's scope of work. Additional project personnel associated with specific Work Assignments and tasks will be identified in the JSAs associated with those tasks.

Project Personnel	
Ramboll	
Imants Reks	Project Officer
Deborah Wright	Program Manager
TBD	Site Safety Leader (SSL)
Drew Walier	HSS Project Manager
Jeffrey Parsons, CIH	Manager of Americas HSS Operations

1.5 Responsibilities

As directed in the HASP, general compliance and HASP implementation will generally be addressed first by the Ramboll Site Safety Leader (SSL) with support from project management. Subcontractors must identify qualified Safety Competent Persons who must be on site for all field activities.

All project personnel have the authority to stop work if any condition or behavior is observed that has the risk to cause injury, illness, property damage, or an environmental release.

1.5.1 Ramboll Project Officer and Program Manager

The Project Officer and Program Manager is responsible for providing upper level management support for health and safety. He or she will provide sufficient authority and resources to the Ramboll Project Manager and SSL to fully implement health and safety requirements as outlined in this HASP, contract documents, and regulatory requirements.

1.5.2 Ramboll Project Manager

The Project Manager is accountable to the Project Officer and is responsible for providing leadership and oversight of Ramboll project team's implementation of HASP requirements. The Project Manager ensures that the Site Safety Leader has adequate resources to implement HASP requirements and that qualified personnel (and subcontractors) are assigned to project teams.

1.5.3 Ramboll Site Safety Leader

The SSL advises project personnel on matters of health and safety on the site. The SSL has the authority to stop work if any operation threatens site workers, the public, or environment. In general, responsibilities of the SSL include, but are not limited to, the following:

- Conducting and documenting safety inspections on a weekly basis and conducting daily safety walkthroughs
- Conducting daily safety pre-work safety meetings and documenting meetings on a daily Pre-Task Planner (or equivalent)
- Selection and inspection of PPE
- Conducting periodic surveillance to evaluate effectiveness of the HASP
- Monitoring on-site hazards and conditions and recommending modifications to the HASP when new hazards are observed
- Inform the Ramboll Project Manager of observed safety deficiencies requiring corrective action beyond their control
- Having knowledge of emergency procedures, evacuation routes, and telephone numbers for emergency services
- Posting directions to the hospital and telephone numbers for emergency services
- Coordinating emergency medical care as necessary
- Immediately notify followed by submittal of written accident/emergency reports to required parties
- Review/develop JSAs for all construction activities
- Reviewing and maintaining safety documentation and reports

1.5.4 Ramboll Health, Safety and Security Project Manager (HSS PM)

The HSS PM provides site-level leadership and oversight for project safety. The HSS PM makes regular site visits to assess compliance with requirements in this HASP and evaluate overall safety performance. The SSL is accountable to the HSS PM. If the SSL encounters a safety issue that they are not confident in correcting they should reach out to the HSS PM for assistance. General support tasks include safety audits, air monitoring, training, accident investigations, etc. Inspections will periodically be conducted to monitor worker health and safety and will address issues such as subcontractor pre-qualification, site safety orientation programs and documentation. The HSS PM will also function as an alternate SSL as needed.

1.5.5 Ramboll Health, Safety and Security (HSS) Americas Manager

The Ramboll HSS Americas Manager will make safety-related recommendations regarding the work area to the HSS PM and engage ongoing support from Ramboll HSS Americas Safety Department as necessary.

1.5.6 Subcontractor Safety Competent Person

All subcontractors under contract to Ramboll are covered by this HASP and will be required to designate a general Safety Competent Person. The Safety Competent Person must be the Superintendent/Foreman unless the project is sufficiently large to require a full-time Safety Competent Person. A Safety Competent Person must be on site at all times when the subcontractor has employees performing work for Ramboll and will have the same responsibilities as the OBG SSL within the subcontractor's scope of work. This individual must possess a sound working knowledge of pertinent OSHA regulations, this HASP, and other applicable safety requirements related to their scope of work. The Safety Competent Person will ensure timely correction of safety deficiencies identified by OBG.

<u>NOTE</u>: Subcontractors must provide a full-time Safety Competent Person when 16 or more field worker are on-site. The Subcontractor's Safety Competent Person must be acceptable to Ramboll

Regulatory agencies, facility owner, and Ramboll may also require specialized competent persons to provide oversight of specific activities. These persons must be designated in writing in this HASP or the associated JSA.

2. SITE SAFETY & CONTROL PROCEDURES

This Health & Safety Plan (HASP) incorporates by reference the Occupational Safety and Health Administration (OSHA) requirements in 29 CFR Part 1910, 29 CFR Part 1926, and the Ramboll Health, Safety, and Security (HSS Manual). Subcontractors must review the site HASP to ensure they meet or exceed Ramboll corporate requirements and all regulations applicable to their scope of work. Key site safety procedures applicable to Ramboll employees and subcontractors are described in more detail in this section.

2.1 Site Security & Control

The elements of site control include restricting access to the site to persons until they have the proper safety training and have reviewed the task specific JSA. All contractors and subcontractors shall have an approved HASP or JSA for the work they will be doing prior to commencing the actual work.

2.1.1 Subcontractor Prequalification

All subcontractors must complete a Ramboll Subcontractor Prequalification form that is reviewed by Americas HSS prior to initiation of any work.

2.1.2 Citizenship

All project personnel must be U.S. citizens or legally authorized to work in the U.S. with the proper work visas.

2.1.3 Language

All project personnel must understand and speak English at a "conversational" level. Subcontractors are responsible for all costs or delays incurred if non-English speaking employees are banned from the site. Ramboll will make the final determination if a person is sufficiently fluent in English. Interpreters may be used if authorized by Ramboll. When authorized, a minimum of one interpreter will be required for every ten non-English speaking personnel at all times while work is being conducted on site.

2.1.4 Site Access

Any specific site access requirements will be outlined in the Work Assignment-specific JSA.

2.1.5 Site Layout & Work Zones

Any work zone delineation and barricading requirements will be outlined in the Work Assignment-specific JSA.

In general, if Level D PPE is being used the SSL will implement administrative controls to keep unauthorized personnel from entering the work area. When Level C PPE or higher is being used, or at the SSLs discretion, formal zones will be established. The zones will be delineated by the use of stakes, cones, rope, barricade tape, and/or signs. Three formal zones will be established as follows.

2.1.5.1 Exclusion Zone
The exclusion zone is where the intrusive work is taking place, only authorized project personnel who have met all training and medical surveillance requirements may enter. The exclusion zone must be large enough to safely contain all project personnel, materials and equipment.

2.1.5.2 Contamination Reduction Zone
The contamination reduction zone (CRZ) contains personnel and equipment decontamination stations, it is located between the exclusion zone and the support zone. It should only be large enough to safely complete the decontamination activities. Only authorized project personnel who have met all training and medical surveillance requirements may enter.

2.1.5.3 Support Zone
The support zone is located outside of the CRZ. The support zone contains support facilities, extra equipment, transport vehicles, and additional personnel and equipment necessary to manage and perform work activities.

2.1.6 Site Communications
Internal and external communications must be maintained at all times. Verbal communication will be used between project personnel unless distance requires the use of radios. Cell phones will be used to communicate with emergency services. If there is no cellphone reception in the work area then another means of communicating with emergency services must be established, such as a satellite phone or mobile alert devices.

2.1.7 Drug & Alcohol Testing
All project personnel are required to work in accordance with Ramboll's policy for a Drug Free Workplace. Drug and alcohol testing may be conducted during this project as listed below:

- ***Reasonable Cause*** – A Supervisor must make the decision that a person exhibits symptoms and behavior that "more probably than not" is the result of a controlled substance
- ***Post-Accident*** – Similar to Reasonable Cause, testing may be performed following an accident if the accident may have been avoided by a "reasonably alert" action and substance abuse cannot be discounted as a contributing factor.

Refusal to take a drug or alcohol test when directed in accordance with Ramboll policies will be treated as a positive test and will result in immediate removal from the project.

2.2 Safety Training & Competent Persons
Project personnel must be properly trained for the type of work being performed and in accordance with OSHA 29CFR1926, 29CFR1910 and Ramboll policies. All project personnel are required to have an OSHA 40-Hour HAZWOPER certification and a current 8-hour HAZWOPER refresher.

Specific safety training is required for working with asbestos, lead, and hazardous waste. Other training is required for tasks that include, but not limited to, confined space entry, fire prevention and control, lockout/tagout, hazard communication, fall protection, forklift/lull license, NFPA 70E (energized electrical), crane operator license or Certified Crane Operator (CCO). Subcontractors will designate in writing to Ramboll their employees who are trained and authorized to operate heavy equipment including, but not limited to, manlifts, excavators, drill rigs, dozers, demolition hammers, shears, grapples, dump trucks, pulverizers and skid steers. Either a company letter or copies of current licenses/certificates is sufficient to prove operator qualifications.

As outlined in Section 1.5.6 subcontractors are also required to designate one person as a general Safety Competent Person who must be on site during all site activities. The Safety Competent Person must have a thorough understanding of OSHA regulations. An Alternate Safety Competent Person may also be designated.

Other task-specific competent persons must be designated in subcontractor safety plans or JSAs and be on site as necessary to support activities performed under their oversight. In addition to written designation, the subcontractor must submit evidence of competency when requested by Ramboll.

In addition to task specific safety training, all project personnel must have completed the Ramboll Project Safety Orientation. This consists of reviewing the task specific JSA, associated exhibits, permits and attachments. Upon completing the review all personnel must sign the ***Pre-Work Briefing Form (Appendix 1)***.

2.3 Pre-Work Planning

Safety planning is a critical component of Ramboll's approach to mitigating safety-related risk. The safety planning documents to be used on this project and their purpose is outlined in the table below.

When Completed	Standard Ramboll Document	Project Document	Purpose of Document
Pre-Mobilization	HASP	No Change	Overall project safety requirements.
Prior to beginning work on major tasks	Ramboll JSA Template		Identify hazards and safety controls for major tasks. Identify training, competent person and permit requirements. Reviewed and updated periodically during project status and coordination meetings.
Daily for each crew	Ramboll Pre-Task Planner		Focus on specific hazards and controls for the day's scope of work.
Permits – prior to beginning high hazard work	Confined Space Permit (Non-Permit/Alternate Entry) Energized Electrical Work Permit Hot Work Permit		Establish safety requirements and oversight of highly hazardous activities. These are issued daily unless otherwise outlined below.

JSAs and Pre-Task Planners (PTPs) will outline effective safety controls that mitigate hazards in accordance with a general hierarchy of controls that favors elimination and substitution over the use of personal protective equipment (PPE) when feasible. See the figure below for additional guidance (courtesy of the National Institute for Occupational Safety and Health).

At least one JSA will be created for each Work Assignment with additional JSAs generated if needed to accommodate the scope of work.

2.4 Safety Meetings

Several different types of safety meetings will occur throughout the project. The purpose of safety meetings is to deliver a unified message and ensure that all project personnel are aware of different safety requirements for the project.

2.4.1 Daily Safety Meetings

Ramboll requires daily safety meetings, or Pre-Task Planners (PTP), that discuss the day's activities, associated hazards and steps to mitigate these hazards. PTPs must be conducted by each foreman for their crew at the start of each shift. They should be documented using a Ramboll ***Pre-Task Planner Form (Appendix 3).***

2.4.2 Weekly Toolbox Safety Meetings

Toolbox safety meetings are held at a minimum of once per week. The intent of the weekly toolbox meeting is to provide additional field safety training and review relevant safety topics for approximately 15 minutes and ensure that a consistent safety message is delivered to all site personnel on larger projects. When applicable, toolbox talks should also include statistics, incidents and near misses. All personnel should have a chance to discuss any safety concerns they have. Attendance will be documented on the **Safety Toolbox Meeting Form (Appendix 4)**.

Toolbox talks will only be required when field activities last five consecutive days or more.

2.4.3 Safety Stand Downs

Similar to toolbox safety meetings, safety stand downs are used to communicate a uniform message to all project personnel. However, safety stand downs are held to discuss recent near misses, incidents, or major upcoming changes to the work environment. Safety stand downs may also be held to celebrate project safety milestones. Safety stand down attendance must also be documented on the **Safety Toolbox Meeting Form (Appendix 4)**.

2.5 Safety Audits and Inspections

NOTE – Inspections will only be conducted if field work lasts more than 5 consecutive business days. Audits will only be conducted if the field work lasts more than 20 consecutive business days.

The Ramboll SSL will conduct daily walkthroughs of the work area and will note any deficiencies in a deficiency tracking log or their field notes. Safety Competent Persons designed by Ramboll subcontractors will also conduct daily inspections of their work areas.

The Ramboll HSS PM will conduct formal monthly audits for large scale projects lasting more than six weeks. These audits will be more thorough than the weekly inspections and will be conducted using *iAuditor* and an initial report will be sent to the Ramboll PM and SSL. Once all identified deficiencies have been addressed a final report will be issued showing all items closed out. The report should include the completed **Inspections Short Form (Appendix 5)**.

Weekly inspections and monthly audits will only be conducted for large, long term projects. Work assignments with small crews such as a geologist and a drilling subcontractor are exempt.

2.6 Personal Protective Equipment

Specific PPE requirements are outlined below but a general dress code for any work area includes long pants that must cover the top of ANSI-approved protective toe work shoe or boot, hard hat, ANSI Class 2 High-Visibility vest and safety glasses with rigid side shields. Shirts must have at least 4 inches of sleeve. ***Gloves are required for all tasks unless glove use is exempted on a JSA approved by Ramboll.*** The type of glove worn will be outlined in the task JSA and will be appropriate for the hazard created by the task. Subcontractors must specify additional PPE as appropriate for specific work methods, tools and equipment covered by their safety plans. Additional PPE that may be necessary is summarized in the following sections.

***NOTE**: When the project involves sampling for emerging contaminants that include per- and polyfluoroalkyl substances (PFAS) refer to Summary of Prohibited and Acceptable Items for PFAS Sampling (Appendix 6) for acceptable PPE.*

2.6.1 Head Protection

All project personnel are required to wear approved hard hats that meet ANSI Z89.1-2014 when overhead danger is present. Hard hats must be in good condition and be worn with brim to the front unless the manufacturer certifies the hard hat to be worn reverse when the harness is oriented properly. All hard hats must be current and not expired per the manufacturer's recommendation. Subcontractors will be required to submit manufacturer's certification upon request from Ramboll

2.6.2 Eye & Face Protection

Project personnel are required to wear approved ANSI Z87.1-2015 safety glasses with rigid side shields. Chemical goggles and a face shield are required during activities that have risk for chemical splash. ANSI Z87.1-2015 impact rated face shields, along with safety glasses, will also be required during activities that produce projectiles or sparks (chipping, grinding, etc.).

2.6.3 Hearing Protection

Approved hearing protection must be worn as specified in all posted areas and while working with or around high noise level producing tools, machines or equipment. In the absence of noise level monitoring all personnel will abide by OSHA's 5-foot rule of thumb. If personnel must raise their voice when talking to someone approximately 5 feet away, then hearing protection must be worn.

2.6.4 Finger, Hand, Wrist, & Arm Protection

Gloves suitable for the job being performed shall be worn at all times. ANSI Level 2 (or greater) cut resistant gloves are required for all tasks involving cutting with a blade where there is risk of cuts unless a different type of glove (*i.e.* chemical resistant) is required for the task. Tool holders should be used when driving stakes and wedges or when holding star drills, bull pins or similar tools.

Fixed blade knives (pocket knives, razor knives, etc.) are prohibited and must be substituted with safer tools (safety knives, scissors, etc.) unless the exempted in an approved JSA. The use of fixed blade knives will require the use of ANSI Cut Level A5 gloves and Kevlar forearm sleeves.

2.6.5 Foot Protection

All project personnel are required to wear footwear that is in accordance with ASTM F 2412 and F 2413. Rubber boots with safety toe protection are required on jobs subject to chemically hazardous conditions. Metatarsal protection should be worn when using jack hammers, tamps and similar equipment which has the potential for foot injury above the toes. Steel or composite-toed shoes are required for all personnel except electrical workers who are required to wear composite-toed shoes.

2.6.6 High Visibility Clothing

All personnel are required to wear a high-visibility shirt or vest that is yellow or orange in color. If work is to be performed in public roadways the shirt/vest must meet ANSI Class II high-visibility standards. Unless in a public roadway, high-visibility clothing is not required when working in remote areas or wearing chemical protective clothing (*i.e.* Tyvek). Exceptions to the high-visibility requirement for project-specific reasons should be identified in the JSA.

2.6.7 Respiratory Protection

Respirators (including SCBAs and airlines) if used by project personnel must meet NIOSH standards. Respirators must be inspected prior to use and stored in a dust-free container. Employees required to wear a respirator must have a physician's approval and be fit tested within the last year. Employees must be clean shaven in the facial area to obtain an acceptable seal. Subcontractors must keep respirator training, fit testing and medical clearance documentation on site for the duration of the project and available for Ramboll inspection.

2.6.8 Skin Protection

If the possibility of skin contact with chemicals, lead, asbestos or other hazardous material exists, then protective clothing will be worn. Exceptions or project-specific requirements should be outlined in the JSA.

- *Tyvek Coverall* – During any activity that could cause hazardous solids to contact clothing.
- *Tychem QC* (poly-coated Tyvek) or *Tychem SL* (Saranex) or equivalent – for liquid chemical exposures during all line breaking activities with a risk of splash.

NOTE: Neither of the above items can be used when the project involves sampling for emerging contaminants that include per- and polyfluoroalkyl substances (PFAS). See Summary of Prohibited and Acceptable Items for PFAS Sampling (Appendix 6) for acceptable alternatives.

2.6.9 Levels of PPE

The following table outlines the different levels of PPE as defined by the OSHA. All PPE must be compliant with the descriptions in the previous sections.

PPE Level	Description
Level A	Level B plus a fully encapsulating chemical protective suit
Level B	Level C plus a SCBA or supplied air respirator (with escape SCBA)
Level C	Modified Level D plus an air purifying respirator
Modified Level D	Level D plus chemical resistant clothing (nitrile gloves, Tyvek, etc.)
Level D	Hard hat, foot protection, eye protection and a high visibility vest, jacket, or shirt

2.7 Temporary Cords

Proper management of temporary cords and hoses is required to minimize the potential for slips and trips. The following guidelines should be implemented to the extent feasible:

- Cords and hoses must be run overhead if possible.
- Cords and hoses must be run out of aisles and sidewalks (*e.g.*, within six inches of a wall or toe board)
- Cords and small diameter hoses that cannot be run overhead or buried must be marked with cones, protected by hose ramps, or equivalent whenever cords cross aisles or sidewalks
- All temporary cords and hoses must be removed from equipment laydown areas when not in use

Cords also pose an electrical hazard if they are not protected from damage and inspected before each use. The following must be implemented to reduce shock hazards:

- Cords may not be run through doors or windows without being protected.
- Cords must not be run across walkways and stairs.
- Cords may not be run through standing water.
- Ground Fault Circuit Interrupters (GFCIs) are required on all extension cords and 120v hand tools and equipment.

***NOTE*: All flexible cords on site must be inspected prior to being used. Any damage to the insulation or prongs (chipped or missing prongs) must be tagged out of service and removed from site.**

2.8 Hot Work

Hot work includes any activities that generate an open flame, arc, or sparks. Hot work will typically include welding, cutting, soldering and grinding. Specific hot work requirements will be identified and approved on a Ramboll ***Hot Work Permit (Appendix 7)*** as outlined in the Pre-Work Planning section of this HASP.

***NOTE*: THE USE OF PORTABLE HEATING EQUIPMENT MUST BE APPROVED BY RAMBOLL**

- Print the names of all persons performing hot work on the permit. Only persons listed may perform hot work as authorized by the permit.

- Print the name of the fire watch on the permit. Changes in fire watch persons must immediately be noted on the permit. Fire watches are responsible for inspecting the site for evidence of fire or fire hazards associated with hot work activities.
  - Fire watches must be trained in basic first aid, fire extinguisher use and the worksite emergency action plan.
- Continue fire watch activities for 60 minutes after hot work activities have stopped.
- All combustible material must be removed from the hot work area when possible or protected from sparks and slag when located within 35 feet of hot work.
- At least one 20 lb. Type ABC fire extinguisher must be in possession of each individual identified as a fire watch. Subcontractors must provide their own fire extinguisher. The use of facility fire extinguishers is prohibited.
- All hot work areas shall be specified on the Hot Work Permit. Hot work shall NOT be conducted in additional areas without first notifying Ramboll and the Hot Work Permit is modified or a new permit is issued.
- Additional fire safety precautions may be specified on the permit and must also be implemented by site personnel.
- Prior to a Hot Work Permit being issued, all necessary tools and equipment must be in good condition and available for inspection.
- Continuous Lower Explosive Limit (LEL) monitoring is required in electrically classified areas. The LEL must stay <10%.

2.9 Fire Protection & Prevention

Hot Work Permits, subcontractor safety plans and JSAs may supplement basic fire safety requirements outlined below by establishing specific requirements throughout the course of the project as needed to ensure that personnel and property are adequately protected from potential fires. Emergency response associated with fires is covered in the Emergency Response (Section 6) section of this HASP. Basic fire protection requirements include:

- Construction heaters or other forms of heat generating equipment may only be used by subcontractors with prior approval from Ramboll.
- Fire hydrants and valves must not be obstructed or blocked. At least a 6-foot clearance must be maintained on all sides for emergency access.
- Subcontractors must inspect extinguishers monthly in addition to annual service provided by an extinguisher service company. Inspections and testing must be documented on weather-resistant tags or labels attached to each fire extinguisher.
- Only fire-resistant tarpaulins are allowed.

2.10 Fall Protection

Appropriate fall protection must be implemented in the following circumstances:

- An employee is working 6 feet or more above the ground.
- An employee is working on scaffolding without a 42-inch railing protection
- An employee is working in an aerial lift or scissors lift
- An employee is involved in assembly/disassembly of scaffolds, work platforms or temporary surfaces working 4 feet or more above the ground
- An employee is working over dangerous equipment/conditions (at any height)

- An employee is working on a walking/working surface or roof and is within 15 feet unprotected edge or floor opening/hole that will expose the employee to a fall greater than four feet.

Acceptable fall protection methods include:

- A properly manufactured/constructed, erected and secured ladder
- A properly manufactured and erected scaffold with complete guardrail system including top rail, mid rail and toe-boards and complete decking.
- Contractors working with properly inspected and operated mobile aerial lifts and elevated work platforms such as scissor lifts shall work within the confines of the basket or railings of the work platform and anchored to the manufacturer's designated anchor point utilizing a full body harness and appropriate lanyard.
- Full body harness (Class III) and lanyard secured to an anchor point that can withstand 5,000 lbs of force when used for fall arrest.
- Other methods to prevent falls include temporary guardrails, installation of hole covers, warning lines (15 ft. from the edge) and fall restraint lines.

When using a full body harness for fall protection, the contractor worker shall, always, be anchored off by at least one connection between his/her body harness and a secured building structural member or another fall protection device. Fall distance and fall arrest distance must be considered to ensure that the fall will be stopped before hitting the lower level. Shock-absorbing lanyards may only be used at heights greater than 17 ft. At heights less than 17’, a self-retracting lifeline must be used.
practices where possible.

2.11 Powered Industrial Trucks

Powered Industrial Trucks (PIT) such as forklifts (including rough terrain forklifts) must adhere to all requirements that are outlined in Section 2.14 Heavy Equipment. In addition:

- All operators must be certified in the type of PIT being used within the last three years
- Forks must be lowered when not in use
- Rigging directly to the forks is prohibited. A manufacturer’s approved lifting point or attachment must be used.
- All operators must know the capacity of the PIT and must not exceed it.
- If the load obstructs the view of the operator a spotter must be used.
- All PITs must undergo daily documented inspections.

2.12 High Hazard Power Tools

Some relatively common power tools are capable of causing serious injury and are classified by Ramboll as highly hazardous as outlined in Ramboll’s HSS Manual in a procedure called, “Power Tools-High Hazard”. Highly hazardous power tools include powder-actuated tools (Hilti), chainsaws, chop (or demo) saws, weed trimmers with blade cutter, die/end grinders, powered abrasive wheel tools, hand-held hydraulic rebar benders, portable HDPE fusion welder, portable circular saw, demo saws and band saws (portable & stationary).

Safer tools should be used when feasible. When the use of highly hazardous power tools is necessary, then they must be used in accordance with requirements in this HASP and Ramboll's "Power Tools-High Hazard" procedure with safety controls identified in JSAs which include the use of a highly hazardous power tool. At a minimum, tools must be operated in accordance with the manufacturer's safe operating guidelines. Prior to work when reviewing JSA requirements, users of highly hazardous power tools should review the Ramboll Safety Meeting Topic for applicable high hazard power tool listed above (or equivalent safety information). The applicable Safety Meeting Topic identifies key hazards and safety controls for each high hazard power tool.

The use of cut-off saws, also known as demo saws, is highly restricted. Safer tools must be used in their place.

2.13 Excavation

Ramboll employees will not assume the role of "Excavation Competent Person," unless authorized by the Project Manager and qualified as an Excavation Competent Person in accordance with Ramboll's Excavation Safe Work Practice . All excavation competent persons must be trained in Shoring and Excavation Safety, specifically in soil analysis, the use of protective systems and the requirements of 29 CFR 1926 Subpart P.

All excavations greater than 5 feet deep require sloping or shoring whenever persons enter excavations OR when adjacent structures may be affected by a cave-in. Subcontractors will identify in their safety plans or JSAs specific shoring systems or sloping/benching that will be used in specific areas. General excavation requirements are as follows:

- All utilities must be located prior to beginning excavation. If the excavation is located on a private facility, a private utility locating service must be used to locate utilities prior to beginning the excavation. Additionally, DigSafe must be notified at least 48 hour prior to beginning an excavation.
- Hand digging is required within 3 feet of all suspected utilities until they are located.
- Assume soil is Type C unless soil testing indicates otherwise and such testing is documented. Standard sloping and benching (per OSHA) will follow a 1:1.5 (V:H) cut-back associated with Type C soil.
- Shield/shore excavations >5 feet where personnel must enter and sloping is not feasible. Equipment used to shore excavations MUST follow OSHA shoring tables, or the subcontractor must have tabulated data from the manufacturer on site.
- If sections of trench are less than 5 feet AND no cave-in hazard exists, then shoring is not required.
- No workers may enter excavations until the designated Excavation Competent Person has inspected the excavations. All excavation inspections must be documented using the **Daily Excavation Checklist (Appendix 8)** with documentation remaining on site for the full project duration and made available for Ramboll review.
- A qualified engineer will design the protective system when excavations are greater than 20' in depth.
- Qualified engineers will evaluate excavations that could affect the stability of adjacent structures.
- A ladder or egress ramp will be provided within 25 feet of workers who must enter excavations that are 4 feet or greater in depth.

- Water will not be allowed to accumulate in trenches in a manner that will affect the integrity of excavation walls and shoring systems.
- All spoils will be kept a minimum of 2 feet from the edge of the excavation.
- Fall Protection will be provided around excavations left open during off-hours. Fall protection will consist of solid barricades (saw horses or portable chain link) or soft barricades (safety fence) off-set 6 feet from the edge.
- Blinking caution lights and/or adequate area lighting must be provided in conjunction with barricades to highlight the excavation area at night.
- Pedestrian Barricades – Portable chain link fence (48 inch high) or equivalent will be used to protect pedestrians. If pedestrian traffic is re-routed to avoid excavations, pedestrian detours must be accessible to bicyclists, handicapped persons and other pedestrian in the area who may have special needs.

2.14 Heavy Equipment

Project personnel may be exposed to "struck-by" injuries by walking in close proximity to heavy equipment and "crush" injuries if caught between heavy equipment (or counterweights) and a fixed object. Subcontractors must comply with requirements in this section, general heavy equipment requirements include:

- Keys must be left in equipment. All vehicles and heavy equipment must be turned off when left unattended.
- Subcontractors shall submit a letter on company letterhead that designates which of their employees is competent and authorized to operate each type of equipment present on this project. The documentation must include;
  - Employees name
  - Instructors name
  - Date of Training
  - Level of training
  - Level of training
  - Method used to verify comprehension
  - Credentials of the instructor
- Forklift operators must have a license or certificate that indicates they have passed a written test and "road" test for the type of forklift they will be operating.
- Operators will use seatbelts if so equipped. Heavy equipment will be equipped with overhead and rollover protection whenever feasible.
- Heavy equipment must be equipped with backup alarms, horns and other safety devices installed by the manufacturer.
- Vehicles operated at night must have headlights, tail lamps and reflectors. Safety devices must not be disabled.

Heavy equipment must undergo an "Acceptance Inspection" conducted by the owners/renters management when first mobilized to the site. Inspections must be documented using a checklist that is acceptable to Ramboll. Ramboll may perform the "Acceptance Inspection" or may delegate the inspection to the subcontractor superintendent/foreman who will submit documentation to Ramboll when complete. Defective equipment must be "rejected" and removed from site or repaired before being placed in service.

Heavy equipment must also be inspected daily by a qualified operator or mechanic. Inspections must be documented using a ***Ramboll Heavy Equipment Checklist*** that is specific to that type of heavy equipment or an acceptable alternative. Documentation must be maintained on site and available for inspection by Ramboll.

Any heavy equipment on site for more than 30 days must be on a written preventative maintenance schedule that is in accordance with the manufacturer’s requirements. The preventative maintenance schedule and documentation of completed preventative maintenance must be retained on site and available for inspection by Ramboll.

Persons working around heavy equipment must implement the “25 Foot Rule.” The 25 Foot Rule requires that persons get the operators attention and permission prior to approaching closer than 25' to heavy equipment. Persons must walk quickly through blind spots. Loitering in heavy equipment blind spots (especially to the rear) must be avoided.

It is assumed that temporary fuel storage tanks will not be used. If they become necessary, this HASP will be updated.

2.15 Drilling Safety

Unless outlined in this section all drilling equipment must abide by the same requirements for heavy equipment as outlined in Section 2.14. The identification of utilities and subsurface structures must be consistent with the requirements outlined in Section 2.13.

Drilling equipment may only be operated by personnel who possess the required state or local license, if applicable. The operator’s certifications must be submitted to Ramboll. The drilling equipment shall be operated, inspected and maintained as specified in the manufacturer's operating manual. A copy of the manual will be available at the job site.

2.15.1 Drilling JSAs

Prior to initiating rock, soil, and/or concrete drilling operations, a JSA must be developed for the work. The JSA shall address, as a minimum:

- All overhead electrical lines/hazards
- Any subsurface obstruction in the soil
- Utilities both above and below grade
- Designated areas for equipment operations and material storage
- Operation of rock, soil, and concrete drilling equipment and handling of associated materials
- A hard copy of the Safety Data Sheet (SDS) for drilling fluids and materials, if required

2.15.2 Safe Drilling Procedures

The following must be adhered to for all drilling activities:

- Drilling equipment must be equipped with emergency shutoffs and all personnel must be informed of their location
- Equipment must be set up on stable ground and maintained level. Integrated jacks, out-riggers or suitable cribbing must be used when necessary
- Powerline safety procedures outlined in Section 2.16 must be adhered to.
- Operators must not wear loose equipment or clothing

- Operators must ensure that all personnel are clear from dangerous parts of the equipment prior to starting it.
- The rig must not be moved with the mast erected or partially erected
- Hoists must only be used for their intended purpose
- Wire cables must be inspected daily. Any wire cable found to be defective must be removed from service.

2.16 Powerline Safety

OSHA requires that all equipment maintain a minimum clearance distance of 10 feet, an additional 0.4 inches per kV is required for lines greater than 50kV. Ramboll requires that a safe clearance of 20 feet be maintained at all times around power lines (horizontal and vertical). If work is required to be conducted within 20 feet of the powerline one of the following requirements must be implemented if the line cannot be deenergized:

- Request the utility owner install insulating sleeves or warning flags
- Install a barricade that equipment will strike prior to entering the OSHA minimum clearance distance.
- Designate a spotter who does not perform any other duties to warn the equipment operator before they enter the OSHA minimum clearance distance. The spotter must:
  - Be equipped with a visual aid to assist in identifying the minimum clearance distance
  - Use equipment that enables the spotter to directly communicate with the operator
  - Give timely information to the operator so that minimum clearance distances can be maintained.

At no time may the OSHA minimum clearance be violated unless the line has been deenergized.

2.17 Traffic Safety

If work is to occur within a public roadway all local requirements and requirements outlined in Part 6 of the DOT’s Manual on Uniform Traffic Control Devices (MUTCD) and local ordinances, if applicable. Any road closures must be coordinated with local authorities. In general, the following is required:

- All traffic control devices and signs must be installed immediately before need and promptly removed when they are no longer required.
- Barriers and signs must be clean and legible. They must be placed where they can be visible at all times.
- Any person who will act as a flagger or signal person must have DOT Flagger Training
- ANSI Class 2 high visibility vests must be worn unless road speeds exceed 50 mph, in which case ANSI Class 3 vests must be worn.
- Any vehicle that will be entering roadway work zones or park vehicles that encroach on public roadways must be equipped and use amber construction-type high intensity, flashing, oscillating or strobe lights.

2.18 Housekeeping & Material Storage

The site shall always be maintained in a clean and orderly condition. Decontamination areas shall be free of waste materials, debris, and rubbish that will be removed on a daily basis. Waste materials shall be placed in appropriate waste receptacles for off-site disposal or recycling. Materials and equipment shall not obstruct traffic or emergency response activities at any time. Each subcontractor will have a designated lay-down area for the storage of their project materials. The general laydown area will be designated on the Work Assignment specific JSA. It is the responsibility of the subcontractor to maintain cleanliness of their area. Unused tools and materials shall be returned to lay-down areas daily.

2.19 Hazard Communication and SDSs

Each subcontractor is responsible for having and administering a Hazard Communication Program (Global Harmonization Program) that requires all employees to be informed about the hazards associated with chemicals used on the job and the location of the safety data sheets (SDSs) for all materials brought on site.

SDSs shall be requested from vendors for materials procured for the current project from all suppliers of paints, coatings, adhesives, grout, caulk, lubricants, welding products, solvents, insulation and similar products prior to being brought on-site. A copy of SDSs will be stored in the Ramboll project office.

All containers must be appropriately labeled as to their contents in accordance with the Global Harmonization System. The label must include the name of the chemical as it appears on the SDS and the hazard warnings appropriate for the chemical. If a container is going to be used to hold something other than what it is labeled for, the label must be "blacked out" and the container re-labeled to its contents.

2.20 Decontamination

Decontamination procedures will be specific to each Work Assignment and will be outlined in the associated JSA.

Decontamination of personnel will take place in the CRZ. PPE will be removed and disposed of and boots will be cleaned. Personnel will have access to supplies for cleaning the hand, face and any other body part that may have been exposed to contamination. Any non-disposable equipment will be cleaned with an agent that is suitable for the anticipated contamination. Heavy equipment, such as a drill rig, will be decontaminated by the subcontractor using acceptable methods.

In the event that emergency decontamination is required normal decontamination procedures will not apply.

All used PPE and decontamination solutions will be containerized and disposed of in accordance with the type of contamination that is anticipated.

2.21 Biological Hazards

The following are biological hazards that may be encountered.

2.21.1 Ticks

Ticks are small, ranging from the size of a comma up to about one quarter inch. They are sometimes difficult to see. The tick season extends from spring through autumn (April through October). When embedded in the skin, they may look like a freckle. The most common disease associated with ticks is Lyme disease, but ticks carry many different diseases.

Standard field gear (work boots, socks and light-colored coveralls) provides good protection against tick bites, particularly if the joints are taped. However, even when wearing field gear, the following precautions shall be taken when working in areas that might be infested with ticks:

- Tyvek or Light polyspun coveralls are required when working in areas with overgrown brush.
  NOTE*: *Tyvek CANNOT be used when the project involves sampling for emerging contaminants that include per- and polyfluoroalkyl substances (PFAS). See Summary of Prohibited and Acceptable Items for PFAS Sampling (Appendix 6) for acceptable alternatives.
- Wear long pants and long-sleeved shirts that fit tightly at the ankles and wrists; tape cuffs if necessary.
  NOTE*: *Clothing made of many synthetics and water repellent fabrics are not allowed to be used when the project involves sampling for emerging contaminants that include per- and polyfluoroalkyl substances (PFAS). See Summary of Prohibited and Acceptable Items for PFAS Sampling (Appendix 6) for acceptable alternatives.
- Wear light colored clothing so ticks can be easily spotted.
- Tick repellents (DEET and Permethrin) must be used when walking in all overgrown areas. DEET (>20%) is a tick repellant. Permethrin, the active ingredient found in the product Permanone, kills ticks on contact. DEET may be used on the skin; Permethrin may only be applied to clothes. Spray outer clothing, particularly your pant legs and socks, BUT NOT YOUR SKIN, with an insect repellant that contains Permethrin or Permanone.
  NOTE*: *Some insect repellents are not allowed to be used when the project involves sampling for emerging contaminants that include per- and polyfluoroalkyl substances (PFAS). See Summary of Prohibited and Acceptable Items for PFAS Sampling (Appendix 6) for acceptable alternatives.
- Inspect clothing frequently.
- Inspect head and body thoroughly when you return from the field, particularly your lower legs and areas covered with hair.
- When walking in wooded areas, wear a hard hat, and avoid contact with bushes, tall grass, or brush as much as possible.
- Remove any ticks by tugging with tweezers. Do not squeeze or crush the tick. DO NOT use matches, a lit cigarette, nail polish, or any other type of chemical to "coax" the tick out.
- Be sure to remove all parts of the tick's body and disinfect the area with alcohol or a similar antiseptic after removal.
- Immediately call WorkCare.

2.21.2 Insect Bites/Stings

Bees and other stinging insects may be present where field work occurs. Contact with stinging insects like bees, hornets and wasps may result in project personnel experiencing adverse health effects that range from being mildly uncomfortable to being life-threatening. Therefore, stinging insects present a serious hazard to project personnel, and extreme caution must be exercised whenever project and weather conditions increase the risk of encountering stinging insects. Some of the factors related to stinging insects that increase the degree of risk associated with accidental contact are as follows:

- The nests for these insects are frequently found in remote wooded or grassy areas. In some instances, nests can be found beneath the covers of protective casings installed over wellheads. Precautions should be taken when unlocking and opening these covers.
- The nests can be situated in trees, rocks and bushes or in the ground, and are usually difficult to see.
- Accidental contact with these insects is highly probable, especially during warm weather conditions when the insects are most active.
- If a worker accidentally disturbs a nest, the worker may be inflicted with multiple stings, causing extreme pain and swelling which can leave the worker incapacitated and in need of medical attention.
- Some people are hypersensitive to the toxins injected by a sting, and when stung, experience a violent and immediate allergic reaction resulting in a life-threatening condition known as anaphylactic shock. Anaphylactic shock manifests itself very rapidly and is characterized by extreme swelling of the body, eyes, face, mouth and respiratory passages.
- The hypersensitivity needed to cause anaphylactic shock can in some people accumulate over time and exposure. Therefore, even if someone has been stung previously and not experienced an allergic reaction, there is no guarantee that they will not have an allergic reaction if they are stung again.

With these things in mind, and with the high probability of contact with stinging insects, all project personnel will comply with the following safe work practices:

- If a worker knows that they are hypersensitive to bee, wasp, or hornet stings, they must inform the SSL of this condition prior to participation in Site activities and provide instructions on appropriate care in the event that they are stung. Project personnel with serious allergies (*i.e.*, likely to require hospitalization if stung a few times) should make the SSL aware of their condition.
- All project personnel will be watchful for the presence of stinging insects and their nests and will advise the SSL if a stinging insect nest is located or suspected in the area.
- Any nests located on Site will be flagged off and project personnel will be notified of its presence.
- If stung, project personnel will immediately report to the SSL to obtain first aid treatment and will then call WorkCare. If the person stung is known to have violent allergic reactions, then medical treatment should be sought.
- Project personnel with a known hypersensitivity to stinging insects will keep required emergency medication on or near their person at all times.

2.21.3 Poisonous Plants

Poison ivy, poison oak and giant hogweed may be present at work locations. Poison ivy thrives in all types of light and usually grows in the form of a trailing vine; however, it can also grow as a bush and can attain heights of 10 feet or more. Poison ivy has shiny, pointed leaves that grow in clusters of three; however, some variations have five leaflets. Poison oak resembles poison ivy except that the poison oak leaves are more rounded rather than jagged like poison ivy, and the underside of poison oak leaves are covered with hair.

Giant hogweed is s a VERY LARGE, invasive plant that can cause painful burns and permanent scarring. Brushing against or breaking the plant releases sap that, combined with sunlight and moisture, can cause a severe burn within 24 to 48 hours. Giant hogweed is a biennial or perennial herb in the carrot family (Apiaceae) which can grow to 14 feet or more. Its hollow, ridged stems grow 2-4 inches in diameter and have dark reddish-purple blotches. Its large compound leaves can grow up to 5 feet wide. Its white flower heads can grow up to 2 1/2 feet in diameter. Some other plants look very similar. Photographs of these plants and the other poisonous plants are provided in the **Field Identification Guide (Appendix 9)**.

The skin reaction associated with contacting these plants is caused by the body's allergic reaction to toxins contained in oils produced by the plant. Becoming contaminated with the oils does not require contact with just the leaves. Contamination can be achieved through contact with other parts of the plant such as the branches, stems or berries, or contact with contaminated items such as tools and clothing. The allergic reaction associated with exposure to these plants will generally cause the following signs and symptoms:

- Blistering at the site of contact, usually occurring within 12 to 48 hours after contact.
- Reddening, swelling, itching and burning at the site of contact.
- Pain, if the reaction is severe.
- Conjunctivitis, asthma and other allergic reactions if the person is extremely sensitive to the poisonous plant toxin.
- If the rash is scratched, secondary infections can occur. The rash usually disappears in one to two weeks in cases of mild exposure and up to three weeks when exposure is severe.

The best treatment is to remove the irritating oil before it has had time to cause inflammation. This is best accomplished by immediately washing the affected area with rubbing alcohol or alcohol-containing disinfecting wipes followed by washing with soap and water. Rubbing alcohol can be diluted not more than 1:1 and still be effective. A visual inspection and identification of the plants should be completed prior to starting work so that all individuals are aware of the potential exposure. Preventive measures, which can prove effective for most project personnel are:

- Avoid contact with any poisonous plants on and keep a steady watch to identify report any poisonous plants to the SSL.
- Wash hands, face or other exposed areas at the beginning of each break period and at the end of each workday.
- Use isopropyl alcohol followed by soap and water
- Avoid contact with, and wash on a daily basis, contaminated tools, equipment and clothing.
- Use isopropyl alcohol followed by soap and water
- Keeping the skin covered as much as possible (*i.e.*, long pants and long sleeved shirts) in areas where these plants are known to exist will limit much of the potential exposure.
- If activities will result in possible contact with the plants then Tyvek coveralls must be worn.

2.21.4 Bears

Bears and other potentially aggressive animals may be present in our work areas. The bear population is much higher in the Adirondacks, but they are present in other parts of the state. In general, bears will avoid humans if they hear humans coming, but the following precautions should be followed when working in an area where bears may be present.

- Always travel in groups and be extra cautions around food sources such as berry bushes.
- Keep food in secured in vehicles
- Carry bear spray and be familiar with its use. Bear spray should be kept in an easily accessible location
- If a bear is spotted the following measures should be taken.
- Use noise to scare the bear away
- Stay calm and walk slowly backwards while talking in a loud calm voice. NEVER TURN YOUR BACK ON THE BEAR
- If a bear charges you stand your ground and use bear spray when the bear is at the distance specified by the manufacturer
- If a bear follows you, stand your ground and try to intimidate the bear, prepare to use bear spray.

2.22 Work Over/Near Water

For Work Assignments requiring working over, near or adjacent to water (within 6 feet), or where the danger of drowning exists, shall implement the following requirements:

- All personnel must wear a Personal Flotation Device (PFD) that is approved by the US Coast Guard for the type of work being conducted.
    - PFDs must be inspected prior to use by the user. Defective PFDs must be removed from service immediately.
- A ring buoy with at least 90’ of line must be provided every 200’ and available for emergency rescue operations
- At least one lifesaving skiff must be immediately available unless exempt. Rescue skiffs are exempt if one or more of the following applies:
    - Water is not navigable or is so shallow that rescuers could run in and the skiff would foul on the bottom.
    - Work being performed is non-construction work (*i.e.* field engineering, studies and investigations) unless the non-construction activity is being conducted in support of construction work.
    - Work is being performed a vessel that meets the same requirements as a rescue skiff.
- If a severe downstream hazard exists (*i.e.* dams, waterffalls, etc.) additional controls need to be implemented as outlined in the Ramboll Working Over or Near Water SWP.

2.22.1 Work in Shallow Water

Work in shallow water is walking or wading into small streams, wetlands, and other shallow bodies of with a significant drowning hazard. There is no regulatory definition for shallow water, for the purpose of this HASP shallow water is defined as up to waist deep. The same requirements as above apply, except as modified:

- Use waders to minimize exposure, reduce the potential for hypothermia and minimize contact with contaminated sediment.
- Implement the buddy system or use a shore based observer.
- Provide a life ring only if a rescue skiff is applicable otherwise it is not required.

2.22.2 Work on Surface Waters (Small Watercraft)

Governmental laws and regulations regarding onshore waters are generally under the jurisdiction of the Unites States Coast Guard and State agencies. However, OSHA may exercise regulatory authority on small watercraft operating on inland waters, State territorial seas and waters that are not U.S. navigable waters (as determined by the U.S.C.G.). The following procedures will be observed when conducting work activities in "open water" conditions in small watercraft:

- Monitor weather conditions. No on-water work may occur is there is a "Small Craft Advisory" issued by the National Oceanic and Atmospheric Administration National Weather Service.
- Monitor operation of other vessels in the area, especially larger commercial shipping vessels. Coordinate with the appropriate agency if necessary
- The small craft must be equipped with all emergency equipment required on a rescue skiff.
- Inspect the condition of the craft prior to launching, especially the outboard motor.
- Secure overboard equipment to the vessel

2.23 General Worker Safety Rules

Workers follow the established safety practices for their respective tasks. The need to exercise caution in the performance of work is made more acute due to weather conditions and restrictions in mobility, peripheral vision and communication caused by the personal protective equipment.

To enhance site safety, the following general worker safety and site procedures have been established:

- No firearms or weapons may be brought on site.
- Employ the buddy system when appropriate. Be alert.
- Minimize contact with contaminated materials.
- Avoid breathing chemical odors.
- Hands must be washed before eating or drinking and after using toilets, and at the end of the work day.
- Consumption of alcohol or intoxication (under the influence or impaired) during work hours or while on site is prohibited.
- Working when ill is prohibited.

3. CONTAMINANTS OF CONCERN

The OSHA HAZWOPER standards (29CFR1910.120 and 1926.65) and OSHA Hazard Communication Standard require that site personnel, subcontractors and visitors must be informed of chemical hazards associated with their work area. Contaminants of concern will be outlined in the JSA for the specific Work Assignment, but common contaminants are outlined in the table below

Chemical	**PEL**	**IDLH**	**Characteristics**	**Routes of Exposure**	**Symptoms of Exposure & Health Effects**
Tetrachloroethylene (PCE)	100 ppm	NA	Colorless liquid with a mild, chloroform-like odor	Inhalation, skin absorption, ingestion, eye contact	Irritation eyes, skin, nose, throat, respiratory system, nausea, CNS depression, liver damage
Trichloroethylene (TCE)	100 ppm	1000 ppm (Ca)	Colorless liquid with a chloroform-like odor	Inhalation, skin absorption, ingestion, eye contact	irritation eyes, skin; headache, CNS Depression, nausea, vomiting; cardiac arrhythmias, liver injury; [potential occupational carcinogen]
1,2-Dichloroethylene (DCE)	200 ppm	1000 ppm	Colorless liquid with a slightly acrid, chloroform-like odor	Inhalation, skin absorption, ingestion, eye contact	irritation eyes, respiratory system; central nervous system depression
Vinyl Chloride	1 ppm 5 ppm (STEL)	NA	Colorless gas or liquid with a pleasant odor at higher concentrations	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]
1,1,2-Trichloroethane	10 ppm	100 ppm (Ca)	Colorless liquid with a sweet, chloroform-like odor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, nose; central nervous system depression; liver, kidney damage; dermatitis; [potential occupational carcinogen]
1,1-Dichloroethane	100 ppm	3000 ppm	Colorless, oily liquid with a chloroform-like odor.	inhalation, ingestion, skin and/or eye contact	irritation skin; central nervous system depression; liver, kidney, lung damage
Chloroethane	1000 ppm	3800 ppm [10% LEL]	Colorless gas or liquid (below 54°F) with a pungent, ether-like odor	inhalation, skin absorption (liquid), ingestion (liquid), skin and/or eye contact	incoordination, inebriation; abdominal cramps; cardiac arrhythmias, cardiac arrest; liver, kidney damage
1,4-Dioxane	100 ppm	500 ppm (Ca)	Colorless liquid or solid (below 53°F) with a mild, ether-like odor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, nose, throat; drowsiness, headache; nausea, vomiting; liver damage; kidney failure; [potential occupational carcinogen]

Chemical	PEL	IDLH	Characteristics	Routes of Exposure	Symptoms of Exposure & Health Effects
Benzene	1 ppm 5 ppm (STEL)	500 ppm (Ca)	Colorless to light-yellow liquid with an aromatic odor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]
Toluene	200 ppm	500 ppm	Colorless liquid with a sweet, pungent, benzene-like odor.	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage
Ethylbenzene	100 ppm	800 ppm [10% LEL]	Colorless liquid with an aromatic odor.	inhalation, ingestion, skin and/or eye contact	irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma
Xylene	100 ppm	900 ppm	Colorless liquid with an aromatic odor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis
PCB	1 mg/m^3 (42% Cl) 0.5 mg/m^3 (54% Cl)	5 mg/m^{3}g (Ca)	Colorless to light-colored, viscous liquid with a mild, hydrocarbon odor.	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes; chloracne; liver damage; reproductive effects; [potential occupational carcinogen]
Lead	0.050 mg/m^3	100 mg/m^3	A heavy, ductile, soft, gray solid.	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 eyes; hypertension

Footnotes

All values are 8-hour time-weighted averages (TWAs) unless otherwise indicated.

- PEL: Permissible Exposure Limit, the concentration an employee may be exposed to for an 8-hour work day for a 40 hour work week for which nearly all employees may be repeatedly exposed without adverse health effects;
- IDLH: IMMEDIATELY Dangerous to Life and Health, contaminant concentration which present the possibility for severe health consequences if exposed to the IDLH concentration without the appropriate personal protective equipment (PPE),
- Units: mg / m3 = milligrams per cubic meter of air; f / cc = fibers per cubic centimeter of air; µg/m3 = micrograms per cubic meter of air
- (Ca): Exposure limit published by the State of California
- NA: Not Available
- STEL: Short-Term Exposure Limit. The maximum concentration an employee can be exposed to for a 15-minute period regardless of exposure the rest of the employees shift.

4. EMPLOYEE AIR MONITORING & EXPOSURE SAMPLING

Air monitoring may be conducted during intrusive activities or as a part of a Community Air Monitoring Program. All air monitoring must have a current calibration from the manufacturer and undergo a daily field calibration. The Work Plan and/or JSA specific to the Work Assignment will outline air monitoring requirements based on site conditions and contaminants of concern.

5. MEDICAL MONITORING

Medical surveillance requirements are required by OSHA for persons who are working under the HAZWOPER standard, exposed to lead (above OSHA action levels), perform asbestos abatement, wear respirators, perform hazardous waste work, and other activities. Subcontractors are required to have medical surveillance that complies with OSHA regulations.

5.1 Fitness for Respirator Use

Persons who may wear respiratory protection must be provided respirators as regulated by 29 CFR 1926.103 and 29 CFR 1910.134. This Standard requires that an individual's ability to wear respiratory protection be medically certified before he / she perform designated duties. Where medical requirements of 29 CFR 1926.65 overlap those of 29 CFR 1910.134, the more stringent of the two will be enforced. Documentation of respirator use clearance must be maintained on-site for all project personnel who may be required to wear a respirator.

5.2 Medical Surveillance

Medical surveillance examinations are required by OSHA regulations for several different types of work, including conducting hazardous waste work, asbestos abatement and lead work. They are administered on a pre-employment and periodically thereafter and as required by applicable regulations. Medical exams must be administered by a board-certified (or one who is eligible for board certification) physician in Occupational Medicine. The examining physician is required to make a report to the employer of any medical condition which would place employees at risk when wearing a respirator, wearing other personnel protective equipment, or working with hazardous materials. Subcontractors must maintain medical records in accordance with OSHA regulations. Documentation of medical clearance to perform regulated work activities must be maintained on site for all project personnel who may perform regulated work.

5.3 Heat Stress Monitoring

Heat stress monitoring must be considered when ambient temperature is above 80°F under normal circumstances and 70°F when personnel are wearing protective clothing, such as Tyvek suits. One of the following methods must be used:

5.3.1 Monitoring Heart Rate

Heart rate should be measured by the radial pulse for a 30 second period as early as possible in the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work cycle by one-third and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following cycle by one-third.

5.3.2 Monitoring Oral Temperature

Oral temperature should be measured at the end of the work period (before drinking). If oral temperature exceeds 99.6°F, shorten the next work cycle by one-third without changing the rest period. If the oral temperature still exceeds 99.6°F at the beginning of the next rest period, shorten the next work cycle by one-third. Do not permit a worker to wear a semi-permeable or impermeable garment when his / her oral temperature exceeds 100.6°F.

5.3.3 Monitoring Heat Stress Index

Implement heat stress precautions in accordance with the Heat Stress Index of the work area as follows.

Heat Index Chart Temperature (°F) vs. Relative Humidity	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%
115	111	115	120	127	135	143	151								
110	105	108	112	117	123	130	137	143	151						
105	100	102	105	109	113	118	123	129	135	142	149				
100	95	97	99	101	104	107	110	115	120	126	132	136	144		
95	90	91	93	94	96	98	101	104	107	110	114	119	124	130	136
90	85	86	87	88	90	91	93	95	96	98	100	102	106	109	113
85	80	81	82	83	84	85	86	87	88	89	90	91	93	95	97
80	75	76	77	77	78	79	79	80	81	81	82	83	85	86	86
75	70	71	72	72	73	73	74	74	75	75	76	76	77	77	78

Heat Index/Heat Disorders	
Heat Index	**Possible heat disorders for people in higher risk groups**
DANGER 130 or higher	Heatstroke/sunstroke highly likely with continued exposure. • **Moderate and strenous outdoor activity prohibited**
WARNING 105-130	Sunstroke, heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity. • **Strenuous outdoor activity while wearing Tyvek is prohibited without the use of personal cooling devices.** • **Workers must drink every 15 minutes or more frequently at their discretion** • **Air conditioned break areas must be available.**
CAUTION 90-105	Sunstroke, heat cramps and heat exhaustion possible with prolonged exposure and/or physical activity. • **Strenuous outdoor activity while wearing Tyvek is prohibited above a HSI of 99 without the use of personal cooling devices and is recommended for lower HSI.** • **SSL to monitor employees for symptoms of heat stress.** • **Workers must drink every 30 minutes or more frequently at their discretion.** • **Air conditioned break areas must be made available for morning, lunch, and afternoon breaks.**
CONCERN 75-90	Fatigue possible with prolonged exposure and/or physical activity. • **SSL to monitor employees for symptoms of heat stress.** • **Workers must drink every 60 minutes or more frequently at their discretion.** • **Shaded break areas must be made available for morning, lunch, and afternoon breaks. Air conditioning is recommended.**
Source: National Weather Service [Modified – The initial HSI for the lowest ("CONCERN") heat stress category was reduced from 80 to 75 because of the potential for increased heat stress when wearing Tyvek.]	

5.3.4 Preventing Heat Stress

Knowing the symptoms of heat stress is crucial to preventing injury to project personnel. Some of the symptoms of heat stress include:

- An elevated heart rate, lack of concentration, difficulty focusing on a task, fatigue
- Irritability and/or sickness

- Cramps, rash, headache
- Loss of desire to drink water
- Fainting
- Skin clammy, moist and pale (severe heat exhaustion)
- Skin extremely dry and red (heat stroke).

The following techniques can be used to prevent heat related illnesses:

- *Acclimatize* - When high heat stress conditions arise, employees should be exposed to the heat for short work periods followed by longer periods of rest. Acclimatization usually takes five (5) days and should be provided for all new employees and employees returning from an absence of two (2) weeks or more. Contact HSS Americas for proper procedures.
- *Hydration & Pace of Work* - Make sure all employees intake plenty of water throughout the work day (sometimes as much as a quart per worker per hour) and let employees know where the drinking water is located. Adjust your work pace and expectations on how much work can be done during periods of high heat stress. Workers cannot do as much during periods of high heat stress compared with similar periods of low heat stress. After acclimatization, workers may be able to resume a more "normal" work pace as long as fluid intake is adequate.
- *Work/Rest Periods* - If possible, heavy work should be scheduled during the cooler parts of the day (*i.e.*, early morning) and rest periods should be taken in cool areas for longer periods. The length of work/rest periods will be dictated by the heat stress monitoring results.
- *Personal Protective Equipment (PPE)* – Although the use of PPE, such as Tyvek suits, can lead to an increase in heat stress PPE is available that will help reduce heat stress. Several different styles of body cooling systems are available and should be considered when there is a high Heat Index.

5.3.5 First Aid for Heat Stress

Mild heat stress: Immediately bring employee to a cool place and have them rest and drink liquids. Provide off-site medical attention for employees who do not fully recover within one (1) hour.

Severe Heat Stress/Heat Stroke: If an employee faints, experiences coordination problems, stops sweating or appears confused or disoriented, then immediately contact emergency services. If employee is suspected of heat stroke, soak employee in their clothes in cool water and contact emergency services. A person afflicted with heat stroke may die if not promptly treated.

5.4 Cold Stress Monitoring

Cold stress is defined as a decrease in core body temperature to 96.8 deg. F and / or cold injury to body extremities. Decreases in core body temperature are associated with reduced mental alertness, reduction in rational decision making, or loss of consciousness in severe cases. Symptoms of cold stress include pain in extremities (*i.e.* hands and feet) and severe shivering. If workers experience these symptoms, then stop work and implement the following controls.

- Workers must don adequate dry insulating clothing; and
- Adjust the work / rest schedule to increase the amount of rest / rewarming time.

- Toolbox safety meetings discussing symptoms of cold stress, clothing requirements, and work breaks must be held when the wind chill temperature drops below 0 deg. F and EACH DAY the wind chill temperature is below 25 deg. F.

The wind chill index provided below shows the effective cooling on exposed skin. When the wind blows across the skin, it removes the insulating layer of warm air adjacent to the skin. When all factors are the same, the faster the wind blows, the greater the heat loss, which results in a colder feeling. Wind chill temperatures that are 25°F below zero or are extremely dangerous. Workers must protect any exposed skin, especially the face, ears and fingers.

Wind Chill Chart (Temperature vs Wind Speed)							
Wind Speed-mph							
Calm	**5**	**10**	**15**	**20**	**25**	**30**	**35**
Temperature (Degrees F)	**Wind Chill**						
45	43	34	29	26	23	21	20
40	37	28	23	19	16	13	12
35	32	22	16	12	8	6	4
30	27	16	9	4	1	-2	-4
25	22	10	2	-3	-7	-10	-12
20	16	3	-5	-10	-15	-18	-20
15	11	-3	-11	-17	-22	-25	-27
10	6	-9	-18	-24	-29	-33	-35
5	0	-15	-25	-31	-36	-41	-43
0	-5	-22	-31	-39	-44	-49	-52
-5	-10	-27	-38	-46	-51	-59	-64
-10	-15	-34	-45	-51	-59	-64	-67
-15	-21	-40	-51	-60	-66	-71	-74
-20	-26	-46	-58	-67	-74	-79	-82
-25	-31	-52	-65	-74	-81	-86	-89

6. EMERGENCY RESPONSE PLAN

This emergency response section details general actions to be taken in the event of site emergencies, specific emergency response procedures will be outlined in the JSA specific to the Work Assignment.

The SSL is responsible for implementation of emergency response procedures and will ensure that a First Aid/CPR trained person is on site at all times when work activities are in progress.

6.1 Emergency Phone Numbers & Notifications

To be posted or provided on site. Emergencies encountered on this site will be responded to by a combination of off-site emergency services and site personnel.

Emergency Number	
Site Address	**Phone Number**
TBD	911

Emergency Notifications		
Fire, Explosion, Emergency Medical, OSHA-Recordable Injuries, Spills		
NYSDEC		
Project Manager:		**Cell:**
Safety:		**Cell:**
Ramboll		
Project Officer;	Imants Reks	**Cell: 315-391-6628**
Program Manager:	Deborah Wright	**Cell: 315-546-4541**
SSL	TBD	**Cell:**
HSS PM:	Drew Walier	**Cell: 315-380-8477**
HSS Americas Operations Manager:	Jeffrey Parsons	**Cell: 315-391-0638**
Regulatory Agencies		
OSHA – TBD	Ramboll to notify OSHA… • Within 8 hrs for any fatality • Within 24 hrs for any in-patient hospitalization, amputation, or loss of an eye	**Phone:**
Local Hospital	TBD	**Phone:**
Occupational Clinic	TBD	**Phone:**
Minor medical injuries for Ramboll employees	WorkCare	**Phone:** 888-449-7787

6.2 Emergency Route

Emergency routes will be outlined in the Work Assignment specific JSA.

6.3 Emergency Inventory

Ramboll and its subcontractors will maintain the following equipment at a minimum:

- An ANSI Z308.1 Class B compliant first aid kit
- 20lb ABC fire extinguisher(s) located within 25’ of hot work
- Spill Control Kit(s)

6.4 General Emergency Response Plans

6.4.1 Evacuation Signal

Verbal communication will act as the emergency evacuation signal on site.

Do NOT leave site vehicles or equipment on access roads and emergency exits such that emergency response vehicles or personnel may be obstructed.

6.4.2 Muster Point

The muster point will be outlined in the Work Assignment specific JSA

6.5 Calls for Emergency Support

When necessary, the SSL will coordinate the arrival of on-site emergency personnel. The SSL or designee will briefly explain the nature of the emergency and site conditions as follows:

- Indicate his/her name
- Location of emergency
- Description of emergency conditions that may require special rescue equipment, such as confined spaces; excavations and elevated work platforms
- Potential chemical hazards and recommended PPE
- Emergency decontamination procedures

6.6 Fire & Explosion Response Plan

<u>NOTE</u>: Trained site personnel may respond to incipient stage fires using a 20lb Type ABC dry chemical fire extinguisher. Personnel shall only attempt to extinguish the fire if it is safe to do so.

All fires or explosions must be reported to the Ramboll Project Manager, SSL and NYSDEC Project Manager. Refer to contact information in the Emergency Phone Numbers & Notifications section of this HASP.

A fire that CANNOT be readily extinguished with a fire extinguisher will require evacuation of the work area personnel to Muster Point areas per this HASP. If personal injuries result from any fire or explosion, the procedures outlined in the Personal Injury Response Plan will also be followed.

6.7 Personal Injury Response Plan

Minor (non-emergency) injuries must be reported to the Ramboll Project Manager, SSL and NYSDEC Project Manager. Refer to contact information in the “Emergency Phone Numbers & Notifications” section of this HASP.

Treatment for minor injuries will be provided on site using available first aid supplies and personnel trained in first aid. All Ramboll employees are required to contact WorkCare for all minor injuries that are not an emergency or otherwise life-threatening. For minor injuries that are not life-threatening but require further medical attention, all Ramboll subcontractors must agree to have their employees treated by occupational physicians at occupational clinics whenever possible. Treatment of **<u>minor</u>** injuries by emergency room or personal physicians should be AVOIDED. When injured workers are released back to work with restrictions, all subcontractors are expected to accommodate those restrictions.

All injuries must be reported immediately to the Ramboll Project Manager, SSL, HSS PM and NYSDEC Project Manager. Refer to contact information in the "Emergency Phone Numbers & Notifications" section of this HASP. Emergency medical incidents include puncture wounds to the head, chest and abdomen, serious head and spinal cord injuries, and loss of consciousness must be treated at the hospital emergency room listed in Emergency Phone Numbers & Notifications section of this HASP.

Route maps to the hospital and occupational clinic (Figure 1 and Figure 2) will be posted in the work area.

6.8 Spill Response

Site personnel should expect and be properly trained and equipped to handle small spills. Potential spills include process chemicals, heat transfer fluids, gasoline, diesel, antifreeze, hydraulic fluid, or oil from heavy equipment. If a spill of any type should occur, the SSL or designee should report the spill immediately to a site owner representative and implement procedures in this Spill Response Plan. Site personnel will generally respond to spills as follows: Stop the leak immediately if it can be done without directly contacting the leaking material.

- Remove or stop all ignition sources (hot work, generators, etc.) that are within 25' of any part of the spill.
- On-site personnel should immediately secure the area to prevent unauthorized entry into the spill area.
- Although not likely given the anticipated types of spills, the SSL or designee should initiate the General Emergency Response Plan in this HASP if a spill may cause an explosion, death, or serious injury.
- Site personnel may only respond to incipient stage fires regardless if such fires are associated with a spill.
- Confined Space Issue – If the leak occurs in an excavation where natural ventilation is limited, air monitoring will be required prior to entering the spill area. This is primarily an issue for fuel (gasoline, diesel and kerosene) spills. The SSL will determine if a fuel spill requires air monitoring.
- PPE for spills to open areas generally requires Modified Level D PPE (poly-coat Tyvek, nitrile gloves and boot covers or boot decontamination). Over-boots or boot covers may also be used if persons cleaning the spill would have to walk on spilled materials. Latex gloves are not acceptable and will degrade with exposure to petroleum products.

6.9 Incident Reporting

Any incident must be reported to the Ramboll Project Manager, SSL, CHS PM and NYSDEC Project Manager. All incidents must be reported immediately. Refer to contact information in the "Emergency Phone Numbers & Notifications" section of this HASP.

Th Ramboll HSS Americas Operations Manager will review all emergency or accident reports and may further investigate any such report if necessary. The Ramboll HSS Americas Operations Manager will see that the area officer of OSHA is notified within 8 hours should there be a fatality and within 24 hours if the incident causes in-patient hospitalization, amputation, or eye loss. If the Ramboll HSS Americas Operations Manager cannot be located, then the HSS PM will make such notification.

All incidents and near misses must be reported through the online **EHS Insights** system. The absence of an injury does not preclude the need to complete a report, as such incidents will be classified as "near miss" or "other." The form must be completed or reviewed by the SSL or designee. It will include, but is not limited to, the nature of the problem, time, location and corrective actions taken to prevent recurrence. This report must be completed and sent to the Ramboll SSL, Ramboll HSS Americas Operations Manager and NYSDEC Project Manager within 24 hours. If all the "facts" cannot be determined in that period of time, then draft report will be submitted, and a final report will be submitted immediately upon completing the investigation.

APPENDIX 1 – PRE-WORK BRIEFING FORM

Pre-Work Briefing

Client:			
Project Name:		**Project No.**	
Project Location:			
Site Safety Leader:			
Main Points of Briefing:	☐ Ramboll Safety Requirements ☐ Site-Specific Safety Pan or JSA ☐ Site Owner Safety Requirements	**Other:**	

The purpose of the Pre-Work Briefing is to provide *site-specific safety orientation* to employees and subcontractors. This certifies that undersigned individuals have read, understand, and agree to comply with applicable *site-specific safety requirements* that can be obtained from site safety plans, site Job Safety Analyses (JSAs), site owner requirements, and/or other site safety documents furnished to them by Ramboll. The undersigned individuals acknowledge that these safety requirements are not "all-inclusive" and that they will be expected to follow any additional safe work practices applicable to their specific scope of work.

Print Name	Signature	Company	Date

-- All Site Personnel Must Acknowledge Their Review and Understanding of Safety Requirements --

APPENDIX 2 – JSA TEMPLATE

Safety to Zero ($S^2$0) – Safety Planning Is Critical To Our Ultimate Goal of Zero Injuries

Project Name:		**Ramboll Project Officer:**	
Project Number:		**Ramboll Project Manager (PM):**	
JSA Title:		**Ramboll Site Supervisor:**	
JSA Revision Date:		**Ramboll Foreman or Superintendent:**	
JSA Prepared By:		**Ramboll Site Safety Leader:**	
Client Name:		**Subcontractor Company Name:**	(☐ NA)
Project Location:		**Subcontractor Project Manager:**	
Project Phone No.:		**Subcontractor Superintendent:**	
Project Fax No.:		**Sub Safety Competent Person:**	

Scope of Work covered by this JSA (identify subcontractors covered by this JSA)	
References (existing safety plans, manuals, spec's, etc.)	**[REMINDER – Ensure JSA covers applicable responsibilities identified in the SSL Tab of the PSRF.]**
Key Hazards (focus on highly hazardous tasks)	
Right to Stop Unsafe Work	All project personnel have the right, and obligation, to stop tasks which they believe to be unsafe or notify their supervisor of unsafe work tasks for which they believe inadequate safety precautions have been implemented. The Ramboll Site Safety Leader (SSL) will communicate this responsibility to all project personnel.
Personal Protective Equipment (PPE) Summary	*(additional safety equipment may be required for specific hazards identified in the following sections)* ☐ Hard Hat ☐ Safety Glasses ☐ Safety Shoes ☐ Cut-Resistant Gloves Other (specify): ☐ High Visibility Vests (required for work on roads and in many construction & remediation sites) ☐ Ear Protection (heavy equipment, loud power tools, etc.) ☐ Fall Protection Harness & Lanyard (falls >6') ☐ Respiratory Protection (☐ N95 dust mask, ☐ half face, ☐ full-face) ☐Specify cartridge in JSA. ☐ Tyvek or other chemical protective coverall: ____ ☐ Face Shield and chemical goggles for chemical handling, line breaks, pressure washing ☐ Nitrile Gloves (☐ Surgical Type and/or ☐ "Dishwashing" Type) ☐

Pre-Work Documentation & Certifications	**Documentation and Certifications**	**To Be Submitted or Provided By.......**
	☐ Drug Testing (☐ alcohol testing is also required)	
	☐ Project Safety Plan or Job Safety Analysis (JSA)	
	☐ Client/Facility Contractor Safety Orientation	

(NOTE - Insert any additional training requirements identified in the body of the JSA.)	☐ Project Safety Orientation (JSA Review)	
	☐ Daily Safety Meetings (Daily Pre-Task Planner)	
	☐ OSHA 10 hr Construction Safety	
	☐ OSHA 30 hr Construction Safety	
	☐ OSHA 40 hr Hazwoper w/ current 8 hr Refresher	
	☐ OSHA Hazwoper Medical Clearance	
	☐ Confined Space Entry Certification (necessary for permit-required entry or non-permit designations)	
	☐ Respirator Training, Fit Test, and Resp. Medical	
	☐ Excavation Competent Person designation	
	☐ Scaffold Competent Person Training	
	☐ Lifting & Rigging Plan	
	☐ Erosion Control Certification	
	☐ Heavy Equipment "Acceptance Inspections"	
Permits & Inspections applicable to scope of work	☐ Confined Space Entry Permit ☐ Hot Work Permit ☐ Energized Electrical Work Permit (from sub)	☐ Daily Excavation Inspection Checklist ☐ Daily Scaffold Inspection Tags ☐ Daily Heavy Equipment Inspection Checklist

Individuals must sign the "Pre-Work Briefing" form on the last page after reviewing this JSA.

	HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
ELEVATED WORK		
☐ NA	FALLS > **6'** or within **15'** of a ROOF OR MEZZANINE EDGE where the fall is >6' OR at **any height** when working above dangerous machinery, a drowning hazard, exposed rebar (impalement) or similar hazard.	☐ Existing Guardrails ☐ Hole Covers Marked "HOLE" ☐ Temporary Guardrails ☐ Fall Restraint ☐ Warning Line 15' from Edge ☐ Fall Arrest w/ harness/lanyard (**identify tie-off points**) ☐ Aerial Lifts used for elevated work - Refer to the "*Aerial Lifts*" section of this JSA. ☐ Areas below elevated work will be protected to prevent entry by unauthorized personnel (describe how this will be accomplished in "Comments") ☐ Process machinery or equipment onto which persons may fall are locked out. Refer to the "Lockout-Tagout/Electrical" section of this JSA. **FALL PROTECTION COMMENTS (describe equipment used):**
☐ NA	LADDERS / STAIRS ☐ Extension Ladders ☐ Step Ladders ☐ Fixed Ladders ☐ Stairs	☐ Employees training in safe ladder use at toolbox safety meeting ☐ Extension ladders are properly footed, secured at top, and setup at proper angle ☐ Stepladders are set on level ground or properly shimmed with spreaders locked. ☐ Stairs have proper rise over run and stairs >4 steps or 4' have guardrails. **LADDERS/STAIRS COMMENTS:**

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
☐ NA	SCAFFOLD Type: _____	☐ Scaffolds **erected** under supervision of, and **inspected daily** (when in use) by: **Competent Person: ___________________Company: _____________________** ☐ Toprail and midrail provided on scaffolds >10' (otherwise specify other fall protection) ☐ Work platforms are at least 18" wide & made of scaffold lumber or cleated aluminum planks. ☐ Scaffolds placed on mud sills, pavement, concrete or other solid surface ☐ Scaffolds are tagged daily by competent persons in accordance with the Green / Yellow / Red tagging system. [MANDATORY – Tags are commercially available.] ☐ Areas below scaffolds will be protected to prevent entry by unauthorized personnel (describe how this will be accomplished in "Comments") **SCAFFOLD COMMENTS:**
☐ NA	AERIAL LIFT used to reach work ☐ Scissor Lift ☐ Extensible Boom ☐ Articulated Boom ☐ Vertical Lift ("Genie")	☐ Operators have **aerial Lift certification** specific to the type of lift being operated. ☐ Equipment is **inspected** after mobilization and is in good condition. ☐ **Fall protection** (harness & lanyard) is required and must be anchored to manufacturer-approved locations. [Scissor Lifts are exempt? ☐YES ☐NO] ☐ Work area is inspected by operators for **overhead and surface obstructions** prior to use. ☐ **Counterweight swing radius** is marked to prevent "struck by" and "crush" injuries. ☐ **Areas below aerial lifts** will be protected to prevent entry by unauthorized personnel (describe how this will be accomplished in "Comments") **AERIAL LIFT COMMENTS:**
EXCAVATIONS / TRENCHING		
☐ NA	☐ Max Depth ≥ 20' ☐ Max Depth ≥ 5' ☐ Max Depth <5' with potential cave-in hazard ☐ Potential permit-required confined space at depth ≥ 4' ☐ Underground utilities ☐ Structures/foundations ☐ Falls into excavations ☐ Other:	☐ Sloping & shoring for excavations ≥**20'** are approved by a professional engineer ☐ Sloping & shoring for excavations ≥**5'** when persons are exposed to cave-in. (specify below) ☐ Sloping & shoring for shallow **(<5')** excavations with cave-in hazard (specify below) ☐ Excavations ≥ **4'** are classified as a **non-permit confined space** ☐ Excavations ≥ **4'** are classified as **Alternate Entry** or **Permit-Required** – Refer to "Confined spaces" section of JSA. ☐ **Underground utilities** have been identified and marked. ☐ **Local "dig safe"** organization has been notified for utility locations in public areas or rights of way. Number: ______________________________ Date: __________________ ☐ **Hand digging** within **3'** of utility locations. ☐ Excavations are protected by **perimeter fencing** (not barricade tape): (☐ rigid fence - chain link or wood ☐ safety fence 6' from edge.) **EXCAVATION COMMENTS:**

<table>
<tr><th colspan="2">HAZARD</th><th>HAZARD CONTROLS (check all that apply and comment as required)</th></tr>
<tr><td colspan="3">CONFINED SPACES</td></tr>
<tr><td>☐
NA</td><td>☐ No <u>Serious</u> Hazards
☐ Toxic Atmosphere
☐ carbon monoxide
☐ hydrogen sulfide
☐ Flammable Atmosphere
☐ Low Oxygen
☐ Combustible dust
☐ Other Serious Hazard:</td><td>Specify confined space entry approach(es) to be used: [Multiple may apply based on spaces]
☐ Confined space is altered so that it is no longer a confined space. (describe below)
☐ Confined space is downgraded to a non-permit confined space. (identify which spaces below)
☐ Alternate Entry is used. (Identify which space qualify for confined space entry below)
☐ Full permit-required confined space entry is used due to presence of serious hazards.
Verify Rescue Team Support [MANDATORY for permit-required entry]:
☐ Rescue team has been notified (☐ Paid FD ☐ Volunteer FD ☐ Plant Rescue)
Rescue Team:_______________ Phone Number: __________________
Verify Other Applicable Requirements:
☐ All entrants and attendants for Alternate Entry and Permit-Required Entry have confined space entry training. [MANDATORY for permit-required and alternate entry]
☐ Mechanical ventilation and continuous air monitoring [MANDATORY for alternate entry]
☐ LOTO is required to make conditions safe for entry (Describe in Lockout-Tagout/Electrical)
☐ Refer to "Manual Lifting" section of this JSA for manhole cover removal safety.
CONFINED SPACE COMMENTS:</td></tr>
<tr><td colspan="3">LOCKOUT-TAGOUT / ELECTRICAL</td></tr>
<tr><td>☐
NA</td><td>Maintenance, construction, or modification of processes and equipment with POTENTIAL UNEXPECTED RELEASE OF ENERGY. Identify energy types:
☐ Electrical
☐ Pressurized liquid piping
☐ Compressed gas / steam
☐ Moving Parts (conveyors, chains, belts, fans, shafts)
☐ Hydraulic systems
☐ Chemical release
☐
Describe Equipment requiring lockout:___________________</td><td>Designate Persons Responsible for Overseeing Ramboll's LOTO activities:
☐ Qualified LOTO Coordinator (MANDATORY):_______________________________________
☐ Test Supervisor (LOTO Equipment-Under-Test): _________________________________
☐ Qualified Electrical Worker (Electrical-Arc Flash): __________________________________
Identify or Develop Written Equipment-Specific LOTO Procedure (☒ at least one):
☐ Equipment owner to lockout equipment using their procedures.
☐ Ramboll operators will de-energize equipment following LOTO procedures integrated into O&M procedures. (Reference procedure in "Comments.")
☐ Ramboll to develop and implement lockout procedures for equipment under Ramboll control using the "Equipment-Specific LOTO Form". (Attach completed LOTO form to JSA.)
☐ LOTO procedures are specified below in "Comments" and are equivalent to LOTO form.
Identify How Locks Will Be Applied (☒ at least one):
☐ Group lock box will be used with all persons working on equipment attaching their own lock(s) and tag(s). Location of lock box: ____
☐ Equipment or process components will be individually locked with all persons working on equipment attaching their locks and tags directly on equipment.
Specify Other Lock Requirements (☒ at least one)::
☐ Ramboll to apply a "Company Lock" to prevent premature startup by owners or subcontractors. Company Locks are NOT intended to replace personal locks for anyone. Specify who is responsible for Company Locks: _________________________________
☐ Workers will <u>not</u> be allowed to work under a supervisor's or another's lock [MANDATORY]</td></tr>
</table>

	HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
		Specify Tags (☒ at least one): ☐ "Danger" tags with diagonal red & white stripes (required unless client's specify different) ☐ Client-required tags specific to the site. Describe below in "Comments." ☐ "Company Locks" identified with an "Out of Service" tag and **not** a LOTO tag. [MANDATORY for multi-shift or multi-subcontractor lockouts] **Other LOTO or Electrical Safety Requirements:** ☐ All project team personnel are informed that they may not **remove electrical panels** or otherwise expose energized electrical equipment (unless they are **NFPA 70E** trained and have implemented the required precautions). [MANDATORY] **LOCKOUT COMMENTS:**
☐ NA	OVERHEAD POWER LINES _____________ KV _____________ ft above ground _____________ KV _____________ ft above ground	☐ Request to de-energize lines will be submitted for work within 20' of power lines. Request sent to: _________________________________ Date: ____________________ ☐ No one will be permitted to work <10' to power lines without lines being de-energized. ☐ Project persons are informed of 20' safety zone around energized power lines. ☐ Project persons are informed of additional restrictions when working ≤20' but >10': ☐ Dedicated spotter for all elevated work or operation of equipment that can contact lines ☐ Barricades setup at 20' from base of power lines to establish a "restricted work area." ☐ "Power Line Safety Permit' required to work within 20' of power lines. ☐ Power lines are shielded and/or marked with high visibility material **POWER LINE COMMENTS:**
☐ NA	ARC FLASH Location: __________________ Voltage: __________________	☐ Electrical equipment evaluated for arc flash potential by a NFPA 70E qualified person. ☐ Persons with potential arc flash exposure are properly trained and equipped with electrically rated gloves, face shield, coveralls, etc. ☐ Non-essential personnel will be kept clear of all areas affected by arc flash ☐ Client/Owner notifications will be made in advance. (Specify below in "Comments.") **ARC FLASH COMMENTS:**
HEAVY EQUIPMENT (other than cranes)		
☐ NA	Struck By, Run-Over, Caught In Between (pinch points), Roll Over, Fluid Leaks ☐ Bulldozer ☐ Excavator ☐ Front Loader ☐ Mini Skid Steer (bobcat)	☐ **Qualified persons** operate all **heavy equipment**. Qualifications were determined by: ☐ **Heavy equipment operator** designation on company letterhead or email with company email address. Designation is specific to the types of heavy equipment. ☐ **Forklift certification or license** is specific to the type of lift being operated. ☐ **"Acceptance Inspection"** for heavy equipment upon mobilization documented on an inspection checklist by: _________________________________(Mgmt representative).

<table>
<tr><th></th><th>HAZARD</th><th>HAZARD CONTROLS (check all that apply and comment as required)</th></tr>
<tr><td></td><td>☐ Mini Excavator
☐ Dump Truck
☐ Drill/Boring Rig
☐ Forklift–rear counter-weight (indoor & yard)
☐ Forklift–rough terrain/lull
☐ Forklift–powered pallet
☐
☐

NOTE – Refer to "Elevated Work" for aerial lifts.</td><td>☐ Daily Heavy Equipment Inspections by Operators documented on an inspection checklist
☐ Preventative Maintenance performed on all heavy equipment on site >30 days (required)
☐ Ramboll's "25' Rule" to be implemented. Unauthorized persons will be kept at least 25' away from heavy equipment. Persons walking within 25' must get operator's permission.
☐ Blind spot general precautions will be implemented as indicated below:
• Operators will not operate heavy equipment while persons are in blind spots.
• Operators are required to use spotters when obstructions are in blind spots or clearances are otherwise tight.
☐ Backup precautions will be implemented. Spotters are required when trucks or other heavy equipment are backing up. Clarify procedure in "Comments" below.
☐ Operators and helpers will maintain a safe distance to moving parts and potential crush or pinch points as indicated below:
• All those working near moving or rotating parts will secure loose hair, clothing, etc.
• All personnel working within 25' of heavy equipment will be instructed to stay clear of pinch or crush points between the load and lift and the lift and fixed objects
☐ Counterweight swing radius will be barricaded.
☐ Operators will be reminded of seatbelt use by: ________________________________
☐ High visibility vests are required for: ____
☐ Operators will review manufacturer's safety guidelines for all equipment operated on slopes. Max. safe slope for each vehicle: ______________________________________
☐ Drill rigs will only be moved with masts lowered. Masts will be erected with outriggers fully extended when equipped with outriggers.
☐ Rigging directly to the forks of a lull, forklift, or front loader equipped forks is prohibited. Crane hook attachments will be used (specify):_________________________
☐ Spill equipment is available for fuel and hydraulic fluid leaks. Location: ______________

HEAVY EQUIPMENT COMMENTS:</td></tr>
<tr><td colspan="3">HOT WORK / WELDING / CUTTING</td></tr>
<tr><td>☐ NA</td><td>Fire, explosion, burns, UV flash, fume, gases
☐ Welding - Specify:
base metal:___________
electrode:____________
Shield gas:____________
☐ Oxy/Acetylene Cutting
base metal:__________
☐ Soldering/Brazing
☐ Grinding
☐</td><td>☐ Ramboll will issue hot work permit. Name:_________________________________
☐ The site owner will issue hot work permits. Name: ______________________________
☐ Hot work permits are visibly posted. Location(s):__________________________________
☐ Fire watches are identified by name on permit.
☐ Fire watches will remain ________________________ minutes after hot work (min of 30).
☐ A 20 lb ABC fire extinguisher will be placed within 25' of hot work or as directed on permit.
☐ Painted surfaces have been evaluated for lead content by: ☐ NA ___________________
☐ Insulation has been evaluated for asbestos content by: ☐ NA ______________________
☐ Pedestrians and adjacent workers will be protected from UV Flash by ________________
☐ Sparks and slag will be prevented from falling through floor and wall openings.
☐ Air monitoring will be conducted in hazardous areas. Haz Material:_________________
Areas to be Tested:____</td></tr>
</table>

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
		☐ Oxygen and acetylene cylinders will be separated by 20' when not used within 24 hours. ☐ All compressed gas cylinders in storage will be secured upright and capped. ☐ Face shields will be used for all grinding, cutting, and welding work. **HOT WORK COMMENTS: (Identify areas or tasks requiring hot work permits.)**
POWER TOOLS, HAND TOOLS, and EXTENSION CORDS		
☐ NA	eye injury, hand/arm cuts, electrical shock, strains, foot injuries, dust ☐ Grinders ☐ Jackhammer/Chip hammer ☐ Needle Gun ☐ Explosive Actuated (Hilti) ☐ Chop saw ☐ Chain saw ☐ Concrete/asphalt saw ☐ ☐	☐ All tools and electrical cords will be inspected upon mobilization by:_______________ ☐ All tools and electrical cords in-use will be inspected daily by:_______________ ☐ **GFCIs** will be used on all extension cords and 120v power tools. ☐ **Razor & Fixed Blade Knives are <u>Prohibited</u> –** Use is prohibited ☐ **Razor & Fixed Blade Knives are <u>Restricted</u>** – Use is allowed for only the task(s) listed below in "comments" because safer alternatives are not available. Additional safety precautions to prevent hand & forearm lacerations are also explained in "comments". ☐ **High Hazard Power Tools** must be used because the use of safer tools is not feasible. High hazard power tools include powder-actuated tools, chainsaws, chop/demo saws, weed trimmers with blade cutter, die/end grinders, abrasive wheel tools, hand-held rebar bender, portable HDPE fusion welder, circular saw, portable band saw: • Implement HSE Manual Requirements in the "Power Tools-High Hazard" procedure. • Refer to the high hazard power tools safety meeting topics in the Safety Meeting Topics manual to support field safety training prior to use of high hazard power tools. ☐ **Grinder** speeds will not exceed grinding wheel ratings. ☐ **Jackhammers** will not be used in a horizontal position without mechanical support. ☐ Only properly certified users will operate **explosive-actuated tools**. Identify user names and training dates: _______________ ☐ **Water or wet cutting** performed to control dust ☐ **Respirators** used to prevent exposure to dust (respirator type:_______________) ☐ **Face shield <u>and</u> chemical goggles** used required for chemical splash hazards ☐ **Face shield <u>and</u> safety glasses** required for all chain saws, weed trimmers, & similar tool ☐ **Kevlar chaps and jacket** are required for all chainsaw work. ☐ **Kevlar chaps** are required for chop saws, weed trimmers with blades, and similar tools ☐ **Hearing protection** required for which tools or areas: _______________ ☐ All **extension cords** are in good condition with no cuts through outer insulation, ground plugs are present, and no "vinyl tape" repairs. **TOOL & CORD COMMENTS:**
MANUAL MATERIAL HANDLING & STORAGE / HOUSEKEEPING / WALKING SURFACES (includes manhole covers, heavy lifting, slippery surfaces, and steep slopes)		
☐ NA	back or shoulder strain, struck by falling objects, trips and falls, incompatible materials (fire or explosion)	MATERIAL HANDLING & HEAVY LIFTING ☐ Mechanical lifting equipment used to reduce manual material handling (NOTE - Refer to *Cranes, Hoists, & Rigging* section of JSA if cranes or hoists are used.): (☐ Forklift/Lull ☐ Heavy Equipment ☐ Dolly☐ _______________)

<table>
<tr><th colspan="2">HAZARD</th><th>HAZARD CONTROLS (check all that apply and comment as required)</th></tr>
<tr><td></td><td>☐ hvy manual lifting (>50 lbs)
☐ chemical storage
☐ compressed gas storage
☐ Tall storage greater than 2 pallets stacked.
☐ Material & equipment laydown areas
☐ Trash & debris removal
☐ Temporary cords & hoses placed across walkways
☐ Manhole Cover Removal
☐ Tripping Hazard (cords, hoses, uneven surfaces)
☐ Slipping Hazard (icy, muddy, oily, etc.)
☐ Steep sloped surfaces
☐</td><td>☐ Manual lifting more than 75 lbs will require a 2-person lift or mechanical lifting device
☐ Good manual lifting techniques will be reviewed with the following trades/persons prior to site work. Refer to the “Lifting-Manual” topic in the Safety Meeting Topics manual:
____
MATERIALS STORAGE & HOUSEKEEPING
☐ Incompatible chemicals will be separated by 20' or a concrete block wall.
☐ Secondary containment will be provided for the following chemicals:
____
☐ Safety equipment will be located near chemical storage.
☐ Spill Kit ☐ Emergency Shower ☐ Eyewash ☐ Drench Hose ☐ Splash PPE
☐ Flammable gases and oxygen will be separated by 20'.
☐ All compressed gas cylinders will be transported vertically and secured upright.
☐ Equipment and materials will be stacked in laydown areas with aisles as necessary for safe access. All un-used equipment & materials will be returned to laydown areas daily. Designated laydown areas:________________________
☐ Materials will not be stacked greater than 2 pallets high without being secured.
☐ Trash and debris will be removed daily and placed in designated containers. Specify debris segregation and location of disposal containers below.
MANHOLE COVERS
☐ Manhole covers will ONLY be removed with tools specifically designed to remove them including J-hooks that are at least 30” long. No pry bars, shovels, or screw drivers.
☐ “Stuck” manhole removal equipment and procedures are described in “comments.”
☐ “Paved-over” manhole removal equipment and procedures are described in “comments.”
WALKING SURFACES
☐ Slippery surface – work area inspected for icy surfaces which will be salted/sanded.
☐ Slippery surface –YakTrax® or similar slip-on traction devices will be used for icy areas.
☐ Hoses & Cords will be run out of walkways (e.g., within 6" of walls or 7.5' overhead) <u>whenever possible</u> or will be clearly marked by cones or barricades.
☐ Inspect Work Area for trip hazards. Hazards will be corrected if possible. If hazards cannot be corrected, then slip & trip hazards will be clearly marked.
☐ Steep slopes will be avoided and alternative walkways established to the extent feasible (describe below)
MATERIAL HANDLING & HOUSEKEEPING COMMENTS:</td></tr>
<tr><td colspan="3">TRAFFIC & SIDEWALK OBSTRUCTION</td></tr>
<tr><td>☐
NA</td><td>☐ Vehicle accidents
☐ Utility Vehicle Rollovers
☐ Pedestrians struck by vehicles or heavy equipment
☐ Pedestrians falls</td><td>☐ DOT signal devices will be used to re-route vehicles around excavations or busy site entrances/exits that affect road traffic.
☐ Flaggers will be used and have DOT Flagger Training
☐ Procedures for work vehicles to enter/exit traffic work zones are required when work zones are setup in high speed roadways or when potential blind-spots exist. Explain in “Comments.”
☐ Pedestrian traffic will be safely routed around or over excavations.</td></tr>
</table>

	HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
	☐ Pedestrian struck-by falling objects	☐ Pedestrian traffic will be safely routed around or under overhead work. ☐ Recreational Style ATVs are prohibited. ☐ ATUVs allowed with rollover protection, seat belts, horn, and lights. ☐ Golf Carts allowed if speed ≤20 mph and operated only on site roads (no off-road use). **TRAFFIC & SIDEWALK COMMENTS:**
CRANES, HOISTS, & RIGGING		
☐ NA	tip-over, struck-by dropped loads, Crane Make:_______________ Crane Model:_______________ Hoist Make: _______________ Hoist Model: _______________	☐ Crane Operator is qualified: ☐ CCO ☐ State License ☐ Company Letterhead ☐ Crane signal person is qualified and has documented OSHA signal person training ☐ Rigging personnel are designated as qualified by their employer. ☐ Lifting & Rigging Plan will be prepared by: Company Name:_______________________ ☐ No Lifting & Rigging Plan is required - crane work is not critical lift. ☐ Annual crane maintenance certification within last 12 months. Date:________________ ☐ Periodic crane inspection within 30 days. Date:______________________ ☐ Site owner notified by: Name:_________________________ Date: _________________ ☐ Hoists are clearly marked with a load rating. ☐ Hoists have a current "frequent" (visual) inspection by qualified operators conducted in the last 30 days and is documented on a tag, checklist, or equivalent. ☐ Hoists have a current "periodic" inspection by a person qualified to perform hoist maintenance conducted in the last 12 months and is documented. ☐ All rigging hardware, slings, wire ropes, etc. are inspected prior to use by qualified riggers. Defective rigging equipment will be immediately removed from service. ☐ Loads will not be hoisted over people. Areas below suspended loads will be barricaded as necessary to prevent entry. **CRANES, HOISTS, & RIGGING COMMENTS:**
STEEL ERECTION		
☐ NA	structural collapse (falls, hot work, cranes, and rigging are covered elsewhere in this JSA)	☐ Written "notice to proceed" will be sent to the steel erection sub. Date:______________ ☐ Written notice of any bolting or rod modifications made by after drawings were "issued for bid" to the steel erection sub. Date(s):______________________________________ **STEEL ERECTION COMMENTS:**
CONCRETE / MASONRY		
☐ NA	struck by injury, trips & falls, cuts from rebar, skin burns from contact with concrete (concrete saw, jackhammers, fall protection, heavy equipment are covered elsewhere in this JSA)	☐ All rebar ends <6' must be protected by rebar caps ☐ Only authorized persons will be allowed to walk on rebar pads to minimize the number of persons at risk of tripping or falling. ☐ Concrete truck operator will be instructed to take direction only from the concrete worker who is handling the discharge chute/hose when related to moving the discharge chute/hose. ☐ Finishers, masonry workers, & others who must kneel extensively will be provided kneepads. ☐ Temporary steps will be provided for all elevation changes ≥18". **CONCRETE MASONRY COMMENTS:**

<table>
<tr><th colspan="2">HAZARD</th><th>HAZARD CONTROLS (check all that apply and comment as required)</th></tr>
<tr><td colspan="3">BIOLOGICAL HAZARDS (Site Surveys & Inspections, Clearing & Grubbing, Caretaking Services)</td></tr>
<tr><td>☐
NA</td><td>Infection, Lyme Disease, West Nile Virus, Eastern Equine Encephalitis (EEE), Severe Rash, Allergic Reaction, Venom effects

☐ Ticks
☐ Mosquitoes (EEE, WNV, etc.)
☐ <u>Venomous Snakes</u>
☐ <u>Venomous Spiders</u>
☐ <u>Poison Ivy, Oak, or Sumac</u>
☐ Bees & Wasps
☐ Fire Ants
☐ Other (identify below):</td><td>☐ Use DEET (25%-98%) repellent on skin for protection against mosquitoes, ticks, and similar insects. Use higher concentrations for heavily infested areas.
☐ Use Permethrin repellent on clothing in areas heavily infested with ticks, chiggers, etc.
☐ Persons working in tick-infested overgrown areas instructed to wear spun-poly or Tyvek coveralls [<u>required</u> for all persons in ESR and working in the NE region plus NJ, & PA.]
☐ Persons returning from work in tick-infested areas instructed to perform periodic field checks for ticks and a thorough tick inspection as soon as they get home.
☐ Employees (only) instructed to call WorkCare for embedded ticks from fieldwork.
☐ All site personnel will be instructed on how to identify poison ivy, sumac, and oak. (Ramboll Field Identification Guide or equiv. has been posted? ☐ YES ☐ NO)
☐ Poison ivy barrier creams (e.g., Ivy Block) will be used on exposed skin prior to the workday.
☐ Poison ivy neutralizing wipes or rubbing alcohol will be used on hands and exposed skin following work activities or incidents where contact with poison ivy/oak/sumac is suspected.
☐ Protective coveralls (such as Tyvek™) will be used to prevent contact with ticks or poison ivy.
☐ All site personnel will be instructed on how to identify venomous snakes indigenous to the area. List venomous snakes of concern in the "Comments" section below. (Ramboll Field Identification Guide or equiv. has been posted? ☐ YES ☐ NO)
☐ All field personnel with a potential to encounter venomous snakes will wear:
☐ Snake Chaps AND/OR ☐ High Leather Safety Boots (NOT ankle-high boots/shoes)
☐ All site personnel will be instructed on how to identify venomous spiders indigenous to the area. List venomous spiders of concern in the "Comments" section below. (Ramboll Field Identification Guide or equiv. has been posted? ☐ YES ☐ NO)
☐ Site personnel with known allergies to bee/wasp stings, fire ant bites, or other insect bites carry an "EpiPen" or equivalent medication prescribed for treating allergic reaction.
BIOLOGICAL HAZARDS COMMENTS:</td></tr>
<tr><td colspan="3">ENVIRONMENTAL & CHEMICAL HAZARDS / HAZARDOUS WASTE SITE WORK</td></tr>
<tr><td>☐
NA</td><td>Exposure to hazardous vapors or dust, contact with contaminated materials, fire, explosion.

Contaminants of Concern and hazardous chemicals include:
☐ volatile organic compounds (describe:_______________ _________________________)
☐ semivolatile organic cmpds (describe:_______________</td><td>☐ Site workers with a potential for contact with contaminated materials and work in Level C PPE will have OSHA 40-hour training, current 8-hour refresher, and medical exam.
☐ Site workers with minimal contact with contaminated materials and no work in Level C PPE will have OSHA 40-hour or 24-hour training, current 8-hour refresher, and medical exam.
☐ Foremen or Supervisors overseeing field crews will have 8-hour OSHA Supervisor training.
☐ No intrusive work activities or areas are anticipated with current scope of work.
☐ Intrusive work activities include: ____ ____
☐ The perimeter of intrusive work areas are identified by:______________________________</td></tr>
</table>

HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
______________________)	☐ Decontamination of personnel or equipment is not anticipated with the current scope of work.
☐ metal dusts (describe:______________ ______________________)	☐ Decontamination of personnel and small tools will be conducted as follows: _________ ______________________ ______________________
☐ PCBs	
☐ Caustic (NaOH)	☐ Decontamination of heavy equipment will be conducted as follows: _______________ ______________________
☐ Acid (H2SO4, HCL)	
☐	☐ Heavy equipment leaving the site will be inspected by: ___________________________
	☐ **Work area monitoring** is not anticipated with the current scope of work.
(many other hazardous waste site hazards are covered elsewhere in this JSA)	☐ **Work area air monitoring** will be conducted per attached air monitoring plan & action levels.
	☐ **Work Area Air Monitoring** as follows for: ☐ Dust, ☐ VOCs, ☐ Other:______________ Description: ______________________

Action Levels[1]	Description & Response Actions
<X	1. Level D PPE (General PPE as required in this JSA)
X	1. Half or Full Face Level C PPE - Tyvek, boot covers, nitrile gloves, half or full face w/ respirator with ______________ cartridges changed (☐ daily, ☐ ___________________) OR 2. Implement additional engineering or administrative controls to reduce contaminant concentrations below action level(s).
10X	1. Full Face Level C PPE w/ Quantitative Fit Testing (no half-face) 2. Or Reduce contaminant(s) below Level B action level(s).
50X	1. Level B PPE – PPE same as above with a supplied air respirator 2. Or STOP work until contaminant levels can be reduced. 3. Notify the Project Manager and Client Representative.
????	1. STOP work

1. Sustained 1 minute

☐ **Community Air Monitoring** is not anticipated with the current scope of work.

☐ **Community Air Monitoring** is required per the attached air monitoring plan.

☐ **Community Air Monitoring** as follows for: ☐ Dust, ☐ VOCs, ☐ Other:______________

Description: ______________________

Action Levels[1]	Description & Response Actions
<0.1 mg/m³	1. Normal Operation
0.1 mg/m³	1. Increase demolition dust controls until dust levels at the site perimeter (fence line) are <0.1 mg/m³
0.15 mg/m³	1. STOP work and evaluate alternate work methods or dust controls 2. Implement revised work methods and dust controls to maintain dust levels at the site perimeter <0.1 mg/m³ 3. Resume work.

1. 15 minutes time-weighted average

ENVIRONMENTAL & CHEMICAL HAZARD COMMENTS:

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
OTHER HAZARDS & CONTROLS not addressed in other sections of this JSA		
☐ NA	☐ ☐ ☐	

EMERGENCY RESPONSE			
(911 Service is Available ☐ Yes ☐ No		**Cell Phone Required** ☐ Yes ☐ No)	
Alternate Emergency Number (if not "911"):			
Site Address:			
Muster Point in case of site evacuation:			
Emergency Medical Treatment - Hospital Name: Hospital Address:		**Number:**	
Non-Emergency Med. Treatment - Clinic Name: Occupational Clinic Address:		**Number:**	
Minor Injury Support for Ramboll Employees:	**WorkCare Incident Intervention**	**Number:**	888-449-7787
Fire Department Name		**Number:**	
Spill Response:		**Number:**	
Client Representative Name:		**Office Number:** **Cell Number:**	
Ramboll **Project Manager** Name:		**Office Number:** **Cell Number:**	
Ramboll **Site Safety Leader** Name:		**Office Number:** **Cell Number:**	
Ramboll **Corporate H&S** Name:		**Office Number:** **Cell Number:**	
Contact Name:		**Office Number:** **Cell Number:**	

EMERGENCY RESPONSE COMMENTS:

1. NOTIFICATIONS - Upon occurrence of any injury, fire, explosion, major spill (beyond incidental), property damage >$1,000, or near-miss that could have resulted in a fatality or disabling injury, **IMMEDIATELY NOTIFY** the Ramboll Project Manager, Ramboll Manager of Corporate H&S, and the Client Representative.

2. WRITTEN REPORT - Complete an *Incident Report* within **24 hours** and submit to the Ramboll Manager of Corporate H&S for review. Report may be submitted as a "draft" or "preliminary" and updated as additional information is identified.

3. INJURY RESPONSE
   - First aid injuries will be handled on site with FA-trained personnel. First aid and CPR supplies are located: _____________.
   - If a person (Ramboll employee or subcontractor employee) may be **working alone** at times when the job site is unoccupied, then regular "check-ins" will be conducted between the lone site person and their supervisor or other designated person. The method of communication (radio, cell phone), the frequency of check-ins, and the names of individual(s) with whom the lone worker will be checking in must be outlined below under "*Other Emergency Information*." Employees should not be assigned to "High Hazard Work" when working alone.

EMERGENCY RESPONSE

- **All Ramboll employees will call WorkCare for minor injuries** that include any strains, cuts for which an employee is not confident that a band aid is sufficient, tick/insect bites for which the employee is concerned about infection or Lyme, any other work-related injury for which the employee would like to talk to a WorkCare medical professional regarding proper treatment or follow-up.
- **WorkCare posters must be posted at each job site with a field office or trailer.**
- Minor (not life threatening) injuries that require medical attention will be treated at the "Non-Emergency Med Treatment" clinic identified above **unless an alternate clinic is recommended by WorkCare**. If no clinic is available or identified, then default to the "Emergency Medical Treatment" facility.
- If an Ramboll employee feels that a minor injury is not healing properly or may be more severe than originally anticipated, they should call WorkCare and discuss their concerns. At this time, WorkCare may direct the employee to a local clinic, or alternately, employees may request evaluation at a local clinic. In either situation, **WorkCare will facilitate the employee's visit to a suitable, local clinic for further evaluation**.
- Life Threatening injuries are an emergency and require implementing emergency response (911 or alternate).

4. FIRE or EXPLOSION
   - Incipient stage (trash can size) fires may be handled by site personnel using fire extinguishers or hoses.
   - Larger fires will require that affected personnel are evacuation to the identified muster point and implementing emergency response (911 or alternate).

5. SPILL RESPONSE
   - Major spills that exceed the available supplies and resources to safely control and cleanup will require contacting an off-site spill responder indicated above for "Spill Response" and in accordance with existing site spill response plans. If a specific spill responder is not identified, a large spill will require implementing emergency response (911 or alternate).
   - Review available spill control and prevention plans that may be applicable to the work area. Ensure project personnel are familiar with plan requirements.
   - Minor or incident spills will be cleaned up by site personnel using supplies that are located: ___________________________.
   - The site owner will make notifications for reportable spills unless Ramboll is authorized to make those notifications.

6. POSTING - Emergency numbers and Hospital Route Map are posted: ____.

7. OTHER EMERGENCY INFORMATION:

Hospital Route Map

< Insert a hospital route map and directions >

Occupational Clinic Route Map

<If Available, Insert an Occupational Clinic Map and Directions>

Pre-Work Briefing Acknowledgement: Individuals who are performing work covered by this JSA have received a *site-specific Project Safety Orientation (PSO)* that includes a review of the safety requirements outlined in this JSA. The undersigned individuals acknowledge that have read this JSA or reviewed this JSA with a designated project representative and agree to comply with safety requirements. The undersigned individuals understand that these safety requirements are not "all-inclusive" and that they are expected to follow any additional safe work practices applicable or customary to their specific scope of work or trade.

Print Signature	Signature	Company	Date

RAMBOLL

Job Safety Analysis (JSA)
Environmental Investigations

Safety to Zero ($S^2$0) – Safety Planning Is Critical To Our Ultimate Goal of Zero Injuries

Project Name:		**Ramboll Project Officer:**	
Project Number:		**Ramboll Project Manager (PM):**	
JSA Title		**Ramboll Site Supervisor:**	
JSA Revision Date:		**Ramboll Site Safety Leader:**	
JSA Prepared By:			
Client Name:		**Subcontractor Company Name:**	(☐ NA)
Project Location:		**Subcontractor Project Manager:**	
Project Phone No.:		**Subcontractor Superintendent:**	
Project Fax No.:		**Sub Safety Competent Person:**	
Scope of Work covered by this JSA (identify subcontractors covered by this JSA)			
References (existing safety plans, manuals, spec's, etc.)	**[REMINDER – Ensure JSA covers applicable responsibilities identified in the SSL Tab of the PSRF.]**		
Key Hazards (focus on highly hazardous tasks)			
Right to Stop Unsafe Work	All project personnel have the right, and obligation, to stop tasks which they believe to be unsafe or notify their supervisor of unsafe work tasks for which they believe inadequate safety precautions have been implemented. The Ramboll Site Safety Leader (SSL) will communicate this responsibility to all project personnel.		
Personal Protective Equipment (PPE) Summary	*(additional safety equipment may be required for specific hazards identified in the following sections)* ☐ Hard Hat ☐ Safety Glasses ☐ Safety Shoes ☐ Cut-Resistant Gloves ☐ Ear Protection Other (specify): ☐ High Visibility Vests (required for work on roads and in many construction & remediation sites) ☐ Ear Protection (heavy equipment, loud power tools, etc.) ☐ Fall Protection Harness & Lanyard (falls >6') ☐ Respiratory Protection (☐ N95 dust mask, ☐ half face, ☐ full-face) Specify cartridge in JSA. ☐ Tyvek or other chemical protective coverall: ____ ☐ Face Shield and chemical goggles for chemical handling, line breaks, pressure washing ☐ Nitrile Gloves (☐ Surgical Type and/or ☐ "Dishwashing" Type) ☐		
Pre-Work Documentation & Certifications	**Documentation and Certifications**	**To Be Submitted or Provided By.......**	
	☐ Drug Testing (☐ alcohol testing is also required)		
	☐ Project Safety Plan or Job Safety Analysis (JSA)		
(NOTE - Insert any	☐ Client/Facility Contractor Safety Orientation		
additional training	☐ Project Safety Orientation (JSA Review)		

requirements identified in the body of the JSA.)	☐ Daily Safety Meetings (Daily Pre-Task Planner)	
	☐ Verification of Hazwoper Medical Surveillance	
	☐ OSHA 40-hr Hazwoper w/ current 8-hr Refresher	
	☐ Respirator Training, Fit Test, and Resp. Medical	
	☐ Confined Space Entry Certification (necessary for permit-required entry or non-permit designations)	
	☐ Excavation Competent Person designation	
	☐ Heavy Equipment "Acceptance Inspections"	
	☐	
Permits & Inspections applicable to scope of work	☐ Confined Space Entry Permit ☐ Hot Work Permit ☐ Energized Electrical Work Permit	☐ Daily Excavation Inspection Checklist ☐ Daily Heavy Equipment Inspection Checklist ☐

Individuals must sign the "Pre-Work Briefing" form on the last page after reviewing this JSA.

	HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
	ELEVATED WORK	
☐ NA	FALLS > **6'** or within **15'** of a ROOF OR MEZZANINE EDGE where the fall is >6' OR at **any height** when working above dangerous machinery, a drowning hazard, exposed rebar (impalement) or similar hazard.	☐ Existing Guardrails ☐ Hole Covers Marked "HOLE" ☐ Temporary Guardrails ☐ Fall Restraint ☐ Warning Line 15' from Edge ☐ Fall Arrest w/ harness/lanyard (**identify tie-off points**) ☐ Aerial Lifts used for elevated work - Refer to the "*Heavy Equipment*" section of this JSA. ☐ Areas below elevated work will be protected to prevent entry by unauthorized personnel (describe how this will be accomplished in "Comments") ☐ Process machinery or equipment onto which persons may fall are locked out. Refer to the "Lockout-Tagout/Electrical" section of this JSA. **FALL PROTECTION COMMENTS (describe equipment used):**
☐ NA	LADDERS / STAIRS ☐ Extension Ladders ☐ Step Ladders ☐ Fixed Ladders ☐ Stairs	☐ Employees training in safe ladder use at toolbox safety meeting ☐ Extension ladders are properly footed, secured at top, and setup at proper angle ☐ Stepladders are set on level ground or properly shimmed with spreaders locked. ☐ Stairs have proper rise over run and stairs >4 steps or 4' have guardrails. **LADDERS/STAIRS COMMENTS:**
	EXCAVATIONS / TRENCHING	
☐ NA	☐ Max Depth ≥ 20' ☐ Max Depth ≥ 5' ☐ Max Depth <5' with potential cave-in hazard ☐ Potential permit-required confined space at depth ≥ 4'	☐ Sloping & shoring for excavations ≥**20'** are approved by a professional engineer ☐ Sloping & shoring for excavations ≥**5'** when persons are exposed to cave-in. (specify below) ☐ Sloping & shoring for shallow **(<5')** excavations with cave-in hazard (specify below) ☐ Excavations ≥ **4'** are classified as a **non-permit confined space**

<table>
<tr><th colspan="2">HAZARD</th><th>HAZARD CONTROLS (check all that apply and comment as required)</th></tr>
<tr><td></td><td>☐ Underground utilities
☐ Structures/foundations
☐ Falls into excavations
☐ Other:</td><td>☐ Excavations ≥ 4' are classified as Alternate Entry or Permit-Required – Refer to "Confined spaces" section of JSA.
☐ Underground utilities have been identified and marked.
☐ Local "dig safe" organization has been notified for utility locations in public areas or rights of way. Number: ______________________________ Date: ______________
☐ Hand digging within 3' of utility locations.
☐ Excavations are protected by perimeter fencing (not barricade tape)
(☐ rigid fence - chain link or wood ☐ safety fence 6' from edge.)
EXCAVATION COMMENTS:</td></tr>
<tr><td colspan="3">CONFINED SPACES</td></tr>
<tr><td>☐
NA</td><td>☐ No <u>Serious</u> Hazards
☐ Toxic Atmosphere
☐ carbon monoxide
☐ hydrogen sulfide
☐
☐ Flammable Atmosphere
☐ Low Oxygen
☐ Combustible dust
☐ Drowning - high water level or <u>potential</u> for sudden changes in flow or level
☐ Other Serious Hazard:</td><td>☐ Confined space is altered so that it is no longer a confined space. (describe below)
☐ Confined space is downgraded to a non-permit confined space. (identify which spaces below)
☐ Alternate Entry is used. (Identify which space qualify for confined space entry below)
☐ Full permit-required confined space entry is used due to presence of serious hazards.
☐ Rescue team has been notified (☐ Paid FD ☐ Volunteer FD ☐ Plant Rescue)
Rescue Team:______________________ Phone Number: __________________
☐ All entrants and attendants for Alternate Entry and Permit-Required Entry have confined space entry training.
☐ LOTO is required to make conditions safe for entry (Describe in Lockout-Tagout/Electrical)
☐ Refer to "Manual Lifting" section of this JSA for manhole cover removal safety.
CONFINED SPACE COMMENTS:</td></tr>
<tr><td colspan="3">ELECTRICAL, LOCKOUT/TAGOUT, UTILITIES, and POWERLINES</td></tr>
<tr><td>☐
NA</td><td>Maintenance, construction, or modification of processes and equipment with POTENTIAL UNEXPECTED RELEASE OF ENERGY. Identify energy types:
☐ Electrical
☐ Pressurized liquid piping
☐ Compressed gas / steam
☐ Moving Parts (conveyors, chains, belts, fans, shafts)
☐ Hydraulic systems
☐ Chemical release
☐</td><td>Designate Persons Responsible for Overseeing Ramboll's LOTO activities:
☐ Qualified LOTO Coordinator (MANDATORY):________________________________
☐ Test Supervisor (LOTO Equipment-Under-Test): ____________________________
☐ Qualified Electrical Worker (Electrical-Arc Flash): ____________________________
Identify or Develop Written Equipment-Specific LOTO Procedure (☒ at least one):
☐ Equipment owner to lockout equipment using their procedures.
☐ Ramboll operators will de-energize equipment following LOTO procedures integrated into O&M procedures. (Reference procedure in "Comments.")
☐ Ramboll to develop and implement lockout procedures for equipment under Ramboll control using the "Equipment-Specific LOTO Form". (Attach completed LOTO form to JSA.)</td></tr>
</table>

	HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
	Describe Equipment requiring lockout:___________________	☐ LOTO procedures are specified below in "Comments" and are equivalent to LOTO form. **Identify How Locks Will Be Applied (☒ at least one):** ☐ Group lock box will be used with all persons working on equipment attaching their own lock(s) and tag(s). Location of lock box: ______________________________ ☐ Equipment or process components will be individually locked with all persons working on equipment attaching their locks and tags directly on equipment. **Specify Other Lock Requirements (☒ at least one):** ☐ Ramboll to apply a "***Company Lock***" to prevent premature startup by owners or subcontractors. Company Locks are NOT intended to replace personal locks for anyone. Specify who is responsible for Company Locks: ______________________ ☐ Workers will **not** be allowed to work under a supervisor's or another's lock [MANDATORY] **Specify Tags (☒ at least one):** ☐ "Danger" tags with diagonal red & white stripes (required unless client's specify different) ☐ Client-required tags specific to the site. Describe below in "Comments." ☐ "Company Locks" identified with an "Out of Service" tag and **not** a LOTO tag. [MANDATORY for multi-shift or multi-subcontractor lockouts] **Other LOTO or Electrical Safety Requirements:** ☐ All project team personnel are informed that they may not **remove electrical panels** or otherwise expose energized electrical equipment (unless they are **NFPA 70E** trained and have implemented the required precautions). [MANDATORY] **LOCKOUT COMMENTS:**
OVERHEAD POWERLINES		
☐ NA	OVERHEAD POWER LINES _____________ KV _____________ ft above ground _____________ KV _____________ ft above ground	☐ Request to de-energize lines will be submitted for work within 20' of power lines. Request sent to: ____________________________ Date: ___________________ ☐ No one will be permitted to work <10' to power lines without lines being de-energized. ☐ Project persons are informed of 20' safety zone around energized power lines. ☐ Project persons are informed of additional restrictions when working ≤20' but >10': ☐ Dedicated spotter for all elevated work or operation of equipment that can contact lines ☐ Barricades setup at 20' from base of power lines to establish a "restricted work area." ☐ "Power Line Safety Permit' required to work within 20' of power lines. ☐ Power lines are shielded and/or marked with high visibility material **POWER LINE COMMENTS:**

	HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
DRILLING / BORING - All self-propelled rigs including trailer-mounted drilling/boring equipment		
☐ NA	Struck By, Run-Over, Caught In Between (pinch points), Roll Over, Hot Work (open flame) Fluid Leaks ☐ Drilling/Boring Rig: specify type(s) below: ____________________ ____________________ ____________________ NOTE – Refer to "*Power Tools, Hand Tools, and Extension Cords*" for operation of cathead hoists, hand augers, and geo probes.	☐ **Qualified persons** operate all drilling/boring equipment. Qualifications were determined by: ☐ Work Experience Summary on company letterhead or email with company email address. ☐ Other (describe): ____ ☐ Equipment will be **inspected** upon mobilization by: ______________________. NOTE - Inspections will include (but not be limited to) the following: leaks, defective safety equipment, and loose/unsecured parts that could fall during operation) ☐ Operators will be reminded of **seatbelt** use by: ___________________________ ☐ **High visibility vests** are required for: __________________________________ ☐ **Cut-resistant gloves** are required when handling cable, rods, and other sharp or "splintery" materials ☐ **Chemical-resistant gloves and clothing** are required while handling grout, cement, chemicals, or contaminated materials including soil or groundwater. (Refer to "Environmental Hazards" section for more information.) ☐ Operators and helpers will maintain a **safe distance** to moving parts. All those working near moving or rotating parts will secure loose hair, clothing, and equipment. All those working near the rods/casings are instructed to not put themselves in a position where they could get hurt if the rods/casings should turn or drop. ☐ Drill rods, casings, and other equipment will be **stored neatly** when not in use and secured to prevent them from falling on, or rolling into, site personnel. ☐ The area will be cleared of **rope, cords, weed-block fabric**, or similar material that could become wrapped around the auger, entangle someone and then pull them into the auger. ☐ **Underground utilities** have been identified and marked. ☐ **Local "dig safe" organization** has been notified for utility locations in public areas or rights of way. Number: ___________________ Date: ____________________ ☐ **Hand digging** within 3' of utility locations. ☐ **Soft-dig/vacuum dig** within ____' of utility locations. ☐ Damage to underground utilities will be prevented by **cribbing outriggers** to spread the load or **relocated outriggers** so they are not placed on utilities. ☐ **Fall protection** will be worn whenever (if) the drilling/boring mast must be climbed above 6'. (Tie-off Points are specified: ☐ in "Comments" below ☐ in the "Fall Protection" section) ☐ Masts located within 20' of an **overhead power line** will only be lowered or raised with a dedicated spotter. (Refer to the "Overhead Powerlines" section of this JSA for additional safety precautions) ☐ Drill rigs will only be **moved with masts lowered**. ☐ Masts will be erected with **outriggers fully extended** when equipped with outriggers. ☐ Outriggers will be placed on a **firm, stable surface** or will be cribbed to prevent sinking of outriggers and collapse of the drilling/boring rig.

<table>
<tr><th colspan="2">HAZARD</th><th>HAZARD CONTROLS (check all that apply and comment as required)</th></tr>
<tr><td></td><td></td><td>☐ Drilling on sloped surfaces will be conducted such that the drilling/boring equipment remains stable and otherwise in accordance with requirements outlined below in Drilling/Boring comments.
☐ Tripod-mounted drill rigs will not be used until matts are placed under tripod legs when placed on soil and tripod leg spacing is verified to be even to maintain center of gravity.
☐ Procedures for responding to natural gas emissions (explosive vapors) are:
☐ Outlined in "Comments" below. ☐ Outlined in an attached procedure.
☐ Procedures for drilling/boring from a barge or otherwise working over water are:
☐ Outlined in "Comments" below. ☐ in the "Working Over Water" section.
☐ Drilling/boring equipment will be de-energized and locked-out prior to maintenance.
☐ Site personnel working in the area surrounding the drilling/boring rig have will be informed where the emergency shutoff in the event of an emergency. Specify the location of the shutoff in the "Comments" section below.
☐ Spill equipment is available for fuel and hydraulic fluid leaks. Location:
____
DRILLING/BORING COMMENTS:</td></tr>
<tr><th colspan="3">HEAVY EQUIPMENT (other than cranes)</th></tr>
<tr><td>☐
NA</td><td>Struck By, Run-Over, Caught In Between (pinch points), Roll Over, Fluid Leaks
☐ Excavator
☐ Dump Truck
☐ mini Skid Steer (bobcat)
☐ mini Excavator
☐ Gator/Off-Road Vehicle
☐ Forklift–rear counter-weight (indoor & yard)
☐ Forklift–rough terrain/lull
☐ Forklift–powered pallet
☐ Aerial Lift - Scissor Lift
☐ Aerial Lift - Extensible Boom
☐ Aerial Lift - Articulated Boom
☐ Aerial Lift - Vertical Lift ("Genie")
☐ Other: ______________
☐ Other: ______________</td><td>☐ Qualified persons operate all heavy equipment. Qualifications were determined by: ____
☐ Heavy equipment operator designation on company letterhead or email with company email address. Designation is specific to the types of heavy equipment.
☐ Forklift certification or license is specific to the type of lift being operated.
☐ Operators have aerial Lift certification specific to the type of lift being operated.
☐ "Acceptance Inspection" for heavy equipment upon mobilization documented on an inspection checklist by: _________________________(Mgmt representative).
☐ Daily Heavy Equipment Inspections by Operators documented on an inspection checklist
☐ Preventative Maintenance performed on all heavy equipment on site >30 days (required)
☐ Ramboll's "25' Rule" to be implemented. Unauthorized persons will be kept at least 25' away from heavy equipment. Persons walking within 25' must get operator's permission.
☐ Blind spot general precautions will be implemented as indicated below:
• Operators will not operate heavy equipment while persons are in blind spots.
• Operators are required to use spotters when obstructions are in blind spots or clearances are otherwise tight.
☐ Backup precautions will be implemented. Spotters are required when trucks or other heavy equipment are backing up. Clarify procedure in "Comments" below.
☐ Operators and helpers will maintain a safe distance to moving parts and potential crush or pinch points as indicated below:</td></tr>
</table>

	HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
		• All those working near moving or rotating parts will secure loose hair, clothing, etc. • All personnel working within 25' of heavy equipment will be instructed to stay clear of pinch or crush points between the load and lift and the lift and fixed objects ☐ **Counterweight swing radius** will be barricaded for excavators, aerial lifts, etc. ☐ Operators are required to wear **seatbelts** for all equipment provided with seatbelts. ☐ **High visibility vests** are required for: ______________________________________ ☐ Operators will review manufacturer's safety guidelines for all **equipment operated on slopes** including Gators© and similar ATVs/4x4's. (In the "Comments" section below, specify the maximum slope for each piece of equipment that will be operated on slopes. This may be completed upon mobilization.) ☐ Dump trucks, 4x4's, or other haul vehicles will not be loaded beyond manufacturer **capacities or weight limits** established by state and local authorities for transportation. ☐ **Spotters** are required when trucks or other heavy equipment are backing up. Clarify procedure in "Comments" below. ☐ Operators and helpers will maintain a **safe distance to moving parts**. All those working near moving or rotating parts will secure loose hair, clothing, and equipment. ☐ Fall protection will be worn by all those in **Aerial Lifts** (scissor lifts are excepted: ☐ Yes ☐ NO) ☐ Work area is inspected by operators for **overhead and surface obstructions** prior to use of aerial lifts. ☐ **Areas below aerial lifts** will be protected to prevent entry by unauthorized personnel (describe how this will be accomplished in "Comments") ☐ **Spill equipment** is available for fuel and hydraulic fluid leaks. Location: _________ **HEAVY EQUIPMENT COMMENTS:**
POWER TOOLS, HAND TOOLS, and EXTENSION CORDS		
☐ NA	eye injury, hand/arm cuts, electrical shock, strains, foot injuries, dust ☐ Misc Hand tools (shovels, hammers, trowels, etc.) ☐ Chainsaws (Clearing & Grubbing) ☐ Sharp hand-tools (knives, cutters, scissors) ☐ Electrofishing (Fish Shocking) Equipment ☐ Hand Augers - Iwan or Spiral type ☐ Hand Sampler - Split Spoon or Thin Wall ☐ Hand Probe (GeoProbe) with _____ lb weight	☐ All tools and electrical cords in-use will be **inspected daily** by: ☐ Users ☐ Site Supervisor/Safety Coordinator ☐ Other: ___________________ ☐ Only the right tools will be used in a manner for which they were designed. ☐ **GFCIs** will be used on all extension cords and 120v power tools. ☐ All **extension cords** are in good condition with no cuts through outer insulation, ground plugs are present, and no "vinyl tape" repairs. (Only 12 gauge extension cords may be repaired.) ☐ **Face shield and chemical goggles** used required for chemical splash hazards ☐ **Face shield and safety glasses** required for all chain saws, weed trimmers, and similar tool ☐ **High Hazard Power Tools** must be used because the use of safer tools is not feasible. High hazard power tools include powder-actuated tools, chainsaws, chop/demo saws, weed trimmers with blade cutter, die/end grinders, abrasive wheel tools, hand-held rebar bender, portable HDPE fusion welder, circular saw, portable band saw: • Implement HSE Manual Requirements in the "Power Tools-High Hazard" procedure.

	HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
	☐ Manual Cathead Hoist with ______ lb weight ☐ Motorized Cathead Hoist with _____ lb weight ☐ Light-weight Motorized Auger drills (not truck-mounted) ☐ Manhole Lifting Devices **(specify in Comments)** ☐ Other (specify):	• Refer to the high hazard power tools safety meeting topics in the Safety Meeting Topics manual to support field safety training prior to use of high hazard power tools. ☐ **Kevlar chaps and jacket** are required for all chainsaw work. ☐ **Kevlar chaps** are required for chop saws, weed trimmers with blades, and similar tools ☐ **Cut-resistant gloves** are worn whenever cutting tools are used. ☐ **Razor & Fixed Blade Knives are <u>Prohibited</u> –** Use is prohibited ☐ **Razor & Fixed Blade Knives are <u>Restricted</u>** – Use is allowed for only the task(s) listed below in "comments" because safer alternatives are not available. Additional safety precautions to prevent hand & forearm lacerations are also explained in "comments". ☐ **Hearing protection** required for which tools or areas: _________________________ ☐ All **hand augers and sampling probes** will be inspected and verified to be in good conditions with ALL parts required by the manufacturer. Inspections will be completed by: ☐ Users ☐ Site Supervisor/Safety Coordinator ☐ Other: _________ ☐ Persons using sampling probes equipped with **manual slide hammers** are physically capable of handling the weight without difficulty and keep hands clear of pinch-points. ☐ Persons using **manual and motorized cathead hoists** have been trained on how to operate them in accordance with manufacturer guidelines. **(Identify qualified persons by name in the "Comments" Section below.)** ☐ Electrofishing equipment will be **inspected** and verified to be in good conditions with ALL parts required by the manufacturer and exterior cords have no cuts through outer insulation and no "vinyl tape" repairs. Inspections will be completed by: ☐ Users ☐ Site Supervisor/Safety Coordinator ☐ Other: ______________________ ☐ Persons using **Electrofishing Equipment** have been **trained** on how to operate it in accordance with manufacturer guidelines. **(Identify qualified persons by name in the "Comments" Section below.)** ☐ Electrofishing will be discontinued if the **public** approaches within **100'** ☐ Electrofishing boats will be marked with "**Danger Electricity**" signs (or equivalent) that can be read at a distance of **150'**. ☐ All electrofishing team members wear **electrically-rated rubber gloves** that are inspected daily by users and replaced every 6 months. Use leather or other cut-resistant gloves to protect the rubber gloves. (Similar to NFPA 70E requirements.) ☐ All electrofishing team members wear **chest or hip waders** to insulate the wearer from electrical shock. ☐ **Net handles** for nets used during electrofishing will be nonconductive and long enough to keep hands out of the water. ☐ The positive electrode (anode) on portable electroshockers is equipped with a **manual switch** that stops the current when released and is **not "bypassed'** with a hold-down mechanism (i.e., tape) ☐ At least **two (2) persons** on each Electrofishing boat or location are trained in **CPR**. ☐ All persons involved in electrofishing know the location of the **emergency shutoff switch**. ☐ **Backpack electrofishing equipment** is equipped with a **tilt switch** that stops the current if the operator falls.

<table>
<tr><th colspan="2">HAZARD</th><th>HAZARD CONTROLS (check all that apply and comment as required)</th></tr>
<tr><td></td><td></td><td>POWER TOOLS, HAND TOOLS & AUGERS, EXTENSION CORDS, & ELECTROFISHING COMMENTS:</td></tr>
<tr><td colspan="3">WORKING OVER/NEAR WATER OR ON ICE</td></tr>
<tr><td>☐
NA</td><td>drowning, hypothermia (winter months), spills to surface waterways, fall through ice

☐ Barge-mounted drilling/ boring rigs
☐ Sampling from a boat
☐ Boat required for site Access
☐ Work on an ice covered body of water
☐ Other:

NOTE – See “Walking Surfaces” section of JSA for slipping hazards on icy surfaces.</td><td>☐ 100% Fall Protection while working over water or when otherwise exposed to a drowning hazard. (Describe how fall protection will be implemented, Tie-off points, and the equipment that will be used. ☐ in "Comments" below ☐ in the "Fall Protection" section)
☐ A "safety observer" will remain on shore with the ability to contact emergency response personnel and communicate with those on boats/barges.
☐ USG-approved flotation vests will be used.
☐ Ring-buoy with 90' of rope and placed within 100' of site personnel.
☐ Rescue skiff will be staged such that one person can immediately launch the skiff.
☐ At least one person will be available to launch and operate the rescue skiff. NOTE - "Safety Observer" may launch rescue skiff after making emergency response notification(s).
☐ Ice Safety - Core samples will be taken every 100' on lakes or 50' on rivers to evaluate the thickness and quality of ice (i.e., clear/blue ice = best quality, white/opaque ice = moderate quality/use caution, gray/slushy ice = poor quality/unsafe).
☐ Ice Safety - Conservative load estimates are established for static and/or moving loads as appropriate for the type of work being conducted. Load estimates are explained: ☐ in "Comments" below ☐ in an attached document
☐ Spill Control - Floating booms will be used around barges, shore-based heavy equipment, or other locations where hydraulic fluid may leak from equipment into surface water.
☐ Spill Control - Silt curtains will be suspended below floating booms.
☐ Boats and Barges will not be operated above their weight capacity.
☐ Boats and barges operated (or potentially operated) in bad weather will be operated below their weight capacity by ______% (suggest at least 25%).
☐ Boat and barge emergency calls - Weather resistant radios that broadcast on Coast Guard frequencies (Channel 16 VHF/FM or 2182 MHZ) will be available for emergency calls.
☐ Boat or barge-based operations will be discontinued when NOAA issues a small craft advisory or when sustained wind speeds of 20 mph are observed and create dangerous wave or boat/barge handling conditions.
☐ NOAA Weather Radio Receiver will be used to monitor weather conditions that may affect boat or barge-based activities.
WORKING OVER WATER COMMENTS:</td></tr>
</table>

<table>
<tr><th colspan="2">HAZARD</th><th>HAZARD CONTROLS (check all that apply and comment as required)</th></tr>
<tr><td colspan="3">MANUAL MATERIAL HANDLING & STORAGE / HOUSEKEEPING / WALKING SURFACES
(includes manhole covers, heavy lifting, slippery surfaces, and steep slopes)</td></tr>
<tr><td>☐
NA</td><td>back or shoulder strain, struck by falling objects, trips and falls, incompatible materials (fire or explosion)
☐ hvy manual lifting (>50 lbs)
☐ chemical storage
☐ compressed gas storage
☐ Tall storage greater than 2 pallets stacked.
☐ Material & equipment laydown areas
☐ Trash & debris removal
☐ Manhole Cover Removal
☐ Tripping Hazard (cords, hoses, uneven surfaces)
☐ Slipping Hazard (icy, muddy, oily, etc.)
☐ Steep sloped surfaces
☐
☐</td><td>MATERIAL HANDLING & HEAVY LIFTING
☐ Mechanical lifting equipment used to reduce manual material handling:
(☐ Forklift/Lull ☐ Heavy Equipment ☐ Dolly ☐ ________________________)
☐ Manual lifting more than 75 lbs will require a 2-person lift or mechanical lifting device
☐ Good manual lifting techniques will be reviewed with the following trades/persons prior to site work. Refer to the "Lifting-Manual" topic in the Safety Meeting Topics manual: ____
MATERIAL STORAGE & HOUSEKEEPING
☐ Incompatible chemicals will be separated by 20' or a concrete block wall.
☐ Secondary containment will be provided for the following chemicals: _____________
☐ Safety equipment will be located near chemical storage.
☐ Spill Kit ☐ Emergency Shower ☐ Eyewash ☐ Drench Hose ☐ Splash PPE
☐ Flammable gases and oxygen will be separated by 20'.
☐ All compressed gas cylinders will be transported vertically and secured upright.
☐ Equipment and materials will be stacked in laydown areas with aisles as necessary for safe access. All un-used equipment & materials will be returned to laydown areas daily. Designated laydown areas:____
☐ Materials will not be stacked greater than 2 pallets high without being secured.
☐ Trash and debris will be removed daily and placed in designated containers. Specify debris segregation and location of disposal containers below.
☐ All chemical containers will be labeled per Hazard Communication requirements.
MANHOLE COVERS
☐ Manhole covers will ONLY be removed with tools specifically designed to remove them including J-hooks that are at least 30" long. No pry bars, shovels, or screw drivers.
☐ "Stuck" manhole removal equipment and procedures are described in "comments."
☐ "Paved-over" manhole removal equipment and procedures are described in "comments."
WALKING SURFACES
☐ Slippery surface – work area inspected for icy surfaces which will be salted/sanded.
☐ Slippery surface –YakTrax® or similar slip-on traction devices will be used for icy areas.
☐ Hoses & Cords will be run out of walkways (e.g., within 6" of walls or 7.5' overhead) <u>whenever possible</u> or will be clearly marked by cones or barricades.
☐ Inspect Work Area for trip hazards. Hazards will be corrected if possible. If hazards cannot be corrected, then slip & trip hazards will be clearly marked.
☐ Steep slopes will be avoided and alternative walkways established to the extent feasible (describe below)
MATERIAL HANDLING & HOUSEKEEPING COMMENTS:</td></tr>
</table>

<table>
<tr><th colspan="2">HAZARD</th><th>HAZARD CONTROLS (check all that apply and comment as required)</th></tr>
<tr><td colspan="3">ROADWAY, RAILROAD, & SIDEWALK OBSTRUCTION</td></tr>
<tr><td>☐
NA</td><td>☐ Vehicle accidents
☐ Pedestrians struck by vehicles or heavy equipment
☐ Pedestrians falls
☐ Pedestrian struck-by falling objects
☐ Railroad accidents</td><td>☐ DOT signal devices will be used to re-route vehicles around excavations or busy site entrances/exits that affect road traffic.
☐ Roadway Flaggers will be used and have DOT Flagger Training
☐ Procedures for work vehicles to enter/exit traffic work zones are required when work zones are setup in high speed roadways or when potential blind-spots exist. Explain in "Comments."
☐ Pedestrian traffic will be safely routed around or over excavations.
☐ Pedestrian traffic will be safely routed around or under overhead work.
☐ Railroad owner notified for permission to work on the railroad right-of-way.
☐ Railroad flagger is required for work in the right-of-way.
☐ Equipment, materials, and personnel may not be closer than 15' to the nearest railroad rail if the railroad flagger or the flagger's signal is not visible.
☐ Derailer(s)/bumper(s) will be installed on railroad tracks to isolate the work area.
ROADWAY, RAILROAD, & SIDEWALK COMMENTS:</td></tr>
<tr><td colspan="3">BIOLOGICAL HAZARDS</td></tr>
<tr><td>☐
NA</td><td>Infection, Lyme Disease, West Nile Virus, Eastern Equine Encephalitis (EEE), Severe Rash, Allergic Reaction, Venom effects
☐ Ticks
☐ Mosquitoes (EEE, WNV, etc)
☐ Venomous Snakes
☐ Venomous Spiders
☐ Poison Ivy, Oak, or Sumac
☐ Bees & Wasps
☐ Fire Ants
☐ Other (identify below):</td><td>☐ Use DEET (25%-98%) repellent on skin for protection against mosquitoes, ticks, and similar insects. Use higher concentrations for heavily infested areas.
☐ Use Permethrin repellent on clothing in areas heavily infested with ticks, chiggers, etc.
☐ Persons working in tick-infested overgrown areas instructed to wear spun-poly or Tyvek coveralls [<u>required</u> for all persons in ESR and working in the NE region plus NJ, & PA.]
☐ Persons returning from work in tick-infested areas instructed to perform periodic field checks for ticks and a thorough tick inspection as soon as they get home.
☐ Employees (only) instructed to call WorkCare for embedded ticks from fieldwork.
☐ All site personnel will be instructed on how to identify poison ivy, sumac, and oak. (Ramboll Field Identification Guide or equiv. has been posted? ☐ YES ☐ NO)
☐ Poison ivy barrier creams (e.g., Ivy Block) will be used on exposed skin prior to the workday.
☐ Poison ivy neutralizing wipes or rubbing alcohol will be used on hands and exposed skin following work activities or incidents where contact with poison ivy/oak/sumac is suspected.
☐ Protective coveralls (such as Tyvek™) will be used to prevent contact with ticks or poison ivy.
☐ All site personnel will be instructed on how to identify venomous snakes indigenous to the area. List venomous snakes of concern in the "Comments" section below. (Ramboll Field Identification Guide or equiv. has been posted? ☐ YES ☐ NO)
☐ All field personnel with a potential to encounter venomous snakes will wear:
☐ Snake Chaps AND/OR ☐ High Leather Safety Boots (NOT ankle-high boots/shoes)</td></tr>
</table>

<table>
<tr><th colspan="2">HAZARD</th><th>HAZARD CONTROLS (check all that apply and comment as required)</th></tr>
<tr><td></td><td></td><td>☐ All site personnel will be instructed on how to identify venomous spiders indigenous to the area. List venomous spiders of concern in the "Comments" section below. (Ramboll Field Identification Guide or equiv. has been posted? ☐ YES ☐ NO)
☐ Site personnel with known allergies to bee/wasp stings, fire ant bites, or other insect bites carry an "EpiPen" or equivalent medication prescribed for treating allergic reaction.
BIOLOGICAL HAZARDS COMMENTS:</td></tr>
<tr><th colspan="3">ENVIRONMENTAL HAZARDS / HAZARDOUS WASTE SITE WORK</th></tr>
<tr><td>☐
NA</td><td>Exposure to hazardous vapors or dust, contact with contaminated materials, fire, explosion.

Contaminants of Concern and hazardous chemicals include:
☐ volatile organic compounds
☐ (describe:______________
______________________)
☐ semi-volatile organic compounds (describe:______________
______________________)
☐ metal dusts (describe:______________
______________________)
☐ PCBs
☐ Caustic (NaOH)
☐ Acid (H2SO4, HCL)
☐
☐

(many other hazardous waste site hazards are covered elsewhere in this JSA)</td><td>☐ Site workers with a potential for contact with contaminated materials and work in Level C PPE will have OSHA 40-hour training, current 8-hour refresher, and medical exam.
☐ Site workers with minimal contact with contaminated materials and no work in Level C PPE will have OSHA 40-hour OR 24-hour training, current 8-hour refresher, and medical exam.
☐ Foremen or Supervisors overseeing field crews will have 8-hour OSHA Supervisor training.
☐ No intrusive work activities or areas are anticipated with current scope of work.
☐ Intrusive work activities include: ____
☐ The perimeter of intrusive work areas are identified by:______________
☐ Decontamination of personnel or equipment is <u>not</u> anticipated with the current scope of work.
☐ Decontamination of personnel and small tools will be conducted as follows:
____
☐ Decontamination of heavy equipment will be conducted as follows:
____
☐ Heavy equipment leaving the site will be inspected by:
____
☐ Work area air monitoring is not anticipated with the current scope of work.
☐ Work area air monitoring will be conducted per attached air monitoring plan.
☐ Work Area Air Monitoring as follows for: ☐ Dust, ☐ VOCs, ☐ Other:___________
Description of Air Monitoring Approach:
<table>
<tr><th>Action Levels[1]</th><th>Description & Response Actions</th></tr>
<tr><td><X</td><td>1. <u>Level D PPE</u> (General PPE as required in this JSA)</td></tr>
<tr><td>X</td><td>1. <u>Half or Full Face Level C PPE</u> - Tyvek, boot covers, nitrile gloves, half or full face w/ respirator with _______________ cartridges changed (☐ daily, ☐ _______________) OR
2. Implement additional engineering or administrative controls to reduce contaminant concentrations below action level(s).</td></tr>
<tr><td>10X</td><td>1. <u>Full Face Level C PPE</u> w/ Quantitative Fit Testing (no half-face)
2. Or Reduce contaminant(s) below Level B action level(s).</td></tr>
<tr><td>50X</td><td>1. <u>Level B PPE</u> – PPE same as above with a supplied air respirator
2. Or STOP work until contaminant levels can be reduced.
3. Notify the Project Manager and Client Representative.</td></tr>
<tr><td>????</td><td>1. STOP work</td></tr>
<tr><td colspan="2">1. Sustained 1 minute</td></tr>
</table></td></tr>
</table>

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
		☐ **Community Air Monitoring** is not anticipated with the current scope of work. ☐ **Community Air Monitoring** is required per the attached air monitoring plan. ☐ **Community Air Monitoring** as follows for: ☐ Dust, ☐ VOCs, ☐ Other:___________ **Description of Air Monitoring Approach**:

Action Levels[1]	Description & Response Actions
<0.1 mg/m³	1. Normal Operation
0.1 mg/m³	1. Increase demolition dust controls until dust levels at the site perimeter (fence line) are <0.1 mg/m³
0.15 mg/m³	1. STOP work and evaluate alternate work methods or dust controls 2. Implement revised work methods and dust controls to maintain dust levels at the site perimeter <0.1 mg/m³ 3. Resume work.
1. 15 minutes time-weighted average	

ENVIRONMENTAL & CHEMICAL HAZARD COMMENTS:

OTHER HAZARDS & CONTROLS not addressed in other sections of this JSA		
☐ NA	☐ ☐	

EMERGENCY RESPONSE			
(911 Service is Available ☐ Yes ☐ No		**Cell Phone Required** ☐ Yes ☐ No)	
Alternate Emergency Number (if not "911"):			
Site Address:			
Muster Point in case of site evacuation:			
Emergency Medical Treatment - Hospital Name: Hospital Address:		**Number:**	
Non-Emergency Med. Treatment - Clinic Name: Occupational Clinic Address:		**Number:**	
Minor Injury Support for Ramboll Employees:	**WorkCare Incident Intervention**	**Number:**	888-449-7787
Fire Department Name		**Number:**	
Spill Response:		**Number:**	
Client Representative Name:		**Office Number:** **Cell Number:**	
Ramboll **Project Manager** Name:		**Office Number:** **Cell Number:**	
Ramboll **Site Safety Leader** Name:		**Office Number:** **Cell Number:**	
Ramboll **Corporate H&S** Name:		**Office Number:** **Cell Number:**	
Contact Name:		**Office Number:** **Cell Number:**	

EMERGENCY RESPONSE

EMERGENCY RESPONSE COMMENTS:

1. NOTIFICATIONS - Upon occurrence of any injury, fire, explosion, major spill (beyond incidental), property damage >$1,000, or near-miss that could have resulted in a fatality or disabling injury, **IMMEDIATELY NOTIFY** the Ramboll Project Manager, Ramboll Manager of Corporate H&S, and the Client Representative.

2. WRITTEN REPORT - Complete an *Incident Report* within **24 hours** and submit to the Ramboll Manager of Corporate H&S for review. Report may be submitted as a "draft" or "preliminary" and updated as additional information is identified.

3. INJURY RESPONSE
   - First aid injuries will be handled on site with FA-trained personnel. First aid and CPR supplies are located: ______________.
   - If a person (Ramboll employee or subcontractor employee) may be **working alone** at times when the job site is unoccupied, then regular "check-ins" will be conducted between the lone site person and their supervisor or other designated person. The method of communication (radio, cell phone), the frequency of check-ins, and the names of individual(s) with whom the lone worker will be checking in must be outlined below under "*Other Emergency Information*." Employees should not be assigned to "High Hazard Work" when working alone.
   - **All Ramboll employees will call WorkCare for minor injuries** that include any strains, cuts for which an employee is not confident that a band aid is sufficient, tick/insect bites for which the employee is concerned about infection or Lyme, any any other work-related injury for which the employee would like to talk to a WorkCare medical professional regarding proper treatment or follow-up.
   - **WorkCare posters must be posted at each job site with a field office or trailer.**
   - Minor (not life threatening) injuries that require medical attention will be treated at the "Non-Emergency Med Treatment" clinic identified above **unless an alternate clinic is recommended by WorkCare**. If no clinic is available or identified, then default to the "Emergency Medical Treatment" facility.
   - If an Ramboll employee feels that a minor injury is not healing properly or may be more severe than originally anticipated, they should call WorkCare and discuss their concerns. At this time, WorkCare may direct the employee to a local clinic, or alternately, employees may request evaluation at a local clinic. In either situation, **WorkCare will facilitate the employee's visit to a suitable, local clinic for further evaluation**.
   - Life Threatening injuries are an emergency and require implementing emergency response (911 or alternate).

4. FIRE or EXPLOSION
   - Incipient stage (trash can size) fires may be handled by site personnel using fire extinguishers or hoses.
   - Larger fires will require that affected personnel are evacuation to the identified muster point and implementing emergency response (911 or alternate).

5. SPILL RESPONSE
   - Major spills that exceed the available supplies and resources to safely control and cleanup will require contacting an off-site spill responder indicated above for "Spill Response" and in accordance with existing site spill response plans. If a specific spill responder is not identified, a large spill will require implementing emergency response (911 or alternate).
   - Review available spill control and prevention plans that may be applicable to the work area. Ensure project personnel are familiar with plan requirements.
   - Minor or incident spills will be cleaned up by site personnel using supplies that are located: ____________________________.
   - The site owner will make notifications for reportable spills unless Ramboll is authorized to make those notifications.

6. POSTING - Emergency numbers and Hospital Route Map are posted: ____.

7. OTHER EMERGENCY INFORMATION:

Hospital Route Map

< Insert a hospital route map and directions >

Occupational Clinic Route Map

<If Available, Insert an Occupational Clinic Map and Directions>

Pre-Work Briefing Acknowledgement: Individuals who are performing work covered by this JSA have received a *site-specific Project Safety Orientation (PSO)* that includes a review of the safety requirements outlined in this JSA. The undersigned individuals acknowledge that have read this JSA or reviewed this JSA with a designated project representative and agree to comply with safety requirements. The undersigned individuals understand that these safety requirements are not "all-inclusive" and that they are expected to follow any additional safe work practices applicable or customary to their specific scope of work or trade.

Print Signature	Signature	Company	Date

APPENDIX 3 – PRE-TASK PLANNER

DAILY PRE-TASK PLANNER (MANAGING CHANGE)

Project Name:		**Date:**	
Company Name:		**Project No.:**	
Authorized Tasks Scope of Work for the day (be specific):			

"YES" Boxes Indicate a Change or Permit/Inspection Which Must Be Addressed.

YES	NO	DAILY SUPERVISOR SAFETY PLANNING (Focus On Changes From Previous Work Shift)
		Change in Personnel – *Has a new person been added to the work or project? If YES, then verify the following have been completed prior to work:* • Project Safety Orientation - Safety Plan, JSA/AHA, SDSs, or other safe work documents are reviewed • Pre-Work Documentation – Training and medical surveillance documentation is on-site
		Change in Work Scope or Methods – Has the work scope or work methods changed in any way which includes task changes or new tools, new equipment, or different chemicals. **IF YES**, then verify the following have been completed prior to work: • Potential for new hazards is evaluated relative to existing JSA/AHA. • If new hazards are identified, then the JSA/AHA is revised and reviewed with work crew.
		Change in Work Area Conditions – Have work area conditions changed or are anticipated for the work area? **IF YES**, identify change below and review changes to safety equipment or procedures under "Key Safety Instructions." ☐ Heavy Rain ☐ Possible Lightening ☐ High Winds ☐ Heat ☐ Cold or Ice ☐ Hazardous Plants ☐ New Work Area ☐ Other:
		Change in Health or Injury Status – Does anyone have a new work-related injury or illness to report? **IF YES**, notify the SSL and conduct an investigation for the purpose of identifying corrective and preventative actions.
		Change in Coordination or Notification - Do ANY of the following ***coordination or notification conditions*** apply to today's authorized tasks? ***IF YES***, take necessary measures (or verify that such measures have already been taken) to coordinate with, or notify, affected organizations including: ☐ Process owners or operators when working near active process equipment including electrical substations, chemical/bulk storage areas, water/wastewater treatment equipment, active production areas, etc. ☐ Contractors performing work in adjacent work areas or other areas potentially impacted by project activities. ☐ Public officials or agencies for work that may impact public roads, navigable waterways, sewer discharges, etc. ☐ Railroad and Utility Companies for work in rights-of-way OR crossing rights-of-way ☐ Rescue services for permit-required confined space entry.
		Permits & Inspections needed for authorized tasks? (**IF YES**, then check all that apply) ☐ Permit-Required Confined Space Entry ☐ Hot Work ☐ Daily Excavation Checklist ☐ Non-Permit Confined Space Downgrade ☐ Energized Electrical Work ☐ Daily Scaffolding Inspection ☐ Alternate Entry (Confined Space) ☐ Lifting & Rigging Plan ☐ Heavy Equipment Inspections ☐ Other:

KEY SAFETY INSTRUCTIONS OR MESSAGE FOR THE DAY (To Be Reviewed With Field Personnel)

☐ JSA/AHA was revised for today's work and was reviewed with the field crew - check (☒) when applicable

Ramboll Representative (review):		
Subcontractor Foreman/Supervisor Signature (authorize):		
Crew Signatures (acknowledge):		

APPENDIX 4 – TOOLBOX MEETING FORM

Safety/Toolbox Meeting Attendance

Client:
Project Name:
Project Location:
Conducted By:
Meeting Topic:

Project No.:
Today's Date:

Name	Signature	Company Name

Safety Meeting Topics (be specific)

KEEP COPIES OF ALL TOOLBOX MEETING MINUTES WITH PROJECT RECORDS

APPENDIX 5 – INSPECTIONS SHORT FORM

RAMBOLL

Safety Inspection Checklist Short Form

Project Name:		**Project Number:**	
Project Location:		**Auditor:**	
Site Supervisor:		**Date of Audit:**	
cc List:	Project Manager, Manager of Corp H&S		

ADMINISTRATIVE (place an X in one of the three categories for each item - specify deficiencies below)

N/A	Y	N	Description
☐	☐	☐	**First aid supplies** available. The site relies on
☐	☐	☐	**Emergency numbers** posted. (**WorkCare** number posted for **employees** – WorkCare poster is available on H&S Intranet site)
☐	☐	☐	**OSHA** and Department of Labor **Posters** conspicuously posted.
☐	☐	☐	**Corporate Health and Safety Manual** Available.
☐	☐	☐	A project **safety plan or JSA** was developed and reviewed with site workers.
☐	☐	☐	Subcontractors have current **Safety Prequalification** form on file.
☐	☐	☐	**Toolbox safety meetings** documented.
☐	☐	☐	**Daily excavation inspections** documented on a *Daily Excavation Checklist*.
☐	☐	☐	**Hot work/confined space entry permits** documented and issued daily.
☐	☐	☐	**Energized Electrical Work Permits** issued for ALL work (including inspections) within energized electrical equip.
☐	☐	☐	**Written "Notice to Proceed"** sent to the steel erection subcontractor?
☐	☐	☐	O&M projects have **equipment-specific Lockout/Tagout** (LOTO) procedures

NOTES: (Identify Major Subcontractors. Explain corrective actions for all observed deficiencies and indicate when corrective actions are completed and by whom. Use reverse side as necessary.)

FIELDWORK (place an X in one of the three categories for each item - specify deficiencies below)

N/A	Y	N	Description
☐	☐	☐	**Hard hats and safety glasses** used in ALL construction areas.
☐	☐	☐	**Ear protection** used where noise requires you to raise your voice to be heard <5 ft away.
☐	☐	☐	**Tick Prevention** – DEET & Permethrin repellants used for work in ALL overgrown areas on projects in NY, NJ, PA, CT, and MA? (Use as necessary in other states.) Tick prevention is addressed in safety plan or JSA?
☐	☐	☐	**Fall protection** used by employees working above 6 ft and in manlifts; (see JSA for exceptions)
☐	☐	☐	**Ladders** used properly: stepladder fully open, extension ladder 3 ft past upper surface & tied off
☐	☐	☐	Good **housekeeping**, job-site looks neat. (aisles clear, designated lay-down areas, etc.)
☐	☐	☒	**Manual Lifting** risks are minimized - ☐Toolbox Training ☐ Dolly ☐ Forklift ☐ Other:

N/A	Y	N	Description
☐	☐	☐	All chemicals and **chemical containers** properly labeled.
☐	☐	☐	**Cylinders** properly secured (upright and bound from tipping) and not set directly on ground.
☐	☐	☐	**Oxygen & flam. gas cylinders** separated by 20 feet and away from heat producing devices.
☐	☐	☐	**Barricades** setup around the Exclusion Zone, unattended excavation/holes, edges, scaffolds
☐	☐	☐	**GFIs** used on all extension cords and temporary 110/120-volt wiring.
☐	☐	☐	**Excavations >5 ft** are sloped/shored and inspected by competent person prior to entry.
☐	☐	☐	**Rescue services** notified of **confined space entry**. Specify Service:
☐	☐	☐	**Retrieval equipment** (harness, lifeline, and hoisting apparatus) setup during **confined space** entry
☐	☐	☐	**Scaffolds** erected over 10 ft have guardrails at 21 inches and 42 inches and a 4-inch toeboard around all sides
☐	☐	☐	**Heavy Equipment & Off-Road Vehicles** are in good condition, inspected daily, & operated safely.
☐	☐	☐	**Cranes** have documented monthly and annual maintenance inspections.
☐	☐	☐	**Crane operators** are qualified: ☐ license ☐ training certification ☐ Other (specify)
☐	☐	☐	**Lockout/Tagout** is used - each employee has own lock – a tag is attached to all locks
☐	☐	☐	Personnel performing **inspections within energized equipment >50V** have NFPA 70E training, Arc Flash PPE, and other safety precautions outlined on an Energized Electrical Work Permit
☐	☐	☐	**High Hazard Power Tools –** documented review of safety requirements, Kevlar PPE required for chop saw, chain saw, weed trimmers w/ blade, Refer to "*Power Tool-High Hazard*" procedure in HSE Manual.
☐	☐	☐	**Razer & Fixed Blade Knives –** Use is prohibited unless documented in a JSA that no safer alternative is available for the task
☐	☐	☐	**Air monitoring** being performed and documented as required by the site safety plan or JSA.

NOTES: (Explain corrective actions for ALL observed deficiencies and indicate when corrective actions are completed and by whom. Use reverse side as necessary.)

APPENDIX 6 – SUMMARY OF PROHIBITED AND ACCEPTABLE ITEMS FOR PFAS SAMPLING

PFAS Sampling Considerations for Personal Protective Equipment (PPE)

The following information is part of Ramboll's Field Guidance Document (FGD) No. 1.07 pertaining to PFAS Sampling. This information pertains to items associated with PPE including items such as insect repellents and sunscreens that may be needed. The full version of FGD 1.07 can be found in *the Field Sampling Plan for NYSDEC Standby Contract D009810* and should be referred to as needed for additional information associated with a site-specific scope or procedure requirement.

The following provides a key to interpreting the information provided in the attached excerpt for FGD 1.07.

A red dot (●) identifies items or materials that are understood to contain PFAS or that PFAS are used in their manufacture and **should not be used** when sampling for PFAS.

A yellow triangle (▲) identifies items or materials for which the potential for PFAS bias or cross-contamination is not fully understood and **may be allowable with special considerations** and/or adjustment to protocols after consultation with the PFAS SME team.

A green square (■) identifies items or materials that are understood to not be sources of PFAS bias or cross-contamination and are **allowed or preferred** when sampling.

Additional questions should be referred to the PFAS SME team. A list of the team members is included in this Appendix.

- HDPE, polypropylene, polyurethane, polyvinylchloride (PVC), silicone, stainless steel, neoprene, and nylon twine a permissible to come in contact with sampling media.
- Alconox®, Liquinox® and Citranox® branded products may be used for equipment decontamination.
- Waxed fabrics and well-washed cotton fabrics are preferred materials for clothing.
- Double-bagged water ice.
- Ball point pens or pencils are preferred for taking notes or writing in the sampling zone.
- Hercules Megaloc® thread compound by Oatey.
- Poly-Sal® brand drilling fluid additive/lubricant and PFAS-free pipe thread compounds that contain degradable guar gums are preferred materials to be used by drillers.

- *Field Clothing and Personal Protective Equipment*. Due to the extensive use of PFAS in many industries and products, and their unique properties in water and oil repellency, clothing (e.g., pants, jackets, boots, shoes, gloves, and jackets) and PPE may contain PFAS. During a PFAS investigation, clothing and PPE containing PFAS should be avoided to prevent cross-contamination. While preparing for sampling and to the extent reasonably possible, avoid clothing that has been advertised as having waterproof, water-repellant, or dirt and/or stain resistant characteristics as these types of clothing are more likely to have had PFAS used in their manufacturing. Consult with a PFAS SME as necessary, and allow common sense to prevail. For instance, a treated insulating undergarment used in the winter and covered by layers of well-washed over garments should be of little concern. Well-worn, treated work boots should likewise be of limited concern, provided typical care is taken to avoid excessive boot-to-equipment contact and boots are kept away from environmental samples or clean equipment when not being worn. Conversely, use of a brand-new treated rain jacket or newly treated boots should be avoided.

  Unless required by the site-specific HASP, field clothing and PPE to be **avoided** include:

  - Clothing that has recently been washed with fabric softener.
  - Coated (i.e., yellow) Tyvek®.
  - Clothing chemically treated for insect resistance and ultraviolet protection.
  - Clothing that has been treated with water and/or stain resistant coatings such as:
    - Any Teflon® fabric protectors (e.g., Gore Tex)
    - Any Scotchgard™ fabric protectors
    - Bionic Finish®
    - GreenShield®
    - High-Performance Release Teflon®
    - Lurotex Protector RL ECO®
    - Resists Spills™ and Releases Stains™
    - RUCO®
    - RUCO-COAT®
    - RUCO-GUARD®
    - RUCO-PROTECT®
    - RUCOSTAR®

- NK Guard S series
- Oleophobol CP®
- Repel Teflon® fabric protector
- Repellan KFC®
- Rucostar® EEE6
- RUCOTEC®
- Ultra Release Teflon®
- Unidyne™

The types of field clothing and PPE that are **permissible** include:

- ▲ Latex gloves may be used if necessary to satisfy site-specific HASP requirements; however, large sampling programs should consider submitting a sample of the glove material for testing of PFAS content. Further, some regulatory agencies or states (e.g., California) prohibit the use of latex sampling gloves, and latex gloves should not be used by individuals who are sensitive or allergic to latex.
- ▲ Weather-proof boots may be used as they are not likely to be in significant contact or proximity to sampling equipment (assuming best practices are followed).
- ■ Powderless nitrile gloves.
- ■ PVC or wax-coated fabrics.
- ■ Clothing made from, containing, or treated with neoprene, polyurethane, or PVC.
- ■ Synthetic and natural fibers (preferably cotton) that are well-laundered (more than six times with no fabric softener) clothes and cotton overalls.
- ■ Non-coated (i.e., white) Tyvek.

- *Sun and Biological Protection*. Because sun and biological hazards (sunburn, mosquitos, ticks, etc.) may be encountered during sampling, the elimination of specific clothing materials or PPE (sunscreens and insect repellants) could pose a health and safety hazard to staff. The safety of field and contract staff must be the primary focus of decisions around site-specific field procedures and selection of sun and biological protection. With that in mind, however, any necessary deviations from this PFAS FGD must be made in consultation with a member of the Ramboll PFAS SME team.

  Ideally, rather than repellants and sunscreens, the preferences are (a) tucking pant legs into socks and/or boots to reduce exposed skin and reduce the risk of being bitten by ticks; (b) wearing well-washed, light-colored clothing to easily see ticks during field activities; and (c) wearing light-colored clothing, long sleeves, and large-brimmed hats to avoid sunburn. However, if it is necessary to use sunscreens and insect repellants, the following guidance is provided: (a) do not apply products near the sample collection area; (b) wash hands well following application or handling of sunscreen and/or repellents, and (c) subsequently don powderless nitrile gloves for the sampling activities.

  Other entities (e.g., the states of California, Michigan and New Hampshire) are constantly testing and updating products, the most recent of which have been listed below, to evaluate PFAS content. If required, sun and biological protection products **preferred for use** (however, care should be taken to use these exact products because similar products from the same brand may contain PFAS) include:

  - ■ Alba Organics Natural Sunscreen
  - ■ Aubrey Organics

- Avon Skin So Soft Bug Guard-SPF 30
- Baby Ganics
- Banana Boat for Men Triple Defense Continuous Spray Sunscreen SPF 30
- Banana Boat Sport Performance Coolzone Broad Spectrum SPF 30
- Banana Boat Sport Performance Sunscreen Lotion Broad Spectrum SPF 30
- Banana Boat Sport Performance Sunscreen Stick SPF 50
- California Baby Natural Bug Spray
- Coppertone Sport High-Performance AccuSpray Sunscreen SPF 30
- Coppertone Sunscreen Lotion Ultra Guard Broad Spectrum SPF 50
- Coppertone Sunscreen Stick Kids SPF 55
- Herbal Armor
- Jason Natural Quit Bugging Me
- Jason Natural Sun Block
- Kiss My Face
- L'Oréal Silky Sheer Face Lotion 50+
- Meijer Clear Zinc Sunscreen Lotion Broad Spectrum SPF 15, 30 and 50
- Meijer Wet Skin Kids Sunscreen Continuous Spray Broad Spectrum SPF 70
- Neutrogena Beach Defense Water + Sun Barrier Lotion SPF 70
- Neutrogena Beach Defense Water + Sun Barrier Spray Broad Spectrum SPF 30
- Neutrogena Pure & Free Baby Sunscreen Broad Spectrum SPF 60+
- Neutrogena Ultra-Sheer Dry-Touch Sunscreen Broad Spectrum SPF 30
- Repel Lemon Eucalyptus
- Sawyer Permethrin
- Yes To Cucumbers

▲ In addition, products listed as "baby-safe, "free," or "natural" are typically PFAS-free, however any of the above products are preferred

Some sampling guidance documents recommend that personal hygiene and personal care products (PCPs; e.g., cosmetics, shampoo, sunscreens, dental floss, toothpaste, etc.) not be used prior to and on the day(s) of sampling over concerns regarding the potential presence of PFAS in these products. If sampling protocols are followed however, these items should not come into contact with sampling equipment or samples being collected, and employing best practices while sampling will minimize the potential that these products, PFAS-containing or not, bias the PFAS analytical results. The following precautions should be taken when dealing with personal hygiene or PCPs before sampling:

- Do not handle or apply PCPs in the sampling area.

- Do not handle or apply PCPs while wearing PPE that will also be worn during sampling.
- ▲ For best practices, shower at the end of the workday.
- ▲ Hair nets can be used if hair care products are a concern as a potential PFAS source.
- ■ Move to the staging area and remove PPE if applying PCPs becomes necessary.
- ■ Wash hands after the handling or application of PCPs and, when finished, put on a fresh pair of powderless nitrile gloves.

- *Food Packaging*. PFAS have been used by the paper industry as a special protective coating against grease, oil, and water for paper and paperboards, including food packaging, since the late 1950s. PFAS application for food packaging includes paper products that come into contact with food such as paper plates, food containers, bags, and wraps. In January 2016, the Food and Drug Administration banned the use of PFAS having eight or more carbon atoms (e.g., PFOA, PFOS and PFNA); however, short-chain PFAS have not been banned for use in the manufacturing of contact food materials in the U.S. and may still be present in the coating materials of some food wrappers.

  When staff require a break to eat or drink, they must remove their gloves, coveralls, and any other PPE in the staging area and move to the designated area for food and beverage consumption (e.g., the "clean zone"). When finished, staff must wash their hands, then don any coveralls or other PPE, and, lastly, put on a fresh pair of powderless nitrile gloves immediately before sampling.

  Other procedures to be followed include:

  - Avoid handling, consuming, or otherwise interacting with pre-wrapped food or snacks, carry-out food, fast food, or other food items while on-site during sampling events.
  - ■ Move to the staging area and remove PPE prior to leaving the sampling and staging areas if consuming food on site becomes necessary.

- *Filtration*. Field-filtration must be avoided as field filtering may result in potential cross contamination. Further, PFOS and higher molecular weight PFSAs may sorb onto glass filters in the field or in the lab. If field-filtered samples for PFAS or other analytes are to be collected because of a client or regulator request:

  - Request clarification from the client or regulator regarding the intent of collecting filtered results (field or laboratory) and whether those results will be meaningful and/or necessary to meet the overall project goals for the PFAS sampling program.
  - Use low-flow sampling to the extent practical to avoid field-filtration.
  - Consider the use of centrifugation by the laboratory instead of filtration.
  - If filtering cannot be avoided, do not use glass, and control for the use of field-filtration by collection of equipment blanks from the filters and filtering equipment in contact with the samples and, if possible, a spiked (positive) control provided by the laboratory.

PFAS Subject Matter Expert Team		
Name	**Location**	**Primary Expertise**
Mark Nielsen*	Princeton, NJ	Site Investigation/Remediation
Jim Fenstermacher*	E Norriton, PA	Site Investigation/Remediation
Linda Dell	Amherst, MA	Epidemiology
Janet Egli	Nashville, TN	Water, wastewater
Paul Hare	Albany, NY	Site Investigation/Remediation
Debra Kaden	Boston, MA	Toxicology
Denise Kay	Lansing, MI	Ecological Risk, PFAS Research
Matt Longnecker	Raleigh, NC	Epidemiology
John Newsted	Lansing, MI	Ecological Risk, Site Investigation, Transport
Jaana Pietari	Westford, MA	Forensics
Imants Reks	Syracuse, NY	Growth Team Lead
Sonja Sax	Amherst, MA	Epidemiology
Rebecca Siebenaler	Princeton, NJ	Human Health/Eco Risk and Due Diligence
Sarah Stoneking	Arlington, VA	Due Diligence
Matthew Traister	Cincinnati, OH	Air Transport
Scott Warner	Emeryville, CA	Site Investigation/Remediation
Steve Washburn	Emeryville, CA	Site Investigation/Remediation
Jason Wilkinson	Westford, MA	Site Investigation/Remediation
Annette Nolan	New South Wales, AUS	PFAS Research, Investigation, Analysis
Gerd Van Den Daele	Sao Paulo, Brazil	PFAS in South America
Dorte Harrekilde	Odense, Denmark	Site Investigation/Remediation
Aldo Trezzi	Milan, Italy	Site Investigation/Remediation

Notes:
* PFAS SME team co-leaders.

APPENDIX 7 – HOT WORK PERMIT

RAMBOLL

Hot Work Permit

Project Name		**Today's Date:**	
Hot Work Location:			
Description of Hot Work Activities:			

INSTRUCTIONS: Each hot work area will have a separate Hot Work Permit. Fire Watch is required unless in a designated "fabrication area."

Y	N/A	EXISTING FIRE DETECTION/SUPPRESSION SYSTEMS
☐	☐	Existing smoke detection systems have been de-activated or building owner has been alerted to the potential for false alarms
☐	☐	Existing fire suppression systems (sprinklers) are de-activated or protected to prevent unintentional discharge

Y	N/A	REQUIREMENTS WITHIN 35 FEET OF HOT WORK
☐	☐	Flammable liquids, dust, lint, and oily deposits are removed.
☐	☐	Explosive atmosphere in area is eliminated.
☐	☐	Monitoring for flammable vapors is required: ☐ before hot work OR ☐ continuously during hot work
☐	☐	Combustible dust (wood, paper, grain, aluminum, magnesium, etc.) is removed from floors, beams, and other flat surfaces.
☐	☐	Combustible floors are wet down and/or covered with damp or fire-resistant tarps.
☐	☐	Combustibles are removed when possible or protected by fire-resistant tarps or non-combustible spark/slag shields.
☐	☐	All wall and floor openings are covered to prevent access by sparks and slag.
☐	☐	Fire-resistant tarps are suspended, or barriers installed, beneath work to catch falling sparks and slag
☐	☐	Protect conduit, wiring, fuel lines, and other equipment from excessive heating by adjacent hot work activities

Y	N/A	WORK ON WALLS OR CEILINGS
☐	☐	Wall or ceiling construction is noncombustible and without combustible covering or insulation.
☐	☐	Combustibles on the other side of walls are moved away or protected.

Y	N/A	WORK ON ENCLOSED EQUIPMENT
☐	☐	Enclosed equipment is cleaned of all combustibles.
☐	☐	Containers have been purged of flammable liquids/vapors [air monitoring (☐ is / ☐ is not) required prior to hot work]

Y	N/A	FIRE WATCH / HOT WORK AREA MONITORING
☐	☐	Fire Watch will be provided during hot work and for at least **60 minutes** after hot work, including any breaks.
☐	☐	**2-A:20-BC Type ABC dry chemical** fire extinguisher is provided or acceptable alternate - specify: ______
☐	☐	Fire Watch understands how and when to call for **emergency support** and has a radio or cell phone to make the call.
☐	☐	Fire Watch understands the **P.A.S.S. approach** to using a fire extinguisher.

Y	N/A	EXTENDED HOT WORK AREA SURVEILLANCE
☐	☐	Extended hot work area surveillance is required based on owner requirements and/or an assessment of site conditions
		Duration (up to 3 hours): ☐ 30 min ☐ 1 hour ☐ 1.5 hours ☐ 2 hours ☐ 2.5 hours ☐ 3 hours
		Surveillance provided by: ☐ personnel in area ☐ automatic smoke detection ☐ 30-minute checks by:

HOT WORK PERMIT REVIEW					
Worker:	print	sign	**Worker:**	print	sign
Worker:	print	sign	**Worker:**	print	sign
Worker:	print	sign	**Fire Watch:**	print	sign
Worker:	print	sign	**Fire Watch:**	print	sign

HOT WORK PERMIT AUTHORIZATION			PERMIT DURATION (1 shift maximum)
Ramboll:	print	sign	Start: Date ____/____/____ Time _____:_____
Subcontractor:	print	sign	Expires: Date ____/____/____ Time _____:_____

APPENDIX 8 – DAILY EXCAVATION CHECKLIST

RAMBOLL

Daily Excavation Checklist

Client:		**Today's Date:**	
Project Name:		**Approx. Temp:**	
Project Location:		**Approx. Wind Dir:**	
Job No.:		**SSL:**	
Excavation Depth & Width:	**D:** **W:**	**Soil Class:**	
Protective System Used:			
Activities in Excavation:			
Competent Person:		**Type:**	☐ **BASIC** ☐ **ADVANCED**

CAUTION REGARDING CONFINED SPACE HAZARD - Excavation > 4' deep? ☐ ***Yes*** ☐ ***No***
If Yes, - Evaluate if the excavation is a permit-required confined space or can be downgraded to a Non-Permit Space

CAUTION REGARDING DEEP EXCAVATIONS: Any excavation over 5 feet must be sloped or shored. Excavations >20 feet require review by a Professional Engineer. Any items marked NO on this form MUST be corrected prior to any employees entering the excavation. Review Excavation from the Corporate Health & Safety Manual for guidance.

Y	N	N/A	GENERAL
☒	☐	☐	Employees in, or near, excavations are protected from cave-ins or from being struck by loose rock/soil
☐	☐	☐	Spoils, materials, and equipment set back at least 2 feet from the edge of the excavation
☐	☐	☐	Engineering designs for sheeting and/or manufacturers data on trench box capabilities on site
☐	☐	☐	Adequate signs posted, and barricades provided
☐	☐	☐	Training (i.e, Toolbox meeting) conducted with employees prior to employees entering excavation
☐	☐	☐	Proper sloping, shoring, and/or distance controls are in place to prevent damage to footings, foundations, sidewalks, roadways, and similar structures from cave-ins or excavation equipment.

Y	N	N/A	UTILITIES
☒	☐	☐	Utility company contacted and given 24 hrs notice and/or utilities already located and marked
☐	☐	☐	Overhead lines located, noted, and reviewed with operator
☐	☐	☐	Utility location reviewed with operator, and precautions taken to ensure contact does not occur
☐	☐	☐	Utilities crossing the excavation supported, and protected from falling materials
☐	☐	☐	Underground installations protected, supported or removed when excavation is open

Y	N	N/A	WET CONDITIONS
☐	☐	☐	Precautions taken to protect employees from water accumulation (i.e., continuous dewatering)
☐	☐	☐	Surface water or runoff diverted/controlled to prevent accumulation in the excavation
☐	☐	☐	Inspection made after every rainstorm or other hazard-increasing occurrence

Y	N	N/A	HAZARDOUS ATMOSPHERE
☐	☐	☐	Is excavation at risk of hazardous atmosphere due to presence of natural gas line, fuel piping, process piping, soil/groundwater contamination, oxy/acetylene hoses, or welding shield gas? If "Yes", identify one or more of the following precautions.
☐	☐	☐	Air in the excavation tested for oxygen deficiency, combustibles, or other contaminants
☐	☐	☐	Ventilation used in atmospheres that are O_2 rich or deficient and/or contains hazardous substances
☐	☐	☐	Ventilation provided to keep LEL below 10%
☐	☐	☐	Emergency equipment available where hazardous atmospheres could or do exist
☐	☐	☐	Safety harness and lifeline used
☐	☐	☐	Supplied Air necessary (if **Yes**, contact CHS prior to entry)

Y	N	N/A	ENTRY & EXIT
☐	☐	☐	Exit (i.e., ladder, sloped wall) no further than 25 feet from ANY employee
☐	☐	☐	Ladders secured, and extended 3 feet above the edge of the trench
☐	☐	☐	Wood ramps constructed of materials of uniform thickness, cleated together on the bottom.
☐	☐	☐	Employees protected from cave-ins when entering or exiting the excavation

Keep 1 copy of EACH Daily Checklist on site for the project duration
Separate forms are required for each excavation.

APPENDIX 9 – FIELD IDENTIFICATION GUIDE

Field Identification Guide
Poisonous Plants

This guide includes basic information to enable employees to recognize common hazardous plants including poison ivy, oak and sumac and giant hogweed. This guide should not be construed as all-encompassing with respect to plant appearance. Other poisonous plants may be native to the area surrounding a particular project and can be addressed in project safety plans or Job Safety Analyses (JSAs) when appropriate.

Poison Ivy

Poison ivy, poison oak, and poison sumac release an oil, urushiol, when the leaf or other plant parts are bruised, damaged, or burned. When the oil gets on the skin an allergic reaction occurs in most exposed people as an itchy red rash with bumps or blisters. When exposed to 50 micrograms of urushiol, an amount that is less than one grain of table salt, 80 to 90 percent of adults will develop a rash.

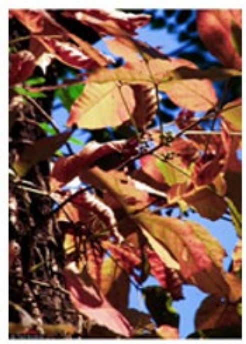
Poison ivy leaves are composed of 3 “leaflets” on a stem that is connected to a central stem or vine. The central stems or vines do not have hair, fuzz, or thorns but may have “air roots”. Look closely at the central vine in the middle right photo. The leaflets alternate up the central vine or stem. This is also evident in the middle right photo. The edges of leaflets may be smooth or notched but are not “sawtooth.”

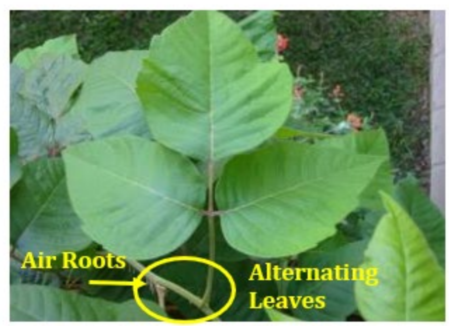
Eastern poison ivy is typically a ropelike vine with three shiny green (or red in the fall) leaflets budding from one small stem forming a leaf.

Western poison ivy is typically a low shrub with three leaves that does not form a climbing vine.

May have yellow or green flowers and white to green-yellow or amber berries
The shininess or shades of green of the leaflets are not reliable indicators.

Wild strawberries and box elder are two frequent “imposters.” Strawberry leaflets have sawtooth edges and fuzzy stems. Box elders have opposing leaflets instead of alternating on poison ivy.





Poison Oak

Poison-oak is usually a shrub, though it sometimes becomes a vine. Sometimes poison oak vines reach several inches in diameter that grow high into mature trees to which they are attached by air-roots. The leaves do come in threes. They are shiny, without prickers, and the middle leaf has a distinct stalk.

It is harder to identify Poison Oak in the winter, when it loses its leaves and looks like erect bare sticks coming from the ground.

Pacific poison oak is often more vine-like than shrub-like.

May have yellow or green flowers and clusters of green-yellow or white berries.

Poison Sumac

Poison sumac is not very common, although the safe (staghorn) sumacs are very common. Poison sumac only grows in very wet areas.
The leaves of poison sumac are not jagged or hairy like the more common safe sumac. Poison sumac is a woody shrub reaching heights of 30' with the following characteristics:

- Grows only in wetlands
- Not common
- Leaves are smooth
- No hair on stems
- 7-13 leaves per stem
- May have glossy, pale yellow, or cream-colored berries

Giant Hogweed

Giant hogweed develops numerous white flowers that form a flat-topped, umbrella-shaped head up to two and a half feet across, resembling "Queen Anne's Lace on steroids." Flowers form from late-spring through mid-summer. Numerous (up to 100,000), half inch long, winged, flattened oval seeds form in late-summer. These seeds, originally green, turn brown as they dry and can be spread by animals, surface runoff of rain, or on the wind, establishing new colonies. Seeds can remain viable in the soil for up to 10 years.

Giant hogweed can colonize a wide range of habitats but prefers rich, damp soil such as that found along abandoned railroad rights-of-way, roadside ditches, stream banks, or other moist disturbed areas. Because of this predilection for wet areas, the plant is considered to be an aquatic invasive species.

People experience an allergic reaction to the plants' poisonous oil (akin to carbolic acid) causes significant skin irritation, itching, rashes and open sores. In the case of giant hogweed, however, simply brushing against the plant's leaves or stems does not cause the skin inflammation. For giant hogweed to affect a person, sap from a broken stem or crushed leaf, root, flower or seed must come into contact with moist skin (perspiration will suffice) with the skin then being exposed to sunlight.

Left: Queen Anne's Lace that is very familiar in look to Giant Hogweed

Giant hogweed stem – green with purple splotches and coarse white hairs

ATTACHMENT 2
NYSDEC GENERIC CAMP & CAMP SPECIAL REQUIREMENTS

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

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 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 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 DEC/NYSDOH staff.

> **Continuous monitoring** will be required for all <u>ground intrusive</u> 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 <u>non-intrusive</u> 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 basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. 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.

1. 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.

2. 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.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) 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.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 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/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

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/m^3, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m^3 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.

ATTACHMENT 3
GENERIC QAPP

Intended for
New York State Department of Environmental Conservation

Document type
Program Plan

Date
October 2020 (Revised February 2021 and March 2023)

QUALITY ASSURANCE PROJECT PLAN
CONTRACT NO. D009810

Bright ideas. Sustainable change.

QUALITY ASSURANCE PROJECT PLAN
CONTRACT NO. D009810

Project name	**NYSDEC Standby Engineering Contract**
Client no.	**10653**
Recipient	**NYSDEC**
Document type	**Generic Plan**
Version	**3**
Date	**October 7, 2020**
Prepared by	**Karen Storne, Scott Tucker, and Michael Grifasi**
Checked by	**Deborah Wright**
Approved by	**Deborah Wright**
Description	**Procedures for sampling handling and analysis.**

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Revisions to Quality Assurance Project Plan

Revision No.	Date Revised	Summary of Revision
1	February 1, 2021	Update to reflect January 2021 PFAS Guidance
2	March 15, 2023	Update to reflect June 2021 and November 2022 PFAS Guidance

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List of Acronyms

ºC	Degrees Celsius
AI	Indoor air
APHA	American Public Health Association
AS	Sub-slab soil vapor
AO	Outdoor air
ASP	Analytical Services Protocol
AWWA	American Water Works Association
BOD	Biochemical Oxygen Demand
CFR	Code of Federal Regulations
COD	Chemical Oxygen Demand
%D	Percent difference
DBMS	data base management system
DQO	Data Quality Objective
DUSR	Data Usability Summary Report
EB	Equipment/field rinsate blank
EDD	Electronic Data Deliverable
ELAP	Environmental Laboratory Accreditation Program
FAP	Field Activities Plan
FD	Field duplicate
GS	Soil gas
HASP	Health and Safety Plan
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LIMS	Laboratory Information Management System
MDL	Method detection limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ng	nanograms
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PAH	polynuclear aromatic hydrocarbons
PCB	Polychlorinated Biphenyl
PFAS	Per- and polyfluoroalkyl substances
PPE	personal protective equipment
QA	Quality Assurance
QAM	Quality Assurance Manual
QA/QC	Quality Assurance/Quality Control
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
QL	Quantitation Limit
REG	regular environmental sample

%R	Percent recovery
%RPD	Relative Percent Difference
SDG	Sample Delivery Group
SE	Sediment
SI	Sample identification
SIM	selected ion monitoring
So	Soil
SOP	Standard Operating Procedure
SPLP	Synthetic Precipitation Leaching Procedure
SS	Surface soil
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TB	Trip blank
TDS	Total dissolved solids
TKN	Total Kjeldahl Nitrogen
TOC	Total organic carbon
TSS	Total suspended solids
TVS	Total Volatile Solids
µg	Micrograms
USEPA	Unites States Environmental Protection Agency
VOC	Volatile Organic Compound
WASD	Work Assignment Scoping Document
WC	Waste characterization
WEF	Water Environment Federation
WG	groundwater
WP	Drinking water
WS	Surface water

1. INTRODUCTION

This generic Quality Assurance Project Plan (QAPP) has been prepared by O'Brien & Gere Engineers, Inc., a Ramboll company (Ramboll) to support activities at New York State project sites. This QAPP specifies the quality assurance/quality control (QA/QC) procedures for field sampling, laboratory analysis and data generation for work assignments awarded by the New York State Department of Environmental Conservation (NYSDEC) under Standby Engineering Contract #D009810.

The specific objective of the QAPP is to:

- Generate data that is scientifically sound, representative, comparable, defensible and of known quality that is sufficient to meet the investigation objectives and support the decision-making process for each work assignment.

Project or site-specific work plans for each work assignment may contain additional scope and quality requirements that are not addressed in this QAPP. Addendums to this QAPP may be required for each work assignment. Project scope and descriptions of the work assignment are provided in the Work Assignment Schedule 1 (WA Schedule 1) and Field Activities Plan (FAP).

Work assignments may include sample collection and laboratory analysis of groundwater, drinking water, surface water, soil, surface soil, sediment, ambient air, soil gas, sub-slab air and indoor air samples.

Data generated will be compared to the applicable standards and guidance values identified in Sections 3.1 and 9.3 of this document.

This QAPP presents the organization, objectives, functional activities and general QA/QC activities associated with the sample collection and laboratory analysis of environmental samples. Laboratory QA/QC is a comprehensive program used to define and document the quality of analytical data. QA involves planning, implementation, assessment, reporting and quality improvement to establish the reliability of laboratory data. QC procedures are the tools used to achieve this reliability. This QAPP defines how QA and QC are applied to the environmental activities at the project sites to assure that the type and quality of data generated meet project needs.

This QAPP has been prepared using the guidance provided in the following documents:

- United States Environmental Protection Agency (USEPA). Reissued 2006. *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations*, EPA QA/R-5. Washington, D.C.
- NYSDEC. 2010. DER-10 *Technical Guidance for Site Investigation and Remediation*. Albany, NY.
- QA/QC procedures described in this QAPP are in accordance with applicable professional technical standards and NYSDEC and USEPA requirements.

The following topics are generally addressed in this QAPP:

- Project background and description
- Data quality objectives
- Project organization and responsibilities
- Sampling design and method requirements
- Field instrumentation
- Sample handing and custody procedures
- Analytical methods requirements
- Data assessment procedures and quality control requirements
- Data acquisition requirements
- Data review and management
- Data validation and usability

2. GENERAL PROJECT, LABORATORY AND DATA VALIDATION INFORMATION

2.1 Project Background, Description and Scope

The WA Schedule 1 completed for each work assignment will present the project background, project description, scope and schedule for each of the work assignments addressed by this contract.

Additional information or an addendum to this QAPP may be required for each work assignment including laboratory detection limits and related QA/QC information for analytical methods and laboratory assigned to the task. Project scope and descriptions of the work assignment are provided in the WA Schedule 1 and FAP.

2.2 Laboratory Analysis

Samples collected for each work assignment will be submitted to a New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP) certified laboratory. Based on the specific requirements and needs of the work assignment, the laboratory will perform one or more of the analyses included in the list of methods provided in Table 1. Samples collected will be shipped from the field location to the laboratory performing the analyses.

Table 1 presents the analytical methods, sample collection containers and volumes, preservation, holding times and associated quality control sample frequency.

Based on the methods applied to the work assignment, the laboratory will report target analytes from the list of target analytes presented in Table 2-1A, Table 2-1B, Table 2-1C, Table 2-2, Table 2-3, Table 2-4A, Table 2-4B, Table 2-5 and Table 2-6.

The QC requirements provided in the laboratory standard operation procedures (SOPs) are to be followed by the laboratory and utilized during data review.

The laboratories performing the analyses be responsible for the quality control of the data reported.

The laboratory will evaluate non-detected results to the method detection limits (MDLs) and report the non-detected results referencing the quantitation limit (QL). The QL concentration is established by the lowest standard in the instrument calibration. For the remaining data, results that are less than the QLs but greater than or equal to the MDLs will be reported using the “J” flag. For example, for a target analyte with a QL of 10 µg/L and an MDL of 2 µg/L, a non-detected result is reported as 10 µg/L "U", indicating that a concentration greater than or equal to the MDL was not detected by the laboratory. A detected concentration of 6 µg/L is reported as 6 "J" and a detected concentration of 23 µg/L is reported without a laboratory flag. The laboratory must include both QLs and MDLs on the sample result sheet that is reported to the data user.

The most current QLs and MDLs will be reported by the laboratory.

Prior to sample analysis, the laboratory QLs and MDLs will be compared to the regulatory limits provided in Table 2-1A, Table 2-1B, Table 2-1C, Table 2-2, Table 2-3, Table 2-4A, Table 2-4B, Table 2-5 and Table 2-6 to identify QL and or/MDLs of target analytes that exceed the regulatory limits.

The laboratory will provide sample containers prepared in accordance with method and laboratory requirements.

Communications with the project organizations (external to the lab) associated with each work assignment will be documented by the laboratory in the data packages.

The analytical data will be reported in USEPA Contract Laboratory Program (CLP)-like full deliverable format in both hardcopy and electronic data format. The data packages will provide documentation consistent with NYSDEC ASP-defined full data package deliverables (Category B). Laboratory standard operating procedures (SOPs) and Quality Assurance Manual (QAM) applicable to the work assignment will be provided to the Ramboll PM prior to completing the analyses. These laboratory SOPs will be utilized during data review.

Analytical data will be reported as an Electronic Data Deliverable (EDD) formatted in accordance with NYSDEC's requirements populated with NYSDEC valid values.

Laboratory data reports will be provided by the laboratory within 30 calendar days following receipt of a complete Sample Delivery Group (SDG). A CLP-like full-deliverable laboratory data package will be provided . Each data package will contain information to support data validation by USEPA Region II SOPs. The completed copies of the chain-of-custody records, accompanying each sample from the time of initial bottle preparation to completion of analysis, must be included in the analytical reports.

2.3 Data Validation

Following receipt of final laboratory data packages, data validation will be performed for samples collected for the work assignments in accordance with the QAPP.

Data will be evaluated using the QA/QC criteria established in the analytical methods utilized by the laboratory and the laboratory SOPs, where applicable.

Samples analyzed for poly- and perfluoroalkyl substances (PFAS) will also be evaluated using Appendix H of the NYSDEC document *Sampling, Analysis, And Assessment of Per- and Polyfluoroalkyl Substances (PFAS) under NYSDEC's Part 375 Remedial Programs* dated June 2021 and November 2022 (Exhibits E-1 and E-2, respectively).

Data affected by excursions will be qualified using the current USEPA Region II data validation guidelines and NYSDEC Data Usability Summary Report (DUSR) guidance (NYSDEC, 2010).

Upon request of the data validator, the laboratory will provide additional or supplemental information within three working days of the request during the validation process.

The specific data quality requirements including precision, accuracy, representativeness, completeness, comparability, and sensitivity will be assessed during data validation. Data usability with respect to the data quality objectives (DQOs) and data uses will be compared to the project requirements. In the event that the completeness objective of 95 percent is not achieved, samples will be recollected at the discretion of the Project Manager.

2.4 Documentation

Data generated for each work assignment will be submitted to the NYSDEC in an EDD format that complies with the NYSDEC's Environmental Data Submission EDD format. Data will be managed in a relational data base management system (DBMS). Laboratory analytical data will be provided in EDD format for direct upload into the DBMS. Data validation qualifiers will be entered into the DBMS and checked independently.

Records will be incorporated into the final project files for the samples. The field logs, data packages, and records will be included in the project files, which will be archived by the project organizations associated with each work assignment for a period of ten years.

3. DATA QUALITY OBJECTIVES AND CRITERIA

The Data Quality Objective Process comprises the following steps, applying general guidance presented in the United States Environmental Protection Agency (USEPA) Guidance for the Data Quality Objectives Process (EPA QA/G-4), February 2006. The DQO process establishes the acceptance criteria, which serve as the basis for collecting data of sufficient quality and quantity to support the goals of the project activities. DQOs will be established for each work assignment and presented in the WA Schedule 1.

3.1 DQO Process

The process consists of the following seven iterative steps for the DQO process:

1. **Step 1** - State the Problem – Define the problem that has initiated the work assignment. As environmental problems are often complex combinations of technical, economic, social, and political issues, it is critical to the success of the process to separate each problem, define it completely, and express it in an uncomplicated format.
2. **Step 2** - Identify the Goal of the Study – Identify the key questions that the study attempts to address, along with alternative actions or outcomes that may result based on the answers to these key questions.
3. **Step 3** - Identify information inputs (the data types that will be required before project decisions can be made) – Determine the types of information needed to address the problem.
4. **Step 4** -Define the Boundaries of the Study (the spatial and temporal features pertinent for decision making) – Identify the area from which samples will be drawn and specify the spatial and temporal features.
5. **Step 5** - Develop the analytic approach (how will the study results be analyzed and conclusions made from the data) – Develop an analytic approach that will provide guidance for how to analyze the study results and draw conclusions from the data.
6. **Step 6** - Specify performance or acceptance criteria (performance or acceptance criteria that the collected data will need to achieve) – Define the acceptance criteria that the collected data will need to achieve in order to keep uncertainty to within acceptable levels. Performance criteria, together with the appropriate level of Quality Assurance practices, will guide the design of new data collection efforts, while acceptance criteria will guide the design of procedures to acquire and evaluate existing data relative to the intended use.
7. **Step 7** - Develop the plan for obtaining data- Develop a design for collecting and measuring environmental samples to address the problem.

To meet DQOs established for each work assignment, results will be compared to the following regulatory criteria, where applicable:

For groundwater and surface water:

- 6 CRR-NY Part 703 *Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations*.

For drinking water:

- 10 CRR-NY Part 5-1.51 *Public Water Systems; Maximum Contaminant Levels; Monitoring Requirements; Notifications Required*.

For sediment:

- *Screening and Assessment of Contaminated Sediment*, NYSDEC Division of Fish and Wildlife and Marine Resources; June 24, 2014.

For soil samples:

- 6 CRR-NY Part 375-6 *Remedial Program Soil Clean Up Objectives*.

For air samples:

- *Guidance for Evaluation of Soil Vapor Intrusion in the State of New York*; New York State Department of Health (NYSDOH); October 2006 (as updated) and updated matrices dated May 2017.

For Per- and polyfluoroalkyl substances (PFAS) samples:

- Screening levels per NYSDEC document *Sampling, Analysis, And Assessment of Per- and Polyfluoroalkyl Substances (PFAS) under NYSDEC's Part 375 Remedial Programs* dated November 2022.

3.2 Analytical Levels

Analytical levels as defined by USEPA as follows:

- **Screening Data** – Screening data are generated by rapid, less precise methods of analysis with less rigorous sample preparation. Sample preparation steps may be restricted to simple procedures such as dilution with a solvent, instead of elaborate extraction/digestion and cleanup. Screening data provide analyte identification and quantitation, although the quantitation may be relatively imprecise. At least 10% of the screening data should be confirmed using analytical methods and QA/QC procedures and criteria associated with definitive data. Screening data without associated confirmation data are not considered to be data of known quality. During sampling activities, the following data may be measured in the field: dissolved oxygen, temperature, oxidation-reduction potential, pH, turbidity, and specific conductance.
- **Definitive Data** – Definitive data are generated using rigorous analytical methods, such as USEPA and Standard Method reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce tangible raw data in the form of paper printouts or computer-generated electronic files. Data may be generated at the Site or at an off-site location, as long as the QA/QC requirements are satisfied. For the data to be definitive, either analytical or total measurement error must be identified. The level of QC that is performed for definitive data involves the QC efforts and calibration procedures described in this QAPP, analytical methods listed in Table 1, and QC requirements listed in the laboratory SOPs. Laboratory control limits for accuracy and precision will be used to evaluate sample data.

The QA/QC program described in this QAPP was developed in order to assess adherence to DQOs. The remainder of this QAPP describes the specific approaches that will be taken to achieve the required DQOs.

Precision describes the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements that have been made in an identical manner, compared to their average value. Precision can be expressed in a variety of manners that include absolute methods such as deviation from the mean or median values, standard deviation and variance, or relative methods (*e.g.*, relative deviation from the mean or median). The overall precision will be determined through the analysis of field duplicates, laboratory duplicates, and matrix spike/matrix spike duplicate (MS/MSD) samples.

Accuracy is defined as the degree of difference between measured or calculated values and the true value. The closer the numerical value of the measurement comes to the true value, or actual concentration, the more accurate the measurement is. Accuracy is expressed in terms of absolute or relative error. Accuracy will be determined through analysis of spiked samples and the analysis of standards with known concentrations.

Representativeness refers to the degree to which a sample taken from a Site accurately reflects the matrix at the Site. It is a qualitative parameter that is most concerned with the design of the sampling program. Factors that should be considered in the determination of representativeness include appropriateness of sampling and analytical methodologies, representativeness of the selected media, and representativeness of the selected analytical procedures. Representativeness will be achieved by the use of procedures for the collection and preservation of samples as described in the WA schedule 1 and FAP.

Comparability refers to the use of consistent procedures, second source reference standards, reporting units, and standardized data format with document control. Adherence to standard procedures and the analysis of external source standard materials maximizes the probability that data generated from a particular method at a given laboratory can be validly compared to the data of another. This QAPP has been written to provide data that will be comparable to other data collected, as standard methods will be utilized for these sampling and analysis activities.

Completeness refers to the process of obtaining the required data as outlined in the WA Schedule 1 and FAP. Completeness is also defined as the percentage of measurements judged to be useable. Samples for which the critical data points fail completeness objectives will require reanalysis of samples (within the specified holding times) until the DQOs are met. The completeness goal has been specified at 95% for the work assignment activities.

Sensitivity refers to a measurable concentration of an analyte that has an acceptable level of confidence. MDLs are the lowest concentration of an analyte that can be measured with 99% confidence that the analyte concentration is greater than zero. QLs are levels above the MDLs at which the laboratory has demonstrated the quantitation of analytes.

3.3 Field Sampling Objectives

The objective of the field sampling program is to obtain samples that represent the environmental matrix being investigated. This will be accomplished through the use of proper sampling techniques and equipment as presented in the WA Schedule 1 and FAP.
Field screening activities may not require sample collection but, nonetheless, involve measurements for which QA concerns are appropriate. The primary QA objective of field screening is to obtain reproducible measurements to a degree of accuracy consistent with the intended use of the measurements and to document measurement procedures.

3.4 Laboratory Objectives

To obtain data of a quality sufficient to meet the work assignment DQOs, the laboratory will adhere to the specific analyses and QA/QC requirements in the analytical methods listed in Table 1. The methods cited in this QAPP provide data of sufficient quality for comparisons to the regulatory criteria. The laboratory SOPs and QAM applicable to the work assignment will be available to the data validators.

4. PROJECT ORGANIZATION

4.1 Project Organization and Qualifications

The project organization and the function and responsibility of each group involved in the work assignment will be presented in WA Schedule 1. The project organization is designed to promote the exchange of information and for efficient project operation. Key contacts, including the project organization's Project Manager, Quality Assurance Officer, and Field Team Leader will be summarized in the WA Schedule 1.

Management and field personnel involved in the work assignment must review the requirements of the QAPP to confirm compliance with the QAPP requirements, including necessary experience needed to support the work assignment.

Field personnel must also adhere to the generic Health and Safety Plan (HASP) and FAP.

4.2 Laboratory Organization

Samples collected for each work assignment will be submitted to a NYSDOH ELAP-certified laboratory. The organization, function and responsibility of each of the laboratory personnel involved in the work assignment will be presented in the laboratory QAM. The Laboratory Project Manager for the work assignment will be included in the WA Schedule 1 and 2.11 package. Laboratories must have experienced staff capable of performing the analyses specified in the WA Schedule 1 and this QAPP. Laboratories will have NYSDOH ELAP certification for analyses performed for the WA Schedule 1. Laboratories must provide the current proficiency-testing results upon request.

4.3 Data Validation

Data generated for each work assignment will be submitted for data validation as described in this QAPP.

- Personnel performing data validation must be:
- Independent of the laboratory generating the data
- Experience in data validation
- Aa Bachelor's degree in chemistry or natural sciences
- One year experience in the implementation and application of analytical laboratory methodologies; and
- A minimum of one year experience evaluating data packages for regulatory compliance.

4.4 Special Training Requirements

Field investigation personnel must comply with the training requirements for hazardous waste operations, codified in 29 CFR 1910.120(e). Each individual must have successfully completed a 40-hour (or 24-hour) course appropriate to the level of work that is performed. In addition, each individual must have completed an 8-hour refresher course within the last 12 months if the initial training was more than 12 months ago. Personnel acting in the capacity of an on-site supervisor, directly responsible for supervising employees engaged in hazardous waste operations, shall also have successfully completed an 8-hour Supervisor training course. Field personnel must have documentation (copies of certificates, or I.D. cards) available on site as proof of compliance with the training requirements.

5. SAMPLING DESIGN

5.1 Sampling Network

The specific analytical methods, sample matrices, and numbers of samples to be collected will be presented in the WA Schedule 1.

The specific target analyte lists associate with analytical methods to be performed by the laboratory are presented in Table 2-1A, Table 2-1B, Table 2-1C, Table 2-2, Table 2-3, Table 2-4A, Table 2-4B, Table 2-5 and Table 2-6.

5.2 Sample Location and Designations

A sample designation system will be used to identify samples for laboratory analysis. A list of identifiers used for each sample will be maintained in the project logbook or sampling logs by the field personnel. Sample locations will be identified on a site map that is included in the WA Schedule 1.

Each sample that is collected will be designated by a unique sample identification number. Designations shall use current valid values for environmental data submission to NYSDEC as listed on the NYSDEC website (https://www.dec.ny.gov/chemical/62440.html) The following information will be utilized to identify samples for the work assignments. This may be modified if needed for specific samples.

1. Sample identification (ID) with the following standard format:

Sample Matrix-Location ID-Sample Depth Interval (if applicable) – Date
Example 1: WG-MW-6S-101620
Example 2: SO-SB-102-9-10-101620

- Example sample types - SO (soil), SS (surface soil), WS (surface water), WG (groundwater), WP (drinking water), GS (soil gas), SE (sediment), AS (sub-slab soil vapor), AO (outdoor air) and AI (indoor air).
- Date - Date sample collected (listed on the chain-of-custody record). Sample times are not recorded for field duplicates and trip blanks.

2. QC Sample Types–Field duplicate (FD), Matrix spike (MS), Matrix spike duplicate (MSD), trip blank (TB), equipment blank (EB).

   - Field duplicate example: WG-FD-1-101616
   - Matrix spike / matrix spike duplicate example: WG-OBG-6S-MS/MSD-101616
   - Trip blank example: TB-1-101616
   - Field blank example: EB-1-101616

3. Waste characterization samples (WC)
   - Example: WC-sample matrix-sample location-date

4. Sample Purpose:

    - REG = regular environmental sample
    - FD = field duplicate
    - MS = matrix spike
    - MSD = matrix spike duplicate
    - TB = trip blank
    - EB = equipment blank

5. Grab/Composite – Identifies samples collected as a grab sample or a composite sample.

6. Field duplicates will be identified with a unique sample identification number, such that the laboratory will not be aware of the sample location utilized as the blind duplicate. The field sampling personnel will note the duplicate sample in the logbook so that this information will be available when the laboratory data is reviewed.

5.3 Sampling Procedures

Sampling procedures, including collection of QC samples and decontamination, will be presented in the WA Schedule 1 and/or FAP.

6. FIELD INSTRUMENTATION AND INSPECTION OF SUPPLIES

Field instrumentation, including calibration and inspection requirements for supplies, will be presented in the WA Schedule 1 and/or FAP.

7. SAMPLING HANDLING AND CUSTODY

7.1 Field and Laboratory Custody Procedures

Chain-of-custody procedures as described in this QAPP will be instituted and followed throughout the work assignment field activities. These procedures include field custody, laboratory custody and evidence files. Samples are physical evidence and will be handled according to strict chain-of-custody protocols. The project organization must be prepared to produce documentation that traces the samples from the field to the laboratory and through analysis.

USEPA has defined custody of evidence as follows:

- In actual possession
- In view after being in physical possession
- In a locked laboratory
- In a secure, restricted area.

7.2 Sample Containers and Field Storage

Table 1 lists the proper sample collection information. If field storage is required, the samples will be stored in a secured storage facility.

The laboratory will supply appropriate sample containers for solid and aqueous samples in coolers as well as preservatives (as presented in Table 1). QA measures for these samples will begin with the sample containers; pre-cleaned containers will be purchased from a USEPA-certified manufacturer (I-Chem 200 or equivalent).

Immediately after collection, samples will be transferred to properly labeled sample containers, and properly preserved. Table 1 lists the proper sample container, sample volumes, preservation, and holding times.

Samples requiring refrigeration for preservation will be promptly transferred to coolers packed with wet ice and/or ice packs. If field storage is required, the samples will be stored in a secured storage facility and a cooler temperature of less than or equal to 6 °C will be maintained.

7.3 Field Documentation

The field sampler is personally responsible for the care and custody of the sample until transferred.

The field logbook, forms or electronic media will be used to note information regarding collection of samples, activities completed, and observations. All entries will be signed and dated. When used, field logbooks will be waterproof and bound. Waterproof paper will not be used for sites where samples will be analyzed for PFAS. The logbook will be dedicated to the work assignment and pages will not be removed. Corrections will be made by drawing a single line through the incorrect data and initialing and dating the correction that was made to the side of the error. An initialed diagonal line will be used to indicate the end of an entry or the end of the day's activities.

The following presents information that may be recorded by the field sampling team:

- Name and title of author, date, and time of site entry, and physical/environmental conditions during the field activity;
- Meteorological data;
- Work assignment number, client name, and Site name;
- Name and title of field crew members;
- Sample media;
- Sample collection method, including equipment utilized;
- Number and volume of samples collected;
- Description of sample locations;
- Date and start and end time of sample collection;
- Diagrams of sampling process;
- Sample and QA/QC identification numbers;
- Sample distribution;
- Field observations;
- Field measurements made and equipment used;
- Calculations, results, and calibration data for field sampling and measurements;
- References for maps and photographs of the sample location; and
- Dates and method of sample shipments.

A completed sample identification label or tag that will be sequentially numbered will be attached to each investigative sample and the sample placed in a shipping container. The identification on the label/tag must be sufficient to enable cross-reference with the logbook. The sample label/tag will be recorded using waterproof, non-erasable ink and will be attached to the sample container using adhesive. Permanent marker will not be used on sample labels/tags.

The sample labels/tags will contain the following information:

- Sample location/number identification;
- Site/Work assignment name;
- Date and time of sample collection;
- Designation of the sample as a grab or composite;
- Type of sample matrix;
- Name/initials of the sampler;
- Whether the sample is preserved or unpreserved;
- Space for laboratory sample number (only on the sample label/tag); and
- General types of analysis to be performed.

7.4 Field Custody Procedures and Documentation

For the environmental samples, chain-of-custody records will be kept starting at the time that sample containers are placed in the coolers for transportation to the laboratory. One completed chain-of-custody record must be kept with each sample cooler at all times.

Example chain-of-custody forms are provided in the laboratory's Quality Assurance Manual (QAM).

The following measures will be taken when completing a chain-of-custody record:

- The chain-of-custody forms will be completed in waterproof, non-erasable ink.
- The chain-of-custody forms will be completed neatly using printed text. If a simple mistake is made, the error will be lined out with a single line and initialed and dated.
- Each separate sample entry will be sequentially numbered.
- The use of "ditto" or quotation marks to indicate repetitive information in columnar entries should be avoided. If numerous repetitive entries must be made in the same column, a continuous vertical arrow will be used between the first entry and the next different entry.
- When more than one chain-of-custody form is used for a single shipment, each form will be consecutively numbered using the "page ___ of ___" format.
- If necessary, additional instructions will be placed directly onto the chain-of-custody form.
- Acronyms used on a chain-of-custody form will be defined.

For environmental samples, the chain-of-custody form will contain the following information:

- Laboratory name and address;
- Work assignment name and number;
- Sample description/location;
- Date and time of sample collection;
- Type and matrix of sample;
- Number of sample containers;
- Analysis requested/comments;
- Sampler signature/date/time;
- Date and signature of the field representative;
- Date and signature of the laboratory representative;
- Carrier used to ship coolers; and
- Air bill number (if shipped by a commercial carrier).

In the case that high concentrations are suspected to be present in the samples, a note to that effect will be included on the chain-of-custody form.

In the field logbook, field samplers will note the information previously presented.

Samples will be packed prior to shipment using the following procedures (where applicable):

- Select a sturdy cooler in good repair and clean. Secure and tape the drain plug with fiber or duct tape.
- Be sure the lids on all bottles are tight (will not leak) and baggies are sealed.
- Where applicable, add ice that has been placed in heavy-duty polyethylene bags and properly sealed on top of or between the samples. Pack samples securely to eliminate breakage during shipment with ice packs to maintain the inside temperature of less than or equal to 6°C.
- Sampling containers will be packed with packing materials. When possible, sample container preparation and packing for shipment will be completed in a well-organized and clean area. Sample containers will be prepared for shipment by wiping containers clean of debris/water using paper towels. Paper towels will be disposed with the personal protective equipment (PPE).

- Place chain-of-custody record into a Ziploc plastic bag, tape the bag to the inner side of the cooler lid, and close the cooler and securely tape (preferably with fiber tape) the top of the cooler shut. Two custody seals will be affixed to the latch and lid of the cooler. The number of the security seal, if applicable, will be recorded on the chain-of-custody form. The custody seals will consist of adhesive-backed tape that easily rips if it is disturbed. The field sampler will initial and date the seal. The seals must be broken to open the cooler and will indicate tampering if the seal is broken before receipt at the laboratory.
- A label containing the name and address of the shipper will be placed on the outside of the container.

7.5 Sample Transportation

The field sampling team will either hand deliver or ship the cooler via an overnight delivery service or contact the laboratory to send a courier for pick up. Prior to shipment of sample coolers, the field sampling team will contact the laboratory to notify the laboratory of the shipment.

Samples will remain in the custody of the sampler until transfer of custody is completed. Transfer consists of:

- Delivery of samples to the Laboratory Sample Custodian; and/or
- Signature of the Laboratory Sample Custodian on the chain-of-custody form as receiving the samples and signature of sampler as relinquishing the samples.

The chain-of-custody document will be completed by the field sampler and provided for each sample cooler. When transferring the possession of samples, individuals relinquishing and receiving will sign, date, and note the time on the chain-of-custody. Custody of samples must be continuous between parties and time gaps must not be present. Each shipment of samples to the laboratory must have its own chain-of-custody record with the contents of the shipment, method of shipment, name of courier, and other pertinent information written on the record. The original record accompanies the shipment and the copies are kept with the field forms and distributed to the Project Manager. A copy of the chain-of-custody will be faxed to the laboratory and to the Project Manager on the same day of sample shipment. Freight bills, postal service receipts, and bills of lading will be retained as permanent documentation.

If a carrier is used to take samples between the sampler and the laboratory, the air bill number must be written on the chain-of-custody.

Samples will be shipped or transported within 24 to 48 hours of being collected and will arrive at the laboratory no later than 72 hours after sample collection, unless specific alternatives are arranged with the laboratory as part of the project.

7.6 Laboratory Custody Procedures

Laboratory custody procedures continue when the samples are received by the laboratory. When the samples arrive at the laboratory, the Laboratory Sample Custodian will sign the courier's air bill or bill of lading (unless hand-delivered) and will note the cooler temperature on the chain-of-custody form, where applicable. If the cooler temperature is greater than 6 °C, the Project Manager will be notified. If the samples were shipped, the courier's air bill number will be attached to the chain-of-custody and the air bill number will be written on the chain-of-custody form. If the cooler or container/box arrives at the laboratory after hours, an external chain-of-custody will be properly filled out and will accompany the cooler until the laboratory receives the cooler.

The Laboratory Sample Custodian's duties and responsibilities upon sample receipt will be to:

- Document receipt of samples by signing the record with the date and time of sample receipt.
- Note the cooler temperature on the chain-of-custody form where applicable.
- Inspect sample shipping cooler for the presence or absence of custody seals (only if shipped via overnight courier) and for container integrity.
- Sign the appropriate forms or documents, verify, and record the agreement or disagreement of information on sample documents and, if there are discrepancies, record the problem and notify the Project Manager.
- Assign a number for each sample upon receipt. That sample number will be placed on the sample label which will remain attached to the sample container.
- Log sample information into the laboratory sample tracking system.
- Label sample with a unique, sequential laboratory sample number.
- Place samples in the walk-in cooler or sample storage area that is a secure, limited-access storage.

If QC samples have not been properly identified during sample collection, the Laboratory Project Manager will contact the Project Manager to assign QC samples prior to the start of sample analysis.

The laboratory will immediately contact the Project Manager if issues pertaining to sample condition or documentation are detected (*e.g.*, broken security seal; compromised sample containers; chain-of-custody information in disagreement with sample labels).

7.7 Final Evidence Files

The final evidence file will be the central repository for documents that constitute evidence relevant to sampling and analysis activities as described in this QAPP. The project organization is the custodian of the evidence file and maintains the contents of evidence files for the Site, including relevant records, reported, logs, field notebooks, pictures, subcontractor reports, and data reviews.

Copies of the laboratory data packages will be stored by the laboratory for incorporation into the sample file. The Laboratory Project Manager will be responsible for laboratory data packages. Upon completion of the analyses, the Project Manager will assimilate the field and laboratory data. In this way, the file for the samples will be generated. The final file for the sample will be stored at the project organization and will consist of the following:

- Laboratory data packages, including the following:
  - summary and supportive raw data from the analysis of environmental and QC samples
  - case narrative
  - chain-of-custody records and associated laboratory check-in records
  - chromatograms

  - mass spectra
  - Continuing, verification calibrations calibration summary and supportive raw data
  - bench and work sheets
  - standard preparation logs (provided upon request)
  - analytical run logs and analytical sequence reports
  - sample preparation log
  - corrective action forms
- Chain-of-custody records
- Data validation DUSR reports
- Field notebooks/logbooks and data
- Field collection report
- Non-conformance forms
- Corrective action forms
- Pictures and drawings, if applicable
- Progress and QA reports
- Contractor and subcontractor reports
- Correspondence

The evidence file must be maintained in a secured, limited access area until submittals for the project have been reviewed and approved, and for a minimum of 10 years past the submittal date of the final report.

8. LABORATORY SAMPLE STORAGE AND HANDLING

At the laboratory, the laboratory personnel will be required to log samples and sample extracts in and out of storage as the analysis proceeds.

There must not be a lapse in the custody for the sample containers and exchanges of custody must be documented on the form. Samples will be returned to secure storage at the close of business. Care must be exercised to properly complete, date, and sign records needed to generate the data package.

Procedures to be followed by the laboratory include:

- Samples will be handled by the minimum number of people possible.
- The laboratory will set aside a secured sample storage area consisting of a clean, dry, refrigerated, isolated room.
- A specific person will be designated sample custodian. Incoming samples will be received by the custodian who will indicate receipt by signing the chain-of-custody form.
- The custodian will ensure that samples which are heat-sensitive, light-sensitive, radioactive, or which require special handling in other ways, are properly stored and maintained prior to analysis.
- The analytical area will be restricted to authorized personnel only.
- After sample analyses are complete, the analytical data will be kept secured and released to authorized personnel only.

9. ANALYTICAL METHOD REQUIREMENTS

The generic list of analytical methods, associated target analytes and regulatory limits that may be utilized for work assignment activities are presented in provided in Table 2-1A, Table 2-1B, Table 2-1C, Table 2-2, Table 2-3, Table 2-4A, Table 2-4B, Table 2-5 and Table 2-6. The WA Schedule 1 will include the specific analytical method and target analyte list (if different than those provided in Table 2) applicable to each work assignment. Prior to sample analysis, the most current laboratory QLs and MDLs will be provided by the laboratory conducting the analyses. The laboratory limits will be compared to the regulatory limits provided in Table 2-1A, Table 2-1B, Table 2-1C, Table 2-2, Table 2-3, Table 2-4A, Table 2-4B, Table 2-5 and Table 2-6 to identify laboratory limits for target analytes that exceed the regulatory limits. Target analytes with QLs or MDLs that exceed regulatory limits will be discussed with NYSDEC prior to sample analysis.

9.1 Analytical Methods and Laboratory Analysis

To obtain data of a quality sufficient to meet the work assignment DQOs, the methods from Table 1 will be used for analysis of environmental samples.

The laboratory will adhere to the specific analyses and QA/QC requirements in the analytical methods and additional requirements listed the laboratory’s SOP and in this QAPP or the referenced regulatory documents. The most recent laboratory control limits for accuracy and precision will be used to evaluate the sample data.

In the event of an analytical system failure, the Laboratory Project Manager will identify the situation and provide corrective action guidance. The QAO will be notified and the situation will be documented in the data package case narrative.

Matrix interferences will be identified and documented during the analytical process. Samples may be diluted only if analytes of concern generate responses in excess of the linear range of the instrument. MDLs and QLs may only be achieved in an undiluted sample free of matrix interferences or of high concentrations of target analytes. If matrix interferences are encountered or if high concentrations of target compounds are present, established MDLs and QLs may not be achievable without impacting the instrument quality. If the laboratory has taken appropriate actions and matrix interferences prevent the laboratory from achieving the specified detection limits, the project organization’s QAO will be contacted as soon as the situation is identified. The Laboratory Project Manager will document, in the data package case narrative, how the laboratory demonstrated good analytical practices in order to attempt to achieve the specified reporting detection limits.

Blanks will not be subtracted from target analyte results.

The generated data will be input into the laboratory DBMS.

Laboratories analyzing samples for submittal to the NYSDEC must meet the required Environmental Laboratory Accreditation Program (ELAP) Certification for the associated methods. Prior to sample collection, the project organization will confirm the laboratory’s conformance with ELAP certification, where applicable.

Data generated will be submitted to the NYSDEC in an EDD format that complies with the NYSDEC's Environmental Data Submission EDD format. Data will be managed in a relational DBMS. Laboratory analytical data will be provided in EDD format for direct upload into the DBMS. Data validation qualifiers will be entered into the DBMS and checked independently.

Complete descriptions of analytical procedures to be used in the laboratory are described in the methods and the laboratory SOPs. Applicable laboratory SOPs, Quality Assurance Manual (QAM) and Proficiency Testing for the work assignment will be provided as attachments to the WA Schedule 1.

9.2 Target Analytes and Detection Limits

The MDL is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. The QL is the lowest concentration that can be reliably quantified within specified limits of precision and accuracy during routine laboratory operations.

The laboratory will evaluate non-detected results for aqueous and solid environmental samples to the MDLs and report the non-detected results referencing the QL. The laboratory will report non-detected results for air samples to the QL.

The QL concentration is established by the lowest standard in the instrument calibration. Results that are less than the QLs but greater than or equal to the MDLs will be reported using the “J” flag. For example, for a target analyte with a QL of 10 µg/L and an MDL of 2 µg/L, a non-detected result is reported as 10 µg/L "U", indicating that a concentration greater than or equal to the MDL was not detected by the laboratory. A detected concentration of 6 µg/L is reported as 6 "J" and a detected concentration of 23 µg/L is reported without a laboratory flag. The laboratory must include both QLs and MDLs on the sample result sheet that is reported to the data user and the most recent MDLs and QLs will be reported.

Laboratories periodically update the MDL and QL values as part of internal laboratory policy. When updated, they should be provided to the Program Manager.

9.3 Regulatory Criteria

The NYSDEC regulatory limits for methods listed in Table 1 are provided in Table 2-1A, Table 2-1B, Table 2-1C, Table 2-2, Table 2-3, Table 2-4A, Table 2-4B, Table 2-5 and Table 2-6. These regulatory limits will be used to evaluate analytical data for the work assignment sampling activities.

To meet the DQOs for the work assignment, the sample results will be compared to the following regulatory criteria:

For groundwater and surface water:

- 6 CRR-NY Part 703 Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations.

For drinking water:

- 10 CRR-NY Part 5-1.51 *Public Water Systems; Maximum Contaminant Levels; Monitoring Requirements; Notifications Required.*

For sediment:

- *Screening and Assessment of Contaminated Sediment*, NYSDEC Division of Fish and Wildlife and Marine Resources; June 24, 2014

For soil samples:

- 6 CRR-NY Part 375-6 *Remedial Program Soil Clean Up Objectives*.

For air samples:

- *Guidance for Evaluation of Soil Vapor Intrusion in the State of New York*; New York State Department of Health (NYSDOH); October 2006 (as updated) and updated matrices dated May 2017.

For Per- and polyfluoroalkyl substances (PFAS) samples:

- Screening levels per NYSDEC document *Sampling, Analysis, And Assessment of Per- and Polyfluoroalkyl Substances (PFAS) under NYSDEC's Part 375 Remedial Programs* dated November 2022.

10. LABORATORY AND FIELD QA/EC PROCEDURES

The overall effectiveness of a QA/QC program depends on operating in the field and laboratory according to a program that systematically ensures the precision and accuracy of analyses by detecting errors and preventing their recurrence or measuring the degree of error inherent in the methods applied.

Quality Assurance is an integrated system of activities involving planning, quality assessment, reporting and quality improvement to ensure that a program meets defined standards of quality with a stated level of confidence. Quality Control involves the technical activities that measure the quality of a program so that it meets the needs of users.

A brief description of laboratory QC analyses is presented in the following sections.

10.1 Laboratory QA/QC Checks

A brief description of laboratory QA/QC analyses is presented in the following subsections.

10.1.1 GC/MS Tuning

Tuning and performance criteria are established to verify mass resolution, identification, and to some degree, instrument sensitivity. These criteria are not sample specific; conformance is determined using standard materials. Therefore, these criteria should be met in all circumstances.

10.1.2 Calibration

Compliance requirements for satisfactory instrument calibration are established to verify that the instrument is capable of producing acceptable quantitative data. Initial calibration demonstrates that the instrument is capable of acceptable performance at the beginning of analysis, and continuing calibration and performance checks document satisfactory maintenance and adjustment of the instrument on a day-to-day basis.

10.1.3 Blanks

Several types of blanks will be analyzed by the laboratory. Corrective action procedures will be implemented for blank analyses if target compounds are detected at concentrations greater than the applicable criteria. The criteria for evaluation of blanks apply to any blank associated with a group of samples collected, prepared and/or analyzed at the same time, where applicable. If problems with a blank exist, data associated with the project must be carefully evaluated to determine whether or not there is an inherent variability in the data for the project, or if the problem is an isolated occurrence not affecting other data.

A method blank is an analyte-free blank that undergoes the preparation procedures applied to a sample. These samples are analyzed to examine whether sample preparation and analysis techniques result in sample contamination. The laboratory will prepare and analyze a method blank with each group of samples that are extracted, digested, or analyzed at the same time.

Field rinsate blanks are analyzed to assess contamination introduced during field sampling procedures and sample shipment, respectively. A field blank will be prepared for sampling when a particular piece of sampling equipment is employed for sample collection and subsequently decontaminated in the field for use in additional sampling. Field rinsate blank collection begins with two sets of identical bottles; one set filled with target analyte-free water provided by the laboratory, and one empty set of bottles identical to those provided for aqueous sample collection. The blank water used to generate the field blank will be provided by the laboratory using the same source of water as that used to prepare method blanks. For sampling that includes analysis for PFAS, the water should be documented as PFAS-free. At the field location, in an area suspected to be contaminated, the water is passed from the full set of bottles through the dedicated or field decontaminated sampling device(s) and into the empty set of bottles. This will constitute identical bottle to bottle transfer. The field rinsate blank samples will be subject to the same analyses as the environmental samples. The field blank will be composed in the field by collecting a blank water rinse from the equipment after execution of the last step of the proper field decontamination protocol. The identical bottle to bottle transfer technique will be used to generate the field blank. Preservatives or additives will be added to the field blank, where appropriate, for the sampling parameters. One field rinsate blank will be collected for every 20 samples or one per matrix for less than 20 samples for each analysis type, unless otherwise specified in the WA Schedule 1. The field rinsate blank will be analyzed for the same parameters as the samples collected the same day that the field blank was generated.

For analysis of PFAS by Modified Method 537.1 and Method 1633, empty sample bottles without preservation and the prepared Field Blank are both shipped to the sampling site. The sampler must pour the preserved reagent water from the laboratory prepared Field Blank into the empty sample bottles and label these bottles as the Field Blank.

For analysis of PFAS by Modified Method 537.1 and Method 1633, collect one equipment blank every day that sampling is conducted and a minimum of one equipment blank for every 20 samples. The equipment 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.

Trip blanks will be prepared as other samples submitted for VOC analysis and will contain analyte-free water or preservative, as appropriate. A trip blank will be prepared by the laboratory, using the same preservation technique as that used to prepare the sample containers, from the same source as the method blank water, and sent to the sampling site in the cooler with the other sample containers. The trip blank will undergo shipment from the sampling site to the laboratory in coolers with the environmental samples to be analyzed for VOCs. Trip blanks will be analyzed for VOCs to determine if contamination has taken place during sample handling and/or shipment. Trip blanks will be included in sample coolers at a frequency of one trip blank per cooler containing samples to be submitted for VOC analysis.

10.1.4 Internal Standards Performance

Internal standards, which are compounds not found in environmental samples utilized for target analyte quantitation, will be spiked into samples, blanks, and laboratory control samples at the time of sample preparation for applicable methods. Internal standards should meet the criteria specified in the laboratory SOPs.

10.1.5 Surrogate Recovery

Accuracy and matrix biases for individual samples are monitored for organic analyses using surrogate additions. Surrogates are compounds similar in nature to the target analytes; the surrogates are spiked into aqueous and solid samples, blanks, and QC samples prior to sample preparation for organic analyses. The evaluation of the results of these surrogate spikes is not necessarily straightforward. The sample itself may produce effects due to such factors as interferences and high concentrations of analytes. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the review and validation of data based on specific sample results is frequently subjective.

10.1.6 Laboratory Control/Laboratory Control Duplicate Samples

Laboratory control samples (LCSs) and laboratory control duplicate samples (LCSDs) are standard solutions that consist of known concentrations of the complete list of target analytes spiked into laboratory analyte-free matrix. They are prepared or purchased from a certified manufacturer from a source independent from the calibration standards to provide an independent verification of the calibration procedure. These QC samples are then prepared and analyzed following the same procedures employed for environmental sample analysis to assess method accuracy independently of sample matrix effects. Percentage recoveries are evaluated to assess the efficiency of the preparation and analysis method independent of environmental sample matrix effects. If performed by the laboratory, the LCSD is evaluated for laboratory precision.

10.1.7 MS/MSD Samples

MS/MSD data are generated to determine long-term precision and accuracy of the analytical method with respect to sample matrices. Generally, the MS/MSD data alone are not used to evaluate the precision and accuracy for associated organic samples since data may reflect specific matrix effects only present within one sample.

One set of MS/MSD samples will be collected for every 20 samples (minimum frequency of 5%) or one per matrix for less than 20 samples. If less than 20 samples are collected, one MS/MSD set will be collected. Whenever possible, MS/MSD samples will be prepared and analyzed within the same batch as the environmental samples. MS/MSD samples will be spiked at the laboratory with the complete list of target analytes.

10.1.8 Analyte Identification and Quantitation

The objective of the qualitative criteria is to minimize the number of erroneous identifications of compounds. An erroneous identification can either be a false positive (reporting a compound present when it is not) or a false negative (not reporting a compound that is present). The identification criteria can be applied much more easily in detecting false positives than false negatives. Negatives, or non-detect compounds on the other hand, represent an absence of data and are therefore much more difficult to assess. The objective for quantitative requirements is to maximize the accuracy of data and sensitivity of the instrument. Unless sample screening indicates the presence of high concentration target analytes, samples will be analyzed undiluted to maximize sensitivity. Samples must be reanalyzed at the appropriate dilution when concentrations exceed the linear calibration range to maximize accuracy. Matrix interferences will be identified and documented. Samples may be diluted only if analytes of concern generate responses in excess of the linear range of the instrument.

10.2 Field QA/QC Checks

In order to evaluate data quality, QA/QC samples will be collected during the sampling activities. Table 1 lists the sample matrices and corresponding QC samples to be collected by analysis.

10.2.1 Field Duplicate Samples

Field duplicate samples will be collected from the same location as the parent sample and will be analyzed for the same parameters as the parent sample. The actual identification of the duplicate QC samples will be recorded in the field logbook. Collection of field duplicate samples provides for the evaluation of the laboratory's precision performance by comparing analytical results of two samples from the same location. They are also collected to evaluate field sample collection precision procedures. Samples are collected from one location and sent to the laboratory blind (with two different sample identifications).

Duplicates of solid samples submitted for VOC analysis are obtained from the same discrete location without mixing. Duplicates for the remaining analyses require homogenization by filling a decontaminated stainless-steel tray or bowl with the sample and mixing it with a decontaminated stainless-steel instrument. The mixed sample is divided in half and scooped alternatively from each half to fill the sample container.

One field duplicate sample will be collected for every 20 samples (minimum frequency of 5%) or one per matrix for less than 20 samples. If less than 20 samples are collected, one field duplicate sample will be collected.

10.2.2 MS/MSDs

The MS/MSD samples will be collected from the same location as the parent sample and will be analyzed for the same parameters as the parent sample. Each sample will be labeled with the same number as the original sample, designated as MS or MSD, and submitted to the laboratory for the appropriate analyses. MS/MSD samples are duplicate samples that are collected in the field and have spiking solutions added at the laboratory during sample preparation. MS/MSD samples are considered identical to the original sample. The percent recovery of the spiked amount indicates the accuracy of the extraction as well as interferences caused by the matrix. Relative percent differences (%RPD) between spike sample recoveries or between duplicate samples will indicate the precision of the data.

One MS/MSD sample set will be collected for every 20 samples submitted to the laboratory (minimum frequency of 5%) or one MS/MSD for less than 20 samples.

10.2.3 Field Blanks

One field rinsate blank, presented in Section 10.1.3, will be collected per 20 samples or once per day as specified in the WA Schedule 1.

10.2.4 Trip Blanks

Trip blanks, presented in Section 10.1.3, will be included in sample coolers at a frequency of either one trip blank per cooler, or one trip blank per shipment of samples sent to the laboratory for VOCs.

10.2.5 Temperature Blanks

Temperature blanks will consist of vials of water that have undergone shipment from the sampling site to the laboratory in coolers with the environmental samples to be analyzed for the sampling program. The temperature of these blanks will be measured at the laboratory upon receipt of the sample cooler to verify compliance with the cooler temperature requirement.

10.3 Corrective Action

Generally, the following corrective actions may be taken by the laboratory. When analytical parameters that are within the control of the laboratory, including calibration, instrument performance, and blank criteria, are not met, the cause of the problem will be located and corrected. The analytical system will then be recalibrated. Sample analysis will not begin until calibration, instrument performance, and blank criteria are met. When matrix spike, standard, or duplicate analyses are out of control, samples analysis will cease. The problem will be investigated. Depending on the results of the overall QC program for the sample set, the data may be accepted, accepted with qualification, or determined to be unusable.

If, through the application of the corrective actions listed in the method or laboratory SOP, the data is determined to be unusable, the QC analysis will be re-prepared and reanalyzed. If QC criteria are met upon reanalysis, only the new results are reported. If QC criteria are still not met upon reanalysis, both sets of sample results will be reported and the QAO will be notified of the situation at the time of sample analysis.

If matrix interferences are suspected, the QAO will be contacted. Unless sample screening indicates the presence of high concentration target analytes, samples may be diluted in the analysis only if analytes of concern generate responses in excess of the linear range of the instrument.

If the laboratory has taken appropriate actions and matrix interferences prevent the laboratory from achieving the specified detection limits, the QAO will be contacted as soon as the situation is identified. The Laboratory Project Manager will document, in the data package case narrative, how the laboratory demonstrated good analytical practices in order to attempt to achieve the specified reporting detection limits.

10.4 Data Assessment Procedures

As presented in Section 3.2, data for accuracy/bias, precision, representativeness, sensitivity, comparability and completeness will be evaluated.

The definitions and equations used for the assessment of data quality are discussed below.

<u>Accuracy/Bias</u> - Is a measure of the nearness of an analytical result, or a set of results, to the true value. It is usually expressed in terms of error, bias, or percent recovery (%R).

Normally, the term accuracy is used synonymously with percent recovery. It describes either the recovery of a synthetic standard of known value, or the recovery of known amount of analyte (spike) added to a sample of known value. The %R or accuracy can be calculated by using:

Standards: %R = (observed value/true value) x 100

Spikes: %R = [((conc. spike + sample conc.) - sample conc.)x100)]/conc. spike

Precision - Refers to the agreement or reproducibility of a set of replicate results among themselves without assumption of any prior information as to the true result. It is usually expressed in terms of the percent difference (%D) or RPD.

The %D is calculated by using:

%D = (larger SR - smaller SR x 100)/smaller SR

Where: SR is the sample result.

The RPD is calculated by using:

RPD = (OSR - DSRx 100)/((OSR + DSR)/2)

Where: OSR is the original sample result and DSR is the duplicate sample result.

Average - The average or arithmetic mean (X) of a set of n values (Xi) is calculated by summing the individual values and dividing by n:

$$X = (\sum Xi_{I=1\,to\,n}) \div n$$

Range - The range (Ri) is the difference between the highest and lowest value in a group. For n sets of duplicate values (X2, X1), the range (Ri) of the duplicates and the average range (R) of the n sets are calculated by the following:

Ri = X2 - X1

$$R = \sum Ri_{i=1\,to\,n} \div n$$

Standard deviation and variation - The standard deviation (S) of a sample of n results is the most widely used measure to describe the variability of a data set. It is calculated by using the following equation:

$$S = \sqrt{\frac{\Sigma (Xi - \overline{X})^2}{n-1}}\; n_{\;\mathrm{to}\, i-1}$$

Where: X is the average of the n results and Xi is the value of result. Normally, X ± S will include 68% and X ± 2S includes about 95% of normally distributed data.

The variance is equal to S2. The percent relative standard deviation (%RSD), or coefficient of variation (CV), is the standard deviation divided by the mean and multiplied by 100 as follows:

CV = 100S/X

The Laboratory Project Manager, with individual laboratory group leaders, will identify any data that should be rated as "unacceptable" based on the assessment of the QA/QC criteria.

Bias - Results of sample spiking are used to calculate the quality control parameter for accuracy evaluation, the percent recovery (%R).

%R = 100(S1 S2)/T1

where: T1 = True concentration of the spike
S1 = Observed spiked sample concentration
S2 = Sample concentration without spike addition

Sensitivity - The measure of sensitivity is made by a comparison of laboratory QLs to the requirements for the DQOs. This comparison will be performed prior to sample analysis, with expected laboratory RLs, and following sample analysis, with actual QLs.

Completeness -Completeness is the fraction of usable data obtained from a measurement system (*e.g.*, sampling and analysis) compared to that which was planned and is calculated as follows:
Completeness = (Usable Laboratory Measurements Made/ Laboratory Measurements Planned) / x 100%

11. DATA REVIEW

For data to be scientifically valid, legally defensible, and comparable, valid procedures must be used to prepare and manage the data.

11.1 Data Reporting Procedures

Specific laboratory procedures and instrumentation can be found in the laboratory QAM and SOPs. The general data production and reporting procedures described below will be employed at the laboratory.

11.1.1 Data Reduction

Data reduction consists of manual and computer data reduction procedures and calculations. Computer data reduction procedures and calculations will be checked manually by the laboratory to verify that compound identification and quantitation adhere to method requirements. The laboratory will be responsible for maintaining a listing of computer-based data reduction programs and SOPs for data reduction. Sample preparation or extraction logs will be used to document sample preparation information (for example, preparation weights, volumes, reagents). Instrument injection logs or bench sheets will also be maintained for each instrument.

11.1.2 Laboratory Data Review

Analytical results are generally entered into the laboratory computer system by the analyst, independently reviewed by another analyst or supervisor experienced in the method, and approved by the Laboratory Manager. The following are requirements that are generally examined as part of this review:

- Initial calibration criteria were met. Standards in the calibration curve covered the expected concentration ranges of the samples including the QL.
- Initial and continuing calibrations met the acceptance criteria defined in the method standard procedure.
- Sample results fell within the range of the standard curve.
- Method blanks were processed with each analytical batch and no detectable levels of contamination were identified.
- MS/MSD and duplicate analyses were performed at the required frequency and results were within the control limits.
- LCS analyses were performed with each analytical batch and the results obtained were within control limits.
- Calculations have been accurately performed.
- Reporting units are correct.
- Data for the analysis provide a complete audit trail.
- Reported QLs comply with data quality requirements.

The analyst's supervisor will check a minimum of 10% of the data back to raw data in the secondary review. When required analyses on the samples in a project are complete, entered, and reviewed, a report will be generated. The report will be forwarded to the assigned Laboratory Project Manager or designee for review. The report will then be reviewed for the following items (at a minimum):

- QC data will be reviewed to identify whether or not internal specification and contract requirements have been me.
- Non-conformance reports, if any, will be reviewed for completion of corrective actions and their impact of results. Non-compliance and corrective action procedures will be documented in the case narrative in the final report.

The report requires the signature of the Laboratory Project Manager or designee. Electronic data are copied onto computer tape, inventoried, and stored off-site in a secure facility, or within locked cabinets on-site. This data archive system is maintained for a minimum of ten years.

Following final review, one hardcopy of the laboratory data package and a portable document format (PDF) copy will be transmitted to the Project Manager.

12. DATA DELIVERABLES AND DATA MANAGEMENT

Definitive data will be generated in the laboratory. The laboratory-generated data will be entered into the laboratory DBMS and presented in data packages. The laboratory will perform the data review process, including a minimum of 10 percent check of the data back to raw data in the secondary review by a laboratory supervisor.

The analytical data will be reported in USEPA CLP-like full deliverable format in both hardcopy and electronic data format. The data packages will provide documentation consistent with NYSDEC ASP-defined deliverables (Category B).

Data validation of the sample data will be performed as described in this QAPP.

All data generated will be submitted to the NYSDEC in an EDD format that complies with the NYSDEC's Environmental Data Submission EDD format and specified valid values. Data will be managed in a relational DBMS by Ramboll and NYSDEC. Laboratory analytical data will be provided in EDD format without errors for direct upload into the Ramboll DBMS.

The laboratory is responsible for providing an EDD that matches the hardcopy and electronic data package for sample and analysis information. The EDD records must be the same format (*i.e.*, flat file format). Field samples that are not collected from the work assignment site must not be included in the laboratory report or EDD.

The DBMS will be used to provide custom queries and reports to support data validation, data analysis, and report preparation. Data validation qualifiers will be entered into the Ramboll DBMS. The Ramboll DBMS will be checked independently to minimize data transmittal error and loss.

Generally, the information flow will include the following steps:

- Samples will be collected in the field and transported to the laboratory.
- Samples will be analyzed at the laboratory and data generated.
- The laboratory data will be sent to the data validator for evaluation and to the Project Manager for preliminary evaluation.
- An EDD will be provided by the laboratory and provided to the data validator for addition of data qualifiers.
- Qualified data will be sent to data management personnel and entered into the Ramboll DBMS.
- The final data set from the Ramboll DBMS will be provided to the Project Manager for data evaluation in terms of project goals.
- The EDD will be uploaded to the NYSDEC database (NYENVDATA@dec.ny.gov) as specified in the WA Schedule 1.
- Project decisions based on results of the data analysis will be reported to NYSDEC.

Records will be incorporated into the final project files for the samples. The field logs, data packages, and records will be included in the project files. The project files will be archived by the project organization for a period of ten years.

13. DATA VALIDATION AND USABILITY

13.1 Scope of Validation

Data validation will be performed on the data collected during the work assignment activities utilizing the current USEPA Region II validation guidance and NYSDEC DUSR guidance (NYSDEC, 2010) as described in the following section.

Samples analyzed for poly- and perfluoroalkyl substances (PFAS) will also be evaluated using Appendix I of the NYSDEC document *Sampling, Analysis, And Assessment of Per- and Polyfluoroalkyl Substances (PFAS) under NYSDEC's Part 375 Remedial Programs* dated June 2021 and November 2022 (Exhibits E-1 and E-2, respectively).

Full data validation, which includes review of raw data to satisfy the DUSR requirements, will be performed on the data from the samples collected during the sampling activities.

Experienced data validators, meeting the requirements in this QAPP including being independent of the laboratory generating the data, will provide data validation services.

Upon request by the data validator, the laboratory will provide additional or supplemental information within three working days of the request.

13.2 Validation Procedures

Data Validation is a process of determining the suitability of a measurement system for providing useful analytical data. Data validation is essentially a three-step process in which the analytical data's QA/QC information is first compared to a series of QA/QC criteria. Based on the results of this comparison, the analytical data are then assigned qualifiers, which provide an indication of the data's usability. Finally, an overall evaluation of the data's usability is performed.

Utilizing the DUSR process as guidance, the following questions will be considered during the validation:

1. Is the data package complete as defined under the requirements for the most current USEPA Contract Laboratory Program (CLP) deliverables?
2. Have the holding times been met?
3. Do all the QC data: blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, duplicate analyses, laboratory controls and sample data fall within the protocol required limits and specifications?
4. Have the data been generated using established and agreed upon analytical protocols?
5. Does an evaluation of the raw data confirm the results provided in the data summary sheets and quality control verification forms?
6. Have the correct data qualifiers been used?
7. Have any exceedances been specifically noted in the report?

The analytical data generated for the work assignment will be evaluated by the data validator using the analytical methods utilized by the laboratories (as presented in the WA Schedule 1), the QA/QC requirements listed in the methods, the laboratory SOPs and professional judgment.

Data affected by excursions from the QA/QC criteria will be qualified using the current USEPA Region II data validation guidance documents the NYSDEC DUSR guidance (NYSDEC, 2010) and professional judgment.

Full data validation consists of a review of data summary forms and raw analytical data that are provided in the data packages. During the full validation, data validators will recalculate selected laboratory sample calculations using raw data when verifying sample results. In addition, data validators will review raw data to verify that compound identification was performed correctly and transcription errors are not present.

The following QA/QC information will be included in the full validation, where applicable:

- QAPP compliance
- Chain-of-custody record
- Sample collection
- Sample preservation
- Percent solids
- Holding times
- Initial, Continuing, Verification Calibrations
- Blank analysis
- MS/MSD analysis
- LCS analysis
- Field duplicate analysis
- Surrogate recovery
- Internal standards performance
- GC/MS instrument performance check/ tune reports
- Analytical sequence
- Isotopic Standard (Extraction and Injection) performance
- ICP interference check analysis
- ICP serial dilution analysis
- Laboratory duplicate analysis
- Sample dilutions
- Target analyte quantitation, identification, and quantitation limits (RLs)
- Documentation completeness

13.3 Assignment of Qualifiers

Data affected by excursions from the previously described QA/QC criteria will be qualified using the current USEPA Region II validation guidance documents, the NYSDEC DUSR guidance (NYSDEC, 2010) and professional judgment. The application of the validation guidelines will be modified to reflect method and QAPP requirements.

For the data associated with the work assignments, if the LCS or LCSD recovery is less than the laboratory control limit but greater than 10%, the non-detected results are qualified as J, biased low. If the LCS or LCSD recovery is less than 10%, the non-detected results must be rejected. In accordance with the USEPA guidance, and utilizing professional judgment, the following qualifiers will be applied in the data validation:

"R"	Indicates that the QL or sample result is determined to be unusable due to a major deficiency in the data generation process. The data should not be used for any qualitative or quantitative purposes.
"U"	Indicates that the analyte was analyzed for, but a concentration was not detected. The sample QL is reported. This qualifier is also used in the validation process to signify that the detection limit of an analyte was revised due to blank contamination.
"J"	Indicates that the concentration should be considered approximate. This qualifier is used when the data validation process identifies a deficiency in the data generation process. This qualifier is also applied by the laboratory when the analyte concentration is greater than the MDL but less than the QL. In the latter case, the identification of the analyte is not in question but the quantitation of the analyte concentration may be uncertain.
"J+"	The result is an approximate quantity, but the result may be biased high.
"J-"	The result is an approximate quantity, but the result may be biased low.
"UJ"	Indicates that the analyte was analyzed for, but a concentration was not detected. The sample RL is reported and should be considered approximate. This qualifier is used when the data validation process identifies a deficiency in the data generation process.
"JN "	Indicates that there is presumptive evidence that the analyte is present, but it has not been confirmed due to confirmation excursions.

The following guidelines will be used regarding the assignment of qualifiers and the evaluation of data:

- The data quality evaluation results in only one type of qualifier ("U", "J", "UJ," or "R") for each analyte; in a case when several qualifiers are applicable to the same analyte, the cumulative effect of the various QA/QC excursions is employed in assigning the final data qualifiers. For example, if a sample result is affected by low surrogate recoveries, for which the "UJ" qualifier is applied, but low MS/MSD recoveries result in the rejection of the sample result (application of the "R" qualifier), the final data qualifier is the "R" qualifier.

13.4 Data Usability Evaluation

The specific data quality requirements including precision, accuracy, representativeness, comparability, sensitivity, and completeness will be assessed during data validation. Data usability with respect to the DQOs and data uses will be compared to the project requirements. In the event that the completeness objective of 95 percent is not achieved, samples may be recollected at the discretion of the Project Manager.

Based on the QA/QC information review and the qualifiers assigned to the analytical data, an overall evaluation of the data's usability will be performed. Data usability is defined as the percentage of data that remains unqualified or is qualified as approximate or non-detected due to blank contamination, divided by the data reported by the laboratory times 100. The percent usability excludes the data qualified as rejected due to major QA/QC excursions. The non-usable data is defined as the percentage of the data qualified as rejected divided by the data reported by the laboratory times 100. The data usability will be provided for each type of analysis performed.

The data usability evaluation considers the data parameters of precision, sensitivity, accuracy,37epresentativeness, comparability, and completeness which are described as follows:

- Precision is evaluated through the review of field duplicate samples, laboratory duplicates, and MS/MSD samples.
- Sensitivity is evaluated through the review of QLs, blank analyses and holding time results.
- Accuracy is evaluated through the review of MS recoveries, LCS recoveries, internal standard recoveries, calibration, instrument performance checks, target analyte identification and quantitation and sample preservation.
- Representativeness is evaluated through the review of sample preservation and sampling containers.
- Comparability is evaluated through the review of the analytical methods and reporting procedures for consistency.
- Completeness is defined as the overall percentage of sample results that are determined to be usable.

13.5 Data Validation DUSR

The data validation DUSR will contain separate QA sections in which data quality information collected during the investigation is summarized. The validation report will include the following:

- Data validation guidelines used to evaluate the data;
- Data qualifiers applied to sample results;
- Summary of samples collected and analyses performed;
- Narrative that identifies major and minor analysis excursions detected for each parameter evaluated for each analysis;
- Additional issues and information that may be beneficial to the data user;
- Data summary forms.

The data validation DUSR will be prepared under the direction of the QAO and will include the report on the usability of the data.

14. DATA ASSESSMENT PROCEDURES

14.1 Data QC Review

Data assessment is a systematic process of reviewing data against a set of criteria to identify outliers or errors and to delete suspect values or to flag them for the user. Laboratory data review starts with the laboratory quality control procedures discussed in Section 10 of this QAPP.

Sample results obtained from the laboratory will be qualitatively and quantitatively assessed by the Project Manager or designee. Factors to be considered in the data assessment will include, but are not necessarily limited to, the following:

- Were all samples collected and handled using the custody procedures, methodologies and SOPs proposed in the QAPP and WA Schedule 1?
- Were samples obtained from all proposed sampling locations?
- Do any analytical results exhibit elevated laboratory QLs?
- Were any reported analytes not expected to be present?
- Which data points were found to be unusable based on the data validation results?
- Have sufficient data of appropriate quality been generated to meet the key objectives of the work assignment as identified in the WA Schedule 1?

14.2 Data Review

The internal laboratory data review process will be used to evaluate data prior to submission to the Project Manager. Data validation will be used to determine the quality and quantity of usable analytical data generated based upon the WA Schedule 1 requirements.

14.3 Reconciliation with DQOS

The work assignment report will include an evaluation of how representative the analytical results are of the medium being evaluated based on measures such as sampling design and quality control results. It will also include a discussion on the sufficiency of the data set for meeting project DQOs. The work assignment report will also contain a discussion of any unusable data and follow up actions for subsequent data collection to meet the project DQOs.

14.4 Project Completeness Assessment

The Project Manager will examine the project data for consistency with historical data, data quality, and usability.

15. PROJECT REPORTING

15.1 Data Validation Report

The data validation report will contain separate QA sections in which data quality information collected during the work assignment is summarized.

The data validation DUSR will be prepared under the direction of the QAO or the designated data validator and will include the report on the usability of the data.

15.2 Work Assignment Report

A work assignment report will be prepared at the conclusion of the site activities and will include sample data results and the findings of the work assignment.

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TABLES

Table 1. Field Sampling Summary

Parameter and Method	Matrix	Sample Containers and Volumes	Preservation	Holding Times	Number of Samples*	QC Sampling Frequency: Field Duplicate	Trip Blank	MS/MSD or Spike Duplicate	Field Rinsate Blank
VOCs (USEPA Methods 5030C/5035A/8000C/ 8260C/8260D)[1]	Aqueous	3 - 40-milliliter glass vials with Teflon® lined septum caps	≤6°C HCL to pH≤2 FC Sealed and Headspace Free	Analysis within 14 days from collection for preserved samples. Analysis within 7 days from collection for samples not acid preserved.	TBD	One for every 20 samples collected	1 each in cooler with VOC samples	One for every 20 samples collected	One per 20 samples or one per sampling event
VOCs Low Level (USEPA Methods 5035A/8000C/8260C/ 8260D)[1]	Solid	Encore™, Terra Core™ (or similar) sampler used to collect and transport sample in accordance with USEPA Method 5035A OR 125 milliliter wide mouth glass container filled head-space free sealed with Teflon® lined lid	≤6°C Sealed	At the laboratory within 48 hours from collection: For Encore sampler: extrude sample to a sealed vial and freeze to -7°C Analysis must be performed within 14 days from collection. Otherwise, 48 hours from collection to analysis.	TBD	One for every 20 samples collected	1 each in cooler with VOC samples	One for every 20 samples collected	One per 20 samples or one per sampling event
VOCs Medium Level (USEPA Methods 5035A/8000C/8260C/ 8260D)[1]	Solid	Encore™, Terra Core™ (or similar) sampler in accordance with USEPA Method 5035A. 5 grams sample volume required OR 125 milliliter wide mouth glass container filled head-space free sealed with Teflon® lined lid	<6°C Sealed	For Encore: At the laboratory within 48 hours of collection: Add methanol solution to 5 grams of sample in accordance with USEPA Method 5035A. If methanol added. 14 days from collection to analysis Otherwise, 48 hours from collection to analysis.	TBD	One per 20 samples collected	One ea. per cooler with VOC samples. Methanol trip blank.	One for every 20 samples collected	One per 20 samples or one per sampling event
VOCs Low Level-SPLP/TCLP (USEPA Methods 5035A/8000C/1311/ 1312/8260C)[1]	Solid	Encore™, Terra Core™ (or similar) sampler used to collect and transport sample in accordance with USEPA Method 5035A. 25 Grams of sample required OR 40-milliliter glass vials with Teflon® lined septum caps OR 125 milliliter wide mouth glass container filled head-space free sealed with Teflon® lined lid	≤6°C Sealed	At the laboratory: Extrude Encore sample to a sealed vial and freeze to -7°C within 48 hours from collection. For TCLP/SPLP -VOCs, 14 days from collection to extract generation. 14 days from extract generation to analysis.	TBD	One per 20 samples collected	1 each in cooler with VOC samples	One for every 20 samples collected	One per 20 samples or one per sampling event

Table 1. Field Sampling Summary									
						QC Sampling Frequency			
Parameter and Method	Matrix	Sample Containers and Volumes	Preservation	Holding Times	Number of Samples*	Field Duplicate	Trip Blank	MS/MSD or Spike Duplicate	Field Rinsate Blank
VOCs (Method TO-15)[2]	Air	6.0 Liter SUMMA® vacuum canisters- Individual Cannister or Batch Certified	None	Analysis within 30 days from collection to analysis. Used and un-used canisters must be returned to the laboratory within 30 days of shipment of the canisters to the sampling location	TBD	One per 20 samples collected	NA	NA	NA
Dissolved Gas (RSK 175)[3]	Aqueous	3- 40-milliliter glass vials with Teflon® lined septum caps	≤6°C HCL to pH≤2	Analysis within 14 days from collection for preserved samples	TBD	One per 20 samples collected	1 each in cooler with VOC samples	One for every 20 samples collected	One per 20 samples or one per sampling event
VOCs (USEPA Method 524.2, Rev 4.1)[4]	Aqueous	4-40 milliliter glass vials with Teflon® lined septum caps Samples collected in duplicate	4°C, RC After dechlorination, add 2 drops of 1:1 HCL for each 40 ml of sample to pH≤2. Seal sample bottle, Teflon® face down, mix for one minute. For foaming sample, collect unpreserved samples and analyze within 24 hours of collection.	14 days from collection for preserved samples For un-preserved sample, collect unpreserved samples and analyze within 24 hours of collection.	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 10 samples or one per sampling event
Halogenated Volatiles (USEPA Methods 8000C/8021B)[7]	Aqueous	3- 40-milliliter glass vials with Teflon® lined septum caps	≤6°CHCL to pH≤2 FC Sealed and Headspace Free	Analysis within 14 days from collection for preserved samples. Analysis within 7 days from collection for samples not acid preserved.	TBD	One per 20 samples collected	1 each in cooler with VOC samples	One for every 20 samples collected	One per 10 samples or one per sampling event
Volatiles (USEPA Method 624)[17]	Aqueous	4- 40-milliliter glass vials with Teflon® lined septum caps	≤6°CHCL to pH≤2 RC	Analysis within 14 days from collection for preserved samples. Analysis within 7 days from collection for samples not acid preserved.	TBD	One per 20 samples collected	1 each in cooler with VOC samples	One for every 20 samples collected	One per 10 samples or one per sampling event

Table 1. Field Sampling Summary

						QC Sampling Frequency			
Parameter and Method	**Matrix**	**Sample Containers and Volumes**	**Preservation**	**Holding Times**	**Number of Samples***	**Field Duplicate**	**Trip Blank**	**MS/MSD or Spike Duplicate**	**Field Rinsate Blank**
Volatiles (USEPA Method 502.2)[4]	Aqueous	4- 40-milliliter glass vials with Teflon® lined septum caps Samples collected in duplicate	≤6°CHCL to pH≤2 RC	Analysis within 14 days from collection.	TBD	One per 20 samples collected	1 each in cooler with VOC samples	One for every 20 samples collected	One per 10 samples or one per sampling event
Volatiles (USEPA Method 601)[17]	Aqueous	4- 40-milliliter glass vials with Teflon® lined septum caps	≤6°C RC	Analysis within 14 days from collection.	TBD	One per 20 samples collected	1 each in cooler with VOC samples	One for every 20 samples collected	One per 10 samples or one per sampling event
Volatiles (USEPA Method 602)[17]	Aqueous	4- 40-milliliter glass vials with Teflon® lined septum caps	≤6°C HCL to pH≤2 RC	Analysis within 14 days from collection.	TBD	One per 20 samples collected	1 each in cooler with VOC samples	One for every 20 samples collected	One per 10 samples or one per sampling event
Total Organic Halides (USEPA Method 9020B)[10]	Aqueous	1-250 milliliter plastic bottle with Teflon septa and protected from light. 125 milliliters sample volume required.	4°C H_2SO_4 to pH<2	28 days from collection for analysis	TBD	One per 20 samples collected	1 each in cooler with VOC samples	One for every 20 samples collected	One per 10 samples or one per sampling event
SVOCs/1,4-Dioxane/SIM (USEPA Methods 3510C/8000C/ 8270D/8270E/SIM)[5]	Aqueous	2-one liter amber glass container with Teflon® lined screw caps	≤6°C	7 days from collection to extraction; 40 days from extraction to analysis.	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
SVOCs/1,4-Dioxane/SIM (USEPA Methods 3541/3550B/ 8000C/8270D/8270E)[5]	Solid	250 milliliter wide mouth glass container with Teflon® lined lid. 100 grams sample volume required	≤6°C	14 days from collection to extraction; 40 days from extraction to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
SVOCs/SPLP/TCLP Preparation (USEPA Methods 3541/ 3550B/8000C/1311/ 1312/ 8270D)[5]	Solid	250 milliliter wide mouth glass container with Teflon® lined lid. 100 grams sample volume required	≤6°C	For SPLP - 14 days from collection to extract generation. 7 days from extract generation to extraction. 40 days from extraction to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
SVOCs (USEPA Method 625)[17]	Aqueous	2-one liter amber glass container with Teflon® lined screw caps	≤6°C RC	7 days from collection to extraction; 40 days from extraction to analysis.	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Phenols (USEPA Method 604)[17]	Aqueous	2-one liter amber glass container with Teflon® lined screw caps	≤6°C RC	7 days from collection to extraction; 40 days from extraction to analysis.	TBD	One for every 20	NA	One for every 20	One per 20 samples or one per

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Table 1. Field Sampling Summary

Parameter and Method	Matrix	Sample Containers and Volumes	Preservation	Holding Times	Number of Samples*	QC Sampling Frequency: Field Duplicate	Trip Blank	MS/MSD or Spike Duplicate	Field Rinsate Blank
						samples collected		samples collected	sampling event
Phenols (USEPA Method 8041)[6]	Aqueous	2-one liter amber glass container with Teflon® lined screw caps	≤6°C	7 days from collection to extraction; 40 days from extraction to analysis.	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
PAHs (USEPA Method 610)[17]	Aqueous	2-one liter amber glass container with Teflon® lined screw caps	≤6°C RC	7 days from collection to extraction; 40 days from extraction to analysis.	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
PCBs (USEPA Methods 3510C/8000C/8082A)[6]	Aqueous	2-one liter 250 ml amber glass container with Teflon® lined screw caps	≤6°C	Project Holding Time: 7 days from collection to extraction; 40 days from extraction to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
PCBs (USEPA Methods 3545A/8000C/8082A)[6]	Solid	4 oz. wide mouth glass container with Teflon® lined lid. 100 grams sample volume required	≤6°C	Project Holding Time: 14 days from collection to extraction; 40 days from extraction to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Organochlorine Pesticides (USEPA Methods 3510C/8000C/8081B)[6]	Aqueous	2-one liter amber glass container with Teflon® lined screw caps	≤6°C	7 days from collection to extraction; 40 days from extraction to analysis.	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Organochlorine Pesticides/PCBs (USEPA Method 608)[17]	Aqueous	2-one liter amber glass container with Teflon® lined screw caps	≤6°C	Project Holding Time: 7 days from collection to extraction; 40 days from extraction to analysis.	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Organochlorine Pesticides (USEPA Methods 3545A/8000C/8081B)[6]	Solid	4 oz. wide mouth glass container with Teflon® lined lid. 100 grams sample volume required	≤6°C	14 days from collection to extraction; 40 days from extraction to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Organochlorine Pesticides/TCLP/SPLP Preparation (USEPA Methods 3545A/8000C/1311/ 1312/8081B)[6]	Solid	4 oz. wide mouth glass container with Teflon® lined lid. 100 grams sample volume required	≤6°C	14 days from collection to extraction; 40 days from extraction to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event

Table 1. Field Sampling Summary

Parameter and Method	Matrix	Sample Containers and Volumes	Preservation	Holding Times	Number of Samples*	QC Sampling Frequency: Field Duplicate	Trip Blank	MS/MSD or Spike Duplicate	Field Rinsate Blank
Organophosphorus Pesticides (USEPA Methods 3510C/8000C/8141B)[6]	Aqueous	2-one liter amber glass container with Teflon® lined screw caps	≤6°C	7 days from collection to extraction; 40 days from extraction to analysis.	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Organophosphorus Pesticides (USEPA Methods 3545A/8000C/8141B)[6]	Solid	4 oz. wide mouth glass container with Teflon® lined lid. 100 grams sample volume required	≤6°C	14 days from collection to extraction; 40 days from extraction to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Chlorinated Herbicides (USEPA Methods 3510C/8000C/8151A)[7]	Aqueous	2-one liter amber glass container with Teflon® lined screw caps	≤6°C	7 days from collection to extraction; 40 days from extraction to analysis.	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Chlorinated Herbicides (USEPA Methods 3510C/8000C/8151A)[7]	Soil	4 oz. wide mouth glass container with Teflon® lined lid. 100 grams sample volume required	≤6°C	14 days from collection to extraction; 40 days from extraction to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Nonhalogenated Organics (USEPA Method 8015B/8015C)[6]	Aqueous	3- 40-milliliter glass vials with Teflon® lined septum caps	≤6°C HCL to pH≤2 FC Sealed and Headspace Free	Analysis within 14 days from collection for preserved samples.Analysis within 7 days from collection for samples not acid preserved.	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 10 samples or one per sampling event
Nonhalogenated Organics (USEPA Method 8015B/8015C)[6]	Solid	250 milliliter wide mouth glass container with Teflon® lined lid. 100 grams sample volume required.	≤6°C	14 days from collection to extraction; 40 days from extraction to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 10 samples or one per sampling event
PFAS (USEPA Method 537.1)[8]	Aqueous	Pre-cleaned 250 ml. HDPE container. 250 ml. sample volume required	≤6°C Hands must be washed and nitrile gloves are used. Samples do not need to be headspace-free.	14 days from collection to extraction; 28 days from extraction to analysis.	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
PFAS (USEPA Method 537.1)[8]	Solids	Pre-cleaned 2-4.5 ounce plastic cup. 10 gram sample volume required	≤6°C	28 days from collection to extraction; 28 days from extraction to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per

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Table 1. Field Sampling Summary									
						QC Sampling Frequency			
Parameter and Method	Matrix	Sample Containers and Volumes	Preservation	Holding Times	Number of Samples*	Field Duplicate	Trip Blank	MS/MSD or Spike Duplicate	Field Rinsate Blank
									sampling event
PFAS (USEPA Method 1633)[8b]	Aqueous	2 x Pre-cleaned 500 ml. HDPE container and 1 x 125 ml HDPE container (for TSS). Must be QEC brand bottles. 500 ml. sample volume required	≤6°C Hands must be washed and nitrile gloves are used. Samples do not need to be headspace-free.	28 days from collection to extraction; 28 days from extraction to analysis. Sample can be frozen for 90 day holding time.	TBD	One for every 20 samples collected	1 x 500 ml plastic w/ DI water	One for every 20 samples collected 6 x 500 ml plastic (QEC) unpreserved + 500 ml plastic (QEC) with DI water	One per 20 samples or one per sampling event. 2x 500 ml plastic (QEC) unpreserved + 2x 500 ml plastic (QEC) with DI water
PFAS (USEPA Method 1633)[8b]	Solids	Pre-cleaned 80 ml plastic (QEC brand) cup. 10 gram sample volume required	≤6°C	90 days from collection to extraction; 28 days from extraction to analysis	TBD	One for every 20 samples collected	1 x 500 ml plastic w/ DI water	One for every 20 samples collected. 1x 250 ml plastic (QEC)	One per 20 samples or one per sampling event. 1x 250 ml plastic (QEC) unpreserved + 1x 250 ml plastic (QEC) with DI water
Metals (USEPA Methods 3005A/6010C/6010D/ 6020A/6020B)[9]	Aqueous	1-1000 milliliter polyethylene or fluorocarbon (TFE or PFA) container. 500 milliliters sample volume required.	HNO3 to pH<2 ≤6°C	180 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Metals (USEPA Methods 3050B/6010C/6010D/ 6020A/6020B)[9]	Solid	2 ounce wide mouth polyethylene or fluorocarbon (TFE or PFA) container. 50 grams sample volume required.	≤6°C	180 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Metals – TCLP/SPLP (USEPA Methods 3005A/6010C/1311/ 1312/6020A/6020B)[9]	Solid	200 grams sample volume required	≤6°C	SPLP - 180 days from collection to extract generation, 180 days from extraction to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event

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Table 1. Field Sampling Summary

Parameter and Method	Matrix	Sample Containers and Volumes	Preservation	Holding Times	Number of Samples*	QC Sampling Frequency: Field Duplicate	Trip Blank	MS/MSD or Spike Duplicate	Field Rinsate Blank
Mercury (USEPA Method 7470A)[10]	Aqueous	1-1000 milliliter polyethylene or fluorocarbon (TFE or PFA) container. 500 milliliters sample volume required.	≤6°C HNO3 to pH<2	28 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Mercury (USEPA Method 7471B)[6]	Solid	2 ounce wide mouth polyethylene or fluorocarbon (TFE or PFA) container. 50 grams sample volume required.	≤6°C	28 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Total Hardness (SM20 2340C)[11]	Aqueous	1-250 milliliter polyethylene or fluorocarbon (TFE or PFA) container. 100 milliliters sample volume required.	<6°C HNO3 to pH<2	180 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 10 samples or one per sampling event
Total Cyanide (USEPA Method 9012B)[7]	Aqueous	1-500 milliliter polyethylene or fluorocarbon (TFE or PFA) container. 250 milliliters sample volume required.	≤6°C NaOH to pH≥12 OA	14 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Total Cyanide (USEPA Method 9012B)[7]	Solid	2 ounce wide mouth glass container with Teflon® lined lid. 50 grams sample volume required.	≤6°C	14 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Hexavalent Chromium (USEPA Method 7196A/7199)[12, 7]	Aqueous	1-1000 milliliter plastic bottle. 500 milliliters sample volume required.	≤6°C Adjust pH to 9-9.5 using buffer solution	Analyze within 24 hours from collection.	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Hexavalent chromium (USEPA Method 3060A/7196A)[12]	Solid	2 ounce wide mouth glass container with Teflon® lined lid. 50 grams sample volume required.	≤6°C	30 days from collection to analysis Analysis performed within 24 hours of extraction.	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Nitrate (USEPA Method 353.2)[13] By calculation/subtraction:	Aqueous	NA	NA	NA	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event

Table 1. Field Sampling Summary

						QC Sampling Frequency			
Parameter and Method	Matrix	Sample Containers and Volumes	Preservation	Holding Times	Number of Samples*	Field Duplicate	Trip Blank	MS/MSD or Spike Duplicate	Field Rinsate Blank
Total Nitrate/Nitrite by 353.2/ (NO2 by SM20 4500NO2B)									
Nitrate (USEPA Method 353.2)[13] By calculation/subtraction: Total Nitrate/Nitrite by 353.2/ (NO2 by SM20 4500NO2B)	Solid	NA	NA	NA	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Nitrate/Nitrite (USEPA Method 353.2)[13]	Aqueous	2 -50 milliliter polyethylene or fluorocarbon (TFE or PFA) container. 50 milliliters sample volume required.	≤6°C H_2SO4 to pH<2	28 days from collection to analysis if preserved	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Nitrate/Nitrite (USEPA Method 353.2)[13]	Solid	4 ounce wide mouth glass container with Teflon® lined lid. 50 grams sample volume required.	≤6°C	28 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Nitrite (SM20 4500 NO2B)[11]	Aqueous	2- 125 milliliter plastic/glass container. 5 milliliters sample volume required.	≤6°C	48 hours from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Nitrite (SM20 4500 NO2B)[11]	Solid	4 ounce wide mouth glass container with Teflon® lined lid. 50 grams sample volume required.	≤6°C	48 hours from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Chloride, Sulfate, Bromide, Fluoride (USEPA Method 300.0)[14]	Aqueous	1-500 milliliter plastic bottle. 100 milliliters sample volume required.	≤6°C	28 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Chloride, Sulfate, Bromide, Fluoride (USEPA Method 300.0)[14]	Solid	250 milliliter wide mouth glass container with Teflon® lined lid. 100 grams sample volume required	<6°C	28 days from collection for analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event

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Table 1. Field Sampling Summary

Parameter and Method	Matrix	Sample Containers and Volumes	Preservation	Holding Times	Number of Samples*	QC Sampling Frequency: Field Duplicate	Trip Blank	MS/MSD or Spike Duplicate	Field Rinsate Blank
Sulfide (SM20 4500 S2)[11]	Aqueous	1-1000 milliliter plastic bottle. 500 milliliters sample volume required.	<6°C 4 drops 2N zinc acetate/100 mL, NaOH to pH >9	7 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Sulfide (SM20 4500 S2)[11]	Solid	4 ounce wide mouth glass container with Teflon® lined lid. 50 grams sample volume required.	<6°C	7 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 10 samples or one per sampling event
Total Phosphorus (USEPA Method 365.3)[14]	Aqueous	One-250 milliliter polyethylene bottle 100 milliliters sample volume required	≤6°C H_2SO_4 to pH<2	28 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 10 samples or one per sampling event
Total Phosphorus (USEPA Method 365.3)[14]	Solid	250 milliliter wide mouth glass container with Teflon® lined lid. 100 grams sample volume required.	≤6°C	28 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 10 samples or one per sampling event
Total and Ortho Phosphate (SM20 4500-PE)[11]	Aqueous	1-500 milliliter plastic bottle. 100 milliliters sample volume required.	≤6°C H_2SO_4 to pH<2	28 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Total and Ortho Phosphate (SM20 4500-PE)[11]	Solid	250 milliliter wide mouth glass container with Teflon® lined lid. 100 grams sample volume required.	≤6°C	28 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 10 samples or one per sampling event
Total Dissolved Solids (TDS) (SM 2540-C)[11]	Aqueous	1-1000 milliliter plastic bottle. 500 milliliters sample volume required.	≤6°C	7 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 10 samples or one per sampling event
Total Suspended Solids (TSS) (SM20 2540D)[11]	Aqueous	1-1000 milliliter plastic bottle. 500 milliliters sample volume required.	≤6°C	7 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 10 samples or one per sampling event
Ammonia (SM20 4500 NH3-B/C)[11]	Aqueous	1-1000 milliliter plastic bottle. 500 milliliters sample volume required.	≤6°C H_2SO_4 to pH<2	28 days from collection for analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per

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Table 1. Field Sampling Summary

Parameter and Method	Matrix	Sample Containers and Volumes	Preservation	Holding Times	Number of Samples*	QC Sampling Frequency: Field Duplicate	Trip Blank	MS/MSD or Spike Duplicate	Field Rinsate Blank
									sampling event
Ammonia (SM20 4500 NH3-B/C)[11]	Solid	4-ounce wide mouth glass container with Teflon® lined lid. 100 grams sample volume required.	≤6°C	28 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 10 samples or one per sampling event
Alkalinity (Total, Bicarbonate, Carbonate) (SM20 2320B)[11]	Aqueous	1-1000 milliliter polyethylene or fluorocarbon (TFE or PFA) container. 200 milliliters sample volume required.	≤6°C	14 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Total Organic Carbon (TOC) (SM20 5310C/USEPA Method 9060A)8[11, 15]	Aqueous	1-1000 milliliter glass amber bottle. 500 milliliters sample volume required.	≤6°C H2SO4 to pH<2	28 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Total Organic Carbon (TOC)(Lloyd Kahn)[16]	Solid	4 ounce wide mouth glass container with Teflon® lined lid. 50 grams sample volume required.	≤6°C	14 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Total Inorganic Carbon (SM20 5310B)[11]	Aqueous	1-250-milliliter amber container. 100 milliliters sample volume required	≤6°CH 2SO4 to pH<2	28 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 10 samples or one per sampling event
Total Inorganic Carbon (SM20 5310B)[11]	Solid	1-250 milliliter wide mouth glass container with Teflon® lined lid. 100 grams sample volume required.	≤6°C	28 days from collection for analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 10 samples or one per sampling event
Biochemical Oxygen Demand (BOD) (SM20 5210B)[11]	Aqueous	1-1000 milliliter plastic bottle. 1000 milliliters sample volume required.	≤6°C	48 hours from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 10 samples or one per sampling event
Chemical Oxygen Demand (COD) (USEPA Method SM 5220 C)[11]	Aqueous	1-250-milliliter plastic container. 100 milliliters sample volume required	≤6°C H_2SO4 to pH<2	28 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 10 samples or one per sampling event

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Table 1. Field Sampling Summary									
						QC Sampling Frequency			
Parameter and Method	Matrix	Sample Containers and Volumes	Preservation	Holding Times	Number of Samples*	Field Duplicate	Trip Blank	MS/MSD or Spike Duplicate	Field Rinsate Blank
Total Kjeldahl Nitrogen (TKN) (USEPA Method 351.2)[14]	Aqueous	1-500 milliliter plastic bottle. 100 milliliters sample volume required.	≤6°C H_2SO4 to pH<2	28 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 10 samples or one per sampling event
Total Kjeldahl Nitrogen (TKN) (USEPA Method 351.2)[14]	Solid	250 milliliter wide mouth glass container with Teflon® lined lid. 100 grams sample volume required	≤6°C	28 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 10 samples or one per sampling event
Corrosivity (USEPA Method 9045D)[15]	Solid	8-ounce wide mouth glass container with Teflon® lined lid. 50 grams sample volume required	≤6°C	28 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Ignitability (USEPA 40 CFR Part 261.21)[17]	Solid	8-ounce wide mouth glass container with Teflon® lined lid. 50 grams sample volume required	≤6°C	28 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Flashpoint (USEPA Method 1010A)[15]	Solid	8-ounce wide mouth glass container with Teflon® lined lid. 50 grams sample volume required	≤6°C	28 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Reactive Cyanide (USEPA Chapter 7-9012B)[7]	Solid	300 milliliter wide mouth glass container with Teflon® lined lid. 100 grams sample volume required	≤6°C	14 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Reactive Sulfide (USEPA Chapter 7-9034)[7]	Solid	300 milliliter wide mouth glass container with Teflon® lined lid. 100 grams sample volume required	≤6°C	28 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Oil & Grease (USEPA Method 1664A)[18]	Solid	60 milliliter pre-cleaned wide mouth glass container with Teflon® lined lid. 100 grams sample volume required	≤6°C Preserve to pH < 2 with HCL. Alert laboratory to	48 hours from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event

Table 1. Field Sampling Summary

Parameter and Method	Matrix	Sample Containers and Volumes	Preservation	Holding Times	Number of Samples*	QC Sampling Frequency: Field Duplicate	Trip Blank	MS/MSD or Spike Duplicate	Field Rinsate Blank
			acidify prior to analysis.						
Acidity (SM20 2310B) [11]	Aqueous	One 500-milliliter polyethylene bottle. 200 milliliters sample volume required.	4°C	14 days from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Surfactants (Methylene Blue Active Substances (MBAS) (SM20 5540C) [11]	Aqueous	One 500-milliliter polyethylene bottle. 250 milliliters sample volume required.	4°C	48 hours from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Color (SM20 2120B) [11]	Aqueous	One 250-milliliter polyethylene bottle. 100 milliliters sample volume required.	4°C	48 hours from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Total Volatile Solids (TVS) (USEPA Method 160.4) [14]	Aqueous	One 1000-milliliter polyethylene bottle. 500 milliliters sample volume required.	4°C	48 hours from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Total Phenols (USEPA Method 9056) [19]	Aqueous	1-1000 milliliter amber glass container with Teflon® lined screw caps. 500 milliliters sample volume required.	≤6°C H_2SO_4 to pH<2	28 days from collection for analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
Total Residual Chlorine (SM20 4500-CL) [11]	Aqueous	1-1000 milliliter amber glass container with Teflon® lined screw caps. 500 milliliters sample volume required.	≤6°C H_2SO_4 to pH<2	48 hours from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
pH (USEPA Method SM4500 H+ B)[11]	Aqueous	1-100 milliliter plastic bottle. 50 milliliters sample volume required.	≤6°C	48 hours from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
pH (USEPA Method 9045D)[15]	Solid	4 ounce wide mouth glass container with Teflon® lined lid. 50 grams sample volume required.	≤6°C	48 hours from collection to analysis	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
SPLP Preparation (USEPA Method 1312)[10]	Solid	250 milliliter wide mouth glass container with Teflon® lined lid.	NA	NA	NA	NA	NA	NA	NA

Table 1. Field Sampling Summary

Parameter and Method	Matrix	Sample Containers and Volumes	Preservation	Holding Times	Number of Samples*	QC Sampling Frequency: Field Duplicate	Trip Blank	MS/MSD or Spike Duplicate	Field Rinsate Blank
		100 grams sample volume required							
TCLP Preparation (USEPA Method 1311)[12]	Solid	300 milliliter wide mouth glass container with Teflon® lined lid. 100 grams sample volume required	NA	NA	NA	NA	NA	NA	NA
Percent Solids (SM20 2540G)[11]	Solid	100 milliliter wide mouth glass container with Teflon® lined lid. 100 grams sample volume required	≤6°C	NA	NA	NA	NA	NA	NA
Temperature, specific conductance, dissolved oxygen (DO), oxidation-reduction potential (ORP), turbidity, pH	Aqueous	Field collection and analysis	NA	NA	NA	NA	NA	NA	NA

NOTES:
MS/MSD indicates matrix spike/matrix spike duplicate sample.
VOC indicates volatile organic compound.
SVOC indicates semivolatile organic compound.
SIM indicates selected ion monitoring.
PCBs indicates polychlorinated biphenyls.
PAHs indicates polynuclear aromatic hydrocarbons.
PFAS indicates Per- and polyfluoroalkyl substances.
TCLP indicates Toxicity Characteristic Leaching Procedure.
SPLP indicates Synthetic Precipitation Leaching Procedure.
RC indicates that if residual chlorine is present in samples, add sodium thiosulfate (VOCs) or sodium sulfite (SVOCs) to the sample container before filling.
* Indicates sample numbers will be determined during project implementation.
Method references:

1. USEPA. 2006. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition. Washington D.C.
2. USEPA. 1999. Compendium Method TO-15: Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS). EPA/625/R-96/010b. Cincinnati, Ohio.
3. Kampbell, D.H., Vandegrift, S.A., 1998. Analysis of Dissolved Methane, Ethane, and Ethylene in Ground Water by a Standard Gas Chromatographic Technique, Journal of Chromatographic Science, Volume 36.
4. USEPA. 1995. National Exposure Research Laboratory Office of Research and Development, Cincinnati, Ohio.
5. USEPA. 2018. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update VI. Washington D.C.
6. USEPA. 2007. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update IV. Washington D.C.
7. USEPA. 1996. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update III. Washington D.C.
8. USEPA. 2019. Method 537.1. Determination of Selected Per- and Polyfluorinated Alkyl Substances in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS), USEPA, Office of Research and Development, National center for Environmental Assessment, Washington, DC.

8b. USEPA. 2021. Draft Method 1633. Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS, USEPA, Office of Science and Technology Engineering and Analysis Division, Washington, DC.

9. USEPA. 2014. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update V. Washington D.C.
10. USEPA. 1994. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update II. Washington D.C.
11. AWWA, APHA and WEF. 1998. Standard Methods for the Examination of Water and Wastewater, 20th Edition. Washington, D.C.
12. USEPA. 1992. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update I. Washington D.C.

Table 1. Field Sampling Summary

Parameter and Method	Matrix	Sample Containers and Volumes	Preservation	Holding Times	Number of Samples*	QC Sampling Frequency: Field Duplicate	Trip Blank	MS/MSD or Spike Duplicate	Field Rinsate Blank

13. USEPA. 1993. Method 353.2. Determination of Nitrate-Nitrite Nitrogen by Automated Colorimetry. Revision 2.0. Washington, D.C.
14. USEPA. 1993. Methods for the Determination of Inorganic Substances in Environmental Samples, EPA-600/R-93/100. Washington, D.C.
15. USEPA. 2004. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update IIIB. Washington D.C.
16. USEPA. 1988. Determination of Total Organic Carbon in Sediment, Region II, Environmental Services Division, Monitoring Management Branch, Edison, New Jersey.
17. USEPA. 2001. 40 CFR Part 136, Appendix A. Washington, D.C.
18. USEPA. 2009. Method 1664, Revision A: N-Hexane Extractable Material (HEM; Oil and Grease) and Silica Gel Treated N-Hexane Extractable Material (SGT-HEM; Non-polar Material) By Extraction and Gravimetry. Washington, D.C.
19. USEPA. 1986. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition. Washington D.C.

Table 2-1A. Laboratory limits and regulatory limits for VOCs in aqueous and solid samples											
Target Analytes	CAS Number	USEPA Method* (8260, 624, 524.2, 8021, 502.2, 601, 602, 9020B)	Laboratory QL Aqueous (µg/L)	Laboratory MDL Aqueous (µg/L)	Laboratory QL Low Level Solid (µg/Kg)	Laboratory MDL - Low Level Solid (µg/Kg)	Laboratory QL Medium Level Solid (µg/Kg)	Laboratory MDL Medium Level Solid (µg/Kg)	Class GA Groundwater (µg/L)	Part 375 Unrestricted SCOs (µg/Kg)	Part 375 Protection Of Groundwater (µg/Kg)
VOCs - TCL											
1,1,1-Trichloroethane	71-55-6	TBD							5	680	680
1,1,2,2-Tetrachloroethane	79-34-5	TBD							5	NC	600
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	TBD							5	NC	6,000
1,1,2-Trichloroethane	79-00-5	TBD							1	NC	NC
1,1-Dichloroethane	75-34-3	TBD							5	270	270
1,1-Dichloroethene	75-35-4	TBD							5	330	330
1,2,3-Trichlorobenzene	87-61-6	TBD							5	NC	NC
1,2,4-Trichlorobenzene	120-82-1	TBD							5	NC	3,400
1,2,4-Trimethylbenzene	95-63-6	TBD							5	3600	3,600
1,2-Dibromo-3-chloropropane	96-12-8	TBD							0.04	NC	NC
1,2-Dibromoethane	106-93-4	TBD							0.0006	NC	NC
1,2-Dichlorobenzene	95-50-1	TBD							3	1100	1,100
1,2-Dichloroethane	107-06-2	TBD							0.6	20	20
1,2-Dichloropropane	78-87-5	TBD							1	NC	NC
1,3-Dichlorobenzene	541-73-1	TBD							3	2400	2,400
1,3-Dichloropropane	142-28-9	TBD							5	NC	300
1,3,5-Trimethylbenzene	108-67-8	TBD							5	8400	8,400
1,4-Dichlorobenzene	106-46-7	TBD							3	1800	1,800
2-Butanone (Methylethyl ketone)	78-93-3	TBD							50**	120	120
2-Hexanone	591-78-6	TBD							50**	NC	NC
4-Methyl-2-pentanone (methyl isobutyl ketone MIBK)	108-10-1	TBD							NC	NC	1,000
Acetone	67-64-1	TBD							50**	50	50
Benzene	71-43-2	TBD							1	60	60
Bromochloromethane	74-97-5	TBD							5	NC	NC
Bromodichloromethane	75-27-4	TBD							50**	NC	NC
Bromoform	75-25-2	TBD							50**	NC	NC
Bromomethane	74-83-9	TBD							5	NC	NC
n-butyl acetate	123-86-4	TBD							NC	NC	NC
Carbon disulfide	75-15-0	TBD							60**	NC	2,700
Carbon tetrachloride	56-23-5	TBD							5	760	760
Chlorobenzene	108-90-7	TBD							5	1100	1,100
Chloroethane	75-00-3	TBD							5	NC	1,900
Chloroform	67-66-3	TBD							7	370	370
Chloromethane	74873	TBD							5	NC	NC
cis-1,2-Dichloroethene	156-59-2	TBD							5	250	250
cis-1,3-Dichloropropene	10061-01-5	TBD							0.4	NC	NC
Cyclohexane	110-82-7	TBD							NC	NC	NC
Dibromochloromethane	124-48-1	TBD							50**	NC	NC
Dichlorodifluoromethane	75-71-8	TBD							5	NC	NC
Ethylbenzene	100-41-4	TBD							5	1000	1,000
Hexachlorobenzene	118-74-1	TBD							0.04	330	NC
Isopropyl Alcohol	67-63-0	TBD							NC	NC	NC
Isopropylbenzene	98-82-8	TBD							5	NC	2,300
Methyl acetate	79-20-9	TBD							NC	NC	NC
Methyl tert-butyl ether	1634-04-4	TBD							10**	930	930
Methylcyclohexane	108-87-2	TBD							NC	NC	NC
Methylene chloride	75-09-2	TBD							5	50	50
n-Butyl benzene	104-51-8	TBD							5	12000	12,000
n-Propylbenzene	103-65-1	TBD							5	3900	NC
p-Isopropyl toluene	99-87-6	TBD							5	NC	10,000
Pyridine	110-86-1	TBD							NC	NC	NC
sec-Butylbenzene	135-98-8	TBD							5	11000	11,000
Styrene	100-42-5	TBD							5	NC	NC
tert-Butylbenzene	98-06-6	TBD							5	5900	5,900
Tetrachloroethene	127-18-4	TBD							5	1300	1,300
Toluene	108-88-3	TBD							5	700	700
trans-1,2-Dichloroethene	156-60-5	TBD							5	190	190
trans-1,3-Dichloropropene	10061-02-6	TBD							0.4	NC	NC
Trichloroethene	79-01-6	TBD							5	470	470
Trichlorofluoromethane	75-69-4	TBD							5	NC	NC
Vinyl chloride	75-01-4	TBD							2	20	20
m,p-Xylene	17601-23-1	TBD							5***	NC	NC
o-Xylene	95-47-6	TBD							5***	NC	NC
Xylenes (total)	1330-20-7	TBD							5	260	1,600
VOCs- Other Target Analytes											
2-Chloroethyl vinyl ether	110-75-8	TBD							NC	NC	NC
Acrolein	107-02-8	TBD							5	NC	NC
Acrylonitrile	107-13-1	TBD							0.07	NC	NC
Benzyl Chloride	100-44-7	TBD							NC	NC	NC
1,1-Dichloropropene	563-58-6	TBD							5	NC	NC
1,2,3-Trichloropropane	96-18-4	TBD							0.04	NC	NC

Table 2-1A. Laboratory limits and regulatory limits for VOCs in aqueous and solid samples											
Target Analytes	**CAS Number**	**USEPA Method* (8260, 624, 524.2, 8021, 502.2, 601, 602, 9020B)**	**Laboratory QL Aqueous (µg/L)**	**Laboratory MDL Aqueous (µg/L)**	**Laboratory QL Low Level Solid (µg/Kg)**	**Laboratory MDL - Low Level Solid (µg/Kg)**	**Laboratory QL Medium Level Solid (µg/Kg)**	**Laboratory MDL Medium Level Solid (µg/Kg)**	**Class GA Groundwater (µg/L)**	**Part 375 Unrestricted SCOs (µg/Kg)**	**Part 375 Protection Of Groundwater (µg/Kg)**
1,2,4-Trimethylbenzene	95-63-6	TBD							5	NC	NC
1,2,4-Trichlorobenzene	120-82-1	TBD							5	NC	NC
1,3,5-Trimethylbenzene	108-67-8	TBD							5	NC	NC
1,3,5-Trichlorobenzene	108-70-3	TBD							5	NC	NC
1,1,1,2-Tetrachloroethane	79-34-5	TBD							5	NC	NC
1,3-Dichloropropane	142-28-9	TBD							5	NC	NC
2,2-Dichloropropane	590-20-7	TBD							NC	NC	NC
2-Chlorotoluene	95-49-8	TBD							5	NC	NC
4-Chlorotoluene	106-43-4	TBD							5	NC	NC
4-Isopropyl benzene	99-87-6	TBD							5	NC	NC
Bromobenzene	108-86-1	TBD							5	NC	NC
Dibromomethane	74-95-3	TBD							5	NC	NC
Ethyl Ether	60-29-7	TBD							NC	NC	NC
Ethyl Methacrylate	97-63-2	TBD							NC	NC	NC
Hexachloroethane	67-72-1	TBD							5	NC	NC
Hexachlorobutadiene	87-68-3	TBD							0.5	NC	NC
Hexachlorocyclopentadiene	77-47-4	TBD							5	NC	NC
Methacrylonitrile	126-98-7	TBD							5	NC	NC
Methyl Acrylate	96-33-3	TBD							3	NC	NC
Methyl Iodide	74-88-4	TBD							5	NC	NC
Methyl Metacrylate	80-62-6	TBD							50	NC	NC
Naphthalene	91-20-3	TBD							10	NC	NC
Pentachloroethane	76-01-7	TBD							5	NC	NC
Pentachlorobenzene	608-93-5	TBD							5	NC	NC
Propionitrile	107-12-0	TBD							NC	NC	NC
Tetrahydrofuran	109-99-9	TBD							50	NC	NC
trans-1,4-Dichloro-2-butene	110-57-6	TBD							5	NC	NC

Notes:

TBD - To Be Determined based on Work Assignment

QL indicates quantitation limit.

MDL indicate method detection limit.

QLs and MDLs will be provided by the laboratory selected.

ug/L indicates micrograms per Liter.

ug/Kg indicates micrograms per kilogram.

* Indicates the method will be determined based on the specific task requirement.

** Indicates guidance value not standard.

*** 5 ug/L is the criteria for total Xylenes

Target compound list (TCL) reference:

USEPA. 2016. SOM02.4- Statement of Work For Organic Superfurd Methods, Multi-Media, Multi-Concentration. Washington D.C.

Regulatory criteria and notes:

For groundwater and surface water -6 CRR-NY Part 703 Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations

For drinking water - 10 CRR-NY Part 5-1.51 Public Water Systems; Maximum Contaminant Levels; Monitoring Requirements; Notifications Required.

For sediment- Screening and Assessment of Contaminated Sediment, NYSDEC Division of Fish and Wildlife and Marine Resources; June 24, 2014

For soil - 6 CRR-NY Part 375-6 Remedial Program Soil Clean Up Objectives.

NC- No Criteria provided for these constituents in the specified regulation or guidance document.

Table 2-1B Laboratory limits and regulatory limits for VOCs in air samples

				Indoor and Ambient Air	Indoor and Ambient Air	Soil Vapor and Subslab Soil	Soil Vapor and Subslab Soil	NYSDOH Matrix Indoor Air	NYSDOH Matrix Sub-slab Air
				Laboratory QL Air	Laboratory QL Air	Laboratory QL Air	Laboratory QL Air		
Target Analytes	USEPA Method	CAS #	Molecular Weight	ppbv	ug/m3	ppbv	ug/m3	ug/m3	ug/m3
Acetone	TO-15	67-64-1	58.08					NA	NA
Benzene	TO-15	71-43-2	78.11					NA	NA
Bromodichloromethane	TO-15	75-27-4	163.83					NA	NA
Bromoethene	TO-15	593-60-2	106.90					NA	NA
Bromoform	TO-15	75-25-2	252.75					NA	NA
Bromomethane	TO-15	74-83-9	94.94					NA	NA
1,3-Butadiene	TO-15	106-99-0	54.09					NA	NA
2-Butanone (methyl ethyl ketone) (MEK)	TO-15	78-93-3	72.11					NA	NA
Chlorobenzene	TO-15	108-90-7	112.55					NA	NA
Chloroethane	TO-15	75-00-3	64.52					NA	NA
Chloroform	TO-15	67-66-3	119.38					NA	NA
Chloromethane	TO-15	74-87-3	50.49					NA	NA
3-Chloropropene	TO-15	107-05-1	76.53					NA	NA
2-Chlorotoluene (o-chlorotoluene)	TO-15	95-49-8	126.60					NA	NA
Carbon disulfide	TO-15	75-15-0	76.14					NA	NA
Carbon tetrachloride	TO-15	56-23-5	153.81					0.25	5
Cyclohexane	TO-15	110-82-7	84.16					NA	NA
Dibromochloromethane	TO-15	124-48-1	208.29					NA	NA
1,2-Dibromoethane (ethylene dibromide)	TO-15	106-93-4	187.90					NA	NA
1,2-Dichlorobenzene (ortho)	TO-15	95-50-1	147.00					NA	NA
1,3-Dichlorobenzene (meta)	TO-15	541-73-1	147.00					NA	NA
1,4-Dichlorobenzene (para)	TO-15	106-46-7	147.00					NA	NA
Dichlorodifluoromethane (Freon 12)	TO-15	75-71-8	120.92					NA	NA
1,1-Dichloroethane	TO-15	75-34-3	98.96					NA	NA
1,2-Dichloroethane	TO-15	107-06-2	98.96					NA	NA
1,1-Dichloroethene	TO-15	75-35-4	96.94					3	100
1,2-Dichloroethene (cis)	TO-15	156-59-2	96.94					3	100
1,2-Dichloroethene (trans)	TO-15	156-60-5	96.94					NA	NA
1,2-Dichloroethene (total)*	TO-15	---	---					NA	NA
1,2-Dichloropropane	TO-15	78-87-5	112.99					NA	NA
1,3-Dichloropropene (cis)	TO-15	10061-01-5	110.97					NA	NA
1,3-Dichloropropene (trans)	TO-15	10061-02-6	110.97					NA	NA
1,3-Dichloropropene (total)*	TO-15	---	---					NA	NA
1,2-Dichlorotetrafluoroethane (Freon 114)	TO-15	76-14-2	170.93					NA	NA
Ethylbenzene	TO-15	100-41-4	106.17					NA	NA
4-Ethyltoluene (p-Ethyltoluene)	TO-15	622-96-8	120.19					NA	NA
n-heptane	TO-15	142-82-5	100.20					NA	NA
Hexachlorobutadiene	TO-15	87-68-3	260.80					NA	NA
n-Hexane (hexane)	TO-15	110-54-3	86.17					NA	NA

Table 2-1B Laboratory limits and regulatory limits for VOCs in air samples									
				Indoor and Ambient Air	Indoor and Ambient Air	Soil Vapor and Subslab Soil	Soil Vapor and Subslab Soil	NYSDOH Matrix Indoor Air	NYSDOH Matrix Sub-slab Air
				Laboratory QL Air	Laboratory QL Air	Laboratory QL Air	Laboratory QL Air		
Target Analytes	USEPA Method	CAS #	Molecular Weight	ppbv	ug/m3	ppbv	ug/m3	ug/m3	ug/m3
Methylene Chloride	TO-15	75-09-2	84.93					NA	NA
4-Methyl-2-pentanone (MIBK)	TO-15	108-10-1	100.16					NA	NA
MTBE (methyl tert butyl ether)	TO-15	1634-04-4	88.15					NA	NA
Styrene	TO-15	100-42-5	104.15					NA	NA
Tertiary butyl alcohol (TBA)	TO-15	75-65-0	74.12					NA	NA
1,1,2,2-Tetrachloroethane	TO-15	79-34-5	167.85					NA	NA
Tetrachloroethene	TO-15	127-18-4	165.83					3	100
Toluene	TO-15	108-88-3	92.14					NA	NA
1,2,4-Trichlorobenzene	TO-15	120-82-1	181.50					NA	NA
1,1,1-Trichloroethane	TO-15	71-55-6	133.41					3	100
1,1,2-Trichloroethane	TO-15	79-00-5	133.41					NA	NA
Trichlorofluoromethane (Freon 11)	TO-15	75-69-4	137.40					NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	TO-15	76-13-1	187.40					NA	NA
Trichloroethene	TO-15	79-01-6	131.39					0.25	5
1,2,4-Trimethylbenzene	TO-15	95-63-6	120.19					NA	NA
1,3,5-Trimethylbenzene	TO-15	108-67-8	120.19					NA	NA
2,2,4-Trimethylpentane	TO-15	540-84-1	132.38					NA	NA
Vinyl chloride	TO-15	75-01-4	62.50					0.25	5
Xylenes (m&p)	TO-15	1330-20-7	106.17					NA	NA
Xylenes (o)	TO-15	95-47-6	106.17					NA	NA
Xylenes (total)	TO-15	---	---					NA	NA
1,4-Dioxane	TO-15	123-91-1	88.11					NA	NA
Isopropyl Alcohol	TO-15	67-63-0	60.10					NA	NA
Methyl Butyl Ketone	TO-15	591-78-6	100.20					NA	NA
Methyl methacrylate	TO-15	80-62-6	100.12					NA	NA
Naphthalene	TO-15	91-20-3	126.18					NA	NA
Tetrahydrofuran	TO-15	109-99-9	72.10					NA	NA

Notes:

QL indicates quantitation limit.

$\mu g/m^3$ indicates microgram per cubic meter.

ppbv indicates parts per billion by volume.

The laboratory will report the results to the QL level only.

QLs will be provided by the laboratory selected.

Target list source - Custom Project Target list

Method reference:

USEPA. 1999. *Compendium Method TO-15: Determination of Volatile Organic Compounds(VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS).* Cincinnati, Ohio.

Regulatory criteria and notes:

Guidance for Evaluation of Soil Vapor Intrusion in the State of New York; New York State Department of Health (NYSDOH); October 2006 (as updated) and updated matrices dated May 2017.

NA- action limits are not available in the reference guidance.

Table 2-1C. Laboratory limits and regulatory limits for dissolved gases in aqueous samples				
Target Analytes	CAS Number	USEPA Method	Laboratory QL Aqueous (µg/L)	Laboratory MDL Aqueous (µg/L)
Dissolved Hydrocarbon Gas				
Methane	74-82-8	RSK-175		
Ethane	74-84-0	RSK-175		
Ethene	74-85-1	RSK-175		
Propane	74-98-6	RSK-175		

Notes:

QL indicates quantitation limit.

MDL indicates method detection limit.

QLs and MDLs will be provided by the laboratory selected.

ug/L indicates micrograms per Liter.

Method Reference:

Kampbell, D.H., Vandegrift, S.A., 1998. Analysis of Dissolved Methane, Ethane, and Ethylene in Ground Water by a Standard Gas Chromatographic Technique, Journal of Chromatographic Science, Volume 36.

Regulatory criteria and notes:

No regulatory action limits are available.

Table 2-2. Laboratory limits and regulatory limits for SVOCs in aqueous and solid samples

Target Analytes	CAS Number	USEPA Method* (8270, 625, 604, 8041, 610)	Laboratory QL Aqueous (µg/L)	Laboratory MDL Aqueous (µg/L)	Laboratory QL Solid (µg/Kg)	Laboratory MDL - Solid (µg/Kg)	Regulatory Criteria (ug/L)	Class GA Groundwater (µg/L)	Part 375 Unrestricted SCOs (µg/Kg)	Part 375 Commercial SCOs (µg/Kg)	Part 375 Industrial SCOs (µg/Kg)	Groundwater Protection SCOs (µg/Kg)
SVOC's- TCL												
1,4-Dioxane	123-91-1	8270**SIM**						1	100	130,000	250,000	100
1,1´-Biphenyl	92-52-4	TBD						5	NC	NC	NC	NC
1,1-Biphenyl	95-52-4	TBD						NC	NC	NC	NC	NC
2,4,5-Trichlorophenol	95-95-4	TBD						1**	NC	NC	NC	NC
2,4,6-Trichlorophenol	88-06-2	TBD						1**	NC	NC	NC	NC
2,3,4,6-Tetrachlorophenol	58-90-2	TBD						NC	NC	NC	NC	NC
2,4-Dichlorophenol	120-83-2	TBD						1**	NC	NC	NC	NC
2,4-Dimethylphenol	105-67-9	TBD						1**	NC	NC	NC	NC
2,4-Dinitrophenol	51-28-5	TBD						1**	NC	NC	NC	NC
2,4-Dinitrotoluene	121-14-2	TBD						5	NC	NC	NC	NC
2,6-Dinitrotoluene	606-20-2	TBD						5	NC	NC	NC	NC
2-Chloronaphthalene	91-58-7	TBD						10***	NC	NC	NC	NC
2-Chlorophenol	95-57-8	TBD						1**	NC	NC	NC	NC
2-Methylnaphthalene	91-57-6	TBD						NC	NC	NC	NC	NC
2-Methylphenol	95-48-7	TBD						1**	330	500,000	1,000,000	330
2-Nitroaniline	88-74-4	TBD						5	NC	NC	NC	NC
2-Nitrophenol	88-75-5	TBD						1**	NC	NC	NC	NC
3,3´-Dichlorobenzidine	91-94-1	TBD						5	NC	NC	NC	NC
3 -Methylphenol	108-39-4	TBD						1**	330	500,000	1,000,000	330
3-Nitroaniline	99-09-2	TBD						5	NC	NC	NC	NC
4,6-Dinitro-2-methylphenol	534-52-1	TBD						1**	NC	NC	NC	NC
4-Bromophenyl phenyl ether	101-55-3	TBD						NC	NC	NC	NC	NC
4-Chloro-3-methylphenol	59-50-7	TBD						1**	NC	NC	NC	NC
4-Chloroaniline	106-47-8	TBD						5	NC	NC	NC	NC
4-Chlorophenyl phenyl ether	7005-72-3	TBD						NC	NC	NC	NC	NC
4-Methyl phenol	106-44-5	TBD						NC	330	500,000	1,000,000	330
4-Nitroaniline	100-01-6	TBD						5	NC	NC	NC	NC
4-Nitrophenol	100-02-7	TBD						1**	NC	NC	NC	100
4-Nitrophenol	100-02-7	TBD						NC	NC	NC	NC	NC
Acetophenone	98-86-2	TBD						NC	NC	NC	NC	NC
Acenaphthene	83-32-9	TBD						20***	20,000	500,000	1,000,000	98,000
Acenaphthylene	208-96-8	TBD						NC	100,000	500,000	1,000,000	107,000
Aniline	62-53-3	TBD						5	NC	NC	NC	NC
Anthracene	120-12-7	TBD						50***	100,000	500,000	1,000,000	1,000,000
Atrazine	1912-24-9	TBD						7.5	NC	NC	NC	NC
Benzo[a]anthracene	56-55-3	TBD						0.002***	1,000	5,600	11,000	1,000
Benzo[a]pyrene	50-32-8	TBD						ND	1,000	1,000	1,100	22,000
Benzo[b]fluoranthene	205-99-2	TBD						0.002*	1,000	5,600	11,000	1,700
Benzo[g,h,i]perylene	191-24-2	TBD						NC	100,000	500,000	1,000,000	1,000,000
Benzo[k]fluoranthene	207-08-9	TBD						0.002***	800	56,000	110,000	17,000
bis(2-Chloroethoxy)methane	111-91-1	TBD						5	NC	NC	NC	NC
bis(2-chloroethyl)ether	111-44-4	TBD						1	NC	NC	NC	NC
bis(2-chloroisopropyl)ether	108-60-1	TBD						5	NC	NC	NC	NC
bis(2-Ethylhexyl)phthalate	117-81-7	TBD						5	NC	NC	NC	NC
Butyl benzyl phthalate	85-86-7	TBD						50***	NC	NC	NC	NC
Carbazole	86-74-8	TBD						NC	NC	NC	NC	NC
Caprolactam	105-60-2	TBD						NC	NC	NC	NC	NC
Chrysene	218-01-9	TBD						0.002***	1,000	56,000	110,000	1,000
Dibenz[a,h]anthracene	53-70-3	TBD						NC	330	560	1,100	1,000,000
Dibenzofuran	132-64-9	TBD						NC	7,000	350,000	1,000,000	6,200
Diethyl phthalate	84-66-2	TBD						50***	NC	NC	NC	NC

Table 2-2. Laboratory limits and regulatory limits for SVOCs in aqueous and solid samples

Target Analytes	CAS Number	USEPA Method* (8270, 625, 604, 8041, 610)	Laboratory QL Aqueous (µg/L)	Laboratory MDL Aqueous (µg/L)	Laboratory QL Solid (µg/Kg)	Laboratory MDL - Solid (µg/Kg)	Regulatory Criteria (ug/L)	Class GA Groundwater (µg/L)	Part 375 Unrestricted SCOs (µg/Kg)	Part 375 Commercial SCOs (µg/Kg)	Part 375 Industrial SCOs (µg/Kg)	Groundwater Protection SCOs (µg/Kg)
SVOC's- TCL												
Dimethyl phthalate	131-11-3	TBD						50***	NC	NC	NC	NC
Di-n-butyl phthalate	84-74-2	TBD						50	NC	NC	NC	NC
Di-n-octyl phthalate	117-84-0	TBD						50***	NC	NC	NC	NC
Fluoranthene	206-44-0	TBD						50***	100,000	500,000	1,000,000	1,000,000
Fluorene	86-73-7	TBD						50***	30,000	500,000	1,000,000	386,000
Hexachlorobenzene	118-74-1	TBD						0.04	330	6,000	12,000	1,400
Hexachlorobutadiene	87-68-3	TBD						0.5	NC	NC	NC	NC
Hexachlorocyclopentadiene	77-47-4	TBD						5	NC	NC	NC	NC
Hexachloroethane	67-72-1	TBD						5	NC	NC	NC	NC
Indeno[1,2,3-cd]pyrene	193-39-5	TBD						0.002***	500	5,600	11,000	8,200
Isophorone	78-59-1	TBD						50***	NC	NC	NC	NC
Naphthalene	91-20-3	TBD						10***	12,000	500,000	1,000,000	12,000
Nitrobenzene	98-95-3	TBD						0.4	NC	NC	NC	NC
N-Nitroso-di-n-propylamine	621-64-7	TBD						NC	NC	NC	NC	NC
N-Nitrosodiphenylamine	86-30-6	TBD						50***	NC	NC	NC	NC
Pentachlorophenol	87-86-5	TBD						1**	800	6,700	55,000	800
Phenanthrene	85-01-8	TBD						50	100,000	500,000	1,000,000	1,000,000
Phenol	108-95-2	TBD						1**	330	500,000	1,000,000	330
Pyrene	129-00-0	TBD						50***	100,000	500,000	1,000,000	1,000,000
SVOCs, Phenols- Other Target Analytes												
1,2,4-Trichlorobenzene	120-82-1	TBD						5	NC	NC	NC	NC
1,2-Diphenylhydrazine	122-66-7	TBD						0.05	NC	NC	NC	NC
Benzidine	92-87-5	TBD						5	NC	NC	NC	NC
bis (2-Chloroisopropyl) ether	108-60-1	TBD						5	NC	NC	NC	NC
n-Nitrosodimethylamine	62-75-9	TBD						NC	NC	NC	NC	NC
2,6-Dichlorophenol	87-65-0	TBD						NC	NC	NC	NC	NC
Dinoseb	88-85-7	TBD						1**	NC	NC	NC	NC

Notes:

TBD - To be Determined based on Work Assignment tasks

QL indicates quantitation limit.

MDL indicate method detection limit.

QLs and MDLs will be provided by the laboratory selected.

ug/L indicates micrograms per Liter.

ug/Kg indicates micrograms per kilogram.

* Indicates the method will be determined based on the specific task requirement.

** Included in Phenolic Compounds which is sum of substances.

*** Indicates Guidance Criteria not standard.

Target compound list (TCL) Reference:

United States Environmental Protection Agency (USEPA). 2016. SOMo2.4- Statement of Work For Organic Superfurd Methods, Multi-Media, Multi-Concentration. Washington D.C.

Regulatory criteria and notes:

For groundwater and surface water -6 CRR-NY Part 703 Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations

For soil samples - 6 CRR-NY Part 375-6 Remedial Program Soil Clean Up Objectives.

NC- No criteria provided for these constituents in the specified regulation or guidance document.

Table 2-3. Laboratory limits and regulatory limits for PCBs, Pesticides and Herbicides in aqueous and solid samples

Target Analytes	CAS Number	USEPA Method*	USEPA Method Reference	Laboratory QL Aqueous (µg/L)	Laboratory MDL Aqueous (µg/L)	Laboratory QL Solid (µg/Kg)	Laboratory Solid MDL (µg/Kg)	Class GA Groundwater (µg/L)	Part 375 Unrestricted SCOs (µg/Kg)	Part 365 Groundwater Protection SCOs (µg/Kg)
PCBs - TCL										
Aroclor 1016	12674-11-2	8082A/608	1/3					0.09**	100**	3200**
Aroclor 1221	11104-28-2	8082A/608	1/3					0.09**	100**	3200**
Aroclor 1232	11141-16-5	8082A/608	1/3					0.09**	100**	3200**
Aroclor 1242	53469-21-9	8082A/608	1/3					0.09**	100**	3200**
Aroclor 1248	12672-29-6	8082A/608	1/3					0.09**	100**	3200**
Aroclor 1254	11097-69-1	8082A/608	1/3					0.09**	100**	3200**
Aroclor 1260	11096-82-5	8082A/608	1/3					0.09**	100**	3200**
Aroclor 1262	37324-23-5	8082A/608	1/3					0.09**	100**	3200**
Aroclor 1268	11100-14-4	8082A/608	1/3					0.09**	100**	3200**
Organochloride Pesticides - TCL										
4,4'-DDE	72-55-9	8081B/608	1/3					0.2	3.3	17,000
4,4'-DDT	50-29-3	8081B/608	1/3					0.2	3.3	136,000
4.4'-DDD	72-54-8	8081B/608	1/3					0.3	3.3	14,000
Aldrin	309-00-2	8081B/608	1/3					ND	5	190
Alpha BHC	319-84-6	8081B/608	1/3					0.01	20	20
Beta BHC	319-85-7	8081B/608	1/3					0.04	36	90
Alpha Chlordane	5103-71-9	8081B/608	1/3					0.05	94	2,900
Gamma Chlordane	5103-74-2	8081B/608	1/3					0.05	NC	NC
Delta BHC	319-86-8	8081B/608	1/3					0.04	40	250
Dieldrin	60-57-1	8081B/608	1/3					0.004	5	100
Endosulfan I	959-98-8	8081B/608	1/3					NC	2,400	102,000
Endosulfan II	33213-65-9	8081B/608	1/3					NC	2,400	102,000
Endosulfan Sulfate	1031-07-8	8081B/608	1/3					NC	2,400	1,000,000
Endrin	72-20-8	8081B/608	1/3					ND	14	60
Endrin Aldehyde	7421-93-4	8081B/608	1/3					5	NC	NC
Endrin Ketone	53494-70-5	8081B/608	1/3					5	NC	NC
Gamma BHC (Lindane)	58-89-9	8081B/608	1/3					0.05	100	100
Heptachlor	76-44-8	8081B/608	1/3					0.04	42	380
Heptachlor Epoxide	1024-57-3	8081B/608	1/3					0.03	NC	20
Methoxychlor	72-43-5	8081B/608	1/3					35	NC	NC
Parathion	56-38-2	8081B/608	1/3					1.5***	NC	NC
Toxaphene	8001-35-2	8081B/608	1/3					0.06	NC	NC
Herbicides										
2,4,5-T	93-76-5	8151A	2					35	NC	NC
2,4,5-TP Acid (Silvex)	93-72-1	8151A	2					0.26	3,800	3,800
2,4-D	94-75-7	8151A	2					50	NC	NC
2,4-DB	94-82-6	8151A	2					NC	NC	NC
Dalapon	75-99-0	8151A	2					50	NC	NC
Dicamba	1918-00-9	8151A	2					0.44	NC	NC
Dichloroprop	120-36-5	8151A	2					NC	NC	NC
Dinoseb	88-85-7	8151A	2					1	NC	NC
MCPA	94-74-6	8151A	2					0.44	NC	NC
MCPP	93-65-2	8151A	2					NC	NC	NC
4-Nitrophenol	100-02-1	8151A	2					1	NC	NC

Notes:

QL indicates quantitation limit.
MDL indicate method detection limit.
QLs and MDLs will be provided by the laboratory selected.
ug/L indicates micrograms per Liter.
ug/Kg indicates micrograms per kilogram.

* Indicates the method will be determined based on the specific task requirement.
** the criterion represents the sum of the Aroclors
*** Refers to the sum of Parathion and methyl parathion.
**** Refers to the sum of Phorate and Disulfoton

Method References:

1- USEPA. 2007. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update IV. Washington D.C.

2 - USEPA. 1996. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update III. Washington D.C.

3- USEPA. 2001. 40 CFR Part 136, Appendix A. Washington, D.C.

Target compound list (TCL) Reference:

1. United States Environmental Protection Agency (USEPA). 2016. SOMO2.4- Statement of Work For Organic Superfurd Methods, Multi-Media, Multi-Concentration. Washington D.C.

Regulatory criteria and notes:

For groundwater and surface water -6 CRR-NY Part 703 Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations
For soil - 6 CRR-NY Part 375-6 Remedial Program Soil Clean Up Objectives.
NC- No criteria provided for these constituents in the specified regulation or guidance document.

Table 2-4A. Laboratory limits and regulatory limits for PFAS in aqueous and solid samples (USEPA Method 537.1 [modified])

Target Analytes	CAS Number	USEPA Method	Laboratory QL Aqueous (ng/L)	Laboratory MDL Aqueous[1] (ng/L)	Laboratory QL Solid (µg/Kg)	Laboratory MDL Solid (µg/Kg)	Groundwater Screening Level[1] (ng/L)	Interim SCOs[1] Unrestricted (µg/Kg)	Residential (µg/Kg)	Restricted Residential (µg/Kg)	Commercial (µg/Kg)	Industrial (µg/Kg)	Protection of Groundwter (µg/Kg)
Per- and polyfluoroalkyl substances (PFAS)													
Perfluoroalkyl sulfonates													
Perfluorobutanesulfonic acid (PFBS)	375-73-5	USEPA Method 537.1											
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	USEPA Method 537.1											
Perfluoroheptanesulfonic acid (PFHpS)	375-92-8	USEPA Method 537.1											
Perfluorooctanessulfonic acid (PFOS)	1763-23-1	USEPA Method 537.1	2		0.5		10	0.88	8.8	44	440	440	3.7
Perfluorodecanesulfonic acid (PFDS)	335-77-3	USEPA Method 537.1											
Perfluoroalkyl carboxylates													
Perfluorobutanoic acid (PFBA)	375-22-4	USEPA Method 537.1											
Perfluoropentanoic acid (PFPeA)	2706-90-3	USEPA Method 537.1											
Perfluorohexanoic acid (PFHxA)	307-24-4	USEPA Method 537.1											
Perfluoroheptanoic acid (PFHpA)	375-85-9	USEPA Method 537.1											
Perfluorooctanoic acid (PFOA)	335-67-1	USEPA Method 537.1	2		0.5		10	0.66	6.6	33	500	600	1.1
Perfluorononanoic acid (PFNA)	375-95-1	USEPA Method 537.1											
Perfluorodecanoic acid (PFDA)	335-76-2	USEPA Method 537.1											
Perfluoroundecanoic acid (PFUdA)	2058-94-8	USEPA Method 537.1											
Perfluorododecanoic acid (PFDoA)	307-55-1	USEPA Method 537.1											
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	USEPA Method 537.1											
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	USEPA Method 537.1											
Fluorinated Telomer Sulfonates													
6:2 Fluorotelomer sulfonate (6:2 FTS)	27619-97-2	USEPA Method 537.1											
8:2 Fluorotelomer sulfonate (8:2 FTS)	39108-34-4	USEPA Method 537.1											
Perfluorooctane- sulfonamides													
Perfluroroctanesulfonamide (FOSA)	754-91-6	USEPA Method 537.1											
Perfluorooctane- sulfonamidoacetic acids													
N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	2355-31-9	USEPA Method 537.1											
N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	2991-50-6	USEPA Method 537.1											

Notes:

QL indicates quantitation limit.

MDL indicate method detection limit.

QLs and MDLs will be provided by the laboratory selected.

ng/L indicates nanograms per Liter.

ng/Kg indicates nanograms per kilogram.

Method Reference:

USEPA. 2018. Method 537.1. Determination of Selected Per- and Polyfluorinated Alkyl Substances in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS), USEPA, Office of Research and Development, National Center for Environmental Assessment, Washington, DC.

Regulatory criteria and notes:

1 - Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) under NYSDEC's Part 375 Remedial Programs dated November 2022.

For aqueous samples, QL for PFOA and PFOS must be 2 ng/L or less. QLs for other PFAS should be as close to 2 ng/L as possible per NYSDEC document Guidelines for Sampling and Analysis of PFAS under NYSDEC's Part 375 Remedial Programs dated November 2022.

For solid samples, QL for PFOA and PFOS must be 0.5 µg/kg or less per NYSDEC document Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) under NYSDEC's Part 375 Remedial Programs dated November 2022.

Table 2-4B. Laboratory limits and regulatory limits for PFAS in aqueous and solid samples (USEPA Method 1633)

Target Analytes	CAS Number	USEPA Method	Laboratory QL Aqueous (ng/L)	Laboratory MDL Aqueous[1] (ng/L)	Laboratory QL Solid (µg/Kg)	Laboratory MDL Solid (µg/Kg)	Groundwater Screening Level[1] (ng/L)	Interim SCOs[1] Unrestricted (µg/Kg)	Residential (µg/Kg)	Restricted Residential (µg/Kg)	Commercial (µg/Kg)	Industrial (µg/Kg)	Protection of Groundwter (µg/Kg)
Per- and polyfluoroalkyl substances (PFAS)													
Perfluoroalkyl sulfonic acids													
Perfluorobutanesulfonic acid (PFBS)	375-73-5	USEPA Method 1633											
Perfluoropentanesulfonic acid (PFPeS)	2706-91-4	USEPA Method 1633											
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	USEPA Method 1633											
Perfluoroheptanesulfonic acid (PFHpS)	375-92-8	USEPA Method 1633											
Perfluorooctanessulfonic acid (PFOS)	1763-23-1	USEPA Method 1633	2		0.5		10	0.88	8.8	44	440	440	3.7
Perfluorononanesulfonic acid (PFNS)	68259-12-1	USEPA Method 1633											
Perfluorodecanesulfonic acid (PFDS)	335-77-3	USEPA Method 1633											
Perfluorododecanesulfonic acid (PFDoS)	79780-39-5	USEPA Method 1633											
Perfluoroalkyl carboxylic acids													
Perfluorobutanoic acid (PFBA)	375-22-4	USEPA Method 1633											
Perfluoropentanoic acid (PFPeA)	2706-90-3	USEPA Method 1633											
Perfluorohexanoic acid (PFHxA)	307-24-4	USEPA Method 1633											
Perfluoroheptanoic acid (PFHpA)	375-85-9	USEPA Method 1633											
Perfluorooctanoic acid (PFOA)	335-67-1	USEPA Method 1633	2		0.5		10	0.66	6.6	33	500	600	1.1
Perfluorononanoic acid (PFNA)	375-95-1	USEPA Method 1633											
Perfluorodecanoic acid (PFDA)	335-76-2	USEPA Method 1633											
Perfluoroundecanoic acid (PFUnA)	2058-94-8	USEPA Method 1633											
Perfluorododecanoic acid (PFDoA)	307-55-1	USEPA Method 1633											
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	USEPA Method 1633											
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	USEPA Method 1633											
Per- and Polyfluoroether carboxylic acids													
Hexafluoropropylene oxide dimer acid (HFPO-DA)	13252-13-6	USEPA Method 1633											
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	USEPA Method 1633											
Perfluoro-3-methoxypropanoic acid (PFMPA)	377-73-1	USEPA Method 1633											
Perfluoro-4-methoxybutanoic acid (PFMBA)	863090-89-5	USEPA Method 1633											
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	151772-58-6	USEPA Method 1633											
Fluorotelomer sulfonic acids													
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	USEPA Method 1633											
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	USEPA Method 1633											
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	USEPA Method 1633											
Fluorotelomer carboxylic acids													
3:3 Fluorotelomer carboxylic acid (3:3 FTCA)	356-02-05	USEPA Method 1633											
5:3 Fluorotelomer carboxylic acid (5:3 FTCA)	914637-49-3	USEPA Method 1633											
7:3 Fluorotelomer carboxylic acid (7:3 FTCA)	812-70-4	USEPA Method 1633											
Perfluorooctane- sulfonamides													
Perfluroroctane sulfonamide (PFOSA)	754-91-6	USEPA Method 1633											
N-methylperfluorooctane sulfonamide (NMeFOSA)	31506-32-8	USEPA Method 1633											
N-ethylperfluorooctane sulfonamide (NEtFOSA)	4151-50-2	USEPA Method 1633											
Perfluorooctane- sulfonamidoacetic acids													
N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	2355-31-9	USEPA Method 1633											
N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	2991-50-6	USEPA Method 1633											
Perfluorooctane- sulfonamide ethanols													
N-methylperfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	USEPA Method 1633											
N-ethylperfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	USEPA Method 1633											
Perfluorooctane- sulfonamide ethanols													
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F-53B Major) (9Cl-PF3ONS)	756426-58-1	USEPA Method 1633											
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor) (11Cl-PF3OUdS)	763051-92-9	USEPA Method 1633											
Perfluoro(2-ethoxyethane) sulfonic acid (PFEESA)	113507-82-7	USEPA Method 1633											

Notes:

QL indicates quantitation limit.

MDL indicate method detection limit.

QLs and MDLs will be provided by the laboratory selected.

ng/L indicates nanograms per Liter.

ng/Kg indicates nanograms per kilogram.

Method Reference:

USEPA. 2021. Draft Method 1633. Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS, USEPA, Office of Science and Technology Engineering and Analysis Division, Washington, DC.

Regulatory criteria and notes:

1 - Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) under NYSDEC's Part 375 Remedial Programs dated November 2022.

For aqueous samples, QL for PFOA and PFOS must be 2 ng/L or less. QLs for other PFAS should be as close to 2 ng/L as possible per NYSDEC document Guidelines for Sampling and Analysis of PFAS under NYSDEC's Part 375 Remedial Programs dated November 2022.

For solid samples, QL for PFOA and PFOS must be 0.5 µg/kg or less per NYSDEC document Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) under NYSDEC's Part 375 Remedial Programs dated November 2022.

Table 2-5. Laboratory limits and regulatory limits for metals in aqueous and solid samples

Target Analytes	CAS Number	Method* (Reference)	Laboratory QL Aqueous µg/L	Laboratory MDL - Aqueous µg/L	Laboratory QL Solid mg/Kg	Laboratory MDL - Solid mg/Kg	Class GA Groundwater µg/L	Part 375 Unrestricted Use SCOs mg/Kg	Part 375 Protection of Groundwater SCOs mg/Kg
Metals- TAL									
Aluminum	7429-90-5	6010C/6010D/6020A/6020B (1)					NC	NC	NC
Antimony	7440-36-0	6010C/6010D/6020A/6020B (1)					3	NC	NC
Arsenic	7440-38-2	6010C/6010D/6020A/6020B (1)					25	13	16
Barium	7440-39-3	6010C/6010D/6020A/6020B (1)					1,000	350	820
Beryllium	7440-41-7	6010C/6010D/6020A/6020B (1)					3**	7.2	47
Cadmium	7440-43-9	6010C/6010D/6020A/6020B (1)					5	2.5	7.5
Calcium	7440-70-2	6010C/6010D/6020A/6020B (1)					NA	NA	NA
Total Chromium	7440-47-3	6010C/6010D/6020A/6020B (1)					50	1/30[h]	19/NC[h]
Cobalt	7440-48-4	6010C/6010D/6020A/6020B (1)					NA	NA	NA
Copper	7440-50-8	6010C/6010D/6020A/6020B (1)					200	50	1,720
Iron	7439-89-6	6010C/6010D/6020A/6020B (1)					300	NA	NA
Lead	7439-92-1	6010C/6010D/6020A/6020B (1)					25	63	450
Magnesium	7439-95-4	6010C/6010D/6020A/6020B (1)					35,000**	NA	NA
Manganese	7439-96-5	6010C/6010D/6020A/6020B (1)					300	1,600	2,000
Mercury	7439-97-6	7470A/7471B (2, 3)					0.7	0.18	0.73
Nickel	7440-02-0	6010C/6010D/6020A/6020B (1)					100	30	130
Potassium	7440-09-7	6010C/6010D/6020A/6020B (1)					NA	NA	NA
Selenium	7782-49-2	6010C/6010D/6020A/6020B (1)					10	3.9	4.0
Silver	7440-22-4	6010C/6010D/6020A/6020B (1)					50	2	8.3
Sodium	7440-23-5	6010C/6010D/6020A/6020B (1)					20,000	NA	NA
Thallium	7440-28-0	6010C/6010D/6020A/6020B (1)					0.5**	NA	NA
Vanadium	7440-62-2	6010C/6010D/6020A/6020B (1)					NA	NA	NA
Zinc	7440-66-6	6010C/6010D/6020A/6020B (1)					2,000**	109	2,480
Total Cyanide	57-12-5	9012 (5)					200	27	40

Notes:

MDLs indicate method detection limits.

QLs indicates quantitation limits.

mg/kg indicates milligrams per kilogram.

ug/L indicates micrograms per Liter.

QLs and MDLs will be provided by laboratory selected.

* Indicates the method will be determined based on the specific task requirement.

** Indicates guidance value not standard.

[h] - No Total Chromium Criterion available. Values are hexavlent/trivalent.

Target analyte list (TAL) reference:

USEPA. 2016. ISM02.4- Statement of Work For Inorganic Superfurd Methods, Multi-Media, Multi-Concentration. Washington D.C.

Method references:

1- USEPA. 2014. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update V. Washington D.C.

2- USEPA. 1994. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update II. Washington D.C.

3- USEPA. 2007. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update IV. Washington D.C.

4- AWWA, APHA and WEF. 1998. Standard Methods for the Examination of Water and Wastewater, 20th Edition. Washington, D.C.

5- USEPA. 1996. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update III. Washington D.C.

Regulatory criteria and notes:

For groundwater and surface water -6 CRR-NY Part 703 Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations

For soil samples - 6 CRR-NY Part 375-6 Remedial Program Soil Clean Up Objectives.

NC- No Criterion provided for constituent in the specified regulation or guidance document.

Table 2-6. Laboratory limits and regulatory limits for inorganics and other analyses in aqueous and solid samples

Target Analytes	CAS Number	Method (Reference)	Laboratory QL Aqueous µg/L	Laboratory MDL - Aqueous µg/L	Laboratory QL Solid mg/Kg	Laboratory MDL - Solid mg/Kg	Class GA Standards or Giidance Value (µg/L)	Part 375 Unrestricted SCOs (µg/Kg)	Part 375 Protection Of Groundwater (µg/Kg)
Inorganics and Other analyses									
Hexavalent Chromium	---	7196A/7199 (1, 2)					50	1	19
Nitrate	---	353.2/ (NO2 by SM20 4500NO2B) (3)					10,000*	NC	NC
Nitrate/Nitrite	---	USEPA Method 353.2 (3)					10,000*	NC	NC
Nitrite	---	SM20 4500 NO2B (4)					10,000*	NC	NC
Chloride	---	USEPA Method 300.0 (5)					250,000	NC	NC
Sulfate	---	USEPA Method 300.0 (5)					250,000	NC	NC
Bromide	---	USEPA Method 300.0 (5)					NC	NC	NC
Fluoride	---	USEPA Method 300.0 (5)					1,500	NC	NC
Sulfide	---	SM20 4500 S2 (4)					NC	NC	NC
Total Phosphorus	---	USEPA Method 365.3 (5)					NC	NC	NC
Total and Ortho Phosphate	---	SM20 4500-PE (4)					NC	NC	NC
TDS	---	SM20 2540-C (4)					NC	NC	NC
TSS	---	SM20 2540-D (4)					NC	NC	NC
Ammonia	---	SM20 4500 NH3-B/C (4)					2,000	NC	NC
Alkalinity	---	SM20 2320B (4)					NC	NC	NC
Total Hardness	---	SM20 2340C (4)					NC	NC	NC
Total Organic Carbon (TOC)	---	SM20 5310C/USEPA Method 9060A/Lloyd Kahn (4,6, 7)					NC	NC	NC
Total Inorganic Carbon	---	SM20 5310B (4)					NC	NC	NC
Biochemical Oxygen Demand (BOD)	---	SM20 5210B (4)					NC	NC	NC
Chemical Oxygen Demand (COD)	---	SM20 5220C (4)					NC	NC	NC
Total Kjeldahl Nitrogen (TKN)	---	USEPA Method 351.2 (5)					NC	NC	NC
Corrosivity	---	USEPA Method 9045D (6)					NC	NC	NC
Ignitability	---	USEPA 40 CFR Part 261.2 (8)					NC	NC	NC
Flashpoint	---	USEPA Method 1010A (6)					NC	NC	NC
Reactive Cyanide	---	USEPA Chapter 7- Method 9012B (2)					NC	NC	NC
Reactive Sulfide	---	USEPA Chapter 7- Method 9034 (2)					NC	NC	NC
Oil & Grease	---	USEPA Method 1664A (9)					NC	NC	NC
Acidity	---	SM20 2310B (4)					NC	NC	NC
Surfactants (Metylene Blue Active Substances (MBAS)	---	SM20 5540C (4)					NC	NC	NC
Color	---	SM20 2120B (4)					NC	NC	NC
Total Volatile Solids (TVS)	---	USEPA Method 160.4 (5)					NC	NC	NC
Total Phenols	---	USEPA Method 9065 (10)					1	NC	NC
Total Residual Chlorine	---	SM20 4500-CL (4)					NC	NC	NC
pH	---	SM20 4500 H+B/USEPA Method 9045D (4, 6)					6.5 to 8.5	NC	NC

Notes:

MDLs indicate method detection limits.

QLs indicates quantitation limits.

mg/kg indicates milligrams per kilogram.

ug/L indicates micrograms per Liter.

QLs and MDLs will be provided by laboratory selected.

Method references:

1- USEPA. 1992. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update I. Washington D.C.

2 - USEPA. 1996. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update III. Washington D.C.

3- USEPA. 1993. Method 353.2. Determination of Nitrate-Nitrite Nitrogen by Automated Colorimetry. Revision 2.0. Washington, D.C.

4- AWWA, APHA and WEF. 1998. Standard Methods for the Examination of Water and Wastewater, 20th Edition. Washington, D.C.

5- USEPA. 1993. Methods for the Determination of Inorganic Substances in Environmental Samples, EPA-600/R-93/100. Washington, D.C.

6- USEPA. 2004. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update IIIB. Washington D.C.

7- USEPA. 1988. Determination of Total Organic Carbon in Sediment, Region II, Environmental Services Division, Monitoring Management Branch, Edison, New Jersey.

8- USEPA. 2001. 40 CFR Part 136, Appendix A. Washington, D.C.

9- USEPA. 2009. Method 1664, Revision A: N-Hexane Extractable Material (HEM; Oil and Grease) and Silica Gel Treated N-Hexane Extractable Material (SGT-HEM; Non-polar Material) By Extraction and Gravimetry. Washington, D.C.

10- USEPA. 1986. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition. Washington D.C.

* - applies to the sum of nitrate and nitrite.

Regulatory criteria and notes:

For groundwater and surface water -6 CRR-NY Part 703 Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations

For soil samples - 6 CRR-NY Part 375-6 Remedial Program Soil Clean Up Objectives.

NC- No Criterion provided for these constituents in the specified regulation or guidance document.

EXHIBIT E-1 – SAMPLING, ANALYSIS, AND ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) UNDER NYSDEC'S PART 375 REMEDIAL PROGRAMS, NYSDEC, JUNE 2021

NEW YORK STATE OF OPPORTUNITY.

Department of Environmental Conservation

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

Under NYSDEC's Part 375 Remedial Programs

June 2021

www.dec.ny.gov

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June 2021

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
Routine Analysis, page 9	"However, laboratories analyzing environmental samples…PFOA and PFOS in drinking water by EPA Method 537, 537.1 or ISO 25101."	"However, laboratories analyzing environmental samples…PFOA and PFOS in drinking water by EPA Method 537, 537.1, ISO 25101, or Method 533."	9/15/2020
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
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

Citation and Page Number	Current Text	Corrected Text	Date
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
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

Citation and Page Number	Current Text	Corrected Text	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

Sampling, Analysis, and Assessment of Per- and 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

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.

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 F) 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

Currently, New York State Department of Health's Environmental Laboratory Approval Program (ELAP) does not offer certification for PFAS in matrices other than finished drinking water. However, laboratories analyzing environmental samples for PFAS (e.g., soil, sediments, and groundwater) under DER's Part 375 remedial programs need to hold ELAP certification for PFOA and PFOS in drinking water by EPA Method 537, 537.1, ISO 25101, or Method 533. Laboratories should adhere to the guidelines and 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). 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).

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. 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.

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]

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 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.

Water Sample Results

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.

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

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.

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]	1.1	3.7

[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 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).

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.

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 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.

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
    - 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
    - Analytical methods to be used per matrix with minimum reporting limits
    - Number and type of matrix spike and matrix spike duplicate samples to be collected
    - Number and type of duplicate samples to be collected
    - Sample preservation to be used per analytical method and sample matrix
    - Sample container volume and type to be used per analytical method and sample matrix
    - 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 LC-MS/MS for PFAS using methodologies based on EPA Method 537.1
- 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
    - Reporting Limits should be less than or equal to:
        - Aqueous – 2 ng/L (ppt)
        - Solids – 0.5 µg/kg (ppb)
- Include the laboratory Method Detection Limits for the PFAS compounds to be analyzed
- Laboratory should have ELAP certification for PFOA and PFOS in drinking water by EPA Method 537, 537.1, EPA Method 533, or ISO 25101
- Include detailed sampling procedures
    - 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

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 methodologies based on EPA Method 537.1.

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, Teflon™) 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 ± 2º 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 methodologies based on EPA Method 537.1.

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, Teflon™) 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 ± 2º 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 methodologies based on EPA Method 537.1.

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, Teflon™) 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 ± 2º 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). 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, Teflon™) 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 ± 2º 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.

Appendix F - Sampling Protocols for PFAS in Fish

This appendix contains a copy of the latest guidelines developed by the Division of Fish and Wildlife (DFW) entitled "General Fish Handling Procedures for Contaminant Analysis" (Ver. 8).

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 **and signed** 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 **and signed** 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 each **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 each 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. **<u>The Bureau of Ecosystem Health will supply the bags.</u>** 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.** Tie 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 ± 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

Project and Site Name ____ DEC Region ____________

Collections made by (include all crew) ____

Sampling Method: ☐Electrofishing ☐Gill netting ☐Trap netting ☐Trawling ☐Seining ☐Angling ☐Other ____________________

Preservation Method: ☐Freezing ☐Other ______________________ Notes (SWFDB survey number): ____________________

FOR LAB USE ONLY- LAB ENTRY NO.	COLLECTION OR TAG NO.	SPECIES	DATE TAKEN	LOCATION	AGE	SEX &/OR REPROD. CONDIT	LENGTH ( )	WEIGHT ( )	REMARKS

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, ______________________________, of ____ collected the
(Print Name) (Print Business Address)

following on ____________________, 20____ from ____
(Date) (Water Body)

in the vicinity of ____
(Landmark, Village, Road, etc.)

Town of ______________________________________, in ________________________________ County.

Item(s) ____

____

Said sample(s) were in my possession and handled according to standard procedures provided to me prior to collection. The sample(s) were placed in the custody of a representative of the New York State Department of Environmental Conservation on ___________________________________, 20______.

____ ___________________________
Signature Date

I, _________________________________, received the above mentioned sample(s) on the date specified and assigned identification number(s) ____ to the sample(s). I have recorded pertinent data for the sample(s) on the attached collection records. The sample(s) remained in my custody until subsequently transferred, prepared or shipped at times and on dates as attested to below.

______________________________________ ___________________
Signature Date

SECOND RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
THIRD RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
FOURTH RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
RECEIVED IN LABORATORY BY (Print Name)	TIME & DATE	REMARKS
SIGNATURE	UNIT	
LOGGED IN BY (Print Name)	TIME & DATE	ACCESSION NUMBERS
SIGNATURE	UNIT	

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
Perfluoroalkyl sulfonates	Perfluorobutanesulfonic acid	PFBS	375-73-5
	Perfluorohexanesulfonic acid	PFHxS	355-46-4
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanesulfonic acid	PFOS	1763-23-1
	Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluoroalkyl carboxylates	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	PFHpA	375-85-9
	Perfluorooctanoic acid	PFOA	335-67-1
	Perfluorononanoic acid	PFNA	375-95-1
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUA/PFUdA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTriA/PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTA/PFTeDA	376-06-7
Fluorinated Telomer Sulfonates	6:2 Fluorotelomer sulfonate	6:2 FTS	27619-97-2
	8:2 Fluorotelomer sulfonate	8:2 FTS	39108-34-4
Perfluorooctane-sulfonamides	Perfluroroctanesulfonamide	FOSA	754-91-6
Perfluorooctane-sulfonamidoacetic acids	N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethyl perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6

Appendix H - Laboratory Guidelines for Analysis of PFAS in Non-Potable Water and Solids

General

New York State Department of Environmental Conservation's Division of Environmental Remediation (DER) developed the following guidelines for laboratories analyzing environmental samples for PFAS under DER programs. If laboratories cannot adhere to the following guidelines, they should contact DER's Quality Assurance Officer, Dana Barbarossa, at dana.barbarossa@dec.ny.gov prior to analysis of samples.

Isotope Dilution

Isotope dilution techniques should be utilized for the analysis of PFAS in all media.

Extraction

For water samples, the entire sample bottle should be extracted, and the sample bottle rinsed with appropriate solvent to remove any residual PFAS.

For samples with high particulates, the samples should be handled in one of the following ways:

1. Spike the entire sample bottle with isotope dilution analytes (IDAs) prior to any sample manipulation. The sample can be passed through the SPE and if it clogs, record the volume that passed through.
2. If the sample contains too much sediment to attempt passing it through the SPE cartridge, the sample should be spiked with isotope dilution analytes, centrifuged and decanted.
3. If higher reporting limits are acceptable for the project, the sample can be diluted by taking a representative aliquot of the sample. If isotope dilution analytes will be diluted out of the sample, they can be added after the dilution. The sample should be homogenized prior to taking an aliquot.

If alternate sample extraction procedures are used, please contact the DER remedial program chemist prior to employing. Any deviations in sample preparation procedures should be clearly noted in the case narrative.

Signal to Noise Ratio

For all target analyte ions used for quantification, signal to noise ratio should be 3:1 or greater.

Blanks

There should be no detections in the method blanks above the reporting limits.

Ion Transitions

The ion transitions listed below should be used for the following PFAS:

PFOA	413 > 369
PFOS	499 > 80
PFHxS	399 > 80
PFBS	299 > 80
6:2 FTS	427 > 407
8:2 FTS	527 > 507
N-EtFOSAA	584 > 419
N-MeFOSAA	570 > 419

Branched and Linear Isomers

Standards containing both branched and linear isomers should be used when standards are commercially available. Currently, quantitative standards are available for PFHxS, PFOS, NMeFOSAA, and NEtFOSAA. As more standards become available, they should be incorporated in to the method. All isomer peaks present in the standard should be integrated and the areas summed. Samples should be integrated in the same manner as the standards.

Since a quantitative standard does not exist for branched isomers of PFOA, the instrument should be calibrated using just the linear isomer and a technical (qualitative) PFOA standard should be used to identify the retention time of the branched PFOA isomers in the sample. The total response of PFOA branched and linear isomers should be integrated in the samples and quantitated using the calibration curve of the linear standard.

Secondary Ion Transition Monitoring

Quantifier and qualifier ions should be monitored for all target analytes (PFBA and PFPeA are exceptions). The ratio of quantifier ion response to qualifier ion response should be calculated for each target analyte and the ratio compared to standards. Lab derived criteria should be used to determine if the ratios are acceptable.

Reporting

Detections below the reporting limit should be reported and qualified with a J qualifier.

The acid form of PFAS analytes should be reported. If the salt form of the PFAS was used as a stock standard, the measured mass should be corrected to report the acid form of the analyte.

Appendix I - 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 analytical results for projects within the Division of Environmental Remediation (DER) as well as aid in the preparation of a data usability summary report. 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 14 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 6ºC 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 five 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%. Linear fit calibration curves should have an R^2 value greater than 0.990.

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
R^2 >0.990	J flag detects and UJ non detects
Low-level calibration check <50% or >150%	J flag detects and UJ non detects
Mid-level calibration check <70% or >130%	J flag detects and UJ non detects

Initial Calibration Verification

An initial calibration verification (ICV) standard should be from a second source (if available). The ICV should be at the same concentration as the mid-level standard of the calibration curve.

ICV recovery <70% or >130%	J flag detects and 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

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	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 criteria can also be used)	Apply J qualifier to detects and UJ qualifier to 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

Secondary Ion Transition Monitoring

Quantifier and qualifier ions should be monitored for all target analytes (PFBA and PFPeA are exceptions). The ratio of quantifier ion response to qualifier ion response should be calculated from the standards for each target analyte. Lab derived criteria should be used to determine if the ratios are acceptable. If the ratios fall outside of the laboratory criteria, qualify results as an estimated maximum concentration.

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.

Branched and Linear Isomers

Observed branched isomers in the sample that do not have a qualitative or quantitative standard should be noted and the analyte should be qualified as biased low in the final data review summary report. Note: The branched isomer peak should also be present in the secondary ion transition.

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.

EXHIBIT E-2 – SAMPLING, ANALYSIS, AND ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) UNDER NYSDEC'S PART 375 REMEDIAL PROGRAMS, NYSDEC, NOVEMBER 2022

NEW YORK
STATE OF
OPPORTUNITY.

Department of
Environmental
Conservation

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

Under NYSDEC's Part 375 Remedial Programs

November 2022

www.dec.ny.gov

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NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

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
Routine Analysis, page 9	"However, laboratories analyzing environmental samples…PFOA and PFOS in drinking water by EPA Method 537, 537.1 or ISO 25101."	"However, laboratories analyzing environmental samples…PFOA and PFOS in drinking water by EPA Method 537, 537.1, ISO 25101, or Method 533."	9/15/2020
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
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

Citation and Page Number	Current Text	Corrected Text	Date
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
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

Citation and Page Number	Current Text	Corrected Text	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

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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 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 text ….EPA 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 Per- and 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]

[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 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.

Water Sample Results

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.

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

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:

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]	1.1	3.7

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

[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 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).

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 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.

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

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
    - 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
    - Analytical methods to be used per matrix with minimum reporting limits
    - Number and type of matrix spike and matrix spike duplicate samples to be collected
    - Number and type of duplicate samples to be collected
    - Sample preservation to be used per analytical method and sample matrix
    - Sample container volume and type to be used per analytical method and sample matrix
    - 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
    - Reporting Limits should be less than or equal to:
        - Aqueous – 2 ng/L (ppt)
        - Solids – 0.5 µg/kg (ppb)
- Include the laboratory Method Detection Limits for the PFAS compounds to be analyzed
-
- Include detailed sampling procedures
    - 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

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, Teflon™) 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 ± 2º 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, Teflon™) 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 ± 2º 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, Teflon™) 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 ± 2º 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). 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, Teflon™) 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 ± 2º 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.

Appendix F - Sampling Protocols for PFAS in Fish

This appendix contains a copy of the latest guidelines developed by the Division of Fish and Wildlife (DFW) entitled "General Fish Handling Procedures for Contaminant Analysis" (Ver. 8).

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 **and signed** 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 **and signed** 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 each **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 each 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. **<u>The Bureau of Ecosystem Health will supply the bags.</u>** 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.** Tie 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 ± 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

Project and Site Name ____________________ DEC Region ________

Collections made by (include all crew) ____________________

Sampling Method: ☐Electrofishing ☐Gill netting ☐Trap netting ☐Trawling ☐Seining ☐Angling ☐Other ____________

Preservation Method: ☐Freezing ☐Other ____________ Notes (SWFDB survey number): ____________

FOR LAB USE ONLY- LAB ENTRY NO.	COLLECTION OR TAG NO.	SPECIES	DATE TAKEN	LOCATION	AGE	SEX &/OR REPROD. CONDIT	LENGTH ( )	WEIGHT ( )	REMARKS

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, ______________________________, of ____ collected the
(Print Name) (Print Business Address)

following on ____________________, 20____ from ____
(Date) (Water Body)

in the vicinity of ____
(Landmark, Village, Road, etc.)

Town of ____, in _________________________________ County.

Item(s) ____

____

Said sample(s) were in my possession and handled according to standard procedures provided to me prior to collection. The sample(s) were placed in the custody of a representative of the New York State Department of Environmental Conservation on ____________________________________, 20______.

____ ___________________________
Signature Date

I, __________________________________, received the above mentioned sample(s) on the date specified and assigned identification number(s) ____ to the sample(s). I have recorded pertinent data for the sample(s) on the attached collection records. The sample(s) remained in my custody until subsequently transferred, prepared or shipped at times and on dates as attested to below.

______________________________________ ___________________
Signature Date

SECOND RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
THIRD RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
FOURTH RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
RECEIVED IN LABORATORY BY (Print Name)	TIME & DATE	REMARKS
SIGNATURE	UNIT	
LOGGED IN BY (Print Name)	TIME & DATE	ACCESSION NUMBERS
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
Perfluoroalkyl sulfonic acids	Perfluorobutanesulfonic acid	PFBS	375-73-5
	Perfluoropentanesulfonic acid	PFPeS	2706-91-4
	Perfluorohexanesulfonic acid	PFHxS	355-46-4
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanesulfonic acid	PFOS	1763-23-1
	Perfluorononanesulfonic acid	PFNS	68259-12-1
	Perfluorodecanesulfonic acid	PFDS	335-77-3
	Perfluorododecanesulfonic acid	PFDoS	79780-39-5
Perfluoroalkyl carboxylic acids	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	PFHpA	375-85-9
	Perfluorooctanoic acid	PFOA	335-67-1
	Perfluorononanoic acid	PFNA	375-95-1
	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
Per- and Polyfluoroether carboxylic acids	Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6
	4,8-Dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4
	Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1
	Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5
	Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6
Fluorotelomer sulfonic acids	4:2 Fluorotelomer sulfonic acid	4:2-FTS	757124-72-4
	6:2 Fluorotelomer sulfonic acid	6:2-FTS	27619-97-2
	8:2 Fluorotelomer sulfonic acid	8:2-FTS	39108-34-4
Fluorotelomer carboxylic acids	3:3 Fluorotelomer carboxylic acid	3:3 FTCA	356-02-5
	5:3 Fluorotelomer carboxylic acid	5:3 FTCA	914637-49-3
	7:3 Fluorotelomer carboxylic acid	7:3 FTCA	812-70-4
Perfluorooctane sulfonamides	Perfluorooctane sulfonamide	PFOSA	754-91-6
	N-methylperfluorooctane sulfonamide	NMeFOSA	31506-32-8
	N-ethylperfluorooctane sulfonamide	NEtFOSA	4151-50-2
Perfluorooctane sulfonamidoacetic acids	N-methylperfluorooctane sulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethylperfluorooctane sulfonamidoacetic acid	N-EtFOSAA	2991-50-6
Perfluorooctane sulfonamide ethanols	N-methylperfluorooctane sulfonamidoethanol	MeFOSE	24448-09-7
	N-ethylperfluorooctane sulfonamidoethanol	EtFOSE	1691-99-2

Group	Chemical Name	Abbreviation	CAS Number
Ether sulfonic acids	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F-53B Major)	9Cl-PF3ONS	756426-58-1
	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	11Cl-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 6ºC 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

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	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 criteria can also be used)	Apply J qualifier to detects and UJ qualifier to 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

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.

ATTACHMENT 4

INDOOR AIR QUALITY QUESTIONNAIRE, BUILDING INVENTORY FORM, AND VAPOR INTRUSION SAMPLING FORMS

RAMBOLL

Indoor Air Quality
Building Survey

Date: ______
Collector: ______
Affiliation: Ramboll

Access Contact: ______ Address: ______
Phone: ______
Best time to contact: ______ Tax ID: ______

Owner ☐ Renter ☐ Other ☐ Access Agreement Signed?: ______

Date built ______
Yrs. of residence ______
No. of occupants ______

Building type:
Residential ☐ School ☐ Industrial ☐
Commercial ☐ Church ☐ Other ______

Check all that apply:

Ranch ☐ Raised Ranch ☐ 2-Family ☐ Apartments ☐
Cape ☐ Colonial ☐ Duplex ☐ Condominium ☐
3-Family ☐ Mobile Home ☐ Other (specify) ______

Above grade building construction

Wood frame ☐ Poured concrete ☐ Stone ☐
Brick ☐ Concrete block ☐ Other ______

Foundation construction

Fieldstone ☐ Solid top concrete block ☐ Slab on grade ☐
Poured concrete ☐ Open top concrete block ☐ Other ______

Is the owner aware of any additions made to the original design of the structure? (please specify)

______

______

Utilities

Sewer:
Public ☐
Private ☐
Other ______

Water:
Public ☐
Private ☐
Other ______

Spring ☐
Well ☐

Hot water heater type:
Gas ☐ Electric ☐
Oil ☐ Other ______

Heating, ventilation, and air conditioning systems

Primary heat type:
Hot air ☐
Hot water ☐
Steam radiator ☐
Electric ☐
Other ______

Fuel type (heat):
Natural gas ☐
Fuel oil ☐
Electric ☐
Wood ☐
Other ______

Secondary heat type:
Kerosene ☐
Wood stove ☐
Electric ☐
Propane ☐
Other ______

Ventilation types:
Attic fan ☐
Kitchen hood ☐
Bathroom fan ☐
Other ______

Whole house fan ☐
Air filtration ☐
Induced fireplace ☐
Other ______

Air conditioning:
Window units ☐
Furnance unit ☐
Electric ☐
Other ______

RAMBOLL

Indoor Air Quality
Building Survey

Date: ____________________
Collector: ____________________
Affiliation: Ramboll

Basement type

None ☐ Half ☐ Vented crawlspace ☐ Other ____________
Full ☐ Slab on grade ☐ Unvented crawlspace ☐ ____________

If slab on grade, is there a garage with occupied space above? ____________________

Basement depth below grade (feet)

Front ________ Rear ________ Side 1 ________ Side 2 ________

Basement characteristics

General:
No. of rooms ☐
Bathroom ☐
Basement use ____________

Floor:
Earth ☐
Concrete ☐
Tile ☐
Carpet ☐
Other ____________

Walls:
Finished ☐
Unfinished ☐
Painted ☐
Sheetrock ☐
Other ____________

Paneling ☐
Tile ☐
Insulated ☐
Uninsulated ☐

Check if present:
Fireplace ☐
Sump pump ☐
Floor drains ☐
Interior walls ☐

Elevator ☐
Ash cleanout ☐
Water damage ☐
Jacuzzi/hot tub ☐

French drain ☐
Floor cracks ☐
Wall cracks ☐
Other ____________

Does the basement have a moisture problem? ____________________

Does the basement ever flood? (specify frequency) ____________________

Does the basement have a radon system installed? ____________________

Has there been recent purchases of furnishings (carpets, rugs, linoleum, tile, or funiture) or remodeling (new construction,roofing, or floor stripping? (please specify) ____________________

____

Chemical usage, exposure and storage

Identify occupant hobbies:
Painting ☐
Stained glass ☐
Jewelry making ☐

Electronics ☐
Woodworking ☐
Furniture refinishing ☐

Model making ☐
Auto repair ☐
Other ____________

Where in the structure are these hobbies conducted? ____________________

Does the occupants' job require chemical exposure? ____________________

If so, where are the occupants clothes cleaned? ____________________

Has the structure been fumigated in the last year? ____________________

If so, is fumigation regularly performed? (how often) ____________________

Are pesticides frequently applied to lawn or garden? ____________________

If so, are they stored on the property? ____________________

RAMBOLL

Indoor Air Quality
Building Survey

Date: __________
Collector: __________
Affiliation: Ramboll

Identify chemicals stored in the basement/1st floor living space, or garage if structure is slab on grade (include fuels, solvents, cleaners, etc.) Use separate inventory sheet for each area surveyed

Brand	Product	Amount stored	PID Reading

Comments

Is there any other information about the structural features of this building, the habits of its occupants or potential sources for chemical contaminents to the indoor air that may be of importance in facilitating the evaluation of the indoor air quality of the building?

Identify photographs taken as additional documentation of existing conditions.

Photo ID	Description of photo

Sketch lot and sample location layout (if applicable)

RAMBOLL

Vapor Intrusion Sampling Form

Project # ______________________ Date ______________________

Project Name ______________________ Collector ______________________

Structure Location

Sample Locations

PID/FID meter ID __________ Site Code __________

Sample Duration (Intended) __________ Op. Unit __________

Indoor Air Sample	Sub-Slab Sample	Circle Sample Type: Indoor Air SS-DUP Ambient IA-DUP
Sample ID	Sample ID	Sample ID
Canister ID	Canister ID	Canister ID
Flow Controller ID	Flow Controller ID	Flow Controller ID
Date/Time start	Date/Time start	Date/Time start
Date/Time end	Date/Time end	Date/Time end
Gauge prior to start	Gauge prior to start	Gauge prior to start
Start Pressure	Start Pressure	Start Pressure
End Pressure	End Pressure	End Pressure
Complete all that apply:	Complete all that apply:	Complete all that apply:
Air temperature (^oF)	Air temperature (^oF)	Air temperature (^oF)
PID/FID reading	PID/FID reading	PID/FID reading
in. tubing used	in. tubing used	in. tubing used
Tubing purged?	Tubing purged?	Tubing purged?
For indoor location:	For indoor location:	For outdoor location:
Noticeable odor	Noticeable odor	Noticeable odor
Intake height above floor (in)	Floor slab depth	Distance to road (ft)
Floor surface type	Intake depth below floor (in)	Direction to closest building (degrees)
Room	Floor surface type	Distance to closest building (ft)
Story/level	Room	Intake height above ground level (in)
	Story/level	

Building Survey and Chemical Inventory Form Completed? __________ Elevated PID Readings? __________

Photographs Taken? __________

Comments: ____

Analytical method required ______________________

Laboratory used ______________________

Dates samples sent to lab ______________________

Ambient Air (Canister) Sample Collection Field Form

Project # ____________________ Consultant ____________________

Project Name ____________________ Collector ____________________

Sample ID ____________________

Vacuum gauge "zero" ("Hg) __________

Start Date/Time ____________________ Start Pressure ("Hg) __________

End Date/Time ____________________ End Pressure ("Hg) __________

Canister ID ____________________ End pressure > "zero"? __________

Flow controller ID ____________________ Sampling duration (intended) __________

Tubing type used __________ Length of tubing __________ cm Tubing volume __________ cc

Volume purged __________ cc @ __________ min 1 to 3 volumes purged @ < 200cc/min? __________

Weather Conditions at Start of Sampling:

Air temperature (^{o}F) __________ Rainfall __________ Wind direction __________

Barometric pressure __________ Relative humidity __________ Wind speed (mph) __________

Substantial changes in weather conditions during sampling or over the past 24 to 48 hrs:

Site Plan showing sample location, building(s) being sampled, building HVAC inlet, outdoor air sources, wind direction

Comments: ____________________

Sub-slab Vapor (Canister) Sample Collection Field Form

Project # ______________________ Consultant ______________________

Project Name ______________________ Collector ______________________

Sample ID ______________________

Vacuum gauge "zero" ("Hg) __________

Start Date/Time ______________________ Start Pressure ("Hg) __________

End Date/Time ______________________ End Pressure ("Hg) __________

Canister ID ______________________ End pressure > "zero"? __________

Flow controller ID ______________________ Sampling duration (intended) __________

Associated indoor air sample ID __________ Associated ambient air sample ID __________

Tubing type used __________ Length of tubing __________ cm Tubing volume __________ cc

Volume purged __________ cc @ __________ min 1 to 3 volumes purged @ < 200cc/min? __________

Weather Conditions at Start of Sampling:

Air temperature (^{o}F) __________ Rainfall __________ Wind direction __________

Barometric pressure __________ Wind speed (mph) __________

Substantial changes in weather conditions during sampling or over the past 24 to 48 hrs:

____

____

Indoor air temp (^{o}F) __________ Indoor relative humidity (%) __________

Building Survey and Chemical Inventory Form Completed? __________ Photograph IDs __________

Floor Plan showing sample location, HVAC equipment, indoor air sources, preferential pathways

Comments: ____

____

____

____

____

RAMBOLL

Indoor Air (Canister) Sample Collection Field Form

Project # ____________________ Consultant ____________________

Project Name ____________________ Collector ____________________

Sample ID ____________________

Vacuum gauge "zero" ("Hg) ____________

Start Date/Time ____________________ Start Vacuum ("Hg) ____________

End Date/Time ____________________ End Vacuum ("Hg) ____________

Canister ID ____________________ End Vacuum > "zero"? ____________

Flow controller ID ____________________ Sampling duration (intended) ____________

Associated ambient air sample ID ____________ Associated sub-slab vapor sample ID ____________

Tubing type used ________ Length of tubing ________ cm Tubing volume ________ cc

Volume purged ________ cc @ ________ min 1 to 3 volumes purged @ < 200cc/min? ________

Weather Conditions at Start of Sampling:

Air temperature (^oF) ________ Rainfall ________ Wind direction ________

Barometric pressure ________ Relative humidity ________ Wind speed (mph) ________

Substantial changes in weather conditions during sampling or over the past 24 to 48 hrs:

____

____

Indoor air temp (^oF) ____________________ Indoor relative humidity (%) ____________________

Building Survey and Chemical Inventory Form Completed? ________ Photograph IDs ____________________

Floor Plan showing sample location, HVAC equipment, indoor air sources, preferential pathways

Comments: ____

____

____

____

____

ATTACHMENT 5

VAPOR INTRUSION SAMPLING STANDARD OPERATING PROCEDURES (SOPs)

APPENDIX B-1

SUB-SLAB VAPOR SAMPLE COLLECTION PROCEDURES

This set of procedures outlines the general steps to collect sub-slab vapor samples. The project-specific work plan and Quality Assurance Project Plan (QAPP) should be consulted for proposed sample locations, sample depths, and sampling duration.

<u>Sub-Slab Vapor Probe Installation</u>

Temporary sampling probes will be installed using the following procedures:

- Sampling personnel must avoid activities immediately before and during the sampling that may contaminate the sample (e.g., using markers, fueling vehicles, etc.).

- If appropriate, record weather information (temperature, barometric pressure, rainfall, wind speed, and wind direction) at the beginning of the sampling event. Record substantial changes to these conditions that may have occurred over the past 24 to 48 hours and that do occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).

- Identify sampling location(s) on a floor plan that also identifies any slab breeches (e.g., utility penetrations, sumps, drains, and cracks) and locations of HVAC equipment.

- Insert a section of food-grade (inert) Teflon® or other appropriate tubing through a 3/8-inch (approx.) hole drilled through the slab. If necessary, advance the drill bit 2 to 3 inches into the sub-slab material to create an open cavity.

- Install the tubing inlet to the specified sampling depth below the slab, not to exceed 2 inches.

- Seal the annular space between the hole and tubing using 100% beeswax or another inert, non-shrinking sealing compound such as permagum®.

Sub-Slab Vapor Sample Collection

Sub-slab vapor samples will be collected by following the steps outlined below.

- Purge the tubing using a vacuum pump or gas-tight syringe (~60 cc). Calculate the volume of air (volume = $\pi r^2 h$) in the tubing and purge one to three tubing volumes prior to sample collection at a rate no greater than 0.2 liter per minute (lpm).

- Use an evacuated Summa® passivated (or equivalent) canister to collect the sub-slab vapor sample. The canister will be provided by the laboratory, along with a flow controller equipped with an in-line particulate filter and a vacuum gauge. The flow controller will be pre-calibrated by the laboratory for the desired flow rate or duration of sample collection, as defined in the site-specific work plan. The sampling flow rate should always be less than 0.2 lpm. The canisters will be batch or individually certified as clean by the laboratory.

- Remove the protective brass or plastic plug from canister. Connect a NIST traceable vacuum gauge to the canister and record the initial canister vacuum.

- Remove the NIST traceable vacuum gauge and connect the pre-calibrated flow controller to the canister.

- Record the identification numbers for the canister and flow controller. Record the initial canister pressure on the vacuum gauge. A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling, refer to the project-specific QAPP for further direction. Record these numbers and values on the chain-of-custody form and sample form for each sample.

- Connect the tubing from the sub-slab vapor sampling probe to the flow controller using a nut and ferrule set.

- Completely open the valve on the canister. Record the time that the valve is opened (beginning of sampling) and the canister pressure on the vacuum gauge provided with the flow controller.

- Photograph the canister and the area surrounding the canister.

- Monitor the vacuum pressure in the canister routinely during sampling, when practical (sometimes the canister will sample over a 24-hour period and routine monitoring is not practical).

- Complete the appropriate building survey and chemical survey form.

- Stop sample collection after the scheduled duration of sample collected, but when the canister still has a minimum amount of vacuum remaining. Check with the laboratory supplying the canister and flow controller for the ideal final vacuum pressure. Typically, the minimum vacuum is between 2 and 5 inches of mercury, but not zero. If there is no vacuum remaining, refer to the project specific QAPP for further direction.

- Close the canister valve. Record the date and time that sample collection was stopped.

- Remove the flow controller from the canister.

- Connect a NIST traceable vacuum gauge to the canister and record the final canister vacuum. Remove the vacuum gauge and attach the brass or plastic protective plug to the canister.

- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.

- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.

- Enter the information required for each sample on the chain-of-custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.

- Include the required copies of the chain-of-custody form in the shipping packaging, as directed by the laboratory. The field crew will retain a copy of the chain-of-custody for the project file.

- Deliver or ship the samples to the laboratory within one business day of sample collection and via overnight delivery (when shipping) when applicable.

- For temporary probes, remove and discard the probe (tubing). Seal the slab hole with polyurethane caulk, concrete or equal.

APPENDIX B-2

SUB-SLAB/SOIL VAPOR TRACER GAS TEST PROCEDURES

This set of procedures outlines the general steps to complete tracer gas testing on sub-slab vapor samples and should accompany sub-slab vapor sample collection procedures.

Tracer Gas Evaluation

A tracer gas evaluation provides a means to evaluate the integrity of the sub-slab vapor probe seal and assess the potential for introduction of ambient air into the sub-slab vapor sample. The following tracer gas testing procedure uses in-field tracer gas measurements and tracer gases (e.g., helium) that can be measured by portable detectors.

- After the temporary probe has been installed, sealed and purged, place a chamber (such as a plastic container or bucket) over the sample location.

- Retain helium tracer gas around the sub-slab sample location by filling the chamber with helium gas.

- Introduce the tracer gas into the chamber. The chamber will have tubing at the top of the chamber to introduce the tracer gas into the chamber and a valved fitting or equivalent (e.g., pinch clamp) at the bottom to let the ambient air out while introducing tracer gas. A tracer gas detector will be attached to the valve fitting at the bottom of the chamber to verify the presence of the tracer gas. Close the valve after the chamber has been enriched with tracer gas at concentrations >50%.

- The chamber will have a gas-tight fitting or sealable penetration to allow the sub-slab vapor sample tubing to pass through and exit the chamber.

- After the chamber has been filled with tracer gas, attach the sample probe tubing to a pump that will is pre-calibrated to extract soil vapor at a rate of no more than 0.2 lpm. Using the pump, draw a suitable volume of sub-slab soil gas into the Tedlar bag (the volume should be great enough to achieve a stable value on the helium detector).

- Use the tracer gas detector to measure the tracer gas concentration in the Tedlar Bag.

- Record the tracer gas concentrations in the chamber and in the sub-slab vapor sample.

If the evaluation indicates a high concentration of tracer gas in the sample (>10% of the concentration of the tracer gas in the chamber), then the surface seal is not sufficient and requires improvement via repair or replacement prior to commencement of the sample collection. A non-detectable level of tracer gas is preferred; however, if the evaluation indicates a low potential for introduction of ambient air into the sample (<10% of the concentration of the tracer gas in the chamber), then proceed with the soil vapor sampling. While lower concentrations of tracer gas are acceptable, the impact of the detectable leak on sample results should be evaluated during the data validation process and in the sampling report.

Once acceptable tracer gas results are achieved and documented, connect the probe (tubing) to the flow controller and sample canister and proceed with sub-slab vapor sample collection procedures.

Note that methane can produce a false-positive reading on many helium analyzers. If methane is present in the sub-slab material, alternative forms of tracer gas testing should be considered (e.g., liquid tracers or sulfur hexafluoride).

APPENDIX B-3
INDOOR AIR SAMPLE COLLECTION PROCEDURES

This set of procedures outlines the general steps to collect indoor air samples. The project-specific work plan and Quality Assurance Project Plan (QAPP) should be consulted for proposed sampling locations and other indoor air sampling requirements (inventory, etc.).

Indoor air samples will be collected by following the steps outlined below:

- Sampling personnel must avoid activities immediately before and during the sampling that may contaminate the sample (e.g., using markers, fueling vehicles, etc.).

- Record weather information (temperature, barometric pressure, relative humidity, wind speed, and wind direction) and indoor temperature and humidity at the beginning of the sampling event. Record substantial changes to these conditions that may have occurred over the past 24 to 48 hours and that do occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).

- Identify sampling location(s) on a floor plan that also identifies locations of HVAC equipment, chemical storage areas, garages, doorways, stairways, sumps, drains, utility perforations, north direction, and separate footing sections

- Use an evacuated Summa® passivated (or equivalent) stainless-steel canister to collect the indoor air sample. The canister will be provided by the laboratory, along with a flow controller equipped with an in-line particulate filter and a vacuum gauge. The flow controller will be pre-calibrated by the laboratory for the desired flow rate or duration of sample collection, as defined in the site-specific work plan. The sampling flow rate should always be less than 0.2 lpm. The canisters will be individually certified as clean by the laboratory.

- Place the canister at the sampling location. The sample should be collected from breathing height (e.g., 3 to 5 feet above ground). Either place the canister on a stable platform or attach a length of inert tubing to the flow controller inlet and support it such that the sample inlet will be at the proper height.

- Remove the protective plug (either brass or plastic) from canister. Connect a NIST traceable vacuum gauge to the canister and record the initial canister vacuum.

- Remove the NIST traceable vacuum gauge and connect the pre-calibrated flow controller to the canister.

- Record the identification numbers for the canister and flow controller. Record the initial canister pressure on the vacuum gauge. A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling, refer to the project-specific QAPP for further direction. Record these numbers and values on the chain-of-custody form and sample form for each sample.

- Completely open the valve on the vacuum pressure in the canister. Record the time that the valve was opened (beginning of sampling) and the canister pressure on the vacuum gauge provided with the flow controller.

- Photograph the canister and the area surrounding the canister.

- Monitor the vacuum pressure in the canister routinely during sampling, when practical (sometimes the canister will sample over a 24-hour period and routine monitoring is not practical). During monitoring, note the vacuum pressure on the gauge.

- Complete the building survey and chemical survey form.

- Stop sample collection after the scheduled duration of sample collected, but when the canister still has a minimum amount of vacuum remaining. Check with the laboratory supplying the canister and flow controller for the ideal final vacuum pressure. Typically, the minimum vacuum is between 2 and 5 inches of mercury, but not zero. If there is no vacuum remaining, refer to the project specific QAPP for further direction.

- Close the canister valve. Record the date and time that sample collection was stopped.

- Remove the flow controller from the canister.

- Connect a NIST traceable vacuum gauge to the canister and record the final canister vacuum. Remove the vacuum gauge and attach the brass or plastic protective plug to the canister.

- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.

- Enter the information required for each sample on the chain-of-custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.

- Include the required copies of the chain-of-custody form in the shipping packaging, as directed by the laboratory. The field crew will retain a copy of the chain-of-custody for the project file.

- Deliver or ship the samples to the laboratory within one business day of sample collection and via overnight delivery (when shipping) when applicable.

APPENDIX B-4

AMBIENT AIR SAMPLE COLLECTION PROCEDURES

This set of procedures outlines the general steps to collect ambient air samples. The project-specific work plan and Quality Assurance Project Plan (QAPP) should be consulted for proposed sample locations and sampling duration.

The following procedures will be followed for the collection of ambient air samples:

- Sampling personnel must avoid activities immediately before and during the sampling that may contaminate the sample (e.g., using markers, fueling vehicles, etc.).

- Select a location upwind of the building or other area that is being evaluated. If possible, select a location upwind and near the HVAC air intake for the building being sampled.

- Record weather information (temperature, barometric pressure, relative humidity, wind speed, and wind direction) and indoor temperature and humidity at the beginning of the sampling event. Record substantial changes to these conditions that may have occurred over the past 24 to 48 hours and that do occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).

- Use an evacuated Summa® passivated (or equivalent) stainless-steel canister to collect the ambient air sample. The canister will be provided by the laboratory, along with a flow controller equipped with an in-line particulate filter and a vacuum gauge. The flow controller will be pre-calibrated by the laboratory for the desired flow rate or duration of sample collection, as defined in the site-specific work plan. The sampling flow rate should always be less than 0.2 lpm. The canisters will be individually certified as clean by the laboratory.

- Place the canister at the sampling location. The sample should be collected from breathing height (e.g., 3 to 5 feet above ground); mount the canister on a stable platform such that the sample inlet will be at the proper height.

- Remove the protective plug (either brass or plastic) from canister. Connect a NIST traceable vacuum gauge to the canister and record the initial canister vacuum.

- Remove the NIST traceable vacuum gauge and connect the pre-calibrated flow controller to the canister. The flow controller inlet should be equipped with stainless steel tubing in the shape of a "button hook" that inverts the inlet downward. Attach a 35 mm polypropylene funnel or equivalent to the stainless tubing (near the canister inlet) to prohibit precipitation from entering the canister.

- Record the identification numbers for the canister and flow controller. Record the initial canister pressure on the vacuum gauge. A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling, refer to the project-specific QAPP for further direction. Record these numbers and values on the chain-of-custody form and sample form for each sample.

- Completely open the valve on the vacuum pressure in the canister. Record the time that the valve was opened (beginning of sampling) and the canister pressure on the vacuum gauge provided with the flow controller.

- Photograph the canister and the area surrounding the canister.

- Document on a field form an outdoor plot sketch that indicates the building being sampled, streets, sampling location, location of potential outdoor air sources, north direction and paved areas. Also record pertinent observations such as odors, readings from field instrumentation, and significant activities in the vicinity that result in air emissions.

- Monitor the vacuum pressure in the canister routinely during sampling, when practical (sometimes the canister will sample over a 24-hour period and routine monitoring is not practical). During monitoring, note the vacuum pressure on the gauge.

- Stop sample collection after the scheduled duration of sample collection but make sure that the canister still has a minimum amount of vacuum remaining. Check with the laboratory supplying the canister and flow controller for the ideal final vacuum pressure. Typically, the minimum vacuum is between 2 and 5 inches of mercury, but not zero. If there is no vacuum remaining, refer to the project specific QAPP for further direction.

- Close the canister valve. Record the date and time that sample collection was stopped.

- Remove the flow controller from the canister.

- Connect a NIST traceable vacuum gauge to the canister and record the final canister vacuum. Remove the vacuum gauge and attach the brass or plastic protective plug to the canister.

- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.

- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.

- Enter the information required for each sample on the chain-of-custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.

- Include the required copies of the chain-of-custody form in the shipping packaging, as directed by the laboratory. The field crew will retain a copy of the chain-of-custody for the project file.

- Deliver or ship the samples to the laboratory within one business day of sample collection and via overnight delivery (when shipping) when applicable.