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Site Characterization Sampling and Analysis Plan

West Sayville Drycleaner
NYSDEC Site No. 152200
Hamlet of West Sayville, Suffolk County, New York
March 2023

Prepared for: New York State Department of Environmental Conservation (NYSDEC)
Prepared by: Ecology and Environment Engineering and Geology, P.C. (E & E)

1 Objective

This Sampling and Analysis Plan (SAP) was prepared for remedial investigation activities at the West Sayville site, Site Number 152200 (the Site) (see Figure 1). This remedial investigation is driven by the discovery of volatile organic compounds (VOCs) in soil and groundwater during previous investigations.

This SAP will be implemented during the remedial investigation field activities. The primary elements of the site characterization include:

- Well cluster installation at four locations and one soil boring via direct-push drilling;
- Groundwater sampling of new and existing monitoring wells to determine if contamination is present in groundwater and to evaluate the extent of contamination at the Site; and
- Soil gas sample collection at two exterior locations and one round of soil vapor intrusion (SVI) sampling at three structures (59, 61, and 63 West Main Street) to assess the potential for indoor air quality impacts.

2 Background

2.1 Site Description and Topography

The Site is located at 61 West Main Street, Hamlet of West Sayville, Suffolk County, New York (see Figure 1). The Site is comprised of one masonry building with a partial basement occupying approximately 2,860 square feet in a suburban area. The front of the parcel is a concrete sidewalk and curb area, and the rear of the parcel is a grassy area. The topography of the site is generally level at grade. Overall area topography slopes towards Green's Creek is located about 1,300 feet southeast of the Site.

The building was constructed in the mid-1930s as a detached downtown row store. Uses included, but are not limited to a delicatessen, food storage/retail, and dry cleaning. Dry cleaning operations began in the early 1980s and are believed to have terminated in the mid

2000s. Since approximately April 2007, the on-site building has been leased, and the building was shared by a laundromat and a can redemption center. The property is currently owned by 61 Sayville Corp. and is utilized as a custom woodworking design studio and showroom.

2.2 Site Geology and Hydrogeology

The soil overburden at the site consists of coarse to fine sands and native material that has been reworked.

Groundwater flow in the overburden is likely to the southeast towards Green's Creek, which is located about 1,300 feet southeast of the Site.

2.3 Previous Investigations

The following section was developed based on the information provided in the December 2006 Berninger Environmental, Inc. Remedial Investigation Workplan. This report is available for download from the NYDEC Environmental Site Database Search Website here: https://www.dec.ny.gov/data/DecDocs/152200/

2.3.1 Excavations 2000 -2002– J.C. Broderick and Associates

Three soil excavation events were previously performed at the Site by J.C. Broderick and Associates and included the removal of approximately 22 55-gallon drums of impacted soils at the rear of the building. End point soil sampling indicated tetrachloroethene (PCE) as high as 590,000 parts per billion (ppb) in soil and 330 ppb in groundwater.

2.3.2 2002 Soil investigation – BEI

In 2002 BEI installed two soil borings behind the building and were sampled for PCE and trichloroethene (TCE)

The following affected site media were identified during the 2002 Investigation:

- Boring GP-1 contained PCE and TCE in groundwater at 56.2 and 7.5 ppb, respectively.
- Boring GP-2 contained PCE and TCE in groundwater at 275 and 60.8 ppb, respectively

2.3.3 2005 Soil Vapor Extraction (SVE) System – BEI

An SVE system was installed in 2005 including two vapor extraction wells near the rear portion of the building. Two groundwater piezometers were also installed. PCE concentrations in the two vapor extraction wells ranged up to over 18,000 micrograms per cubic meter ($\mu g/m^3$). The SVE system is no longer active and the termination date of active extraction is unknown.

2.3.4 2005 Sampling – SCDHS

Indoor air sampling was performed by the Suffolk County Department of Health Services (SCDHS) from an adjoining property. PCE concentrations ranged from 539 to 721 $\mu g/m^3$ and TCE ranged from 4.0 to 124 $\mu g/m^3$. SCDHS also sampled three monitoring wells within the right-of-way at the West Sayville Fire District and detected PCE at concentrations up to 15 ppb.

3 General Site Activities

E & E will provide in-house surveying services to survey existing and new monitoring wells and sampling locations. Surveying will include determination of the elevations of monitoring well reference points for determination of the groundwater table elevation.

Land Air Water Environmental Service (LAWES) will be subcontracted to provide drilling and monitoring well installation services. LAWES will contact Dig Safely New York to request mark-outs of underground utilities prior to beginning intrusive activities in accordance with New York Code Rule 753. Soft-dig hand clearing is also included for each of the monitoring well drilling locations.

All field activities listed below will be performed in accordance with E & E's Master Quality Assurance Project Plan (QAPP) (E & E 2020a) and Field Activities Plan (FAP) (E & E 2020b). Sampling and analysis for per- and polyfluoroalkyl substances (PFAS) shall be implemented in accordance with NYSDEC's November 2022 guidance, "Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS)" (NYSDEC 2022).

A site-specific Community Air Monitoring Plan will be implemented during intrusive activities (Appendix A).

A summary of planned environmental sampling is provided in Table 1.

4 Soil Boring/Monitoring Well Installation and Sampling

A total of four locations were selected for well cluster installations. One of these locations was selected for direct push soil sampling for the purpose of identifying subsurface stratigraphy. The remaining well cluster locations will be drilled without soil sampling. Well cluster locations include two in the West Sayville Oakdale Fire District (WSOFD) parking lot and two in the rear of the WSOFD property (see Figure 1). The soil boring will be at one of the locations in the WSOFD parking lot.

4.1 Direct Push Soil Boring

Initially, one soil boring will be completed via direct-push drilling at one of the proposed well locations in the WSOFD parking lot area, MW-1 (see Figure 1). The purpose of this soil boring is to collect geologic (soil) data and to confirm well screen interval placements. An E & E geologist will log the soil core and screen soil using a photoionization detector (PID). Drilling observations during borehole advancement will include lithology of recovered soil, PID readings, and the depth of water bearing zone(s). Lithologic and construction information will be recorded in a field book. This boring is anticipated to be advanced to no greater than 50 feet bgs.

4.2 Monitoring Well Installation

Following completion of the soil boring advancement, well installation will commence via hollow stem auger (HSA) drilling methods with no additional soil core sampling. At each of the four proposed well cluster locations, the drill rig will advance 4-1/4 -inch inside diameter (ID) augers to an anticipated depth of 50 feet below ground surface (bgs). Following achievement of drilling depth, three separate 1-inch ID monitoring wells will be installed within each borehole to provide for monitoring of shallow, intermediate, and deep groundwater. The exact screen intervals will be determined based on field conditions but are estimated to be 10-15 feet bgs (interval “A”), 25-30 feet bgs (interval “B”), and 45-50 feet bgs (interval “C”). The annulus will then be backfilled within No. 1 Morie sand from total depth to eight feet bgs, with the exception that bentonite pellet seals will be placed between each screen interval at estimated depths of 19-21 and 41.5-43.5 feet bgs. The remainder of each borehole will be finished with at least 3 feet of bentonite and 4 feet of cement-based grout. The surface will then be completed with an 8-inch-diameter flush-mounted manhole set into a 2x2-foot concrete apron. An as-built boring log will be prepared for each monitoring well, and well construction logs will be completed for each installed well after completion of the field activities. Figure 1 shows the monitoring well locations, which may be modified in the field.

No soil samples will be collected for laboratory analysis from the monitoring well installations. All soils associated with MW installation will be screened to determine if grossly impacted materials are present in the soil. This screening will include the use of the PID, visual, and olfactory methods. This information will be documented and evaluated in the remedial investigation report.

4.3 Monitoring Well Development

All newly installed wells will be developed by pumping utilizing a Waterra pump and polyethylene tubing fitted with a check valve, or equivalent. Well development will occur no sooner than 24 hours after grout installation.

4.4 Groundwater Sampling

A groundwater sampling event will be conducted that will include water level gauging and the collection of groundwater samples from the 12 new monitoring wells (MW-1A through MW-4C) and two existing onsite piezometers (PZ-1A and PZ-2B), if located, for a total of 14 samples. Groundwater levels will be measured with an electronic water-level indicator graduated to 0.01 foot. The sampling event will be a separate mobilization at least 14 days after well development.

Where ample well recharge allows, sampling will be performed using US Environmental Protection Agency (EPA) low-flow purging and sampling techniques using a bladder pump equipped with dedicated polyethylene bladders and tubing. Upon stabilization of parameters or sufficient recharge, groundwater samples will be collected and submitted to the laboratory for analysis of VOCs at all locations. In addition, sample aliquots for analysis of 1,4-dioxane, polyfluoroalkyl substances (PFAS), target analyte list metals (including mercury and hexavalent chromium),semivolatile organic compounds, pesticides, herbicides, and polychlorinated biphenyls (PCBs) will be collected from three locations (PZ-2B, MW-1B, and MW-3B). Table 1 contains a summary of samples to be collected and analytical methods to be used. PFAS sample portions will be collected in accordance with NYSDEC’s Sampling, Analysis, and Assessment of Per-and -Polyfluoroalkyl Substances (PFAS) Under NYSDEC’s Part 375 Remedial Programs dated November 2022. This document is provided in Appendix B. Quality assurance/quality control (QA/QC) samples, including duplicates, matrix spike/matrix spike duplicates, rinsate blanks, etc.

will be collected in accordance with the QAPP (see Table 1). One trip blank per shipping cooler will be included for VOC analysis. Additional rinsate blanks may be collected for PFAS analysis depending on the sampling equipment used.

4.5 Data Validation

Standard data validation will be performed. Laboratory data will be reviewed for completeness, validated, and data usability summary reports (DUSRs) will be prepared by an E & E chemist. DUSRs will be prepared in accordance with DER-10 Appendix 2B and EPA Region 2 data validation procedures and will occur on all data collected. Analytical, location, and monitoring well construction (where applicable) data will be submitted in an EQuIS electronic data deliverable.

5 Soil Gas Sampling

In conjunction with the off-site groundwater investigation, a direct-push drilling rig will be utilized in the vicinity of the Site for the collection of exterior soil gas samples. Two locations will be sampled, one location adjacent to the driveway to the east of the site building, adjacent to the neighboring property (59 West Main Street), and the other located to the northwest of the site, in the back alley behind the current South Shore Drive Restaurant Patio (63 West Main Street). Proposed sample locations are shown of Figure 1. The samples will be collected using Summa cannisters fitted with 2-hour regulators, with the soil gas intake at a depth equivalent to the basement floor (~10 feet bgs). All exterior soil gas samples will be collected following New York State Department of Health (NYSDOH) procedures and will be analyzed for VOCs using EPA Method TO-15. Sampling will be conducted using the Geoprobe post-run tubing system or by installing a temporary 8- to 12-inch-long vapor implant with inert glass beads or sand and bentonite seal of at least 6 linear feet. Each location will be backfilled with bentonite or cement upon completion. Leak detection will be performed via helium tracer testing.

6 Soil Vapor Intrusion Sampling

One round of soil vapor intrusion (SVI) sampling will be completed for the site (61 West Main Street) and adjacent buildings at 59 and 63 West Main Street. These sampling events may not be performed concurrently based on when access to each building can be obtained. Based on a January 24, 2023 site visit, the basement areas beneath each of these structures are approximately half full basement with concrete floor and half crawlspace with exposed soil. The exact sampling locations will be determined based on field observations the day of the field work; however, sampling is anticipated to include one sub-slab vapor from below the concrete slab portion of the basement, one crawlspace air sample, and one first-floor air sample per structure. In addition, one outdoor air sample will be collected during each concurrent sampling event.

SVI sampling activities will be conducted in accordance with NYSDOH's Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006, and associated updates. The indoor air samples will be collected via Summa canisters placed within the breathing zone at each location and will utilize a 24-hour sample regulator. For the collection of the sub-slab vapor sample, at each location a hole will be drilled through the concrete slab using an electric powered hammer drill (approximately 5/8-inch bit) before temporary installation of a VaporPin® sampling port (the procedure for sampling using a vapor pin, including leak detection, is included as Appendix C). A shop vacuum will be used to clean the area around the drilled hole. An low-flow air sampling pump (SKC sampling pump, or equivalent) will be used to purge a minimum of three volumes of air before sample collection (calculated by length of tubing). A water dam and pressure test will be implemented at each location to verify a competent seal. Following the leak test, the sub-slab sample will be collected. Hydraulic cement will be used to patch the drill hole after sampling is complete. The sub-slab vapor and indoor/outdoor air samples will be collected over a 24-hour period and analyzed for VOCs by EPA Method TO-15.

The soil vapor intrusion assessment will include performing a building inspection and materials inventory. A pre-sampling site inspection will be conducted prior to conducting the sampling activities. During the site inspection, E & E will evaluate the building construction, complete the NYSDOH's indoor air quality questionnaire and building inventory form, and conduct an inventory of materials and equipment stored in accessible areas in the basement and on the first floor of the building. In general, the volatile ingredients of each material, if available, will be photographed or recorded on the inventory form, and the containers will be scanned with a photoionization detector (RAE Systems ppbRAE or equivalent) for potential vapor emissions. If the contents of a container are not listed on the label, E & E will record the product name and manufacturer's name and address (if available) on the inventory form. E & E will recommend that the facility remove from the building any materials that contain VOCs of concern (e.g., TCE- or PCE-containing materials or other high-VOC content material).

7 Equipment Decontamination

The following procedures will be used for all non-dedicated equipment and tools including downhole equipment such as macro-core cutting shoes:

- Initially remove all foreign matter;
- Scrub with brushes in a laboratory-grade detergent solution;
- Rinse with potable water; and
- Rinse with distilled water.

All decontamination wastes will be containerized and stored on site pending characterization and disposal.

8 Quality Assurance/Quality Control (QA/QC)

QA/QC procedures will be performed in accordance with E & E's 2020 Master Quality Assurance Project Plan for New York State Department of Environmental Conservation Projects, Contract No. D009807. Specific activities that apply to the implementation of this sampling plan include:

- Collect field duplicates at a rate of 1 per 20 samples per matrix.
- Collect additional volume for matrix spike/matrix spike duplicate (MS/MSD) analysis at a rate of 1 per 20 samples per matrix.

- Collect at least one equipment rinsate blank daily from sampling equipment. Typically, one sample per matrix per day will be collected for all analyses performed on that matrix. Additional rinsate blanks will be collected for PFAS analysis only and shall include dedicated sampling equipment such as sampling pump bladders and tubing, bailers, etc. Laboratory-supplied, analyte-free water shall be used for rinsate blanks.
- Document all data and observations on field data sheets and/or in the field logbooks.
- Operate and calibrate all field instruments in accordance with operating instructions as supplied by the manufacturer unless otherwise specified.
- Ensure all laboratory deliverables are validated by an E & E chemist prior to release.

9 Project Logbook and Photo-Documentation

Photos of the site will be taken, and associated notes will be recorded in the field logbook. A logbook will be maintained to record all on-site activities. Data from the sampling events will be forwarded to NYSDEC and summarized in the remedial investigation report. Photos of field work completed including the soil vapor, and indoor air locations will be taken and provided in the associated reports.

10 Sample Packaging and Shipping

The sample containers will be placed inside sealed plastic bags as a precaution against cross-contamination caused by leakage or breakage. The samples will be placed in coolers with wet ice to begin the cooling process. If sample shipment by common carrier is required, inert packaging material such as bubble wrap will be added to the cooler to minimize the chance of breakage during transport.

Eurofins Environment Testing Northeast, a NYSDOH Environmental Laboratory Accreditation Program (ELAP) certified lab, will provide laboratory analytical services.

Delivery of sample containers and supplies to the field and return shipment of samples to the laboratory will be coordinated through the laboratory at the following address or an alternative location to be determined in coordination with the lab:

Eurofins Environment Testing Northeast
47-32 32nd Pl #1141,
Queens, NY 11101
Phone (347) 507-0579

11 Investigation-Derived Waste Disposal

Three investigation-derived waste streams are expected to be generated during sampling activities: expendable material solid wastes such as personal protective equipment, paper towels, plastic tubing, macro-core sleeves etc.; excess soil from soil boring drilling; and wastewater from decontamination and well development and pre-sample purging. Expendable materials generated during the investigation will be bagged and disposed of off-site as non-hazardous solid waste. Soil and decontamination/purge water generated during installation and sampling of soil borings/monitoring wells will be containerized in Department of

Transportation-compliant 55-gallon steel drums. These drums will be stored to the northeast of the parking lot along the tree line. This location is shown on Figure 1.

E & E will collect one composite sample from the soil drums and one from the water drums for waste characterization. Analyses will be determined based on disposal facility requirements but are expected to include toxicity characteristic leaching procedure (TCLP) VOCs, TCLP Metals, PCBs, and pH for solids and Target Compound List VOCs, Target Analyte List Metals, and pH for water.

12 Site-Specific Health and Safety Plan

A site-specific health and safety plan has been prepared for this fieldwork and is attached in Appendix D.

13 Reporting

E & E will document the details of daily field activities submitted electronically to NYSDEC.

The laboratory shall provide “Category B” deliverables as described in Appendix 2B of NYSDEC's Technical Guidance for Site Investigation and Remediation, DER-10 (NYSDEC 2010). Lab deliverables will include a complete electronic (PDF) report and NYSDEC EQuIS electronic data deliverable (EDD). An E & E chemist will review the lab reports for completeness and process the EDDs to assign appropriate location codes, sample matrices, parent sample codes, etc. The laboratory data will be validated by E & E and will include review of the deliverables, assessment of the validity and usability of the results, and preparation of DUSRs in accordance with Appendix 2B of DER-10 (NYSDEC 2010). The validator will update the EDDs with validator qualifiers, prepare and submit an EQuIS EDD to NYSDEC, and prepare final report tables. Validated sample data will be presented in a table accompanied by site figures depicting the sampling locations.

Following completion of all sample analyses and completion of data validation, E & E will prepare a Remedial Investigation (RI) report that will include photos and a description of the activities performed, any deviations from proposed procedures, sampling locations depicted on site maps, and analytical results in tables. Site figures will include monitoring well and sampling locations, groundwater elevation data, cross-sections of subsurface geology (if warranted), and soil vapor/air and groundwater quality data. Based on preliminary evaluation of site conditions and its location, a brief qualitative human health exposure assessment will be included, but a fish and wildlife impact assessment is not required and will not be included. The draft report will be submitted electronically to NYSDEC for review, with a final electronic version of the report produced approximately two weeks after receiving draft report comments.

In addition, a feasibility study (FS) report will be prepared and will follow the streamlined format of the alternative analysis report presented in NYSDEC DER-10. Up to three alternatives, excluding the no action alternative, suitable for addressing contaminants at the Site will be considered for this project. No source area soil sampling was requested by NYSDEC because impacted soils were previously addressed by the responsible party.

14 References

Berninger Environmental, Inc. (BEI). 2006. Remedial Investigation Workplan for West Sayville Dry Cleaners, 61 West Main Street, West Sayville, New York, December 2006

Ecology and Environment Engineering and Geology, P.C. (E & E). 2020a. Master Quality Assurance Project Plan (QAPP) for New York State Department of Environmental Conservation Projects, May 2020.

New York State Department of Environmental Conservation (NYSDEC). 2010. DER-10, Technical Guidance for Site Investigation and Remediation, May 2010.

New York State Department of Environmental Conservation (NYSDEC). 2010. DER-10, Technical Guidance for Site Investigation and Remediation, May 2010. Appendix 1A Community Air Monitoring Plan (CAMP).

APPENDIX A

COMMUNITY AIR MONITORING PLAN

APPENDIX B

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

APPENDIX C

FIELD STANDARD OPERATING PROCEDURE FOR SUB-SLAB VAPOR SAMPLING

APPENDIX D

SITE-SPECIFIC HEALTH AND SAFETY PLAN

(Provided Separately)

Table 1 Analytical Summary for West Sayville

Analytes	Method [1]	Matrix	Sample Quantity	Container	Field Duplicates	MS/ MSD	Rinse Blanks [2]	Trip Blanks [3]	Total
Groundwater (14 locations)									
TCL VOCs	8260D	WG	14	40 mL VOA Vial (3)	1	2	1	2	20
PFAS (40 compound list)	EPA draft Method 1633	WG	3	250 mL HDPE (1)	1	2	3	0	9
1,4-Dioxane	8270E-SIM-MS-ID	WG	3	1 L Amber Glass (2)	1	2	3	0	9
Metals	6010D	WG	3	1 500 ml Plastic	1	2	3	0	6
Mercury	7470A	WG	3	1 500 ml Plastic	1	2	3	0	6
Chromium, hexavalent	7196A	WG	3	1 500 ml Plastic	1	2	3	0	6
SVOCs	8270E	WG	3	1 L Amber Glass (2)	1	2	3	0	6
Pesticides	8081B	WG	3	1 L Amber Glass (2)	1	2	3	0	6
PCBs	8082A	WG	3	1 L Amber Glass (2)	1	2	3	0	6
Herbicides	8151A	WG	3	1 L Amber Glass (2)	1	2	3	0	6
Waste Classification (Composites)									
TCLP Extraction	1311	IDW (soil)	1	8oz glass (1)	0	0	0	0	1
TCLP VOCs	8260D	IDW (soil)	1	8oz glass (1)	0	0	0	0	1
TCLP Metals	6010D/7471B	IDW (soil)	1	8oz glass (1)	0	0	0	0	1
PCBs	8082A	IDW (soil)	1	8oz glass (1)	0	0	0	0	1
pH	9040C	IDW (soil)	1	8oz glass (1)	0	0	0	0	1
TCL VOC	SW-846 8260C	IDW (water)	1	40 mL VOA Vial (3)	0	0	0	0	1
TAL Metals	6010D/7471B	IDW (water)	1	500mL plastic	0	0	0	0	1
Soil Gas (2 Locations)									
TCL VOCs	EPA Method TO-15	GS	2	6-L Summa Canister with 2-hour flow regulator	1	0	0	0	3
Soil Vapor Intrusion (3 Buildings [4])									
TCL VOCs	EPA Method TO-15	AS/AI/AO	11	6-L Summa Canister with 24-hour flow regulator	2	0	0	0	13

Notes:

1. All methods are EPA SW-846 unless specified.
2. Rinse blanks will be collected once per day for equipment set for PFAS/1,4-dioxane and one per equipment set per 20 samples for VOCs; quantities are estimated.
3. Trip blanks are estimated and will be collected at the rate of one per cooler when collecting VOCs.
4. Includes 1 sub-slab vapor, 1 crawl space air, 1 first floor air per structure, plus 1 outdoor air and duplicate sample per event.

Key:

EPA = U.S. Environmental Protection Agency
HDPE = high density polyethylene
L = liter
mL = milliliter
oz = ounce
PFAS = per- and polyfluorinated alkyl substances
TCL = Target Compound List
VOCs = volatile organic compounds
AI = indoor ambient air, SVI
AO = outdoor ambient air
AS = Sub-slab soil vapor, SVI
IDW = investigation-derived waste
WG = groundwater

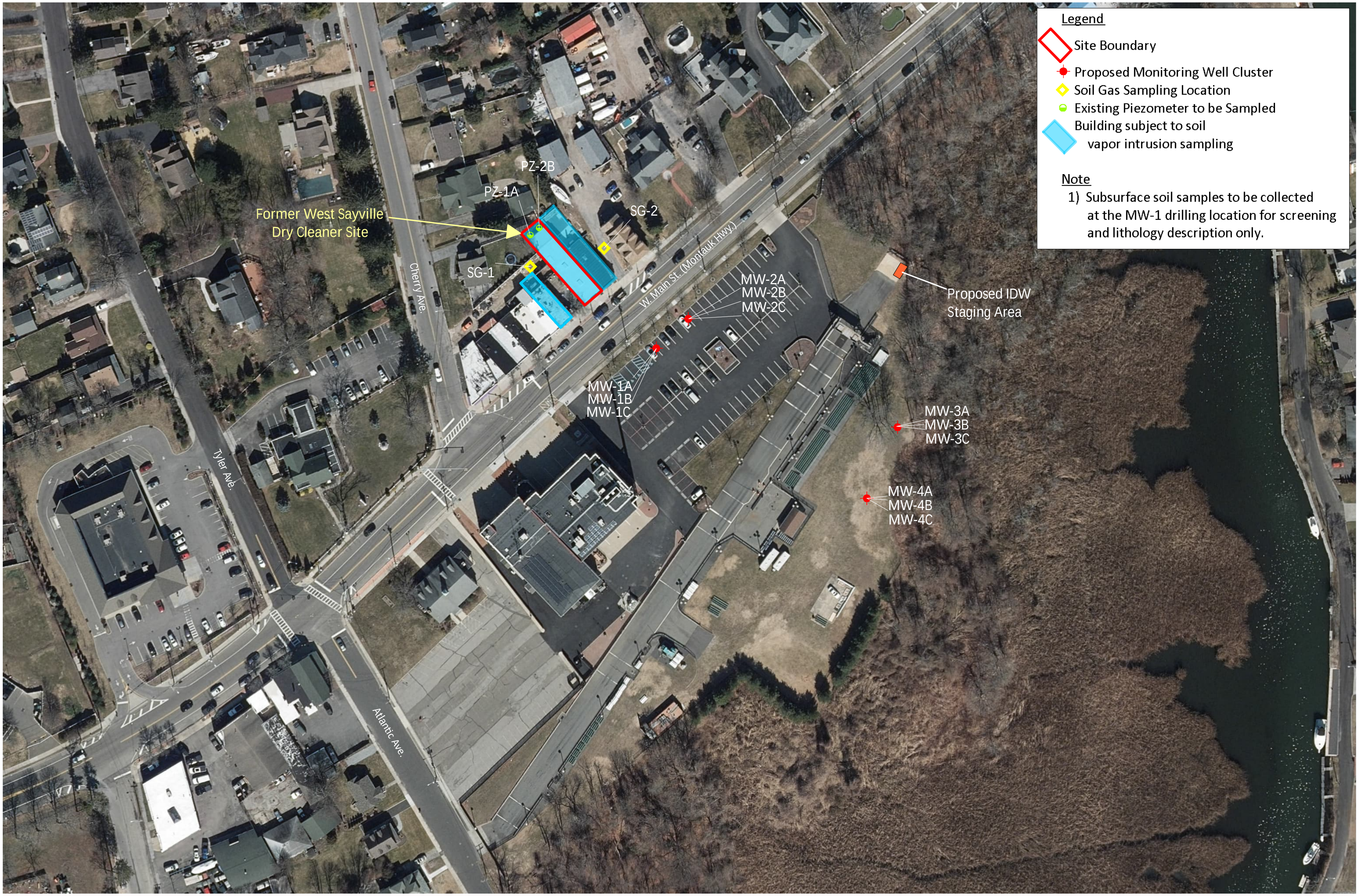

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Figure 1
Site Location and Proposed Sampling Locations
West Sayville Dry Cleaners Site
61 West Main Street
West Sayville, New York

APPENDIX A

COMMUNITY AIR MONITORING PLAN

Community Health and Safety Plan
West Sayville Drycleaner
NYSDEC Site No. 152200
West Sayville, New York

1.0 Community Air Monitoring Plan (CAMP)

This CAMP was prepared based on the New York State Department of Health (NYSDOH) Generic CAMP[1]. This plan requires real-time monitoring for volatile organic compounds (VOCs) and particulates at the downwind perimeter of each designated work area when certain activities are in progress at potentially 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, 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.

Reliance on the CAMP shall not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

A Special Requirements CAMP shall be implemented at the Site when ground intrusive or soil handling activity occurs within an occupied building or within 20 feet of a receptor (e.g., occupied buildings, bus stop, etc.). The standard CAMP is outlined in this Section and Sections 2 and 3 below. The additional requirements of a Special Requirements CAMP is outlined in Section 4.

Volatile Organic Compound Monitoring Plan
Periodic monitoring for VOCs will be required during non-intrusive activities such the collection of groundwater samples from 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, 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 and anticipated contaminant concentrations, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at contaminated wells along busy urban streets adjacent to a residence/business.

For intrusive activities such as drilling and direct push sampling, not located within 20 feet of potentially exposed populations or occupied structures, VOCs must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) at intervals of no

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[1] New York State Department of Environmental Conservation (NYSDEC). 2010. DER-10, Technical Guidance for Site Investigation and Remediation, May 2010. Appendix 1A, Community Air Monitoring Plan (CAMP).

more than 15 minutes. Upwind concentrations shall be measured at the start of each workday and periodically thereafter to establish background conditions. VOC monitoring shall be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. For example, for total organic vapor concentrations, a photo-ionization detector (PID) shall be used. The equipment shall be calibrated at least daily.

<u>VOC Response Levels:</u>

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 a 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 and mitigative measures implemented before work can continue.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations shall be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring shall 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 shall be equipped with an audible alarm or be continuously visually monitored to indicate exceedance of the action level. In addition, fugitive dust migration shall be visually assessed during all work activities.

<u>Particulate Response Levels:</u>

1. If the downwind PM-10 particulate level is **100 micrograms per cubic meter** ($\mu g/m^3$) greater than background (upwind perimeter) for a 15-minute period or if airborne dust is visually 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 $\mu g/m^3$** 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 $\mu g/m^3$** above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume if dust suppression measures and other

controls are successful in reducing the downwind PM-10 particulate concentration to within 150 µg/m^3 of the upwind level and in preventing visible dust migration.

2.0 Public Safety

Intrusive activities such as drilling and direct push sampling within the community will require the development of an exclusion zone at the perimeter of the work zone. The exclusion zone is meant to prevent pedestrians from entering the work zone and potentially being exposed to contaminants or physical safety hazards associated with the equipment used. The exclusion zone will be marked using caution tape and/or cones or similar high visibility barriers. When working on or immediately adjacent to a public road, the regulations listed in the NYS Manual of Uniform Traffic Control Devices (Title 17b, NYCRR) will be implemented. This includes the correct formation and placement of cones and “Road Work Ahead” signs to divert and warn oncoming traffic. Depending on the type of work and length of time needed, traffic controllers and observers may be required.

3.0 Responsibility

It shall be the responsibility of the Site Safety Officer to conduct monitoring at the downwind perimeter of the work zone as defined above and record all relevant data in the health and safety field notebook, which will be available for State (NYSDEC and NYSDOH) personnel to review. The Site Safety Officer shall also be responsible for visually monitoring the work zone for potential safety hazards and to prevent public intrusion in the work zone.

4.0 Special Requirements CAMP

In addition to the standard CAMP requirements per above the Special Requirements CAMP requires the following:

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). Depending upon the nature of contamination, chemical-specific colorimetric tubes of sufficient sensitivity may be necessary for comparing the exposure point concentrations with appropriate pre-determined response levels (response actions should also be pre-determined). 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 µg/m^3, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m3 or less at the monitoring point.

Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions should be pre-determined, as necessary, for each site.

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

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

APPENDIX B

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

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

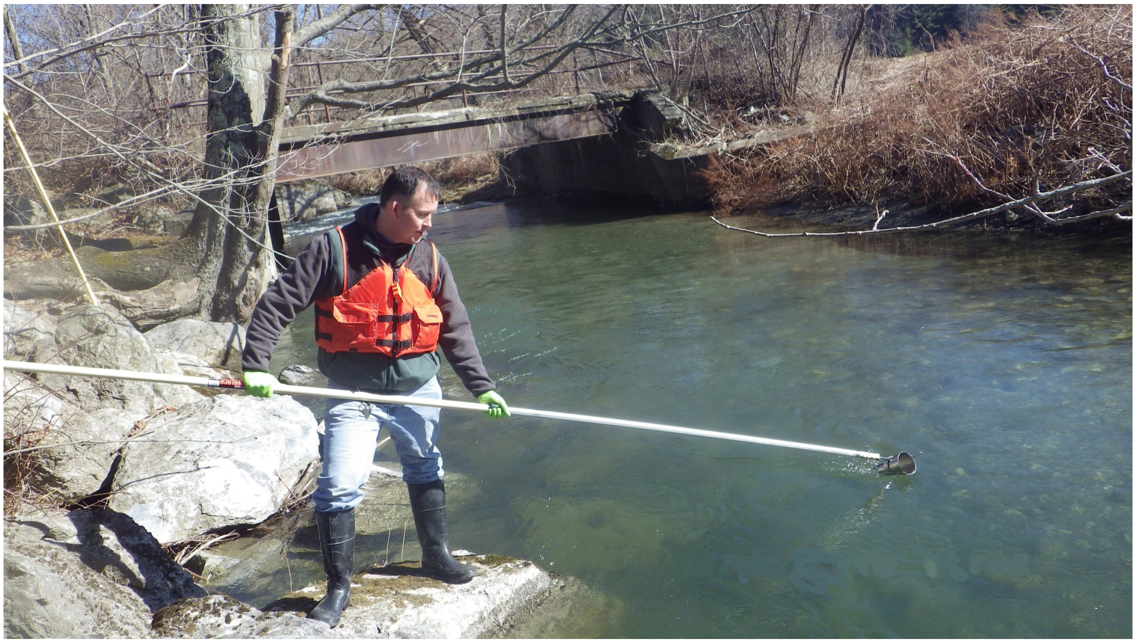

Table of Contents

Objective 1
Applicability 1
Field Sampling Procedures....................1
Analysis and Reporting....................2
  Routine Analysis 2
  Additional Analysis....................2
Data Assessment and Application to Site Cleanup 3
  Water Sample Results 3
  Soil Sample Results....................3
Testing for Imported Soil....................4
Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS 5
Appendix B - Sampling Protocols for PFAS in Soils, Sediments and Solids....................6
Appendix C - Sampling Protocols for PFAS in Monitoring Wells 8
Appendix D - Sampling Protocols for PFAS in Surface Water....................10
Appendix E - Sampling Protocols for PFAS in Private Water Supply Wells....................12
Appendix F - Sampling Protocols for PFAS in Fish 14
Appendix G - PFAS Analyte List....................22
Appendix H - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids....................24

November 2022

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

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	

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

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Objective

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

Applicability

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

As part of a site investigation or remedial action compliance program, whenever samples of potentially affected media are collected and analyzed for the standard Target Analyte List/Target Compound List (TAL/TCL), PFAS analysis should also be performed. Potentially affected media can include soil, groundwater, surface water, and sediment. Based upon the potential for biota to be affected, biota sampling and analysis for PFAS may also be warranted as determined pursuant to a Fish and Wildlife Impact Analysis. Soil vapor sampling for PFAS is not required.

Field Sampling Procedures

DER-10 specifies technical guidance applicable to DER's remedial programs. Given the prevalence and use of PFAS, DER has developed "best management practices" specific to sampling for PFAS. As specified in DER-10 Chapter 2, quality assurance procedures are to be submitted with investigation work plans. Typically, these procedures are incorporated into a work plan, or submitted as a stand-alone document (e.g., a Quality Assurance Project Plan). Quality assurance guidelines for PFAS are listed in Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS.

Field sampling for PFAS performed under DER remedial programs should follow the appropriate procedures outlined for soils, sediments, or other solids (Appendix B), non-potable groundwater (Appendix C), surface water (Appendix D), public or private water supply wells (Appendix E), and fish tissue (Appendix F).

QA/QC samples (e.g. duplicates, MS/MSD) should be collected as specified in DER-10, Section 2.3(c). For sampling equipment coming in contact with aqueous samples only, rinsate or equipment blanks should be collected. Equipment blanks should be collected at a minimum frequency of one per day per site or one per twenty samples, whichever is more frequent.

Analysis and Reporting

The investigation work plan should describe analysis and reporting procedures, including laboratory analytical procedures for the methods discussed below. As specified in DER-10 Section 2.2, laboratories should provide a full Category B deliverable. In addition, a Data Usability Summary Report (DUSR) should be prepared by an independent, third party data validator. Electronic data submissions should meet the requirements provided at: https://www.dec.ny.gov/chemical/62440.html.

DER has developed a *PFAS Analyte List* (Appendix G) for remedial programs to understand the nature of contamination at sites. It is expected that reported results for PFAS will include, at a minimum, all the compounds listed. If lab and/or matrix specific issues are encountered for any analytes, the DER project manager, in consultation with the DER chemist, will make case-by-case decisions as to whether certain analytes may be temporarily or permanently discontinued from analysis at each site. As with other contaminants that are analyzed for at a site, the *PFAS Analyte List* may be refined for future sampling events based on investigative findings.

Routine Analysis

EPA Method 1633 is the procedure to use for environmental samples. Reporting limits for PFOA and PFOS in aqueous samples should not exceed 2 ng/L. Reporting limits for PFOA and PFOS in solid samples should not exceed 0.5 µg/kg. Reporting limits for all other PFAS in aqueous and solid media should be as close to these limits as possible. If laboratories indicate that they are not able to achieve these reporting limits for the entire *PFAS Analyte List*, site-specific decisions regarding acceptance of elevated reporting limits for specific PFAS can be made by the DER project manager in consultation with the DER chemist. Data review guidelines were developed by DER to ensure data comparability and usability (Appendix H - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids).

Additional Analysis

Additional laboratory methods for analysis of PFAS may be warranted at a site, such as the Synthetic Precipitation Leaching Procedure (SPLP) and Total Oxidizable Precursor Assay (TOP Assay).

In cases where site-specific cleanup objectives for PFOA and PFOS are to be assessed, soil parameters, such as Total Organic Carbon (Lloyd Kahn), soil pH (EPA Method 9045), clay content (percent), and cation exchange capacity (EPA Method 9081), should be included in the analysis to help evaluate factors affecting the leachability of PFAS in site soils.

SPLP is a technique used to determine the mobility of chemicals in liquids, soils and wastes, and may be useful in determining the need for addressing PFAS-containing material as part of the remedy. SPLP by EPA Method 1312 should be used unless otherwise specified by the DER project manager in consultation with the DER chemist.

Impacted materials can be made up of PFAS that are not analyzable by routine analytical methodology. A TOP Assay can be utilized to conceptualize the amount and type of oxidizable PFAS which could be liberated in the environment, which approximates the maximum concentration of perfluoroalkyl substances that could be generated if all polyfluoroalkyl substances were oxidized. For example, some polyfluoroalkyl substances may degrade or transform to form perfluoroalkyl substances (such as PFOA or PFOS), resulting in an increase in perfluoroalkyl substance concentrations as contaminated groundwater moves away from a source. The TOP Assay converts, through oxidation, polyfluoroalkyl substances (precursors) into perfluoroalkyl substances that can be detected by routine analytical methodology.[1]

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[1] TOP Assay analysis of highly contaminated samples, such as those from an AFFF (aqueous film-forming foam) site, can result in incomplete oxidation of the samples and an underestimation of the total perfluoroalkyl substances.

Commercial laboratories have adopted methods which allow for the quantification of targeted PFAS in air and biota. The EPA's Office of Research and Development (ORD) is currently developing methods which allow for air emissions characterization of PFAS, including both targeted and non-targeted analysis of PFAS. Consult with the DER project manager and the DER chemist for assistance on analyzing biota/tissue and air samples.

Data Assessment and Application to Site Cleanup

Until such time as 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

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[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.

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.

page ______ of ______

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): ______________________

<u>FOR LAB USE ONLY</u>- 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.

APPENDIX C

FIELD STANDARD OPERATING PROCEDURE FOR SUB-SLAB VAPOR SAMPLING

FIELD STANDARD OPERATING PROCEDURE #14

SUB-SLAB VAPOR SAMPLING PROCEDURES

Sub-slab vapor (SSV) sampling involves the collection of samples from the space beneath a concrete slab and above the soil column and is typically conducted within a building footprint. The procedures outlined in this Standard Operating Procedure (SOP) are designed to ensure that SSV samples are representative and have not been altered or contaminated by the sampling and handling methods. SSV sampling is generally conducted to assess the presence of volatile organic compounds (VOCs) beneath a concrete slab, but, in special cases, may also include semivolatile organic compounds, such as naphthalene, elemental metals, such as mercury, or other organic compounds, such as polychlorinated biphenyls. The user is advised to read the entire standard operating procedure (SOP) and review the project-specific site health and safety plan (HASP), project-specific Work Plan, and project-specific Quality Assurance Project Plan (QAPP) before beginning any onsite activities. In accordance with the HASP, proper personal protective equipment (PPE) must be selected and used appropriately.

Note that air sampling described in SOP #13 may be conducted in concert with sub-slab vapor sampling discussed in SOP #14 as well as soil vapor sampling discussed in SOP #15.

The standard WSP SOP was modified herein to include additional details for work conducted specifically by WSP's Government Restoration Services District, which is part of the Water & Environment Sector. Revision numbers are documented in the table below and approved by the Area Manager and District Manager.

REVISION	DATE	DESCRIPTION OF CHANGE	PREPARER	AREA MANAGER APPROVAL	DISTRICT MANAGER APPROVAL
1	3/28/23	WSP SOP was modified to include details on field sampling protocol, and leak testing	AmyMarie Accardi-Dey	Ed Dudek	Ken Goldstein

14.1 ACRONYMS AND ABBREVIATIONS

ACRONYM	DEFINITION
COC	Chain-of-Custody
HASP	Health and Safety Plan
ID	Identification
IDW	Investigation-Derived Waste
PID	Photoionization Detector
PPB	Parts-Per-Billion
PPE	Personal Protective Equipment
PSP	Project Safety Plan
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control

SOP	Standard Operating Procedure
SSV	Sub-Slab Vapor
VI	Vapor Intrusion
VOCS	Volatile Organic Compounds

14.2 MATERIALS

1. Air quality monitoring equipment (e.g., photoionization detector [PID]) with calibration reagents and standards, as needed (refer to SOP #8)
2. Portable weather station, as needed
3. Knife or scissors
4. Sample point installation materials:
5. Concrete drill or corer and appropriately sized bits (e.g., hammer drill)
6. SSV point assembly
7. Teflon®, Teflon®-lined, or stainless steel tubing
8. Tube fittings (e.g. Swagelok®, Qwik-Lok®)
9. Non-volatile sealant material (e.g., hydrated bentonite, silicone stopper, non-shrinking clay)
10. Permanent cover assembly, if necessary
11. Potable water
12. Leak testing materials, as needed:
13. Pressure test apparatus
14. Water dam
15. Water dam sealant material (e.g., bentonite pellets or modeling clay)
16. Tedlar® bags (to capture purged soil gas), as required
17. Tubing (e.g., Teflon®, Tygon®)
18. Air purging pump or syringe, as needed
19. Adjustable wrenches, as needed
20. Screwdriver, as needed
21. Air sampling pump, as needed
22. Rotometer / Inline flow meter (with stand and desired pre-calibrated flow rate), as needed
23. Glass tube cracker, as needed
24. Resealable bags, as needed
25. Plastic end caps, as needed
26. Sample management supplies
27. Decontamination supplies
28. Field notebook or field forms (refer to SOP #1)
29. Site maps and aerial photography of area to be sampled
30. PPE and copy of HASP
31. Miscellaneous supplies as necessary, including, but not limited to: writing instrument, field computer, digital camera

14.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the procedures presented in this document is mandatory for all field personnel and provides technically defensible environmental data. This SOP will provide the best opportunity for the tasks to be performed in a safe and consistent manner in accordance with federal and state guidance.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company SOP. Before working, be sure to review the project-specific Work Plan or project-specific QAPP and be aware of any applicable state and/or federal guidelines for conducting field work.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, and the Quality Management System.

This SOP is designed to provide the user with a general outline for conducting sub-slab vapor sampling and assumes the user is familiar with basic field procedures, such as recording field notes (SOP #1), utility location (SOP #2), sample shipment procedures (SOP #3), sample collection and quality assurance procedures (SOP #4), investigation-derived waste (IDW) management procedures (SOP #5), equipment decontamination (SOP #6), and calibration of monitoring equipment (SOPs #7 and #8). This SOP does not cover investigation planning, waste storage, waste characterization, or waste profiling, nor does it cover the evaluation of the analytical results. These topics are more appropriately addressed in a project-specific Work Plan or project-specific QAPP.

Consult and involve your assigned compliance professional during all phases of sampling. Do not ship hazardous waste samples without first consulting a company compliance professional.

All sampling and monitoring references must be available for consultation in the field, including:

1. Company SOPs
2. Applicable state and federal guidelines or sampling procedures
3. Manufacturer's manuals
4. Work Plan and QAPP

14.4 GENERAL PROCEDURES

14.4.1 SAFETY CONSIDERATION

Review the HASP before beginning any onsite activities. Don PPE as required by the HASP and be aware of slips, trips, and falls as well as potential splash hazards while decontaminating equipment. All "near-misses" and health and safety related incidents should be reported immediately to the Project Manager and the Corporate Health and Safety Officer. An incident report needs to be logged through the company's iSMS portal.

14.4.2 BEST PRACTICES FOR SAMPLING

SSV can be affected by temporal, structural, and meteorological factors. It is important to carefully note the use of the building and minimize the number of factors that could influence the SSV results (e.g., keeping the windows closed during the sampling). The user should also be aware that a number of regulatory agencies have specific guidelines as to timing or the sequence of the sampling activities, particularly if performed as part of a vapor intrusion (VI) investigation.

Although the specific procedures used to sample SSV vary between investigations, most sampling can be broken down into a five-step sequence:

1. Inspection (if sampling is performed within a building): a detailed survey the subject building including an evaluation of all materials used or stored in the structure that could potentially interfere with the sample collection
2. Sample Point Installation: installing the SSV point in the sub-slab material.
3. Leak Testing: testing the integrity of the SSV sample point (if required).
4. Purging: removing any non-representative vapor from the SSV sample point.

5. Sample Collection: collecting samples over a specified period (typically grab, 1-hour, 8-hour or 24-hour), using a laboratory-supplied container, such as an evacuated sample canister with the appropriate regulator, or a Tedlar® bag with an air sampling pump.

Information regarding weather conditions, including temperature, barometric pressure, wind speed and direction, and precipitation, should be noted and recorded in the field notebook during all steps. A portable weather station is often required for documenting the weather conditions. Consult the project-specific Work Plan, project-specific QAPP, and applicable regulatory guidance to determine if fixed weather monitoring during the sample collection is required.

The project team should discuss the project-specific sampling procedures and equipment in advance of site mobilization. While the investigation is underway, the project team should avoid other environmental activities which may release volatile vapors into the investigation area, including soil sampling, excavation, and groundwater monitoring.

To ensure the integrity of the samples collected, the following common procedures shall be employed:

1. The use of new, disposable or decontaminated sampling equipment
2. The use, changing, and disposal of the appropriate PPE
3. Selection of a suitable sampling location and staging area

Wear a clean pair of new, disposable gloves each time a different sample is collected and don the gloves immediately prior to collection. This limits the possibility of cross-contamination from accidental contact with gloves soiled during collection of the previous sample. The gloves must not contact the medium being sampled and must be changed any time during sample collection when their cleanliness is compromised. *In no case should gloved hands be used as a sampling device: always use the appropriate sampler to move the sample from the sampling device to the laboratory-supplied containers.*

14.4.2 PRE-SAMPLING CONSIDERATIONS

In preparing for sampling, you should perform the following activities (with all observations and measurements noted in the field notebook):

1. Perform a reconnaissance of the site to identify sampling locations listed in project-specific Work Plan or project-specific QAPP.
2. Record the approximate ambient air temperature, precipitation, wind (direction and speed), tide, and other field conditions in the field notebook. Any site-specific conditions or situations that could potentially affect the samples at the sample locations should also be recorded.
3. Record sampling locations with respect to approximate distance to and direction from at least one permanent feature.
4. Survey the breathing zone around the sampling location with a PID, as necessary (see HASP), to ensure that the level of PPE is appropriate.
5. If indoor air monitoring is being conducted, a parts-per-billion (PPB) PID meter should also be used to establish background air quality levels.
6. Establish a secure sample staging area in an uncontaminated area of the site.
7. All construction materials must be selected in accordance with the project-specific Work Plan or project-specific QAPP.
8. All field measurements must include units. Clearly state in the field notebook if measurements are recorded in the English or Metric system.

14.5 BUILDING INSPECTION AND MATERIALS SURVEY

A building inspection and materials inventory is often a prerequisite activity before initiating SSV sampling. The scope of this activity, including completion of an inspection questionnaire (with a building representative, if possible), shall be performed in accordance with the project-specific Work Plan, project-specific QAPP, and applicable regulatory guidance. Before embarking on the inspection, confirm that there are no access limitations for the inspection, sampling activities, or photography.

Components of a typical building walkthrough and survey include:

1. Identification of potential background sources of volatile compounds, such as vapor releases from neighboring properties, or materials stored within the building, such as paint, fuels, solvents, cleaners, etc. Some states may require scanning of the potential background sources with an appropriately sensitive PID.
2. Review of current and historical building operations and chemical use.
3. Assessment of the building construction and condition (e.g., whether or not a basement is present, poured or block foundation, concrete slab present, air flow, etc.).
4. Identifying areas of potential VI into a building (e.g. cracks in the concrete slab or walls, pipe penetrations, sumps, etc.).
5. Inspection and photographic documentation, if necessary, of proposed sample locations.
6. Identification of building pressure/ventilation system location and specifications.

At the conclusion of the building inspection and survey, discuss the sampling procedures with building occupants and prepare the structure for the SSV sampling in accordance with the project-specific Work Plan or project-specific QAPP. Building preparations typically include requesting that the building occupants close windows and remove sources of background VOCs (e.g., paint, fuels, solvents, household cleaners, beauty items), and that they refrain from smoking in the investigation area during sampling activities.

14.6 SAMPLE POINT INSTALLATION

Ensure each proposed SSV location is clear of potential hazards, including utilities prior to breaking the ground surface (see SOP 2). SSV points are installed through the concrete floor slab to sample the space beneath the slab and above the soil column, and are installed on ground level (slab-on-grade construction) or basement level of a structure. If the building floor is not made of concrete (e.g., earthen), you must contact the project manager to determine if soil vapor or indoor air samples are more appropriate for the conditions encountered in the field. The samples are typically collected through a small diameter (typically less than 1-inch) core hole drilled in the concrete floor to allow access to the soil and soil vapor directly beneath the slab. Before drilling, inspect the proposed location for potential hazards, including utilities (see SOP 2). In buildings with an earthen floor on the lowest level, consult the project-specific Work Plan, project-specific QAPP, and applicable regulatory guidance to determine if SSV samples collected from the available concrete area (e.g., concrete pads beneath a furnace, hot water heater, or other equipment) should be collected concurrently with either air samples (SOP #13) or soil vapor samples (SOP #15) collected from the space overlying the earthen floor.

Depending on the type of SSV sample point selected for the project, one or two concentric holes are drilled in or through the concrete slab with a hammer drill (or similar). If two holes are drilled, first the larger diameter hole (typically 1-inch), is advanced from the ground surface to a depth of approximately 1 inch to 2 inches deep. This hole will serve as an annular space to be filled with a seal (e.g., hydrated bentonite, a silicone stopper, or non-shrinking, non-volatile clay) or to house a flush-mount cover. Once the outer hole is complete, a second, smaller diameter hole (typically 3/8-inch) is drilled through the center of the outer hole, and advanced through the concrete slab and into the sub-slab material (e.g., soil, gravel); the thickness of the concrete should be recorded in the field notebook. The intent is to create a small space suitable for insertion of the sampling tubing or soil vapor sampling implant (if required) below the slab. Once the targeted depth has been reached, remove the drill from the hole and use a hand vacuum or shop vacuum to remove concrete dust from the hole and surrounding work area.

Next, based on the slab thickness, construct the SSV point; typically, the base of the point extends through the slab. SSV points can be purchased from various manufacturers, constructed of stainless steel tubing and various fitting, or constructed of simply Teflon®/Teflon®-lined tubing. If using purchased points, place the assembled point into the hole, and seal in place as per manufactures instructions. If assembling points by hand, place a small amount of clay or a silicon stopper on the point where, when inserted, the outer hole meets the inner hole (i.e., slab thickness less 1- to 2-inches). Insert assembled point into the hole snugly to create an airtight seal. The seal can be augmented, if necessary, by adding a non-shrinking, non-volatile material, such as modeling clay or grout. SSV points can be completed with protective covers (flush-mount preferred) for permanent points. Attach the appropriate fittings (e.g., a 3-way valve) and additional tubing, as necessary, and seal the point. Be sure that the tubing is clamped or otherwise closed off to avoid discharging vapor to the air.

Sampling must not be performed until the subsurface equilibrium has been re-established below the slab and, if sampling indoors as part of a VI investigation, any vapors that have escaped from the subsurface during the implant installation have had a chance to dissipate. Since soil vapor points are temporary and sealed, there is no wait time for establishing equilibrium in soil gas if the point is purged. However, some projects may require equilibration time; equilibrium is typically re-established approximately 24 hours after the sample point installation, or as otherwise specified in the project-specific Work Plan or project-specific QAPP.

14.7 LEAK TESTING PROCEDURES

If required, the integrity of the seal between the concrete slab and the SSV point and sample train can be verified using a water dam and a pressure manifold. This type of leak testing is typically performed before sampling and involves creating pressure on the fittings to the Summa canisters and a water dam over the SSV sampling apparatus (such as a Colvin-Cox Vapor Pin®) installed through the concrete floor. Constant pressure on the system and a lack of water leaks will ensure that the system is tight and no ambient air is cross-contaminating the vapor samples.

The user should verify the leak testing procedures in the project-specific Work Plan, project-specific QAPP, or relevant regulatory guidance.

The leak testing procedures are as follows:

1. Cut a piece of sampling tubing no shorter than 2 inches long and place it on the vapor pin installed through the slab. This can also be done prior to installing the collar. Install a valve on the tubing.
2. Firmly attach the regulator to the Summa cannister, be sure not to strip the threads, and seat the regulator before trying to screw on the nut.
3. Attach the regulator to the pressure manifold using sampling tubing.
4. Attach pressure manifold to the vapor pin using sampling tubing.
5. Make sure all valves are open at this point, except for the main valve on the Summa canister, which must remain fully closed sampling begins.
6. Place a water dam (PVC pipe collar or similar) around the Vapor Pin and seal the bottom with a non-VOC-containing medium, such as bentonite pellets or modeling clay.
7. Use deiozized or distilled water to fill the water dam to a point above the tubing and valve connection closest to the vapor pin.
8. Attach a vacuum pump to the pressure manifold; close the valve at the vapor pin and ensure the Summa canister valve is still closed.
9. Using the hand pump, create a positive pressure of between 5 and 10 psi in the system.
10. Close the valve closest to the hand pump.
11. Watch the gauge to make sure pressure doesn't drop (at least 30 seconds).
12. Once the system has been confirmed to be leak free remove the hand pump.
13. Connect a low-flow air pump (SKC sample pump or similar) to the discharge end of the pressure manifold and purge the system of three volumes of air while not exceeding a flow rate of 200 milliliters per minute. The volume is calculated as follows: Purge Volume (milliliters) = $(3 * \pi * r^2 * h)$, where *r* is the inner radius of the vapor pin and connecting tubing in centimeters, and *h* is the total length of the pin and tubing in centimeters. Be sure to use appropriate conversion factors if not using centimeters and milliliters ($1\ cm^3 = 1\ mL$).
14. Prior to purging, connect a Tedlar bag (or equivalent) to the exhaust on the pump to avoid discharging subslab vapor to the indoor air space. The Tedlar bag may later be connected to a photoionization detector (or equivalent) outside of the structure to measure the initial head-space reading beneath the slab. Do not discharge the contents of the Tedlar bag to the interior of the structure if indoor air quality testing is going to be performed.
15. After completing purging, close the valves around the pressure manifold, remove the pump, and open the valve to the vapor pin.
16. Begin sample collection per below.

14.8 SSV SAMPLE COLLECTION

SSV samples are collected using clean, evacuated stainless steel canisters (e.g., Entech-style or SUMMA®-equivalent), or active (requires a pump) equipment, such as a Tedlar® bag, charcoal tubes, and electric/hand-powered pump. The canister sampling equipment typically includes a canister under vacuum, a flow regulator with an in-line vacuum gauge, and in-line particulate filters. The flow regulator is pre-set by the laboratory to collect a sample over the collection period specified in the project-specific Work Plan or project-specific QAPP. Instructions for connecting the sample canister to the flow regulator are typically provided by the laboratory. Charcoal tubes require an active pump that needs to be calibrated to set/verify flw rates. Tedlar® bag sampling is only appropriate for “grab” samples.

At each sampling location, record the initial conditions at the sample location in accordance with the project-specific Work Plan or project-specific QAPP, often including the weather conditions (e.g., precipitation, barometric pressure, and indoor and outdoor temperature), PID readings, and any observations. Record sample locations with respect to a permanent feature and record a description of the sampling location.

Collect quality assurance/quality control (QA/QC) samples in accordance with SOP #4 and the project-specific Work Plan or project-specific QAPP. Duplicate samples may be collected by using a “T” fitting attached to the sample tubing.

14.8.1 CANISTER SAMPLING

1. Don PPE per HASP.
2. Connect the sample canister to its dedicated[1] , pre-set flow controller with an in-line vacuum gauge. If using a SUMMA®-equivalent canister, tighten (hand-tight) the fitting with adjustable wrenches. Do not overtighten. If using an Entech-style canister, connect the canister to the flow controller by sliding back the collar on the female end of the regulator’s fitting and inserting it into the male end of the canister’s fitting.
3. Ensure that the canister is in a stable position and will not fall or be relocated during the sampling process. Place physical and visual barriers around the canisters, as necessary, so they are not disturbed during sample collection.
4. Open the appropriate valve port on the SSV discharge tubing to allow vapor flow from the SSV point to the sample canister.
5. Open the canister’s intake valve, record initial vacuum, and begin sample collection. Do not use canisters that show unacceptable initial vacuum readings.
6. Affix a sample tag or label to each sample container and complete all project required information (sample number, start date, start time, sampler’s initials, analysis, initial vacuum readings, and place of collection).
7. As possible, check the canister vacuum gauge reading at least once during the sample collection period to ensure the canister’s pressure is changing at the appropriate rate. If the canister’s pressure is not changing at the appropriate rate, contact your project manager.
8. Once the sample collection period is completed, record the final vacuum, close the canister’s intake valve, close the valve port connected to the SSV discharge tubing, disconnect the sample canister’s intake port to the tubing from the SSV point, and disconnect the pre-set flow controller from the canister. Residual vacuum should be measurable after the collection period is completed; recommended residual vacuum is typically between -2 and -5 inches of mercury. Field crew should check with laboratory for the final vaccuum pressure of the canister before disconnecting. The sample results may be subject to rejection during validation if vacuum was not maintained during the entire sample collection period. If vacuum readings are outside of the recommended range, inform your project manager as soon as possible. Enter the remaining information on the sample label and field notebook (stop date, stop time, and final vacuum reading).
9. Record the final conditions at the sample location in accordance with the project-specific Work Plan or project-specific QAPP, often including the weather conditions (e.g., precipitation, barometric pressure, and indoor and outdoor temperature), PID readings, and any observations (e.g., odor, staining, or spills).

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[1] Some laboratories match and pre-test specific flow controller and canister assemblies at the laboratory prior to shipment to the field for sample collection; be sure to assemble the equipment in the field using the matched components.

14.8.2 TEDLAR® BAG SAMPLING

1. Don PPE per HASP.
2. Attach a new, appropriately-sized section of Teflon® or Teflon®-lined tubing to the air sampling pump.
3. Purge the tubing by operating the pump in accordance with the manufacturer's specifications (this will remove whatever air was present in the tube and pump mechanism allowing the air to be sampled to enter the sampling assembly).
4. Connect the pump's intake to the SSV discharge tubing, and the pump's discharge to the Tedlar® bag sample port.
5. Open the Tedlar® bag valve and the appropriate valve port for the SSV discharge tubing to allow air flow from the SSV point to the Tedlar® bag.
6. Turn on the air sampling pump (or use the hand-powered pump) and begin filling the Tedlar® bag. Ensure the air sampling pump's flow rate meets any requirements in the project-specific Work Plan, project-specific QAPP, or regulatory guidance, using a calibrated air sampling pump or inline flow meter.
7. Once the Tedlar® bag is approximately two-thirds full, close the valve on the Tedlar® bag and the valve on the SSV discharge tubing.
8. Discontinue pumping and disconnect the air sampling pump from the Tedlar® bag.
9. Affix a sample tag or label to each sample container and complete all project required information (sample number, date, start/stop time, sampler's initials, analysis, and place of collection).
10. Record the final conditions at the sample location in accordance with the project-specific Work Plan or project-specific QAPP, often including the weather conditions (e.g., precipitation, barometric pressure, and indoor and outdoor temperature), PID readings, and any observations (e.g., odor, staining, or spills).

14.9.3 CHARCOAL TUBE SAMPLING

1. Don PPE per HASP.
2. Calibration
   - A. Assemble calibration train comprised of a sampling pump, rotometer, calibration tube and Tygon® tubing. The calibration tube should be a representative tube from the same lot of charcoal tubes that will be used for sampling.
   - B. Turn on the pump and adjust flow using the flow adjustment mechanism on the pump until float ball on the rotometer is aligned with the desired flow rate.
   - C. Affix a sticker to pump indicating the flow rate.
   - D. Remove the calibration tube.
3. Field Sampling
   - A. Remove the end plugs from the charcoal tube.
   - B. Connect to the charcoal tube to the sample pump using Tygon® tubing, verifying the correct air flow direction.
   - C. Start the sample pump and record the start time.
   - D. After the desired duration, stop the pump and record the end time.
   - E. Disconnect Tygon® tubings from charcoal tube.
   - F. Replace end plugs on both ends of the charcoal tube.
   - G. Record the sample ID, tube ID and the collection date/time on the COC and field notebook. In addition, record weather data (ambient temperature, barometric pressure, relative humidity) in the field notebook.
4. Verify Calibration: Following sample collection activities, reattach rotometer and representative tube into the pump and measure the post-sampling flow rate. Record post-sampling flow rate, which should match within 10% of the pre-sample flow rate.

14.9 SAMPLE LABELING AND PREPARATION FOR SHIPMENT

Once sample collection is complete, prepare the air sample canisters for offsite laboratory analysis in accordance with SOP #3 and guidelines below:

1. Clean the outside of the sample container, if necessary.
2. Ensure all required information is completed on each sample label (see above).
3. Record the sample designation, date, time, and the sampler's initials in the field notebook and on a sample tracking form, if appropriate.
4. Complete chain-of-custody (COC) forms with appropriate sampling information:
    A. Location
    B. Sample Identification (ID)
    C. Sample collection start and end date and times
    D. Initial vacuum measurement, if applicable
    E. Ending vacuum measurement, if applicable
    F. Sample regulator number, if applicable
    G. Sample canister number, if applicable
    H. Analytical method
5. Complete sample packing and ship in accordance with proper procedures. Note that air samples are typically shipped under ambient temperatures.

14.10 CLOSING NOTES

Once field activities are complete, secure the site in accordance with the project-specific Work Plan. Decontaminate field equipment prior to departing site or returning field equipment per SOP #6. Properly manage all PPE and IDW in conformance with SOP #5, the project-specific Work Plan, and applicable regulations before departing site. Refer to the project-specific Work Plan if any site restoration is warranted at the completion of field work. Ensure that all field notes are complete and accurately depict field work prior to departing site.

APPENDIX D

SITE-SPECIFIC HEALTH AND SAFETY PLAN

(Provided Separately)