# Field Activities Plan (FAP) Addendum

Nostrand Avenue Groundwater NYSDEC Site No. 224433
(390 Nostrand Avenue, Brooklyn, New York 11216)

New York State Department of Environmental Conservation

Project number: 60754071

October 2025

NYSDEC
625 Broadway 12th Floor
Albany, New York 12233

## Revision History

| Revision | Revision date | Details | Authorized | Name | Position |
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# CERTIFICATION

*I Robert Forstner, certify that I am currently a New York State Registered Professional Engineer (License No. 080989) as defined in 6 NYCRR Part 375 and that this Field Activities Plan Addendum was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and DER Green Remediation (DER-31).*

Signature

November 12, 2025
Date

## Prepared for:

New York State Department of Environmental Conservation
NYSDEC
625 Broadway 12th Floor
Albany, New York 12233

## Prepared by:

Cary Friedman
Project Manager

M: 646-739-0054
E: cary.friedman@aecom.com

AECOM
605 Third Avenue
New York, NY 10158
aecom.com

# Table of Contents



## Figures



## Tables



## Appendices

Appendix B Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) – (NYSDEC April 2023)

# 1. Introduction

This Field Activities Plan (FAP) Addendum has been prepared to outline the procedures for the implementation of field activities under this work assignment. This work is being implemented under the New York State Department of Environmental Conservation (NYSDEC) Contract D009803.57 Multi-Site Site Characterization Brooklyn/Bronx. This FAP Addendum describes the planned scope of work for the Nostrand Avenue Groundwater Site (NYSDEC Site No. 224423) (Figure 1). In addition to the field activities described in this document, all personnel will comply with the project Quality Assurance Project Plan (QAPP), project Health and Safety Plan (HASP), and the scope of work and time schedule outlined in AECOM's scope of work and time schedule approved by NYSDEC.

## 1.1 Scope of Work Objectives

Field activities are planned to complete the site characterization of off-site portions of the Nostrand Avenue Groundwater (NYSDEC Site No. 224423). Work will be conducted in general accordance with NYSDEC DER-10, Technical Guidance for Site Investigation and Remediation (NYSDEC, 2010), New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, 2006), and NYSDEC PFAS Sampling and Analysis Guidance (April 2023).

## 1.2 Site Description and Background

Available site information has been reviewed in preparation of the scope of work outlined in this FAP Addendum. The Nostrand Avenue Groundwater Site Characterization is the investigation of off-site areas in the vicinity of a previous investigation conducted at the property located at 390 Nostrand Avenue, Brooklyn, New York 11216 (NYSDEC Site No. C224418).

The property at 390 Nostrand Avenue was investigated during redevelopment of the parcel. Soil and groundwater sampling indicated the presence of chlorinated Volatile Organic Compounds (VOCs) in groundwater and soil vapor beneath the site. The highest groundwater concentration of chlorinated VOCs was detected in an off-site, cross gradient monitoring well near the northwest corner of Nostrand and Gates Avenues. The off-site cross gradient detection, as well as the absence of chlorinated VOCs in subsurface site soils, suggested an off-site unknown source of contamination.

The primary chlorinated compounds detected during the investigation were Tetrachloroethylene (PCE) and Trichloroethylene (TCE) which are two widely used compounds associated with dry cleaning of clothing, degreasing of metal parts, and as a component in adhesives and paint removers.

AECOM's scope of work for this site characterization includes the investigation of off-site areas adjacent to the 390 Nostrand Avenue property to try and determine the source of the chlorinated VOCs detected in the localized groundwater and soil vapor during the 390 Nostrand Avenue investigation.

# 2. Preparatory Field Activities

## 2.1 Historical File Review

Site history research was conducted via a review of records from EDR (Environmental Database Reports, Inc) during development of this scope of work. Those records included historical Sanborn Fire Insurance Maps, historical topographic maps, historical aerial photographs, a building permit report, city directory report, lien search, property tax map, and a radius map search of several databases for records within 1 mile of the site.

The review revealed several records for the property located at 390 Nostrand Avenue including the recent investigation history for the 390 Nostrand Avenue site conducted under oversight from New York City Office of Environmental Remediation (NYC OER) that revealed the chlorinated solvent contamination in groundwater and soil vapor. The record review also included the 390 Nostrand Ave site's active AST records for on-site storage of fuel oil, a historical petroleum spill from 2001 (Spill No. 0108675) that was closed in 2003, and RCRA EPA ID records related to disposal of Investigation Derived Waste (IDW).

A review of adjacent property records indicated several historical petroleum spills upgradient and downgradient of the 390 Nostrand Avenue site. Two historical dry cleaners were located within 200ft of the 390 Nostrand Ave property. The property located at 337 Nostrand Avenue, approximately 134ft north/northeast which is upgradient or cross-gradient from the 390 Nostrand Avenue site operated as a dry cleaner between 1992 and 2010. Prior to that 337 Nostrand Avenue was operated as a leather dye facility. The property located at 386-388 Nostrand Avenue, just north of 390 Nostrand Avenue, operated as a dry cleaner between 1928 and 1970 as well as a car service center around 1970. After that the 386-388 Nostrand Avenue property was operated and is currently operating as a deli/restaurant. Both of these former dry cleaning operations are potential sources of the chlorinated solvent contamination discovered during the investigation of 390 Nostrand Avenue.

Additional historical site research details will be presented in the Site Characterization Report for this site.

## 2.2 Health and Safety

It is anticipated that all work at this site will be completed in Level D personal protection. Should health and safety monitoring during field activities warrant an upgrade in protection, work will stop, and site conditions will be re-evaluated by NYSDEC and AECOM.

A project-specific Health and Safety Plan has been developed to cover activities at this site and others planned as part of the Multi-Site Site Characterization under this WA-57.

## 2.3 Utility Clearance

Prior to intrusive activities, including but not limited to, soil borings and monitoring well installations, the drilling subcontractor will be tasked with contacting UDig NY for New York City and Long Island, 811 or 1-800 272-4480 for utility markouts to minimize the risk of encountering subsurface utilities. AECOM will obtain copies of the markout contacts and verify that the markouts are complete prior to the start of intrusive work.

## 2.4 Permitting

All planned work locations for the Nostrand Avenue Groundwater site are currently proposed to be through sidewalks on public property. Prior to the start of work, the drilling contractor will obtain sidewalk permits (known as street opening permits) from the New York City Department of Transportation (NYC DOT) for authorization to begin work. Copies of the permits will be provided to AECOM.

# 2.5 Green and Sustainable Remediation

The work to be completed will comply with NYSDEC guidance documents including DER-31: Green Remediation (2010b). To ensure compliance with DER-31, the work will be completed using best management practices (BMPs) and techniques. BMPs to be employed for this site will include, but are not limited to the following:

- Use renewable energy where possible;
- Reduce vehicle idling;
- Use of Low Sulfur Diesel Fuel (LSDF) or alternate fuels (i.e., biodiesel or E85);
- Sequence work to minimize double-handling of materials;
- Use energy efficient systems; and
- Minimize the use of paper via electronic data gathering devices.

As part of complying with elements of DER-31 guidance, the Site Characterization Report for this work will include an assessment of climate vulnerability to evaluate the impact of climate change on the project site, including (but not limited to) extreme weather events, flooding, and sea level rise.

Additionally, an Environmental Footprint Analysis (EFA) will be completed to evaluate elements of the SC work as it relates to water consumption, greenhouse gas emissions, renewable and non-renewable energy, and waste reduction. The analysis will be completed using an accepted environmental footprint analysis calculator such as SiteWise™.

# 3. Field Activities

The following subsections detail the planned field activities as part of the Nostrand Avenue Groundwater Site Characterization. The proposed Scope of Field Work is detailed in the following subsections and is depicted on Figure 2.

## 3.1 Geophysical Survey

A geophysical survey of each boring/monitoring well location will be conducted by a qualified subcontractor to obtain information on subsurface conditions, utilities, obstructions, or other notable features. The primary survey technology will be Ground Penetrating Radar (GPR). GPR utilizes high frequency radio waves to acquire subsurface information. From a small antenna, which is moved slowly across the ground surface, energy is radiated downward into the subsurface. This energy is then reflected back to the receiving antenna, where variations in the return signal are continuously recorded. This produces a continuous cross-section of the shallow subsurface conditions. Radar responds well to the different electrical properties between rock units, soils, groundwater, and most importantly for this application, buried pipes, utilities, and foundations. It should be noted that GPR technology can be limited by rebar re-enforced concrete which is expected to be encountered at all sidewalk drilling locations.

## 3.2 Soft Dig / Vac-tron®

Soft dig / Vac-tron® techniques will be utilized to open the sidewalk to check for subsurface/shallow utilities to reduce the chance of impacts or damage to active utilities. The general procedure is as follows:

1. Excavate a two-foot square by approximately five-foot deep area manually using post-hole diggers, pry bars, soil knifes, and/or hand digging, along with the Vac-Tron® unit.

2. After the location is cleared for drilling, the hole will be backfilled flush with the sidewalk using the excavated spoils (small rocks and debris removed) and if necessary, temporarily patched with blacktop patch or concrete unless drilling is to begin immediately.

3. Excavated material not returned to the hole will be drummed along with the monitoring well boring spoils for proper disposal.

## 3.3 Community Air Monitoring

Community air monitoring will be performed as outlined in the NYSDOH Generic Community Air Monitoring Plan (CAMP), unless it is determined by NYSDEC that a site-specific air monitoring plan is required, or that some of the provisions of the CAMP are not appropriate for a specific site in this multi-site program.

### 3.3.1 Continuous Air Monitoring

Continuous monitoring for VOCs and particulates will be required for ground intrusive activities associated with the site, including, but not limited to, the installation of soil borings and groundwater monitoring wells.

VOC monitoring will be conducted at the downwind perimeter of the immediate work area on a continuous basis. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. VOC monitoring will be performed using a MiniRAE 3000 or equivalent, which is appropriate to detect a wide range of contaminants typically encountered. The MiniRAE 3000 will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The MiniRAE 3000 is capable of calculating 15-minute running average concentrations, which will be compared to the action levels specified below.

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the work area at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring

equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) such as a Thermo MIE pDR-4000 DataRam or equivalent. The Thermo MIE pDR-4000 DataRam is a real-time monitoring equipment capable of measuring particulate matter less than 10 microns (µm) in size [PM-10] and capable of integrating over a period of 15 minutes for comparison to the airborne particulate action level. The Thermo MIE pDR is equipped with an audible alarm to indicate exceedance of the action level. In addition to using the Thermo MIE pDR-4000 DataRam, fugitive dust migration will be visually assessed during work activities. If particulate concentrations at the upwind station are higher or equivalent to concentrations at or downwind of work areas, then continuous air monitoring may be discontinued, as approved by NYSDEC.

Real time readings will be collected and recorded in field notes to supplement the automatic data logging from the PID and particulate monitors.

# 3.3.2 Action Levels and Response

This subsection identifies the action levels and corresponding responses for concentrations of VOCs and particulates detected during the field activities associated with a site.

## 3.3.2.1 Volatile Organic Compounds

If the ambient air concentration of total organic vapors at the downwind perimeter of the work area exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted, and monitoring will continue. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.

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

If the organic vapor level is above 25 ppm at the perimeter of the work area, field activities will be shut down.

All 15-minute readings will be recorded and be available for NYSDEC and NYSDOH personnel to review. Instantaneous readings (if any) used for decision purposes will also be recorded.

## 3.3.2.2 Particulates

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

If, after implementation of dust suppression techniques, the downwind PM-10 particulate levels are greater than 150 µg/$m^3$ above the upwind level, work will be stopped, and a re-evaluation of activities initiated. Work will resume provided that 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.

Similar to the VOC readings, particulate readings will be recorded and be available for state (NYSDEC and NYSDOH) and/or city health personnel to review.

# 3.4 Drilling Procedures

The Nostrand Avenue Groundwater Site Characterization includes the installation of soil borings and monitoring wells. Borings will be advanced by direct push (geoprobe) methods and HSA (Hollow-Stem Auger) methods will be utilized to install monitoring wells.

## 3.4.1 Direct Push Soil Borings

Soil samples will be collected at specific locations identified on Figure 2. Each boring will include continuous sampling from 5 feet below ground surface (bgs) to a maximum depth of 50 feet bgs (based on previous investigations). Samples will be collected in 5-foot increments (macrocores) using the following general procedures.

1. Inspect the sampling equipment to ensure proper working condition.
2. Insert dedicated disposable acetate liner into the sampler and select additional components for the¬ sampler as required (i.e., leaf spring core retainer for clays, or a sand trap for non-cohesive sands).
3. Lower the sampler to the ground surface, or bottom of the hole previously made by the sampler and check the depth against length of the rods and the sampler.
4. Attach the drive head assembly to the sample rods.
5. Push the sampler in increments up to 5 feet into the subsurface up to the desired depth with a hydraulic press.
6. Rotate the sampling rods clockwise and remove the sampler.
7. Split the sample lengthwise and screen the soil with a PID for volatile organic vapors.
8. Abandon the direct-push boring by backfilling with bentonite pellets and hydrate with potable water or use concrete patch in impervious areas, unless a monitoring well is installed at a given location.

## 3.4.2 Hollow-Stem Auger Drilling

Hollow-Stem Auger drilling procedures will be utilized to install monitoring wells in the same locations as the soil borings to facilitate the installation of monitoring wells using the following general procedures.

1. The drill rig will be inspected for oil leaks and any leaks reported prior to starting drilling operations.

2. Advance the boring by rotating and advancing the HSAs to the desired depth.

3. Remove the center plug from the HSAs and install the monitoring wells as per the specifications detail in Section 3.5.

# 3.5 Monitoring Well Installation and Development

Monitoring wells will be installed at each soil boring location as shown on Figure 2. Each well is planned to be installed to a depth of 50 feet bgs and developed by the drilling subcontractor. The following procedures and specifications for well construction and development are detailed in the following subsections.

## 3.5.1 Monitoring Well Installation

The groundwater monitoring wells will be installed during this investigation using the procedures described below.

1. Advance subsurface boring to the desired depth by means of hollow-stem auger drilling.

2. Remove center plug from augers and verify borehole depth using weighted measuring tape.

3. Add washed and graded medium sand as needed to base of borehole.

4. Insert 10 feet of 10-slot well screen and riser pipe into boreholes through the hollow stem augers. Cap the riser to prevent well construction materials from entering the well.

4. Add sand to screen section of well while slowly removing augers. Sand pack should extend at least two feet above the top of the screen section. Measure with a tape.
5. Slowly add bentonite pellet seal to borehole as augers are slowly removed. The bentonite seal should extend at least two feet above the top of the sand pack section. Measure with tape.
6. If bentonite seal is placed above the groundwater level within the borehole, add water to the borehole to hydrate the bentonite pellets. Allow pellets to hydrate for at least 30 minutes.
7. Mix cement/bentonite grout per manufacturer's specifications.
8. Add grout to borehole through tremie pipe or hose from the top of the bentonite seal to the ground surface.
9. Remove remaining augers from the borehole.
10. Top off grout in borehole. Grout should extend to approximately two feet below ground surface.
11. Cut well-riser pipe to about three feet above the ground surface for stickup type wells. Flush-mount well risers should be cut off just below surface grade.
12. Backfill the remaining two feet of the borehole with concrete.
13. Install a protective flushmount casing over the well riser pipe and set it into the concrete backfill.

### 3.5.2 Monitoring Well Development

Each monitoring well that is installed will be developed by the drilling subcontractor at least 24 hours after installation. Wells will be developed by pumping until the discharged water is relatively sediment free. Additionally, geochemical parameters (including temperature, Ph, dissolved oxygen, specific conductance, and turbidity) will be continuously monitored during well development. Wells will be considered developed when geochemical parameters are stabilized (within 10% or less and turbidity reaching less than 50 NTUs) for three consecutive readings, a minimum of five well volumes is removed from the well, or the well is pumped for at least two hours (whichever occurs first). Well development activities will meet the requirements of DER-10 Section 3.13(c(4). A well development log will be kept electronically for each well that is installed and developed (Appendix A).

## 3.6 Investigation Derived Waste (IDW) Management

The soil boring and monitoring well installation and sampling will generate IDW that includes soil cuttings, development/purge water, and concrete/asphalt. All IDW will be contained in DOT rated 55-gallon steel drums. Drums will be staged near the work areas and picked up for disposal on a daily basis unless the drums are able to be stored/staged on private property and secured from the public/pedestrian traffic and with approval from NYSDEC. Since work will begin without existing analytical data, all drums will be transported off-site as f-listed Hazardous waste. Samples of soil and water will be collected for waste characterization purposes during the field program so IDW can be transported off-site as non-hazardous waste as soon as possible, where analyses confirm the IDW meets that criteria.

Waste manifests must accompany the IDW during shipment off site for disposal. For non-hazardous waste, a non-hazardous waste manifest must be completed. For hazardous waste, a Uniform Hazardous Waste Manifest (USEPA Form 8700-22) must be completed, along with a Land Disposal Restriction Notification Form 1. IDW manifests can be signed by AECOM personnel as agents for the generator (NYSDEC).

## 3.7 Survey

At the conclusion of all boring and well installation activities, a New York State licensed surveyor will be mobilized to the site to collect elevation and location data. They will survey all boring and monitoring well locations, building outlines, curb lines, marked utilities and any other site features that may impact the site. All monitoring wells will be surveyed for their location as well as the elevation at the ground surface, the top of the out casing, and the top of the inner casing (well riser). Horizontal datum will be referenced to North American Datum 1983 (NAD 83), New York State Plane Coordinate System, East Zone #3101. Vertical datum will be referenced to the North American Vertical Datum 1988 (NAVD 88). The survey data will be used to develop mapping as well as groundwater flow direction and gradient.

# 4. Soil and Groundwater Sampling

## 4.1 Subsurface Soil Sampling

Soils are classified for engineering purposes according to the Unified Soil Classification System (USCS) adopted by the U.S. Army Corps of Engineers and U.S. Department of the Interior Bureau of Reclamation. Soil properties that form the basis for the USCS are:

- Percentage of gravel, sand, and fines;
- Shape of the grain-size distribution curve; and
- Plasticity and compressibility characteristics.

Soil samples collected during boring advancement will be visually identified. Soil properties required to define the USCS classification of a soil and other observed characteristics normally identified in describing a soil are defined below:

a. Color
b. Moisture conditions
c. Grain size
   i. Estimated maximum grain size
   ii. Estimated percent by weight of fines (material passing No. 200 sieve)
d. Gradation
e. Grain shape
f. Plasticity
g. Predominant soil type
h. Secondary components of soil
i. Classification symbol
j. Other features such as:
   - organic, chemical, or metallic content;
   - compactness;
   - consistency;
   - cohesiveness near plastic limit;
   - dry strength; and
   - source - residual, or transported (aeolian, water borne, glacial deposit, etc.)

All soil cores will also be screened with a photoionization detector (PID) with the appropriate ionization lamp for the targeted contaminants (PCE/TCE). All soil observations will be recorded in a boring log (Appendix A).

### 4.1.1 Soil Analytical Samples

Analytical soil samples will be collected at each location. Up to three samples will be collected from each boring based on the following criteria:

- One sample from the interval at the water table interface;
- One or two samples will be collected from the intervals with the highest indications of contamination (PID response, visual, or olefactory), if present. If there are no indications of contamination, one sample will be collected from the bottom of the boring.

At least one blind duplicate sample and one Matrix Spike/Matrix Spike Duplicate (MS/MSD) sample will be collected for quality control/quality assurance purposes.

Each soil sample will be collected following the protocols described in the Project's QAPP and on Table 1 attached to this document. Soil samples will be analyzed by a New York State ELAP Certified Laboratory for VOCs (EPA 8260).

# 4.2 Groundwater Sampling

Groundwater sampling will be conducted to evaluate the extent of groundwater contamination. Proposed sampling locations are shown on Figure 2 and the proposed analytical summary is provided in the project QAPP as well as Table 1 attached to this document.

Proposed monitoring wells will be sampled in accordance with *Groundwater Sampling Guidelines for Superfund and RCRA Project Managers* (USEPA OSWER 542-S-02-001). The default groundwater sampling method will be in accordance with EPA's low stress (often referred to as low flow) sampling technique (EPA, 1998).

Prior to beginning groundwater sampling activities, the depth to groundwater will be measured at all accessible monitoring wells. The water level data will be used in conjunction with elevation data collected by a licensed surveyor after the completion of drilling to confirm the groundwater flow direction and gradient of the investigation area.

Monitoring well purging will be completed using the low-flow purging technique as follows:

1. The well cover will be unlocked and carefully removed to avoid having any foreign material enter the well. The interior of the riser pipe will be monitored for organic vapors using PID. If a reading of greater than 5 ppm is recorded, the well will be vented until levels are below 5 ppm before purging begins.

2. Using an electronic interface probe/water level detector, the water level below top of casing will be measured. The depth of the well will be measured to determine the volume of water in the well. The bottom of the well will also be checked for DNAPL using the interface probe/water level indicator. The end of the probe will be decontaminated between wells.

3. Calibrate field instruments (e.g., pH, specific conductance, PID, turbidity).

4. Purge the required water volume (i.e., until stabilization of pH, temperature, specific conductivity, and turbidity) using a low-flow pump (e.g., Solinst or Geopump) and dedicated HDPE tubing. New dedicated tubing will be used for each well.

5. Purge the well until the water quality parameters have stabilized. The stabilization criteria are: specific conductivity - 3% full-scale range; pH - 0.10 pH unit; dissolved oxygen – 10%;, Turbidity – 10% and oxidation/reduction (redox) potential - +/- 10 units.

6. Purging of three well volumes is not necessary if the indicator parameters are stable. However, at least one (1) well volume must be purged before sampling can begin. During purging, it is permissible to by-pass the flow cell until the groundwater has cleared.

7. Indicator parameters of pH, conductivity, dissolved oxygen, oxidation/reduction (redox) potential, turbidity, and temperature must be measured continuously using the flow cell.

8. Well purging data are to be recorded in the field notebook and on the Low Flow Purge Log (Appendix A).

9. The sample will be collected once indicator parameters are stable for three consecutive readings.

### 4.2.1 Groundwater Analytical Samples

Groundwater samples will be collected from each monitoring well location as described in the section above as well as the project-specific QAPP and Table 1 attached to this document. Each sample will be submitted for the following analyses:

- VOCs (EPA 8260)
- PFAS (EPA 1633A)
- 1,4-Dioxane (EPA 8270 SIM)

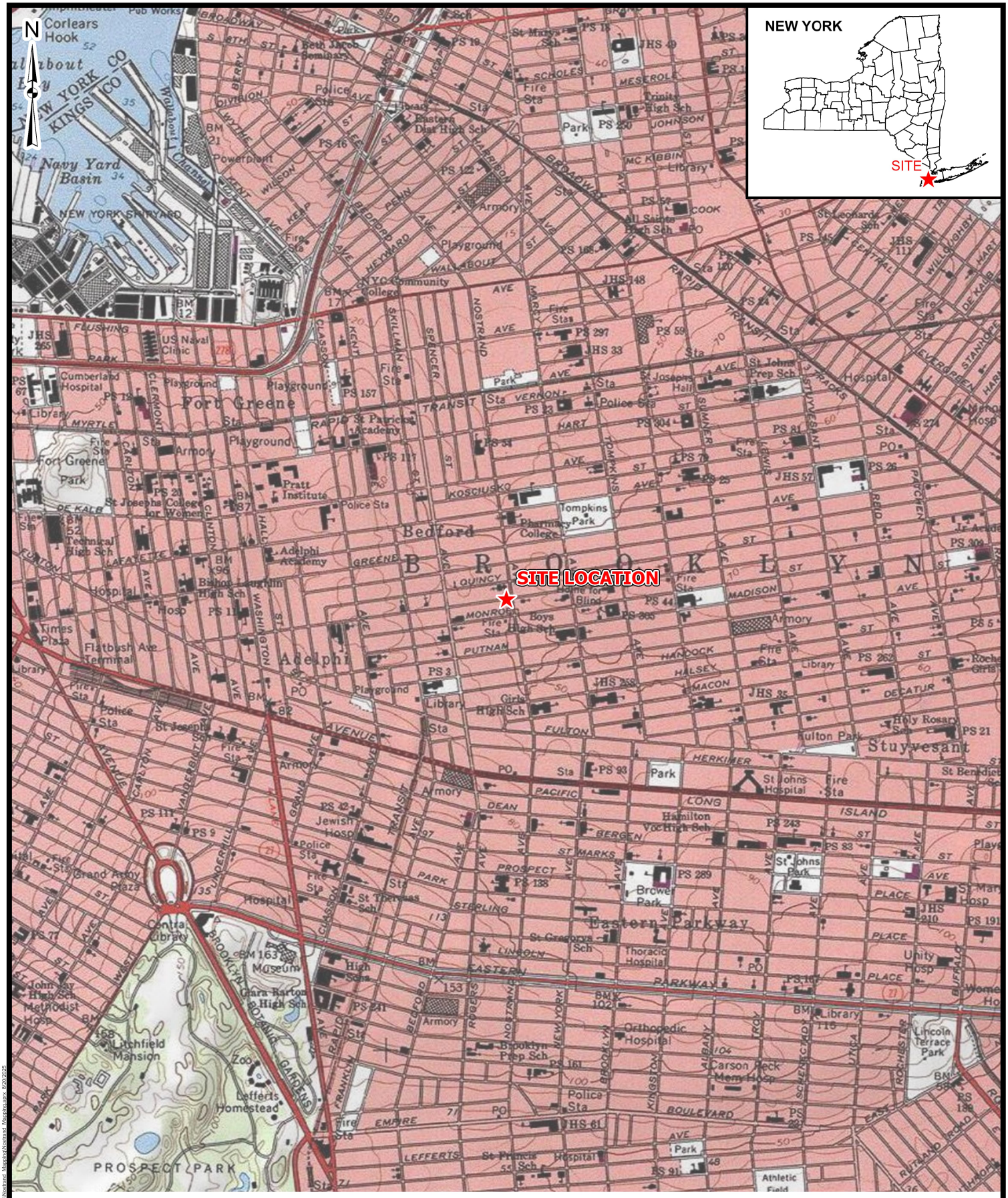
Quality control samples in the form of one blind duplicate and one MS/MSD sample will also be collected. A trip blank will also be kept with each batch of investigation samples sent to the laboratory and analyzed for VOCs.

PFAS sampling protocols will be utilized for all groundwater sampling activities and sampling protocols will be in accordance with NYSDEC PFAS Sampling and Analysis Guidance (April 2023). The PFAS guidance is attached to this document in Appendix B).

# 5. Reporting

Daily activities, including CAMP data will be provided to the NYSDEC and NYSDOH project managers on a daily basis during the field investigation. All of the activities and data gathered during the activities described in this document will be presented in a Site Characterization report. The report will meet the requirements of DER-10 Section 3.13.

# FIGURES




Sources: USGS 1:24,000-scale topographic map, 7.5 x 7.5 Minute Quadrangle: Brooklyn, 1975

2,000 0 2,000 Feet

AECOM
605 3RD AVENUE
3RD FLOOR
NEW YORK, NEW YORK 10158
PHONE: (212) 377-8700

NYSDEC SITE NO. 224423
NOSTRAND AVENUE GROUNDWATER
SITE LOCATION

FIGURE 1

8/20/2025 C:\Users\maxwell.reis\AECOM\60754071 WA-57 Multi-Site SC Bronx Brooklyn - 60754071 WA-57 Multi-Site SC Bronx_Brooklyn\900_CAD_GIS\920_GIS\Nostrand\Nostrand_Mapping\Nostrand_Mapping.aprx


AECOM
605 3RD AVENUE
3RD FLOOR
NEW YORK, NEW YORK 10158
PHONE: (212) 377-8700

NYSDEC SITE NO. 224423
NOSTRAND AVENUE GROUNDWATER
PROPOSED SCOPE OF WORK

FIGURE 2

# TABLES

## Table 1

### Nostrand Avenue Groundwater, Brooklyn, Site #224423

### NYSDEC Standby Engineering Contract (D009803-57)

### Reporting Limits and QA/QC Sample Quantity Summary

| MATRIX/ANALYSIS | Analytical Method | Laboratory | Reporting Limit -Typical (units as specified) | Field Sample Quantity | Matrix Spike (MS) or LCS | MS Duplicate or Matrix Duplicate | Field Duplicate | Equipment Blank [2] | Trip Blank | Field Blank | Total Billable Analyses |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Soil Samples** | | | | | | | | | | | |
| Volatile Organics | SW-846 8260C | Pace | 5 µg/kg [1] | 27 | 2 | 2 | 2 | 2 | 0 | 0 | 35 |
| **Groundwater Samples** | | | | | | | | | | 0 | |
| Volatile Organics | SW-846 8260C | Pace | 0.5 - 1.0 µg/L | 10 | 1 | 1 | 1 | 1 | 1 | 0 | 15 |
| 1,4-Dioxane | SW-846 8270D SIM | Pace | 0.1 ug/L | 10 | 1 | 1 | 1 | 1 | 0 | 0 | 14 |
| PFAS | USEPA 1633A | Pace | Analyte-specific (Method: Table 9) | 10 | 1 | 1 | 1 | 1 | 0 | 1 | 15 |

Pace= Pace Analytical Laboratory

Notes

(1) Reporting limits for soils, when adjusted for dry weight, will be higher. Detections above the MDL but less than reporting limits will be reported and flagged estimated (J).

(2) Field equipment rinsate blank quantity will vary depending on sample collection rate and types of sampling equipment used; quantity may be greater or less than that shown.

# APPENDIX A – TYPICAL FIELD FORMS

AECOM

**Total Depth** 6.0 ft

**Client** NYSDEC
**Project Name**
**Project Number**
**Site Location**
**Date Started** 03/26/2025 **Completed** 03/26/2025
**Survey By** **Survey Date** 05/20/2025
**Drilling Contractor** **Northing** **Easting**
**Drilling Equipment** Hand Auger **Ground Elevation** 577.1 ft AMSL **Hole Size** 4 in
**Drilling Method** Hand Auger
**Logged By** **Checked By**

| Depth (feet bgs) | Sample | Recovery (%) | PID (ppm) | Graphic | Material Description | Well Construction |
|---|---|---|---|---|---|---|
| -2 | | | | | | PROTECTIVE CASING Type: Steel Diameter: 4" Set in concrete/grout 0 - 0.5 ft; WELL CASING Type: Schedule 40 PVC Diameter: 2" 0 - 1 ft |
| 0 | | | | | Silt with sand, 15-25% fine sand [TOPSOIL]<br>- brown, moist, soft<br>- no odor, no staining | Concrete/Grout 0 - 0.5 ft |
| | | | 0 | | SILT with Sand (ML), 15-25% fine Sand [NATIVE]<br>- brown, wet, soft<br>- no odor, no staining | |
| 2 | HA | 100 | 0 | | Elastic SILT (MH), 5-15% Clay, 5-15% fine tan Sand lenses [NATIVE]<br>- brown, wet, soft<br>- no odor, no staining | Filter Pack Type: FilPro #0 Sand 0.5 - 6 ft; SCREEN Type: Schedule 40 10-Slot PVC Diameter: 2 in 1 - 6 ft |
| 4 | | | 0 | | | |
| 6 | | | | | Fat CLAY (CH) [NATIVE]<br>- gray, moist, firm<br>- no odor, no staining | |
| 8 | | | | | | |
| 10 | | | | | | |

Notes: 1. Coordinates and elevation data in NAVD 88 for vertical datum and NAD 83 for horizontal datum. All measurements in U.S. Survey Feet.
2. AMSL = Above Mean Sea Level
3. bgs = below ground surface
4. ppm = parts per million
5. HA = Hand auger

# GROUNDWATER SAMPLING LOG

Client: NYSDEC Project #:

Site: Event:

| Sample Information | |
|---|---|
| Sample ID: | Date: |
| Well ID: | Location Type: |
| Duplicate ID: | Sampler: |
| Equipment: Field param meter: AquaTroll # 808878 WL/int meter: Solinst 101 # | |
| Analysis: | |
| Comments: | |

| Water Level | |
|---|---|
| Date: | Measured Well Depth: |
| Screen Interval: | Total Depth: |
| Is Well Dry? | Depth to DNAPL: |
| Depth to Water: | Depth to LNAPL: |
| Notes: | |

| Purge Information | | |
|---|---|---|
| Begin Date and Time: | End Date and Time: | 5/21/2025 4:50:00 PM |
| Purge Method: | Sample Method: | Low flow |
| Notes: | | |

| Time | Cumulative Purge Volume (l) | Purge Rate (ml/min) | Temperatue (deg c) | pH (su) | Specific Conductance (us/cm) | Dissolved Oxygen (mg/l) | Oxidation-Reduction Potential (millivolts) | Turbidity (ntu) | Depth to Water (ft) | Color (none) | Odor (none) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **3:50 PM** | 0 | 800 | 10.36 | 7.77 | 1353.85 | 3.89 | -73.2 | 21.50 | 3.13 | Clear | None |
| **3:55 PM** | 4 | 800 | 10.31 | 7.81 | 1356.98 | 0.00 | -75.3 | 11.26 | 3.16 | Clear | None |
| **4:00 PM** | 8 | 800 | 10.22 | 7.80 | 1357.92 | 0.00 | -75.5 | 11.77 | 3.16 | Clear | None |
| **4:05 PM** | 12 | 800 | 10.14 | 7.84 | 1356.14 | 0.00 | -77.1 | 8.65 | 3.16 | Clear | None |
| **4:10 PM** | 16 | 800 | 10.10 | 7.82 | 1356.19 | 0.00 | -93.9 | 5.89 | 3.16 | Clear | None |
| **4:15 PM** | 20 | 800 | 10.03 | 7.76 | 1354.24 | 0.00 | -120.6 | 7.01 | 3.16 | Clear | None |
| **4:20 PM** | 24 | 800 | 9.99 | 7.70 | 1350.07 | 0.00 | -132.8 | 6.95 | 3.16 | Clear | None |
| **4:25 PM** | 28 | 800 | 9.93 | 7.64 | 1352.10 | 0.00 | -144.8 | 6.15 | 3.16 | Clear | None |
| **4:30 PM** | 32 | 800 | 9.93 | 7.63 | 1348.79 | 0.00 | -153.0 | 4.28 | 3.16 | Clear | None |
| **4:35 PM** | 36 | 800 | 9.94 | 7.65 | 1346.58 | 0.00 | -160.8 | 3.33 | 3.16 | Clear | None |
| **4:40 PM** | 40 | 800 | 9.95 | 7.61 | 1349.60 | 0.00 | -166.5 | 3.30 | 3.16 | Clear | None |
| **4:45 PM** | 44 | 800 | 9.90 | 7.59 | 1349.77 | 0.00 | -171.0 | 2.93 | 3.16 | Clear | None |
| **4:50 PM** | 48 | 800 | 9.94 | 7.60 | 1349.25 | 0.00 | -175.7 | 3.36 | 3.16 | Clear | None |

# APPENDIX B – SAMPLING, ANALYSIS, AND ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) – APRIL 2023

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

April 2023

www.dec.ny.gov

# Table of Contents

ERRATA SHEET for

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

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

| Citation and Page Number | Current Text | Corrected Text | Date |
|---|---|---|---|
| Footnote 2 Page 3 | 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). | The Protection of Groundwater values are based on the above referenced ambient groundwater guidance values. Details on that calculation are available in the following document, prepared for the February 2022 proposed changes to Part 375 (https://www.dec.ny.gov/docs/remediation_hudson_pdf/part375techsupport.pdf). The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf). | 3/28/2023 |
| Testing for Imported Soil Page 4 | 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. | If the concentrations of PFOA and PFOS in leachate are at or above the ambient water quality guidance values for groundwater, then the soil is not acceptable. | 3/28/2023 |
| 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 |

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

| Citation and Page Number | Current Text | Corrected Text | Date |
|---|---|---|---|
| Soil Sample Results, page 10 | "The extent of soil contamination for purposes of delineation and remedy selection should be determined by having certain soil samples tested by Synthetic Precipitation Leaching Procedure (SPLP) and the leachate analyzed for PFAS. Soil exhibiting SPLP results above 70 ppt for either PFOA or PFOS (individually or combined) are to be evaluated during the cleanup phase." | "Soil cleanup objectives for PFOA and PFOS will be proposed in an upcoming revision to 6 NYCRR Part 375-6. Until SCOs are in effect, the following are to be used as guidance values. "<br><br>[Interim SCO Table]<br>"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.<br><br>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.<br><br>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.<br>[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:<br>a. any other individual PFAS (not PFOA or PFOS) is detected in water at or above 100 ng/L; or<br>b. total concentration of PFAS (including PFOA and PFOS) is detected in water at or above 500 ng/L" | Deleted | 6/15/2021 |

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

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

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

## Objective

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

## Applicability

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

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

## Field Sampling Procedures

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

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

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

## Analysis and Reporting

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

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

### Routine Analysis

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

### Additional Analysis

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

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

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

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

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

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

## Data Assessment and Application to Site Cleanup

Until such time as Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Preliminary target levels for cleanup of PFOA and PFOS in other media, including biota and sediment, have not yet been established by the DEC.

### Water Sample Results

NYSDEC has adopted ambient water quality guidance values for PFOA and PFOS. Groundwater samples should be compared to the human health criteria of 6.7 ng/l (ppt) for PFOA and 2.7 ng/l (ppt) for PFOS. These human health criteria should also be applied to surface water that is used as a water supply. This guidance also includes criteria for surface water for PFOS applicable for aquatic life, which may be applicable at some sites. Drinking water sample results should be compared to the NYS maximum contaminant level (MCL) of 10 ng/l (ppt). Analysis to determine if PFOA and PFOS concentrations are attributable to the site should include a comparison between upgradient and downgradient levels, and the presence of soil source areas, as defined below.

If PFOA and/or PFOS are identified as contaminants of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.

### Soil Sample Results

NYSDEC will delay adding soil cleanup objectives for PFOA and PFOS to 6 NYCRR Part 375-6 until the PFAS rural soil background study has been completed. Until SCOs are in effect, the following are to be used as guidance values:

| Guidance Values for Anticipated Site Use | PFOA (ppb) | PFOS (ppb) |
|---|---|---|
| Unrestricted | 0.66 | 0.88 |
| Residential | 6.6 | 8.8 |
| Restricted Residential | 33 | 44 |
| Commercial | 500 | 440 |
| Industrial | 600 | 440 |
| Protection of Groundwater[2] | 0.8 | 1.0 |

PFOA and PFOS results for soil are to be compared against the guidance values listed above. These guidance values are to be used in determining whether PFOA and PFOS are contaminants of concern for the site and for determining remedial action objectives and cleanup requirements. Site-specific remedial objectives for protection of groundwater can also be presented for evaluation by DEC. Development of site-specific remedial objectives for protection of groundwater will require analysis of additional soil parameters relating to leachability. These

[2] The Protection of Groundwater values are based on the above referenced ambient groundwater guidance values. Details on that calculation are available in the following document, prepared for the February 2022 proposed changes to Part 375 (https://www.dec.ny.gov/docs/remediation_hudson_pdf/part375techsupport.pdf). The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).

additional analyses can include any or all the parameters listed above (soil pH, cation exchange capacity, etc.) and/or use of SPLP.

As the understanding of PFAS transport improves, DEC welcomes proposals for site-specific remedial objectives for protection of groundwater. DEC will expect that those may be dependent on additional factors including soil pH, aqueous pH, % organic carbon, % Sand/Silt/Clay, soil cations: K, Ca, Mg, Na, Fe, Al, cation exchange capacity, and anion exchange capacity. Site-specific remedial objectives should also consider the dilution attenuation factor (DAF). The NJDEP publication on DAF can be used as a reference: https://www.nj.gov/dep/srp/guidance/rs/daf.pdf.

## Testing for Imported Soil

Testing for PFAS should be included any time a full TAL/TCL analyte list is required. Results for PFOA and PFOS should be compared to the applicable guidance values. If PFOA or PFOS is detected in any sample at or above the guidance values then the source of backfill should be rejected, unless a site-specific exemption is provided by DER based on SPLP testing, for example. If the concentrations of PFOA and PFOS in leachate are at or above the ambient water quality guidance values for groundwater, then the soil is not acceptable.

PFOA, PFOS and 1,4-dioxane are all considered semi-volatile compounds, so composite samples are appropriate for these compounds when sampling in accordance with DER-10, Table 5.4(e)10. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.

# Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS

The following guidelines (general and PFAS-specific) can be used to assist with the development of a QAPP for projects within DER involving sampling and analysis of PFAS.

## General Guidelines in Accordance with DER-10

- Document/work plan section title – Quality Assurance Project Plan
- Summarize project scope, goals, and objectives
- Provide project organization including names and resumes of the project manager, Quality Assurance Officer (QAO), field staff, and Data Validator
    - The QAO should not have another position on the project, such as project or task manager, that involves project productivity or profitability as a job performance criterion
- List the ELAP certified lab(s) to be used for analysis of samples
- Include a site map showing sample locations
- Provide detailed sampling procedures for each matrix
- Include Data Quality Usability Objectives
- List equipment decontamination procedures
- Include an "Analytical Methods/Quality Assurance Summary Table" specifying:
    - Matrix type
    - 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 current SOP developed by the Division of Fish and Wildlife (DFW) entitled "General Fish Handling Procedures for Contaminant Analysis" (Ver. 8). This SOP should be followed when collecting fish for contaminant analysis. Note, however, that the Bureau of Ecosystem Health will not be supplying bags or tags. All supplies are the responsibility of the collector

**Procedure Name:** General Fish Handling Procedures for Contaminant Analysis

**Number:** FW-005

**Purpose:** This procedure describes data collection, fish processing and delivery of fish collected for contaminant monitoring. It contains the chain of custody and collection record forms that should be used for the collections.

**Organization:** Environmental Monitoring Section
Bureau of Ecosystem Health
Division of Fish and Wildlife (DFW)
New York State Department of Environmental Conservation (NYSDEC)
625 Broadway
Albany, New York 12233-4756

**Version:** 8

**Previous Version Date:** 21 March 2018

**Summary of Changes to this Version:** Updated bureau name to Bureau of Ecosystem Health. Added direction to list the names of all field crew on the collection record. Minor formatting changes on chain of custody and collection records.

**Originator or Revised by:** Wayne Richter, Jesse Becker

**Date:** 26 April 2019

**Quality Assurance Officer and Approval Date:** Jesse Becker, 26 April 2019

**NEW YORK STATE**
**DEPARTMENT OF ENVIRONMENTAL CONSERVATION**

# GENERAL FISH HANDLING PROCEDURES FOR CONTAMINANT ANALYSES

A. Original copies of all continuity of evidence (i.e., Chain of Custody) and collection record forms must accompany delivery of fish to the lab. A copy shall be directed to the Project Leader or as appropriate, Wayne Richter. All necessary forms will be supplied by the Bureau of Ecosystem Health. Because some samples may be used in legal cases, it is critical that each section is filled out completely. Each Chain of Custody form has three main sections:

   1. The top box is to be filled out **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. **The Bureau of Ecosystem Health will supply the bags.** If necessary, food grade bags may be procured from a suitable vendor (e.g., grocery store). It is preferable to redundantly label each bag with a manila tag tied between the knot and the body of the bag. This tag should be labeled with the project name, collection location, tag number, collection date, and fish species. If scales are collected, the scale envelope should be labeled with

the same information.

F. Groups of fish, by species, are to be placed in one large plastic bag per sampling location. **The Bureau of Ecosystem Health will supply the larger bags.** Tie or otherwise secure the bag closed. Label the site bag with a manila tag tied between the knot and the body of the bag. The tag should contain: project, collection location, collection date, species and **tag number ranges**. Having this information on the manila tag enables lab staff to know what is in the bag without opening it.

G. Do not eviscerate, fillet or otherwise dissect the fish unless specifically asked to. If evisceration or dissection is specified, the fish must be cut along the exact midline or on the right side so that the left side fillet can be removed intact at the laboratory. If filleting is specified, the procedure for taking a standard fillet (SOP PREPLAB 4) must be followed, including removing scales.

H. Special procedures for PFAS: Unlike legacy contaminants such as PCBs, which are rarely found in day to day life, PFAS are widely used and frequently encountered. Practices that avoid sample contamination are therefore necessary. While no standard practices have been established for fish, procedures for water quality sampling can provide guidance. The following practices should be used for collections when fish are to be analyzed for PFAS:

No materials containing Teflon.
No Post-it notes.
No ice packs; only water ice or dry ice.
Any gloves worn must be powder free nitrile.
No Gore-Tex or similar materials (Gore-Tex is a PFC with PFOA used in its manufacture).
No stain repellent or waterproof treated clothing; these are likely to contain PFCs.
Avoid plastic materials, other than HDPE, including clipboards and waterproof notebooks.
Wash hands after handling any food containers or packages as these may contain PFCs.
Keep pre-wrapped food containers and wrappers isolated from fish handling.
Wear clothing washed at least six times since purchase.
Wear clothing washed without fabric softener.
Staff should avoid cosmetics, moisturizers, hand creams and similar products on the day of sampling as many of these products contain PFCs (Fujii et al. 2013). Sunscreen or insect repellent should not contain ingredients with “fluor” in their name. Apply any sunscreen or insect repellent well downwind from all materials. Hands must be washed after touching any of these products.

I. All fish must be kept at a temperature <45° F (<8° C) immediately following data processing. As soon as possible, freeze at -20° C ± 5° C. Due to occasional freezer failures, daily freezer temperature logs are required. The freezer should be locked or otherwise secured to maintain chain of custody.

J. In most cases, samples should be delivered to the Analytical Services Unit at the Hale Creek field station. Coordinate delivery with field station staff and send copies of the collection records, continuity of evidence forms and freezer temperature logs to the field station. For samples to be analyzed elsewhere, non-routine collections or other questions, contact Wayne Richter, Bureau of Ecosystem Health, NYSDEC, 625 Broadway, Albany, New York 12233-4756, 518-402-8974, or the project leader about sample transfer. Samples will then be directed to the analytical facility and personnel noted on specific project descriptions.

K. A recommended equipment list is at the end of this document.

**NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION**
**DIVISION OF FISH AND WILDLIFE**
**FISH COLLECTION RECORD**



Project and Site Name _____ DEC Region _____

Collections made by (include all crew) _____

Sampling Method: □Electrofishing □Gill netting □Trap netting □Trawling □Seining □Angling □Other _____

Preservation Method: □Freezing □Other _____ Notes (SWFDB survey number): _____

| FOR LAB USE ONLY- LAB ENTRY NO. | COLLECTION OR TAG NO. | SPECIES | DATE TAKEN | LOCATION | AGE | SEX &/OR REPROD. CONDIT | LENGTH ( ) | WEIGHT ( ) | REMARKS |
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richter: revised 2011, 5/7/15, 10/4/16, 3/20/17; becker: 3/23/17, 4/26/19

# NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
# CHAIN OF CUSTODY

I, _____, 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.