NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Frequently Asked Questions (FAQs) for Sampling and Analysis of PFAS at WMD Sites

This Fact Sheet was developed to respond to Frequently Asked Questions (FAQs) regarding incorporation of per- and polyfluoroalkyl substances (PFAS) as routine contaminants of concern in NHDES Waste Management Division (WMD) programs. PFAS are emerging contaminants, and the current guidance and the content in this document may be modified as information becomes available.

PFAS have been widely used since the 1940s in industrial applications and in consumer products because of their properties to resist heat, oil, grease, stains, and water. In the environment, some PFAS are stable, persistent, and bioaccumulative. PFAS impacts to groundwater used as drinking water have been identified in several communities in New Hampshire; however, the full nature and extent of PFAS impacts to groundwater throughout New Hampshire are unknown.

Table of Contents

1. What terminology should be used for work reviewed by the WMD?

"Per- and polyfluoroalkyl substances (PFAS)" is the preferred term to refer to this class of chemicals, although the general public and others have also referred to some of these compounds as "perfluorinated chemicals (PFCs)" or "perfluorinated compounds (PFCs)." For further information, see: https://www.epa.gov/pfas/what-are-pfcs-and-how-do-they-relate-and-polyfluoroalkyl-substances-pfass. An introduction to terminology is provided in the ITRC PFAS fact sheet "Naming Conventions and Physical and Chemical Properties" (https://pfas-1.itrcweb.org/fact-sheets/).

2. What is the basis for the USEPA Health Advisory level and NHDES' Ambient Groundwater Quality Standard (AGQS), and the responses described herein?

On May 19, 2016, USEPA issued drinking water lifetime health advisories for perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS), and after a review of USEPA's information, NHDES filed an emergency rule on May 31, 2016 to establish the health advisories as Ambient Groundwater Quality Standards (AGQS). NHDES set three groundwater quality standards: 70 nanograms per liter (ng/L, equivalent to parts per trillion [ppt]) for PFOA, 70 ng/L for PFOS, and 70 ng/L for PFOA and PFOS combined, where these chemicals are present together. These rules were officially amendedon October 22, 2016 after completion of the regular rulemaking process. The AGQS were further amended on September 1, 2018 to update the nomenclature for PFOS to perfluorooctane sulfonic acid.

On December 31, 2018, NHDES initiated rulemaking to establish Maximum Contaminant Levels (MCLs) and AGQS for four PFAS: PFOA, PFOS, perfluorononanoic acid (PFNA) and perfluorohexane sulfonic acid (PFHxS) to ensure greater protection of public health related to the consumption of drinking water. Public hearings on the proposed MCLs took place in March 2019, and the public comment period closed on April 12, 2019. On July 18, 2019, the New Hampshire Joint Legislative Committee on Administrative Rules (JLCAR) adopted rules that established MCLs and AGQS for four individual PFAS that include: 12 ng/L for PFOA, 15 ng/L for PFOS, 18 ng/L for PFHxS, and 11 ng/L for PFNA. The updated standards became effective on September 30, 2019.

For other information about health effects, please refer to:

- https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos
- https://www.epa.gov/pfas/basic-information-about-and-polyfluoroalkyl-substances-pfass#tab-3
- https://www.atsdr.cdc.gov/pfas/index.html

3. What resources are available to learn more about PFAS?

There are many resources available for learning about PFAS. Of note,

- The Northeast Waste Management Officials' Association (NEWMOA) has provided several webinar trainings since 2016 (http://www.newmoa.org/cleanup/workshops.cfm).
- The Interstate Technology & Regulatory Council (ITRC) has prepared a series of fact sheets about PFAS, which are available at http://pfas-1.itrcweb.org/.

4. At what existing wastes sites should an initial screening be performed??

NHDES requires waste sites that meet certain criteria to complete an initial screening for the presence of PFAS per the provisions of the NH Code of Administrative Rules, Chapters Env-Or 600 and Env-Or 700, as applicable. Affected waste sites include:

- All sites subject to New Hampshire Groundwater Release Detection Permits;
- All landfills (lined, unlined, active, and/or closed) that are subject to groundwater monitoring requirements;
- All active hazardous waste sites managed by the NHDES Hazardous Waste Remediation Bureau (HWRB) (including, but not limited to, sites with active New Hampshire Groundwater Management Permits), where either of the following is true:
    - A thorough review of site history reveals that past or present site activities have involved the use of PFAS containing products, and releases have occurred from one or more of those activities; or
    - Class B firefighting foam (e.g., aqueous film forming foam [AFFF]) has been used or released (for example, to extinguish a fire, in training exercises, or in the cleaning of firefighting equipment); and
- All sites undergoing required environmental site assessment activities for which the results will be reported and submitted to the Waste Management Division (WMD) for review, where either of the following is true:
    - A thorough review of site history reveals that past or present site activities have involved the use of PFAS containing products; or
    - Class B firefighting foam (e.g., AFFF] may have been used or released.

Sampling is appropriate and required at the sites described above due to the wide-ranging use of PFAS in commercial and industrial applications, as summarized in the following table. This table is for general guidance and is not exhaustive, and does not include all possible uses of PFAS. Other information is available from the ITRC Fact Sheet “History and Use of PFAS”

(https://pfas-1.itrcweb.org/wp-content/uploads/2017/11/pfas_fact_sheet_history_and_use__11_13_17.pdf).

Table 1 – Potential PFAS Uses and Applications

Commercial Products	Industrial Uses
• Nonstick Cookware • Fast Food Containers • Candy Wrappers • Microwave Popcorn Bags • Personal Care Products (Shampoo, Dental Floss) • Cosmetics (Nail Polish, Eye Makeup) • Paints and Varnishes • Stain Resistant Carpet • Stain Resistant Chemicals • Water Resistant Apparel • Cleaning Products • Electronics • Ski Wax	• Photo Imaging • Metal Plating • Semiconductor Coatings • Aviation Hydraulic Fluids • Medical Devices • Class B Firefighting Foam (e.g., Aqueous Film-Forming Foam [AFFF]) • Insect Baits • Printer and Copy Machine Parts • Chemically Driven Oil Production • Textiles, Upholstery, Apparel and Carpets • Paper and Packaging • Rubber and Plastics

At this time, sampling and analysis for PFAS at sites impacted only with petroleum-related constituents that are managed by the NHDES Oil Remediation and Compliance Bureau (ORCB) is not required, unless otherwise instructed by the ORCB Project Manager.

5. What media should be sampled for the initial screening?

The initial evaluation should assess potential impacts to groundwater quality.

Sampling of other media (e.g., soil, surface water) may be required in future monitoring events after considering the concentrations detected in groundwater, the potential release mechanism, extent of impacts, and proximity to sensitive receptors.

6. How many samples should be collected, and which wells should be sampled for the initial screening?

The number of samples will depend on the site. Representative sampling should be performed to assess whether PFAS are present at the site at concentrations which exceed AGQS and whether receptors (e.g., drinking water supply wells) are impacted.

Sample locations should be selected based on the professional judgement of the Professional Engineer and/or Geologist directing the sampling effort in consideration of previous and current

uses of the site, site hydrogeology, proximity to sensitive receptors, and other known releases. Sampling locations to be included in this initial screening effort should include, at a minimum:

- At least one monitoring well from each source area;
- Representative downgradient monitoring well(s) [e.g., at the extent of a site Groundwater Management Zone (GMZ), if established]; and
- Active drinking water supply well(s) included in the current Groundwater Management Permit (GMP) schedule and active drinking water supply wells with previous detections of other site contaminants of concern.

It also may be appropriate to include at least one hydraulically upgradient (background) monitoring location, based on site conditions and surrounding property uses.

Samples collected from water supply wells should be collected prior to treatment.

The proposed sampling locations do not need to be submitted to the NHDES for review prior to the sampling effort, unless otherwise requested by the NHDES Project Manager (e.g., sampling locations at solid waste landfills need to be submitted to NHDES for review). Please provide justification for selection of the sampling locations in the summary documentation provided to NHDES following the sampling effort. NHDES may request further sampling and analysis if NHDES considers that the sampling completed was not representative.

7. What sampling protocols have been developed?

Because of the potential presence of PFAS in common consumer products and in equipment often used to collect groundwater samples, special handling and care must be taken when collecting PFAS samples. Accordingly, ***NHDES strongly recommends that protocols specific to sampling groundwater for the presence of PFAS be used for all well purging and groundwater sampling collection and handling methods, and that the sampling be performed by a consultant familiar with these protocols.***

NHDES' *Sample Collection Guidance* summarizes suggested PFAS sampling protocols. For more detailed information, please refer to Standard Operating Procedure (SOP) No. HWRB-21 in the NHDES *HWRB Master Quality Assurance Project Plan*, prepared for sites investigated through contracts administered by the HWRB.

NHDES recognizes that studies are ongoing to identify the potential for cross-contamination from PFAS-containing items during sampling, and that some studies have found that the referenced guidance may be conservative. NHDES recommends appropriate quality assurance and quality control sampling be implemented if sampling protocols are modified. Please contact your project manager for further information.

Other information is available from:

- ITRC Fact Sheet "Site Characterization Considerations, Sampling Precautions, and Laboratory Analytical Methods for PFAS" (https://pfas-1.itrcweb.org/wp-content/uploads/2018/03/pfas_fact_sheet_site_characterization_3_15_18.pdf).

- Michigan PFAS Sampling Guidance (https://www.michigan.gov/pfasresponse/0,9038,7-365-86510_87154-469832--,00.html), with a quick reference guide available at: https://www.michigan.gov/documents/pfasresponse/PFAS_Sampling_Quick_Reference_Field_Guide_634603_7.pdf

- *"Bottle Selection and other Sampling Considerations When Sampling for Per- and Polyfluoroalkyl Substances (PFAS)"* July 2017 http://www.denix.osd.mil/edqw/home/

8. What laboratory analysis should be used?

For the most recent guidance, please refer to the Fact Sheet *Laboratory Testing Guidelines for Per- and Polyfluorinated Substances (PFAS),* which summarizes recommendations for analytical laboratory qualifications, analytical methods, parameters, and reporting limits.

USEPA Method 537.1, issued November 2018) is a method for determining concentrations of select PFAS compounds in drinking water samples and was developed as part of the Safe Drinking Water Act program. There are concerns that this method may not be appropriate for groundwater samples collected as part of site investigations due to potential matrix interference effects. To account for these potential effects, laboratories have developed their own analytical methods for PFAS using isotope dilution techniques based on the USEPA Method 537.1. As of the date of this FAQ document, there is no standardized isotope dilution method for PFAS analysis

NHDES strongly recommends that PFAS samples be analyzed by an analytical method that utilizes isotope dilution, following the protocols for PFAS by LC/MS/MS outlined in Table B-15 of the U.S. Department of Defense (USDOD) Quality Systems Manual (QSM) 5.2 (or later).

NHDES understands that USEPA is developing standardized methods for analysis of groundwater samples. This document will be updated when further information is available.

9. What laboratories perform the analysis?

At this time, NHDES strongly recommends using a lab with USDOD Environmental Laboratory Accreditation Program (ELAP) accreditation for "PFAS by LC/MS/MS Compliant with QSM 5.1 Table B-15" and/or a lab with National Environmental Laboratory Accreditation Program (NELAP) certification by NHDES be used for PFAS analysis. NHDES currently accredits labs via NELAP as appropriate for PFAS analysis following USEPA Method 537.1 (for drinking water samples). These programs specify criteria that the laboratory must follow when performing the

analysis. Please note that the laboratory used for analysis of other site samples does not need to be the same as the laboratory that analyzes the PFAS samples. Drinking water samples submitted to the NHDES Water Division for MCL compliance may have other requirements.

At this time, HWRB will accept PFAS analytical data obtained from NELAP or ELAP accreditation, or obtained following an LC/MS/MS isotope dilution method from laboratories that are not NELAP accredited (but are accredited for other common analytes), given that a USEPA validated LC/MS/MS isotope dilution method has yet to be issued. NHDES understands that USEPA is currently working on preparing such a method.

10. What compounds should be reported?

NHDES recommends that samples be submitted for a broad analysis of PFAS compounds to evaluate the potential source, fate, and transport PFAS impacts at your site.[1] Samples collected by NHDES are typically analyzed for the list of PFAS provided on the attached table, which includes at least 18 PFAS that are identified using USEPA Method 537.1. Generally, the analytical reporting limit of analyses for each contaminant should be no greater than 5 ng/l for aqueous samples. Quantification of linear and branched isomers should be completed as required by USEPA Method 537.1. The laboratory should report acid forms, accounting for the mass of the counterion as described in USEPA Method 537.1.

NHDES strongly recommends that analytical data summary tables (and laboratory reports) include both CAS Nos. and the analyte names. In addition, on summary tables, NHDES recommends that the PFAS be ordered by carbon chain length, and split by families (see groupings on the attached analytical table).

11. Why does NHDES require reporting of sulfonic acids and not sulfonates?

In NHDES' experience, some analytical laboratories report slightly different forms of PFOS, PFHXS, and PFBS (i.e., perfluorooctane sulfonic acid vs. perfluorooctane sulfonate), which vary slightly from one another in molecular weight, resulting in slight differences in reported concentrations. Confirm with the analytical laboratory that the forms of PFAS being analyzed **and reported** correspond to the appropriate CAS numbers.

Inconsistent nomenclature and CAS Nos. have been used by laboratories to report PFOS data to NHDES. The NH AGQS for PFOS was promulgated in NH Code of Administrative Rules

[1] In prior guidance, NHDES recommended analysis for as many compounds as feasible, noting that samples should, if possible, include at least nine PFAS identified by USEPA Method 537. Limiting reporting to nine or fewer compounds will limit the understanding of potential PFAS sources, fate, and transport. As such, and given the increased analytical capacity and the emerging understanding of release types and contaminant fate and transport, NHDES recommends reporting as many PFAS as feasible to develop a more comprehensive conceptual site model associated with PFAS release(s).

Env-Or 600 under CAS No. 1763-23-1, based on the information provided by USEPA in their 2016 Lifetime Health Advisory.

Data provided to NHDES should match the AGQS (i.e., the acid form of PFOS with CAS No. 1763-23-1). Where an AGQS are not established for perfluoroalkyl acids (PFAAs), data should be provided in the acid form unless otherwise requested by NHDES. NHDES requests the acid forms to be consistent with health information provided by USEPA; however, it is acknowledged that PFAAs typically occur as anions (e.g., perfluorooctane sulfonate) in humans and the environment (ITRC 2017).

Through December 2017, twelve laboratories had reported PFAS data to NHDES, with inconsistencies found in both written laboratory data reports and electronic (.csv) submittals to NHDES' Environmental Monitoring Database (EMD).

Common errors include, but are not limited to:

- Data only provided as perfluorooctane sulfonate, with labs stating that a conversion to perfluorooctane sulfonic acid is not possible. (Note that EPA Method 537 Revision 1.1 Section 7.2.3 addresses this issue.)
- Data labeled as "PFOS" only, no full analyte name and/or CAS No. provided. Data should be provided with the CAS No. to confirm that the appropriate analyte is reported.
- Data provided as PFOS CAS No. 45298-90-6 on written report but as PFOS CAS No. 1763-23-1 in the electronic data deliverable (or vice versa). The electronic data deliverable and the written laboratory report should match.

12. What QA/QC is necessary?

Many clothing items and field equipment may contain PFAS, which increases the potential for inadvertent contamination of the samples. To support the validity of the data, one set of the following QA/QC samples per 20 field samples is suggested as part of the initial screening efforts, although not required:

- Equipment rinseate blank (only if non-dedicated equipment is used);
- Blind field duplicate (only if more than 10 samples collected); and
- Field blank.

Depending on detections, additional QA/QC samples may be warranted in future monitoring rounds, and will likely be necessary for site investigations.

13. What lead or turn-around times are typical?

Typical turn-around times may range from about two to six weeks for reporting of laboratory data. Data transmittals are due to NHDES within 45 days of sampling; if the laboratory cannot

provide the analytical data within this timeframe, contact the NHDES Project Manager to discuss whether a separate data transmittal will be warranted. In most cases, a separate transmittal will not be required.

14. How should the data be provided to NHDES?

Reports should be uploaded to OneStop following standard procedures. The summary documentation should include justification for selection of the sampling locations. ***Please be sure to include PFAS information on the report cover sheet that is attached to all OneStop uploads.***

Additionally, PFAS analytical data should be uploaded to the NHDES Environmental Monitoring Database (EMD). Analytical results for non-PFAS compounds do not need to be uploaded to EMD at this time (unless otherwise required under separate initiatives). Further guidance can be found in the *EMD Process for PFAS Data Collected at Waste Sites*.

Sample locations (i.e. "Stations") should be uploaded to EMD one week prior to the sampling event. ***Please confirm with your HWRB Project Manager whether stations have already been established in EMD prior to creating new stations.***

For each compound, please be sure that the CAS Number reported in the laboratory report match the respective CAS Number uploaded in EMD.

Technical questions regarding EMD data upload should be directed to Sam Fontaine at (603) 271-2979 (Samuel.Fontaine@des.nh.gov).

15. Are the PFAS data publicly accessible?

At the current time, PFAS data stored in EMD are available via download from the NHDES website, either by using the OneStop search for PDFs of reports, or by using the EMD data query tool for sampling results. Electronic data may also be displayed on the interactive GIS map of PFAS detections in New Hampshire.

16. What are the notification requirements for an exceedance of AGQS?

Notification requirements are detailed in Env-Or 600. In summary:

Location	Required Written Notification
Water Supply Well	5 business days
Monitoring Well (at or beyond GMZ boundary)	30 days
Monitoring Well (new site)	60 days

If the exceedance of AGQS is discovered in a water supply well or a downgradient compliance monitoring well, NHDES strongly recommends that verbal notification is provided to NHDES and the property owner upon receipt of the results. This notification (similar to the reporting requirements for oil contaminated sites), should include the following:

- Contact the property owner.
- Contact the HWRB Project Manager (if the project manager is unassigned, contact the HWRB State Site Supervisor, Amy Doherty at (603) 271-6542 or Amy.Doherty@des.nh.gov). Provide supporting information about the site, receptors, and release.
- Provide written notification per Env-Or 604 via OneStop upload.

17. What is the anticipated response for an exceedance of AGQS?

If an exceedance of the AGQS is discovered in a water supply well in the GMZ at a permitted site, then the permittee shall implement the contingency provisions required by the permit and Env-Or 607.06(b) (i.e., provide a potable supply). For newly discovered sites, it is NHDES' expectation that an alternate water source (e.g. bottled water) will be provided as an interim measure by the potentially responsible party.

For exceedances in water supply wells or monitoring wells, initial response actions pursuant to Env-Or 605.04 will be required, as appropriate. The immediate concern is to confirm whether there are any potential receptors that may be impacted. As such, an updated receptor survey will be needed for sites with exceedances in monitoring wells at or beyond the GMZ boundary, or in water supply wells. If potential receptors are identified, sampling of the receptors will be required.

The potentially responsible party should self-initiate a receptor survey and water supply assessment. In an effort to promote timely response actions, NHDES does not plan to review and approve each work scope for the receptor survey and drinking water well sampling in advance; however, if you have questions about the scope of this effort, please contact the NHDES Project Manager for the site, or the State Sites Section Supervisor.

The distance needed for the receptor survey should be based on the level of understanding of the site conditions and hydrogeology, to the extent they are known, as well as the suspected release mechanism (e.g., suspected air release sites should consider a larger initial receptor radius).

For planning purposes, the following general recommendations are provided:

- Within 14 days of knowledge of the exceedance, identify and notify potential drinking water receptors located within 500 to 1,000 feet of the **sampling location**; and

- Within 28 days of knowledge of the exceedance, collect PFAS samples from potentially impacted drinking water wells identified in the receptor survey.

An additional receptor survey and sampling may be required if impacts are identified in one of the sampled supply wells.

18. Following the initial screening, will future monitoring be required?

The need for future assessment and/or investigation will be evaluated following NHDES' review of the PFAS data collected, similar to the approach taken for other contaminants of concern at a site. Site-specific considerations will be given to the concentrations, types, and distribution of PFAS, the site remedial status, the potential for temporal changes, and the proximity to sensitive receptors. As appropriate, the GMP may be revised to incorporate PFAS as a contaminant of concern (COC).

If the source of the PFAS release is not known, and the extent of PFAS impacts are not defined by the existing monitoring network, a focused site investigation may be required to identify potential source(s) and delineate the extent of impacts.

General guidelines are provided below for a well characterized release, but may be modified on a site-specific basis:

- **Non-detect in water supply wells and/or monitoring wells:** In general, WMD will consider waiving future sampling requirements if the initial sampling effort fails to detect these PFAS above the reporting limits, assuming appropriate reporting limits are achieved. A second, confirmatory round may be requested from the Project Manager. Also, please note that as necessary, WMD will require a second analysis of a sample to obtain lower detection limits to assess the presence of PFAS that were reported with a high detection limit during the initial analysis.

- **For detections greater than laboratory reporting limits, but less than AGQS**: Additional monitoring and/or assessment may be required based on site conditions.

- **For detections greater than AGQS:** Additional monitoring will be required, and based on site conditions, additional investigation may be required, as described above.

Attachment 1 – Summary of PFAS Analytes

PFAS Name	Abbreviation	CAS No.	USEPA Method 537.1[a]	USEPA Target SW846 [b]	US DOD QSM 5.2 [c]
PERFLUOROALKYL CARBOXYLIC ACIDS (PFCAs)					
perfluorooctadecanoic acid	PFODA	16517-11-6			
perfluorohexadecanoic acid	PFHxDA	67905-19-5			
perfluorotetradecanoic acid	PFTeA	376-06-7	x	x	x
perfluorotridecanoic acid	PFTrA	72629-94-8	x	x	x
perfluorododecanoic acid	PFDoA	307-55-1	x	x	x
perfluoroundecanoic acid	PFUnA	2058-94-8	x	x	x
perfluorodecanoic acid	PFDA	335-76-2	x	x	x
perfluorononanoic acid	PFNA	375-95-1	x	x	x
perfluorooctanoic acid	PFOA	335-67-1	x	x	x
perfluoroheptanoic acid	PFHpA	375-85-9	x	x	x
perfluorohexanoic acid	PFHxA	307-24-4	x	x	x
perfluoropentanoic acid	PFPeA	2706-90-3		x	x
perfluorobutanoic acid	PFBA	375-22-4		x	x
PERFLUOROALKYL SULFONIC ACIDS (PFSAs)					
perfluorododecane sulfonic acid	PFDoDS	79780-39-5			
perfluorodecane sulfonic acid	PFDS	335-77-3		x	x
perfluorononanesulfonic acid	PFNS	68259-12-1		x	x
perfluorooctane sulfonic acid	PFOS	1763-23-1	x	x	x
perfluoroheptane sulfonic acid	PFHpS	375-92-8		x	x
perfluorohexane sulfonic acid	PFHxS	355-46-4	x	x	x
perfluoropentane sulfonic acid	PFPeS	2706-91-4		x	x
perfluorobutane sulfonic acid	PFBS	375-73-5	x	x	x
FLUOROTELOMERS±					
10:2 fluorotelomer sulfonic acid	10:2 FTSA	120226-60-0			
8:2 fluorotelomer sulfonic acid	8:2 FTSA	39108-34-4		x	x
6:2 fluorotelomer sulfonic acid	6:2 FTSA	27619-97-2		x	x
4:2 fluorotelomer sulfonic acid	4:2 FTSA	757124-72-4		x	x
PERFLUOROALKANE SULFONAMIDES (FASAs) AND SULFONAMIDO SUBSTANCES±					
Perfluorooctanesulfonamide	FOSA	754-91-6		x	x
N-ethyl perfluorooctane sulfonamide	EtFOSA	4151-50-2			
N-methyl perfluorooctane sulfonamide	MeFOSA	31506-32-8			x
N-ethyl perfluorooctanesulfonamido ethanol	EtFOSE	1691-99-2			
N-methyl perfluorooctanesulfonamido ethanol	MeFOSE	24448-09-7			
N-ethyl perfluorooctanesulfonamido acetic acid	EtFOSAA	2991-50-6	x	x	x

PFAS Name	Abbreviation	CAS No.	USEPA Method 537.1[a]	USEPA Target SW846 [b]	US DOD QSM 5.2 [c]
N-methyl perfluorooctanesulfonamido acetic acid	MeFOSAA	2355-31-9	x	x	x
PER- and POLYFLUOROALKYL ETHER CARBOXYLIC ACIDS					
2,3,3,3-tetrafluoro-2-(heptafluoropropoxy)propanoic acid	HFPO-DA† (GenX acid)	13252-13-6	x		
4,8-dioxa-3h-perfluorononanoic acid	DONA ‡ (ADONA acid)	919005-14-4	x		
ADDITIONAL SUBSTANCES					
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS * (F53B Major)	763051-92-9	x		
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid	9Cl-PF3ONS ** (F53B Minor)	756426-58-1	x		

Notes:

a. USEPA Method 537.1 (November 2018)
https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NERL&dirEntryId=343042&simpleSearch=0

b. USEPA SW846 Target Analyte List

c. USDOD Quality Systems Manual 5.2, Appendix C, Table C-44 (December 2018)
https://denix.osd.mil/edqw/documents/manuals/qsm-version-5-2-final-updated/

Abbreviations:
† HFPO-DA is sometimes referred to as the acid form of the GenX salt
‡ DONA is sometimes referred to as the acid form of the ADONA salt
* The major component of compound F53B (sometimes referred to as F53 Major)
** The minor component of compound F53B (sometimes referred to as F53 Minor)
± Denotes precursor compounds