



Laboratory Testing Guidelines for Per- and Polyfluoroalkyl Substances (PFAS) at Waste Sites

This document summarizes the recommended analytical requirements for analytical sampling data that will be submitted to NHDES' Waste Division programs. Please ensure the laboratory you utilize can meet the recommendations provided below prior to contracting with the laboratory. Note that the NHDES Water Division has separate recommendations for samples submitted to Water Division programs for their review, which are summarized in a separate document.

- **Reporting Limits:** Analytical methods with reporting limits of at least 5 nanograms per liter should be utilized, or lower, as achievable by the analytical method.
- **Analytical Methods:** It is preferred that analytical methods use isotope dilution following the protocols for PFAS by LC/MS/MS Compliant with U.S. Department of Defense' (DOD's) Quality Systems Manual (QSM) 5.2 (or later) Table B-15. Analysis by USEPA Method 537.1 is also acceptable. Several laboratories are accredited for these approaches by the DOD Environmental Laboratory Accreditation Program (ELAP) and/or the National Environmental Laboratory Accreditation Program (NELAP).
- **Analytes:** 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 The PFAS to be included in the requested analysis should include the PFAS reportable by the method used, or more. Laboratories may have developed their own reporting list for isotope dilution methods. At a minimum, report perfluorocarboxylic acids (PFCAs) and perfluorosulfonic acids (PFSAs) obtainable by the methods. ***NHDES highly recommends analysis for other PFAS, as other PFAS, such as polyfluorinated precursors to perfluoroalkyl acids, will aid in understanding and delineating PFAS releases.*** Common PFAS analytes are shown on the following table. Contact your Waste Management Division project manager with questions.

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).

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	PFTTrA	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)[±]					
Perfluorooctanesulfonamide	FOSA	754-91-6		x	x
N-ethyl perfluorooctane sulfonamide	EtFOSA	4151-50-2			
N-methyl perfluorooctane sulfonamide	MeFOSA	31506-32-8			x
PERFLUOROALKANE SULFONYL SUBSTANCES[±]					
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
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_public_record_report.cfm?Lab=NERL&dirEntryId=343042&simpleSearch=0
- b. USEPA SW 846 Target PFAS Analytes
- 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/>

[†] 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