



Extended PFAS Analyte Reporting and Trace-Level Testing by EPA Method 1633A




ALS now offers trace-level testing for up to 60 Per- and Polyfluoroalkyl Substances (PFAS) in surface water, groundwater, soil, sediment, and biosolids by US EPA Method 1633A — expanding the standard 40-analyte suite by an additional 20 compounds.

Extended PFAS Testing Suites by EPA 1633A


ALS has been testing for complex suites of PFAS analytes globally under accredited methods since the late 2000s, supporting global trends to monitor and restrict these persistent chemicals in the environment. What started out as testing for PFOS and PFOA has steadily grown to include dozens of new compounds as PFAS regulation and knowledge of their precursors and degradation processes increases. The ALS global network of expert PFAS scientists are constantly developing new capabilities to meet local and global testing needs. This includes global reviews of emerging analytes, including those becoming increasingly regulated or requested by our global customers. The availability of testing for expanded parameter lists reduces the risk of underestimating cumulative PFAS impacts.

In 2021, ALS added 11 analytes beyond the EPA 1633 analyte list, including PFECHS (found in aviation hydraulic oils) and several fluorotelomer carboxylic acids (FTCAs and FTUCAs, which can be major PFAS components of legacy landfill leachates). From 2023 to 2026, we added 9 more important analytes, including 4 short and ultra-short PFAS (PFPrA,

PFPrS, PFBSA, PFHxSA) and 3 widely used polyfluoroalkyl phosphate diesters (diPAPs). The ALS extended PFAS suites for Method 1633A now include up to 60 PFAS analytes, as shown in Table 3. Please refer to Table 1 for a concise summary of all our extended-list PFAS analytes, with information about their usage and importance.



Canadian Council of Ministers of the Environment / Le Conseil canadien des ministres de l'environnement



Canadian Soil and Groundwater Quality Guidelines for the Protection of Environmental and Human Health

PERFLUOROCTANE SULFONATE (PFOS)
2021

Perfluorooctane sulfonate (PFOS) (C₈HF₁₇SO₃) is an extremely stable anthropogenic compound present in significant quantities in many environmental media. PFOS is present in numerous products such as firefighting foams, insecticides, coatings used for textiles and paper, and cleaning products. PFOS can be released directly into the environment as a result of its production, use (in consumer, commercial and industrial products) and disposal, or it may result indirectly from the biodegradation, photo oxidation, photolysis and hydrolysis of precursor per- and polyfluoroalkyl substances (PFAS).

Expanding Canadian PFAS Regulations

PFAS guidelines and regulations in Canada are expanding quickly. The first Canadian PFAS regulations were issued in British Columbia in 2017 under the BC Contaminated Sites Regulation. [CCME water and soil quality guidelines](#) and a [scientific criteria document](#) were released in September 2021. The Canadian Maritime provinces issued new regulations for 9 individual PFAS in July 2022 under the Atlantic Canada RBCA Environmental Quality Standards. In January 2023, Alberta added PFOS and PFOA to their Tier 1 Soil and Groundwater Remediation Guidelines. And on August 9th 2024, Health Canada published the Objective for Canadian Drinking Water Quality for PFAS, setting a maximum objective concentration of 30 ng/L for the sum of 25 specific PFAS (refer to [EnviroMail 62](#) for more information about PFAS in drinking water). This objective replaces the Canadian drinking water guidelines and screening values issued in 2018 and 2019.

Detection limits achieved by our EPA 1633A tests are below all established and proposed limits in Canadian PFAS regulations and CCME guidelines, with most below the lowest of any global PFAS regulatory guidelines from the USA, Europe, or Australia (refer to [compilation published by ITRC, the US Interstate Technology Regulatory Council](#)).

Highlights of EPA Method 1633A

The December 2024 version of Method 1633A provides performance-based method guidance and performance requirements for testing of 40 PFAS analytes in waters, soils, biosolids, and tissues, in support of the US PFAS Strategic Roadmap and US Clean Water Act (CWA). ALS in Canada is applying Method 1633A for trace-level analysis of our extended PFAS suite in wastewaters, surface waters, groundwaters, soils, sediments, and biosolids. Our test offerings meet all requirements of Method 1633A, including:

- LC-MS/MS with Multiple Reaction Monitoring (MRM);
- Whole-sample bottle extraction for waters (representative subsampling is used only for high-level samples identified by pre-screening, and is indicated on reports);
- Soils and sediments are extracted three times with 0.3% methanolic ammonium hydroxide;
- Solid Phase Extraction (SPE) and carbon cleanup steps are used for isolation and concentration of PFAS from sample matrix, and to minimize interferences;
- All required isotopically labelled Extracted Internal Standards (EIS) and Non-extracted Internal Standards (NIS) are incorporated and assessed against specified QC limits;

Table 1. PFAS Analytes in Extended Suites beyond 1633A list

Short Name	CAS #	Importance and Usage
PFECHS	646-83-3	Long-chain perfluoroalkyl sulfonic acid (C8 cyclic PFSA); used in aircraft hydraulic fluids.
PFUdS	749786-16-1	Long-chain perfluoroalkyl sulfonic acid (C11 PFSA); high risk for bioaccumulation and persistence.
PFTTrDS	791563-89-8	Ultra-long-chain perfluoroalkyl sulfonic acid (C13 PFSA); high risk for bioaccumulation and persistence.
PFHxDA	67905-19-5	Ultra-long-chain perfluorocarboxylic acid (C16 PFCA); used in production of non-stick, stain-repellent, inert coatings; high bioaccumulation potential relative to shorter-chain PFCA.
PFODA	16517-11-6	Ultra-long-chain perfluorocarboxylic acid (C18 PFCA); used in production of non-stick, stain-repellent, inert coatings; very high bioaccumulation potential.
PFPrA	422-64-0	Ultra-short-chain perfluoroalkyl carboxylic acid (C3 PFCA); degradation product; less toxic and bioaccumulative than long chain PFAS, but highly water soluble and mobile.
PFPrS	423-41-6	Ultra-short-chain perfluoroalkyl sulfonic acid (C3 PFSA); found in AFFF formulations, highly persistent and mobile.
PFBSA	30334-69-1	Short chain perfluoroalkyl sulfonamide (C4 PFSA); widely used (AFFFs, surface treatments), precursor to PFBS.
PFHxSA	41997-13-1	Short chain perfluoroalkyl sulfonamide (C6 PFSA); widely used (AFFFs, surface treatments), similar to PFOS, but shorter chain.
10:2 FTS	120226-60-0	Widely used (AFFFs, surface treatments), precursor to 10:2 FTUCA, 10:2 FTCA, PFDA, PFNA, PFUnA.
6:2 FTUCA	70887-88-6	Degradation product; precursor to 6:2 FTCA and PFHxA.
8:2 FTUCA	70887-84-2	Degradation product; precursor to 8:2 FTCA and PFOA.
10:2 FTUCA	70887-94-4	Degradation product; precursor to 10:2 FTCA and PFCA.
6:2 FTCA	53826-12-3	Degradation product; precursor to PFHxA.
8:2 FTCA	27854-31-5	Degradation product; precursor to PFOA.
10:2 FTCA	53826-13-4	Degradation product; precursor to PFCA.
TFSI	82113-65-3	Used as lithium battery electrolytes.
6:2 diPAP	57677-95-9	Widely used in consumer products, textiles, packaging (water/oil/grease repellent); degrades to 6:2 FTUCA and PFHxA.
8:2 diPAP	678-41-1	Widely used in consumer products, textiles, packaging (water/oil/grease repellent); degrades to 8:2 FTUCA and PFOA.
6:2/8:2 diPAP	943913-15-3	Widely used in consumer products, textiles, and packaging (water/oil/grease repellent); degrades to 6:2 FTUCA, PFHxA, 8:2 FTUCA, and PFOA.

- Quantification is based on isotope dilution or extracted internal standards;
- Both linear and branched PFAS isomers are quantified for all PFAS for which linear/branched reference mixtures are available (PFOA, PFNA, PFOSA, PFOS, PFHxS, NMeFOSA, NEtFOSA, NMeFOSE, NEtFOSE, NMeFOSAA, NEtFOSAA);
- All water samples are pre-screened for PFAS and TSS to prevent cross-contamination and to determine optimal SPE sample preparation strategy.

EPA Method 1633A is designed to provide top-quality ultra-trace PFAS analysis for an extensive analyte list, with exceptional resolution from potential interferences through optimized cleanup procedures, chromatographic separations, and MS/MS conditions.

More on PFAS in Soils, Sediments, and Biosolids

For more details about PFAS in soils and sediments, please refer to [EnviroMail 59](#), which includes a comprehensive compilation of Canadian soil criteria for PFAS, including the Health Canada PFAS Soil Screening Values for Federal Contaminated Sites.

For more details about PFAS in biosolids, please refer to [EnviroMail 68](#), which includes a summary of all current & pending Canadian PFAS biosolids regulations.

Sampling Considerations

Table 2 summarizes sample collection requirements for trace-level PFAS analysis by EPA Method 1633A. Trace-level testing of waters requires submission of 2 x 250 mL sample containers to permit whole-sample analysis with SPE with an option for re-analysis if required. An additional 60 mL sample is also required for pre-screening and TSS testing. Trace-level testing of soils, sediments, and biosolids requires a single 120 mL HDPE soil jar.

Samples should be protected from light and shipped with sufficient ice to maintain temperature at 0-6°C from the time of collection until arrival at the laboratory. Allow at least 48 hours to account for shipping delays. For cooling of PFAS samples, ALS recommends double-bagged regular ice in sealed poly bags (e.g., Ziploc®), or HDPE bottles filled with water and frozen. Chemical or “blue” ice should be avoided (many brands are in use and most are untested for PFAS).

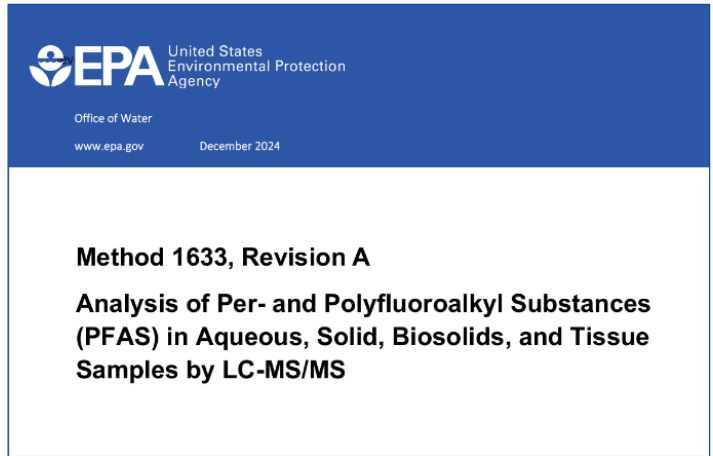


Table 2. PFAS Sampling Details

	Waters	Soils & Sediments	Biosolids
Method Reference	EPA 1633A	EPA 1633A	EPA 1633A
ALS Test Code	E745P-T	E745P-T	E745P.B
Sample Containers (Teflon-free)	2 x 250 mL HDPE + 1 x 60 mL HDPE (pre-screen)	1 x 120 mL HDPE soil jar	1 x 120 mL HDPE soil jar
Preservation	none	none	none
Hold Time & Storage Temperature	28 days (≤ 6°C)	28 days (≤ 6°C)	28 days (≤ 6°C)

A 28 day hold time is applied for all 1633A tests; however EPA indicates that NMeFOSE, NEtFOSE, NMeFOSAA, and NEtFOSAA have reduced stability in waters (7 days), and NFDHA has reduced stability in soils/sediments/biosolids (3 days). If these are analytes of particular concern at a site, please contact ALS to arrange for expedited analysis.

ISO 17025 Accreditation and Further Details

Our Canadian PFAS specialty laboratory in Waterloo offers ISO 17025 accredited testing for an extensive and rapidly expanding PFAS parameter suite in environmental waters, soils, sediments, and biosolids by US EPA Method 1633A. Please refer to the [CALA scope of accreditation for ALS in Waterloo](#) for current status.

Please contact your ALS Project Manager for further information or to arrange for sampling supplies.

Table 3. ALS Extended PFAS Analyte Suites

Parameter	Short Name	CAS No.	1633A Analyte?	Waters	Soils	Biosolids
				E745P-T	E745P-T	E745P-T.B
				LOR ¹ (µg/L)	LOR ¹ (µg/kg)	LOR ¹ (µg/kg)
Perfluoroalkyl carboxylic acids						
Perfluoropropanoic acid	PFPrA	422-64-0	extra	0.0008	0.1	1
Perfluorobutanoic acid	PFBA	375-22-4	✓	0.002	0.2	2
Perfluoropentanoic acid	PFPeA	2706-90-3	✓	0.002	0.1	1
Perfluorohexanoic acid	PFHxA	307-24-4	✓	0.0004	0.1	1
Perfluoroheptanoic acid	PFHpA	375-85-9	✓	0.0008	0.1	1
Perfluorooctanoic acid	PFOA	335-67-1	✓	0.001	0.1	1
Perfluorononanoic acid	PFNA	375-95-1	✓	0.002	0.1	1
Perfluorodecanoic acid	PFDA	335-76-2	✓	0.003	0.1	1
Perfluoroundecanoic acid	PFUnA	2058-94-8	✓	0.001	0.1	1
4,8-Dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4	✓	0.0004	0.1	1
Perfluorododecanoic acid	PFDoA	307-55-1	✓	0.002	0.1	1
Perfluorotridecanoic acid	PFTrDA	72629-94-8	✓	0.002	0.1	1
Perfluorotetradecanoic acid	PFTeDA	376-06-7	✓	0.001	0.1	1
Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	15172-58-6	✓	0.005	0.4	4
Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5	✓	0.0004	0.1	1
Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1	✓	0.0004	0.1	1
Hexafluoropropylene oxide dimer acid	HFPO-DA (GenX)	13252-13-6	✓	0.004	0.4	4
Perfluorohexadecanoic acid	PFHxDA	67905-19-5	extra	0.002	0.25	2.5
Perfluorooctadecanoic acid	PFODA	16517-11-6	extra	0.0004	0.1	1
Perfluoroalkyl sulfonic acids						
Perfluoropropane sulfonic acid	PFPrS	423-41-6	extra	0.0008	0.1	1
Perfluorobutanesulfonic acid	PFBS	375-73-5	✓	0.001	0.1	1
Perfluoropentanesulfonic acid	PFPeS	2706-91-4	✓	0.002	0.2	2
Perfluorohexanesulfonic acid	PFHxS	355-46-4	✓	0.0025	0.1	1
Perfluoroheptanesulfonic acid	PFHpS	375-92-8	✓	0.0025	0.1	1
Perfluorooctanesulfonic acid	PFOS	1763-23-1	✓	0.002	0.1	1
Perfluoroethylcyclohexanesulfonic acid	PFECBS	646-83-3	extra	0.0004	0.1	1
Perfluorononanesulfonic acid	PFNS	68259-12-1	✓	0.003	0.2	2
Perfluorodecanesulfonic acid	PFDS	335-77-3	✓	0.002	0.1	1
Perfluoroundecanesulfonic acid	PFUDS	749786-16-1	extra	0.004	0.5	5
Perfluorododecanesulfonic acid	PFDoS	79780-39-5	✓	0.002	0.2	2
Perfluorotridecanesulfonic acid	PFTrDS	791563-89-8	extra	0.04	5	50
Perfluorooctane sulfonamides						
Perfluorobutanesulfonamide	PFBSA	30334-69-1	extra	0.0008	0.1	1
Perfluorohexanesulfonamide	PFHxSA	41997-13-1	extra	0.002	0.2	2
Perfluorooctanesulfonamide	PFOSA	754-91-6	✓	0.002	0.1	1
N-methyl perfluorooctanesulfonamide	NMeFOSA	31506-32-8	✓	0.001	0.1	1
N-ethyl perfluorooctanesulfonamide	NEtFOSA	4151-50-2	✓	0.001	0.1	1
Perfluorooctane sulfonamidoacetic acids						
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9	✓	0.004	0.2	2
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6	✓	0.004	0.2	2
Perfluorooctane sulfonamide ethanols						
N-methyl perfluorooctanesulfonamidoethanol	NMeFOSE	24448-09-7	✓	0.002	0.2	2
N-ethyl perfluorooctanesulfonamidoethanol	NEtFOSE	1691-99-2	✓	0.002	0.2	2
Ether sulfonic acids						
9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid	9Cl-PF3ONS	756426-58-1	✓	0.0004	0.1	1
11-Chloroheptafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9	✓	0.0004	0.1	1
Perfluoro(2-ethoxyethane)sulfonic acid	PFEEESA	113507-82-7	✓	0.0008	0.1	1
Fluorotelomer sulfonic acids						
4:2 Fluorotelomer sulfonic acid	4:2 FTS	757124-72-4	✓	0.001	0.1	1
6:2 Fluorotelomer sulfonic acid	6:2 FTS	27619-97-2	✓	0.004	0.5	5
8:2 Fluorotelomer sulfonic acid	8:2 FTS	39108-34-4	✓	0.004	0.25	2.5
10:2 Fluorotelomer sulfonic acid	10:2 FTS	120226-60-0	extra	0.008	0.5	5
Fluorotelomer carboxylic acids						
6:2 Fluorotelomer carboxylic acid	6:2 FTCA	53826-12-3	extra	0.08	10	100
8:2 Fluorotelomer carboxylic acid	8:2 FTCA	27854-31-5	extra	0.08	10	100
10:2 Fluorotelomer carboxylic acid	10:2 FTCA	53826-13-4	extra	0.09	10	100
3:3 Fluorotelomer carboxylic acid	3:3 FTCA	356-02-5	✓	0.01	0.5	5
5:3 Fluorotelomer carboxylic acid	5:3 FTCA	914637-49-3	✓	0.004	0.5	5
7:3 Fluorotelomer carboxylic acid	7:3 FTCA	812-70-4	✓	0.002	0.5	5
Unsaturated fluorotelomer acids						
6:2 Fluorotelomer unsaturated carboxylic acid	6:2 FTUCA (FHUEA)	70887-88-6	extra	0.008	1	10
8:2 Fluorotelomer unsaturated carboxylic acid	8:2 FTUCA (FOUEA)	70887-84-2	extra	0.004	0.5	5
10:2 Fluorotelomer unsaturated carboxylic acid	10:2 FTUCA (FDUEA)	70887-94-4	extra	0.0016	0.2	2
Polyfluoroalkyl phosphate diesters						
Polyfluoroalkyl phosphate diester, 6:2	6:2 diPAP	57677-95-9	extra	0.004	0.2	2
Polyfluoroalkyl phosphate diester, 8:2	8:2 diPAP	678-41-1	extra	0.004	0.2	2
Polyfluoroalkyl phosphate diester, 6:2/8:2	6:2/8:2 diPAP	943913-15-3	extra	0.004	0.2	2
Perfluoroalkyl sulfonimides						
Bis(trifluoromethane)sulfonimide	TFSI	82113-65-3	extra	0.0004	0.1	1

¹ Trace-level Limits of Reporting (LORs) may not be achievable for high-level contaminated samples.