

Perfluoroalkyl and polyfluoroalkyl substances (PFASs) in Soil / Biosolids

The method is for determination of perfluoroalkyl and polyfluoroalkyl substances (PFASs) in soil/sediment/biosolid samples by high performance liquid chromatography/triple quadrupole mass spectrometry (HPLC/MS/MS). All results are corrected for labelled surrogate recoveries and reported as received on a wet weight basis.

Isotopically labelled standards are added to the sample to serve as surrogates. Samples are extracted with organic solvent. A labelled standard is added to the sample to serve as recovery standard.

Qualitative/quantitative analysis for PFASs is performed with an ultra performance liquid chromatograph/triple quadrupole mass spectrometer/computerised data system. Multiple reaction monitoring, or MRM, (two characteristic ions) is performed for PFC analysis. Analyte identification is confirmed when target ions are detected in both the monitored SIM windows, within established retention time windows. Quantification is based on the use of the labelled surrogates.

Analyte	Abbreviation & CAS Number	Soil Standard LOR (mg/kg)	Soil Low Level LOR (mg/kg)	Biosolids* Standard LOR (mg/kg)	Biosolids* Low Level LOR (mg/kg)
Perfluoroalkane Carboxylic Acids					
Perfluorobutanoic acid (C4)	PFBA (375-22-4)	0.002	0.0005	0.01	0.001
Perfluoropentanoic acid (C5)	PFPeA (2706-90-3)	0.002	0.0002	0.005	0.0002
Perfluorohexanoic acid (C6)	PFHxA (307-24-4)	0.001	0.0001	0.005	0.0001
Perfluoroheptanoic acid (C7)	PFHpA (375-85-9)	0.001	0.0001	0.005	0.0001
Perfluorooctanoic acid (C8)	PFOA (335-67-1)	0.001	0.0001	0.005	0.0001
Perfluorononanoic acid (C9)	PFNA (375-95-1)	0.001	0.0001	0.005	0.0001
Perfluorodecanoic acid (C10)	PFDA (335-76-2)	0.001	0.0001	0.005	0.0001
Perfluoroundecanoic acid (C11)	PFUDA (2058-94-8)	0.002	0.0002	0.005	0.0005
Perfluorododecanoic acid (C12)	PFDoA (307-55-1)	0.002	0.0002	0.005	0.0005
Perfluorotridecanoic acid (C13)	PFTTrDA (72629-94-8)	0.002	0.0002	0.005	0.0005
Perfluorotetradecanoic acid (C14)	PFTeDA (376-06-7)	0.002	0.0002	0.005	0.0005
Perfluorohexadecanoic acid (C16)	PFHxDA (67905-19-5)	0.002	0.0002	0.005	0.0005
Perfluorooctadecanoic acid (C18)	PFODA (16517-11-6)	0.005	0.0005	0.02	0.0005
Unsaturated Telomer Acids					
2H-Perfluoro-2-decenoic acid	FOUEA (70887-84-2)	0.001	0.0001	0.005	0.0002
Perfluoroalkane Sulfonic Acids					
Perfluorobutane sulfonic acid (C4)	PFBS (375-73-5)	0.001	0.0001	0.005	0.0001
Perfluoro pentane sulfonic acid (C5)	PFPeS (2706-91-4)	0.001	0.0001	0.005	0.0001
Perfluorohexane sulfonic acid (C6)	PFHxS (355-46-4)	0.001	0.0001	0.005	0.0001
Perfluoroheptane sulfonic acid (C7)	PFHpS (375-92-8)	0.001	0.0001	0.005	0.0001
Perfluorooctane sulfonic acid (C8)	PFOS (1763-23-1)	0.002	0.0002	0.005	0.0002
Perfluorononanesulfonic acid (C9)	PFNS (68259-12-1)	0.001	0.0001	0.005	0.0005
Perfluorodecane sulfonic acid (C10)	PFDS (335-77-3)	0.001	0.0001	0.005	0.0005
Perfluoroalkyl Sulfonamides					
Perfluorooctane sulfonamide	PFOSA (754-91-6)	0.001	0.0001	0.005	0.0001
N-Methyl perfluorooctane sulfonamide	N-MeFOSA (31506-32-8)	0.002	0.0002	0.005	0.0005
N-Ethyl perfluorooctane sulfonamide	N-EtFOSA (4151-50-2)	0.002	0.0002	0.005	0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid	N-MeFOSAA (2355-31-9)	0.002	0.0002	0.005	0.0005
N-Ethyl perfluorooctane sulfonamidoacetic acid	N-EtFOSAA(2991-50-6)	0.002	0.0002	0.005	0.0005
N-Methyl perfluorooctane sulfonamidoethanol	N-MeFOSE (24448-09-7)	0.005	0.0002	0.01	0.0005
N-Ethyl perfluorooctane sulfonamidoethano	N-EtFOSE (1691-99-2)	0.005	0.0002	0.01	0.0005
(n:2) Fluorotelomer Sulfonic Acids					
4:2 Fluorotelomer sulfonic acid	4:2 FTS (757124-72-4)	0.001	0.0001	0.005	0.0005
6:2 Fluorotelomer sulfonic acid	6:2 FTS (27619-97-2)	0.001	0.0001	0.005	0.0005
8:2 Fluorotelomer sulfonic acid	8:2 FTS (39108-34-4)	0.001	0.0001	0.005	0.0005
10:2 Fluorotelomer sulfonic acid	10:2 FTS (120226-60-0)	0.002	0.0002	0.01	0.001
Phosphate Esters					
8:2 Fluorotelomer phosphate diester	8:2 diPAP (678-41-1)	0.002	0.0005	0.01	0.001

*Biosolid LORs based on 20% total solids.

Sample requirements

10-20 g of wet sample collected in HDPE or polypropylene container, AVOID teflon, store and transport at 4 °C

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Analyte	Abbreviation & CAS Number	Soil Standard LOR (mg/kg)	Biosolids Standard LOR (mg/kg)
Supplementary PFAS list			
Perfluoropropanesulfonic acid	PFPrS (423-41-6)	0.001	0.01
Perfluorododecane sulphonic acid	PFDoS (79780-39-5)	0.001	0.01
3:3 Fluorotelomer carboxylic acid	3:3 FTCA / FPrPA (356-02-5)	0.001	0.01
5:3 Fluorotelomer carboxylic acid	5:3 FTCA / FPePA (914637-49-3)	0.001	0.01
7:3 Fluorotelomer carboxylic acid	7:3 FTCA / FHpPA (812-70-4)	0.001	0.01
Hexafluoropropylene oxide dimer acid (GenX)	HFPO-DA (13252-13-6)	0.001	0.01
Perfluoro-3-methoxypropanoic acid	PFMPA / PF4OPeA (377-73-1)	0.001	0.01
Perfluoro-4-methoxybutanoic acid	PFMBA / PF5OHxA (863090-89-5)	0.001	0.01
Nonafluoro-3,6-dioxaheptanoic acid	NFDHA / 3,6-OPFHpA (151772-58-6)	0.001	0.01
bis(1H,1H,2H,2H-perfluorooctyl) phosphate	6:2 diPAP (57677-95-9)	0.001	0.01
(1H,1H,2H,2H-perfluorooctyl-1H,1H,2H,2H-perfluorodecyl) phosphate	6:2/8:2 diPAP (943913-15-3)	0.001	0.01
Potassium perfluoro-4-ethylcyclohexanesulfonate	PFECHS (335-24-0)	0.001	0.01
Perfluoro(2-ethoxyethane)sulfonate	PFEESA (113507-82-7)	0.001	0.01
9-chlorohexadecafluoro-3-oxanonane-1-sulfonate	6:2 Cl-PFESA / 9Cl-PF3ONS (756426-58-1)	0.001	0.01
11-chloroeicosafluoro-3-oxaundecane-1-sulfonate	8:2 Cl-PFESA / 11Cl-PF3OUdS (763051-92-9)	0.001	0.01
6:2 fluorotelomer sulfonamide alkylbetaine	6:2 FTAB / N-CMAmP-6:2FOSA (34455-29-3)	0.001	0.01
4,8-Dioxa-3H-perfluorononanoic Acid	ADONA (919005-14-4)	0.001	0.01
Perfluorobutylsulphonamide	FBSA (30334-69-1)	0.001	0.01