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Technical BRIEF
INNOVATIVE RESEARCH FOR A SUSTAINABLE FUTURE

Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS)

Methods and guidance for sampling and analyzing water and other environmental media

Background

Per- and polyfluoroalkyl substances (PFAS) are a group of synthetic chemicals that have been in use since the 1940s. PFAS are found in a wide array of consumer and industrial products. PFAS manufacturing and processing facilities, facilities using PFAS in production of other products, airports, and military installations are some of the contributors of PFAS releases into the air, soil, and water. Due to their widespread use and persistence in the environment, most people in the United States have been exposed to PFAS. There is evidence that continued exposure above specific levels to certain PFAS may lead to adverse health. The U.S. Environmental Protection Agency (EPA) will continue to partner with other federal agencies, states, tribes, and local communities to protect human health and, where necessary and appropriate, to limit human exposure to potentially harmful levels of PFAS in the environment.

EPA's methods for analyzing PFAS in environmental media are in various stages of development. The Agency is working to develop validated analytical methods for groundwater, surface water, wastewater, and solids, including soils, sediments, and biosolids.

Drinking Water

Analysis using EPA Method 537.1

To assess for potential human exposure to PFAS in drinking water, EPA's validated method 537.1 will ensure that both government and private laboratories can accurately and consistently measure 18 PFAS in drinking water, which is a critical step for estimating people's exposure and potential risk to PFAS. EPA Method 537 was first published in 2009 to initially determine 14 different PFAS. In 2018, the method was updated to include 4 more PFAS including the GenX chemical hexafluoropropylene oxide dimer acid (HFPO-DA).

Short-chain PFAS in drinking water method

EPA is finalizing an additional drinking water method that is specific to "short chain" PFAS [none greater than C_{12}), that includes perfluorinated acids, sulfonates, fluorotelemers and mono/poly perfluorinated ethers.

EPA expects to have a draft method for non-potable water by fall 2019.

Many of these couldn't be analyzed using 537.1 due to physicochemical disparities. The method is expected to be published in the summer 2019 and is anticipated to include a total of 25 PFAS (14 of the 18 PFAS in 537.1 plus an additional 11 "short chain" PFAS).

Health Advisories

In May 2016, EPA issued drinking water health advisories for two types of PFAS: perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS). EPA's health advisories are non-regulatory and non-enforceable, and are intended to provide technical information to state agencies and other public health officials on health effects, analytical methodologies, and treatment technologies associated with drinking water contamination.

Method Development & Validation

Currently, there are no validated standard EPA methods for analyzing PFAS in surface water, non-potable groundwater, wastewater, or solids. For non-drinking water samples, some U.S. laboratories are using modified methods based on EPA Method 537. These modified methods have no consistent sample collection or analytical guidelines and have not been validated or systematically assessed for data quality.

To address this sampling and analytical gap, EPA formed a cross-Agency method development and validation workgroup to provide sampling guidance and validated methods for sample types other than drinking water. The workgroup developed SW-846 Draft Method 8327 for quantifying PFAS analytes. The method development process will occur in a phased approach.

Phase I EPA labs tested an existing direct injection analytical protocol for preparing and analyzing 24 PFAS analytes in groundwater, surface water, and wastewater effluents. Labs completed this phase in winter 2017, and results warranted moving to Phase II.

Phase II In October 2018, seven external labs began validating the direct injection method. Data packages from the participating laboratories have been reviewed and statistically analyzed. The target timeframe for publishing the validated draft SW-846 direct injection method (Draft Method 8327) for public review is the summer 2019.

EPA has also drafted a solid-phase extraction/isotope dilution (SPE-ID) method in collaboration with the Naval Seas Systems Command Laboratory Quality and Accreditation Office and SGS-AXYS.

The SPE-ID protocol will be externally validated, with a target start time in summer 2019. The SPE-ID method will include solid matrices in addition to non-drinking water aqueous matrices. In addition to the 24 analytes under draft Method 8327, EPA plans on adding analytes for the SPE-ID Method to include recent additions to drinking water method 537.

Developing Sampling & Storage Methods

EPA ran time-based studies on degradation or loss of target analytes during sample storage (45 days) and assessed the effects of different sample vessel materials (e.g., plastic, glass) on analyte recovery. Based on these studies, the SW-846 methods under development will utilize PFAS-free, high-density polyethylene containers; whole sample preparation; and sample holding times of 28 days. EPA will also develop guidelines for field sampling, which are critical for minimizing sample contamination and optimizing data quality for site characterization and remediation.

Due to the widespread use of PFAS, many materials normally used in field and laboratory operations contain PFAS. For example, polytetrafluoroethylene products (tubing, sample containers, and sampling tools) are often used in sampling; however, since these products can contain PFAS, they cannot be used in sampling for PFAS.

In addition, many consumer goods brought to a sampling site may contain PFAS that can contaminate samples. Field sampling and laboratory hygiene protocols are critical to ensuring that testing results reflect actual PFAS levels in the analyzed media. The Interstate Technology and Regulatory Council has summarized site characterization, sampling precautions, and analytical method issues and options through their fact sheet series.

Contacts

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Additional Information

- **PFAS in Your Environment:** *epa.gov/pfas*
- **Clean-Up Information:** *clu-in.org/*
- **EPA Method 537.1**: *cfpub.epa.gov/si/si_public_file_download.cfm?p_download_id=537290&Lab=NERL*
- **SW-846 (Compendium):** *epa.gov/hw-sw846/sw-846-compendium*
- **PFOA & PFOS Drinking Water Health Advisories:** *epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos*
- **Third Unregulated Contaminant Monitoring Rule (UCMR3):** *epa.gov/dwucmr/third-unregulated-contaminant-monitoring-rule*
- **Interstate Technology and Regulatory Council PFAS Fact Sheets:** *pfas-1.itrcweb.org/fact-sheets/*
- **EPA's Water Research:** *epa.gov/water-research*