HALEY & ALDRICH

PFAS TECHNICAL UPDATE

Avoiding costly errors in PFAS sampling

Per- and polyfluoroalkyl substances (PFAS) are a class of human-made chemicals that have attracted significant attention in the last few years from the regulatory community, industry, and general public. But it is crucial to carefully modify conventional sampling techniques for PFAS analysis because manufacturers use PFAS to produce a variety of industrial, commercial, and consumer products, and the possibility of false positives from contaminating the samples is high (Simon et al., 2019; Interstate Technology & Regulatory Council [ITRC], 2018a; California State Water Resources Control Board [SWRCB], 2019a). Further, laboratory detection limits and current regulatory threshold concentrations for PFAS are very low—in the parts per trillion (ppt) range (Simon, 2018; ITRC, 2018b). Haley & Aldrich staff reviewed and considered guidelines from several regulatory agencies and developed a detailed and standardized operating procedure (OP) for collecting soil and water samples for PFAS. A summary of the best practices in Haley & Aldrich's OP is below.

WHAT ARE THE RISKS?

Studies have found PFAS throughout the environment, including in common sampling materials and equipment, which then contaminate soil and water samples. These fall into two categories (Bartlett and Davis, 2018):

- **Sampling equipment and materials that contact the sample media—**such as bailers, pumps, tubing, sample jars and lids, spoons and trowels, gloves, aluminum foil, prepackaged filter screens, drilling equipment, passive samplers, decontamination surfactants, and decontamination water; and
- **Other items within the sample collection and staging areas** that are not specifically sampling equipment—such as personal protection equipment, personal care products, clothing and laundry products, notebooks, permanent markers, paper towels, water-resistant clothing and boots, insect repellents, sunscreens, and blue ice packs.

A recent study investigated potential cross-contamination from 26 commonly used sampling materials and equipment by measuring PFAS concentrations leached out from sampling materials and equipment mixed with commercially available PFAS-free bottled water for 24 hours (Denly et al., 2019). The results showed that low PFAS concentrations may leach from different sampling materials such as polytetrafluoroethylene tubing and bladders, low-density polyethylene tubing, sample labels, pizza boxes, certain types of water level tapes, nitrile gloves, field book pages, field book covers, and bailer string. On the other hand, the study showed that PFAS did not leach out from silicone tubing, aluminum foil, adhesive notes (i.e., Post-its®), resealable plastic storage bags, polyethylene bladders, passive diffusion bags, protein bar wrappers, polyvinyl chloride pipes, bubble wrap, most bentonite samples, and one type of water level meter tape.

Another study evaluated the potential for PFAS cross-contamination from three common commercially available insect repellents. The researchers applied the repellents to strips of fabric from well-worn t-shirts and then air-dried and submerged the fabric in PFAS-free water for 30 seconds. Analysis of the water showed PFAS at non-detectable levels (less than 2.5 ppt), indicating that the tested insect repellents were not potential sources of PFAS cross-contamination (Bartlett and Davis, 2018).

Researchers have also explored whether the quantity of the materials typically used during sample collection that potentially contain PFAS could contaminate the sample sufficiently to create a "false positive" result (Rodowa et al., 2020). Although the researchers successfully extracted and detected PFAS from first-aid bandage wrappers, aluminum foil, paper towels, plumber's tape, and reusable ice packs during the study, they determined that—based on the quantity of PFAS detected—there "was no plausible pathway for impacting the concentrations of PFAS to levels of concern."

WHAT ARE THE BEST PRACTICES?

Regulatory agencies and practitioners across the country have developed numerous sampling guidance documents as a result of the growing awareness of potential cross-contamination of soil and water samples analyzed for PFAS (SWRCB, 2019b; NAVFAC, 2017; ITRC, 2018a; United States Environmental Protection Agency [EPA], 2019; New Hampshire Department of Environmental Services, 2016; Massachusetts Department of Environmental Protection, 2018). For example, SWRCB published two PFAS sampling guidance documents for drinking water and general environmental sampling to reduce the potential for sample cross-contamination and ensure unbiased sample collection (SWRCB, 2019a; 2019b). Haley & Aldrich has reviewed these and other guidance documents and developed the following best practices for PFAS sampling:

- **Obtain drinking water and residential well samples after purging the sampling location** (i.e., tap or spigot) for a minimum of 20 minutes (NHDES, 2016) prior to sample collection to clear stagnant water from the transfer lines and obtain a sample from the water source. For the analysis of PFAS in a potable water source in accordance with EPA Method 537.1, a field blank sample must be collected for each sample location. A field blank sample is originally free of the analyte, the substance being identified and measured (in this case, PFAS), that samplers pour into a container in the field, preserve, and ship to the laboratory with their field samples to provide a quantitative measure of the potential impact of the sample handling on the reported results.
- Because of the uncertainty concerning the PFAS sampling process, it's critically important to **collect field quality control (QC) samples** to evaluate the usability of any data set (Simon et al., 2019). In addition to field blanks, your QC field samples should include the following (SWRCB, 2019b; Simon et al., 2019):
  - Equipment rinse blanks to determine the likelihood of PFAS impacts from non-dedicated sampling materials, and
  - Field duplicates to determine the precision of the sampling and laboratory analysis process.

Among these QC samples, equipment rinse blanks provide the most meaningful and value-added control for evaluating PFAS results (Simon et al., 2019). Field duplicates provide a quantitative measure of the reproducibility of the sampling procedures and representativeness of the sample results to the site conditions.

- Since PFAS are considered "semi-volatile" compounds due to their low vapor pressure, be sure to **collect representative groundwater and surface water samples using several methods** including low-stress (low-flow) purging methods (EPA, 2017) to optimize the amount of investigation derived waste (IDW). However, the use of dedicated sampling equipment eliminates the need to reuse sampling equipment at other locations. This reduces the decontamination required between sampling locations and the associated generation of wastewater for off-site disposal.

- Use one of the following techniques to obtain groundwater samples:

  A. Well purging and bailer sampling with dedicated polypropylene or high-density polyethylene (HDPE) bailers and PFAS-free polypropylene rope

  B. Hydrasleeve® grab sampling using PFAS-free HDPE liners with polypropylene rope

  C. Peristaltic pump (for sample collection at depths of less than 25 feet below ground surface) using HDPE or polypropylene tubing with flexible silicone tubing at the pump head

  D. Low-stress (low-flow) sampling using a submersible bladder pump equipped with stainless steel or PFAS-free O-rings and seals and polypropylene or HDPE bladders and tubing. Examples include QED Sample Pro® or Geotech Low Flow Bladder pumps

- For solid matrices such as soil and sediment, **use coring and sampling devices constructed of stainless steel and which include an HDPE sleeve or acetate liner** (e.g. Geoprobe® macro core samplers) within the core barrel. Place soil or IDW samples to be composited prior to analysis in a pre-washed stainless-steel bowl, mixed with pre-washed stainless-steel or PVC/ HDPE utensils, and transfer them directly to the appropriate sample containers.

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For more information about PFAS or to discuss our sampling OP in more detail, please contact:

John Xiong, Ph.D., P.E.
Emerging Contaminants Practice Leader
Tel: (714) 371.1808
jxiong@haleyaldrich.com

Denis Conley
Senior Chemist
Tel: (585) 321.4245
dconley@haleyaldrich.com

Anita Broughton
Industrial & Manufacturing Market Segment Leader
Tel: (619) 285.7104
abroughton@haleyaldrich.com

Michael Basel
Aerospace Market Segment Leader
Tel: (913) 693.1901
mbasel@haleyaldrich.com