An Overview of PFAS Sampling Guidelines & the Potential for Cross-Contamination

The Science of PFAS:
Public Health & the Environment
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Marlborough, MA

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Topics for Discussion

- Sampling guidance recommendations
  - Drinking water
  - Soils
  - Ground water

- Cross contamination avoidance
  - General guidance
  - Product leaching study results

Drinking Water Sampling

- Sampling for SDWA compliance?
  - Use Method 537.1 or Method 533

Method 533: 25 compounds*
Method 537.1: 18 compounds

**** 25 compound Method 533 list does not include all 18 Method 537.1 compounds***

If the 4 cmpds dropped from 533: **PFTrDA, PFTA, NMeFOSAA & NEtFOSAA** are run by Method 537.1 = **29 compounds combined both methods**

UCMR 5

- Specific method requirements
  - De-chlorinating agent/buffers
  - Trizma@ (Method 537.1) or ammonium acetate (Method 533)
  - Field reagent blanks (FRB)

- FRB must be handled along with each sample set
  - Sample set - samples collected from the same sample site / same time

Evolution of EPA FRB Protocol

FRB = (1) bottle of preserved PFAS free H2O
(2) empty bottle

Ambiguous language

?

Unambiguous language

FRB = (1) bottle of PFAS free H2O
(2) empty bottle w/ presevative

Here is the original language from Method 537 (2009)

8.3.1 A FRB must be handled along with each sample set. The sample set is composed of samples collected from the same sample site and at the same time. At the laboratory, fill the field blank sample bottle with reagent water and preservatives, seal, and ship to the sampling site along with the sample bottles. For each FRB shipped, an empty sample bottle (no preservatives) must also be shipped. At the sampling site, the sampler must open the shipped FRB and pour the preserved reagent water into the empty shipped sample bottle, seal and label this bottle as the FRB. The FRB is shipped back to the laboratory along with the samples and analyzed to ensure that PFAAs were not introduced into the sample during sample collection/handling.

Method 537.1 (2018)
8.3.1. A FRB must be handled along with each sample set. The sample set is composed of samples collected from the same sample site and at the same time. At the laboratory, fill the field blank sample bottle with reagent water and preservatives, seal, and ship to the sampling site along with the sample bottles. For each FRB shipped, an empty sample bottle (no preservatives) must also be shipped. At the sampling site, the sampler must open the shipped FRB and pour the preserved reagent water into the empty shipped sample bottle, seal and label this bottle as the FRB. The FRB is shipped back to the laboratory along with the samples and analyzed to ensure that PFAS were not introduced into the sample during sample collection/handling.

Method 537.1 was revised in March 2020 (version 2.0)
8.3.1. An FRB must be handled along with each sample set. The sample set is composed of samples collected from the same sample site and at the same time. At the laboratory, fill the field blank sample bottle with reagent water, then seal, and ship to the sampling site along with the sample bottles. For each FRB shipped, a second FRB bottle containing only the preservative must also be shipped. At the sampling site, the sampler must open the shipped FRB and pour the preserved reagent water into the empty shipped sample bottle, seal and label this bottle as the FRB. The FRB is shipped back to the laboratory along with the samples and analyzed to ensure that PFAS were not introduced into the sample during sample collection/handling. **(JFO underlined)**

Method 533 (12/2019)
8.4.2 Field Reagent Blank Procedure
In the laboratory, fill the FRB sample bottle with the analyzed reagent water (Sect. 8.4.1), then seal and ship to the sampling site with the sample bottles. For each FRB shipped, a second FRB sample bottle containing only preservative must also be shipped. At the sampling site, open the FRB bottle and pour the reagent water into the second sample bottle containing preservative; seal and label this bottle as the FRB with the date, time and location of the site.

MassDEP Homeowners Private Well Sampling Instructions

READ THIS PACKET BEFORE OPENING ANYTHING ELSE IN THE COOLER!

Thank you for participating in the DEP PFAS Monitoring Program. Please read these instructions closely before collecting the samples and follow them closely. Your attention to detail is needed to obtain valid results.

This program will be measuring PFAS at parts per trillion levels, to help illustrate how small a part per trillion is, think of it as a half a teaspoon in 1000 Olympic-size swimming pools.

You must collect samples only on a Monday, Tuesday or Wednesday and ship no later than Thursday of the same week. Samples must arrive at the laboratory within 48 hours of sampling, chilled on ice. Be sure to put a lot of ice in the cooler.

Please watch this instructional video before performing the sampling—it's very helpful: https://youtu.be/zrwhwSI-R9M

Please contact UMass directly if you have any questions regarding sampling:

Call **413-545-7327** ("545-PFAS")
Or email PFAS-testing@umass.edu

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PFAS Sampling Instructions

Check? √

Before Sampling: _____

- Read all lab sampling instructions before sampling.
- Plan to have samples collected just prior to the pick-up time of your overnight carrier to limit potential contamination.
- If your sampling point (sink, tub, hose spigot) has a faucet with an aerator, remove aerator prior to collection of the samples.

Sampling Clothing and Other Considerations: _____

Do not wear clothing or boots containing Gore-Tex ® or other materials containing Tyvek ®, cosmetics, moisturizers, or heavy fabric softeners on clothes the day of sampling. Do not use sunscreen or insect repellant the day of sampling.

Consideration of Supplies: _____

Many common household items contain chemicals which can interfere with PFAS measurements. Please follow the guidelines below when selecting materials for sampling your home.

- Do not use chemical ice packs.
- Do not use Felt-tip pens or permanent markers. Use regular ballpoint pens or pencils only.
- Do not use adhesive products like sticky notes.
- Do not use plastic clipboards, binders, hard covers, etc.
- Use nitrile gloves provided in your package from the lab.
- Use only the containers that have been provided by the laboratory, do not use funnels, hose, buckets, or anything else.

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In your Package: _____

Items	Container Type	Preservative
2 or 3 Sampling Bottles - Empty	275 mL container	Bottles already contain Trizma ®
1 Bottle filled with Reagent Water	275 mL container	None
1 Field Blank Bottle - Empty	275 mL container	Bottle already contains Trizma ®
1 Chain of Custody form		
1 Pair of Nitrile Gloves		

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Sampling Steps: _____

Caution: bottles may contain chemical preservatives. Avoid skin contact.

1. Sample COLD WATER ONLY.
2. Turn on the cold water tap or faucet for 15 minutes immediately prior to sampling.
3. Before collecting the sample, slow the water until the stream is the thickness of a pencil to avoid splashing.
4. After opening the cooler, **wash your hands thoroughly before putting on the nitrile gloves.**
5. Each sampling event requires 3 or 4 bottles to be filled depending on which contracted lab is doing the analysis. **Do not rinse bottles before filling and do no overfill bottles**. Bottles must be filled **to the neck** of the provided bottles. See black line on the photo at right.

6. Take Reagent Water bottle in the package.
7. Take the empty sampling bottle labeled "Field Blank".
8. Open both bottles and place the caps on a flat surface with the inside of the cap facing upward to avoid contamination.
9. Do not touch inside of the cap or around the edge of the bottle.
10. Transfer all the liquid from the "Reagent Water" bottle into the "Field Blank" bottle.
11. Carefully screw bottle caps back on.
12. Take the two empty sampling bottles in the cooler.
13. Fill both sample bottles with your tap water to neck (as illustrated above), taking care to not touch inside caps or the rims of the bottles.
14. Close bottles securely and invert the 3 filled bottles 5 times (to mix water with the preservative).
15. Write the sampling date, time and site on the bottle labels and the enclosed Chain of Custody. Information on the Chain of Custody form and labels must match and be complete. Sign the Chain of Custody.
16. Put all bottles back into the cooler.
17. Dispose of the nitrile gloves.
18. Ensure Chain of Custody form is complete and place it in the provided Ziploc bag. Place the sealed Ziploc bag with Chain of Custody into the cooler.

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Appendix E - Sampling Protocols for PFAS in Private Water Supply Wells

Sampling Techniques

Locate and assess the pressure tank and determine if any filter units are present within the building. Establish the sample location as close to the well pump as possible, which is typically the spigot at the pressure tank. Ensure sampling equipment is kept clean during sampling as access to the pressure tank spigot, which is likely located close to the ground, may be obstructed and may hinder sample collection.

Prior to sampling, a faucet downstream of the pressure tank (e.g., wash room sink) should be run until the well pump comes on and a decrease in water temperature is noted which indicates that the water is coming from the well. If the homeowner is amenable, staff should run the water longer to purge the well (15+ minutes) to provide a sample representative of the water in the formation rather than standing water in the well and piping system including the pressure tank. At this point a new pair of nitrile gloves should be donned and the sample can be collected from the sample point at the pressure tank.

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

GUIDELINES FOR SAMPLING AND ANALYSIS OF PFAS

Under NYSDEC's Part 375 Remedial Programs

January 2020

Field sampling for PFAS…soils…GW … fish tissue

Good reference document

As always, refer to applicable regulatory oversight

January 2020

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

Guidelines for Sampling and Analysis of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs

Objective

New York State Department of Environmental Conservation's Division of Environmental Remediation (DER) performs or oversees sampling of environmental media and subsequent analysis of PFAS as part of remedial programs implemented under 6 NYCRR Part 375. To ensure consistency in sampling, analysis and reporting of PFAS, DER has developed this document to summarize procedures and update previous DER technical guidance pertaining to PFAS.

Applicability

Sampling for PFAS has already been initiated at numerous sites under DER-approved work plans, in accordance with specified procedures. All future work plans should include PFAS sampling and analysis procedures that conform to the guidelines provided herein.

As part of a site investigation or remedial action compliance program, whenever samples of potentially affected media are collected and analyzed for the standard Target Analyte List/Target Compound List (TAL/TCL), PFAS analysis should also be performed. Potentially affected media can include soil, groundwater, surface water, and sediment. Based upon the potential for biota to be affected, biota sampling and analysis for PFAS may also be warranted as determined pursuant to a Fish and Wildlife Impact Analysis. Soil vapor sampling for PFAS is not required.

Field Sampling Procedures

DER-10 specifies technical guidance applicable to DER's remedial programs. Given the prevalence and use of PFAS, DER has developed "best management practices" specific to sampling for PFAS. As specified in DER-10 Chapter 2, quality assurance procedures are to be submitted with investigation work plans. Typically, these procedures are incorporated into a work plan, or submitted as a stand-alone document (e.g., a Quality Assurance Project Plan). Quality assurance guidelines for PFAS are listed in Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS.

Field sampling for PFAS performed under DER remedial programs should follow the appropriate procedures outlined for soils, sediments or other solids (Appendix B), non-potable groundwater (Appendix C), surface water (Appendix D), public or private water supply wells (Appendix E), and fish tissue (Appendix F).

QA/QC samples (e.g. duplicates, MS/MSD) should be collected as specified in DER-10, Section 2.3(c). For sampling equipment coming in contact with aqueous samples only, rinsate or equipment blanks should be collected.

Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS

Specific Guidelines for PFAS

- Include in the text that sampling for PFAS will take place
- Include in the text that PFAS will be analyzed by LC-MS/MS for PFAS using methodologies based on EPA Method 537.1
- Include the list of PFAS compounds to be analyzed (*PFAS Analyte List*)
- Include the laboratory SOP for PFAS analysis
- List the minimum method-achievable Reporting Limits for PFAS
    - Reporting Limits should be less than or equal to:
        - Aqueous – 2 ng/L (ppt)
        - Solids – 0.5 µg/kg (ppb)
- Include the laboratory Method Detection Limits for the PFAS compounds to be analyzed
- Laboratory should have ELAP certification for PFOA and PFOS in drinking water by EPA Method 537.1, EPA Method 533, or ISO 25101
- Include detailed sampling procedures
    - Precautions to be taken
    - Pump and equipment types
    - Decontamination procedures
    - Approved materials only to be used
- Specify that regular ice only will be used for sample shipment
- Specify that equipment blanks should be collected at a minimum frequency of 1 per day per matrix

Appendix B - Sampling Protocols for PFAS in Soils, Sediments and Solids

- Laboratory analysis & containers
  - ***Based on*** Method 537.1
  - Use HDPE containers
- Acceptable sampling materials include:
  - Stainless steel, HDPE, PVC, silicone, acetate, & polypropylene
- No contact with:
  - Aluminum foil, LDPE, glass, PTFE
- Acceptable equipment list *
  - SS spoon
  - SS bowl
  - Steel hand auger / shovel w/ no coatings

Appendix C - Sampling Protocols for PFAS in Monitoring Wells

- Laboratory analysis & containers
- Acceptable sampling materials
- No contact with

- Acceptable equipment list
  - SS inertia pump w/HDPE tubing
  - Peristaltic pump w/ HDPE and silicone tubing
  - SS bailer w/ SS ball
  - Bladder pump (identified as PFAS-free) w/HDPE tubing

- Filtering groundwater
  - Does not mention, not recommended

photo courtesy Sanborn,Head & Associates, Inc.

Field Quality Control (in General)

- Other than FRB for compliance drinking water sampling…
  - Include PFAS field QC the same as you would in any sampling program
    - Same concept as non-PFAS sampling program
- Follow regulatory guidelines where applicable
- Field QC options
  - Precision
    - Field duplicates, MS/MSD
  - Accuracy
    - Matrix spike, PT samples

PFAS Cross-Contamination Minimization Guidance

MassDEP Drinking Water Program

February 2019

Do's and Don'ts

MassDEP 12/27/2019 BWSC update
"there is extensive guidance available online and it is not MassDEP's intent to require the use and avoidance of certain products, particularly as formulations may change over time"

Category	Prohibited Items	Allowable Items
Pumps and Tubing	Teflon® and other fluoropolymer containing materials	High-density polyethylene (HDPE), low density polyethylene (LDPE) , or silicone tubing, peristaltic pump or stainless steel submersible pump
Decontamination	Decon 90	Alconox® or Liquinox®, potable water followed by deionized rinse.
Sample Storage and Preservation	LDPE or glass bottles, PTFE-or Teflon®-lined caps, chemical ice packs	Laboratory-provided sample container -preferred; or, HDPE or polypropylene bottles, regular ice
Field Documentation	Waterproof/treated paper or field books, plastic clipboards, Sharpie® and permanent markers, Post-It® and other adhesive paper products	Plain Paper, metal clipboard, pens
Clothing	Clothing or boots made of or with Gore-Tex™ or other synthetic water resistant and/or stain resistant materials, Tyvek® material	Synthetic or cotton material, previously laundered clothing (preferably previously washed greater than six times) without the use of fabric softeners
Personal Care Products (on day of sample collection)	Cosmetics, moisturizers, hand cream and other related products	Sunscreens: Alba Organics Natural, Yes to Cucumbers, Aubrey Organics, Jason Natural Sun Block, Kiss My Face, Baby-safe sunscreens ('free' or 'natural') Insect Repellents: Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus, Herbal Armor, California Baby Natural Bug Spray, BabyGanics Sunscreen and Insect Repellents: Avon Skin So Soft Bug Guard-SPF 30
Food and Beverage	Pre-packaged food, fast food wrappers or containers	Bottled water or hydration drinks

November 2016

PerFluorinated Compound (PFC) Sample Collection Guidance

The purpose of this document is to provide guidance on groundwater sampling protocols when collecting a sample(s) for PFCs. Detection of these compounds at very low levels can be influenced by materials that are present at the sampling site, materials used by the sampling agent, or sample container handling practices.

The following table provides a summary of items that are likely to contain PFCs (i.e. prohibited items) and therefore should not be used by the sampling agent at the sampling site.

Category	Prohibited Items	Allowable Items
Pumps and Tubing	Teflon® and other fluoropolymer containing materials	High-density polyethylene (HDPE), low density polyethylene (LDPE) , or silicone tubing, peristaltic pump or stainless steel submersible pump
Decontamination	Decon 90	Alconox® or Liquinox®, potable water followed by deionized rinse.
Sample Storage and Preservation	LDPE or glass bottles, PTFE-or Teflon®-lined caps, chemical ice packs	Laboratory-provided sample container -*preferred*; or, HDPE or polypropylene bottles, regular ice
Field Documentation	Waterproof/treated paper or field books, plastic clipboards, non-Sharpie® markers, Post-It® and other adhesive paper products	Plain Paper, metal clipboard, Sharpies®, pens
Clothing	Clothing or boots made of or with Gore-Tex™ or other synthetic water resistant and/or stain resistant materials, Tyvek® material	Synthetic or cotton material, previously laundered clothing (preferably previously washed greater than six times) without the use of fabric softeners
Personal Care Products (for day of sample collection)	Cosmetics, moisturizers, hand cream and other related products	Suncreens: Alba Organics Natural Yes to Cucumbers Aubrey Organics Jason Natural Sun Block Kiss My Face Baby-safe sunscreens ('free' or 'natural') Insect Repellents: Jason Natural Quit Bugging Me Repel Lemon Eucalyptus Herbal Armor California Baby Natural Bug Spray BabyGanics Sunscreen and Insect Repellents: Avon Skin So Soft Bug Guard-SPF 30
Food and Beverage	Pre-packaged food, fast food wrappers or containers	Bottled water or hydration drinks

For samples collected from monitoring wells

- When feasible, use single-use, disposable polyethylene or silicone materials (tubing, bailers, etc.) for monitoring well purging and sampling equipment.

- When feasible - single use equipment
  - When not - decontamination protocol

- When using positive displacement/submersible pump sampling equipment, familiarize yourself with the sampling pump/accessory equipment specifications to confirm that device components are not made of nor contain Teflon® or PTFE.

For samples collected during production well pumping tests

- If feasible, do not use Teflon® tape or pipe thread paste on pipe fittings or sampling tap threads on the pump discharge pipe.
- As with all other sample parameters, the sample for PFCs should be collected at the last hour (or hours) of the pumping portion of the testing program.
- Discharge water should be purged through the sampling tap on the discharge pipe for a minimum of 20 minutes prior to collection of samples.

For samples collected from active production wells

- If feasible, avoid contact with any Teflon® tape or pipe thread paste on pipe fittings or sampling tap threads on the water supply discharge pipe.
- The sample for PFCs should be collected while the production well pump is operating, and, preferably, has been operating for at least one hour.
- Discharge water should be purged through the sampling tap on the discharge pipe for a minimum of 20 minutes prior to collection of samples.

Sample collection method/sequence

- Using new nitrile gloves collect the sample for PFCs *first*, prior to collecting samples for any other parameters into any other containers; this avoids contact with any other type of sample container, bottles or package materials.
- As with all other samples, do not place the sample bottle cap on any surface when collecting the sample, and avoid all contact with the inside of the sample bottle or its cap.
- When sample is collected and capped, place the sample bottle(s) in an individual sealed plastic bag (e.g. Ziploc®) separate from all other sample parameter bottles, and place in shipping container packed only with ice.

Revised 10/2018

GENERAL PFAS SAMPLING GUIDANCE

This document contains an introduction to PFAS, biosecurity recommendations, and general recommendations to decrease the possibility of cross-contamination.

Revised 10/16/2018

Michigan Department of Environmental Quality

4. General PFAS Sampling

The following sections discuss technical issues such as the need to use PFAS-free water; information about PFAS-free clothing and PPE; and laboratory issues that should be considered when sampling for PFAS.

4.1 Sampling Objectives

Before conducting any PFAS sampling, it is recommended that a project-specific Quality Assurance Project Plan (QAPP) should be developed. The QAPP must meet MDEQ policy and should include the analyte list, method of analysis, environmental matrices, and reporting limits, which are based on the project objectives. All of these considerations will be discussed in more detail in this guidance document.

4.2 PFAS Cross-Contamination Potential Sources

Potential sources of PFAS cross-contamination in the typical sampling environment include water used during drilling or decontamination, materials used within the sampling environment, sampling equipment, field clothing and personal protective equipment (PPE), sun and biological protection products, personal hygiene and personal care products (PCPs), food packaging, and the environment itself.

The materials associated with sampling that have the potential for PFAS cross-contamination have been divided into three major groups:

- Prohibited (●) identifies items and materials that should not be used when sampling. It is well documented that they contain PFAS or that PFAS are used in their manufacture.
- Allowable (■) identifies items and materials that have been proven not to be sources of PFAS cross contamination and are considered allowable for sampling.
- Needs Screening (▲) identifies items and materials that have the potential for PFAS cross-contamination due to a lack of scientific data or statements from manufacturers to prove otherwise. These items and materials are further sub-divided into two categories:
  - **Category 1:** Items and materials that <u>will come in direct contact</u> with the sample. These should not be used when sampling unless they are known to be PFAS-free, by collecting an equipment blank sample prior to use.
  - **Category 2:** Items and materials that <u>will not come in direct contact</u> with the sample. These should be avoided, if possible, unless they are known to be PFAS-free by collecting an equipment blank sample prior to use.

All of the materials or items discussed in each of the MDEQ's PFAS Sampling Guidance Documents will be divided into ● Prohibited ■ Allowable, or ▲ Needs Screening. Several examples of prohibited and allowable materials and materials that need screening are listed in the **MDEQ PFAS Sampling Quick Reference Field Guide** at the end of this document. Also, materials and items that are specific to a particular environmental media or sampling method will be thoroughly explained in that media's sampling guidance document (such as peristaltic pumps for groundwater sampling).

NOTE: If recommended PPE will be used during sampling, Category 2 materials are not expected to be a source of cross-contamination as long as they do not come into contact with the samples.

●- Prohibited ■- Allowable ▲- Needs Screening

Michigan Department of Environmental Quality

MDEQ PFAS Sampling Quick Reference Field Guide[1]

All Items Used During Sampling Event

Prohibited

• Items or materials that contain fluoropolymers such as
  ○ Polytetrafluoroethylene (PTFE), that includes the trademarks Teflon® and Hostaflon®
  ○ Polyvinylidene fluoride (PVDF), that includes the trademark Kynar®
  ○ Polycholotrifluoroethylene (PCTFE), that includes the trademark Neoflon ®
  ○ Ethylene-tetrafluoro-ethylene (ETFE), that includes the trademark Tefzel®
  ○ Fluorinated ethylene propylene (FEP), that includes the trademarks Teflon® FEP and Hostaflon® FEP
• Items or materials that contain any other fluoropolymer

Pumps, Tubing, and Sampling Equipment

Prohibited	Allowable	Needs Screening[2]

• Items or materials containing any fluoropolymer (potential items include tubing, valves, or pipe thread seal tape)	• High-density polyethylene (HDPE)
	• Low-density polyethylene (LDPE) tubing
	• Polypropylene
	• Silicone
	• Stainless-steel
	• Any items used to secure sampling bottles made from:
	  ○ Natural rubber
	  ○ Nylon (cable ties)
	  ○ Uncoated metal springs
	  ○ Polyethylene
		• Any items or materials that will come into direct contact with the sample that have not been verified to be PFAS-free
		  ○ Do not assume that any sampling items or materials are PFAS-free based on composition alone

Sample Storage and Preservation

Prohibited	Allowable	Needs Screening[2]
• Polytetrafluoroethylene (PTFE): Teflon® lined bottles or caps	• Glass jars[4] • Laboratory-provided PFAS-Free bottles: ○ HDPE or polypropylene • Regular wet ice • Thin HDPE sheeting • LDPE resealable storage bags (i.e. Ziploc®) that will not contact the sample media[5]	• Aluminium foil[4] • Chemical or blue ice[5] • Plastic storage bags other than those listed as ■ Allowable • Low-density polyethylene (LDPE) bottles

Field Documentation

Prohibited	Allowable	Needs Screening[2]
• Clipboards coated with PFAS • Notebooks made with PFAS treated paper • PFAS treated loose paper • PFAS treated adhesive paper products	• Loose paper (non-waterproof, non-recycled) • Rite in the Rain® notebooks • Aluminium, polypropylene, or Masonite field clipboards • Ballpoint pens, pencils, and Fine or Ultra-Fine Point Sharpie® markers	• Plastic clipboards, binders, or spiral hard cover notebooks • All markers not listed as ■ Allowable • Post-It® Notes or other adhesive paper products • Waterproof field books

Decontamination

Prohibited	Allowable	Needs Screening[2]
• Decon 90® • PFAS treated paper towel	• Alconox®, Liquinox®, or Citranox® • Triple rinse with PFAS-free deionized water • Cotton cloth or untreated paper towel	• Municipal water • Recycled paper towels or chemically treated paper towels

Clothing, Boots, Rain Gear, and PPE

Prohibited	Allowable	Needs Screening[2]

• New or unwashed clothing
• Anything made of or with:
  ○ Gore-Tex™ or other water-resistant synthetics
• Anything applied with or recently washed with:
  ○ Fabric softeners
  ○ Fabric protectors, including UV protection
  ○ Insect resistant chemicals
  ○ Water, dirt, and/or stain resistant chemicals
	• Powderless nitrile gloves
	• Well-laundered synthetic or 100% cotton clothing, with most recent launderings not using fabric softeners
	• Made of or with:
	  ○ Polyurethane
	  ○ Polyvinyl chloride (PVC)
	  ○ Wax coated fabrics
	  ○ Rubber / Neoprene
	  ○ Uncoated Tyvek®
		• Latex gloves
		• Water and/or dirt resistant leather gloves
		• Any special gloves required by a HASP
		• Tyvek® suits, clothing that contains Tyvek®, or coated Tyvek®

Food and Beverages

Prohibited	Allowable

• No food should be consumed in the staging or sampling areas, including pre-packaged food or snacks.
  ■ If consuming food on-site becomes necessary, move to the staging area and remove PPE. After eating, wash hands thoroughly and put on new PPE.
	• Brought and consumed only outside the vicinity of the sampling area:
	  ○ Bottled water
	  ○ Hydration drinks (i.e. Gatorade®, Powerade®)

Personal Care Products (PCPs) - for day of sample collection[6]

Prohibited	Allowable	Needs Screening[2]
• Any PCPs[6], sunscreen, and insect repellent applied in the sampling area.	PCPs[6], sunscreens, and insect repellents applied in the staging area, away from sampling bottles and equipment followed by thoroughly washing hands: **PCPs[6]:** • Cosmetics, deodorants/antiperspirants, moisturizers, hand creams, and other PCPs[6] **Sunscreens:** • Banana Boat® for Men Triple Defense Continuous Spray Sunscreen SPF 30 • Banana Boat® Sport Performance Coolzone Broad Spectrum SPF 30 • Banana Boat® Sport Performance Sunscreen Lotion Broad Spectrum SPF 30 • Banana Boat® Sport Performance Sunscreen Stick SPF 50 • Coppertone® Sunscreen Lotion Ultra Guard Broad Spectrum SPF 50 • Coppertone® Sport High Performance AccuSpray Sunscreen SPF 30 • Coppertone® Sunscreen Stick Kids SPF 55 • L'Oréal® Silky Sheer Face Lotion 50 • Meijer® Clear Zinc Sunscreen Lotion Broad Spectrum SPF 50 • Meijer® Sunscreen Continuous Spray Broad Spectrum SPF 30 • Meijer® Clear Zinc Sunscreen Lotion Broad Spectrum SPF 15, 30 and 50 • Meijer® Wet Skin Kids Sunscreen Continuous Spray Broad Spectrum SPF 70 • Neutrogena® Beach Defense Water+Sun Barrier Lotion SPF 70 • Neutrogena® Beach Defense Water+Sun Barrier Spray Broad Spectrum SPF 30 • Neutrogena® Pure & Free Baby Sunscreen Broad Spectrum SPF 60+ • Neutrogena® UltraSheer Dry-Touch Sunscreen Broad Spectrum SPF 30 **Insect Repellents:** • OFF® Deep Woods • Sawyer® Permethrin	• Products other than those listed as ■ Allowable

[1] This table is not considered to be a complete listing of prohibited or allowable materials. All materials should be evaluated prior to use during sampling. The manufacturers of various products should be contacted in order to determine if PFAS was used in the production of any particular product.

[2] Equipment blank samples should be taken to verify these products are PFAS-free prior to use during sampling.

[3] For surface water foam samples: LDPE storage bags may be used in the sampling of foam on surface waters. In this instance, it is allowable for the LDPE bag to come into direct contact with the sample media.

[4] For fish and other wildlife samples: Depending on the project objectives, glass jars and aluminum foil might be used for PFAS sampling. PFAS has been found to bind to glass and if the sample is stored in a glass jar, a rinse of the jar is required during the sample analysis. PFAS are sometimes used as a protective layer for some aluminum foils. An equipment blank sample should be collected prior to any aluminum foil use.

[5] Regular ice is recommended as there are concerns that chemical and blue ice may not cool and maintain the sample at or below 42.8°F (6°C) (as determined by EPA 40 CFR 136 – NPDES) during collection and through transit to the laboratory.

[6] Based on evidence, avoidance of PCPs is considered to be precautionary because none have been documented as having cross-contaminated samples due to their use. However, if used, application of PCPs must be done at the staging area and away from sampling bottles and equipment, and hands must be thoroughly washed after the use of any PCPs prior to sampling.

● - Prohibited ■ - Allowable ▲ - Needs Screening

PFAS in Sampling / Laboratory Supplies?

- **Study conducted by TRC & Alpha Analytical**
  - *"Per- and polyfluorinated substances in environmental sampling products: Fact or fiction?" Elizabeth Denly, Jim Occhialini, Phil Bassignani, Michael Eberle, & Nidal Rabah, Remediation, 2019;29:65–76.*

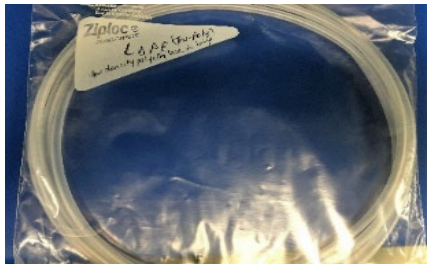
- **Acknowledgements**
  - Elizabeth Denly, Michael Eberle, Nidal Rabah - TRC
  - Philip Bassignani - Alpha Analytical

HDPE Tubing - Lab

Note Pad

Polyethylene Bladder

HDPE Tubing: 1/8” OD
3/8” OD



LDPE Tubing :
2 Manufacturers

Silastic Tubing

PTFE
Bladder

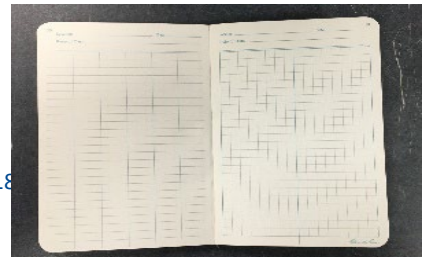
Suit

PTFE
Tubing

Passive Diffusion Bag

Nitrile Gloves

Bailer Line



Field Book
(cover & pages)

Concept

- Objective:
  - Can PFAS be transferred from common field and other commercial products during sampling?

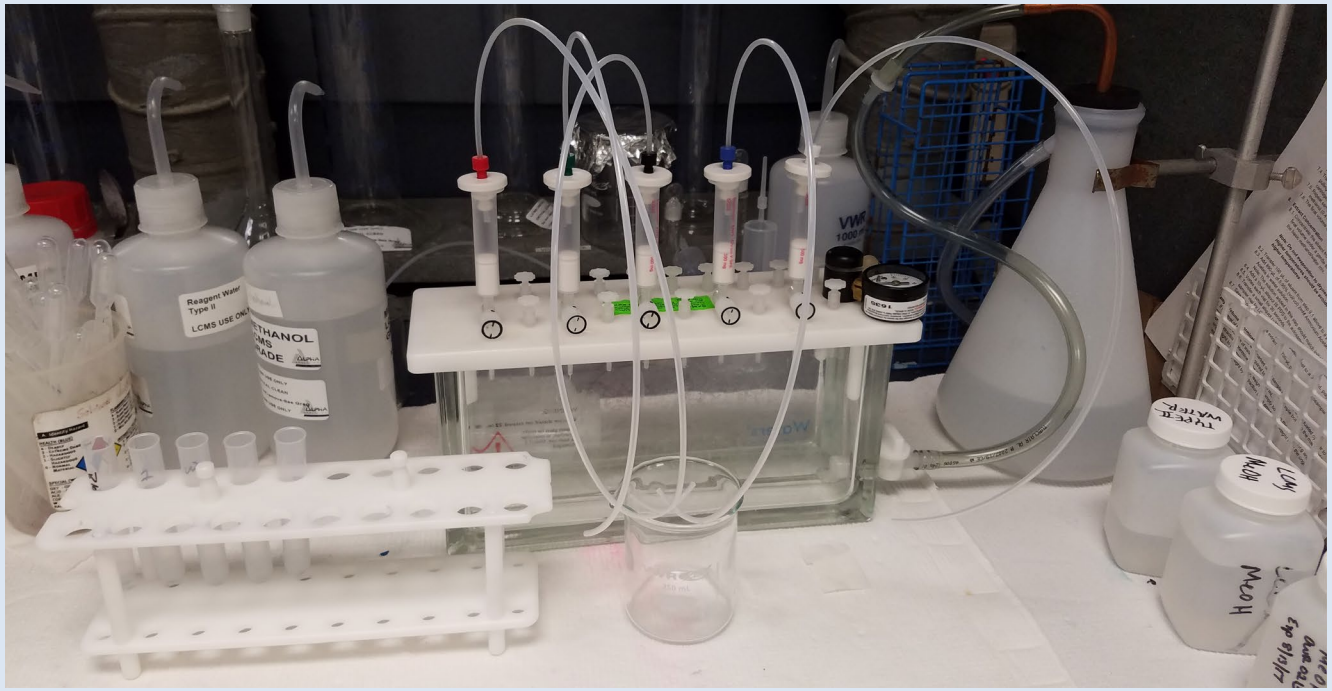
- Disclaimer

  Worst case scenario, snapshot

  - Products chosen at random
    - Generic product names are used as descriptions but not to endorse or invalidate any individual product for use
    - Nothing implied concerning a given product's results
      - Sources, manufacturers, product ID, lot #, etc.

Experimental Design, Leaching Step

- Leaching Step
  - Shaker table, 24 hr. contact time then decant
    - 2 replicate extractions per product, where possible
  - PFAS-free water
  - 250 mL volume
    - neutral pH, moderate conductivity: 300 us/cm
  - 10 x 10 in product surface area (ideally)
    - Leaching containers
      - HDPE 250 ml bottles
- Leaching blanks
  - 1 per batch plus method blanks



Quality Control:

Method Blanks

LCS

Calibration Checks

Extracted IS

Matrix Spikes

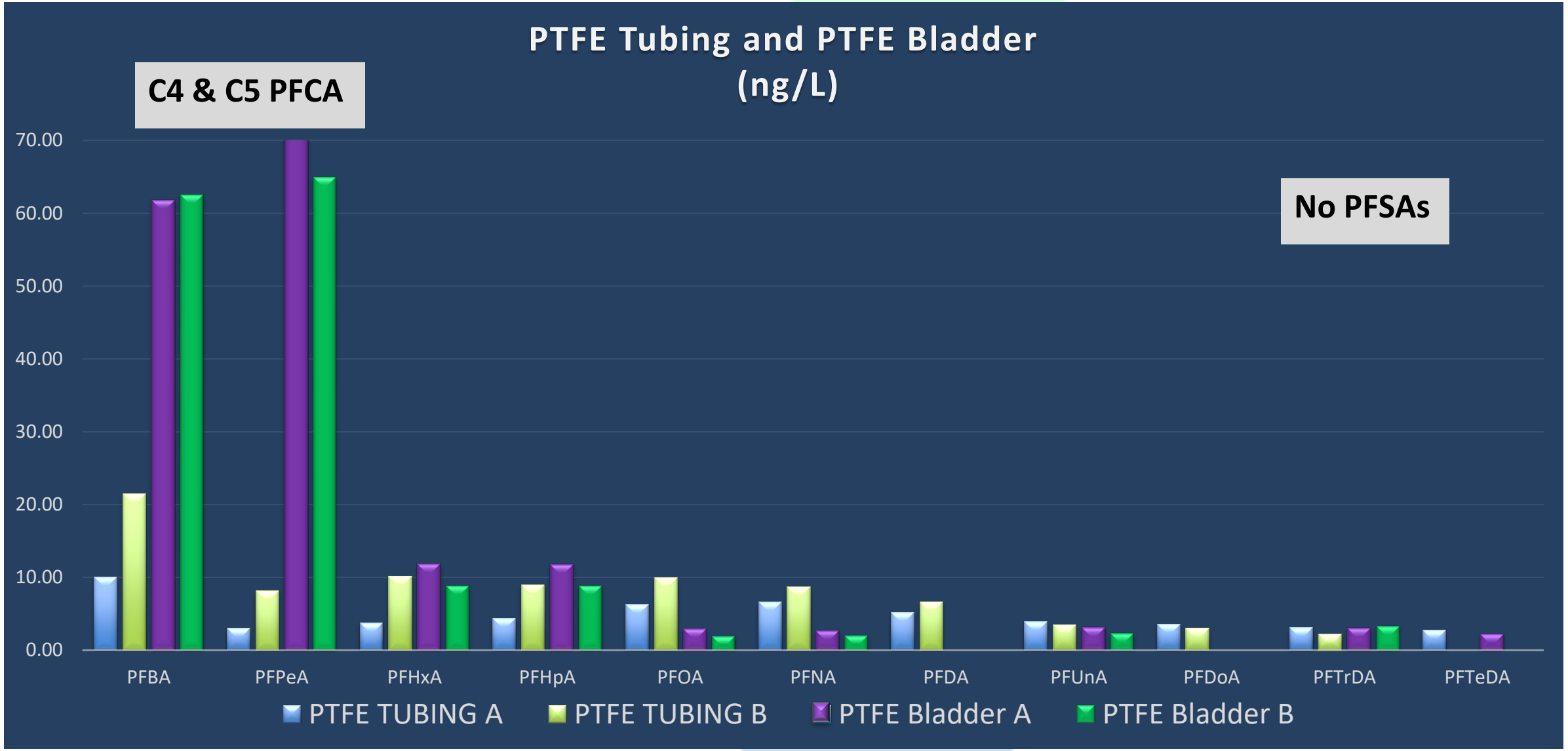
Experimental Design Analysis

Solid phase extraction

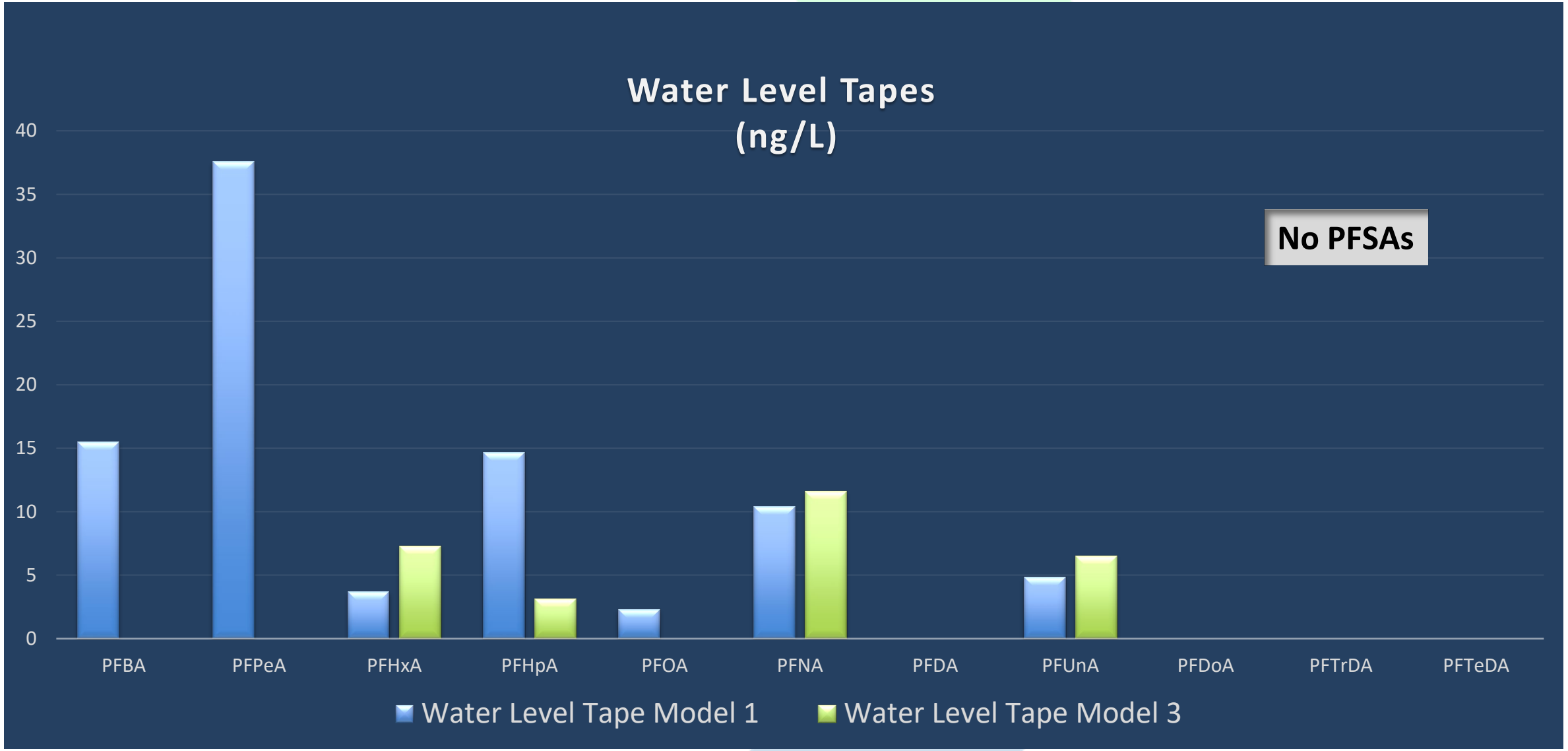
LC/MS/MS, isotope dilution

24-compound target list

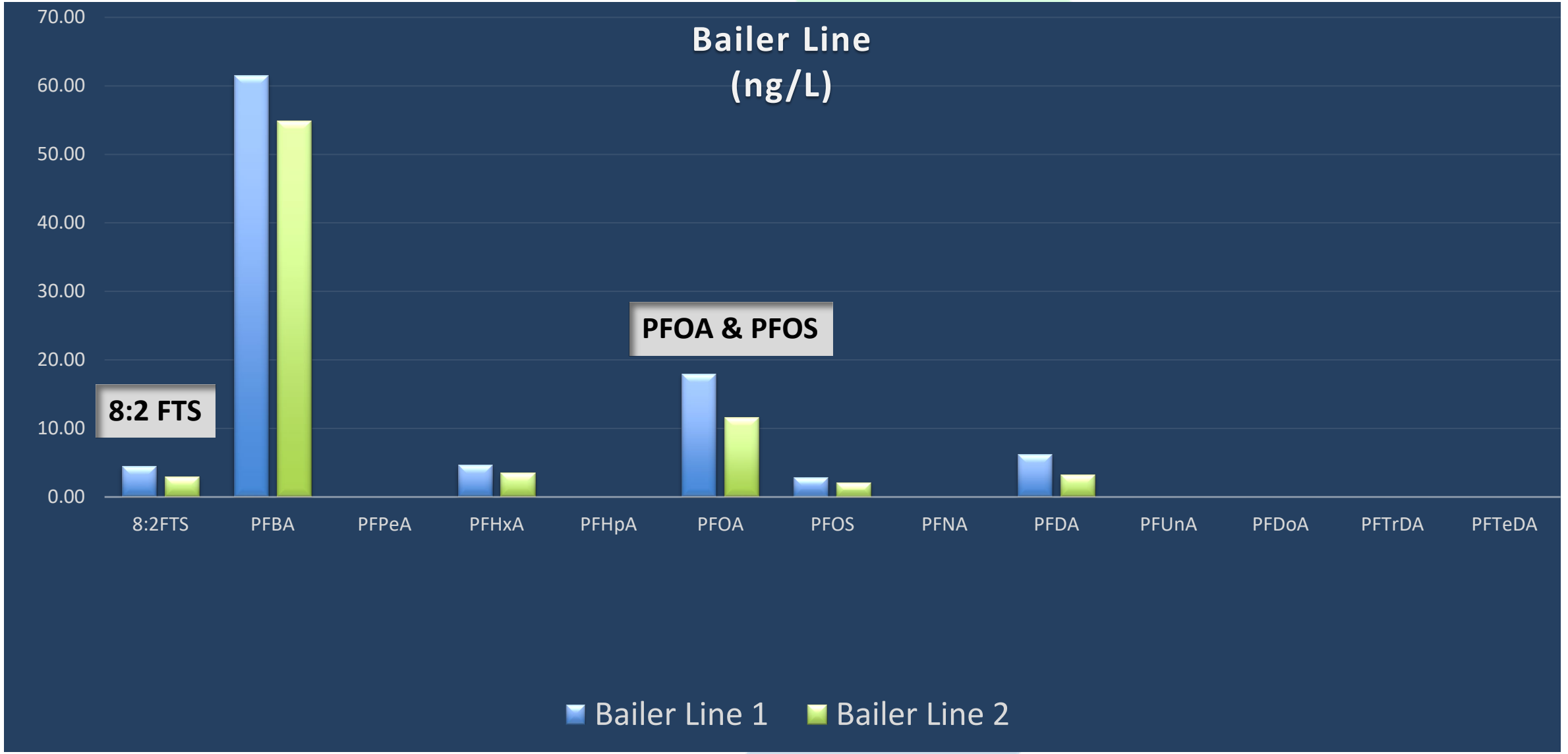
PTFE Tubing & PTFE Bladder



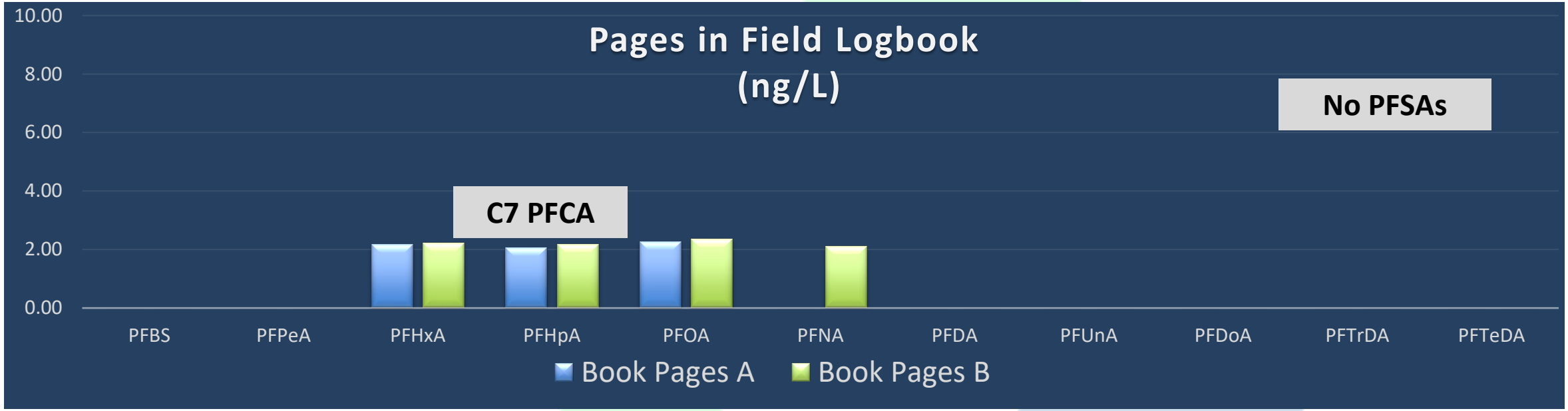
Water Level Tapes

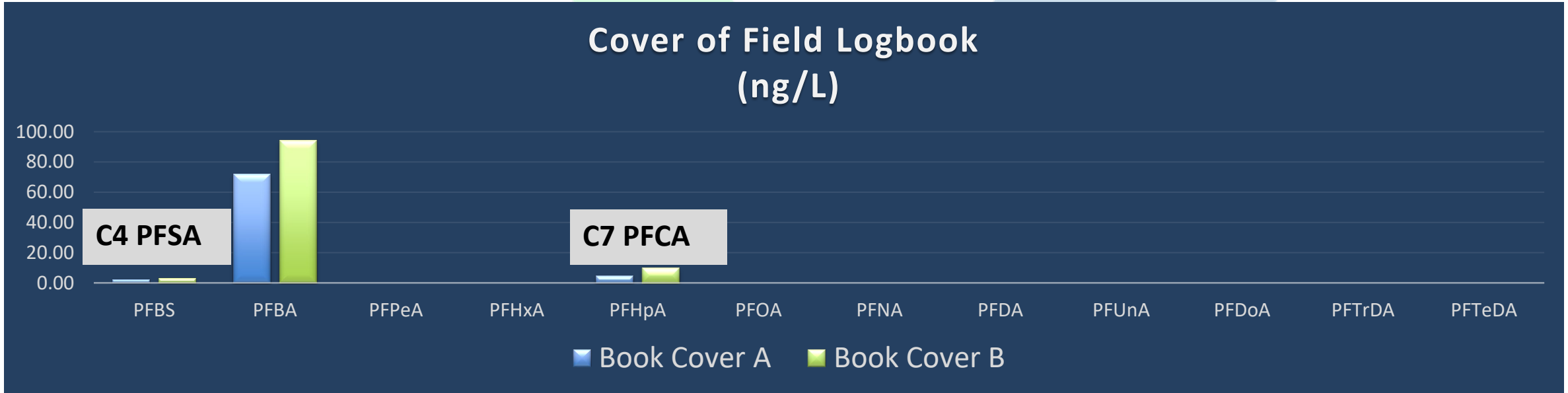


Bailer Line


Bailer Line
(ng/L)
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
ng/L
8:2 FTS
PFOA & PFOS
8:2FTS
PFBA
PFPeA
PFHxA
PFHpA
PFOA
PFOS
PFNA
PFDA
PFUnA
PFDoA
PFTrDA
PFTeDA
Bailer Line 1
Bailer Line 2

Field Book Pages vs Field Book Cover





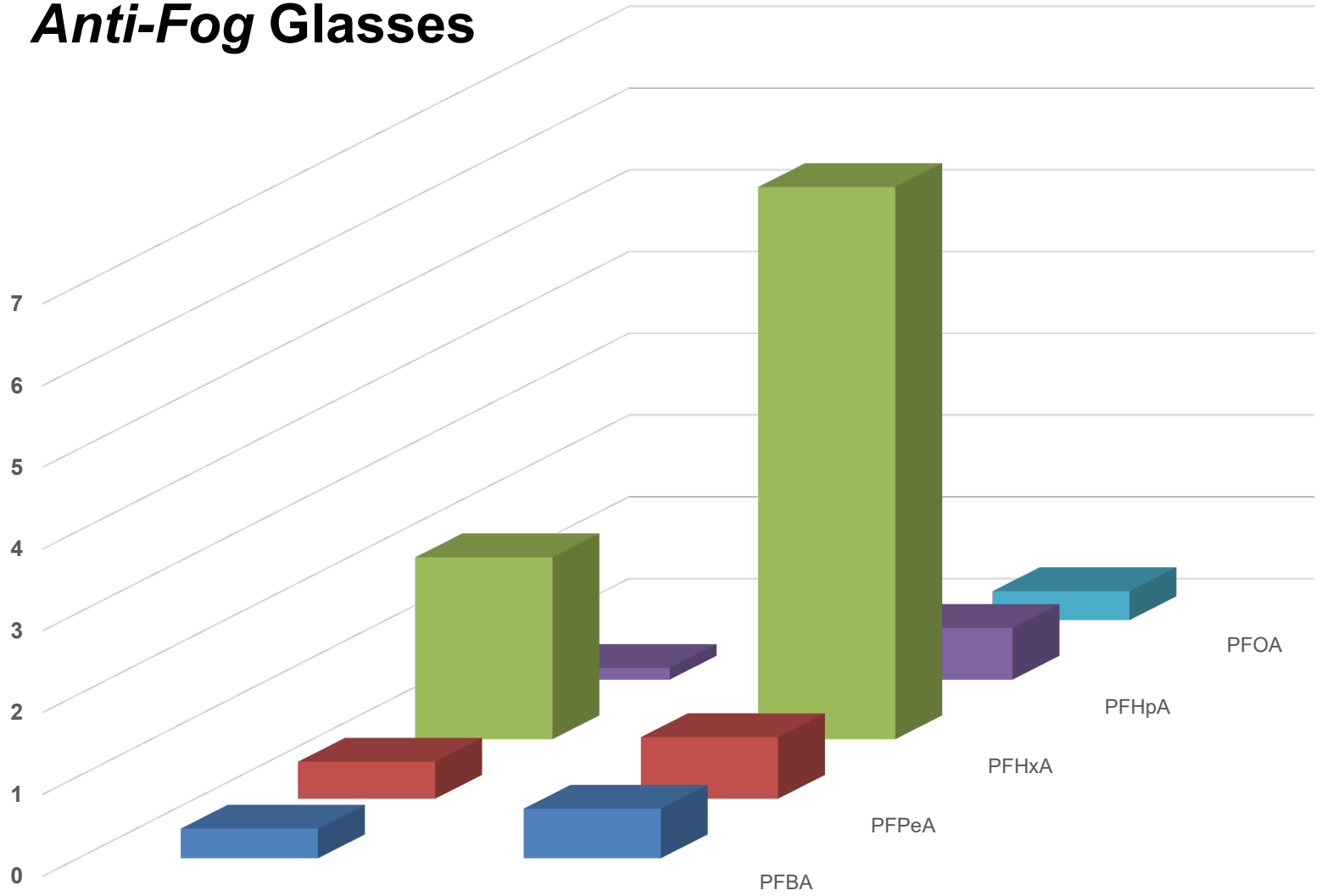
Piping -Related Products

Analyte	PVC Pipe A	PVC Pipe B	Cured Liner	PTFE Tape A	PTFE Tape B
4:2FTS	ND	ND	ND	ND	ND
6:2FTS	ND	ND	ND	ND	ND
8:2FTS	ND	ND	ND	ND	ND
FOSA	ND	ND	ND	ND	ND
NEtFOSAA	ND	ND	ND	ND	ND
NMeFOSAA	ND	ND	ND	ND	ND
PFBA	ND	ND	ND	**7.16**	**7.02**
PFBS	ND	ND	ND	ND	ND
PFDA	ND	ND	ND	ND	ND
PFDoA	ND	ND	ND	ND	ND
PFDS	ND	ND	ND	ND	ND
PFHpA	ND	ND	ND	ND	ND
PFHpS	ND	ND	ND	ND	ND
PFHxA	ND	ND	ND	ND	ND
PFHxS	ND	ND	ND	ND	ND
PFNA	ND	ND	ND	ND	ND
PFNS	ND	ND	ND	ND	ND
PFOA	ND	ND	ND	**44.64**	**62.98**
PFOS	ND	ND	ND	ND	ND
PFPeA	ND	ND	ND	**3.36**	**4.93**
PFPeS	ND	ND	ND	ND	ND
PFTA	ND	ND	ND	ND	ND
PFTrDA	ND	ND	ND	ND	ND
PFUnA	ND	ND	ND	ND	ND

Miscellaneous

Analyte	Bubble Wrap	Garbage Bag A	Garbage Bag B	Pizza Box A	Pizza Box B	"Protein Bar" Wrapper A	"Protein Bar" Wrapper B
4:2FTS	ND	ND	ND	ND	ND	ND	ND
6:2FTS	ND	ND	ND	ND	ND	ND	ND
8:2FTS	ND	ND	ND	ND	ND	ND	ND
FOSA	ND	ND	ND	ND	ND	ND	ND
NEtFOSAA	ND	ND	ND	ND	ND	ND	ND
NMeFOSAA	ND	ND	ND	ND	ND	ND	ND
PFBA	ND	ND	ND	**6.83**	**12.29**	ND	ND
PFBS	ND	ND	ND	ND	ND	ND	ND
PFDA	ND	ND	ND	ND	ND	ND	ND
PFDoA	ND	ND	ND	ND	ND	ND	ND
PFDS	ND	ND	ND	ND	ND	ND	ND
PFHpA	ND	ND	ND	ND	ND	ND	ND
PFHpS	ND	ND	ND	ND	ND	ND	ND
PFHxA	ND	ND	ND	ND	ND	ND	ND
PFHxS	ND	ND	ND	ND	ND	ND	ND
PFNA	ND	ND	ND	ND	ND	ND	ND
PFNS	ND	ND	ND	ND	ND	ND	ND
PFOA	ND	ND	ND	**4.78**	**3.79**	ND	ND
PFOS	ND	ND	ND	ND	ND	ND	ND
PFPeA	ND	ND	ND	ND	ND	ND	ND
PFPeS	ND	ND	ND	ND	ND	ND	ND
PFTA	ND	ND	ND	ND	ND	ND	ND
PFTrDA	ND	ND	ND	ND	ND	ND	ND

Anti-Fog Glasses



Masks?

Recent publication by Rodowa et al did not show much contribution from sampling materials

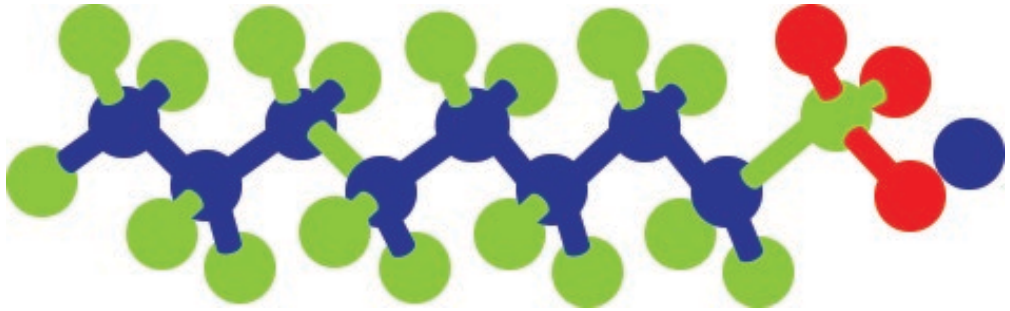
Field Sampling Materials Unlikely Source of Contamination for Perfluoroalkyl and Polyfluoroalkyl Substances in Field Samples

Alix E. Rodowa, Emerson Christie, Jane Sedlak, Graham F. Peaslee, Dorin Bogdan, Bill DiGuiseppi, and Jennifer A. Field

Environmental Science & Technology Letters **2020** *7* (3), 156-163

DOI: 10.1021/acs.estlett.0c00036

Wrap Up



Start with -
Standard industry practice for site characterization & sampling…
And then make PFAS accommodations

Stay current w/regulatory requirements, have project - specific discussion with laboratory

Blanks?

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