



right solutions.
right partner.

PFAS in Air : Just the Facts

October 2025

Presented by:

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Safety moment



right solutions.
right partner.

Hearing Protection? Listen UP!

- Wear protection when sound exceeds 85 decibels and exposure is 8 hrs or more
- What does 85 dBA sound like?
 - hairdryer
 - police car siren
 - passing train
 - vacuum cleaner
 - airport
- For TYPES of Protection available → speak with your H&S team



Outline



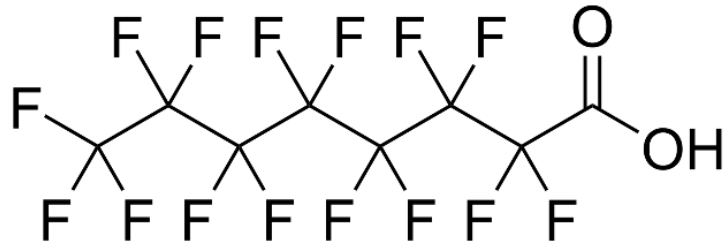
- **What** PFAS can be found in air?
- **Where** are PFAS Compounds in Air?
- **Why** are we concerned about them?
- **When** might PFAS air testing be considered?
- **How** do we sample and analyze for them?
- Now What?



What PFAS can be found in the air?

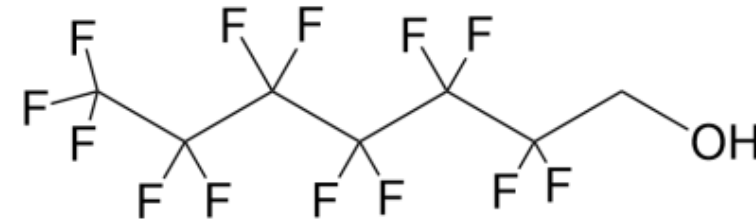
PFAS have distinct volatility characteristics based on their chemical properties

PFOA



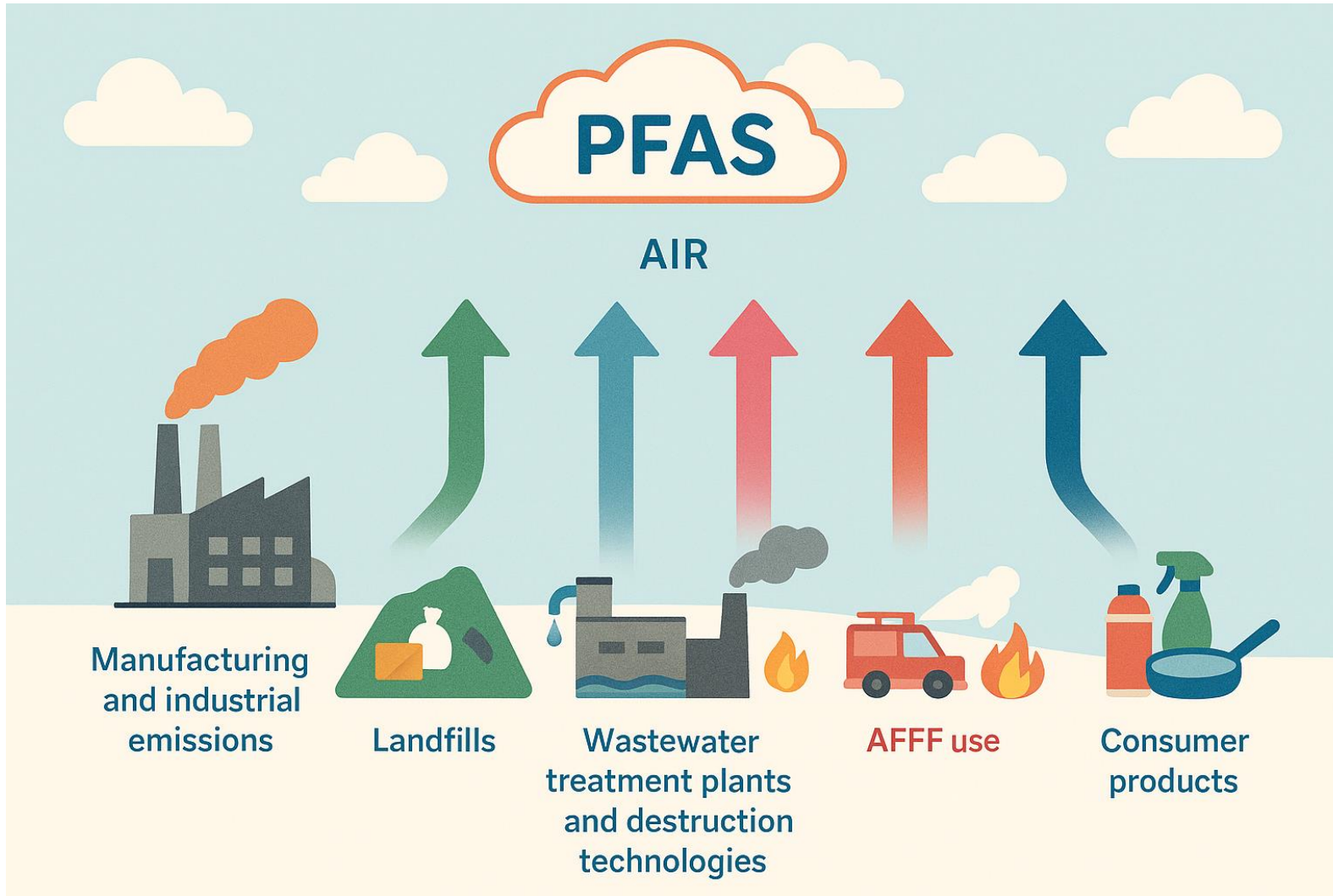
- Low volatility
- Can be dispersed bound to water or particulate

6:2 FTOH

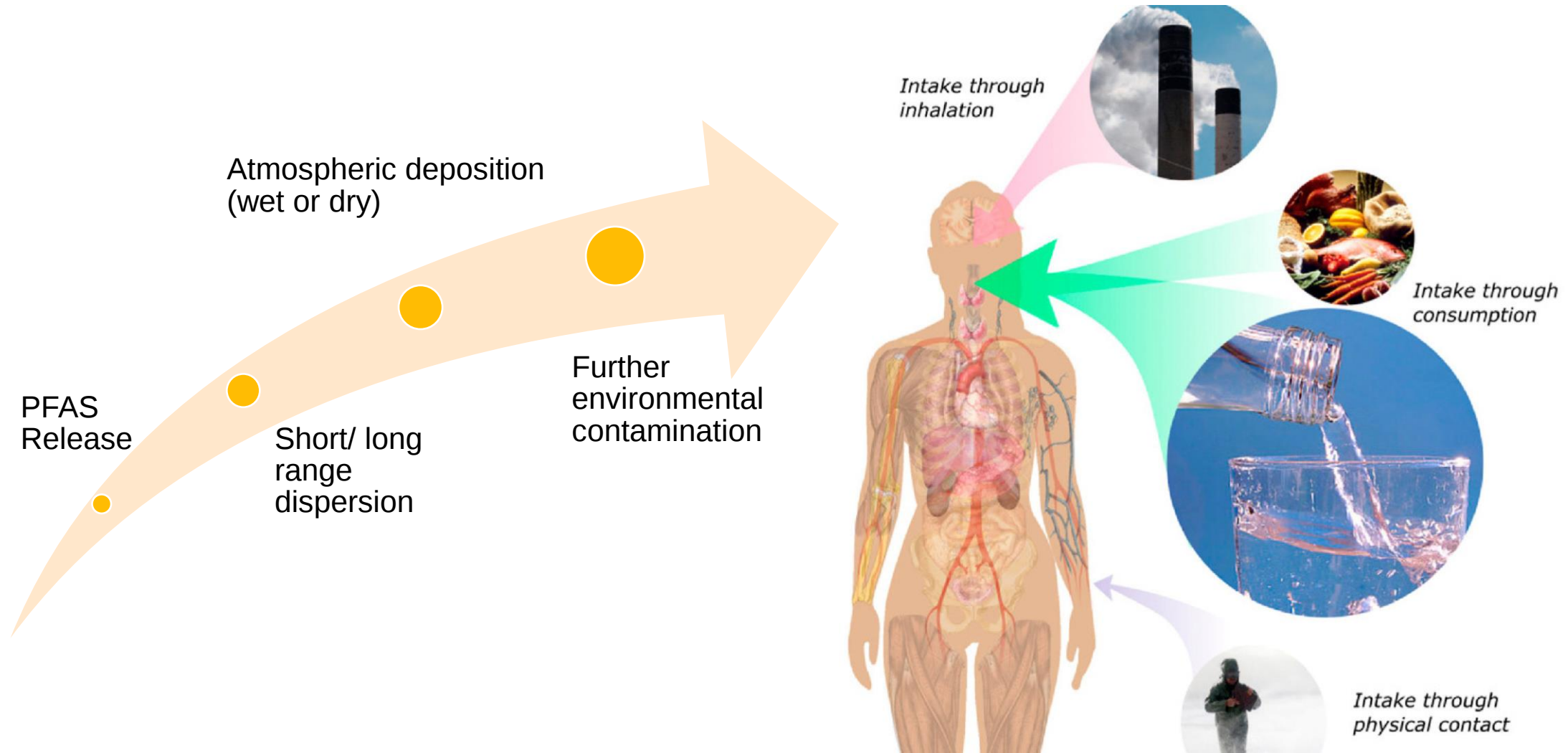


- High volatility

Where: The Sources

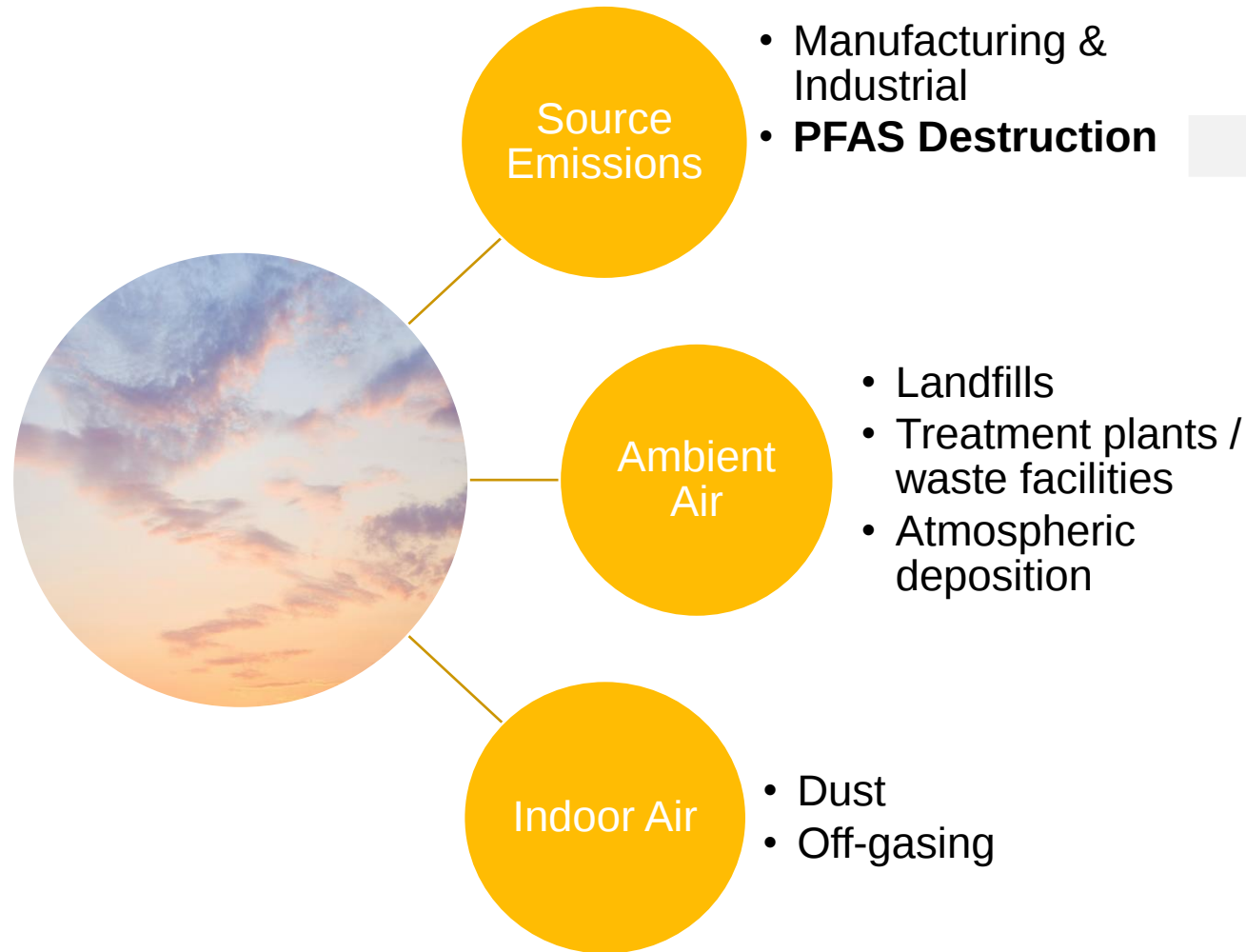


Why : Environmental and Health Implications



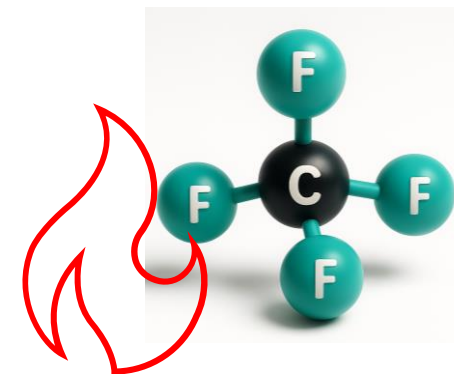
Source: Meegoda et al. 2020

When might PFAS air testing be considered?



Is PFAS destruction complete?

- Incomplete destruction could lead to release of PIDs / PICs
- Confirm adequate temperatures to mineralize all fluorine



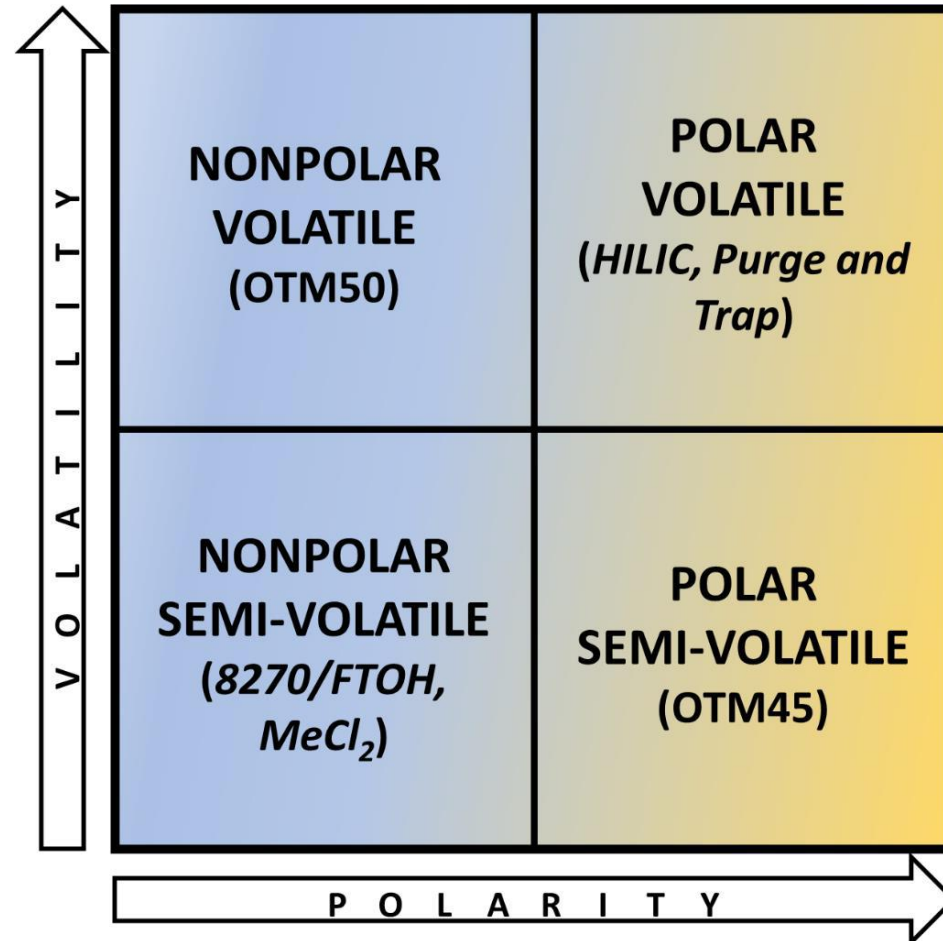
>1400°C
(Tsang et al., 1998)

How: Air Methods



- Canister sample collection
- Analysis by GC/MS-MS
- 30 compounds (mostly PIC)

- OTM-55 (under development)
- FTOH and others



future?
Not many known compounds in this category

- Stack sampling
- Analysis by LC-MS/MS
- 49 compounds (typical water analytes)

Source: US EPA

How: OTM-45 (Polar Semi-Volatile)



- Stack sampling
- Analysis by LC-MS/MS
- 49 compounds (typical water analytes)

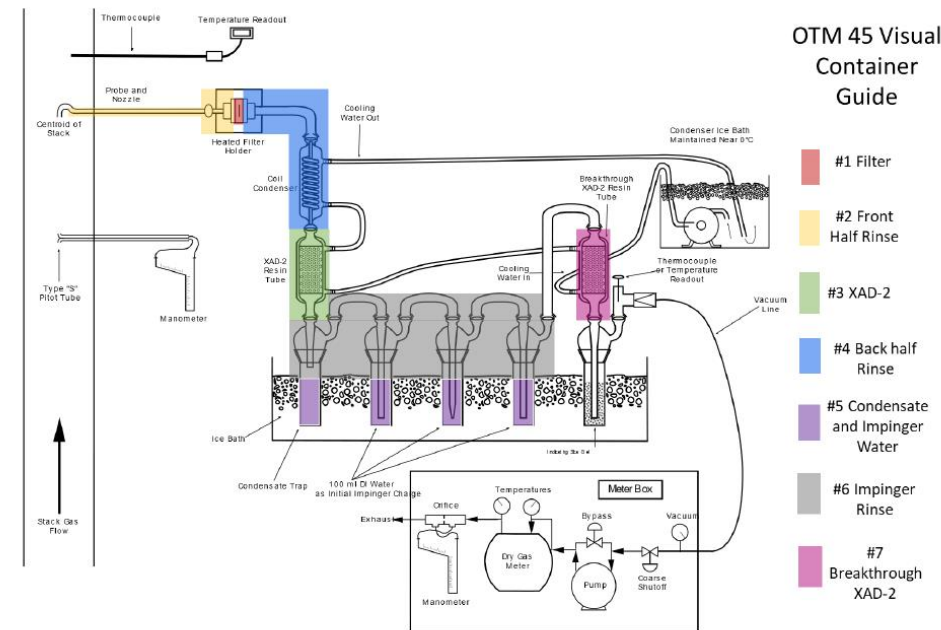


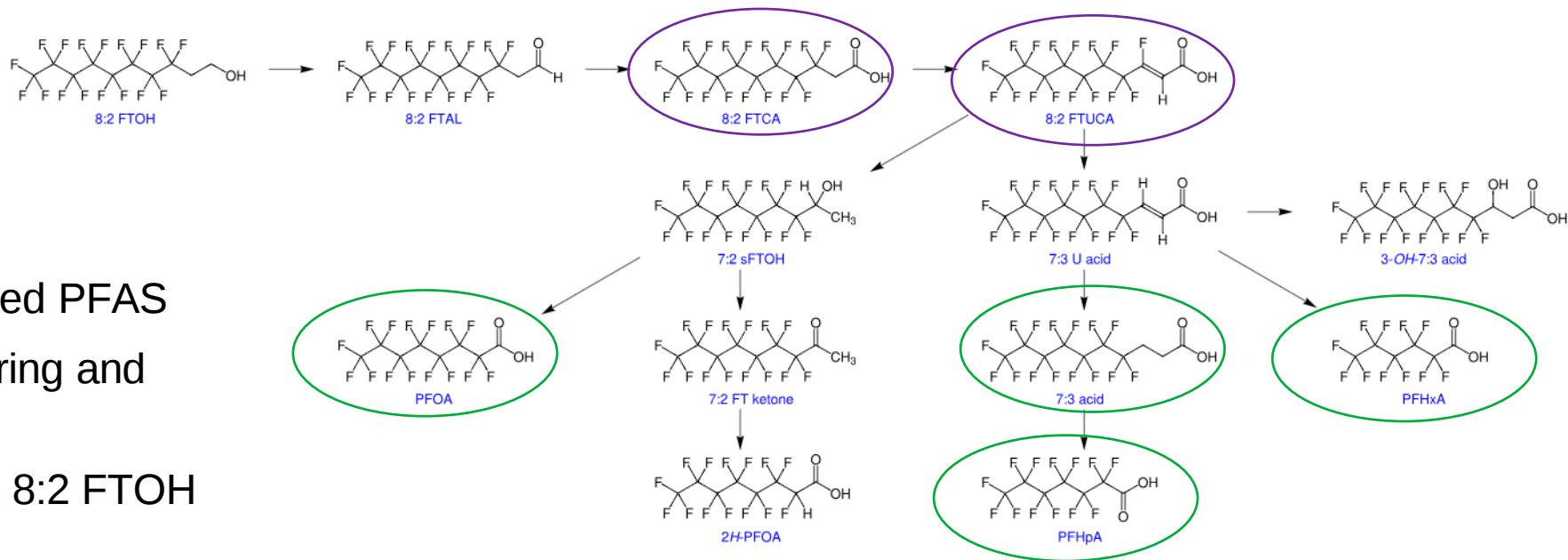
Figure OTM-45-1. Sampling Train



ALS Method Trials (2022)

- Project completed as part of a study of PFAS in air using Orbo 1500-PUF/XAD
 - Extraction completed and analysis for PFAS by LC/MS-MS
 - Achieved reasonable data but method is not supported by OTM-45 (draft at the time)
 - 33 compounds
- Further development underway

How: Fluortelomer Alcohols (FTOHs)



- Major category of polyfluorinated PFAS
- Commonly used in manufacturing and AFFF
- Pending regulation for 6:2 and 8:2 FTOH in Europe
- Testing in air via OTM-55 and ASTM D8591-24 (still under development)
- Testing in soil and water available for select compounds

Figure 1: Aerobic biotransformation of 8:2 FTOH in soil – compounds in green boxes are included in ALS's 40 analyte PFAS suite, compounds in purple boxes are included in ALS's extended 52 analyte suites

https://commons.wikimedia.org/wiki/File:Aerobic_biotransformation_8-2_FTOH_soil_labeled.svg

Which: OTM-50 (Non-polar Volatile)



Compound Name	CAS #	Chemical Formula
Carbon tetrafluoride	75-73-0	CF ₄
Hexafluoroethane (FC-116)	76-16-4	C ₂ F ₆
Tetrafluoroethene	116-14-3	C ₂ F ₄
Trifluoromethane (HFC-23)	75-46-7	CHF ₃
Octafluoropropane	76-19-7	C ₃ F ₈
Difluoromethane (HFC-32)	75-10-5	CH ₂ F ₂
Fluoromethane (HFC-41)	593-53-3	CH ₃ F
Pentafluoroethane (HFC-125)	354-33-6	C ₂ HF ₅
Hexafluoropropene	116-15-4	C ₃ F ₆
Hexafluoropropene oxide (HFPO)	428-59-1	C ₃ F ₆ O
Decafluorobutane	355-25-9	C ₄ F ₁₀
Dodecafluoropentane	678-26-2	C ₅ F ₁₂
Tetradecafluorohexane	355-42-0	C ₆ F ₁₄
1H-Perfluoropentane	375-61-1	C ₅ HF ₁₁
Hexadecafluoroheptane	335-57-9	C ₇ F ₁₆
Heptafluoropropyl-1,2,2,2-tetrafluoroethyl ether (E1)	3330-15-2	C ₅ HF ₁₁ O
1H-Perfluorohexane	355-37-3	C ₆ HF ₁₃
1H-Perfluoroheptane	375-83-7	C ₇ HF ₁₅
2H-Perfluoro-5-methyl-3,6-dioxanonane (E2)	3330-14-1	C ₈ HF ₁₇ O ₂
1H-Perfluorooctane	335-65-9	C ₈ HF ₁₇
Octadecafluorooctane	307-34-6	C ₈ F ₁₈
1H-Nonafluorobutane	375-17-7	C ₄ HF ₉
1H-Heptafluoropropane	2252-84-8	C ₃ HF ₇
1,1,1,2-Tetrafluoroethane (HFC-134a)	811-97-2	C ₂ H ₂ F ₄
1,1,1-Trifluoroethane (HFC-143a)	420-46-2	C ₂ H ₃ F ₃
Chlorodifluoromethane (HCFC-22)	75-45-6	CHClF ₂
Chlorotrifluoromethane (CFC-13)	75-72-9	CF ₃ Cl
Octafluorocyclobutane (FC-C318)	115-25-3	C ₄ F ₈
Octafluorocyclopentene (FC-C1418)	559-40-0	C ₅ F ₈
Trichloromonofluoromethane (CFC-11)	75-69-4	CCl ₃ F

- Canister sample collection
- Analysis by GC/MS-MS triple-quad
- 30 compounds (mostly PIC)

Volatile fluorinated compounds (VFCs)

- Products of incomplete combustion / destruction (PICs/PIDs)
- Industrial compounds of interest

Silonite vs Summa – Why?



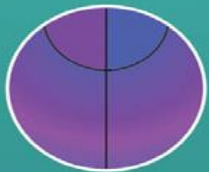
SILONITE CANISTER vs SUMMA & UNCOATED CANISTER

SILONITE



100% inertness tested prior to shipment. Polished internal surface prior to Silonite™ coating for the most inert surface possible.

All Entech Canisters are coated in Silonite™ to ensure there is no chance for corrosion and the subsequent loss of reactive compounds.



Silonite™ canisters are the only "inertness-repairable" canisters on the market. No need to fear canister inertness testing. Entech's renewal process can return old Silonite™ cans to often better than new conditions.

Externally electro-polished "after" Silonite™ coating to provide a more analytical and professional look.



UNCOATED

Rapidly lose their ability to recover important VOCs such as Carbon Tetrachloride.

During the manufacturing of 6L half shells, organic contaminants in the form of grease and oils become trapped in the surface pores found in all stainless steel sheet metal.

Interior will easily corrode.

SUMMA

The metal oxides found in SUMMA canisters can actually be catalytic in promoting certain chemical reactions.

Because of the limited inertness of the SUMMA canister, a certain amount of water vapor is actually needed to allow Air Toxic compounds to remain stable. Even aromatic hydrocarbons can be lost to the surface of a SUMMA canister if enough water isn't present.



What and How ?



1.4L Silonite canister
Dedicated PFAS canisters



Longer Sampling?

Sampling Times : 4,10, 20
or 60 minutes



1.4L Silonite canister with
short-term grab sampler
or long-term TWA

Quality Control – Duplicate Samples



Considerations

- ✓ Type of sample taken?
- ✓ Same or different flow?
- ✓ Same or different time?

Suggestions

- Co-located (side-by-side) for indoor air
- Equalized pressure in joined canisters provides uniform filling

Same sampling time requires flow controller set to double the flow rate



Quality Control Protocol – Considerations



**Segregation of
PFAS Canisters**



Teflon Tubing



**Cleaning &
Proofing**



Shipping



**Handling in the
lab**



What else ?

Canister Cleaning Procedure , specific to PFAS

- 1.4 L cans and bottle vacs are cleaned for 1 week: Quick Connects are cleaned for one week
- Flow controllers are cleaned and conditioned also, as well as checked on the digital flow meter to confirm accuracy
- All canisters are individually proofed; however, we only report 1 in a batch into our LIMS (**meets batch proofing requirements, but we actually proof all cans**).

By individually proofing each canister, the client is able to request the individual proof certificate (\$100) after analysis based on data received.

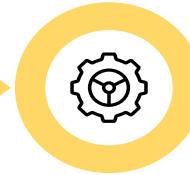
This saves cost for the client as they can pick and choose which canister proofs they want.

When ?



Analysis in Canada – November 2025

Real-time samples, sampling equipment testing (sampling time, materials)



Fall 2025

Equipment troubleshooting, autosampler software



Spring 2025/ Summer 2025

Method Development: optimal column research, collaboration with Agilent/Entech



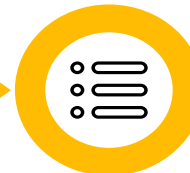
February 2025

Equipment Set up GC/MS-MS , pre-concentrator, autosampler



October 2024

PFAS in air project initiation – ALS Waterloo.





Looking to the future...PFAS in Air – where are we at?

- **Objective** – method development for non-polar PFAS in ambient air and soil vapour by canister
- EPA OTM-50 method to be used as a guidance document for compound list and Quality Control – ALS Roll Out – November 2025
- Various columns have been evaluated, and we have determined which is best and delivers the best chromatography

Wrap Up



Where have we been?

PFAS in Water, Soil, Sludge - processes to determine analysis and treatment - legislation

Where are we now?

PFAS in Water, Soil, Sludge - processes to determine analysis and treatment

And what about AIR??

Where are we going?

More research, more investigation, better practices, more defined sampling and analysis protocols

Questions?



right solutions.
right partner.

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