

# *The Problem of PFAS Contamination: How Can We Make Rapid Progress to Address it?*

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- Regulators wish to classify these chemicals into groups with regard to their toxicity, persistence, mobility and potential for bioaccumulation
  - Discuss whether such grouping is possible and if so what approaches could be taken to generate the data required to make decisions
  - Discuss what should be done in the short-term (1-2 years) and long-term (5-10 years) for each of the subject areas
    - Characterizing the persistence and mobility of PFAS in the environment? Assessing persistence and environmental mobility  
*Andre Algazi (DTSC)*
    - Quantifying persistence  
*Tom Webster (Boston University)*
    - Removing persistent PFAS  
*David Sedlak (UCB)*



# A Practitioner's Perspective

## *PFAS persistence and mobility*

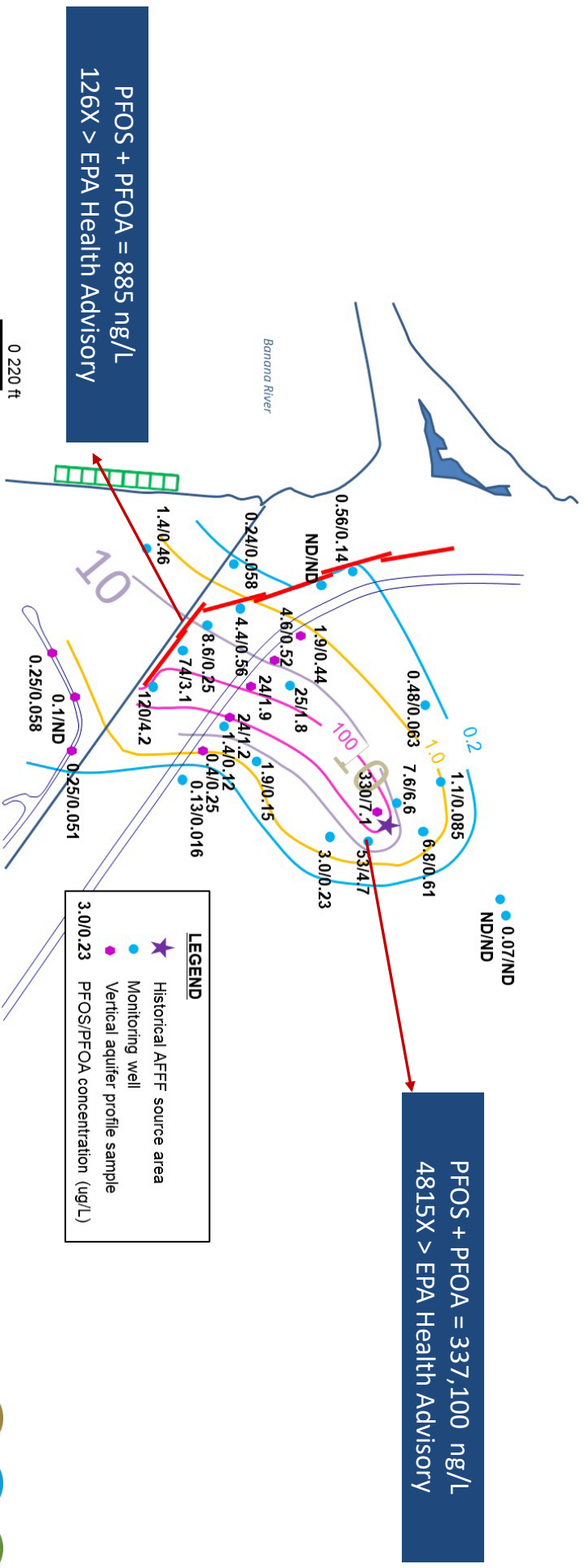
### **State of science vs. state of practice**

- Multiple sources
- Widespread occurrence
- Contaminant footprints
- The precursor issue
- Analytical limitations
- Treatment challenges
- Lack of regulatory guidance



# PFAS Contaminant Footprints

## Cape Canaveral Air Force Station Fire Training Area (FT-17) Operated before 1970



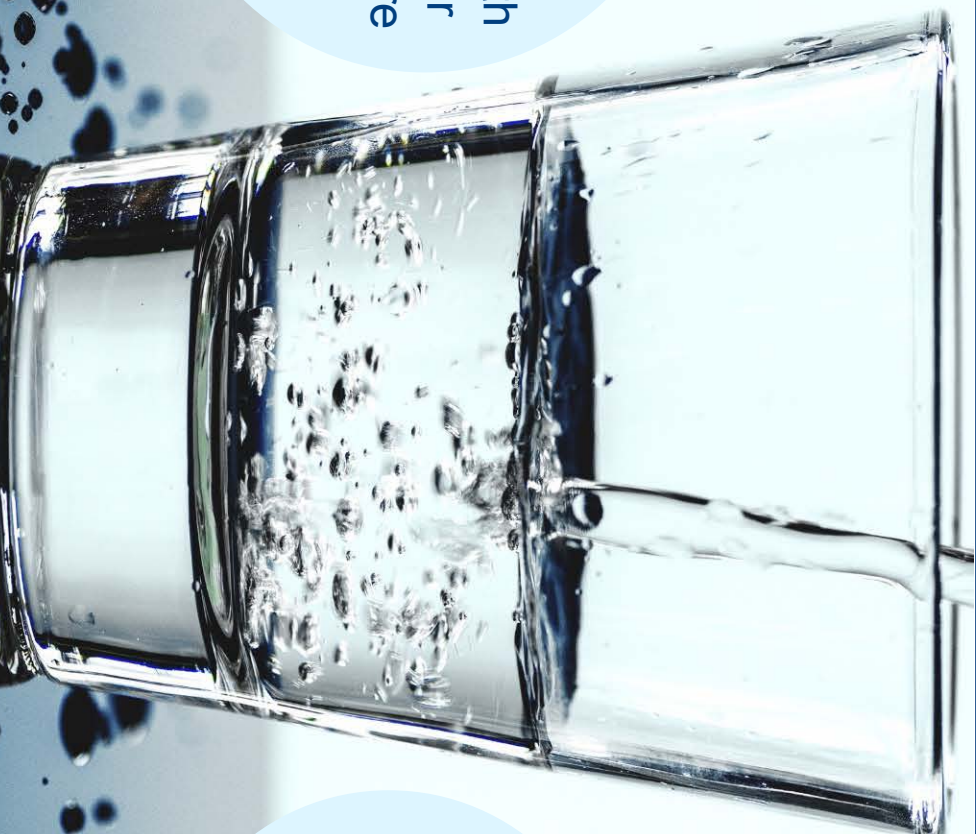
# PFAS Regulatory Targets

No Federal  
MCLs

EPA's lifetime  
drinking water health  
advisories (HAs) for  
PFOS and PFOA are  
not enforceable  
cleanup levels

Limited trigger  
mechanisms  
to require  
cleanup

Many states  
are proposing  
values that are  
much lower  
than HAs



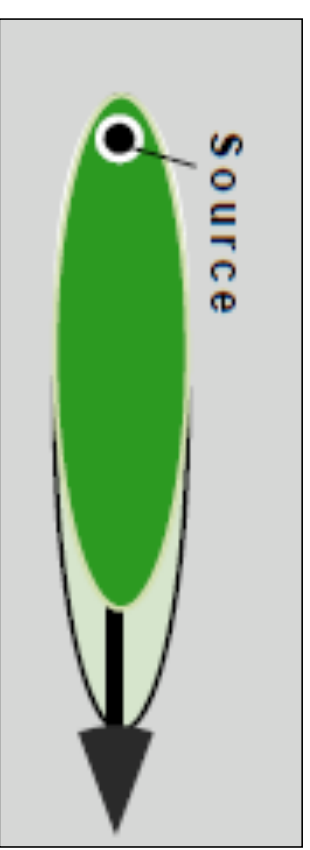
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Extra Slides



# PFAS Mobility and Persistence

- Sorption generally increases with number of carbons
- Transport related to charged state of PFAS
  - Anions > zwitterions > cations
  - Shorter chain lengths generally move faster
- Polyfluoroalkyl substances
  - Potential to form perfluoroalkyl carboxylates (PFCA) and perfluoroalkane sulfonates (PFSA), abiotically and biotically
  - Variable transport properties
- PFSA and PFCA
  - Not readily biodegradable
  - Not readily transformed abiotically
  - Generally high mobility



# PFAS Sources



\*PFAS concentrations vary widely depending on the waste stream; not all landfills or WWTPs/biosolids are major sources

Source: ITRC, 2019





# PFAS Treatment Challenges

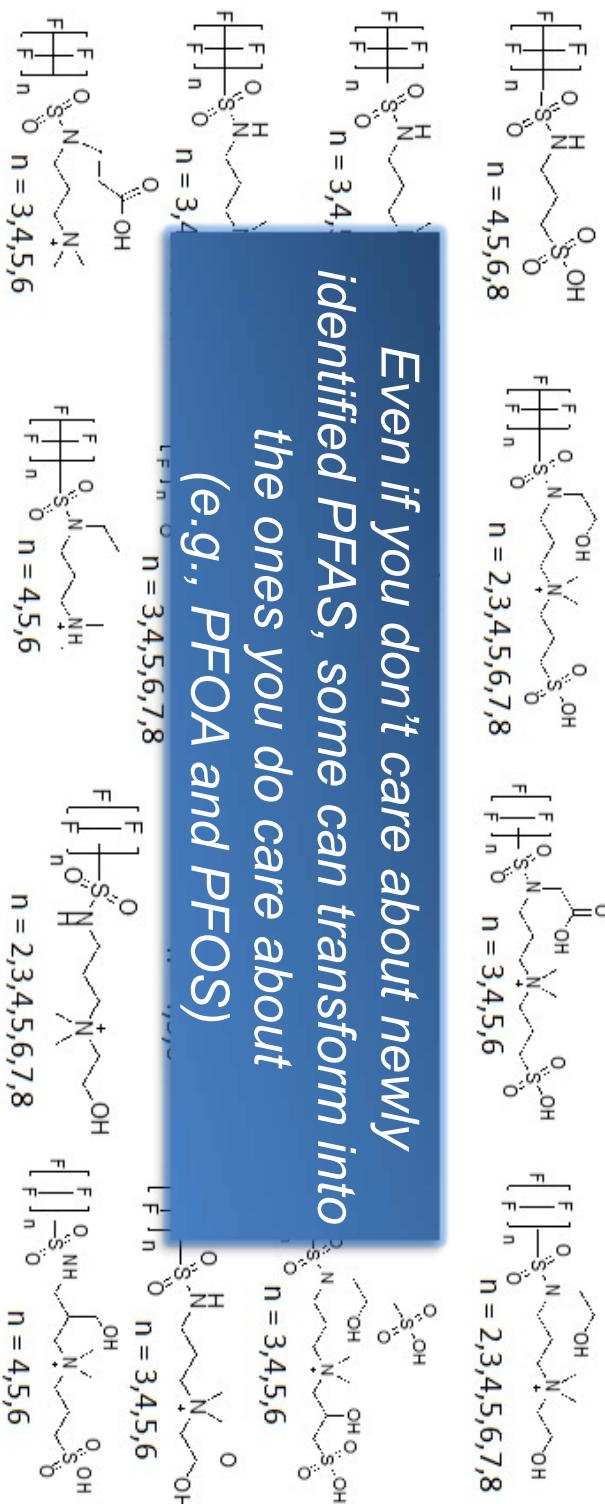
- Chemical stability
- Presence in complex mixtures
- Contaminant footprints
- Limitations of conventional technologies
- Lack of destruction technologies
- Changing regulatory targets



# PFAS Treatment Challenges Mixtures

**PFAS are more complex than PFOA and PFOA**

*Even if you don't care about newly identified PFAS, some can transform into the ones you do care about (e.g., PFOA and PFOA)*



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Discovery of 40 Classes of Per- and Polyfluoroalkyl Substances in Historical Aqueous Film-Forming Foams (AFFFs) and AFFF-Impacted Groundwater

Krista A. Barzen-Hanson,<sup>1</sup> Simon C. Roberts,<sup>2</sup> Sarah Choyke,<sup>3</sup> Karl Oerjen,<sup>4</sup> Alan McAlees,<sup>1</sup> Nicole Riddell,<sup>1</sup> Robert McCormick,<sup>5</sup> P. Lee Ferguson,<sup>6</sup> Christopher P. Higgins,<sup>6\*</sup> and Jennifer A. Field<sup>6\*</sup>



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