PFAS PANEL DISCUSSION

Adding Context to PFAS Decision Making, from Regulations to Data Usability Considerations

				
Panel Moderator: Taryn McKnight	AnnieLu DeWitt Clean Harbors	Morgan Greenwald Geosyntec Consultants	Matt Narter ADEQ	Mike Sherer Trinity Consultants

PFAS Federal Regulations

February 2024

Taryn McKnight, VP
PFAS Practice Leader
Eurofins Environment Testing

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DRINKING WATER
Federal Updates

Unregulated Contaminants Monitoring Rule UCMR5

https://www.epa.gov/dwucmr/fifth-unregulated-contaminant-monitoring-rule-data-finder#data-finder

What a difference a decade makes…

SCOPE

2023–2025
4 analytes from 537.1
25 analytes from 533
All PWS serving >10,000
All PWS serving 3,300-10,000
~800 Systems serving < 3,300

RESULTS TO DATE

PFOA >HAL in 11.5% of PWS

PFOS >HAL in 12.8% of PWS

HFPO-DA >HAL in one PWS

PFBS not detected >HAL

4 analytes from 537.1 no detections so far

Highest detection frequency of: PFBS, PFOS, PFOA, PFHxS, PFBA, PFHxA, & PFPeA

Drinking Water Contaminants Candidate List "CCL5"

Proposals for contaminants for consideration are submitted

Contaminants are selected for the CCL and published every five years

EPA must make regulatory determinations for at least five contaminants listed on the CCL every five years

For the purposes of CCL 5, the structural definition of PFAS includes chemicals that contain at least one of these three structures:

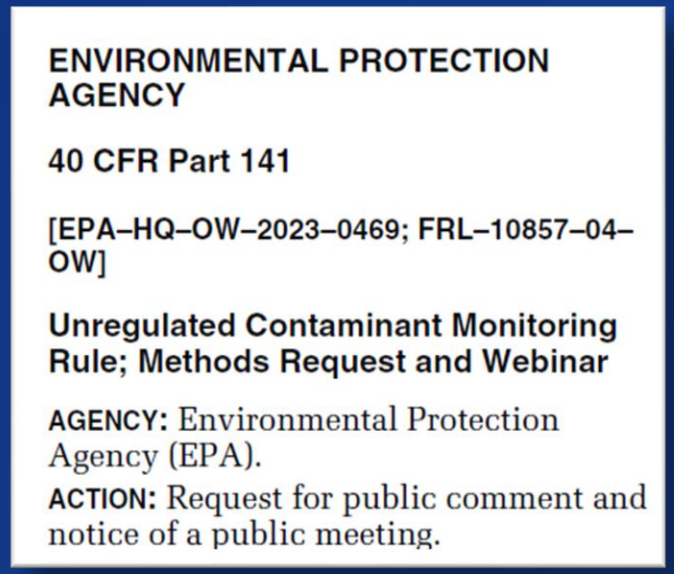
(1) R-(CF2)-CF(R')R", where both the CF2 and CF moieties are saturated carbons, and none of the R groups can be hydrogen.

(2) R-CF2OCF2-R', where both the CF2 moieties are saturated carbons, and none of the R groups can be hydrogen.

(3) CF3C(CF3)RR', where all the carbons are saturated, and none of the R groups can be hydrogen.

EPA is also providing a list of PFAS that meet the CCL 5 structural definition on its CompTox dashboard (https://comptox.epa.gov/dashboard/chemical-lists)

https://www.regulations.gov/document/EPA-HQ-OW-2018-0594-0106



ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 141

[EPA–HQ–OW–2023–0469; FRL–10857–04–OW]

Unregulated Contaminant Monitoring Rule; Methods Request and Webinar

AGENCY: Environmental Protection Agency (EPA).

ACTION: Request for public comment and notice of a public meeting.

PFAS Maximum Contaminant Levels (MCLs)

News Releases: Headquarters | Water (OW)

CONTACT US

Biden-Harris Administration Proposes First-Ever National Standard to Protect Communities from PFAS in Drinking Water

March 14, 2023

- **PFOA and PFOS**:

  Regulate PFOA and PFOS at a level they can be reliably measured at 4 parts per trillion.

- **PFNA, PFHxS, PFBS, and GenX**:

  Limit any mixture containing one or more of PFNA, PFHxS, PFBS, and/or GenX Chemicals using a hazard index calculation, defined in the proposed rule

https://www.epa.gov/newsreleases/biden-harris-administration-proposes-first-ever-national-standard-protect-communities

Hazard Index Calculation

$$H.I. = (GenX / 10ppt) + (PFBS / 2000ppt) + (PFNA / 10ppt) + (PFHxS / 9.0ppt)$$

Divide the measured concentration of Gen X by the health-based value of 10 ppt

Divide the measured concentration of PFBS by the health-based value of 2000 ppt

Divide the measured concentration of PFNA by the health-based value of 10 ppt

Divide the measured concentration of PFHxS by the health-based value of 9 ppt

Repeat calculation for each sample collected in the past year for that entry point and calculate the average H.I. for all samples taken in that year.

If the running annual average H.I. is greater than 1.0, it is a violation of the *proposed* H.I. MCL.

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WASTEWATER

Effluent Guidelines Program

Program Plan 15

- ✓ Propose limits on PFAS for the chemical, plastics, and synthetic fiber manufacturers (NDAA June 2024)
- ✓ Expand Textiles study (NDAA June 2025)
- ✓ Revise ELGs for the Landfills category (NDAA June 2025)
- ✓ Not pursuing further action for the Electrical and Electronic Components Category (NDAA June 2025)
- ✓ Will monitor PFAS use and discharges from the Pulp, Paper, and Paperboard Category and Airports
- ✓ Leather tanning/finishing, paint formulating, and plastics molding categories (NDAA December 2026)

2023 NDAA, SEC. 5883. CLEAN WATER ACT EFFLUENT LIMITATIONS GUIDELINES
The Administrator shall publish in the Federal Register effluent limitations guidelines and standards for priority industry categories, not later than the following dates…

NPDES News

https://www.epa.gov/system/files/documents/2023-01/11143_ELG%20Plan%2015_508.pdf#page=48

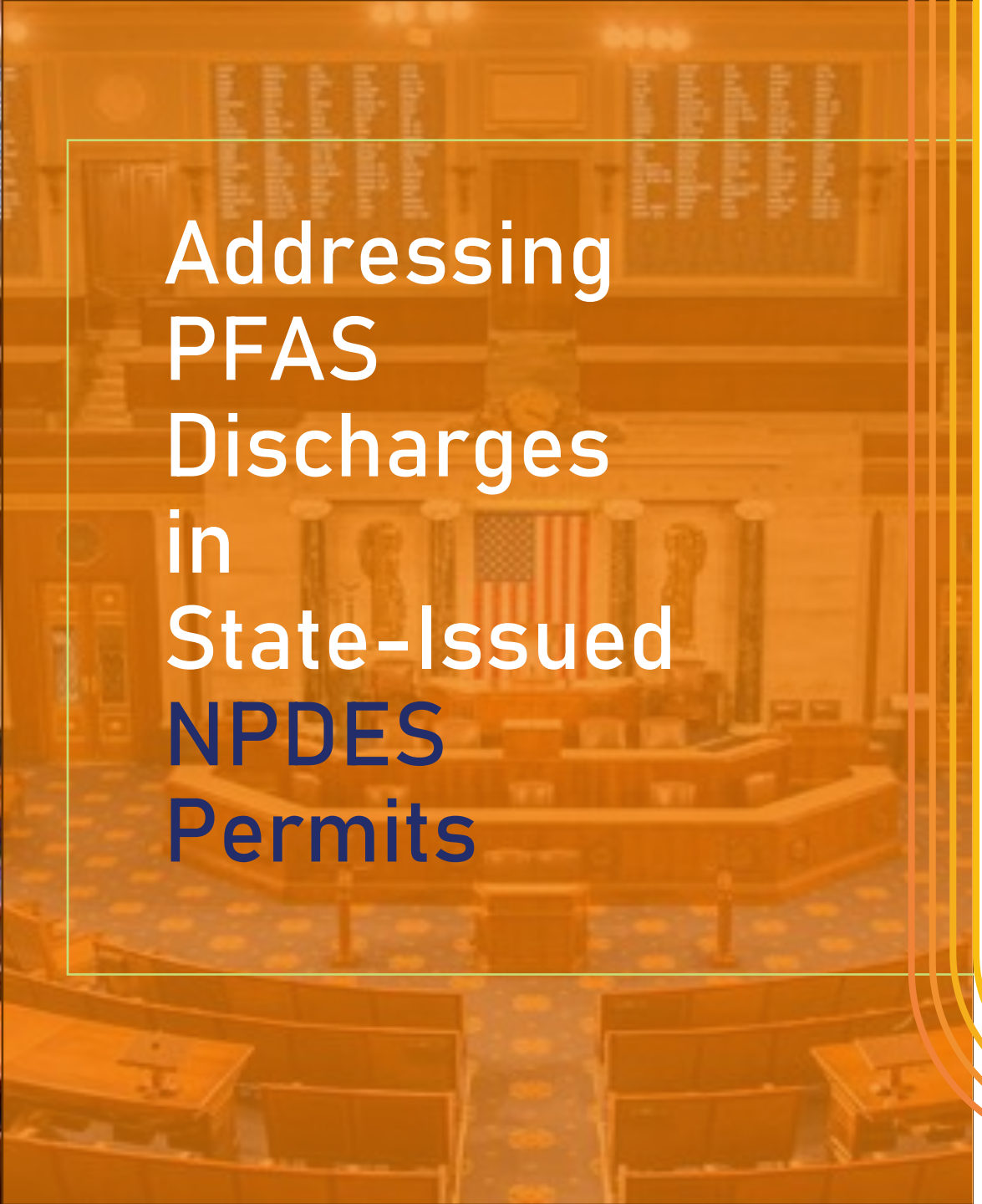
https://www.epa.gov/system/files/documents/2023-01/11143_ELG%20Plan%2015_508.pdf

Effluent Guidelines Program

Program Plan 15

- ✓ EPA intends to initiate a Publicly Owned Treatment Works (POTW) influent study of PFAS
- ✓ Information Collection Request (ICR) underway
- ✓ Submit to OMB for review
- ✓ Collect data in 2024-2025
- ✓ The sampling would be done using EPA Method 1633 and Draft EPA Method 1621

https://www.epa.gov/system/files/documents/2023-01/11143_ELG%20Plan%2015_508.pdf



Addressing PFAS Discharges in State-Issued NPDES Permits

EPA issues guidance to state permit writers and pretreatment authorities to address PFAS

- Monitoring should include the 40 PFAS by draft method 1633
- Draft 1621 for AOF can be used if appropriate

Tools and Resources

Example Permit Language, State and Local PFAS Strategies, and Other PFAS Permitting Resources

Funding Resources

- Clean Water State Revolving Fund Emerging Contaminants

BMP and Source Reduction Resources

- Fact Sheet: Pollution Prevention Strategies for Industrial PFAS Discharges (pdf) (713.1 KB)

https://www.epa.gov/npdes/industrial-wastewater#pfas

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HAZARDOUS WASTE

CERCLA & RCRA

CERCLA Hazardous Substances

PFOA & PFOS

EPA would have the authority to:

- Order the investigation and remediation of these chemicals, including cost recovery;
- Re-open closed sites;
- Private parties would have a cause of action for cost recovery; and
- PFOA and PFOS will be included in the scope of Phase 1s in order to satisfy the All Appropriate Inquiries Rule

"CERCLA does not impose liability on manufacturers of hazardous substances, potentially leaving water suppliers, landfill owners, local fire departments, farmers, and other municipal entities to bear the entire costs associated with investigation and remediation of PFAS contamination."

EPA-HQ-OLEM-2019-0341

RCRA

"RESOURCE CONSERVATION AND RECOVERY ACT"

Regulation of Hazardous Waste "Cradle to Grave""

Subtitle C gives EPA the authority to control and regulate hazardous waste from "cradle-to-grave, requiring tracking of hazardous waste from generation to disposal. Subtitle C only governs "hazardous wastes".

Corrective Action

The RCRA Corrective Action Program requires facilities that treat, store, or dispose of hazardous wastes to investigate and clean up contaminated soil, groundwater, and surface water.

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HAZARDOUS CONSTITUENTS DESIGNATION RCRA

EPA must undertake a two-step process to categorize PFAS-contaminated waste as hazardous waste subject to RCRA:

(1) list PFAS as a Hazardous Constituent in 40 CFR part 261, Appendix VIII

(2) publish a finding that PFAS-containing waste could pose a "substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed"

EPA Proposes to list PFOA, PFOS, PFBS, HFPO-DA, PFNA, PFHxS, PFDA, PFHxA, & PFBA as RCRA "Hazardous Constituents"

Those chemicals listed are subject to Corrective Action requirements under RCRA at hazardous waste treatment, storage, and disposal facilities.

https://www.federalregister.gov/documents/2024/02/08/2024-02324/listing-of-specific-pfas-as-hazardous-constituents

https://www.epa.gov/hw/proposal-clarify-authority-address-releases-hazardous-waste-treatment-storage-and-disposal

EPA PFAS Destruction & Disposal Guidance

- ✓Expected Spring 2024
- ✓Will address utilization of analytical tools for demonstration of mineralization of PFAS
- ✓Significant data gaps remain


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TSCA
Reporting Laws

TSCA Section 8(a)(7) Reporting and Recordkeeping Requirements for PFAS

EPA to require certain persons that manufacture (including import) or have manufactured these chemical substances in any year since **January 1, 2011**, to electronically report information regarding PFAS uses, production volumes, disposal, exposures, and hazards.

All entities that manufactured/imported PFAS
-Deadline is 18 months to report.

Small manufacturers limited to article imports
-Deadline is 24 months to report

T Toxic
S Substances
C Control
A Act

https://www.epa.gov/newsreleases/epa-finalizes-rule-require-reporting-pfas-data-better-protect-communities-forever

https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/tsca-section-8a7-reporting-and-recordkeeping

Toxics Release Inventory TRI

Rule to Remove de minimis Exemptions

EPA classifies PFAS compounds on the TRI as "chemicals of special concern." Such classification ***eliminates the availability of the de minimis exemption to TRI reporting***, known as Section 313 reporting, for both manufacturers and suppliers as well as ***removes the exemption under the Supplier Notification Requirements***.

https://www.federalregister.gov/documents/2023/10/31/2023-23413/changes-to-reporting-requirements-for-per--and-polyfluoroalkyl-substances-and-to-supplier


THANK YOU
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PFAS in Arizona

Matt Narter
Senior Hydrogeologist

February 27, 2024

ADEQ Arizona Department of Environmental Quality

Clean Air, Safe Water, Healthy Land for Everyone

ADEQ PFAS Approach

Healthy Drinking Water

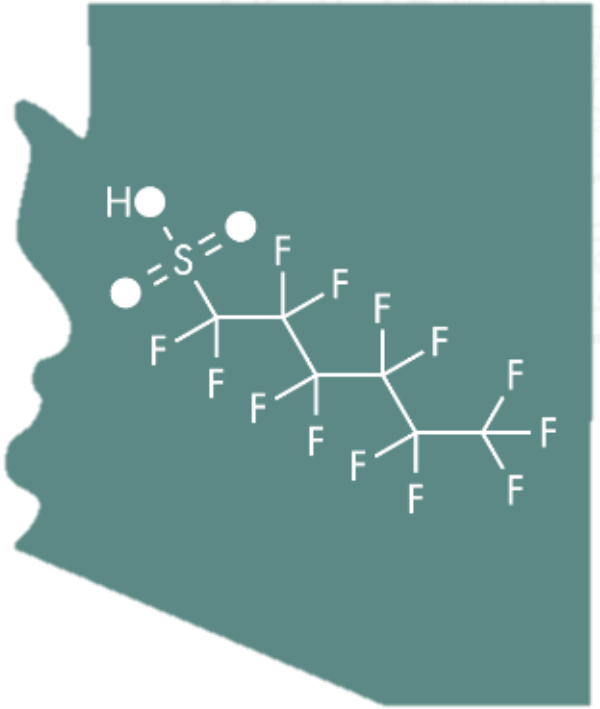
- Gather and analyze data
- Advocate for additional resources
- Assist drinking water systems

Balanced Resources

- Maximize the benefit of PFAS funding

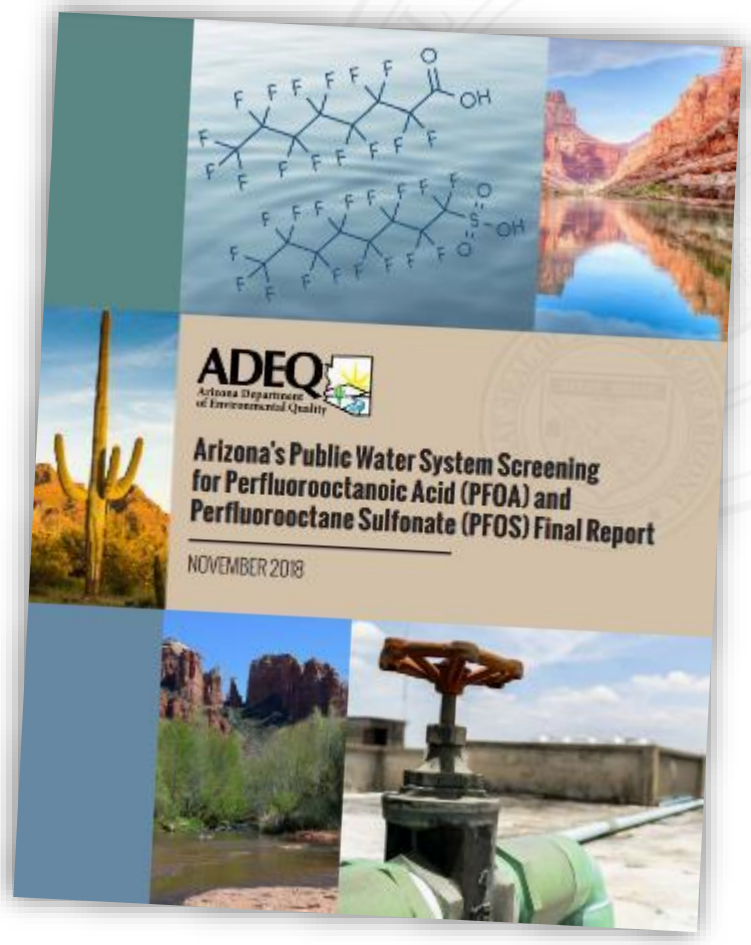
Community Engagement

- Community outreach
- Web resource development



ADEQ Statewide PFAS Actions

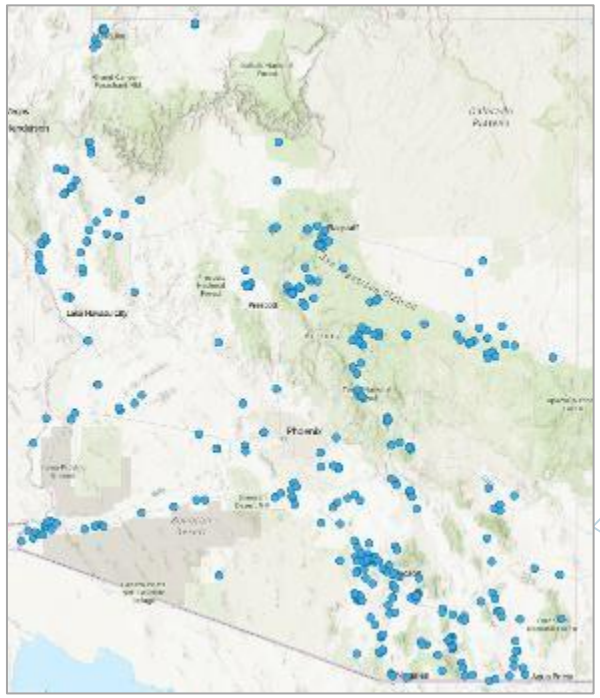
- Targeted statewide PFAS screening (2018-2022)
- AFFF take-back and replace pilot (2023)
- Expanded drinking water testing (2023-2024)

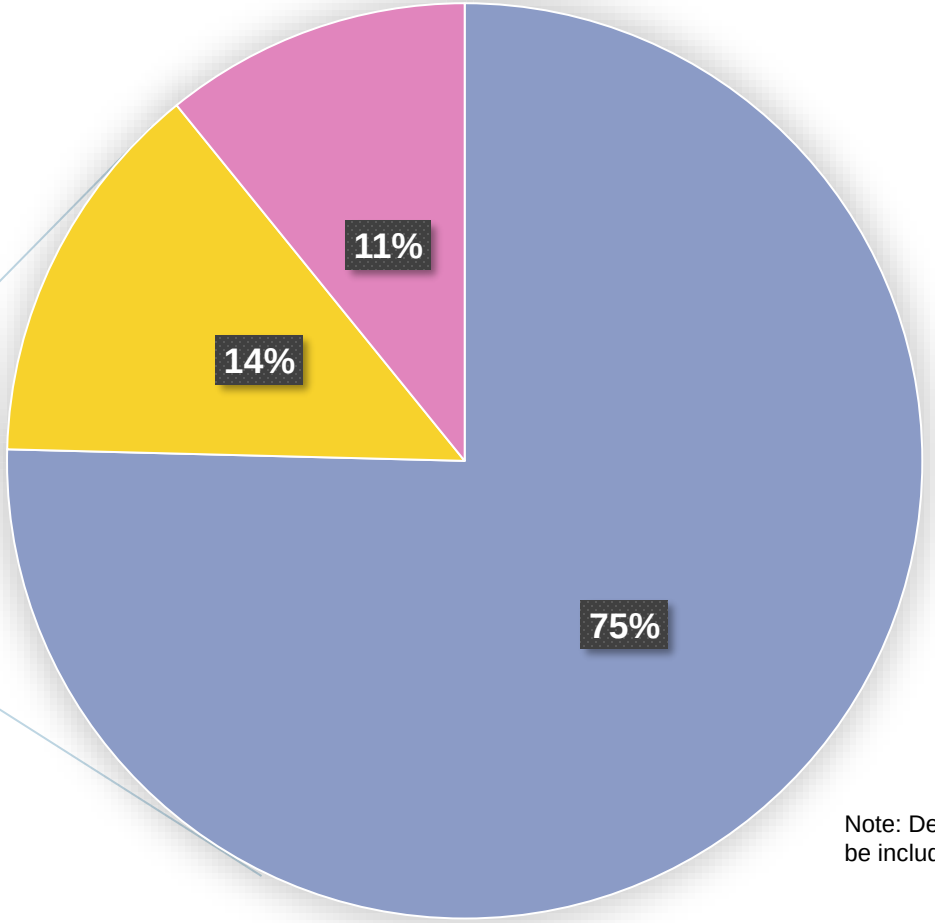


Drinking Water PFAS Testing Effort

- EPA's UCMR 5 requires PFAS sampling for systems serving 3,300 people or more
- ADEQ is sampling more than 700 smaller systems not included in UCMR 5
- Testing for 29 unique PFAS using EPA methods 537.1 and 533

ADEQ Testing Results



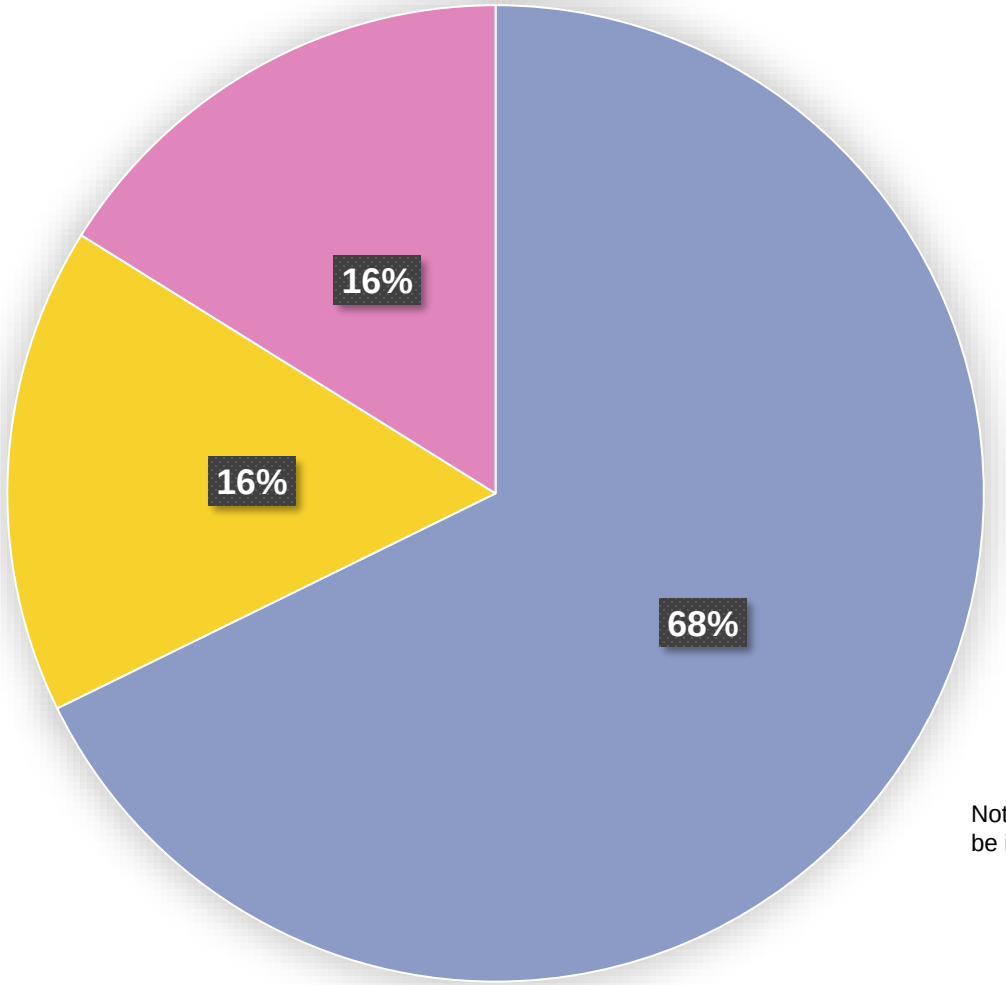


Note: Detections are based on the six PFAS proposed by EPA to be included in the National Primary Drinking Water Standard

683 Systems Sampled to Date[1] (~90%)

[1]Data through 1/18/24

UCMR 5 Testing Results



Note: Detections are based on the six PFAS proposed by EPA to be included in the National Primary Drinking Water Standard

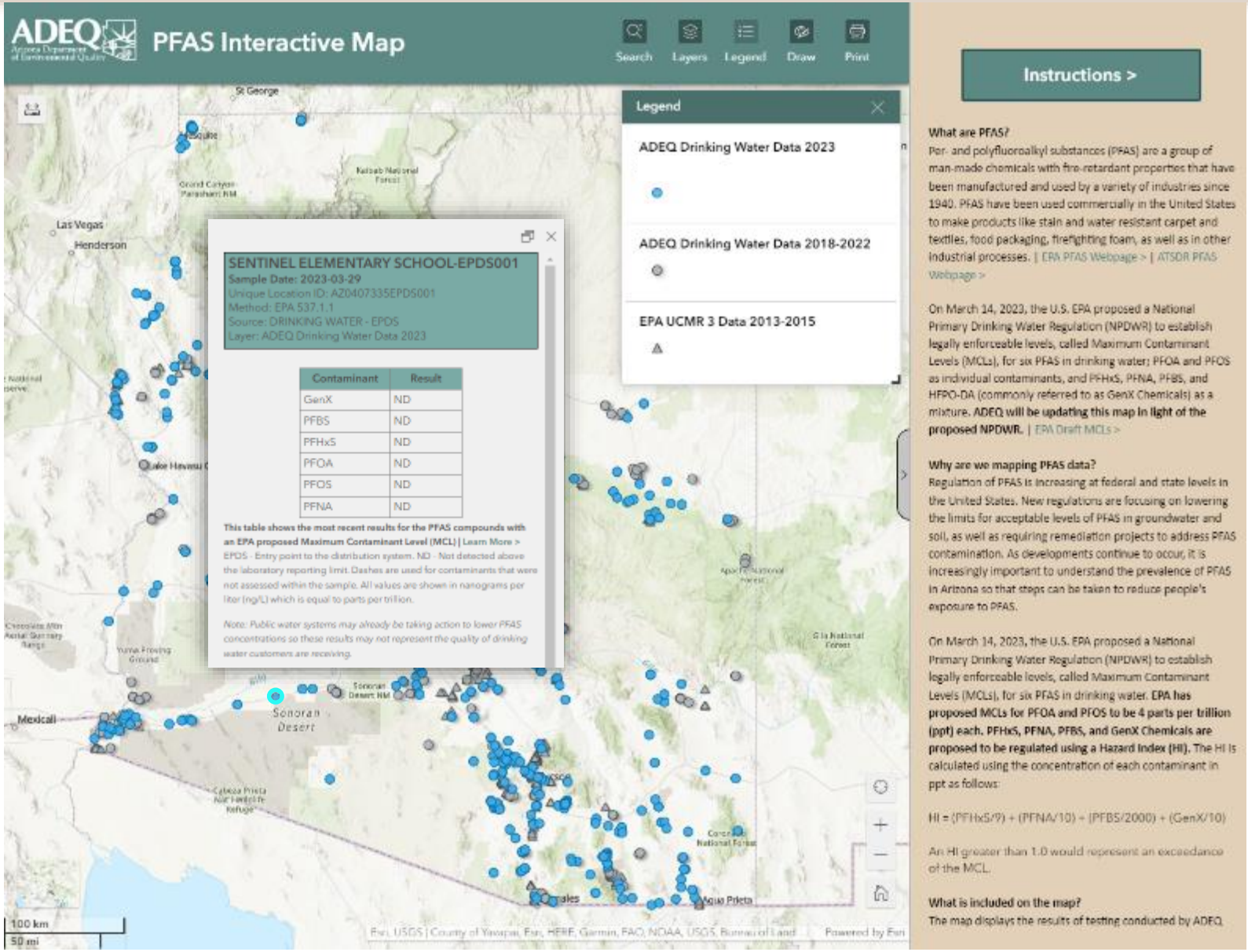
62 System Results Reported to Date[1] (~42%)

[1]Results received by EPA as of 2/15/24

Assistance to Water Providers

- $42 million available through the Bipartisan Infrastructure Law for small or disadvantaged systems
- Additional $5M in funding from the state budget designated for PFAS mitigation
- Funds to be allocated according to prioritization, which includes:
  - Magnitude of impact
  - Disadvantaged population
  - Co-contaminants

Web Resources



azdeq.gov/pfas-resources

azdeq.gov/MyCommunity

Looking Forward…

- Continue to focus on healthy drinking water through outreach, technical assistance, and mitigation for water providers
- Plan for the incorporation of final federal regulations within existing ADEQ programs
- Re-evaluate the approach as new federal regulations are proposed/finalized

Thank You

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ADEQ Arizona Department of Environmental Quality

Clean Air, Safe Water, Healthy Land for Everyone

Geosyntec consultants

PFAS Analytical Methods, Data Validation and Usability

Morgan Greenwald

Quality Assurance and Data Validation Scientist

Presentation Outline

- Per- and Polyfluorinated Alkyl Substances (PFAS) Analytical Methods Overview
- PFAS Project Planning Overview
- Data Validation Overview
- Data Usability Considerations for PFAS Datasets

PFAS Analytical Methods – Drinking Water

- EPA Method 537.1
  - Applicable to Drinking Water Only
  - Includes 18 PFAS Analytes
- EPA Method 533
  - Applicable to Drinking Water Only
  - Includes 25 PFAS Analytes, 14 are also included in 537.1
  - Added some shorter chain PFAS

PFAS Analytical Methods – Environmental Matrices

- Non-potable waters have higher suspended solids and generally more complex matrices than drinking water.
- Drinking water methods do not apply to solid matrices
- EPA Method 537.1 (Modified) –
  - Laboratories developed in-house methods based on Method 537.1 to allow them to analyze environmental matrices
  - Modifications were not standardized
  - Department of Defense (DoD) Quality Systems Manual (QSM) Version 5.x Table B-15 provided quality control requirements for PFAS Analysis Using LC/MS/MS for matrices other than drinking water

EPA Method 1633 – PFAS In Environmental Matrices

- EPA and DoD recognized need for a standardized PFAS Method for Environmental Matrices
- EPA Method 1633 – Analysis of PFAS in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS
  - EPA and DoD collaborated on a single-laboratory method validation study followed by multi-laboratory validation study
  - Applicable to Clean Water Act
  - Applicable Matrices: Wastewater, surface water, groundwater, soil, biosolids, sediment, landfill leachate, and fish tissue
  - A method that can be implemented at a typical mid-sized, full-service environmental laboratory
  - Includes 40 PFAS Analytes
  - Uses solid phase extraction (SPE) & carbon cleanup to remove matrix interferences

EPA Method 1633

- Four Draft Versions released incrementally starting in 2021
- Labs began to perform Draft Method 1633
- Labs were accredited to Draft Method 1633 by DoD and some State Accreditation Bodies
- Method 1633 was released as Final in January 2024
- Provides Acceptance Limits for Aqueous and Solid Matrices
- Provides Pooled MDL Values and Ranges of LOQ Values
- Method 1633 is the EPA and DoD Recommended Analytical Method for PFAS in Environmental Matrices

EPA Method 1633 – Current Status

- Method 1633 has not yet been promulgated through EPA rulemaking
- Until then, EPA recommends using Method 1633, including for NPDES permits
- Arizona Department of Health Services (ADHS) currently offers laboratory licensure for PFAS analysis only in drinking water via Methods 533 and 537.1
- Method 1633 will not be available for ADHS laboratory licensure until it is promulgated by the EPA
- Laboratories could apply for ADHS licensure for Method 1633 by Director Approval now
- DoD QSM 6.0 now includes Table B-24 (quality control requirements for PFAS Analysis by Method 1633) and removed Table B-15

EPA Method 537.1 (Mod) vs. EPA Method 1633 – Method Selection Considerations

- EPA Method 1633 –
  - Method water sample size: 500 mL vs. 250 mL for 537.1 (Mod)
    - Labs are allowed to use lower volumes if they can meet target limits
  - Analytical cost is higher than 537.1 (Mod)
  - Sensitivity is comparable to 537.1 (Mod)
  - Limited to 40 PFAS, whereas 537.1 (Mod) can support a longer list of PFAS (anywhere from 40-100 PFAS)
  - Data comparability considerations:
    - Historical 537.1 (Mod) Dataset
    - Changing to Method 1633 mid-project

PFAS Analysis In Environmental Matrices – Other Methods

- EPA Method 8327 – PFAS by LC/MS/MS
  - Direct Injection Method
  - Applies to non-potable water matrices only
  - Should be used for screening purposes only
- EPA Method 1621 – Adsorbable Organic Fluorine (AOF) in Aqueous Matrices
  - Measures the aggregate concentration of organofluorines (molecules with a carbon-fluorine bond) in wastewater, includes both PFAS and non-PFAS
  - Indicates organofluorine presence, but cannot identify specific compounds
- Total Oxidizable Precursor (TOP) Assay
  - Oxidizes unknown PFAS precursors and intermediates, converting them into stable PFASs with established analytical standards
  - No EPA Method, Laboratories use In-House SOPs

Data Quality Relies on **Quality Assurance (QA)**

- Quality Assurance: The **Planning** Steps
  - Work Plans
  - Quality Assurance Project Plans (QAPPs)
  - Conceptual Site Models (CSMs)
  - Data Quality Objectives (DQOs)
  - Field Sampling Plans (FSPs)
  - Standard Operating Procedures (SOPs)
  - Technical Guidance and Methodology
  - Professional and Technical Judgment and Expertise

Data Quality Relies on **Quality Control (QC)**

- Quality Control: The **Measurement** Criteria
  - Appropriate Sample Collection Methods and Preservation
  - Extraction and Analysis Within Holding Times
  - Appropriate Methodology, Reporting Limits and Target Analyte Lists
  - Appropriate Calibrations
  - Laboratory QC Samples
    - Method Blanks, Laboratory Control Samples, Laboratory Duplicates
  - Field QC Samples
    - Field Duplicates, Trip/Equipment/Field Blanks, Matrix Spikes/Matrix Spike Duplicates

Data Quality Relies on **A Good Analytical Laboratory**

- Properly Vet the Laboratory to Ensure It Can Provide:
  - Required Sampling Devices and Supplies
  - Required Analytical Method(s) and Analyte Lists
  - Required Accreditation(s)
  - Reporting Limits Required to Meet Project Action Levels
  - A Defensible Data Package with Appropriate QC Reported
  - Required Electronic Data Deliverable (EDD) Format
  - Capacity (Sample Volume, Turnaround Times)
  - Identify a Lab and Begin Communication Early in the Planning Process

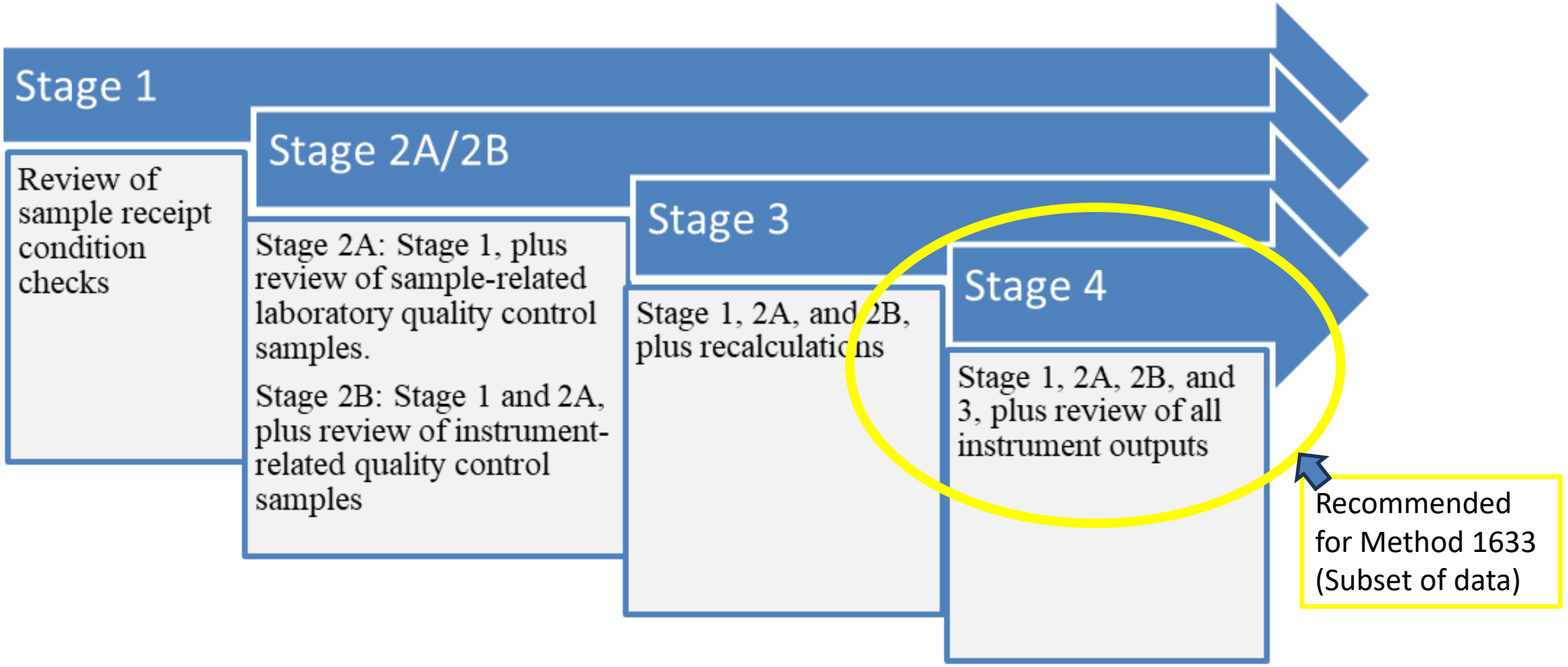
PFAS Project Planning Considerations

- Consider your Conceptual Site Model (CSM) and Establish Data Quality Objectives (DQOs)
- Incorporate into a Quality Assurance Project Plan (QAPP)
- Select Sampling SOPs specific to PFAS
- Establish Project Measurement Performance Criteria (MPC) in relation to PARCCS parameters:
  - Precision, Accuracy/Bias, Representativeness, Data Completeness, Comparability, and Sensitivity
- Consider how data will be validated and how data usability will be determined with respect to project DQOs

What is Data Validation?

- Assesses data with respect to its use in supporting project data quality objectives (DQOs) and measurement quality objectives (MQOs)
- Must completed by third party, independent from the laboratory
- Identifies non-conformances and their potential impact on the quality of the dataset
- This reduces risk by recognizing the limitations of the data being used in project decisions
- The objective of data validation is reject data, but to qualify its usability

Stages of Data Validation



From: Analytical Data Quality Review: Verification, Validation, and Usability – EDM (itrcweb.org)

Data Validation Guidance for PFAS

- EPA Superfund CLP National Functional Guidelines (NFGs) for Data Review:
  - Includes Organics, Inorganics, High Resolution Methods
  - No PFAS-specific data validation guidance
- EPA Data Review & Validation Guidelines for PFAS:
  - Specific to Method 537 (Drinking Water)
- DoD Data Validation (DV) Guidelines:
  - Includes General DV Guidelines and Modules specific to PFAS analysis by DoD QSM Table B-15 (Module 3) and by DoD QSM Table B-24 (Module 6)

Data Usability Assessment

QAPP

DQOs

- Performed by Project Team
- Uses Findings from Data Verification, Validation, and overall Data Quality Review
- Considers Data Quality within the Context of Project DQOs
- Is the quality of the analytical data fit for its intended use?

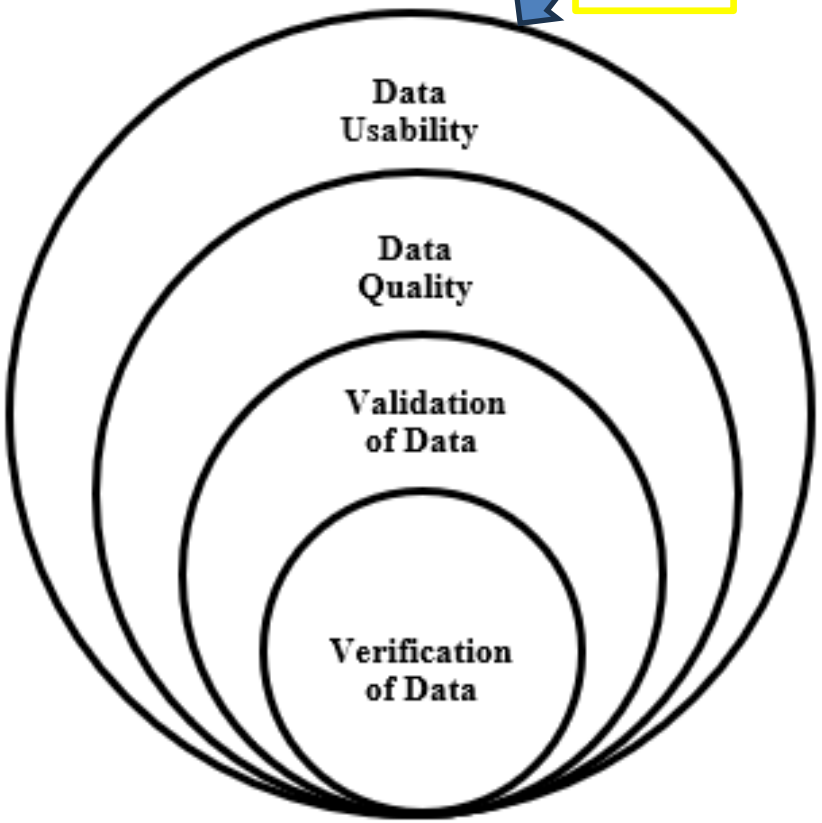


Figure 2. Data usability in relation to verification, validation, and data quality

From: Analytical Data Quality Review: Verification, Validation, and Usability – EDM (itrcweb.org)

Geosyntec consultants

Thank you!

Morgan Greenwald

PFAS Treatment: Assessment of the Life Cycle

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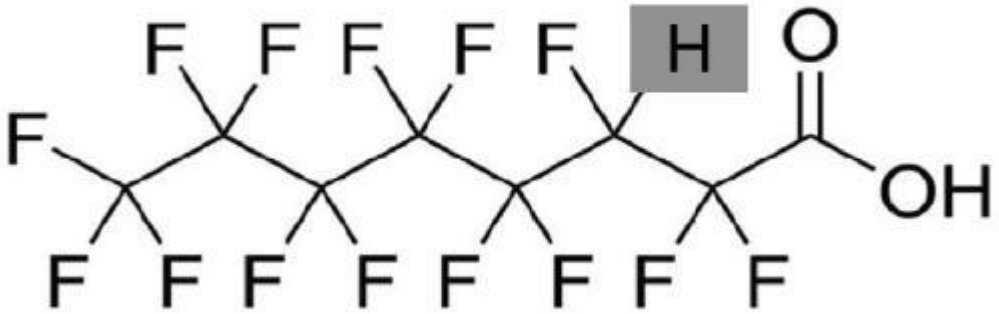
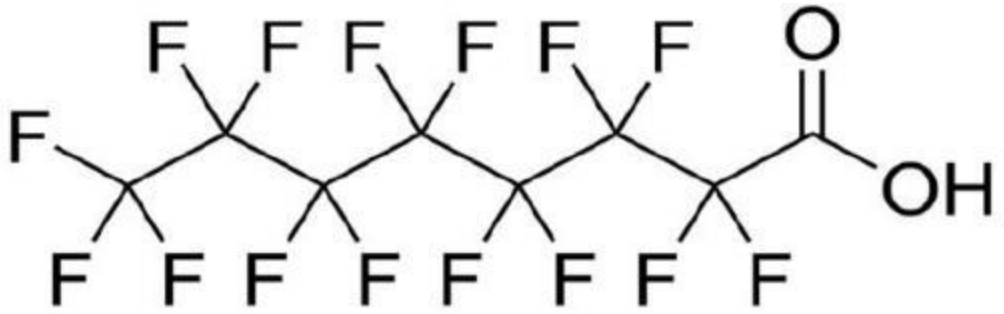
Key Concepts

- Selective vs. Non-Selective Analysis Which to Use?
- Analytical Test Purpose
- Analytical Importance Throughout PFAS Treatment Life Cycle- Project Example

Current Analytical Tools for Identification of PFAS

- LC/MS/MS- including 537 series of methods, EPA 533 and EPA1633 these methods are targeted analysis methods
- Very low detection limits capable of seeing concentrations below 1ppt
- The trade off is that these methods are **very selective** in what they are looking for and sort out other compounds
- A small change in the chemical structure would make the compound invisible because the current methods being employed commercially are so targeted and selective.
- Of the over **6,000** compounds that fit the current definition of PFAS there are approximately **70** compounds with commerciallv available standards





What will the PFAS Data be Used For?

- **Evaluating for Source Identification-** Forensics- Not relevant in the treatment process, more use for liability determination
- **Evaluating Treatment Approach**- Full Characterization of water, PFAS as well as potential interference evaluation. What else is in the water?
- **Continuing Operation and Maintenance**- Testing between media beds to evaluate breakthrough
- **Compliance Testing**- Effluent testing, testing methods will be determined by who data is being reported to.
- **Media / PFAS Impacted Material Disposal**- Testing methods will be determined by where you are disposing of PFAS impacted materials

Military Installation West Coast

High Concentration PFAS, VOC, TOC, SVOCs, O&G, TSS, TDS

99.99999% removal efficiency for our PFAS Treatment Trailer

- In collaboration with on-site engineering firm Clean Harbors designed, built, installed and trained staff to operate a mobile high concentration PFAS treatment system that addressed TOC, VOCs, SVOCs, O&G, TSS, TDS and other contaminants to meet strict discharge limits for a local POTW. The system treated influent water with influent concentrations in excess of 11ppm to less than 2 ppt for PFOS, PFOA and short chained PFBS.

- Full characterization of water TOP assay, EPA1633, 537m DoD list, 537m 1633 list save money? VOCs, SVOC, etc. Do not need full data package.
- O&M Testing- Influent, effluent, between media beds, look for cost savings other ways. The more data you have fills out the overall picture and helps tell a story.
- Compliance Testing- Correct frequency, correct method, correct compound list.
- Disposal Testing- facilities will have a list of analytical required for disposal. Simple PFOA and PFOS testing will not work for most places at this time.

CleanHarbors®

Thank you!

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PFAS Experiences in Semiconductor Fabs

February 27, 2024

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What are Per- and Polyfluoroalkyl Substances (PFAS)?

Current Definitions

EPA broad-reaching definition and U.S. Toxic Substances Control Act (TSCA) definition:

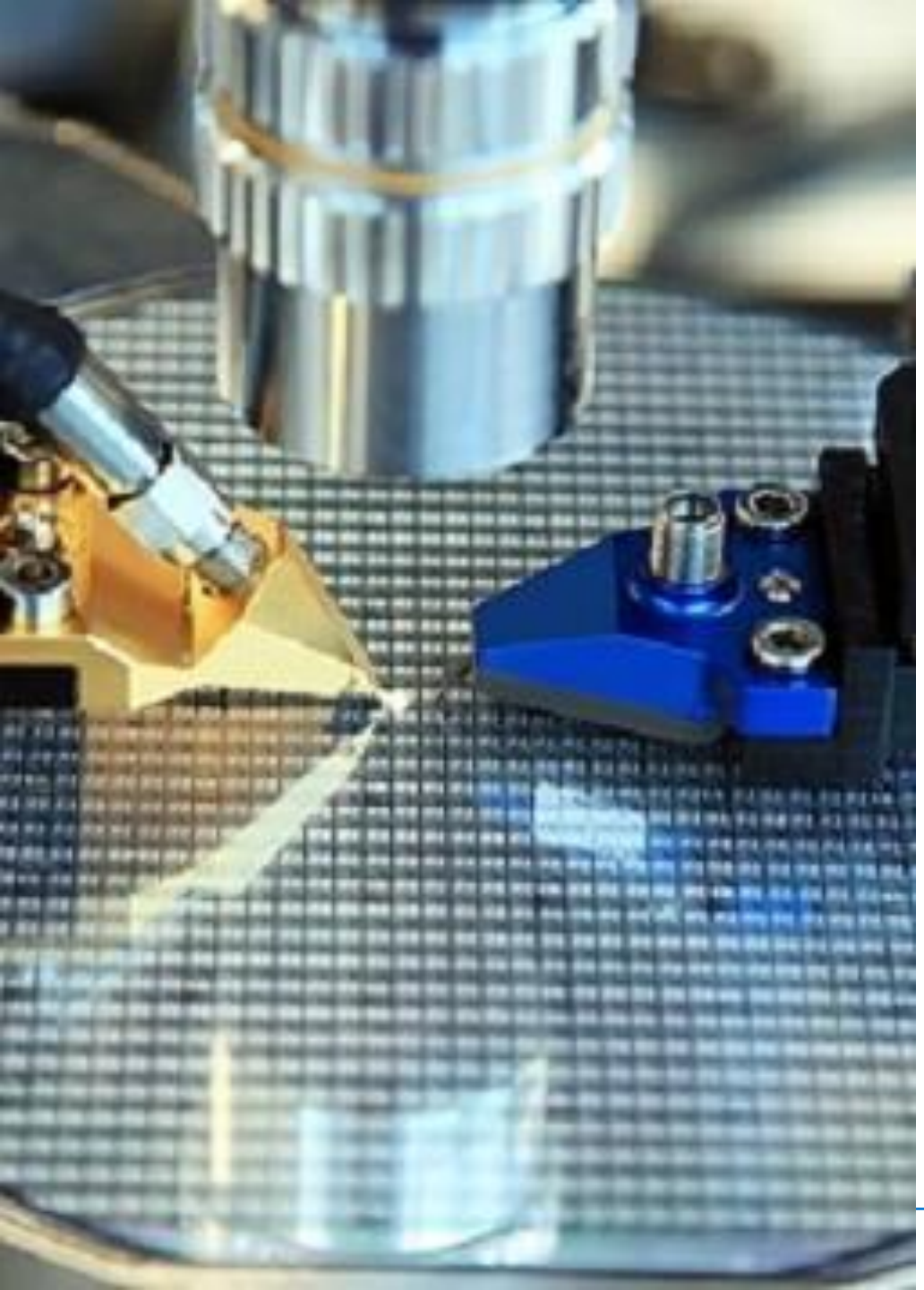
- Any chemical substance or mixture containing a chemical substance that contains at least one of the following three sub-structures:
  1. R-(CF_2)-CF(R')R'', where both the CF_2 and CF moieties are saturated carbons
  2. R-CF_2OCF_2-R', where R and R' can either be F, O, or saturated carbons
  3. $CF_3C(CF_3)$R'R'', where R' and R"" can either be F or saturated carbons.

European definition:

- Any molecule with two or more per-fluorinated carbons (not necessarily adjacent)
- Extends to a much larger number of compounds than U.S. most broad definition

U.S. Toxic Release Inventory (TRI) definition:

- Includes 196 specific compounds listed by CAS number



Semiconductor Manufacturing

- In the past 15+ years, PFAS alternatives have been replacing older chemicals
- Some photoresist chemistries still have PFAS as critical components. Most commonly:
  - Photoacid generators
  - Anti-reflective coatings
- Spent plating or etching solutions
- Potential incidental process byproducts formation
- Older processes may use legacy PFAS formulations
  - Not limited to photolithography

Current Issues and Developments

- Supplier notifications with removal of TRI *de minimis*
  - Low concentrations of PFAS on SDS, previously didn't have to declare below 1.0 or 0.1 weight percent
- TSCA lookback reporting records review for manufacture and import 2012-2022
- Developing ability of analytical testing methods
- EPA pushing wastewater monitoring and BMPs for discharges to POTWs
  - Product substitution
  - Accidental discharge minimization
  - Equipment cleaning or replacement
- Scrutiny of anything organic with fluorine

QUESTIONS?