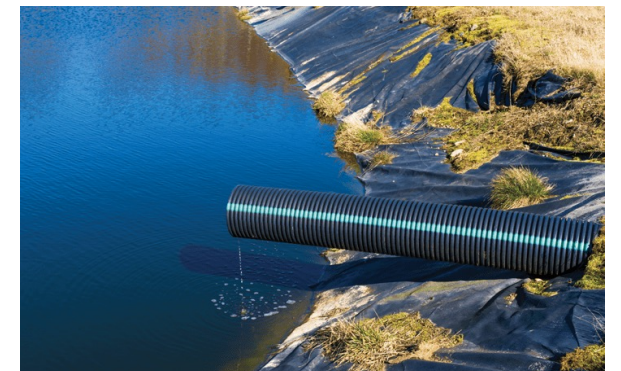




NEWEA 2023 Specialty Conference & Workshop Series – Tackling Contaminants of Emerging Concern

Drinking Water Overview: Regulations, Treatment, and Response Actions

September 13, 2023 | Kyle Hay, PE | 978.983.2081 | khay@BrwnCald.com



Agenda

1. EPA's proposed MCLs
2. Common responses to PFAS contamination
3. Treatment technologies
4. Q&A

Reference values over time

Compound	Provisional HALs 2009	Interim HALs 2016	Interim and Final HALs 2022	Proposed MCLG 2023	Proposed MCL 2023
PFOA	400 ppt	70 ppt	0.004 ppt	0	4 ppt
PFOS	200 ppt	70 ppt	0.02 ppt	0	4 ppt
PFNA			-	Hazard Index <1.0*	Hazard Index <1.0*
PFHxS			-		
PFBS			2,000 ppt		
HFPO-DA (Gen X)			10 ppt		

**The Hazard Index calculation for the sum of these four compounds should not exceed a ratio of 1 based on individual health-based water concentrations.*

How to calculate the Hazard Index (HI)

$$\text{Hazard Index}^* = \frac{\text{GenX}_{\text{water}}}{10} + \frac{\text{PFBS}_{\text{water}}}{2000} + \frac{\text{PFNA}_{\text{water}}}{10} + \frac{\text{PFHxS}_{\text{water}}}{9}$$

Monitored concentration of compound

Health-based water concentration (ppt)

**should not exceed a ratio of 1.0*

Monitoring requirements

Initial monitoring

- Large groundwater and surface water systems: Quarterly
- Small groundwater systems: Twice annually (at least 90 days apart)
- Can use previously collected data to meet initial requirements



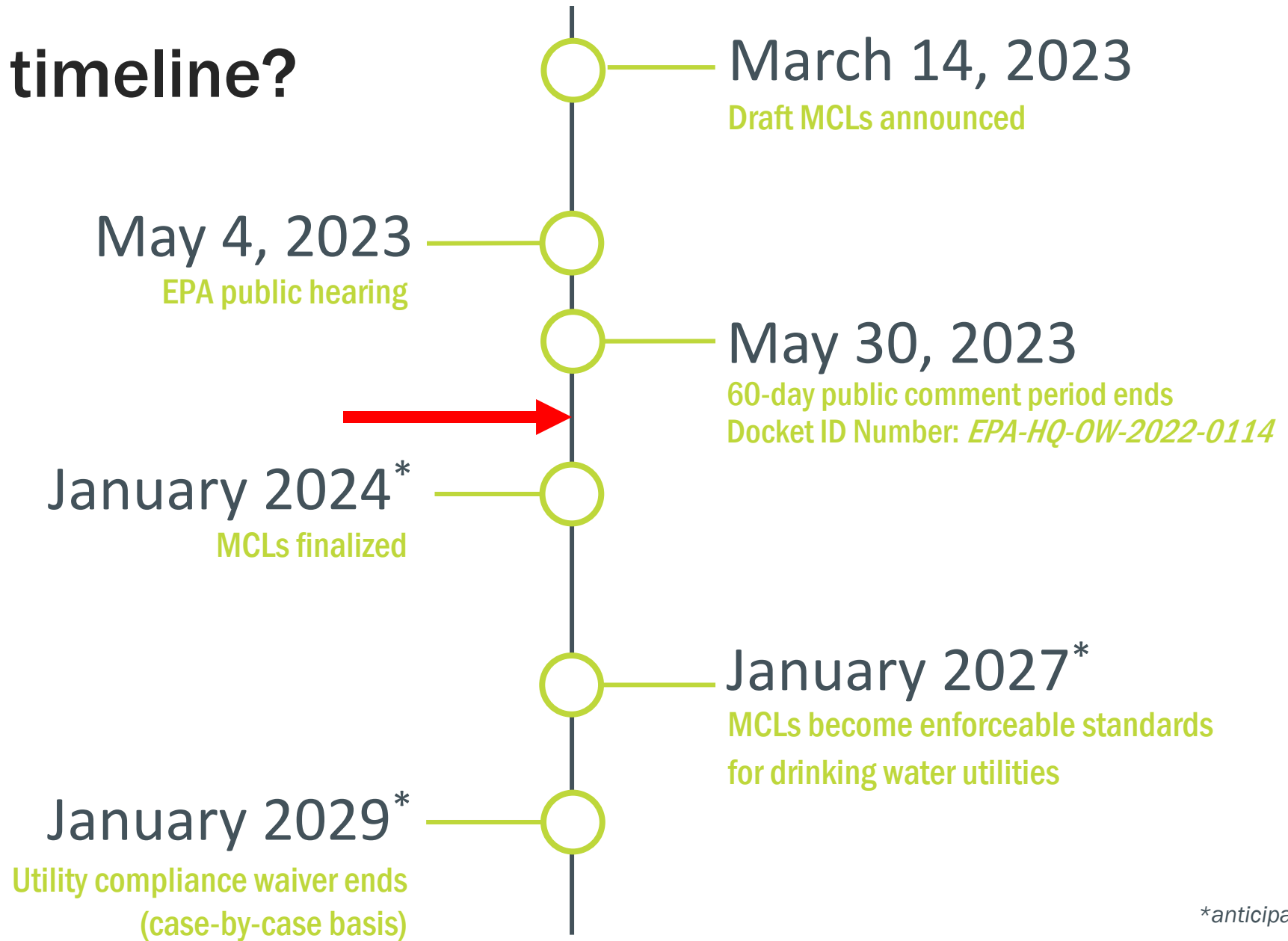
Reduced monitoring

- If under 1/3 of PQL (1.3 ppt MCLs, 0.33 HI)
- Large systems sample 2x/year every 3 yrs

Running annual average

- Entry point to distribution system
- Samples under PQL will count as zero
- Add'l samples need to be included in the average

What is the timeline?



*anticipated dates

Alternatives – Anything Applicable?

- Shut down source
- Activate emergency interconnections/backups
- Find new sources
- Blending – piping or operational modifications
- POU/POE
- Remediation of sources
- Treatment – consider as last resort

Weighing cost vs time to implement a solution.

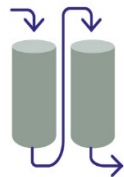
How to Respond - Drinking Water Considerations

Established Technologies and Standard Approach

- Sampling, water quality review
- Potential bench and/or pilot testing
- Alternatives analysis, conceptual layouts
- Life cycle cost assessment
- Treatment selection, final design
- Construction, and startup



GAC



IX



RO

To be Successful...

- Determine treatment goal
- Futureproof, flexible designs
- Limiting liabilities with residuals management
- Insulation from supply issues

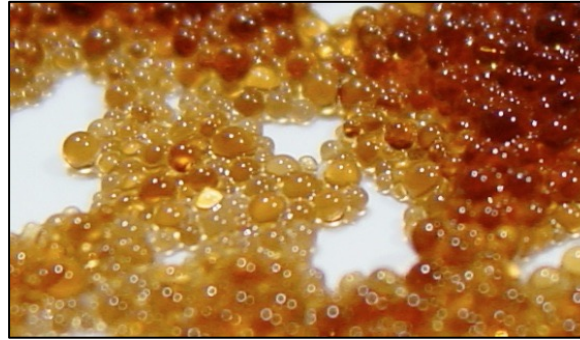
Key Questions to Address

- If and when to bench/pilot test?
- Testing goals/objectives?
- Which technologies to test?
- Does the project schedule align with compliance timelines?

Selecting the right treatment approach requires several considerations



Granular Activated Carbon (GAC)



Ion Exchange Resin (IX)



Nanofiltration/Reverse Osmosis (NF/RO)



Powdered Activated Carbon (PAC)



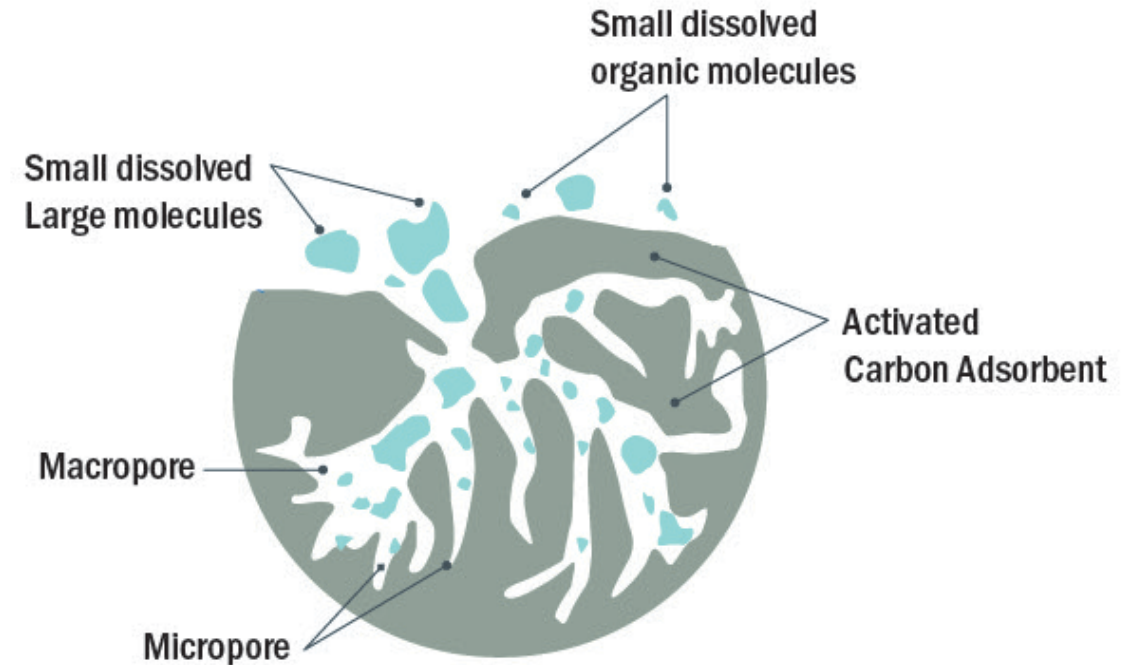
Fluorosorb-200 (FS)



Dexsorb (DX)

What you need to know about activated carbon...

- Works primarily by **adsorption** (not absorption) in micro/macropores
- Made by **thermally treating** organic sources
- Available in granular or powdered forms (GAC and PAC)
- May be **unwashed or acid-washed**
 - Backwashing to rinse fines out of the bed is required for unwashed GAC
 - Acid washing addresses initial pH rise that occurs
 - Some metals, (arsenic) can leach during start-up depending on media and the source water quality

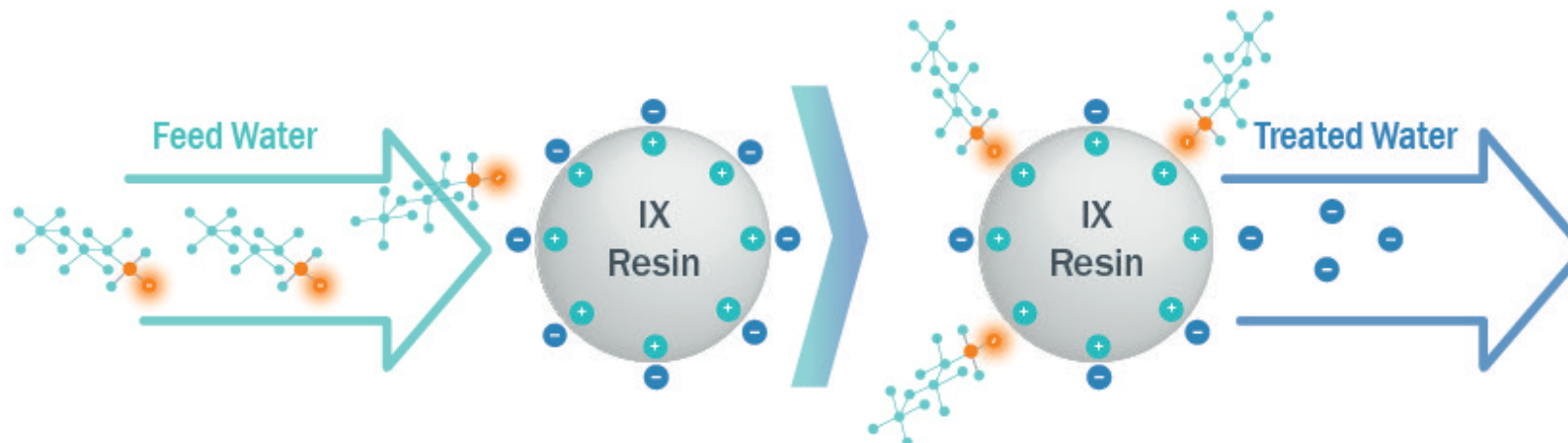


IX resins work differently than GAC

IX works by removal of charged PFAS species with resins “designed” to have chemical specificity

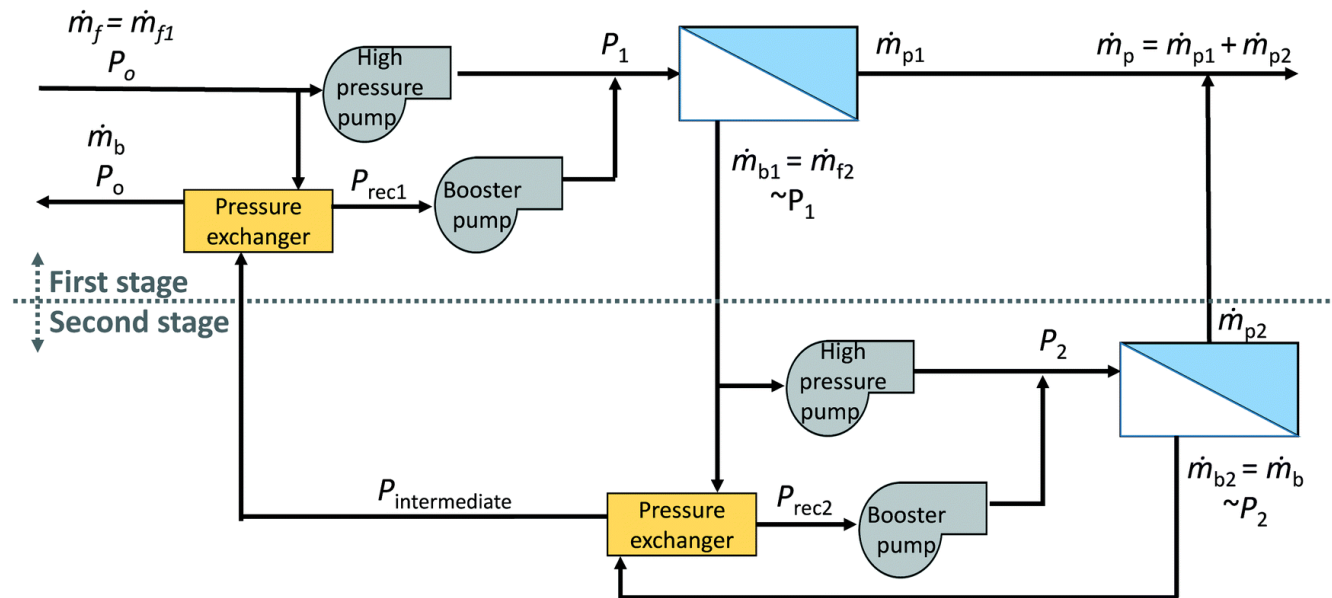
PFAS is addressed using strong IX with ion exchange AND sorption functionality

- Resin is composed of neutral copolymers with positive exchange sites
- The polymer cross linkage type and percentage impacts PFAS removal
- Mechanisms are still being researched



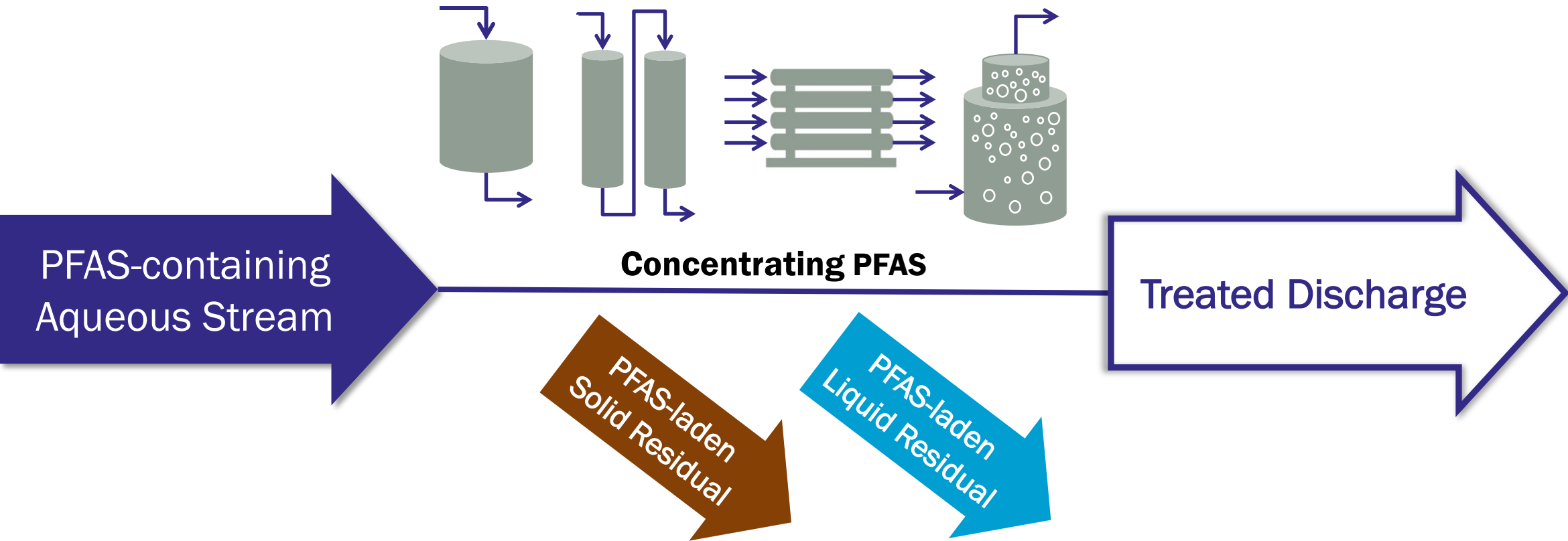
Nano-Filtration and Reverse Osmosis

- Energy intensive; requires pretreatment
- Typically designed based on water quality projections
- Concentrate disposal can double project costs



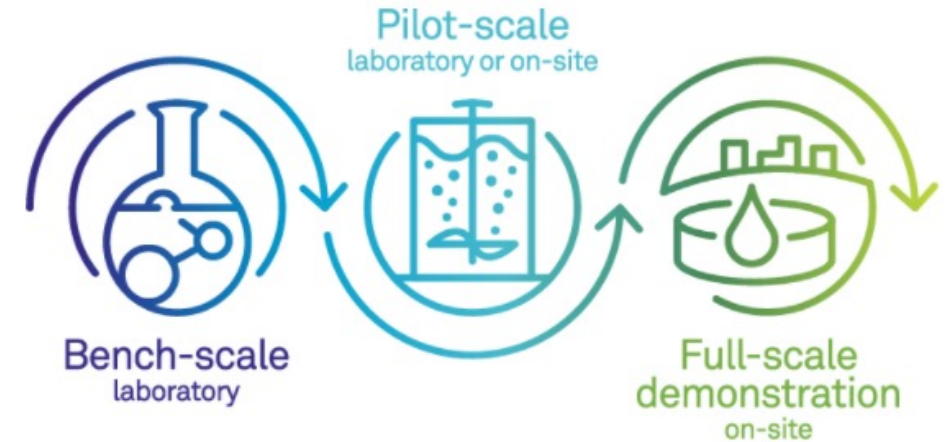
Foam Fractionation

Different residual streams



Bench vs Pilot vs Demonstration Testing

- Bench Testing (Isotherm and RSSCT)
 - Comparative results – GAC vs GAC, IX vs IX
 - Quick results – report in 4-6 weeks
- Pilot Testing
 - Quantitative results that can be used to compare GAC vs IX, accurate O&M costs
 - May be slow to get results, sometimes up to a year
 - Identify startup and O&M challenges
- Demonstration Testing
 - Full-scale results
 - May be able to use existing filter cell
- When to choose – regulatory requirements, project schedule, risk tolerance





Questions?

Kyle Hay

khay@brwnncald.com

Brown AND
Caldwell