Industrial Wastewater Compliance Strategies &

PFAS: How Big of a Deal is it Really?

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Speaker Info

- John Shaffer - CEO & Principal Chemist at EEC Environmental (EEC)
- EEC – Consultant for industries and POTWs for 30 years
- Industrial wastewater pretreatment programs
- Industrial wastewater treatment trainer
- PFAS consultant for water/wastewater agencies and industries

Agenda

- Industrial Wastewater Compliance Strategies
  - Helpful compliance strategies for industries
  - Avoiding Significant Non-compliance (SNC)
- PFAS
  - What do we know now?
  - What is possibly coming?

Industrial Wastewater Compliance Strategies

Diagnostic Sampling

Diagnostic Sampling = Sampling collected to verify proper system operation or to troubleshoot your system

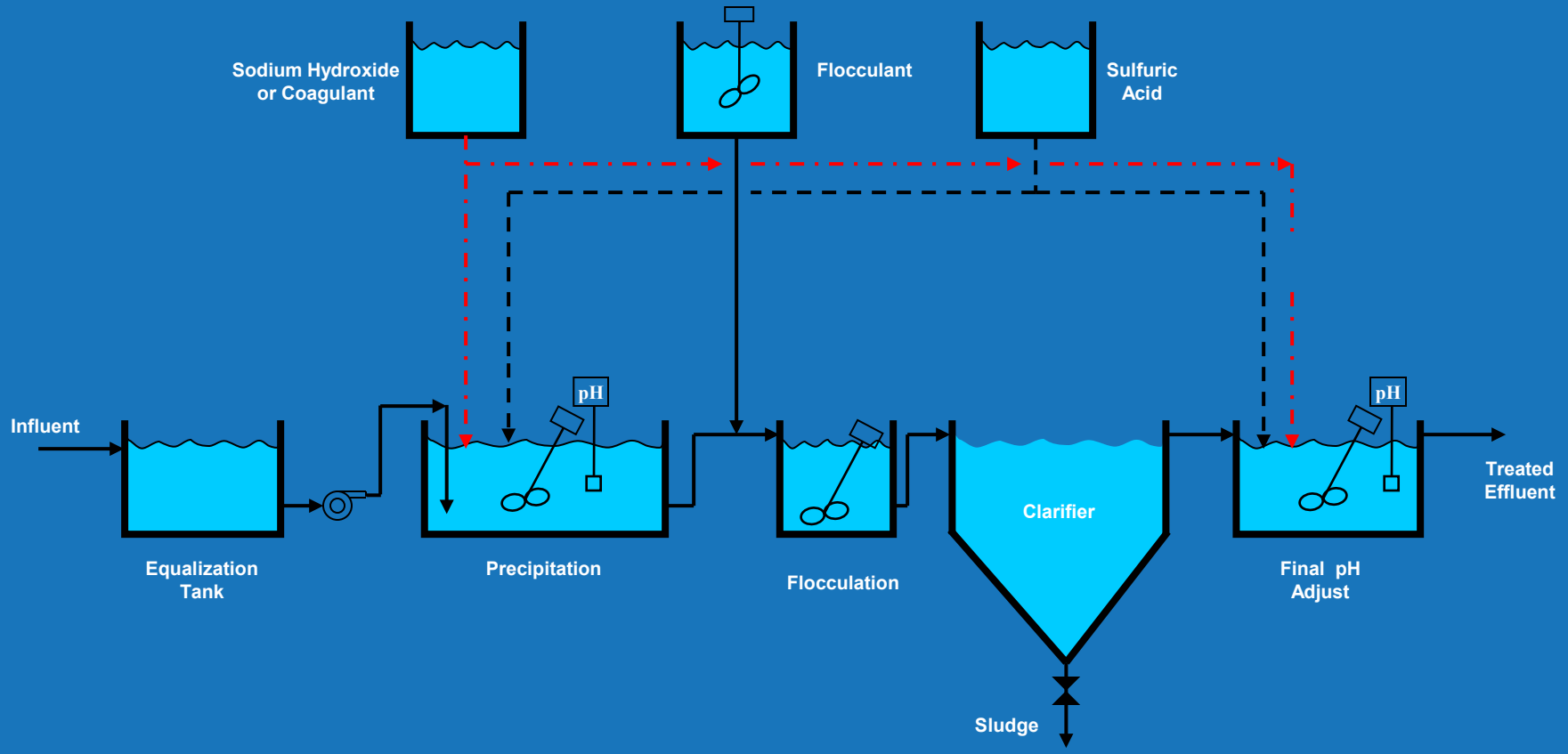
- Collected upstream of the official sampling point

- Collected at multiple locations in the treatment system (e.g.. equalization tank, chromium reduction effluent)

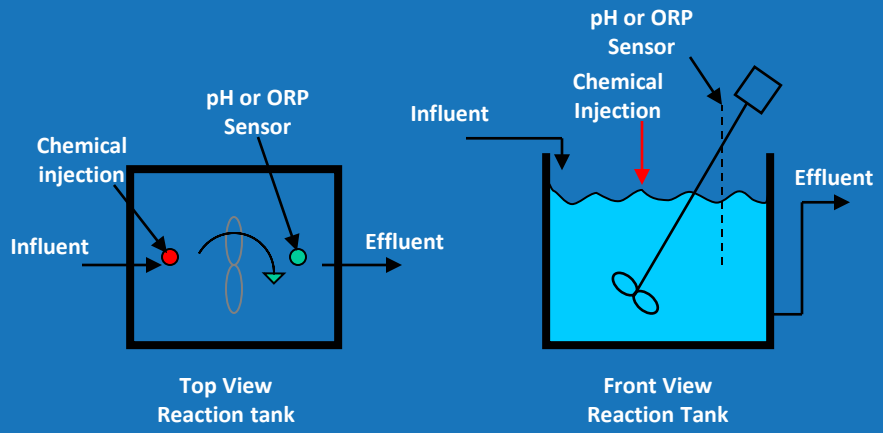
- A minimum of one diagnostic sample should be collected and analyzed (onsite laboratory or field test kit) each day or for each batch

- If you are close to the compliance limit, conduct more diagnostic sampling upstream to determine the problem

Continuous Treatment Process



Troubleshooting - pH or ORP Adjustment System

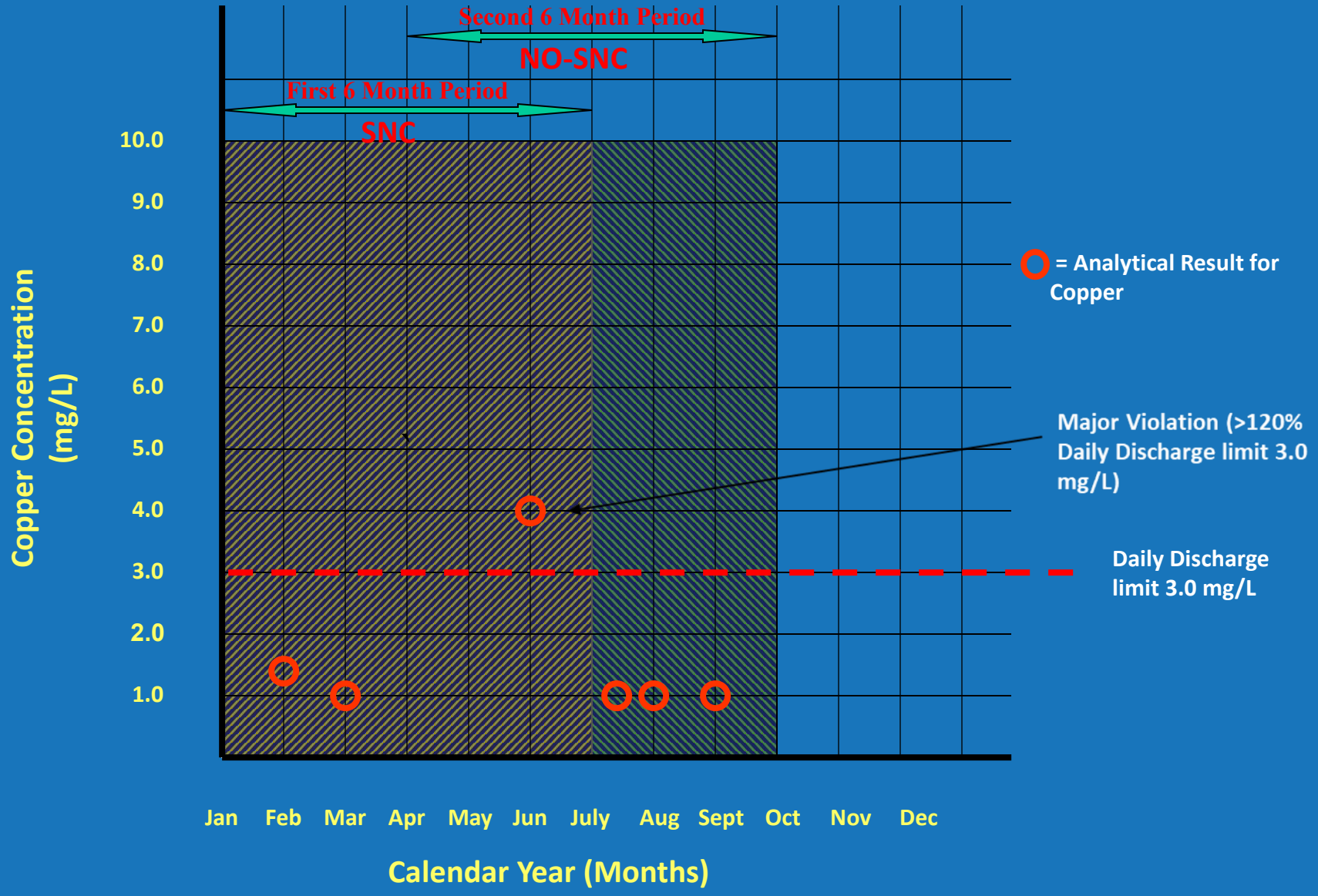


pH or ORP Probe

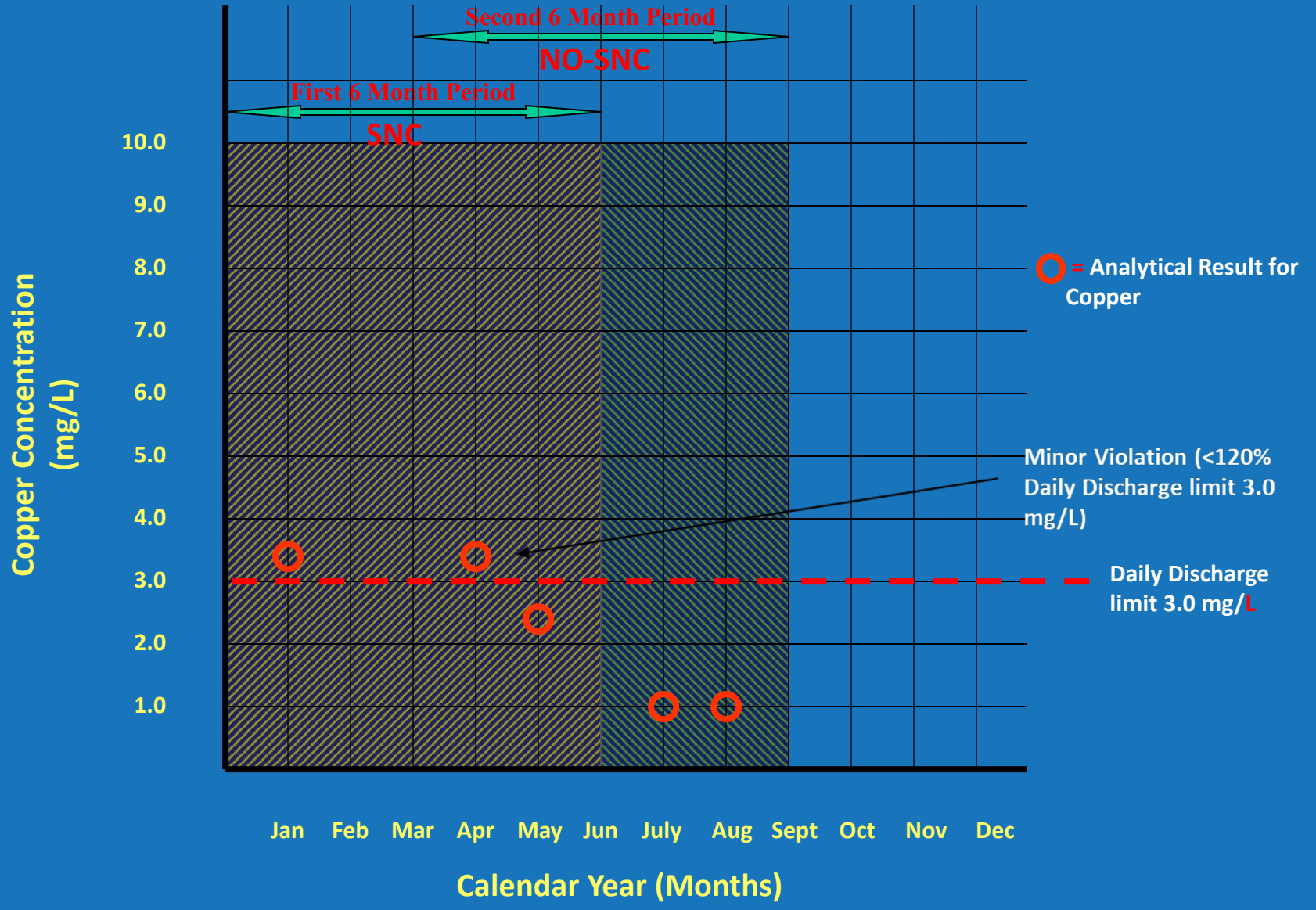
Items to Check:

- Needs Cleaning – If the pH or ORP probe value does not equal the value measured with the calibrated handheld probe
- Needs Calibration – If after the pH probe is cleaned and it still not doesn't measure the same value as the handheld pH probe, then the pH probe should be calibrated.
- Needs to be Replaced – If while calibrating the pH sensor from one standard solution (pH = 7.0) to another (pH=10,0), it takes too long ,or the pH sensor never reaches desired span value, it is time for a new pH probe. If after the ORP was cleaned and still does not measure the same value as the standard solution, then it needs to be replaced.

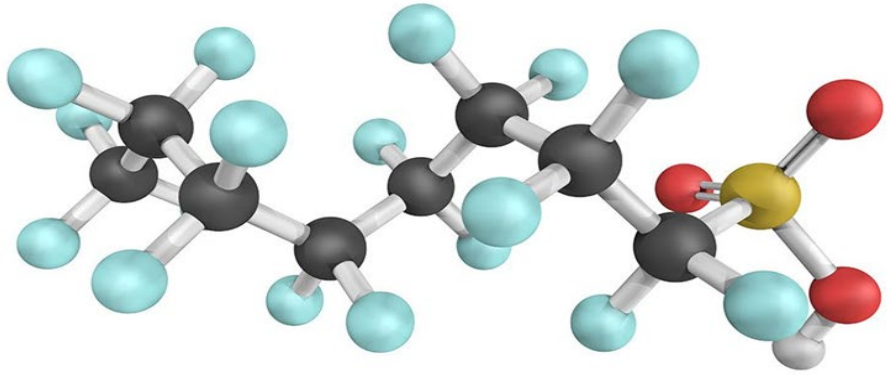
Avoiding Significant Non-Compliance Caused by an Acute Violation for Copper (Occurring 33% or More)



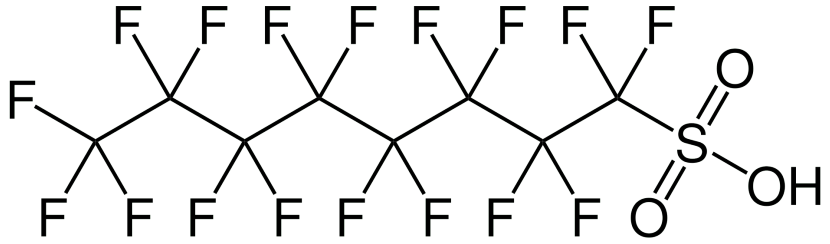
Avoiding SNC Due to Chronic Violations for Copper (Occurring 66% or More)



PFAS

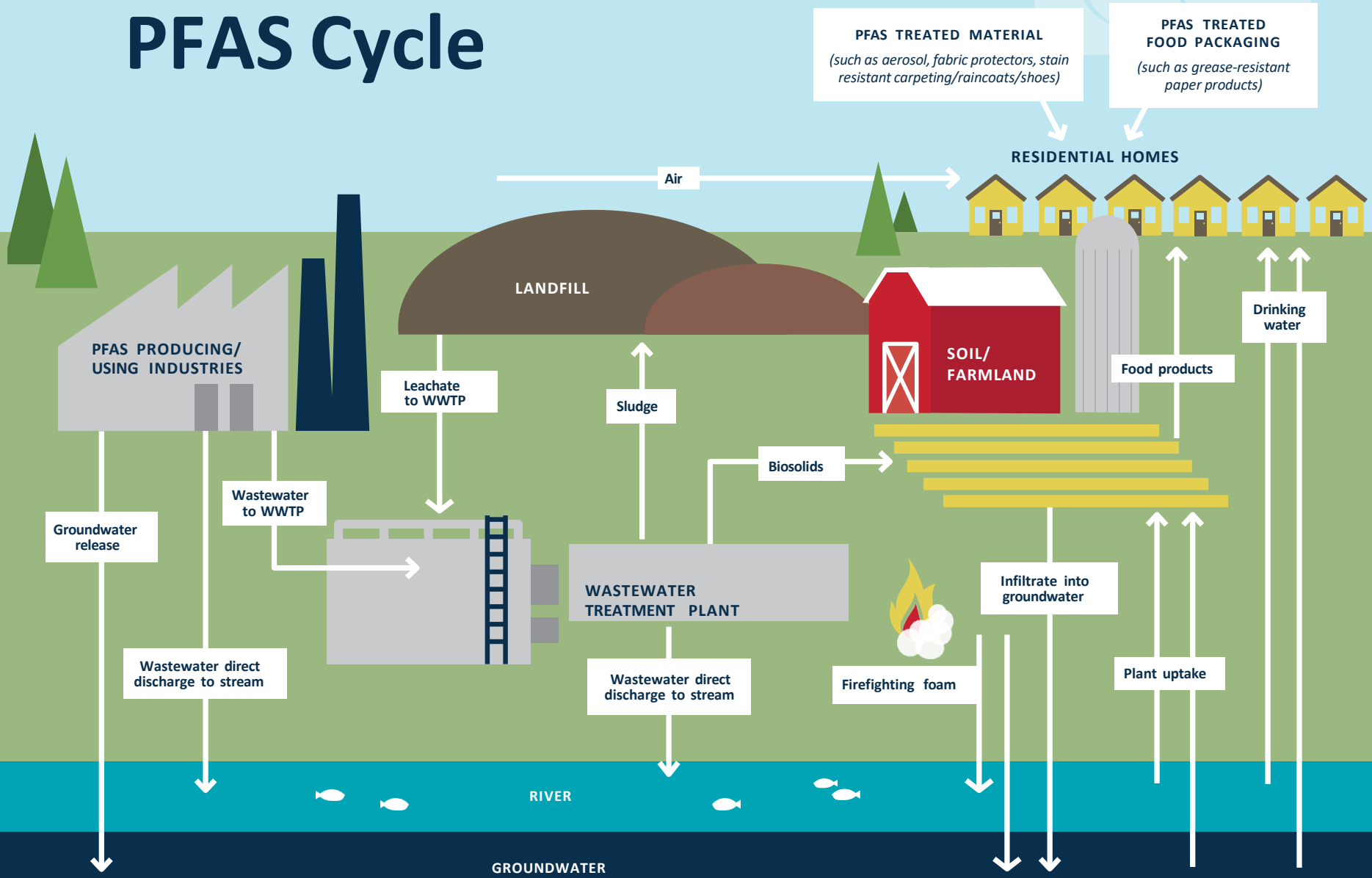


What is PFAS?



- Per- and polyfluoroalkyl substances, or man-made fluorinated compounds that don't break down in nature (aka "Forever Chemicals")
- Found in fire fighting foam, Teflon, Scotchgard, carpet, food packaging, water/oil/stain resistant clothing, fume suppressants, and much more
- Found in the blood of 99% of humans causing cancer, thyroid issues, decreased fertility, and reduced childhood vaccine response
- >5,000 PFAS compounds with PFOA and PFOS being the most well known and studied
- PFOA and PFOS have been phased out of most US manufactured products, but not from many imported products
- POTW removal efficiency is low
- Found in drinking water wells and surface waters throughout the country

PFAS Cycle



EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

800-662-9278 | *Michigan.gov/PFASresponse*

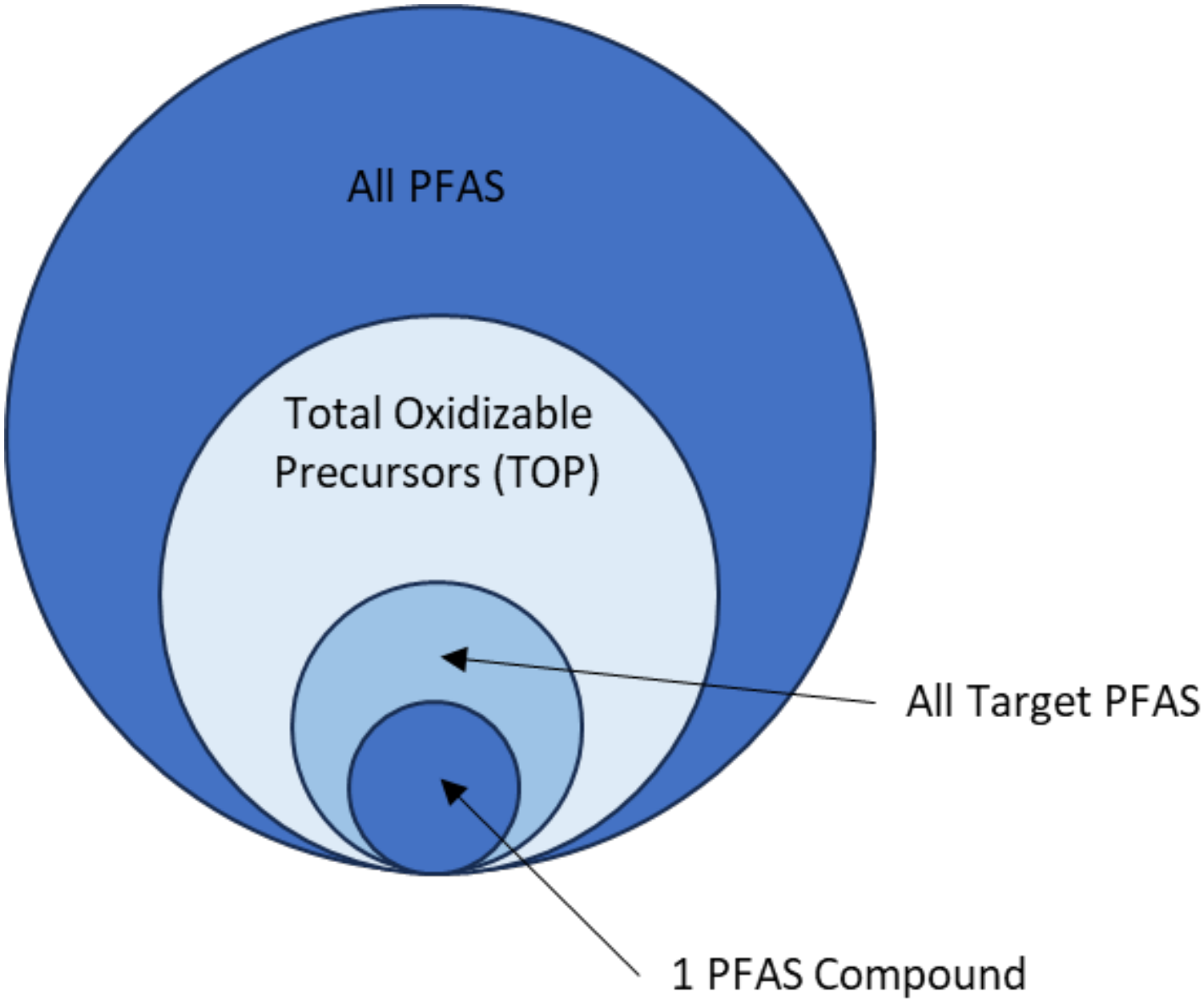
Rev. 09/2020

PFAS Terminology Help

- PFAS = All per- and polyfluoroalkyl substances
- PFOS and PFOA (the King and Queen)
  - Currently considered the PFAS compounds of greatest concern
- GenX, PFNA, PFHxS, and PFBS (the Princes and Princesses)
  - Currently considered to be the next PFAS compounds of greatest concern

PFAS Terminology Help

- Target PFAS (includes PFOA and PFOS)
  - PFAS compounds quantified by current analytical methods
- Terminal PFAS (includes PFOA and PFOS)
  - PFAS compounds of concern that don't transform
- PFAS Precursors (hidden PFAS, indicator of total PFAS)
  - PFAS compounds that transform into terminal PFAS
  - Common examples: n-MeFOSE, n-EtFOSE, 6:2 FTOH


All PFAS
Total Oxidizable Precursors (TOP)
All Target PFAS
1 PFAS Compound

What Could Make PFAS a Really Big Deal?

1) Pending drinking water MCLs
2) Pending hazardous substance/waste designations
3) PFAS precursors (Bay Area POTW study findings)
4) Residential vs. industrial PFAS (Bay Area POTW study findings)
5) Lack of PFAS-targeted treatment technologies
6) Aquatic life criteria (future discussion)
7) Recycled water quality criteria (future discussion)

Drinking Water MCLs (State and Federal)

State	PFOS	PFOA	PFNA	PFHxS	PFBS	HFPO-DA (GenX)	PFHpA	PFHxA	PFDA
Massachusetts (MCL)	20	20	20	20			20		20
Michigan (MCL)	16	8	6	51	420	370		400,000	
New Hampshire (MCL)	15	12	11	18					
New Jersey (MCL)	13	14	13						
New York (MCL)	10	10							
Pennsylvania (MCL)	18	14							
Vermont (MCL)	20	20	20	20			20		
California (NLs)	6.5	5.1		3	500				
USEPA (Proposed MCL)	**4**	**4**	**10 ***	**9 ***	**2,000 ***	**10 ***			

Values in parts per trillion (ppt) or ng/L

*Hazard Index Values: Sum of fractions must not exceed 1.0

Hazardous Substance/Waste Designations

1) CERCLA hazardous substance designation for PFOA and PFOS to be adopted any day now
   - Other PFAS compounds are likely to follow
2) RCRA hazardous substance designation for nine PFAS compounds was just proposed
3) What if all PFAS-bearing waste is hazardous?
   - Maine has already banned biosolids land application

PFAS Precursors and Total PFAS

- PFAS precursor compounds: PFAS compounds that transform into terminal PFAS compounds
  - Examples: 8:2 FTOH ➡ PFOA, nMeFose ➡ PFOS

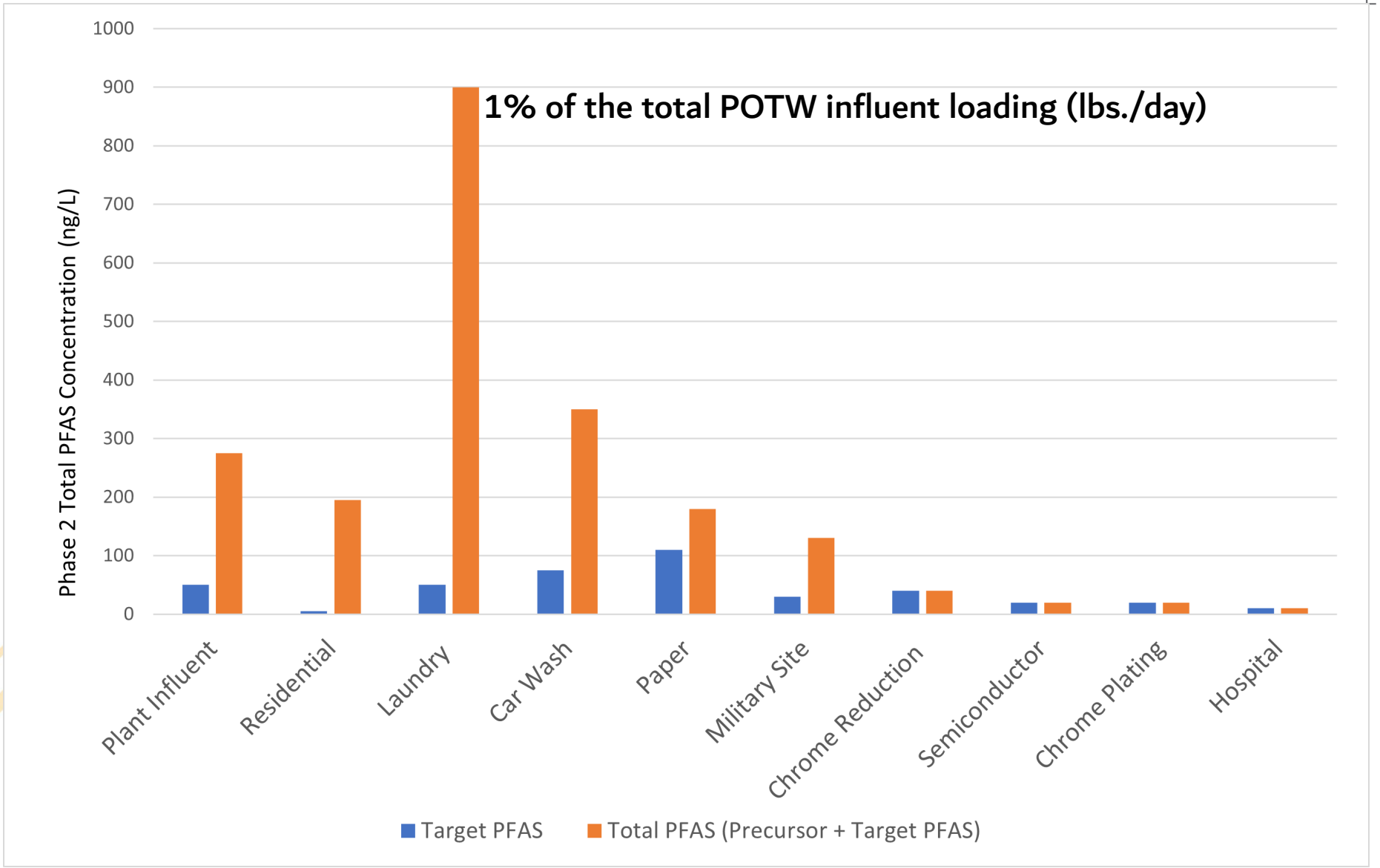
- TOP Assay analytical method measures PFAS precursors
  - Provides an indication of total PFAS, including those compounds that transform into target compounds like PFOA and PFOS

Bay Area POTW Study Findings

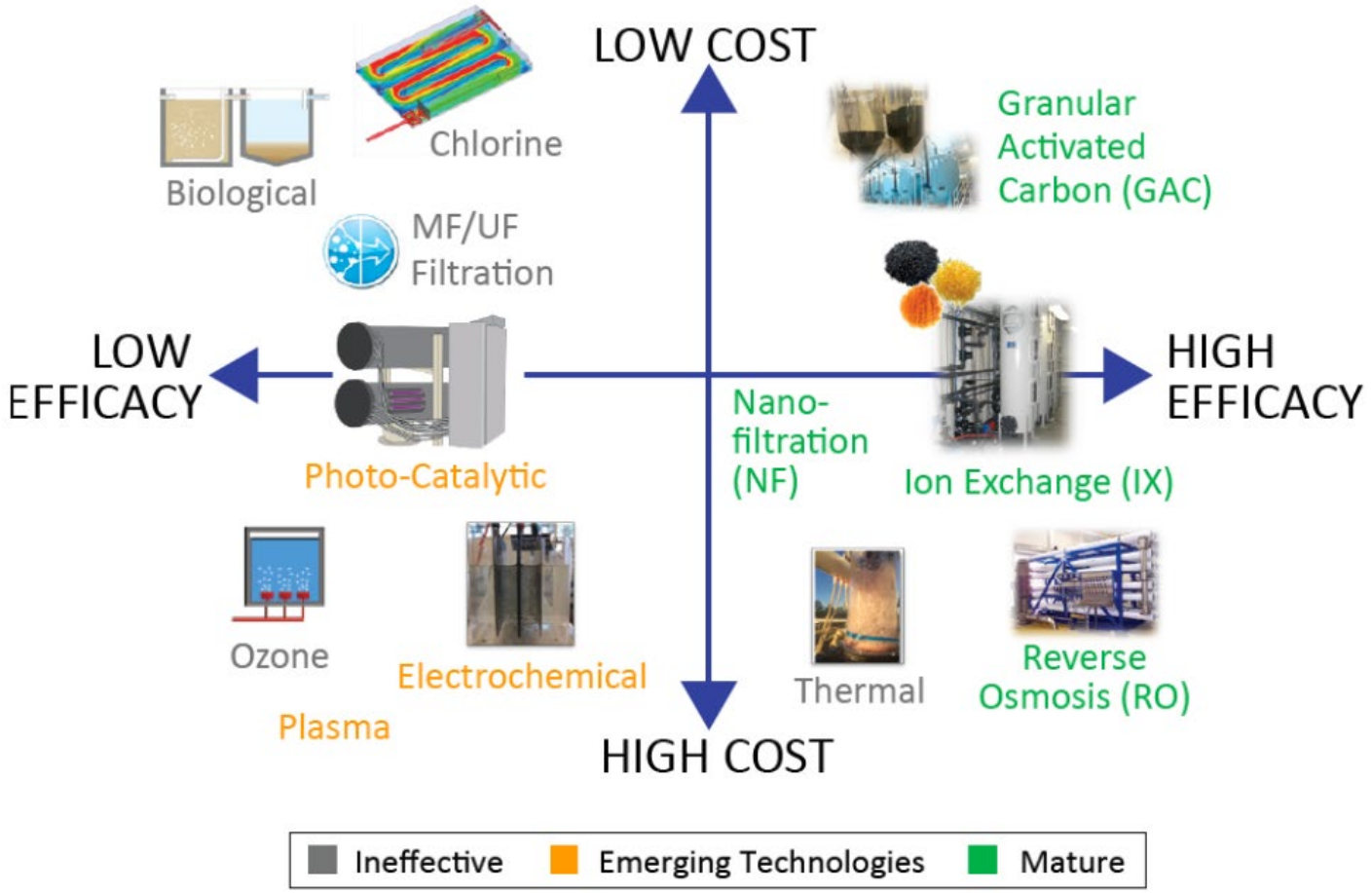
- Total PFAS concentrations quantified (based on TOP analysis) will often be much larger than the sum of the target PFAS compounds due to presence of PFAS precursors that are not on the target PFAS analyte list

- Residential loads may be the largest source of PFAS to municipal WWTPs in the SF Bay region in sewersheds

Bay Area POTW Study Phase 2 Findings



Lack of PFAS-Targeted Treatment Technologies for Primary Waste Streams



Source: Carollo Engineers

Take Homes

- If these are realities soon:
  - Currently proposed PFAS drinking water MCLs are adopted
  - ppt NPDES PFAS discharge limits are adopted
  - PFAS-bearing waste becomes hazardous
  - Residential PFAS is the largest POTW loading source
    - PFAS bans and product substitutions take 10+ years to help
  - No cost effective PFAS-targeted treatment technology is developed for the primary waste streams

Take Homes

- Then:
  - Treatment is inevitable for many POTWs
  - Treatment and waste disposal/destruction costs may be an order of magnitude higher than current costs
  - Industrial pretreatment program PFAS efforts may be completely different than any other toxic contaminant in the past

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