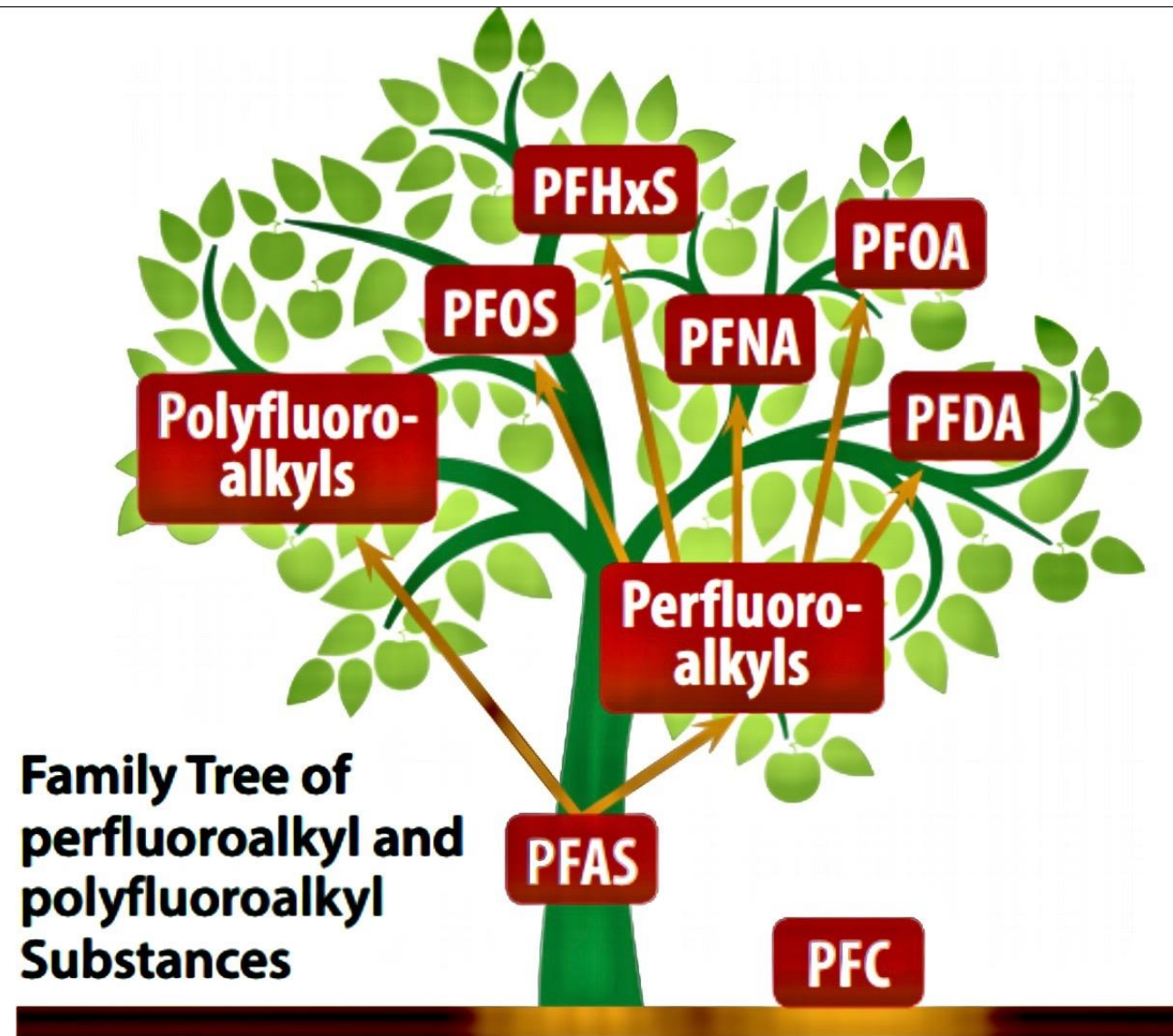




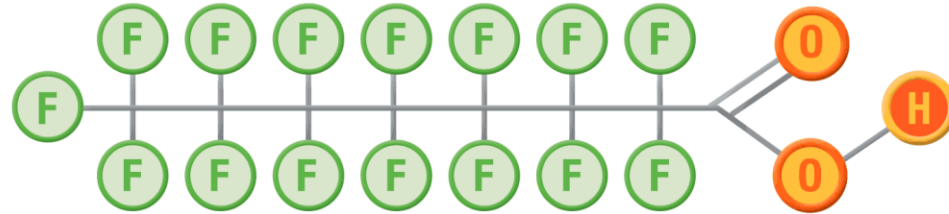
PRETREATMENT AND PFAS

2022 NC-PC ANNUAL
CONFERENCE



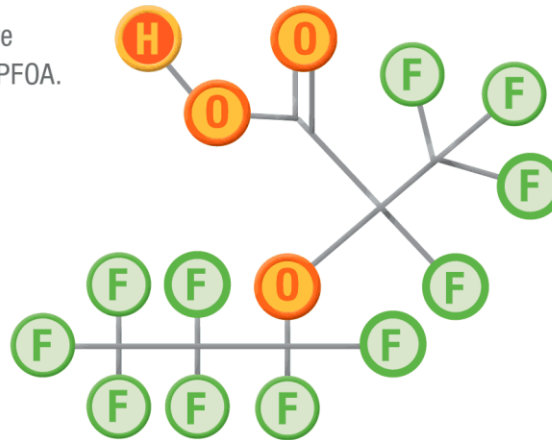
PFOA and PFOS chemicals

U.S. manufacturers voluntarily phased out PFOA and PFOS, two specific PFAS chemicals.



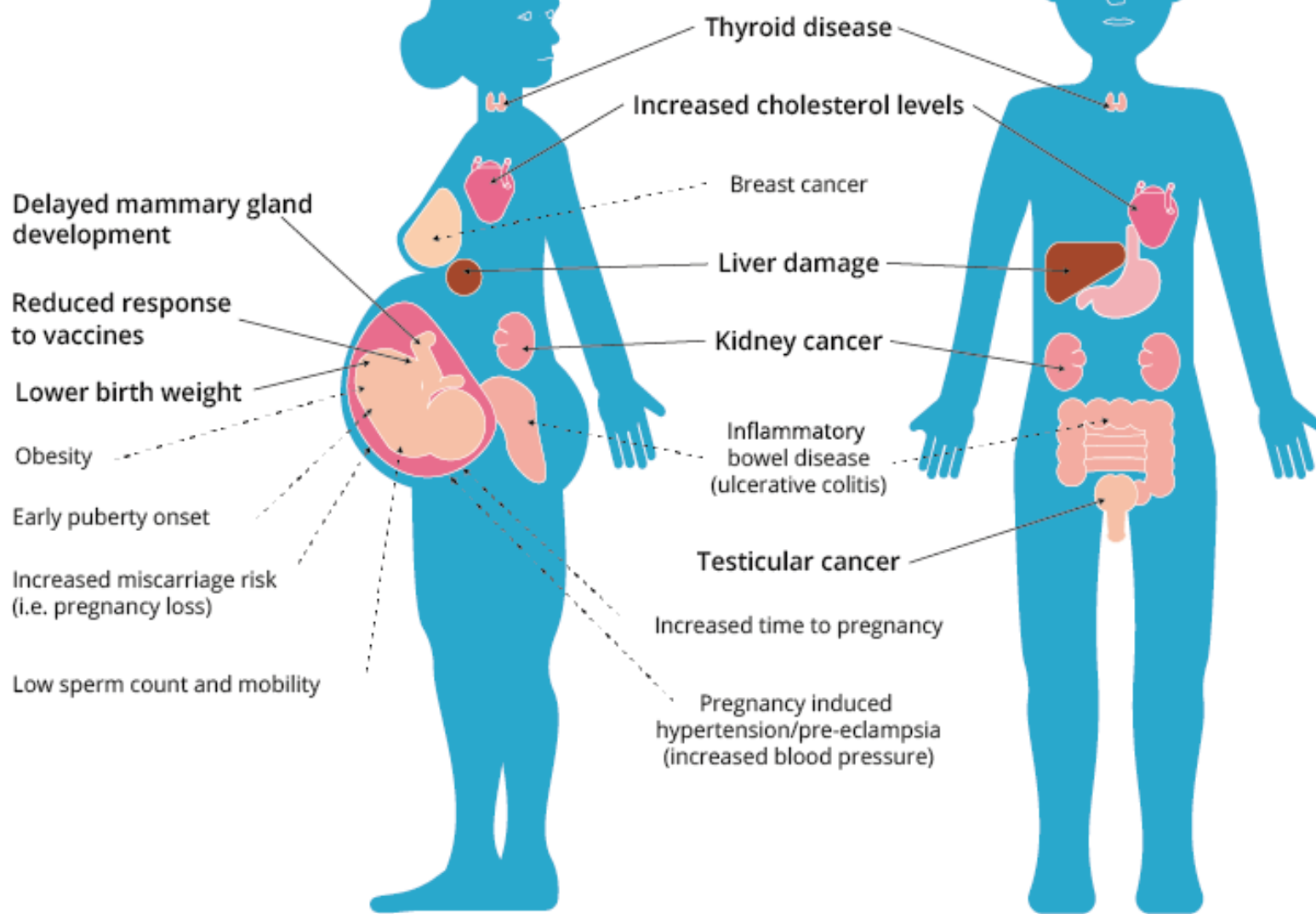
GenX chemicals

GenX chemicals are a replacement for PFOA.





**Developmental effects
affecting the unborn child**

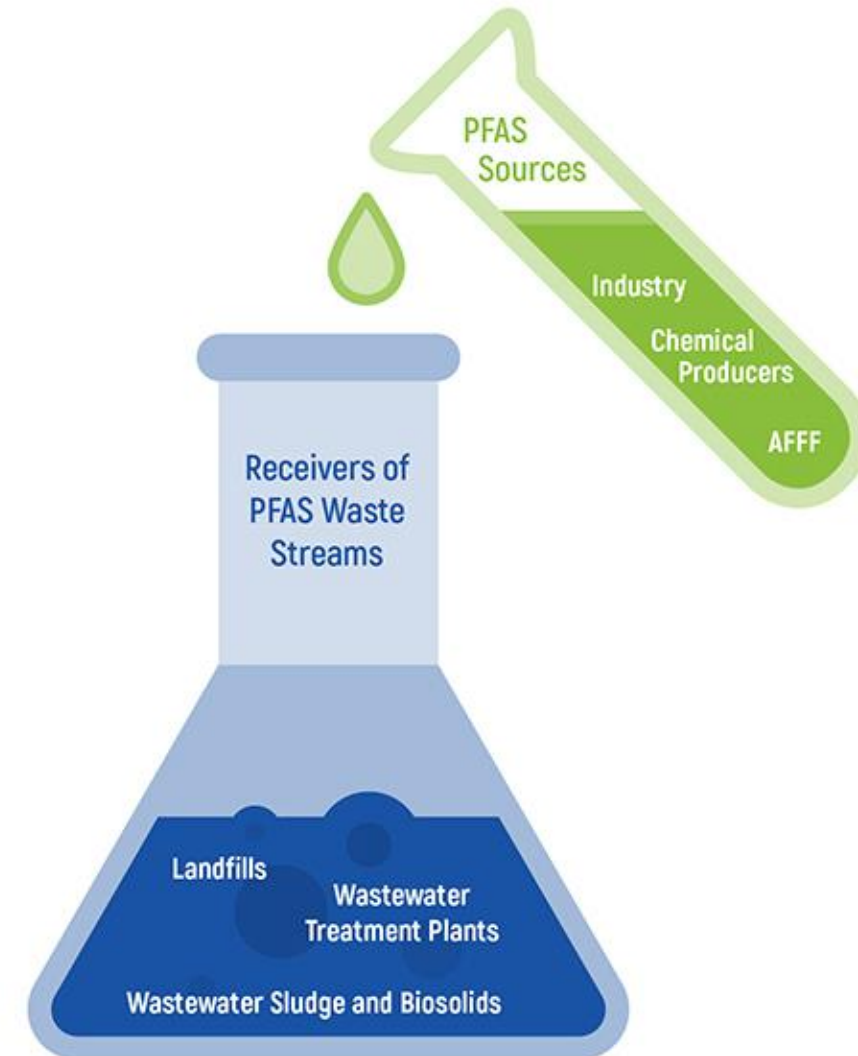


PRETREATMENT'S ROLE

WWTPs are the central point of collection.

Source Reduction highly effective.

- Prevent entry
- Product limitation
- BMPs
- Product Substitution



MONITORING LOCATIONS

- POTW LOCATIONS

- Influent
- Effluent
- Biosolids?



- INDUSTRIAL LOCATIONS

- Metal Finishers (413, 433) (Chrome Plating)
- Centralized Waste Treatment (437)
- OCPSF
- Textile Mills
- Landfills
- Chemical Manufacturers
- Paint and Paper Manufacturers
- Fire Fighting Foam (only 3%)

SCIENCE-BASED

- Draft Method 1633
(40 PFAS) for Wastewater
- “Screening” Method- 1621
 - Screens only for synthetics
 - Not recommended

LABORATORIES MOST COMMONLY USED

- GEL Labs (Charleston, SC)
- Enthalpy (Wilmington, NC)
- Eurofins (Lancaster, PA)
- Pace Analytical (SC, MN and Baton Rouge, LA)
- SGS (Wilmington, NC)
- Others?

SAMPLING

- **Pumps and Tubing:** Don't use Teflon™ and other fluoropolymer-containing materials (Do use high density polyethylene [HDPE] or silicone tubing materials)
- **Containers:** Use HDPE or polypropylene containers with HDPE or polypropylene caps, regular ice and Zip-loc bags
- **Dippers, scoops :** Grab sampling- use Stainless Steel rinsed with Methanol
- **Detergents:** Use Alconox® or Liquinox®, potable water followed by deionized PFAS free water rinse
- **Clothing:** Don't use, clothing or boots with Gore-Tex® or other synthetic water-resistant and/or stain-resistant materials, Tyvek material, fabric softener (Do use clothing made of cotton preferred)

SAMPLING

- **Field documentation:** Don't use waterproof/treated paper or field books, plastic clipboards, waterproof markers, Sharpies, Gel pens, Post-its and other adhesive paper products (Do use loose plain paper, metal clipboard, **ballpoint pens**)
- **Personal care products on day of sample collection:** Don't use cosmetics, moisturizers, hand cream, sunscreen, insect repellent unless lab provides a list of "safe" products.
- **Use Stainless Steel Dipper:** Clean dipper and rinse with Methanol. Sample Clean to Dirty- rinsing with Methanol in between samples.

INTERPRETING RESULTS

What am I looking at???

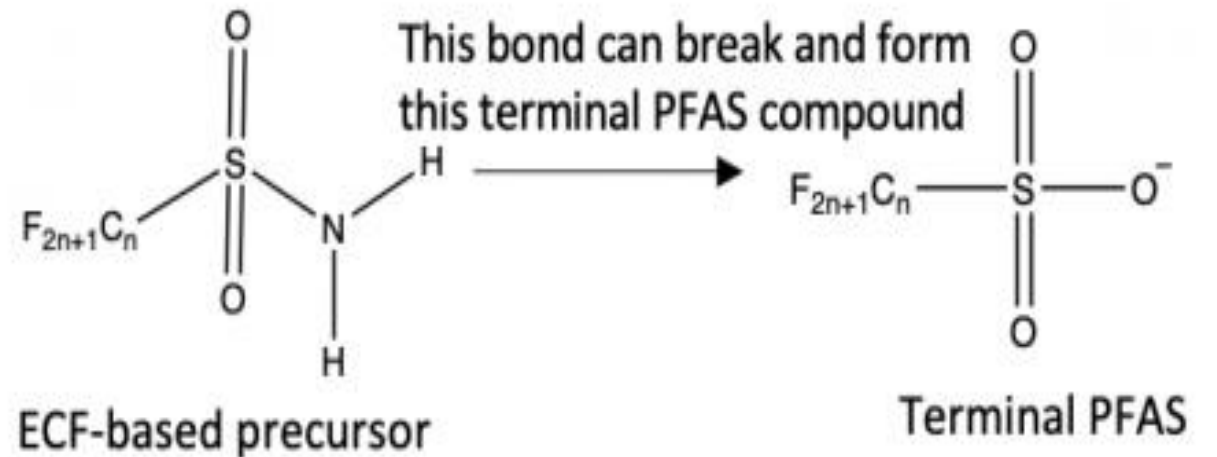
Is this “NORMAL?”

- Effluent is higher than Influent??
- Have different types of PFAS at each location?

WHY?

- Precursors and terminals.
- WWTP recirculation of treatment streams.
- Contamination

Breakdown of a PFAS Precursor



REPORTING

How do I report results? Should/Must I report?

- If NPDES permit requires, must report as indicated on permit.
- Otherwise- include results in form of letter with attachment to NCDENR permit writing staff and regional office or place in comment section of eDMR.
- Keep a summary of results to be submitted with NPDES permit renewal application.
- ***REMEMBER: The results are not “compliant” because Method is not approved! Only for information gathering currently.***

TREATMENT OPTIONS

EPA'S Interim Health advisory lifetime limitations for **PFOA 0.004 ppt** and **PFOS at 0.2 ppt**, previously at 70 ppt. EPA's Final lifetime HA for Gen X is 10 ppt and PFBS at 2,000 ppt.

How can our Industries "Pretreat" for PFAS?

How does our Plant reduce/remove PFAS?

Who pays? Manufacturers – "product liability" EPA/State funding?

In CA, found PFAS coming from residential areas.

CURRENT TREATMENT OPTIONS

- Product Limitation or Substitution- most promising for reduction of PFAS
- BMPs
- Reverse Osmosis
- Granulated/Powdered Activated Carbon
- Pyrolysis (Biosolids)
- Ion Exchange



FUTURE REMOVAL TECHNOLOGY

- Univ. of Buffalo- Metal “Traps” iron-based captures PFAS with 6 or more chains
- Univ. of California-Riverside – PFAS degradation in presence of excess electrons
- Rice University (Houston) and Tsinghua (Beijing)- Boron Nitride powder reacts with UV light- *removes 99% of PFOA in 4 hours.*
PFAS → Fluoride, Carbon Dioxide, and Hydrogen.
It also destroys GenX.

Filtration Options to Remove PFAS

Technology	Removal System • ^ PFAS removed below detectable levels (unless noted otherwise)
Reverse Osmosis	Apec Water: RO-45 • APEC RO-45 • AquaTru Countertop Water Filtration • Aquasana: Under Sink OptimH2O® RO + Claryum® (PFHxA 99.2%, PFHpA 98.9%) • Culligan • Culligan Aqua-Clear • Culligan Aqua-Clear R030 • Ecowater • Purotics Micromax 7000 • Titan Water Pro NW-R050-NP35 • Zero Water • Kinetico® K-5*
Under-sink single stage	Custom Formulations KDF/GAC • eSpring 100189 (UV lamp off) • Hydroviv Tailored Tapwater
Whole house - GAC	Aquasana EQ-1000 • North American Aqua WHS-400*
Dual-stage	GE: FXSVC • Hyroviv Tailored Tapwater & HDX Whirlpool 3 • Kenmore • Whirlpool • Whirlpool: WHEM B40 (PFBA 94.9%)

^GenX, PFOS, PFOA, PFBS, PFHxS, PFBA, PFPA, PFNA, PFDA, PFHxA, PFHpA

Additional Options with Lower Effectiveness

Technology	Removal System	Average PFAS Removed %
Pitcher filter	Brita • Pur • Berkey • Zero Water • Aquasana: Clear Water Machine	GenX (46%) • PFOS (71%) • PFOA (67%) • PFBS (65%) • PFHxS (54%) • PFBA (36%) • PFPA (42%) • PFHxA (43%) • PFHpA (43%) • PFNA (>54%) • PFDA (>57%)
Fridge filter	LG 5231JA2006B • GE Smart WaterPlus • Every Drop • Whirlpool HDX FMW-5 • GE: Smart Water • Clear Choice: CLCH105 • Samsung • Amana • Bosch • Jenn-Air • Frigidaire • EcoAqua EFF6027A	GenX (56%) • PFOS (61%) • PFOA (71%) • PFBS (29%) • PFHxS (65%) • PFBA (45%) • PFPA (35%) • PFHxA (59%) • PFHpA (65%) • PFNA (72%) • PFDA (57%)

Note: Most of the filtration options listed in the tables above were compiled based on a study on the effectiveness of removal systems by Herkert, et al. available at <https://pubs.acs.org/doi/10.1021/acs.estlett.0c00004>. Two systems identified by an asterisk (*) were tested and approved for use by the NC Department of Environmental Quality (DEQ). NCDHHS has neither vetted nor endorsed any of the removal systems above.

All filtration systems require regular maintenance (e.g., filter changes) to be effective and can even become a source of increased PFAS levels over time if not properly maintained.



NC DEPARTMENT OF
**HEALTH AND
HUMAN SERVICES**
Division of Public Health

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DEQ/EPA STRATEGY FOR PFAS

DEQ propose GW standards

EPA enhances reporting under the TRI Toxics Release Inventory- "Chemicals of Special Concern."

Publish health advisories for PFBS and GenX.

DEQ support initiatives focused on Pollution Prevention and minimizing future releases of PFAS. BMPs, PFAS -free alternatives, source reduction, etc.

DEQ propose SW and DW Standards for PFAS. PFOA and other compounds as data becomes available.

EPA Leverage NPDES permitting to reduce PFAS discharges.

EPA

Restrict PFAS discharges from industries- Effluent Limitations Guidelines Program

OCPSE, Summer 2023

Metal Finishing- Summer 2024

Finalize risk assessment for PFOA and PFOS in biosolids Winter 2024

EPA publish final recommended ambient Water Quality Criteria for PFAS

Summer/Fall 2022

Summer/Fall 2022

Fall/Winter 2022-2023

2022 and ongoing

Winter 2022/Fall 2024

SEPTEMBER UPDATE

- EPA released Notice of Proposed Rulemaking to list PFOA and PFOS as hazardous substances under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), or “Superfund”. What does this mean?
 - REPORTING OBLIGATIONS for when there is a release >1 lb.
 - DOT requirement
 - Transfer of Government Property

HAZARDOUS SUBSTANCES

- Indirect Effects of Designation
 - EPA could recover PFOA and PFOS clean up costs from Potentially Responsible Parties (PRP)
 - Cost Impact – the Office of Management and Budget found could cost \$11 B for cleanup alone with expected annual cost of \$100 M
 - What about our POTWs? Since we are passive treaters of waste and generate biosolids, we will likely be designated as a PRP and subject to clean up of sites.
 - Comments are due November 7, 2022. Final rule targeted for mid-2023

QUESTIONS

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Commission

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CLEAN WATER ACT



1972 - 2022

