



PFAS/PFOS/PFOA 2024

George Fuchs

**Director – Regulatory Affairs and Technology
National Association of Printing Ink Manufacturers
February 1, 2024**



PFAS/PFOS/PFOA 2024



Today's Outline:

- **Speaker Introduction/Trade Association**
- **Printing Ink Industry and PTFE**
- **Definitions & Chemistry**
- **History/Overview of PTFE**
- **Federal Regulatory Activities**
 - **TSCA**
 - **CWA/CAA**
 - **Waste**
- **State Regulatory Activities**
 - **EPR Programs**
 - **Bans**
- **What Can We Do (Strategy and Tactics)**



PFAS/PFOS/PFOA 2024



National Association of Printing Ink Manufacturers

NAICS: 32591/SIC 2893

Producers of Commercial and Packaging Inks

~\$4B (~3B lbs) Industry

George Fuchs

gfuchs@napim.org

35+ years in chemical industry regulatory compliance

- **Allied Chemical**
- **Pennwalt**
- **Kennecott Utah Copper**
- **EniChem**
- **NAPIM**

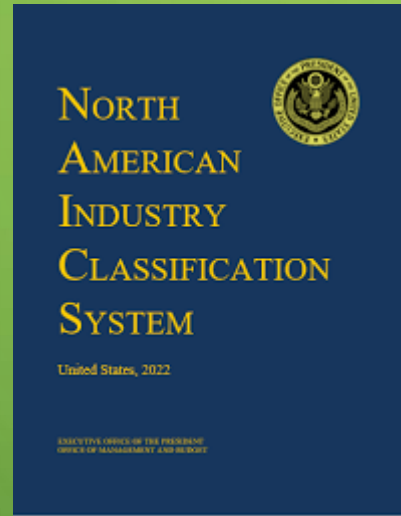
PTFE in Inks



Rub Resistance, Slip and Block and Heat Resistance
Being systematically replaced by PP, HDPE and others



NAICS Codes



326220 Rubber and Plastics Hoses and Belting Manufacturing

32591 Printing Ink Manufacturing

**Basis of regulatory applicability
Drives tariff classifications**



Dr. Roy Plunkett “accidentally” discovers PTFE in 1938



AFFF – Aqueous film forming firefighting foam



PFAS ¹	Development Time Period							
	1930s	1940s	1950s	1960s	1970s	1980s	1990s	2000s
PTFE	Invented	Non-Stick Coatings			Waterproof Fabrics			
PFOS		Initial Production	Stain & Water Resistant Products	Firefighting foam				U.S. Reduction of PFOS, PFOA, PFNA (and other select PFAS ²)
PFOA		Initial Production		Protective Coatings				
PFNA					Initial Production	Architectural Resins		
Fluoro-telomers					Initial Production	Firefighting Foams		Predominant form of firefighting foam
Dominant Process ³		Electrochemical Fluorination (ECF)						Fluoro-telomerization (shorter chain ECF)
Pre-Industrial Chemistry /			Initial Chemical Synthesis / Production			Commercial Products Introduced and Used		

Notes:

1. This table includes fluoropolymers, PFAAs, and fluorotelomers. PTFE (polytetrafluoroethylene) is a fluoropolymer. PFOS, PFOA, and PFNA (perfluorononanoic acid) are PFAAs.
2. Refer to Section 3.4.
3. The dominant manufacturing process is shown in the table; note, however, that ECF and fluorotelomerization have both been, and continue to be, used for the production of select PFAS.

Sources: Prevedouros et al. 2006; Concawe 2016; Chemours 2017; Gore-Tex 2017; US Naval Research Academy 2017

Definitions

perfluorooctane sulfonic acid (PFOS)



Perfluorooctanoic acid (PFOA)



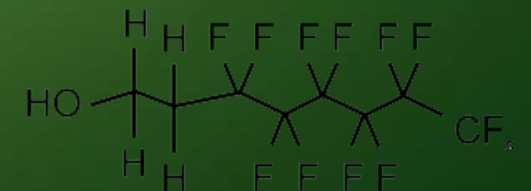
per- and polyfluoroalkyl substances

The prefix "Per" means complete fluorination no C-H bonds; The prefix "poly" means at least one carbon not fluorinated one or more C-H bonds

Perfluorinated



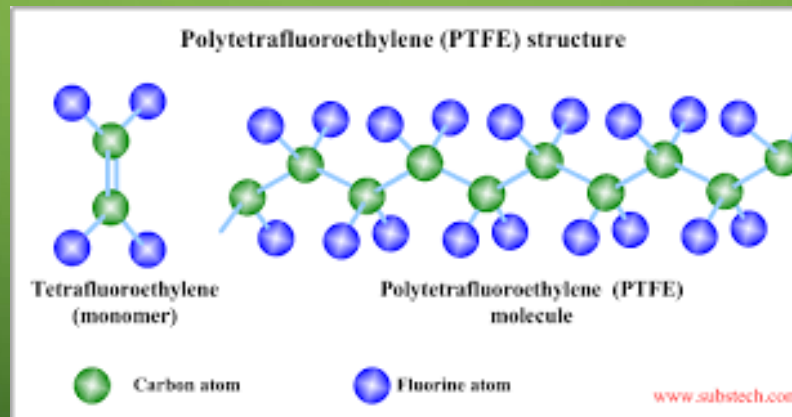
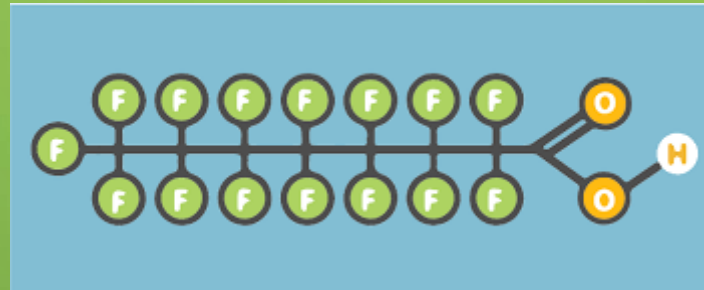
Polyfluorinated



State Adoptions Increasing

Packaging/Food Packaging

PerfluoroAlkyl Substances PFAS



IUPAC Polymer Definition

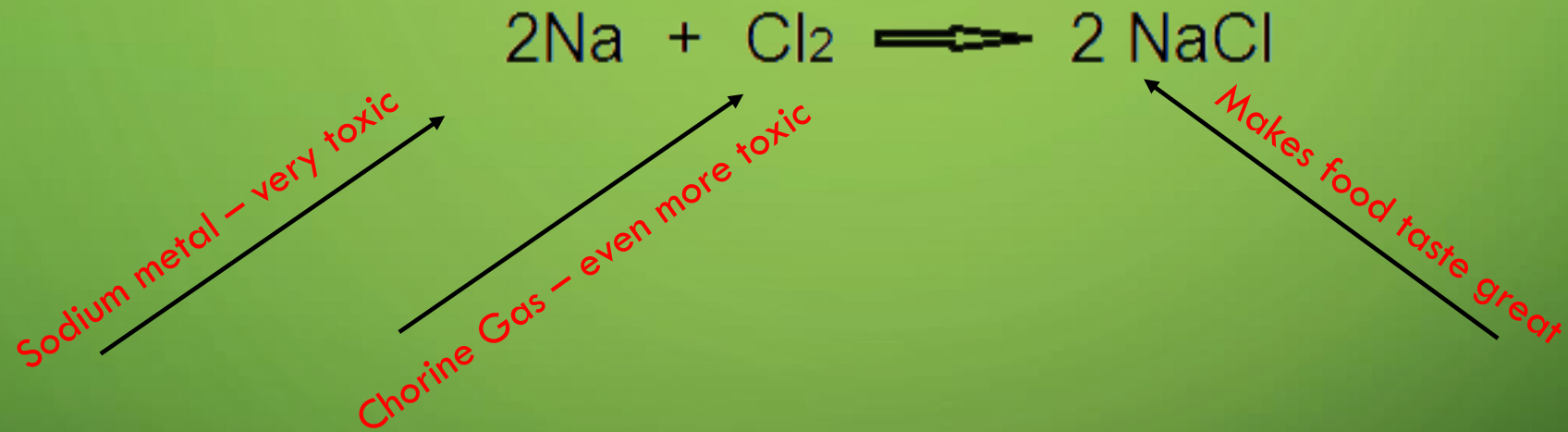
A substance composed of macromolecules.

IUPAC Macromolecule Definition

A molecule of high relative molecular mass, the structure of which essentially comprises the **multiple repetition of units derived, actually or conceptually, from molecules of low relative molecular mass.**

PFAS/PFOS/PFOA 2024

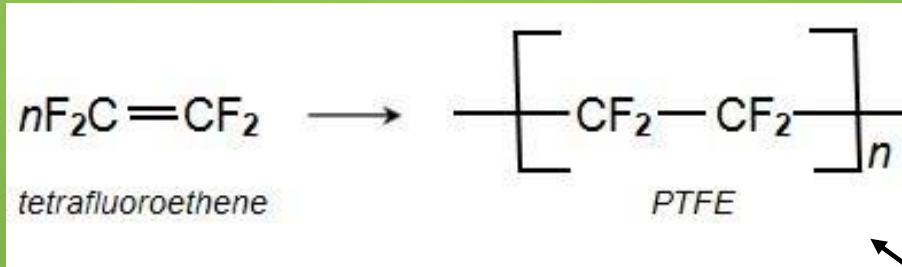
Chemical reactions create new compounds with different properties





How PTFE is made

TFE highly flammable/explosive



Completely inert





PFAS/PFOS/PFOA 2024

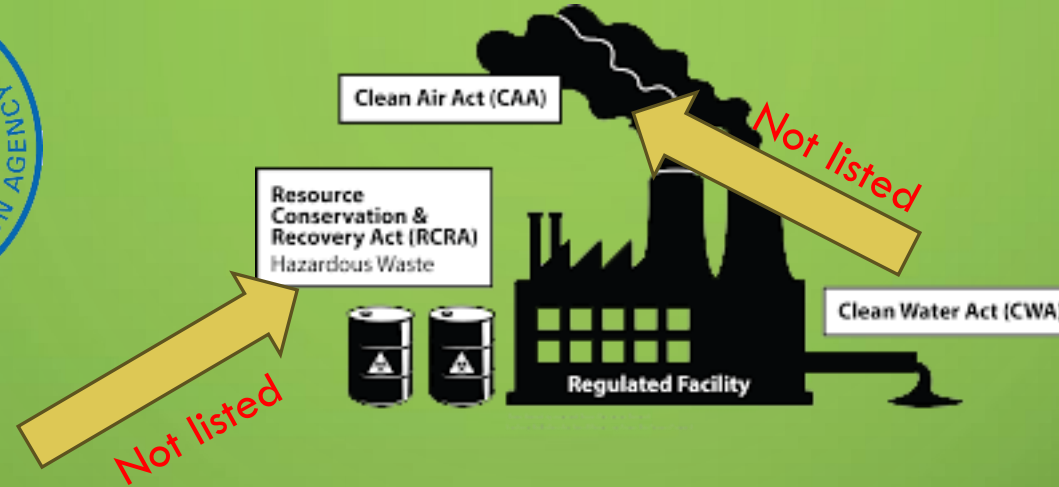
The Regulatory Process

- Step 1 – Issue Identification
- Step 2 – Measurement
- Step 3 – Corrective Actions
- Step 4 – Re-Measurement
- Step 5 – Effectiveness Assessment





PFAS/PFOS/PFOA 2024



PFAS compounds are not listed as hazardous wastes under the Resource Conservation and Recovery Act (RCRA) also not regulated as a hazardous air pollutants under Clean Air Act (CAA) regulations

<https://www.epa.gov/pfas/key-epa-actions-address-pfas>



PFAS/PFOS/PFOA 2024



Current Regulatory Activity

EPA PFAS REPORTING RULE UNDER TSCA 8(a)(7)

Why? Enable EPA to “better characterize the sources and quantities”

Who? Manufacturers of PFAS; Importers of PFAS; Importers of mixtures containing PFAS; Importers of articles containing PFAS¹ in any year since 2011

What? $R-(CF(R')R'')$, where both the CF_2 and CF moieties are saturated carbons; $R-CF_2OCF_2-R'$, where R and R' can either be F , O , or saturated carbons; and $CF_3C(CF_3)R'R''$, where R' and R'' can either be F or saturated carbons. Fluoropolymers meeting the rule’s definition of PFAS must be reported.

No duty to test or conduct exhaustive surveys but... May require additional inquiries to “fill in the gaps”

¹ TSCA Classifications: Manufacturers, Importers and Processors



PFAS/PFOS/PFOA 2024

Current Regulatory Activity



EPA PFAS Definition vs EU/ECHA

EPA: PART 705—REPORTING AND RECORDKEEPING REQUIREMENTS FOR CERTAIN PER- AND POLYFLUOROALKYL SUBSTANCES

705.3 Definitions

Per- and polyfluoroalkyl substances or PFAS means, for the purpose of this part, any chemical substance or mixture containing a chemical substance that structurally 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.

FYI: R group: An abbreviation for any group in which a carbon or hydrogen atom is attached to the rest of the molecule. Sometimes used more loosely, to include other elements such as halogens, oxygen, or nitrogen.

EU/ECHA Definition:

Per- and polyfluoroalkyl substances (PFASs) defined as: Any substance that contains at least one fully fluorinated methyl (CF_3 -) or methylene ($-CF_2-$) carbon atom (without any $H/Cl/Br/I$ attached to it).

A substance that only contains the following structural elements is excluded from the scope of the proposed restriction:

CF_3-X or $X-CF_2-X'$,

where $X = -OR$ or $-NRR'$ and $X' = \text{methyl } (-CH_3)$, methylene ($-CH_2-$), an aromatic group, a carbonyl group ($-C(O)-$), $-OR''$, $-SR''$ or $-NR''R'''$,

and where $R/R'/R''/R'''$ is a hydrogen ($-H$), methyl ($-CH_3$), methylene ($-CH_2-$), an aromatic group or a carbonyl group ($-C(O)-$).

EPA definition is broader than the EU definition. EPA appears to be covering substances w carbons with a single fluorine (CF) or more (CF₂ and CF₃) where the EU/ECHA definition covers only substances w carbons with 2 fluorines (CF₂) or three fluorines (CF₃).



PFAS/PFOS/PFOA 2024



Current Regulatory Activity

EPA PFAS REPORTING RULE UNDER TSCA 8(a)(7)

Issues and Challenges?

Very high compliance costs

Understanding the level of effort that is required to determine if manufacturer/importer is subject to the rule

Implications for compliance with state level PFAS restrictions and reporting

Implications for compliance with international PFAS restrictions



PFAS/PFOS/PFOA 2024



Other Federal Regulations

(<https://www.epa.gov/pfas/key-epa-actions-address-pfas>)

- **RCRA** — Resource Conservation and Recovery Act
- **CWA** — Clean Water Act
- **SDWA** — Safe Drinking Water Act
- **CERCLA** — Comprehensive Environmental Response, Compensation, and Liability Act



PFAS/PFOS/PFOA 2024

Other Federal Regulations



(<https://www.fda.gov/food/environmental-contaminants-food/and-polyfluoroalkyl-substances-pfas>)

“...The FDA has authorized certain PFAS for use in specific food contact applications. Some PFAS are used in cookware, food packaging, and in food processing for their non-stick and grease, oil, and water-resistant properties. To ensure food contact substances are safe for their intended use, the FDA conducts a rigorous review of scientific data prior to their authorization for market entry. The FDA’s authorization of a food contact substance requires that available data and information demonstrate that there is a reasonable certainty of no harm under the intended conditions of use....”



PFAS/PFOS/PFOA 2024

State Regulations



Coalition of Northeastern Governors (CONEG): The 2021 update to the CONEG legislation added perfluoroalkyl and polyfluoroalkyl substances (PFAS) to its list of prohibited chemicals in packaging. This prohibition applies to the “intentional introduction” of this substance into packaging and packaging components.

California Proposition 65: In 2017 PFOA was listed under “developmental” toxicity in Prop 65 list. In March 2021 the California Environmental Protection Agency’s Office of Environmental Health Hazard Assessment (OEHHA) published a notice of its intent to list *perfluorooctanoic acid (PFOA)* (CAS RN 335-67-1) as known to the state to cause cancer under the Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65[1])



PFAS/PFOS/PFOA 2024



State Activities (<https://www.saferstates.org/bill-tracker/>)

Topic	Bill	Author	Description	Status	Location
PFAS	CO SB 81	Cutter (D)	Bans additional products under the state's PFAS Chemicals Consumer Protection Act.(C.R.S. 25-15-604). Repeals an exemption from the firefighting foam ban that applies to gasoline distribution facilities, refineries, and chemical plants.	Pending	Senate Committee on Business, Labor & Technology. .
1,4 Dioxane, PFAS	FL HB 1153	Cross (D)	Requires report on PFAS, 1,4 Dioxane in certain wastewater sewage disposal facilities, among other things	Pending	House Water Quality subcommittee and 2 other committees
1,4 Dioxane	FL HB 1533	Plakon (R)	Require DEP to establish MCLs for 1,4 Dioxane, groundwater testing	Pending	House Water Quality subcommittee and 2 other committees
Auxiliary Containers	FL HB 1641	Yeager (R)	Prohibits local regulation of auxiliary containers; preempts such regulation to state.	Pending	House Committee on Agriculture Conservation and Resiliency subcommittee
Auxiliary Containers	FL HB 1641	Yeager (R)	Prohibits local regulation of auxiliary containers; preempts such regulation to state.	Pending	House Committee on Agriculture Conservation and Resiliency subcommittee
1,4 Dioxane, PFAS	FL HB 1665	Gossett-Seidman (R)	Require DEP to establish discharge limits for PFOA, PFOS, 1,4 Dioxane; inventory of industrial users	Pending	House Agriculture & Natural Resources Appropriations Subcommittee
Recycling	FL HB 455	Casello (D)	requires DEP to develop a comprehensive waste reduction and recycling plan	Pending	House Agriculture & Natural Resources Appropriations Subcommittee
Single-Use Plastics	FL SB 1126	Martin (R)	Establishes that only the state can regulate auxiliary containers.	Pending	Senate Community Affairs Committee
Auxiliary Containers	FL SB 1126	Martin (R)	Preempts the regulation of auxiliary containers to the state.	Pending	Senate Community Affairs Committee
1,4 Dioxane, PFAS	FL SB 1304	Berman (D)	Requires report on PFAS, 1,4 Dioxane in certain wastewater sewage disposal facilities, among other things	Pending	Senate Environment and Natural Resources Committee
1,4 Dioxane	FL SB 1546	Stewart (D)	Require DEP to establish MCLs for 1,4 Dioxane, groundwater testing	Pending	Passed Senate Environment and Natural Resources Committee



PFAS/PFOS/PFOA 2024

Strategy & Tactics
(subtext: strength in numbers)



Overall Strategies

- Identity safe levels
- Identity specific consensus test methods
- Identity specific compounds to be regulated
- Identity essential uses



PFAS/PFOS/PFOA 2024



Tactics: (Example) Industry Coordinated Response to State Legislation

Importantly, **all PFAS are NOT the same**. Individual PFAS chemistries have their own unique properties, as well as environmental and health profiles. A one-size-fits-all approach to chemical regulation is neither scientifically accurate nor appropriate. Other states have passed more thoughtful PFAS bills that acknowledge the diversity of these chemistries, allowing the states to target the PFAS of concern while avoiding the sweeping consequences of SB 81.

Unfortunately, SB 81 would **ban thousands of products that families and businesses rely** on without providing a meaningful impact on public health. A bill this broad is extreme, and would affect all products containing any kind of PFAS sold in Colorado. PFAS chemistries are critical to many applications, such as solar panels, lithium-ion batteries, life-saving medical devices, and semiconductors. Their use supports Colorado sustainability and supply chain priorities, and alternatives to these chemistries are not always available



PFAS/PFOS/PFOA 2024



Tactics: (Example) Industry Coordinated Response to State Legislation

Coloradans want to see common-sense, practical approaches to our state's challenges. SB 81 is an **extreme bill** that is out-of-step with important work happening at the federal level. It also undercuts the compromises that were reached in 2022 PFAS legislation (HB22-1345) and creates broad-sweeping bans before CDPHE has even finished its work on the previous bill.

PFAS are a diverse universe of chemistries that are essential to modern life. These chemistries can provide products with strength, durability, stability, and resilience. These properties can be critical to the reliable and safe function of a wide range of products that are important for businesses and consumers.



PFAS/PFOS/PFOA 2024

U.S. Chamber of Commerce Priorities and Economic Impact Analysis



Top Priorities

- Not all PFAS are created equally and should be regulated according to the best science and risk.
- Many sectors rely on PFAS due to unique properties, such as durability and heat, water, and oil resistance.
- Products critical to modern society – including aircraft, automobiles, cell phones, semiconductors, and medical equipment – cannot be produced without these chemistries as there are no feasible or economic PFAS replacements. Replacing the performance of PFAS in specific products is complex and will likely increase costs for companies and households.
- The PFAS restriction, therefore, would have significant negative impacts on the operations, business models, and supply chain dynamics in those sectors and others.

Prioritize



Essential Use



Economic Impact

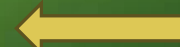


Economic Activity At Risk

Table 1 summarizes the total economic and fiscal impacts of goods exported from the U.S. to the EU that contained PFAS in 2022. This activity supported 502,000 jobs domestically, \$168 billion in sales output, \$81 billion in U.S. gross domestic product, and \$46 billion in labor income. The activity generated \$12 billion in federal tax revenues and \$7 billion in state and local tax revenues.

Table 1 – Total economic and fiscal impacts of goods exported from the U.S. to the European Union that contain PFAS in 2022

Metric	Total Impacts	Unit
Employment	502,000	Jobs (units)
Output	\$168	2022 USD (billions)
GDP	\$81	2022 USD (billions)
Labor Income	\$46	2022 USD (billions)
Federal Tax Revenues	\$12	2022 USD (billions)
State and Local Tax Revenues	\$7	2022 USD (billions)



U.S. Chamber of Commerce



PFAS/PFOS/PFOA 2024

American Chemistry Council – Recommendations/EPA Roadmap



THE FOUR PILLARS OF A COMPREHENSIVE APPROACH INCLUDE:



Prioritize: Assess, categorize and prioritize PFAS substances based on science and risk

Manage: Manage priority PFAS in an expedited manner through regulation and stewardship

Remediate: Advance remediation of priority media and sites

Track: Assess effectiveness of overall PFAS efforts and determine need for any future action

Progress

To date, ACC has worked with regulators and lawmakers at the federal and state levels on a host of initiatives to address key issues of concern while continuing to allow for the important uses and benefits of PFAS technologies. In October 2021, the Environmental Protection Agency (EPA) identified several activities as part of its PFAS Strategic Roadmap, many of which ACC and its members support.

Flip Over →

EPA's PFAS Strategic Roadmap, 2021-24:

The EPA is addressing PFAS concerns with a comprehensive approach through its PFAS Strategic Roadmap. Many concrete steps are already underway, including:

In Drinking Water

- EPA is developing maximum contaminant levels (MCLs) in drinking water for PFOA and PFOS and has committed to finalizing these levels in early 2024.
- EPA is collecting national drinking water occurrence data for 29 PFAS for which validated text methods exist as part of the Agency's Unregulated Contaminant Monitoring Rule (UCMR 5).
- EPA is developing methods for detecting a broader range of PFAS in environmental media beyond drinking water.

In Commerce

- EPA has identified about 600 PFAS chemistries currently in commerce.
- EPA issued expanded significant new use restrictions (SNURs) that will prevent the reintroduction of PFAS no longer manufactured or imported into the United States without initial thorough review by the Agency.
- EPA has finalized a requirement for manufacturers and importers of PFAS to report the quantities of materials produced or imported since 2011.

For Toxicity Testing

- EPA has developed a National PFAS Testing Strategy that divides this large class of substances into subgroups to assist in the prioritization for testing and evaluation.
- EPA has developed toxicity values for several priority PFAS and is currently conducting assessments of additional substances.

For the Environment

- EPA has made interim recommendations for acceptable levels of the two most commonly detected PFAS, PFOA and PFOS, in groundwater.
- EPA has used its emergency authority under various laws to eliminate exposure to PFAS and expedite cleanup of contamination.
- EPA has added more than 180 PFAS to its Toxic Release Inventory, which requires that release of these substances to air and water from industrial sources be reported annually.
- EPA has initiated efforts to categorize and prioritize industrial sources of PFAS to limit the release of PFAS to US surface and ground water.
- EPA has proposed to designate PFOA and PFOS as hazardous substances under the Comprehensive Emergency Response, Compensation, and Liability Act (CERCLA, or Superfund) to better monitor releases of these two substances and to assist in the identification of parties responsible for contamination.





PFAS/PFOS/PFOA 2024



Final Thoughts

Unavoidable usage

Non-intentional Usage – Useful??? It depends...

American Chemistry Council

(<https://www.americanchemistry.com/chemistry-in-america/chemistries/fluorotechnology-per-and-polyfluoroalkyl-substances-pfas>) participation

Chamber Of Commerce participation



PFAS/PFOS/PFOA 2024



Questions?

George Fuchs
NAPIM
gfuchs@napim.org