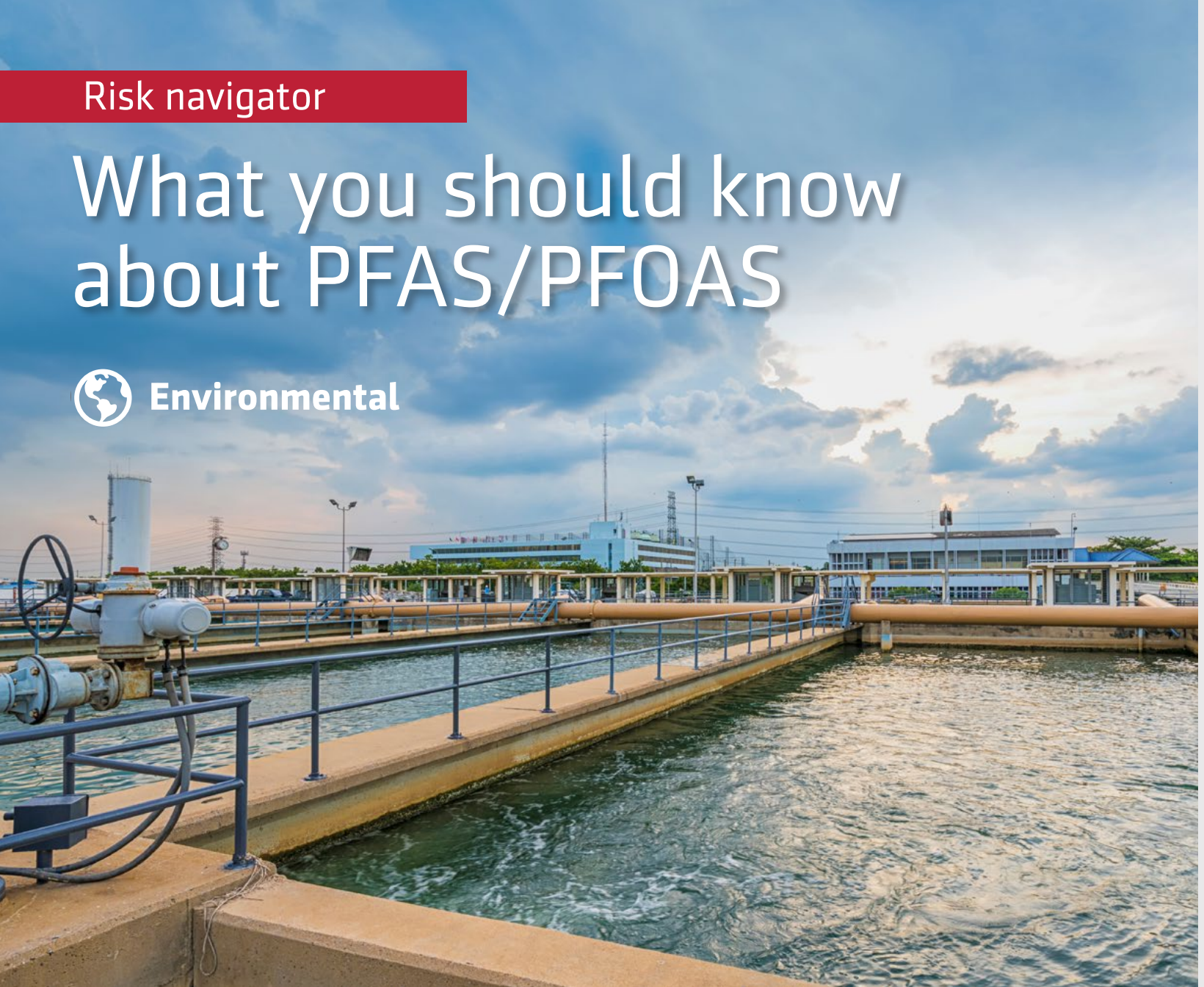
Risk navigator

What you should know about PFAS/PFOAS

Environmental



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About Markel's Risk Solution Services team

Risk Solution Services provides technical insight related to existing and potential insured risk at Markel. The team partners with our customers, claims, and underwriters to educate on both current and future risk trends and supports our clients with a comprehensive offering of risk management solutions.

We do this by engaging with clients, underwriting, and claims teams.

E-mail our team at risksolutions@markel.com.

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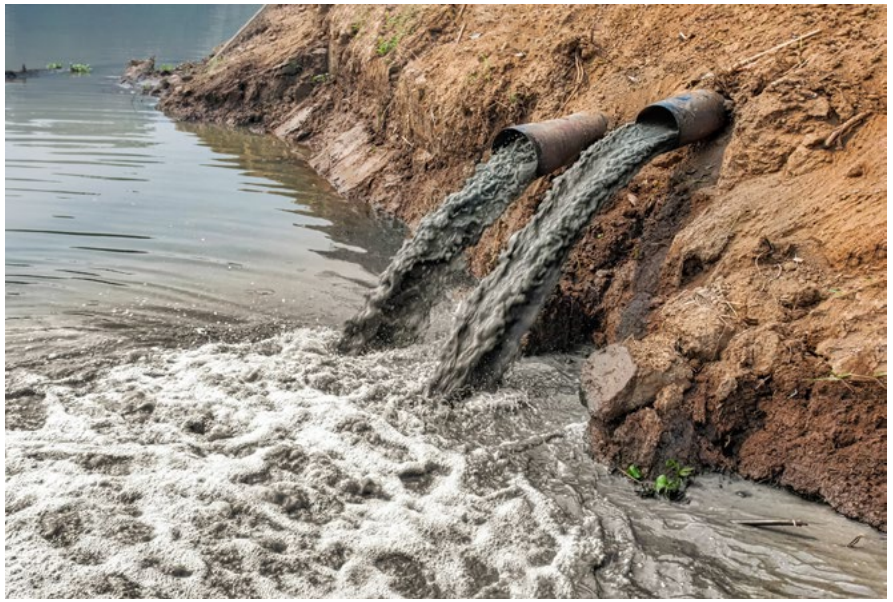
What are PFAS?

PFAS (per- and polyfluoroalkyl substances) also commonly referred to as perfluorinated chemicals (PFCs) includes a large universe of substances with different properties, including gases, liquids, surfactants, and solid material high-molecular weight polymers. Non-polymer perfluoroalkyl (PFAS) substances are the primary focus of this guide though other related chemicals are mentioned for clarity as concerns have been raised about them due to them being found in drinking water systems, their mobility, their persistence in the environment; and the fact that they have toxic properties.

Primary concern is with “long-chain PFASs” and their subcategories perfluoroalkyl carboxylic acids (PFCAs) and perfluoroalkane sulbonates (PFSAs), including both perfluorohesane sulfonic acid (PFHxS) and perfluorooctane sulfonic acid (PFOS).



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Recent regulation

The Toxic Substances Control Act (TSCA) regulates PFAS and the US EPA has issued Significant New Use Rules (SNURs) for over 250 chemically-related PFAS and PFOS. These SNURs place significant restrictions on the use and import of PFAS; however, there are exceptions by use, by import, and there is no total ban.

As of January 1, 2020, through the National Defense Authorization Act (NDAA), the Toxic Release Inventory under Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) has added an additional 160 per and polyfluoroalkyl substances to their list of chemicals. Reporting is now required for these substances, due July 1, 2021, for the 2020 reporting year, using a reporting threshold of 100 pounds for each listed PFA/PFOA. List of PFAS Added to TRI by NDAA.

In the US, regulatory interest in PFAS started in the early 2000s principally with 3M products, additives, and chemicals. To date, interest has mainly focused on PFAS subcategories PFOA (perfluorooctanoic acid, aka C8), PFOS (mentioned above), and similar related compounds. Per- and polyfluoroalkyl substances (PFAS) refer overall to a large group of man-made organic chemicals that include fluorine. Both Perfluorinated chemicals and Polyfluorinated chemicals are subsets.

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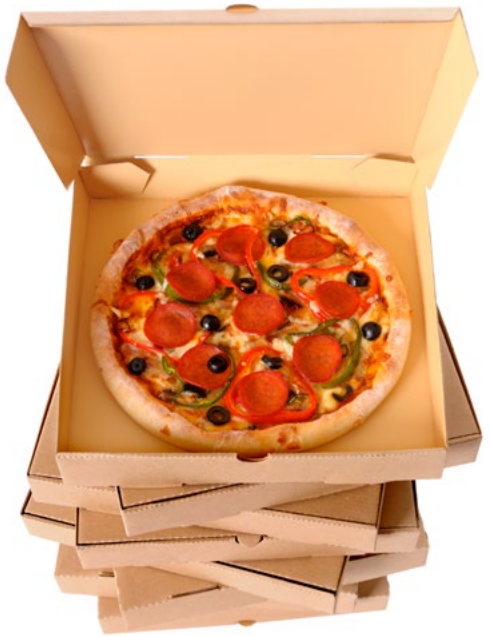
Manufacturing concerns

Major US PFOA manufacturers eliminated or reduced the manufacture of PFOA and many precursors by 2015, and in 2016, the US Environmental Protection Agency developed a drinking water Lifetime Health Advisory of 70 nanograms per liter (or parts per trillion) of PFOA, PFOS, or both. Since 2016, numerous states have also developed drinking water guidelines for PFAA. However, these range in basis of toxicity, as well as concentration. 3M also was included in a voluntary phase out of PFOS that took place between 2000 and 2002.

Historically, the Food and Drug Administration (FDA) had authorized the use of long-chain PFAS for specific food-contact uses such as coatings on fast-food wrappers, to-go boxes, and pizza boxes. In 2010, the FDA identified safety concerns and worked with industry to phase out the use of these compounds. In January 2016, the FDA amended their food additive regulations to no longer allow the use of a limited number of specific PFAS compounds as indirect food additives in paper and paperboard components.

A number of chemicals are relevant to the PFAS discussion including:

- 335-67-1 Perfluorooctanoic acid (PFOA),
- 1763-23-1, Perfluorooctane sulfonate (PFOS)
- 375-85-9, Perfluoroheptanoic acid (PFHpA)
- 108427-53-8, Perfluorohexane sulfonate (PFHxS)
- 375-95-1, Perfluorononanoic acid (PFNA)



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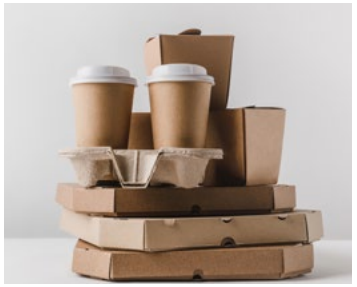
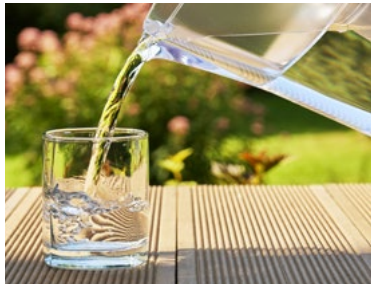
Where PFAS are found

PFAS can be found in:

- **Food** packaged in PFAS-containing materials, processed with equipment that used PFAS, or grown in PFAS-contaminated soil or water.
- **Commercial household products**, including stain- and water-repellent fabrics, nonstick products (e.g., Teflon), polishes, waxes, paints, cleaning products, and fire-fighting foams (a major source of groundwater contamination at airports and military bases where firefighting training occurs).
- **Workplace**, including production facilities or industries (e.g., chrome plating, electronics manufacturing, or oil recovery) that use PFAS.
- **Drinking water**, typically localized and associated with a specific facility (e.g., manufacturer, landfill, wastewater treatment plant, firefighter training facility).
- **Living organisms**, including fish, animals and humans, where PFAS have the ability to build up and persist over time.



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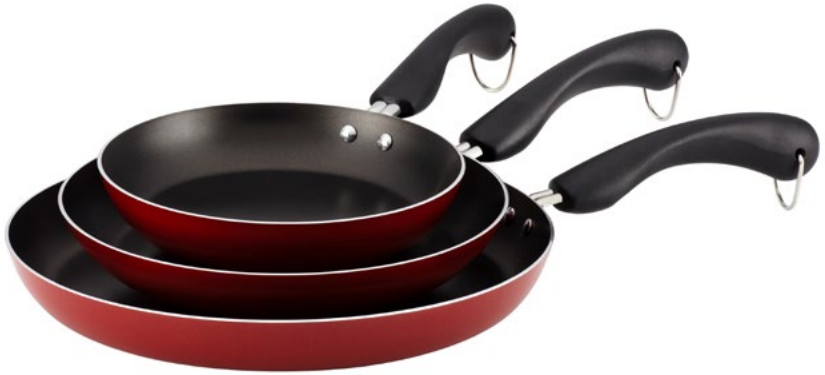
Non-polymer PFAS

Non-polymer PFAS of concern have oil-repelling, water-repelling, and surfactant qualities, and have been used in numerous products. PFAS were manufactured in the US since the 1940s and since that time have been used in coatings for textiles, paper products, and cookware to formulate aqueous film forming foams (AFFF) used in fighting hydrocarbon fires, and in cutting-oil mist suppression. In addition, applications have been noted in the photographic imaging, semiconductor, electronics, automotive, construction, aviation, and aerospace industries.

The subset of non-polymer PFAS compounds, the perfluoroalkyl acids (PFAAs, including carboxylic acids and sulfonic acids), have recently been the focus of further scientific and regulatory scrutiny. A number of the PFAAs are also mobile, persistent, and bioaccumulative, and cannot readily degrade in the environment. PFAS chemicals have been found to be present in environmental media, food, human blood and tissue, and breast milk. People are exposed to PFAS compounds primarily through the ingestion of food, contact with household dust (especially infants and toddlers), and consumer products, occupationally, or through drinking water, ingesting soil, or breathing air. Due to its widespread presence and potential for toxicity, there has been recent public concern and regulatory action.

Numerous non-cancer effects have been noted for specific PFAAs, including effects related to fetal development, reproduction, the thyroid, liver, nervous, and immune systems. Testicular and liver cancers have also been noted with respect to a subset of PFAAs. Generally, longer-chain PFAAs are considered more toxic than shorter-chain compounds.



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PFOA Stewardship Program

In 2006, EPA invited eight major leading companies in the per- and polyfluoroalkyl substances (PFASs) industry to join in a global stewardship program with two goals:

- To commit to achieve, no later than 2010, a 95 percent reduction, measured from a year 2000 baseline, in both facility emissions to all media of perfluorooctanoic acid (PFOA), precursor chemicals that can break down to PFOA, and related higher homologue chemicals, and product content levels of these chemicals.
- To commit to working toward the elimination of these chemicals from emissions and products by 2015.

All eight companies have met the PFOA Stewardship Program goals. Participating companies included:

- Arkema
- Asahi
- BASF Corporation (successor to Ciba)
- Clariant
- Daikin
- 3M/Dyneon
- DuPont
- Solvay Solexis

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Other regulatory programs

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) investigations have started to include PFAS when supported by historical site information or activities. PFAS are not currently regulated under many federal programs; however, states have been addressing PFAS contamination through numerous regulatory programs, including:

- Hazardous waste or hazardous substance designation: Numerous states, including New York and Vermont, regulate certain PFAS compounds as hazardous substances or hazardous waste.
- Environmental remediation programs: Numerous states have developed drinking water, groundwater, soil, and/or surface water guidelines or standards to be applied in state remediation programs.
- Adoption of USEPA's HLA values, while others have developed their own standards. (i.e., Texas has developed toxicity criteria for numerous PFAS under the Texas Risk Reduction Program (TRRP). These criteria are used to calculate risk-based values for a variety of media.)
- Addition to consumer products listings: PFOA and PFOS have been added to the list of chemicals known to the state of California to cause reproductive toxicity (developmental endpoint) for purposes of Proposition 65.

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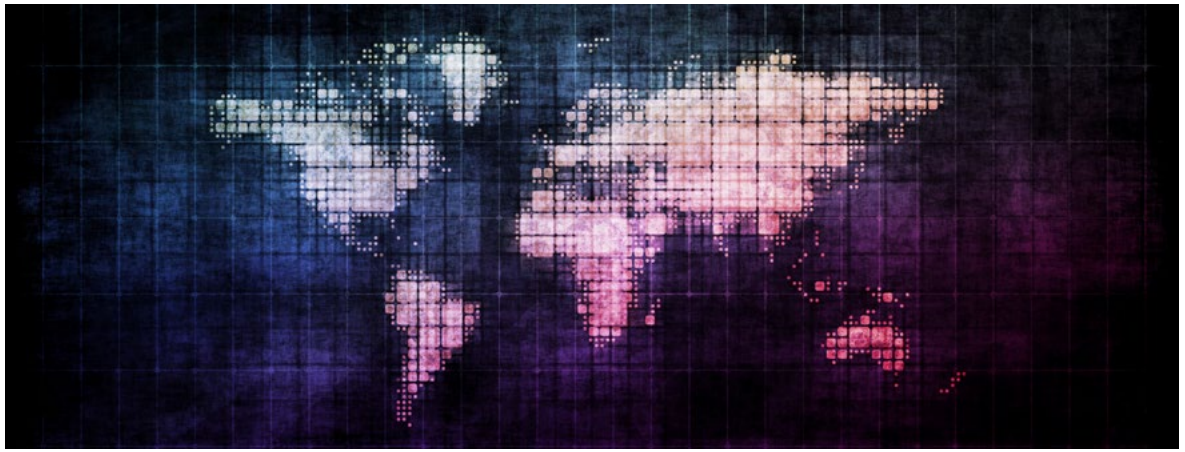
Use in the US

PFOA and PFOS are no longer produced in the US and have been phased out throughout much of the world; however, they are present in the environment worldwide, remain in historic consumer products and certain firefighting foams and are still imported in the US. A principal manufacturer is China. Related compounds, including shorter-chain compounds "believed" to be less toxic and less persistent, are still commonly used within the US.

While use of and exposure to toxic PFAAs have decreased in the US, the persistent chemicals remain in the environment. Potential sources of higher levels of PFAAs in the environment include fire training/response sites, industrial sites, landfills, wastewater treatment plants, and biosolids.

Current PFAA exposure in the general US population is primarily through ingestion of food and beverages. Fish, eggs, milk, vegetables, and other foods contain PFAS. PFAS may be introduced to plants from soil, water, or air, and the use of contaminated irrigation water or contaminated biosolids-amended soil may increase food concentrations. Seafood from throughout the world is impacted. The use of food-related consumer products such as grease-resistant paper or pizza boxes and nonstick cookware has also contributed to exposure via food.



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