



WHITE PAPER

PFAS Regulations and Strategies for Compliance

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Executive Summary

In the ever-evolving world of chemical regulation, per- and polyfluoroalkyl substances (PFAS) have emerged as a critical focus due to their widespread use and enduring impact on both ecosystems and human health. The broader definition of PFAS — which encompasses roughly 10,000 substances — highlights the scope of regulatory and management challenges facing industry leaders.

Their versatility has led to the use of PFAS in an array of products since their commercial introduction in the 1930s, with applications spanning from consumer goods such as textiles and kitchenware to industrial uses in electronics, air emission filters and medical devices. This widespread use poses distinct challenges and opportunities for supply chains.

Release of PFAS into the environment through means such as production processes, landfill leachate and the use of aqueous film-forming firefighting foams increases human and wildlife exposure, leading to a cascade of health implications. Their persistence in the environment, earning them the moniker “forever chemicals,” combined with their ability to migrate and contaminate distant locales, raises significant concerns along with their links to a range of health issues.

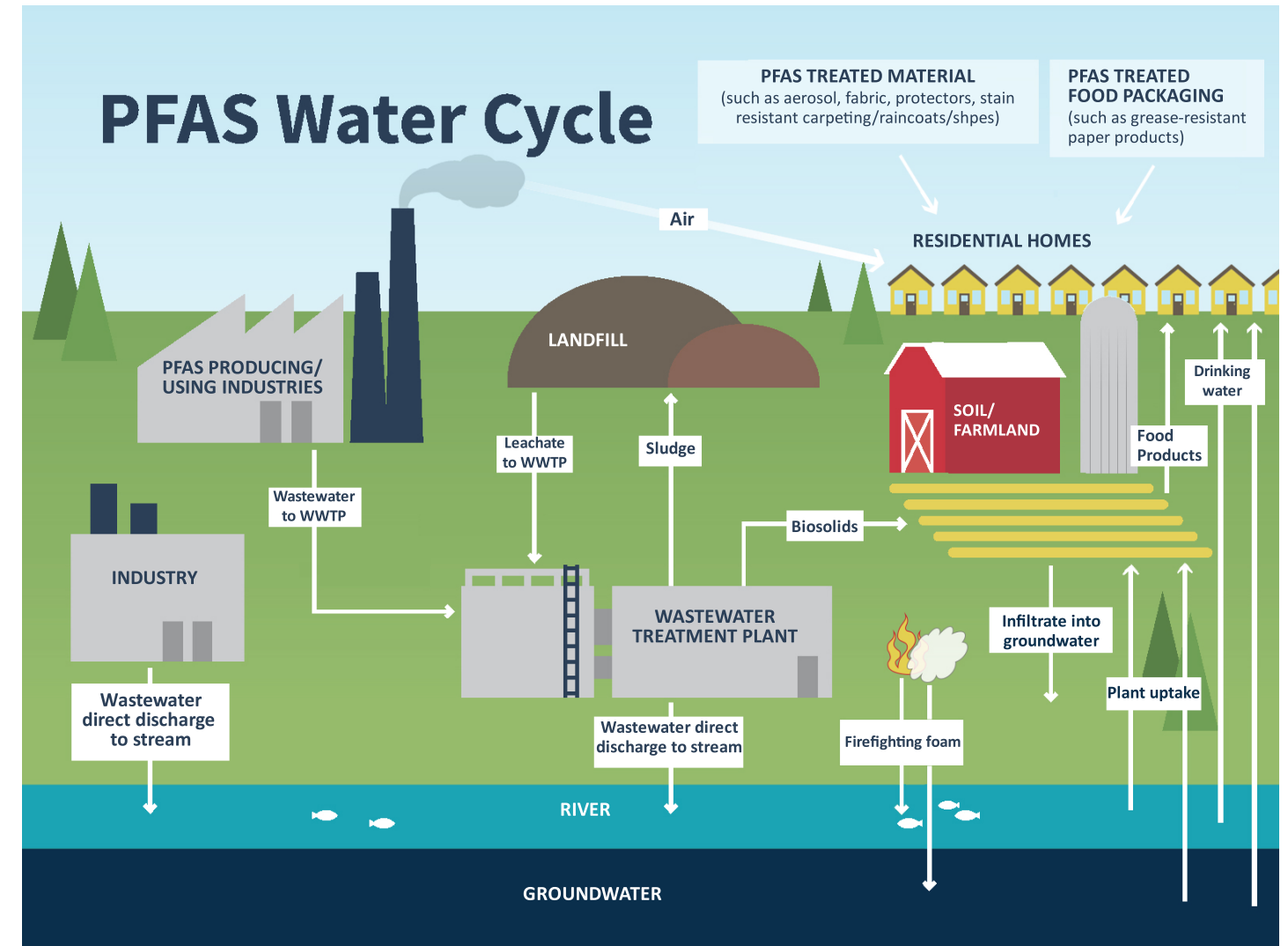
To mitigate the effects of PFAS on the environment and human health, many jurisdictions have adopted legislation addressing a range of applications. With definitions and standards varying across jurisdictions, staying compliant requires staying informed and proactive. Whether you’re in manufacturing, retail or any sector using PFAS, knowing the rules is the first step toward responsibility. Managing these requirements entails a multifaceted strategy consisting of:

- Comprehensive review and inventory of PFAS usage within products and processes, identifying critical areas for compliance focus.
- Proactive engagement in regulatory developments, understanding how evolving standards across jurisdictions impact operations and supply chain management.
- Investment in alternative materials research to identify and transition to PFAS-free solutions, minimizing regulatory risk and environmental impact.
- Transparent communication with stakeholders, including consumers, regulatory bodies and supply chain partners, to navigate PFAS challenges collaboratively.
- Rigorous environmental and health impact assessments to guide responsible decision-making and product stewardship.

Background on PFAS

PFAS are a class of synthetic organic chemicals. They are characterized by their carbon-fluorine bonds, though what exactly constitutes a PFAS from a regulatory perspective varies across jurisdictions. Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) are two of the most recognized and regulated PFAS. The Organization for Economic Co-operation and Development (OECD) has one of the most inclusive definitions for PFAS. It recognizes any substance containing at least one fully fluorinated methyl or methylene carbon atom as a PFAS and includes roughly 10,000 substances.

The carbon-fluorine bond is one of the strongest in nature, which makes the class valuable across a range of technical applications. However, their resistance to degradation also means they can negatively impact living things and persist in the environment. This persistence has earned the group the nickname “forever chemicals” because they don’t break down quickly once released into soil or other natural resources. Many PFAS are also characterized as mobile in the environment. This means after an initial release onto a contaminated site, the PFAS can move quite far and has the potential to contaminate other locations. Examples of how PFAS can contaminate the environment include production release, landfill leachate, use of aqueous film-forming firefighting foam (AFFF) and incineration of PFAS-containing materials. Environmental release of PFAS also increases human and wildlife exposure to PFAS through interaction with contaminated media (e.g., soil) or even drinking water. Contaminated water or soil can also increase plant uptake of certain PFAS that transfer to the edible portions of the plants.



Source: [U.S. Environmental Protection Agency](https://www.epa.gov/pfas)



PFAS also impact organisms. Some of the more well-studied PFAS have shown a potential for both bioaccumulation and biomagnification — their levels can build up not only in an individual, but also in other organisms closer to the top of a food chain, which often have the highest levels of PFAS. Research is not available for the full class of PFAS, but available evidence suggests certain PFAS are linked to the following effects, among others:¹

- Increases in cholesterol levels
- Decreases in birth weight
- Thyroid disease
- Certain cancers, such as kidney or testicular

The U.S. Environmental Protection Agency (EPA) says most Americans have some level of PFAS in their blood.¹ Environment and Climate Change Canada (ECCC) estimated in their Draft State of PFAS Report that nearly 100% of the Canadian population has detectable levels of PFAS based on blood monitoring samples and that samples taken from cord blood of pregnant women suggests that children may be exposed to PFAS in the womb.² Humans may be exposed to PFAS through various means, including eating or drinking, environmental exposure or through contact with PFAS-containing products. Research also suggests that certain populations such as firefighters and those working in the chemical industry may be disproportionately affected by PFAS pollution. Another study conducted by Harvard T.H. Chan School of Public Health discovered that due to proximity to watersheds where PFAS pollution is more prominent, “communities with higher proportions of Black and Hispanic/Latino residents are more likely to be exposed to harmful levels of PFAS.”³ Co-exposure to multiple PFAS, or higher levels of certain PFAS, is likely for many individuals given the presence of PFAS in a range of sources.

Wide use of PFAS across products

The oldest uses of PFAS date to the 1930s, with usage in consumer products and commercial or industrial applications greatly increasing through the 1950s to present day. For example, the commercialization of the fluoropolymer polytetrafluoroethylene (PTFE, known under brand names like Teflon™ and Polyflon®) occurred in 1946. PFAS have a range of applications courtesy of their chemical properties. These properties make them heat- and chemical-resistant, non-stick and good at greaseproofing or waterproofing. Known applications include⁴:

- Solvent- and water-based adhesives
- Building and construction applications (e.g., air emission filters, concrete and roofing)
- Creation of ceramics and nanostructures
- Cleaning products, including floor polishes, waxes, detergents and shampoos
- Coatings, waxes, paints, varnishes and inks
- Cosmetics and personal care
- Dry cleaning
- Electronics (e.g., lithium batteries, automotive, electrical wiring and circuit boards)
- Explosives, propellants and ammunition
- Firefighting foam
- Medical applications, including drugs, diagnostics and devices
- Metal plating and finishing
- Mining
- Oil and gas
- Packaging, paper and cardboard (e.g., liners, wrappers, popcorn bags, pet food bags and pizza boxes)
- Pesticides and fertilizers (both as inactive and active ingredients)
- Photography and lithography
- Plastics, resins and rubbers
- Recycling and recovery of materials
- Refrigeration
- Semiconductors
- Textiles
- Transportation (inclusive of coatings, component parts, textiles and fluids)



PFAS compounds are found in many common household items



An ever-evolving regulatory landscape

The environmental persistence and mobility of PFAS, in addition to the human health impacts associated with exposure, have stirred significant recent concern over this class of chemicals. Because of the various ways PFAS can be released or present exposure risk, a patchwork of legislation has emerged across different regions (and even agencies or levels of government within the same jurisdiction). Types of legislation can include restrictions on the disposal of PFAS-containing waste; labeling or disclosure requirements for products containing PFAS; prohibitions on the usage of PFAS in products; or financial and legal liability for parties who contaminate sites with PFAS through various actions. They may also vary in their scope of substances. Here are some key markets and regulations addressing the class.





North America

Regulatory movement addressing PFAS is very active in North America, with both the U.S. and Canada taking recent action beyond monitoring or limiting concentration of PFAS in drinking water.

At the U.S. federal level, the EPA has acted on PFAS in several broad ways, as the table below outlines:

Statute	Parties Affected	Summary of Requirements	Compliance Date/Next Steps
Final rule designating PFOA and PFOS as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or Superfund).	Current and former owner/operators of facilities where hazardous waste is released or disposed and transporters of hazardous waste.	This rule makes PFOA and PFOS contamination subject to the provisions of CERCLA, including reporting, investigation, remediation and monitoring.	Final rule is effective July 8, 2024.
PFAS Recordkeeping and Reporting Rule under section 8(a)(7) of Toxic Substances Control Act (TSCA).	Any entity that has manufactured or imported for commercial purposes any chemical substance, mixture or article containing PFAS in calendar years 2011 through 2022.	The rule established a one-time reporting requirement for any covered entities. PFAS falling within the scope of the requirement are not specifically listed. Rather, the rule applies to a category of PFAS meeting a definition based upon molecular structure. Unlike some other TSCA reporting rules, the PFAS reporting rule includes no de minimus concentrations or production volume thresholds below which reporting is not required. Furthermore, the final rule doesn't exempt polymers, impurities, research and development or small businesses.	The reporting period for all impacted parties opens on November 12, 2024.

North America continued

Statute	Parties Affected	Summary of Requirements	Compliance Date/Next Steps
Proposed rule to list certain PFAS as hazardous constituents under the Resource Conservation Recovery Act (RCRA).	Facilities that treat, store and dispose hazardous waste.	Seeks to list nine PFAS substances (including PFOA, PFOS, GenX, and PFHxS) as hazardous constituents under Appendix VIII, 40 C.F.R. Part 261. If passed in the same form, corrective action under Section 3004(u) of RCRA would be impacted. Facilities may be required to investigate the presence of covered substances if released into the environment and pursue corrective actions if present.	Comment period ended April 8, 2024.
Proposed rule amending the definition of hazardous waste applicable to corrective action under RCRA.	Facilities that treat, store and dispose hazardous waste.	Proposes to amend the definition of hazardous waste that is applied to corrective actions. The new definition is broader and would extend RCRA corrective actions to substances that meet the statutory definition of hazardous waste, even if they've not yet been designated as hazardous waste under the RCRA regulations.	Comment period ended March 11, 2024.
Final PFAS National Primary Drinking Water Regulation	Public water systems.	Monitoring is required for the six covered PFAS, alongside public information sharing. Where systems exceed the limits, solutions must be implemented to reduce levels. Starting 2029, systems that have levels above the limits must notify the public.	Before 2027, initial monitoring must be complete. Routine monitoring and public notifications begin 2027.

North America continued

In late 2023, the U.S. Consumer Product Safety Commission (CPSC) published a notice of availability and request for information regarding data specific to PFAS use in consumer products. In the request, CPSC notes that data on usage of PFAS in consumer products, exposure risks from products containing PFAS, and potential human health impacts are key topics of interest. In addition to the request for information, CPSC also contracted with an external partner (RTI International) to review PFAS present in consumer products and report. The report was made available as part of the Federal Register notice and contains relevant information on the uses or applications of PFAS in the sector, current known regulatory action or restrictions for either the group or specific substances, and a summary of recent risk assessments conducted.

The U.S. Food and Drug Administration (FDA) has also recently acknowledged PFAS. The Modernization of Cosmetics Regulatory Act (MoCRA) passed in 2022, heralding the most significant change to how cosmetics are regulated in the U.S. since 1938. The new law addresses many aspects of cosmetics safety and as part of its implementation, FDA is required to assess the use of PFAS in cosmetics and evidence relating to risks and safety of their use. The result of this review will be a public-facing report to be published on FDA's website before Dec. 29, 2025.

Some U.S. states have also stepped in to fill perceived regulatory gaps. Measures by state governments may also include drinking water limits but have largely focused on consumer products containing PFAS. More than half of U.S. states have enacted some type of legislation addressing PFAS, creating a patchwork of requirements even at the state level to which businesses must comply. (See article for more detail.⁵) Examples of state action include:

- Maine and Minnesota have both passed legislation broadly addressing PFAS in consumer products. These laws include phased-in prohibitions where classes of product are first addressed early on, and general prohibitions for consumer products containing avoidable uses of PFAS take effect later. They also include reporting requirements.
- Several state laws target products commonly formulated with PFAS, such as children's products, textiles and apparel, cosmetics, food packaging, cleaning products, menstrual products and dental floss.
- Washington State has addressed PFAS in a variety of ways in their Safer Products Program Cycles 1 and 1.5
- California has initiated many PFAS legislative actions. Among these are AB 1200 (targeting cookware and fiber-based food packaging) and the listing of three PFAS (PFOA, PFOS, PFNA) under Proposition 65.



North America continued

Outside of state-specific legislation, the Toxics in Packaging Clearinghouse (TPCH) legislation was modified to include PFAS in its scope in 2021. This is a model legislation which restricts intentionally introduced hazardous chemicals in packaging. Adoption and enforcement of the TPCH legislation is up to individual states through adoption of new laws or modification of existing ones. At the time of the new legislation's update, 19 U.S. states have adopted the TPCH model legislation.⁶

Using the TPCH model legislation as a springboard, the Northeast Waste Management Officials' Association (NEWMOA) and a group of state officials from the Northeastern U.S. worked together to draft model legislation addressing PFAS. The final version was approved in March 2024. The model legislation was drafted with the objective of reducing PFAS usage while also supporting safer alternatives. It was written to educate consumers, clarify regulatory requirements for those in scope and harmonize strategy for various methods such as phase-outs, prohibitions and notification/labeling requirements. Detail on regulatory approaches for products containing PFAS is provided in scope of interstate clearinghouses, notification, restriction of product, certificates of compliance, product labeling and producer responsibility.

Canada also has PFAS regulation under way. PFOS (and its salts), PFOA and long-chain perfluorocarboxylic acids (C9-21 PFCAs) are all listed under Schedule 1 of the Canadian Environmental Protection Act, 1999 (CEPA), which identifies them as toxic substances. Following that classification, the same substances are regulated under the Prohibition of Certain Toxic Substances Regulations, 2012. These regulations prohibit the manufacture, use, sale and import of these substances as well as products containing them (with

few exceptions). Changes were proposed in 2022 to the regulations that sought to remove many of the exemptions in the existing law. Similar to the U.S. states, Canadian provinces may adopt their own requirements as demonstrated by British Columbia and Alberta's frameworks addressing contaminated sites through the Contaminated Sites Regulation and the Tier 1 Soil and Remediation Guidelines, respectively.

In addition to existing regulation of PFAS, in 2021 the Canadian government announced its intent to address PFAS as a class. One action outlined in the announcement was release of a State of PFAS Report detailing relevant information on the class. The draft report was issued in May 2023. The findings outlined the impracticality of addressing PFAS at a substance level but highlighted the risks associated with more well-studied PFAS. The report recommended the addition of PFAS to Schedule 1 of CEPA. This action would classify the group as toxic and enable additional regulatory measures. These measures can include new regulations, information gathering and adopting actions that align with other jurisdictions. In July 2024, an updated report was released. The updated report proposes to conclude that the class of PFAS, excluding fluoropolymers, meet the criteria for addition to CEPA.



Europe and the U.K.

Certain PFAS are currently the subject of both Regulation (EU) No 850/2004 and its amendments (also known as the Persistent Organic Pollutants or POPs Regulation) and the REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) Regulation. The EU POPs regulation is the means through which the provisions of the Stockholm Convention are implemented and restricts or prohibits the placing on market or use of substances identified as POPs. PFOS, PFOA and their salts and related substances are regulated under the POPs regulation. PFHxS was added in May 2023 and became effective three months later. Additional PFAS under consideration in the Stockholm Convention include C9-21 PFCAs. Separately, substances and applications proposed and/or considered for restrictions under REACH include C9-14 PFCAs, undecafluorohexanoic acid (PFHxA) and the use of PFAS in firefighting foams. There are also three groups of PFAS on the REACH Candidate List of substances of very high concern (SVHCs). Additionally, five substances or groups have been assigned harmonized classification and labeling under the Classification, Labelling and Packaging (CLP) Regulation. The EU also regulates PFAS in drinking water under the new recast Drinking Water Directive, which took effect in early 2021 and establishes a limit of 0.5 µg/l for all PFAS.

After much movement, agreement was reached between the European Parliament and Council on an updated Packaging and Packaging Waste Regulation (PPWR). The updates include a ban on the use of PFAS in food packaging. For the agreement to go into force, both Parliament and Council must formally approve the agreement. The European Food Safety Authority (EFSA) has also completed work relating to PFAS in food. Since 2022, EFSA has recommended monitoring PFAS concentration in human food in addition to establishment of baseline levels for several categories.

More regulation is on the horizon in the EU. In early 2023, the European Chemicals Agency (ECHA) published a proposal to restrict PFAS as a class under REACH. The proposal was prepared by authorities from Germany, the Netherlands, Denmark, Sweden and Norway. The class as defined in the proposal contains over 10,000 different PFAS and would impose a broad ban on manufacturing, placing on the market (including importation) and use in whole or as part of other substances, mixtures or in product. The proposal included planned, time-limited derogations for certain sectors, but derogations were not included for most consumer products in the initial proposal. The consultation on the proposal ended in August 2023, with it having the most comment activity ever seen at nearly 6,000 comments.

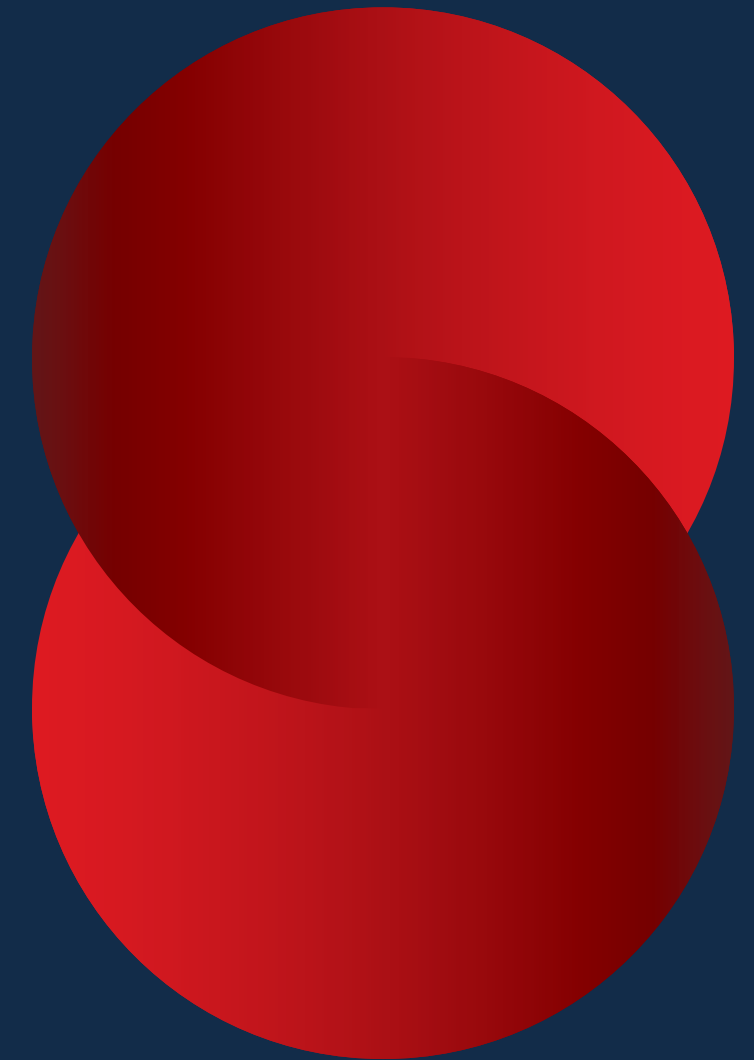
Europe and the U.K. continued

ECHA published information in March 2024 outlining the next steps for the proposal. These include evaluation of both comments and the proposal by the committees for Risk Assessment (RAC) and Socio-Economic Analysis (SEAC). The initial preparing member states are also updating their report to address comments received. Updates include identification of uses not originally evaluated, examination of how other recent EU regulatory changes would impact final form, assessment of data supporting alternatives and consideration of other restriction paths outside of bans. Meetings of the two scientific committees began in March 2024, occurring again in June and September 2024 for further discussion on certain sectors or elements such as hazards of PFAS. On the current timeline, any future restriction would likely not take effect until 2026 or 2027.

Post-Brexit, the U.K. (POPs and REACH) continues to regulate PFOA and PFOS in the same manner as before under the EU POPs regulation, with violations now enforced under the U.K. equivalent (Persistent Organic Pollutants Regulations 2007). This retention prohibits the sale, manufacture or use of the substances. The identification of PFHxS as a POP took place after Great Britain's exit from the EU; this substance and its related compounds were added to the U.K. POPs Regulation, which entered into force November 2023. Several dozen PFAS are regulated under U.K. REACH, which is managed by the

Health and Safety Executive (HSE). In March 2023, HSE also released a report summarizing regulatory management options for PFAS in the U.K., but further action has not yet been taken.

As is common with other regulatory matters, EU member states have also adopted their own measures relating to PFAS. As early as 2020, Denmark banned food contacting paper and board containing PFAS. In April 2022, the Netherlands issued an update revising the Commodities Act on Packaging and Consumer Articles that Come into Contact with Food (Commodities Act, Warenwet). These updates included several changes to Part A of the Annex as well as some technical amendments. Amendments to Chapter II addressing paper and cardboard included the removal of four PFAS under the positive list. Germany adopted environmental measures in 2023 under the Mantelverordnung (General Ordinance), which establishes binding test values for a group of PFAS, including PFOA, PFBA and PFOS. These values are captured in the Federal Soil Protection Ordinance (BBodSchV), and under the new measures, potentially responsible parties suspected of soil contamination may be subject to an assessment and authority-ordered remediation. Potentially responsible parties can include the contaminator, the owner of a contaminated site and the party in control of the contaminated site.



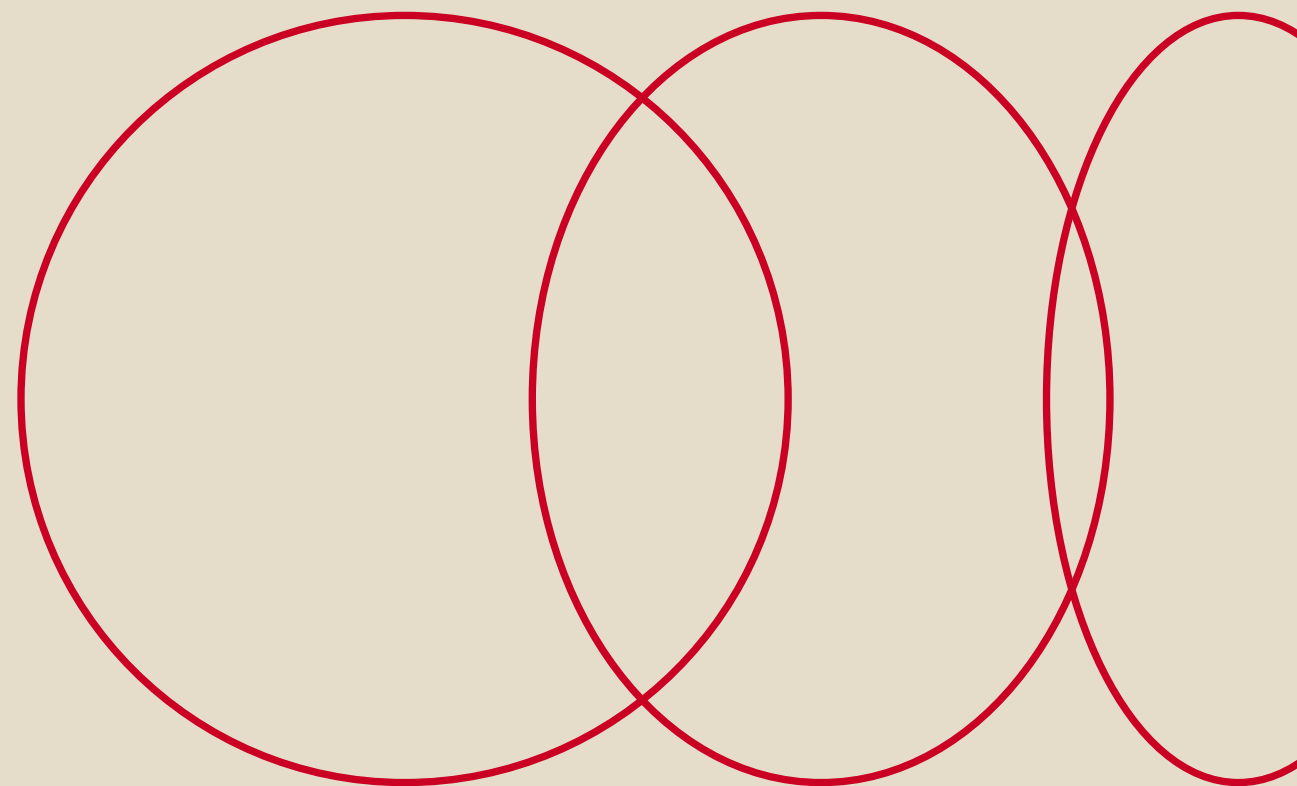


Australia and New Zealand

In 2023, Australia's Department of Climate Change, Energy, the Environment and Water opened a consultation on proposed changes to the Industrial Chemicals Environmental Management Standard (IChEMS). IChEMS is one of the means through which the government manages the use, disposal or import of chemicals. This new framework was created through work by various levels of the Australian government and released in early 2022. At a high level, these standards set requirements for businesses that use industrial chemicals, which are grouped on schedules based on their relative environmental impact. The consultation sought public comment on the scheduling of a handful of chemicals, but notably included PFOA, PFOS and PFHxS as well as their salts and precursor chemicals. They were proposed to be listed on Schedule 7 of the IChEMS Register due to their likelihood of negatively impacting the environment and their reputations as POPs. The tentative date of effect is July 1, 2025, to allow affected parties time to prepare, as chemicals on Schedule 7 are restricted from import, export, manufacture or use under most circumstances in Australia.

Similarly, New Zealand regulates PFOA and PFOS under the Hazardous Substances and New Organisms Act 1996 (HSNO). This act was updated in 2020 to reflect changes to the Stockholm Convention and add PFOA, its salts and related compounds as POPs. The 2020 update included a five-year exemption for specific firefighting foams and photographic coatings applied to films and another condition for articles. PFOS has been regulated under the same act since 2011, when its use was banned in all other products following an earlier provision addressing firefighting foams in 2006. Prohibition of the production and use of PFHxS, its salts and related compounds is prohibited under the HSNO effective October 2023.

In January 2024, New Zealand also became the first country to ban PFAS in cosmetics, which takes effect Dec. 31, 2026. The announcement came through the New Zealand Environmental Protection Authority (EPA), which confirmed that the update would be reflected in the Cosmetics Products Group Standard.





Africa

Most regions of Africa have not yet adopted PFAS legislation, outside of where participants in the Stockholm Convention have implemented measures to fulfil those obligations. South Africa, for example, passed regulations prohibiting the production, distribution, import, export, sale or use of PFOA and its related compounds in May 2021.



Central and South America

In May 2023, a draft PFAS control policy was introduced in Brazil's Chamber of Deputies. The draft sought to address PFAS on several fronts — namely, environmental emissions; PFAS content in water, soil and food; use, production and disposal of PFAS; and products in which PFAS are used. The draft did not establish a formal definition for PFAS in scope but would require businesses using PFAS to report annually and adopt measures to reduce their use toward elimination. The proposal arrived at the appropriate Chamber committee in April 2023 but has not progressed.

Most PFAS remain largely unregulated by other countries of South and Central America as well as within economic and political blocs such as the Southern Common Market (Mercosur).



Asia

PFAS activity is progressing slowly, with Japan and China the furthest along. China has addressed PFOS and its salts through addition to the List of Chemicals Strictly Restricted in China (中国严格限制的有毒化学品名录) as previously announced under the New Pollutants Governance Action Plan. This update prohibited the manufacturing of covered substances as of March 2023; use of the substances in firefighting foam effective Dec. 31, 2023; and the import/export of them starting Jan. 1, 2024. The PFOA and PFHxS groups of compounds are also similarly addressed in the list, with a prohibition on production, processing and use of them in addition to other control measures.

In early 2024, Japan launched a consultation on a proposal to list the PFOA group of compounds as Class 1 Specified Chemical Substances under the nation's Chemical Substances Control Law (CSCL). This proposal would also prohibit the manufacture and import of the substances, in addition to the import of designated products containing the substances and use outside of approved essential uses. The responsible ministries announced anticipated timelines in April 2024, with August and December 2024 listed depending on the substance. PFOS and its related substances are already listed on Class 1 under the law. PFHxS and its related substances are also listed on Class 1, and as of February 2024, the use, manufacture and import of them is prohibited. Starting June 2024, the import of a group of products containing the substances is prohibited. Products covered under this provision include fire extinguishers, fiber protection agents for water or oil repellency, resists for semiconductors and several consumer products treated for water or oil repellency.

Though regulation in other countries is moving at a languid pace, consumer protection groups and watchdogs have called for action. For example, last year the Philippines-based EcoWaste Coalition called on the Philippines Environmental Management Bureau to implement a ban on PFAS.



PFAS liability and litigation

Legal activity related to PFAS as a substance or in products continues to increase, even outside of enforcement under many of the regulations previously covered. Companies that have action brought against them may face not only legal ramifications like remediation responsibility or fines and legal fees, but also a negative impact to brand reputation or consumer confidence. Lawsuits have been filed by private citizens, state officials and municipalities.⁷⁻¹²

Companies that sell or distribute products branded as green, clean, nontoxic, natural and the like should be aware of PFAS-related litigation. In these instances, parties may identify PFAS chemicals in a product and as such, allege that the products are falsely or misleadingly advertised. Product categories often impacted include food and beverages, dental care products like floss and toothpaste, cosmetics and personal care products as well as textiles, including apparel. Litigation in these sectors often brings into question the safety or sustainability of the product due to the properties or toxicological characteristics of PFAS. Some products may bear PFAS-free claims but contain detectable quantities of PFAS when tested. For product claims, it's important to substantiate claims based on the product's composition.

Environmental lawsuits are also on the rise.¹³⁻¹⁶ These can be filed by states addressing damage to wildlife or waterways, or may be filed in cases where the desired outcome is remediation of PFAS release by industrial sites or manufacturing facilities into groundwater or rivers. Examples of recent action include lawsuits where multibillion-dollar settlement agreements were reached to help clean up contaminated drinking water. In 2023, a subsidiary of a global corporation that specializes in fire control systems filed bankruptcy, citing an increase in allegations that their aqueous film-forming foam products have contributed to water contamination around specific sites. Class action lawsuits for environmental contamination are also possible, evidenced by a judge allowing a class action lawsuit to move forward in North Carolina, where more than 100,000 private citizens and property owners alleged both private wells and municipal water systems were compromised through industrial activities at a local facility.

With the prevalence of PFAS in the environment, increased consumer awareness and regulatory trends, it's likely that litigative activity will continue.

Strategies for identification and management of PFAS

In addition to regulatory complexity, consumers demand more transparent, safer or more sustainable products.

Nongovernmental organizations also advocate for policies addressing hazardous chemicals like PFAS. Manufacturers and retailers may adopt their own restricted substance policies, which can further impact materials acceptable for use while also adding to the lists of chemicals that require management.

As suppliers cease production of PFAS, regulatory pressures grow and companies restrict PFAS usage in products, manufacturers may face supply-chain challenges. These may include shortages of key components, supply-driven pricing fluctuations and required modifications to processes, components or equipment. Identification and evaluation of alternatives are key considerations for PFAS obsolescence — particularly where parts or materials are no longer available or in sectors where PFAS-containing products don't meet consumer expectations. As an example, data from consumer analytics platform CivicScience posted in July 2023 suggests 53% of surveyed U.S. adults are at least somewhat concerned about the impact of PFAS on health and the environment. In the same survey, over a third (34%) indicated that they'd be more likely to shop with a company or retailer that bans PFAS from their products.¹⁷

To evaluate if PFAS are present in a supply chain, the best place to start is with what is already known. Review chemical data on

hand to identify where PFAS are used in materials directly or as part of a manufacturing process. Once you have reviewed current information, surveying your suppliers is the next step. Ideally, information received would include chemical data (including the CAS number and quantity). You may also need more than that, depending on your role in the supply chain and what regulatory obligations apply. Collaboration is important in this step, and your immediate suppliers may need time to work with their upstream suppliers. Retailers may also commonly request certificates of compliance from their suppliers to confirm products they purchase comply with regulatory requirements. If PFAS are found through data collection, you'll need to determine the correct path forward. Is the product subject to restrictions, or even undesirable reporting or labeling obligations? Do suppliers intend to keep the substances in their portfolios? If you're a manufacturer and desire (or need) to shift away from PFAS, are modifications necessary to the manufacturing process or equipment? As noted previously, if PFAS are in your product and subject to restrictions or supplier phase-outs, you may need to consider alternatives. There may also be regulatory exemptions in certain laws. If a product is subject to restrictions (without exemptions) and alternatives are not available, it may be necessary to discontinue sale or production.



When available alternatives are identified, they must be assessed for suitability. There are different well-accepted methodologies for this, but key considerations include:

- **Hazards:** Evaluate the safety and hazards associated with the alternatives to identify those that are less hazardous. Application of the precautionary principle may be valid in this step, which assumes that an alternative cannot be safer until there is sufficient data available.
- **Function and performance:** Verify that product performance is not negatively impacted.
- **Cost and availability:** Verify that the alternative is cost competitive and available consistently in sufficient quantities.
- **Exposure assessment:** Examine the product and substance life cycle to identify where there is potential for human or environmental exposure.
- **Impact to sustainability:** Where product footprint is of concern, review how an alternative changes datapoints relating to climate impact, resources, usage patterns, ethical sourcing practices and so on.

In addition, certain products or materials may also be subject to certification, registration requirements or additional regulatory testing.

To effectively manage chemicals of concern across the supply chain, best practices include:

- Identifying and monitoring chemicals in your portfolio (raw materials, components, finished product)
- Establishing a chemical policy to be updated as regulatory requirements or corporate standards evolve
- Understanding your upstream and downstream supply chain, including your requirements, requirements of downstream recipients, partner risk and mitigative measures
- Evaluating changes to regulatory requirements and how they may impact new and current products or processes
- Automating and digitizing management of chemicals and regulations through software
- Communicating requirements, changes that may impact a product's status, and processes in a clear, consistent and concise manner

Helping you manage your PFAS challenges

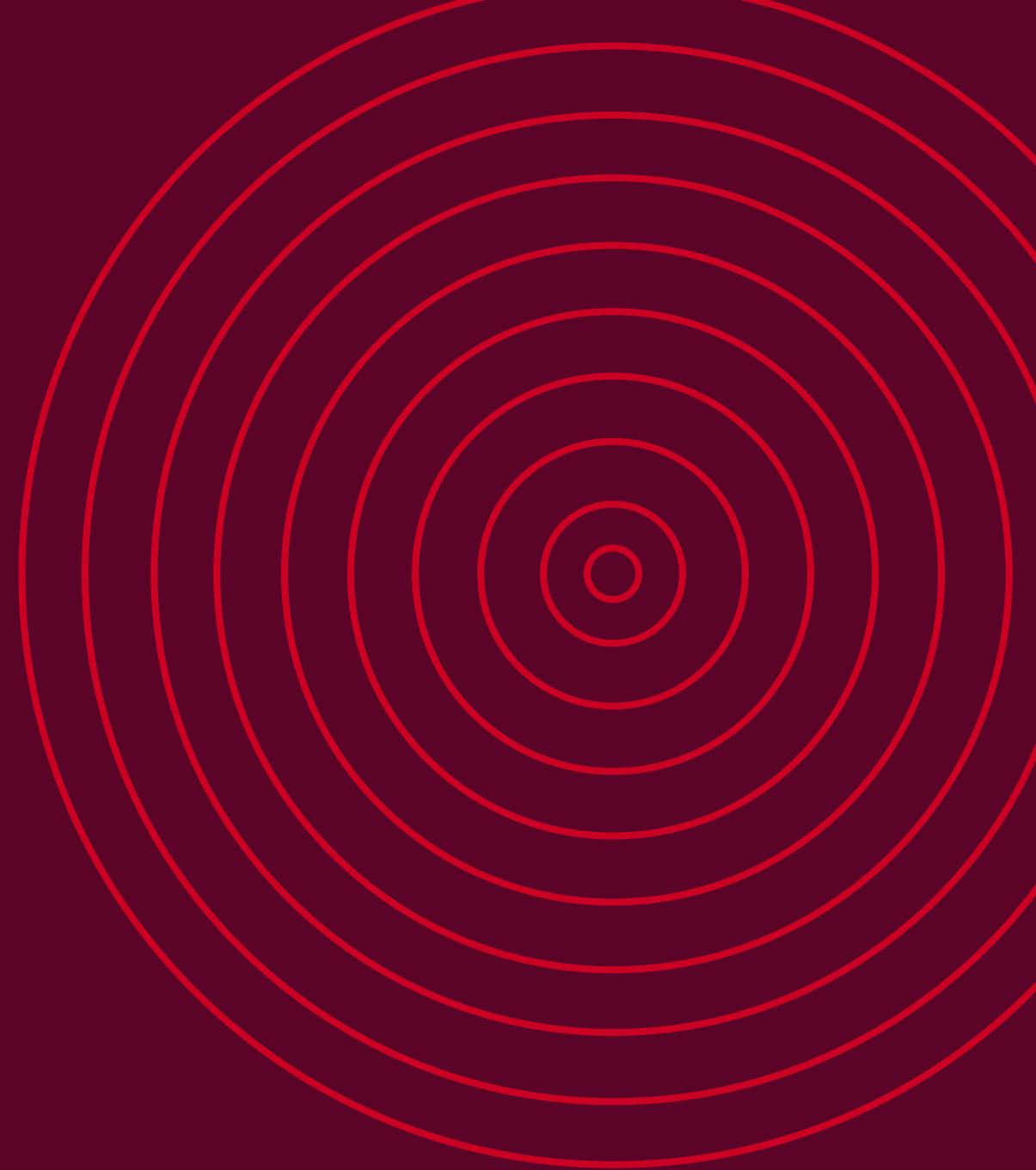
UL Solutions can help address compliance obligations based on your specific business needs. We can support our customers with product and material testing, material data collection, material screening and chemical policy development to enable compliance and mitigate risks associated with chemical regulations.

For example, manufacturers are using our software to survey their suppliers and collect data electronically. Once our customers have collected such data, we can analyze it against over 8,000 regulatory lists, including evolving requirements for PFAS, and give them the information they need to make informed decisions to comply with regulations and eliminate PFAS in their portfolio. Our global laboratories can also test articles for targeted PFAS and screen for total fluorine.

We offer services and software that can help you collect and analyze the materials in your products so you can manage the safe handling, storage, transport and disposal of products that have restricted substances like PFAS and other materials of high concern. Like other retailers and product manufacturers, you can also trust UL Solutions to perform product testing against global chemical requirements to help mitigate risk, support claims that differentiate your products and compete at a higher level.

To learn how UL Solutions can help you manage your PFAS challenges and comply with key global chemical regulations with confidence, contact us at UL.SupplyChain@UL.com.

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Endnotes

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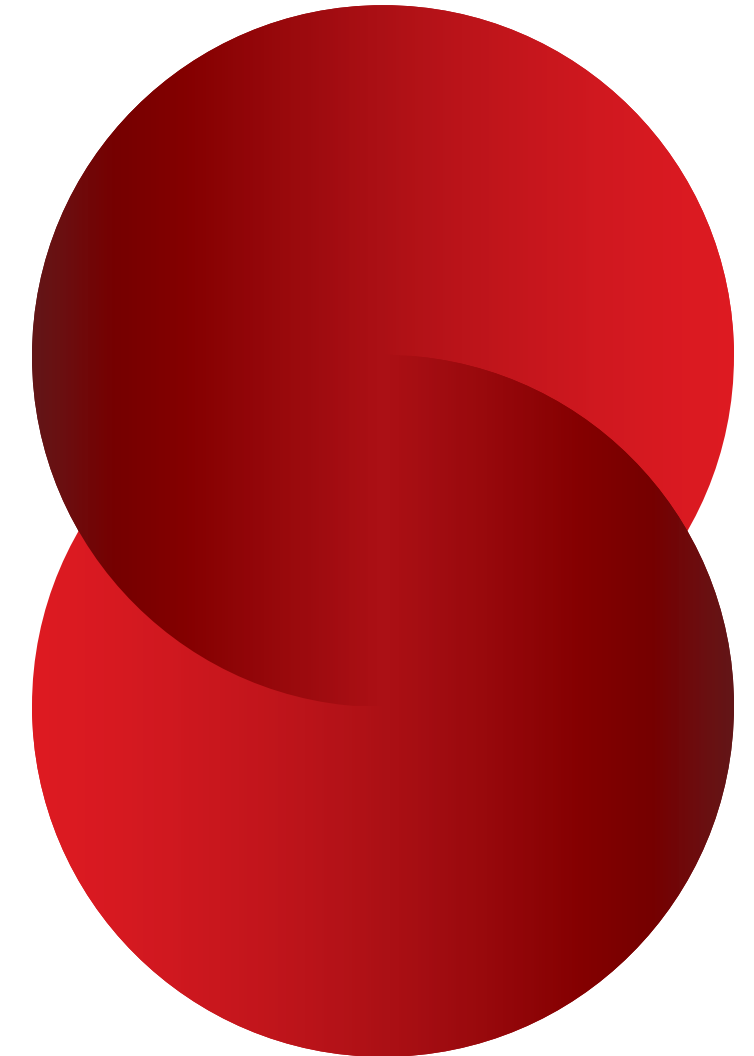
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