



PFAS and Forever Chemicals

What are PFAS?

PFAS (per- and poly fluoroalkyl substances) is a chemical family consisting of at least 5,000 individual substances. They are sometimes referred to as 'forever chemicals' because of their persistence in the environment.

In manufacturing, PFAS are favoured for their durability and useful properties such as non-stick, water repellence and anti-grease. PFAS are used in the manufacture of many domestic products, including:

- skin creams and cosmetics,
- car and floor polish,
- rinse aid for dishwashers,
- textile and fabric treatments,
- food packaging and microwave popcorn bags,
- baking equipment,
- frying pans,
- outdoor clothing and shoes.

They also have many and widespread uses in industry, including in firefighting foam. The properties of these substances mean that they are very resistant to biodegradation.

In recent years, they have received increased interest from both a research and regulatory perspective to better understand and mitigate the potential for any public health impacts.

Chemistry of PFAS

PFAS are typically described as comprising a group of compounds having carbon atoms linked to each other and bonded to fluorine atoms at most, or all the carbon bonding sites. These can be classified as polymers and non-polymers.

Polymers

Fluoropolymers are an example of polymers. Examples include PTFE, FEP, ETFE, and PFA, which have been referred to as 'polymers of low concern' because they have high molecular weight and are extremely stable.

Non-polymers

Most research interest has been in the behaviour of non-polymer PFAS, due to them being the most commonly detected so far in humans, biota, and other environmental media and appear to be relatively more abundant at PFAS investigation sites.

Are PFAS harmful?

As a result of their widespread use and persistence, PFAS are being found to be present in many different environments. Toxicity data is not available for many PFAS.

Some PFAS, such as perfluorooctanoic acid (PFOA), and perfluorooctane sulfonic acid (PFOS), have been associated with adverse effects in animal and human studies at sufficient levels of exposure. This has led to the restricted use of some of these substances in a variety of global markets. Perfluorooctanoic acid (PFOA), and perfluorooctane sulfonic acid (PFOS), have been restricted in England and Wales through UK REACH, the regulatory framework for Registration, Evaluation, Authorisation and Restriction of Chemicals.

The Environment Agency (EA) is currently undertaking surveillance of PFA S as part of their groundwater quality monitoring network, and water companies are also monitoring for a range of PFAS substances in the raw water. The Drinking Water Inspectorate (DWI) is currently engaged with water companies in England and Wales to improve knowledge about the location, types and levels of specific PFAS compounds. These PFAS may have entered the water environment due to historical and/or current industrial practices that produce products for all areas of modern society. Drinking water is only one possible route of exposure to PFAS, accounting

for a small proportion of the possible overall exposure alongside use of various chemical products, food, and even household dust.

Based on our current knowledge, the low levels of PFAS detected in some untreated water abstracted for public drinking water supplies has no acute or immediate impact on human health.

Recognising the potential for longer term accumulation of some PFAS in the human body, the DWI has set guidance levels for PFAS (based on an assessment of existing scientific knowledge) that provide a precautionary margin of safety in advance of further international research results on PFAS toxicology. Water companies are required to comply with this guidance, and where necessary take specific actions such as additional treatment and/or blending with other sources to reduce PFAS prior to supply.

Precautionary approach to Regulation

Water companies have a duty to ensure water is wholesome. There are currently no statutory standards for PFAS in drinking water England and Wales, nor is there a World Health Organisation guideline value. The DWI has taken a precautionary approach and produced tiered guideline values for water companies to adhere to.

Other countries have also put restrictions on PFAS concentrations in drinking water and the European Union is in the process of adopting a standard of 0.1 micrograms per litre for 20 individual substances. Prior to leaving the EU the UK worked with partners towards developing the methodology and assessment approach for setting these limits. DWI considers that this approach remains valid, and that a guidance limit of 0.1 micrograms per litre for PFAS is a robust level with an appropriate margin of safety to ensure the wholesomeness of drinking water.

The DWI is working closely with the UK Health Security Agency, the EA and government, to adopt the most up to date information regarding standards and toxicology. We are also carrying out our own research on analytical methods, and risk assessment to inform our decision making.

DWI guidance to water companies

In January 2021, the DWI published updated [guidance](https://cdn.dwi.gov.uk/wp-content/uploads/2021/01/12110137/PFOS-PFOA-guidance-2021.pdf) (https://cdn.dwi.gov.uk/wp-content/uploads/2021/01/12110137/PFOS-PFOA-guidance-2021.pdf) for PFAS compounds in drinking water, and in response to emerging data from the EA about environmental risks, the Inspectorate sent an [Information Letter](https://cdn.dwi.gov.uk/wp-) (https://cdn.dwi.gov.uk/wp-

content/uploads/2021/10/04203217/Information-Letter-PFAS-Monitoring.pdf) to water companies in England and Wales requiring companies to monitor for a wider range of PFAS and update their risk assessments accordingly.

The DWI [guidance](https://cdn.dwi.gov.uk/wp-content/uploads/2021/01/12110137/PFOS-PFOA-guidance-2021.pdf) (https://cdn.dwi.gov.uk/wp-content/uploads/2021/01/12110137/PFOS-PFOA-guidance-2021.pdf) follows a tiered approach with a wholesomeness value of 0.1 micrograms per litre, which is equivalent to 0.1 parts per billion.

Table 1 Tiered Guidance Values

Tier	Regulatory requirement	Guidance values in micrograms per litre	Minimum action to be taken by water company
Tier 1	Regulation 27 Risk assessment	potential hazard	Ensure PFAS are considered as part of statutory risk assessment
Tier 2	Regulation 10 Sampling: further provisions	> 0.01µg/L	Consult with local health professionals. Monitor levels in drinking water.
Tier 3	Regulation 4(2) Wholesomeness	> 0.1µg/L	As tier 2 plus: Put in place measures to reduce concentrations to below 0.1µg/L as soon as is practicable.
Tier 4	Water Industry (Suppliers' Information) Direction 2020 Notification of events	> 1.0ug/L	As tier 3 plus: Ensure consultation with local health professionals takes place as soon as possible. Take action to reduce exposure from drinking water within 7 days.

Private Water Supplies

Local authorities are responsible for identifying risks to the quality of private water supplies and will seek advice from the UK Health Security Agency when required.

DWI has [provided advice](http://www.dwi.gov.uk/private-water-supplies/local-authorities/) (www.dwi.gov.uk/private-water-supplies/local-authorities/) that in the first instance, it is important for local authorities to understand if any of their supplies are at high risk of the presence of PFAS. High risk supplies can then be prioritised for further action which may include sampling and analysis when it is available. The UK Health Security Agency will help them advise on any potential risks to the wholesomeness of the water.

Owners of private supplies where the individual PFAS substances are detected above the guidance level of 0.1µg/l for drinking water are advised to contact the Environmental Health Team at their local authority to discuss what these results mean for their drinking water quality.

Sampling and Analysis

Laboratory capacity is being expanded in England and Wales, and analytical methods are constantly being developed and improved to monitor a larger range of PFAS substances at ever more smaller concentrations. So far only a few of these are accredited as quantified analytical techniques (essentially techniques with a high level of accuracy, repeatability and reliability) and a [Standing Committee of Analysts](http://www.standingcommitteeofanalysts.co.uk/) (www.standingcommitteeofanalysts.co.uk/) Blue Book method is being developed to further improve the suite analytical approaches.

PFAS are ubiquitous, in personal care products, waterproof jackets and in sampling and laboratory equipment. Therefore, specialist PFAS free laboratory equipment is required, which has led to the current situation where only a few labs are able to analyse for PFAS substances with the degree of quality required.

Is my water safe to drink?

Drinking water in England and Wales is safe, reliable and of very high quality. Public supplies in particular are among the best in the world. Water companies carry out water safety planning and use a risk-based approach to deal with any issues before they become a problem.

Our regulatory system is designed to protect consumers at all times. A few companies have detected traces of PFAS in some source waters,

although the monitoring data shows the large majority of sources are not affected. Water supplies are made safe through a combination of treatment processes and managed dilution through blending, to achieve stringent regulatory standards, before reaching the consumers tap. As companies carry out more extended monitoring for PFAS we are likely to detect traces in more sources. This does not mean that the water has been unwholesome. Even where a guideline standard is exceeded, this does not mean that consumer's health has been harmed, rather that the safety margin is less than we would expect to see achieved. In such instances the water company will be required to put in more protection to meet the guideline standards or if this cannot be achieved in suitable timeframe, remove the source from supply pending further assessment of treatment options.

By law, your water company must inform you if there is a problem with your supply which could pose a risk to health and provide alternative water while any problem is fixed.

The DWI regulates water companies in accordance with its [enforcement policy](http://www.dwi.gov.uk/what-we-do/enforcement-policy/) (www.dwi.gov.uk/what-we-do/enforcement-policy/), and has a range of powers to ensure risks are adequately dealt with before they become a problem, such that consumers are protected at all times.

Further Information

The Drinking Water Inspectorate is the independent regulator of drinking water quality for public supplies in England and Wales. Visit www.dwi.gov.uk. Contact us at dwi.enquiries@defra.gov.uk or telephone 0300 068 6400.