

# FOREVER CHEMICALS

## The Hidden Threat from Toxic PFAS



**“PFAS persist and accumulate in soil, water, air, wildlife, our bodies.”**

**“PFAS has been found in human breast milk.”**

**“PFAS is found in the blood of 97% of the American population.”**

**“PFAS has been linked to fertility problems and changes in metabolism.”**

**“PFAS has been linked to an increased risk of obesity and some cancers.”**

**“Globally PFAS is found in rivers, lakes and every ocean on our planet.”**

**“PFAS has been detected on Mount Everest. There is no-where that PFAS is not present. It is in the soil, the air and water.”**

**“PFAS is manmade, it is damaging our environment on a daily basis.”**

**MOST COMMONLY FOUND IN**

**FAST-FOOD WRAPPERS & CONTAINERS**

**WATER-RESISTANT CLOTHING**

**PIZZA BOXES**

**DRINKING WATER**

**PLASTIC WATER BOTTLES**

**GREASEPROOF PAPER**

**RIVER SEDIMENT**

**HUMAN BODIES**

**MICROWAVE BAGS**

**NON-STICK COOKWARE**

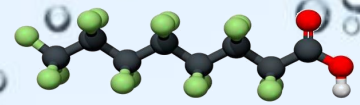
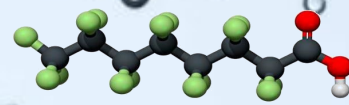
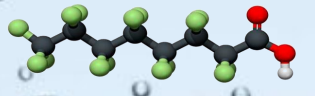
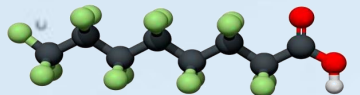
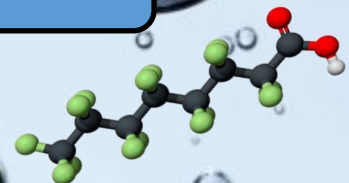
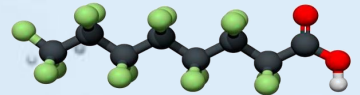
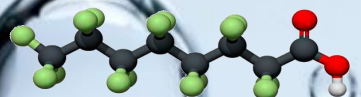
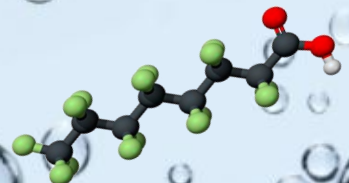
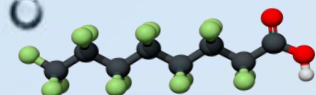
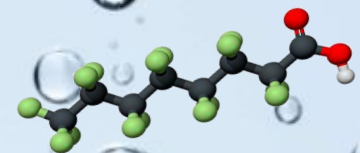
**CLEANING PRODUCTS**

**OCEANS**

**STAIN RESISTANT COATINGS**

**PAINT**

**SWEET WRAPPERS**



## FRAGRANCE



## FLAVOURS



## COSMETICS



## TEXTILES



## MINING



## ENERGY

**ELECTRICITY, GAS, SOLAR,  
ATOMIC, RENEWABLES**



## PETROCHEMICAL

**OIL, GAS, PETROLEUM**



## FOOD



**WINE, BEER & SPIRITS  
TESTING & PRODUCT  
DEVELOPMENT**



## PHARMACEUTICAL



## AGRICULTURAL



## FORENSICS



## ENVIRONMENTAL

**WATER, AIR, SOIL**



## CHEMICAL



  
**Greyhound**  
CHROMATOGRAPHY  
AND ALLIED CHEMICALS

## **Are all PFAS toxic to humans?**

This is a question that remains to be answered. Research over many years will provide the data needed to analyse the impact PFAS has on the environment. Some PFAS, sometimes used in construction materials are not released into the air or water table when it rains but they are released when buildings are demolished and the debris is sent to landfill.



## **Should we be concerned?**

Some PFAs are of a more immediate concern as they are released into the environment when they are used or when they come into contact with water. Small residual PFAS molecules wash off easily and are carried to the soil, air and water very quickly. Many short-chain PFAS dissolve in water. Gradually, over time, the PFAS sinks to the depths of oceans and rivers, settles in the sediment and becomes a concern as marine life feeds on plants and other animals that are in the sediment. Some PFAS such as PFOA act like detergents, they repel water and rise back to the surface, they are then released into the atmosphere as droplets. Some scientists believe that spray from the oceans is the biggest source of atmospheric PFAS.

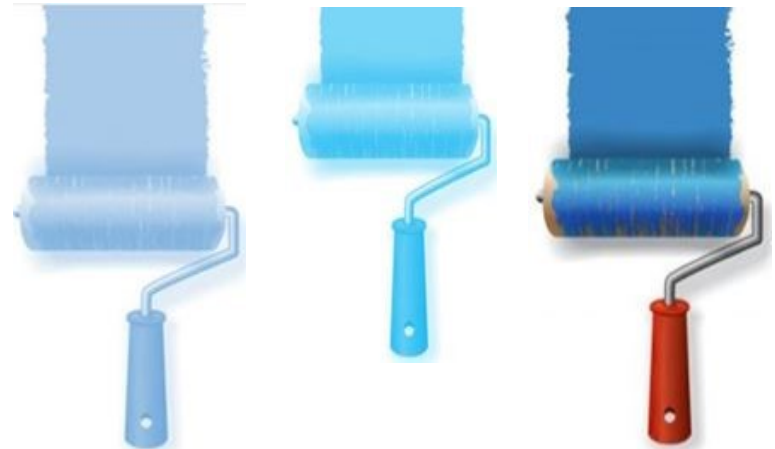


**PFAS (per- and polyfluoroalkyl substances), known as “forever chemicals” are found in everyday objects. Food Packaging, paints, cosmetics, wood lacquers, sealants , solar panels, fire fighting foams, artificial grass and many more seemingly innocent products.**

**Generally used to prevent corrosion and make products waterproof and stain-resistant they are present in our everyday life. Unfortunately they do not break down in our environment and as a consequence are “forever present”.**

**PERFLUORO  
POLYFLUORO  
OR FLUORO**

**INDICATES THAT AN  
ITEM CONTAINS PFAS**



## PFAS and Other Toxic Forever Chemicals in Drinking Water



For over 30 years the European Union have worked tirelessly to protect the integrity of our drinking water. EU officials have recently reached a provisional agreement to update the Union's 1998 Drinking Water Directive to tighten up the permissible limits allowed for both PFAS and several other drinking water contaminants, including bisphenol-A, microplastics, lead and chromium. At the time of writing the European Parliament and Council are still to formally approve the proposal.

European drinking water standards currently far exceed the standards set in the United States but this is a changing picture as state by state new instances of contaminants are emerging. Currently, the U.S. Environmental Protection Agency has only issued a non-enforceable health advisory of 70 ppt for PFOA, formerly used by DuPont to make Teflon, and PFOS, formerly an ingredient in 3M's Scotchgard. Those compounds are no longer manufactured in the U.S., but they and other PFAS contaminate the drinking water for an estimated 110 million Americans.

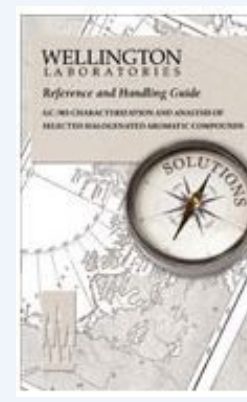
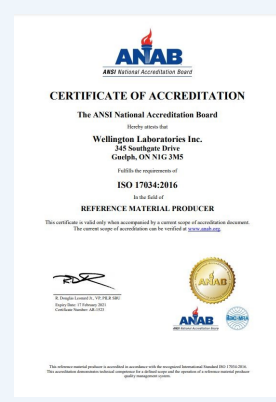
# TESTING FOR PFAS?



**Wellington Laboratories** has been committed to providing high quality reference standards and exceptional customer service since its inception in 1980.

The primary source of Standards for EPA Methods 23, 513, 1613, 1668, 8280, 8290, European Method EN-1948 and World Health/EPA Standards, C13 and Native Dioxins, Furans, PCBs and Brominated Diphenyl Ethers, Brominated Dioxins and Furans, Methylated PCDDs and PCDFs, Fluorinated Compounds and more.

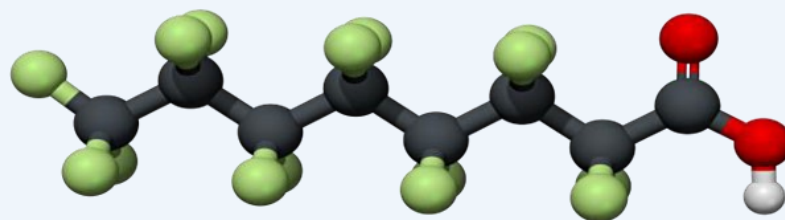
## Wellington's Quality Documents





## General Concepts of Organofluorine Chemistry for PFAS

**Organofluorine Chemistry:** A branch of organic chemistry involving organic molecules with a carbon-fluorine bond. Organofluorine molecules have many commercial uses. They include PFAS, such as PFOA, shown below:



**EXAMPLE: 3D model of a PFOA (perfluorooctanoic acid) molecule, in its acid form.**

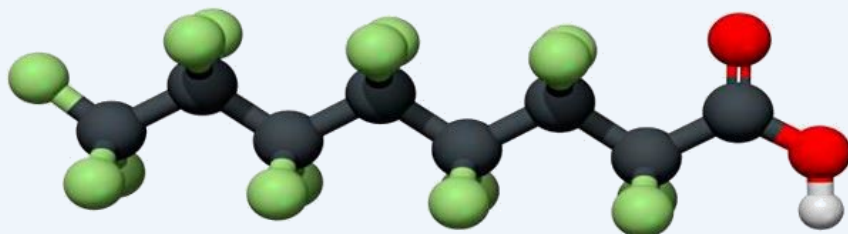
Source: Manuel Almagro Rivas (Own work using: Avogadro, Discovery Studio, GIMP) [CC BY-SA 4.0] (<https://creativecommons.org/licenses/by-sa/4.0/>), via Wikimedia Commons. <https://commons.wikimedia.org/wiki/File:PFOA-3D.png>

Gray spheres represent carbon atoms linked together in a chain; there are eight of them, so “octane” is used in the name. Green spheres represent fluorine atoms bonded to carbon atoms. Red spheres represent oxygen atoms. White sphere represents a hydrogen atom that dissolves away in water, which makes this an acid. Fluorine atoms are attached to all possible bonding sites, making this **per**fluorinated. If some of the fluorine atoms were replaced by other atoms (such as oxygen or hydrogen), it would be **poly**fluorinated. Without the hydrogen, the “head end” takes on a negative charge and can bond to things through electrostatic attraction. The fluorine “tail end” is strong and stable, giving it lipid- and water-repelling properties, but also making it persistent in the environment.

## General Concepts of Organofluorine Chemistry for PFAS

**Isomer:** A molecule with the same molecular formula as another molecule, but with a different chemical structure. **Isomers** contain the same number of atoms of each element, but have different arrangements of their atoms. See [Figure 2-15](#) for an example; linear and branched PFOS contain the same number of carbon, fluorine, oxygen, and sulfur atoms, but these atoms are arranged differently depending on whether it is a linear or branched isomer of PFOS.

**Homologue Groups and Homologous Series:** A group of organic compounds, usually listed in order of increasing size, that has a similar structure (and therefore also similar properties) and whose structures differ only by the number of carbon atoms in the chain. For example, all of the linear and branched isomers of PFOS would be in the C<sub>8</sub> homologue group, while all of the linear and branched isomers of perfluorohexane sulfonic acid (PFHxS) would be in the C<sub>6</sub> homologue group. The C<sub>4</sub>-C<sub>12</sub> PFASs are a homologous series of perfluorosulfonates.



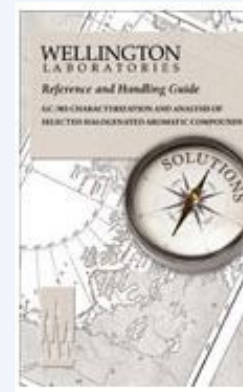
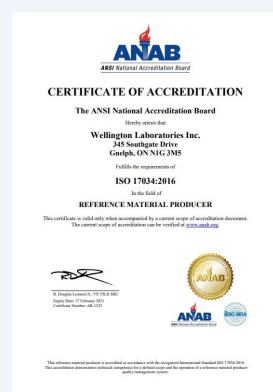
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## Wellington's Quality Documents

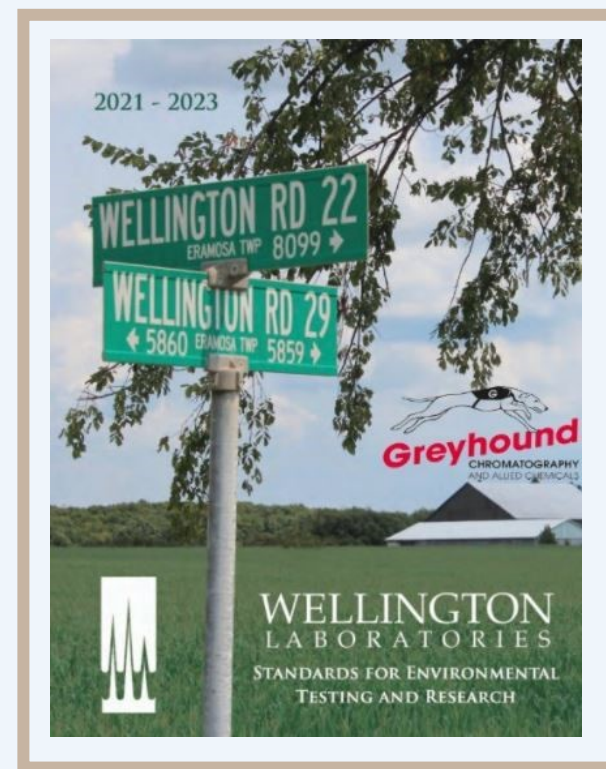


**Per- and Polyfluoroalkyl Substances (PFAS) are an emerging class of environmental contaminants. Their unique properties create a host of analytical challenges that require the use of native and mass-labelled standards for the generation of accurate data.**



The most notable PFAS include PFOS (perfluorooctanesulfonate) and PFOA (perfluorooctanoic acid) and Wellington Laboratories currently offers multiple mass-labelled standards for these compounds to meet your analytical needs. In fact, Wellington offers a large selection of native and mass-labelled per- and poly-fluorinated compounds, including:

-  **Perfluoroalkylcarboxylic Acids (PFCAs)**
-  **Perfluoroalkylsulfonates (PFASs)**
-  **Perfluorooctanesulfonamides (FOSAs)**
-  **Perfluorooctanesulfonamidoethanols (FOSEs)**
-  **Perfluorooctanesulfonamidoacetic acids (FOSAAs)**
-  **Telomer Alcohols (FTOHs)**
-  **Telomer Acids (FTAs)**
-  **Telomer Sulfonates (FTSs)**
-  **Perfluoroalkylphosphonic acids (PFAPAs)**
-  **Perfluoroalkylphosphinic acids (PFPi's)**



**Wellington Laboratories  
Product Catalogue 2021 –2023**

**Wellington Laboratories started to synthesize perfluorinated compounds in 2004 . Since then, new native and mass-labelled standards have been added to their inventory.**



**Also Available:**

**PFC-C-CVS Calibration Set and Support Solutions**

**Unsaturated Fluorinated Telomer Acids (FTUAs)**

**Perfluoroalkylphosphinic Acids (X:XPFPi)**

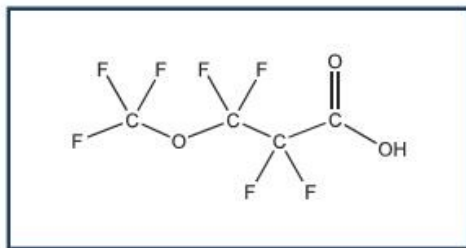
**Polyfluorinated Phosphate Esters (PAPs and SAmPAPs)**

**Fluorinated Telomer Acrylates and Acetates (FTAcrs and FTOAcS)**

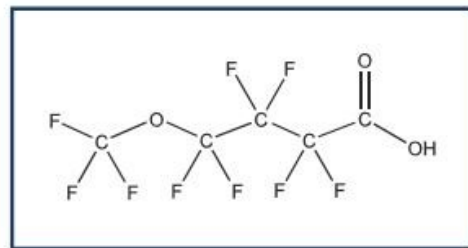
**PFCs are still emerging environmental contaminants and each of the groups of compounds listed above pose unique analytical challenges. In addition, the individual isomers, such as the branched PFOA and PFOS isomers, are being found to have different toxicokinetic and ecokinetic properties. Wellington Laboratories' inventory of PFCs will continue to grow.**

## Testing for PFAS in Everyday Products

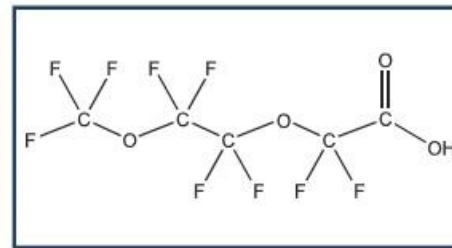
In response to the ever increasing demand for new Reference Standards to test for the presence of PFAS in everyday products Wellington Laboratories has increased its product line to include four new perfluoroether and perfluoropolyether-carboxylic acids (PF4OPeA, PF5OHxA, 3,6-OPFHpA and P5MeODIOXOAc), a perfluoroethersulfonate (PFEESA), perfluorodecanesulfonamide (FDSA-1) and N-methylperfluorobutanesulfonamide (N-MeFBSA-M).



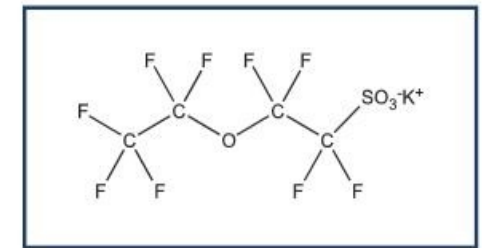
PF4OPeA



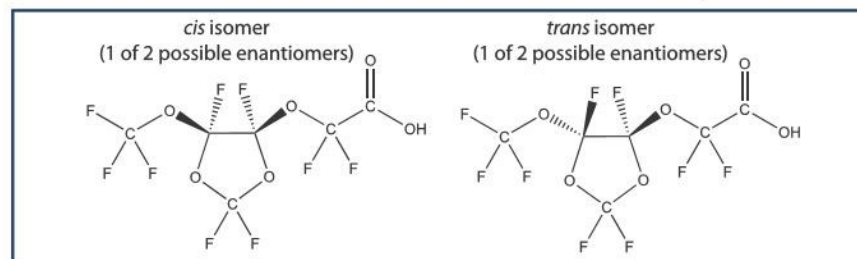
PF5OHxA



3,6-OPFHpA



PFEESA



P5MeODIOXOAc

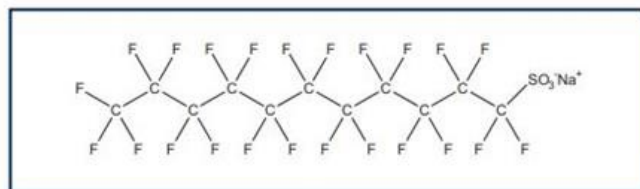
## Native Certified Reference Standards for L-PFUdS & L-PFTrDS

In early 2020 the European Parliament and the Council of the European Union released new requirements for the analysis of per- and polyfluoroalkyl substances (PFAS) in water intended for human consumption (5813/20). Unfortunately this amendment to Council Directive 98/83/EC included perfluoroalkanesulfonates that were not commercially available. In response to this, Wellington Laboratories synthesized, purified, characterised and prepared accurate Certified Reference Standards of the required substances: sodium perfluoro-1-undecanesulfonate (L-PFUdS) and sodium perfluoro-1-tridecanesulfonate (L-PFTrDS).

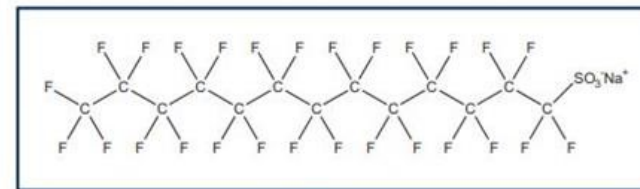
Wellington Laboratories have also prepared a native solution/mixture (EU-5813-NSS) that contains all of the PFAS listed in the drinking water directive (5813/20) for your convenience. This solution/mixture can be used in conjunction with two of Wellington's existing mass-labelled PFAS mixtures to easily prepare a calibration set for quantitation:

Suggested Extraction Standard Mixture: [MPFAC-C-ES](#)

Suggested Injection Standard mixture: [MPFAC-C-IS](#)



L-PFUdS



L-PFTrDS

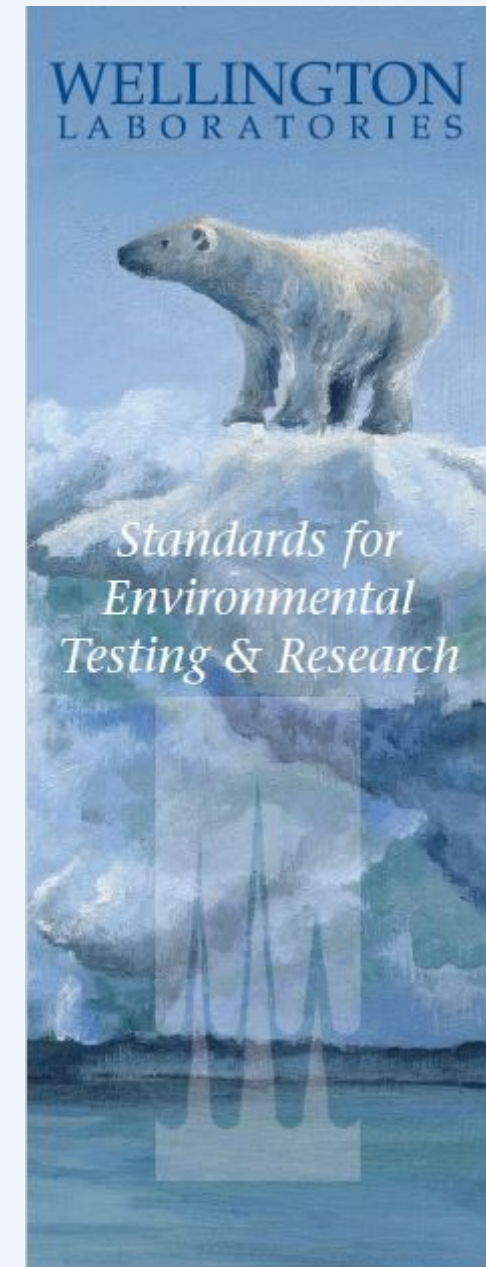
**PFAS STANDARDS**

## **NEW PRODUCTS PFAS TESTING STANDARDS**

### **Native & Mass-Labelled PFAS Solution/ Mixtures**

#### **Compatible with U.S. EPA Draft Method 1633**

Wellington Laboratories is pleased to support U.S. EPA Draft Method 1633 for the analysis of PFAS in aqueous, solid, biosolid and tissue samples by releasing compatible prime stock solutions. To offer the greatest degree of flexibility with other applications, a series of native (PFAC-MXF, PFAC-MXG, PFAC-MXH, PFAC-MXI and PFAC-MXJ) and mass-labelled (MPFAC-HIF-ES and MPFAC-HIF-IS) stock solutions have been prepared. These mixtures can be diluted and/or combined to achieve the spiking and calibration solutions recommended by the method.



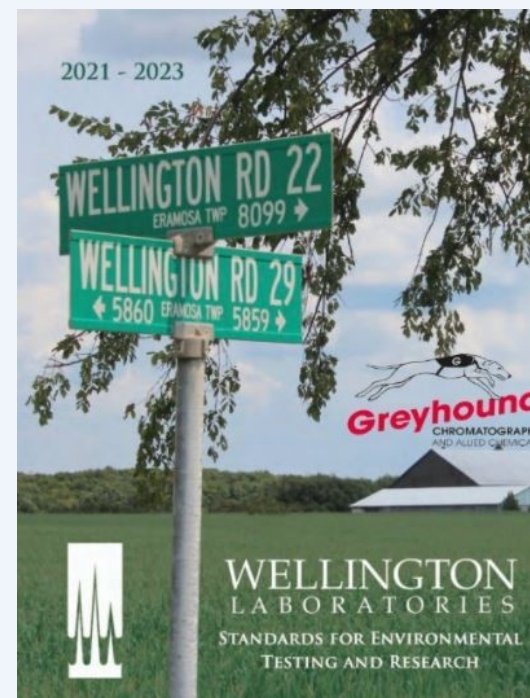
[\*EPA Draft Method 1633 - Further Information\*](#)



# Wellington Laboratories Catalogue 2021 - 2023

Wellington Laboratories is pleased to announce the long-awaited release of their latest catalogue which contains the most up-to-date listing of Wellington's Certified Reference Standard Solutions, Solution/Mixtures and Calibration Sets. Below you will find a selection of new products introduced in this new catalogue. Amongst the new products on offer you will find a comprehensive calibration set for polychlorinated naphthalenes (PCNs), native and mass-labelled PCN Support Solutions and additional individual organochlorine pesticide (OPC) standards.

Wellington Laboratories also continue to offer most of the products that were listed in their previous catalogue as they have remained relevant for environmental analysis and are frequently requested.



## NEW ADDITIONS TO WELLINGTON LABORATORIES PRODUCT LIST

**Alternative Method 16130 Calibration Set (16130CVS)**

**Mass-Labelled PCDD Window Defining Mixture (MD5CWDS)**

**Mass-Labelled PCDF Window Defining Mixture (MF5CWDS)**

**PCN Calibration Set (PCN-CVS-A) & Support Solutions**

**24 Mass-Labelled OCP Standards**

**27 Individual Native PCN Standards**

**14 Mass-Labelled PCN Standards**

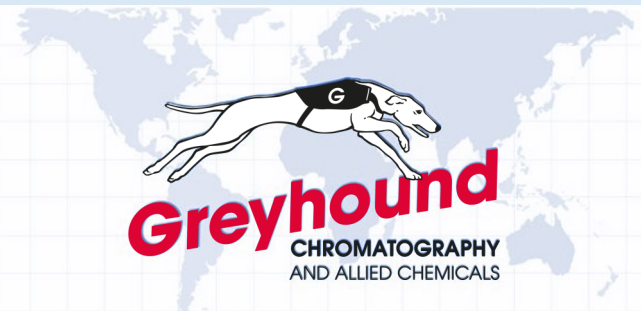
**and more .....**





**A Wide Range  
Of PFAS  
Related Products**

**COLUMNS  
REFERENCE STANDARDS  
SPECIALISED TESTING VIALS  
And So Much More .....**



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**SPECIALISED  
PFAS TESTING VIALS**

**[WWW.GREYHOUNDCHROM.COM](http://WWW.GREYHOUNDCHROM.COM)**



**PFAS  
REFERENCE STANDARDS**



# Getting the Goods to our Customers



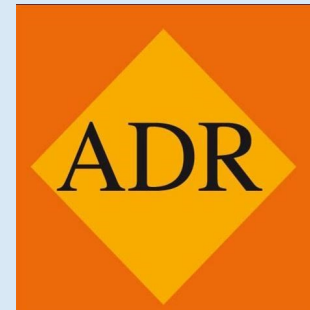
Tired of frustrating telephone calls, late deliveries, no deliveries, lost items, too much form filling, incorrect paperwork, no certification, customs issues, broken promises etc, etc...?



Greyhound will take care of all the paperwork, certification, despatch and transport issues, so you can relax and look forward to receiving your goods.

By air, sea, road or rail Greyhound products will arrive on time, every time.

Our IATA, ADR (Road) and IMDG (Sea) trained Logistics Department have many year's experience of shipping hazardous and non-hazardous materials around the world. Greyhound prides itself on using our extensive logistics knowledge to facilitate successful delivery of your goods, either to your door or an approved airport.



## USEFUL LINKS

[GREYHOUND CHROMATOGRAPHY WEBSITE](#)

[GREYHOUND CATALOGUE DOWNLOADS](#)

[WELLINGTON LABORATORIES WEBSITE](#)

[Q-RANGE PFAS ANALYSIS SCREW TOP VIALS](#)

[PFAS VIAL SAMPLING KITS](#)

[MACHEREY-NAGEL PFAS PRODUCTS](#)

[WELLINGTON LABORATORIES PFAS REFERENCE STANDARDS](#)

[PFAS FOCUS—PFAS IN DRINKING WATER](#)

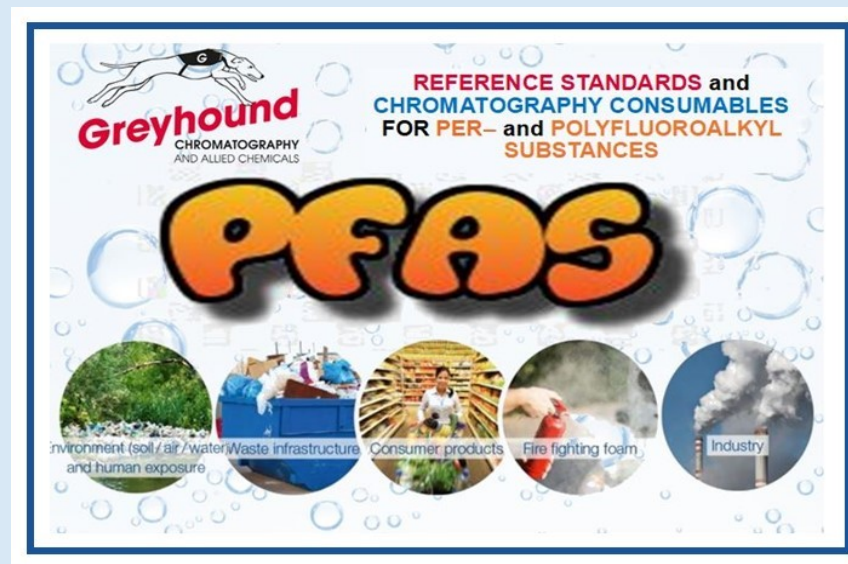
[MIXED NATIVE PFCAs AND PFASs SOLUTION](#)

[PFOS/PFOA ISOMERS](#)

[AQUEOUS FILM-FORMING FOAM PFAS](#)



[WWW.GREYHOUNDCHROM.COM](http://WWW.GREYHOUNDCHROM.COM)



**ChemSec** is an international non-profit organization that works to phase out harmful chemicals in favor of safe alternatives. In their work, **ChemSec** wants to create a strong link between researchers, decision makers and companies in the fight against harmful chemicals. By joining **ChemSec's** PFAS movement, companies commit to work towards getting all PFAS chemicals covered by EU's chemicals legislation, REACH, which lists the harmful chemicals banned from use in the EU, phased out from supply chains.



Like a number of other large companies, **Greyhound Chromatography** has joined the Swedish non-profit organization **ChemSec's** PFAS movement. The movement is working to have a number of harmful fluorinated compounds – known as “forever chemicals”, since they don't degrade – phased out and banned.





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