ARCADIS Design & Consultancy for natural and built assets

THE RAPID EMERGENCE OF PFASs TO PROMINENT CONTAMINANTS OF CONCERN

WHAT ARE PFASs?

Poly- and Perfluoroalkyl substances (PFASs) are a large group of contaminants used in a wide array of commercial goods and products since the 1940s. PFASs repel oils and water with impressive surface tension leveling properties. For example, they have been used in some firefighting foams, for coating fabrics and textiles like carpet and clothing, in non-stick surfaces for cooking and applied in hydraulic and lubricant oils. Since the mid-1960s, some PFASs have been the key ingredient in firefighting foams used in fire training events and to extinguish fires fueled by flammable or combustible liquids.

WHY A PROBLEM?

There is growing evidence there are human health risks and potential ecological harm associated with PFASs and increasingly more countries are now regulating an increasing number of PFASs. PFASs are known to threaten drinking water supplies in many countries, with increased awareness and regulatory scrutiny being most evident in Scandinavia, Germany, Australia, Canada the United States.

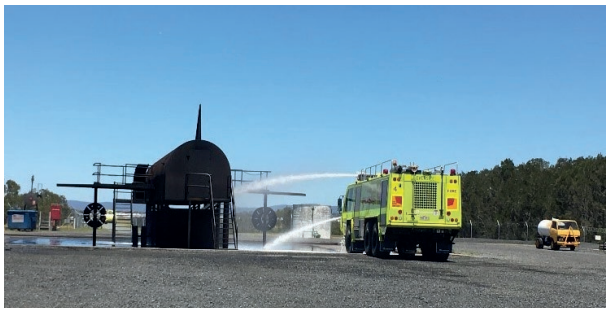
Acceptable guidance concentrations for drinking water are very conservative (in the parts per trillion), and the threat of third party litigation from communities affected by PFASs in their drinking water has created an increased need for environmental management services related to PFAS vulnerability, investigation and restoration.

Globally, environmental regulations considering PFASs are rapidly being promulgated to very conservative (low) levels, have generally focused on perfluorinated compounds and have been evolving since 2009. PFASs show no sign of biodegradation at all and so have been described as “forever chemicals.” PFASs are generally soluble and hence very mobile in the environment. Depending on the site setting, they can be transported with groundwater well beyond the original source area and form large plumes.

In addition, there are also many more proprietary PFASs present in commercial products than are regulated. These varieties have evaded detection by common analytical methods but, in the environment, will be transformed to the increasingly regulated perfluorinated PFASs. Firefighting foams, for example, comprise hundreds of individual PFASs which have not been accounted for until recent analytical advances have enabled the total amount of PFASs to be measured using a novel technology termed the total oxidizable precursor (TOP) assay.

In the U.S., PFASs are now a core focus of the current administration’s environment policy. However, the greatest current financial and brand liabilities are associated with providing PFASs treatment to public water supplies, as well as settling third party litigation related to drinking water exposure or loss in property value.

For multinational companies, and particularly U.S. traded companies, the initial conundrum is how to assess these potential risks and liabilities without triggering an increase in reserves that can affect the business value and bottom line.



CONTINUED FIRE EXTINGUISHMENT

As a result of the environmental liabilities associated with the continued use of PFASs in firefighting foams, an increasing number of stakeholders are swapping out foams for fluorine-free foams (F3), while evaluating the conversion of firefighting capabilities to the use of F3 for tank farm protection. The costs for changing foam delivery infrastructure may be substantial but must be balanced with the potential environmental liabilities associated with continued use of PFASs. The tradeoff between effective fire extinguishment and continued use of PFASs in firefighting foams is being addressed by LASTFIRE, a consortium of international oil companies and storage companies who are reviewing the risks associated with tank fires and developing best practices to mitigate the risks.

Arcadis has built sustainable, sealed and contained fire training areas, as well as having expertise with cleaning PFASs in pipework and tanks. In collaboration with LASTFIRE, Arcadis provides a complete foam assurance package. Finally, Arcadis is poised to offer a package of services which manage all activities involved with replacing the current fluorine-based foams with fluorine-free firefighting foams and the associated infrastructure in fire suppressant systems at refineries and depots.

ARCADIS CAN HELP

Arcadis has a long history of managing PFASs with our first projects in Belgium, Germany and the UK more than 14 years ago. We now have more than 75 projects or portfolios representing 300 individual sites in 12 countries. Our strength is centered on our knowledge of complex PFASs chemistry, combined with significant expertise in environmental risk assessment and our long-standing involvement with research and development on remedial technologies. A large part of what we do is focused on cost efficiency and advocacy strategies centered on leveraging environmental risk assessment and modeling to demonstrate if exposures to human health and ecological receptors is significant and actionable. This avoids excessive expenditure managing PFASs that are not associated with risk and prioritization of subsequent investigations and remediation on the sites (or sources) where the financial liabilities may be the greatest.

Environmental site investigations have been initiated at hundreds of locations globally as a preliminary evaluation of the perceived risks posted by PFASs to human health and the environment. Many of these PFAS-impacted sites are likely to require a combination of rapid, comprehensive and cost-effective remediation options.

For remediation, Arcadis has a detailed understanding of multiple remedial options (Ross et al., 2018) and has been pioneering work with partners in the PFASs space for remediation of PFASs impacts to the environment, the extraction of PFASs from impacted groundwater and the sealing/containment of firefighting training facilities to protect the environment. For soil remediation, we focus on providing cost-effective alternatives to expensive off-site incineration such as stabilization of PFAS source areas, soil mixing with organoclays and carbon fixants, use of soil washing, or use of mobile onsite thermal remedies.

With significant expertise in using conventional groundwater treatment for PFASs, Arcadis designed and installed approximately 12 large scale water treatment systems for PFAS removal in the U.S. and Germany. Recently, we introduced a new technology at full scale in Australia called ozofractionation, which can remove the full range of PFASs from water by concentrating it in a small volume waste stream. Ozofractionation can provide a significant cost advantage over existing technologies that are ineffective for removal of some PFASs or create large volumes of waste that require high temperature regeneration or incineration.

The available remedial options for PFASs are limited in number as compared to those available for many other contaminant classes and the science is still evolving.

Most recently, Arcadis developed ultrasound-induced sonolysis, which uses high frequency sound waves to create localized bubbles of high temperature plasma to destroy PFASs. Sonolysis is an energy efficient and destructive technique that can be used in conjunction with OZF to destroy the small volume of resultant concentrated waste. We are currently testing and demonstrating the effectiveness of sonolysis as a lower cost, more sustainable alternative to high temperature incineration.

Contact us to learn more about the identification of PFASs and explore available treatment options.

CONTACT US

Ian Ross Ph.D.
Global PFAS Lead
T: +44 7855 745531
E: ian.ross@arcadis.com

Jeff Burdick
North America PFAS Lead
T: +1 267 385 1804
E: jeff.burdick@arcadis.com

www.arcadis.com

REFERENCES

Ross I, McDonough J, Miles J, et al. A review of emerging technologies for remediation of PFASs. Remediation. 2018; 28:101–126. https://doi.org/10.1002/rem.21553