

# SOIL





# PFAS

## IN SOIL

**PFAS compounds have been widely used in manufacturing of commercial and industrial products. Some examples include:**



**FIREFIGHTING FOAMS**



**FOOD PACKAGING AND NON-STICK COOKWARE**



**STAIN-REPELLENTS**




**CHROMIUM PLATING MIST SUPPRESSANTS AND ETCHANTS**



**BIOSOLIDS FROM WASTEWATER TREATMENT**



A photograph of a forest landscape featuring large, moss-covered rocks in the foreground and middle ground. The background shows a dense forest of tall, thin trees. A large, semi-transparent geometric overlay, consisting of several interlocking chevron-like shapes, is positioned on the right side of the image, partially obscuring the forest background.

**Because of their widespread use and presence in a range commercial manufacturing processes or products, PFAS have become widely distributed in the global environment. Regulations and guidance generally focus on groundwater or drinking water, with lesser regulations focusing on PFAS present in soil. PFAS impacts in soil can leach into surface water and groundwater used as drinking water sources. Management and remediation of PFAS impacted soil may therefore be an appropriate measure in order to cost effectively remove or minimize a source of PFAS that is resulting in risk to downgradient receptors, and/or requiring more expensive long term remedial efforts.**



# Various remediation technologies can be applied to manage PFAS-impacted soil.

Arcadis focuses on providing our clients with reliable, safe and cost-effective solutions. Management of soil impacts may include options such as onsite containment, soil washing or off-site disposal to landfill. However, off-site disposal of PFAS-impacted soils at a landfill is becoming increasingly less viable as an option, given that tipping fees are becoming more expensive as PFAS face a hazardous substance designation, and is recognized by many as long term liability.



# — OUR — SOLUTIONS





# Soil treatment technologies are currently being developed for management of PFAS impacted sites, and include:

## **SOIL STABILIZATION**

Stabilization of PFAS in soil can be achieved by applying fixing agents such as organoclays, activated carbon, or other proprietary soil amendments. Stabilization can reduce or prevent PFAS leaching from soil, effectively minimizing the risk factor related to disposing (unstabilized) soils off site in a landfill, or managing them on site in a containment strategy.



## **SOIL WASHING**

Soil washing is a separation process that employs a range of physical and chemical techniques to remove PFAS impacts from soil. Washing is done by transferring PFAS into the liquid phase, where it can be more readily treated or concentrated using a variety of water treatment technologies. Once treated, the washed soil may then be suitable for reuse.

## **ONSITE MANAGEMENT / CONTAINMENT OPTIONS**

Regulatory hierarchy of management options for soils usually prefer onsite management options before offsite treatment or disposal. Onsite options could take the form of onsite caps and/or containment cells.

Arcadis engineers and scientists have extensive experience in the design and construction of caps and containment cells that can be used in conjunction with the above treatment options.

## **ONSITE THERMAL TREATMENT**

Multiple thermal treatment options are available for the management of PFAS in soil that can be used onsite. Some commercially offered techniques subject soil in onsite treatment unit to an elevated temperature, desorbing the PFAS into a separate phase such as a vapor or liquid. The PFAS concentrate can then be thermally destroyed at an even higher temperature or disposed.





# THE ARCADIS STORY

Arcadis has a long history of management and remediation of PFAS impacts, starting over 14 years ago with our first projects in Belgium, Germany and the UK. Arcadis now has **more than 400 projects** in **12 countries**. Our expert team consists of **over 100 innovators**, including chemists, toxicologists, hydrogeologists, geologists, risk assessors and remediation engineers.

Arcadis is the leading global Design & Consultancy organization for natural and built assets, tracing its roots back to the Association for Wasteland Redevelopment in the Netherlands in 1888. Applying our deep market sector insights and collective design, consultancy, engineering, project and management services, **we work to deliver exceptional and sustainable outcomes.**

**With over 27,000 people in over 70 countries and a generated €3.3 billion in revenue, Arcadis' rich history lends the perfect foundation for the innovative solutions we have now become renowned for.**

**27,000**  
**PEOPLE**





**WE WORK  
TO DELIVER  
EXCEPTIONAL  
— & —  
SUSTAINABLE  
OUTCOMES**

**70**

**COUNTRIES**

**€3.3**

**BILLION IN REVENUE**



# MINIMISE YOUR IMPACT TODAY

Jeff Burdick

Global Leader Site Evaluation and Restoration

[Jeff.Burdick@arcadis.com](mailto:Jeff.Burdick@arcadis.com)

T: +(267) 685 1804 | M: +61(0) 215 375 4879

[www.arcadis.com](http://www.arcadis.com)