



PFAS remediation

Biopolymer-enhanced elution
and immobilization



Who are we?

We are your competent partners, specialized in soil and groundwater remediation with a focus on PFAS contamination.

With the **20 years of experience** in the field of site investigation and remediation of environmental contaminations, **Sensatec** is proud to be one of the market leaders in Central Europe.

The **GreenSoil Group** is the leading expert in sustainable soil remediation. They have more than **15 years of experience with over 30 pollutants** and maintain worldwide cooperation partnerships with various organizations for the implementation of remediation projects.

Let's **revitalize our environment** together, so feel free to contact us for a non-binding project inquiry.

What are PFAS?

PFAS, or per- and polyfluorinated alkyl substances, are a group of **chemicals** used in many everyday products.

They are known to be **mutually hydro- and lipophobic (stain-resistant)**, which is why they are used in products such as coated pans, outdoor clothing, fast food packaging and fire-fighting foams.

The environmental fate of PFAS is dependent on their properties. PFAS are very stable and accumulate in the environment and the human body. Due to their longevity and their adverse health effects, PFAS are referred to as “forever chemicals”.

Strategic Partnership

Since 2023, GreenSoil and Sensatec have joined forces in a strategic partnership focused on the treatment of PFAS-contaminated soil and groundwater.

Sensatec brings cutting-edge expertise in biopolymer-based remediation technologies, along with a strong track record in the development and execution of in-situ remediation solutions.

GreenSoil complements this with deep experience in both on-site and in-situ remediation, as well as groundwater treatment across a wide range of projects.

With non-overlapping geographic footprints and highly complementary capabilities, this collaboration enables us to expand our reach, enhance our shared knowledge base, and deliver innovative, site-specific remediation solutions. Together, we offer a stronger, more comprehensive service portfolio to meet the growing demand for PFAS treatment.

Tailored Expertise for Every Project.

Depending on the specific needs of each remediation project, both partners contribute targeted expertise to ensure successful outcomes — from concept to completion.

Services Sensatec

- **Site investigation**

Extensive experience in the technical implementation of site investigations using drilling technology

- **Feasibility studies in the laboratory**

Knowledge from numerous laboratory feasibility studies on the remediation of PFAS contaminated soils and groundwater

- **Site-specific remediation plan**

Realization of technical remediation planning and support in the preparation of necessary permits

- **Remediation techniques**

Biopolymer-enhanced PFAS elution from contaminated soils and/or permanent immobilization of residual PFAS contamination in the soil

Services Sensatec

- **Business Development & Sales Support**
Identifying suitable remediation opportunities and preparing tailored proposals
- **Project Management**
Full project coordination and execution
- **Site Management**
Overseeing all soil handling and treatment activities, particularly in on-site remediation projects
- **Water Treatment**
Managing the treatment of leachate and process water generated from both in-situ and on-site remediation operations.

Methods

- In-situ elution
- On-site elution
- In-situ/on-site immobilization

Definition

Biopolymere

- Surface-active substances
- Readily biodegradable
- Amphiphilic
- Main components: Amino acids, sugar compounds, fatty acids and lipids

Elution

- Dissolving, removing or displacing adsorbed substances from adsorbents or ion exchangers or in this case soil particles

Adsorbentia

- Solids to whose surface molecules/atoms from a liquid or gas adhere
- Surface adhesion is caused by physical or chemical forces

In-situ elution

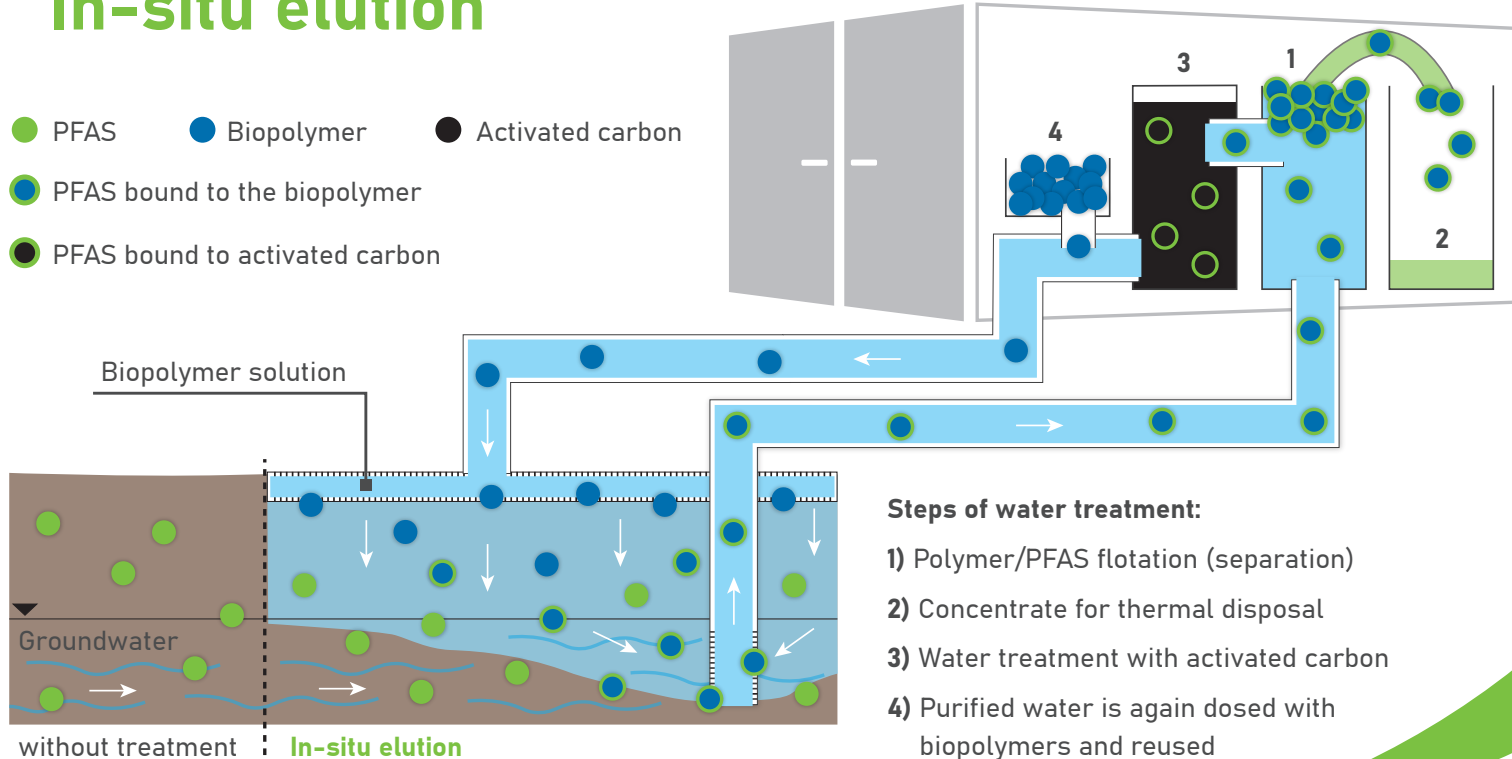
In this process, the **contaminated soil is flushed with an aqueous biopolymer solution**. The PFAS are hereby transferred from the soil particles into the aqueous solution, thus cleaning the contaminated soil. The PFAS eluted into the groundwater are then fully removed using one or more extraction wells. The resulting process water with a high PFAS content is purified in a special water treatment plant.

The waste product of the water treatment, the PFAS concentrate, is ultimately thermally destroyed so that the **PFAS are completely removed from the natural cycle**. The purified water can then be recycled in the elution process for e.g. irrigation.

See diagram on the next slide.

In-situ elution

- PFAS
- Biopolymer
- Activated carbon
- PFAS bound to the biopolymer
- PFAS bound to activated carbon



On-site elution

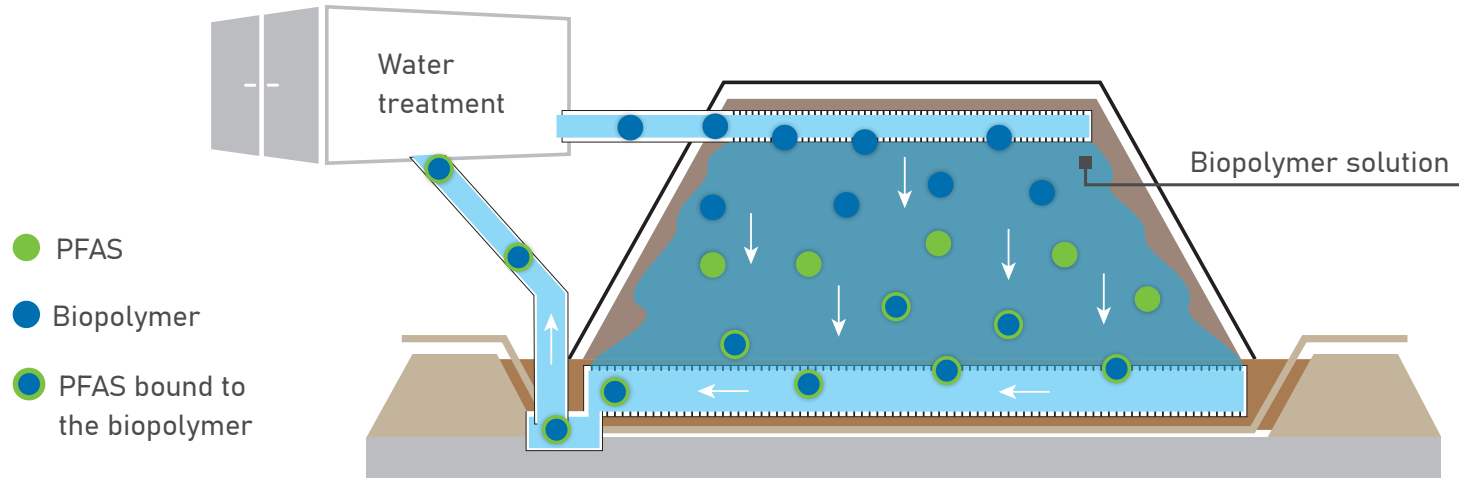
This method follows the **same leaching principle as in the in-situ elution**, but here the **contaminated soil is excavated first**.

The excavated material is assembled in soil piles on a sealed surface. The piles have a height of approx. 2-3 m and are equipped with irrigation tubes, a central water collection system as well as sensors for remote monitoring. Operation is largely automatic. Biopolymer solution is continuously applied to the pile through the irrigation system. By passing the contaminated soil the biopolymer solution takes up the PFAS and is hence cleaning the soil.

The PFAS-containing washing solution is collected, purified and then returned to the cycle with biopolymers. The process is carried out until the PFAS concentration in the soil has reached target levels.

See diagram on the next slide.

On-site elution



In-situ/on-site immobilization

When applying immobilization techniques, PFAS are bound directly in-situ or on-site to permanently **stop them from mobilizing into the water phase or spreading with the groundwater**. High-performance PFAS adsorbents such as specially activated carbons are used for this purpose.

In the on-site application the activated carbon is simply mixed with the contaminated soil. For the in-situ application however, we utilize our specially developed **TSE®** (=targeted solids emplacement) technology.

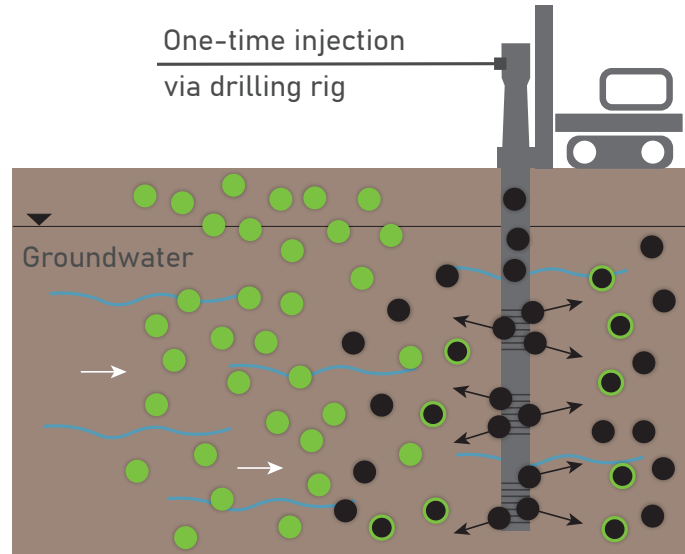
The TSE® technology enables the targeted injection of granular activated carbon directly into the subsoil, regardless of its hydraulic absorption capacity. The injection of the activated carbon in a highly viscous suspension enables large ranges and input quantities.

The in-situ immobilization is best combined with the biopolymer-enhanced in-situ elution to treat the source zone. **The combination of both techniques offers the greatest possible process reliability for in-situ treatment.**

See diagram on the next slide.

In-situ/on-site immobilization

- PFAS
- Activated carbon
- Bound PFAS



**Feel free to contact us
for a non-binding project inquiry!**



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