



**With a Focus on Ecology**

**Geosynthetic Solutions for Environmental Engineering**

**# HUESKER**  
Ideen. Ingenieure. Innovationen.

We will find

# the Solution



Reliable performance, cost-effectiveness, sustainability: these are the three pivotal factors in environmental engineering.

And that is why delivering solutions that match with these criteria is the top priority for HUESKER's engineers. Whatever the challenge – whether in landfill construction, contaminated site remediation, groundwater protection, sludge dewatering or liquid storage – every product that we develop and every project that we handle must fulfil its designated purpose over a long period of time, while at the same time remaining cost-effective and eco-friendly.

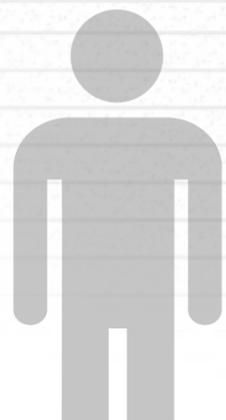
## Engineering Excellence

HUESKER has been setting new standards in the field of environmental engineering for some 40 years. Our internationally networked team includes professionals who specialize in a wide variety of applications. This wealth of engineering specialise enables us to find solutions to virtually every problem.

### We offer

- Advice on complex questions and issues
- Support in the technical design of structures
- Site inspections aimed at design optimisation
- Our engineering expertise and knowledge

At HUESKER, every  
**7<sup>th</sup> employee is  
an engineer**



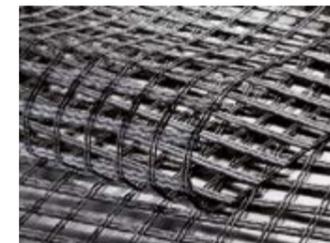
## Product Excellence

Sealing, protection, reinforcement, drainage – these are just some of the key functions performed by geosynthetics in environmental engineering. Boasting a 150-year-plus track record in textile production, HUESKER now ranks among the world's market leaders in the geotextile sector. We capitalise on this know-how every day in the manufacture of our products.

HUESKER offers a broad assortment of premium-quality geosynthetic products for environmental engineering. These include geogrids, geosynthetic clay liners, protective and separating nonwovens, active geo-composites and sand mats.

### We offer a globally unique portfolio

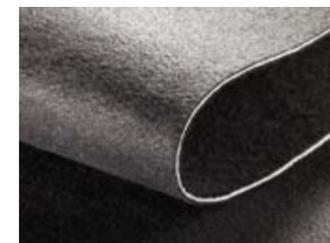
- Wide range of special products
- Large selection of raw materials
- Custom-manufacture of project-specific solutions
- All necessary environmental engineering certifications
- Fully co-ordinated systems



Fortrac®



Fortrac® 3D



Tektoseal® Active



Drainage mat



Tektoseal® Clay



NaBento®



HaTe® nonwoven



SoilTain®

# Environmental Engineering

## Your Requirements

on technical solutions

### Reliable Performance

Dependable environmental protection through engineering solutions at the cutting edge of science and technology

### Cost-Effectiveness

Efficiency through rational deployment of precious financial and natural resources

### Sustainability

Future compatibility of all works through targeted promotion of natural regeneration capacity of systems

**HUESKER** meets  
the highest demands



## Our Specialties

in environmental engineering

### Landfill construction

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Global waste production will continue to grow until 2075 – and with it the need for eco-efficient landfill capacity. We are experts in the sealing of landfill bodies and offer certified solutions for landfill construction.

### Remediation

Page 12

Numerous disused brownfields sites pose a serious ecological challenge. HUESKER's geosynthetic products offer protection where it is not feasible to decontaminate or relocate the affected soil.

### Groundwater protection

Page 16

Groundwater accounts for over 90% of readily accessible global fresh-water reserves. Each year an estimated 650 cubic kilometres are extracted. HUESKER's wide-ranging barrier products protect this vital drinking water supply from contaminants in polluted surface water and leachate.

### Dewatering

Page 20

Eco-friendly disposal is needed not only for industrial, mining and sewage plant sludge, but also for large volumes of waterlogged sediment. SoilTain Dewatering Tubes provide a high-flow solution for sludge dewatering.

### Liquid storage

Page 22

Stormwater storage basins and water reservoirs offer capacity for large water quantities. HUESKER's reliable lining products guarantee the trouble-free storage of water for any length of time.

# Landfill Construction

## Reliable seal

HUESKER's certified landfill capping and lining systems ensure the secure, long-term retention of gas emissions and contaminated leachate.

## Enhanced reliability

Made from hardwearing materials such as PVA and PES, Fortrac geogrids increase the stability of landfill bodies. Particularly when incorporated as intermediate seals, they help to reduce deformation and thus the risk of damage to the lining system. They also form a strong base for the additional compaction of new layers of waste. PVA's exceptional resistance to liquid media (pH values of between 2 and 13) makes it the ideal choice for landfill applications.



## Solutions for every phase

To guarantee the reliable long-term sealing of landfill bodies, HUESKER offers suitable systems for every stage of the process.

## Cover lining systems

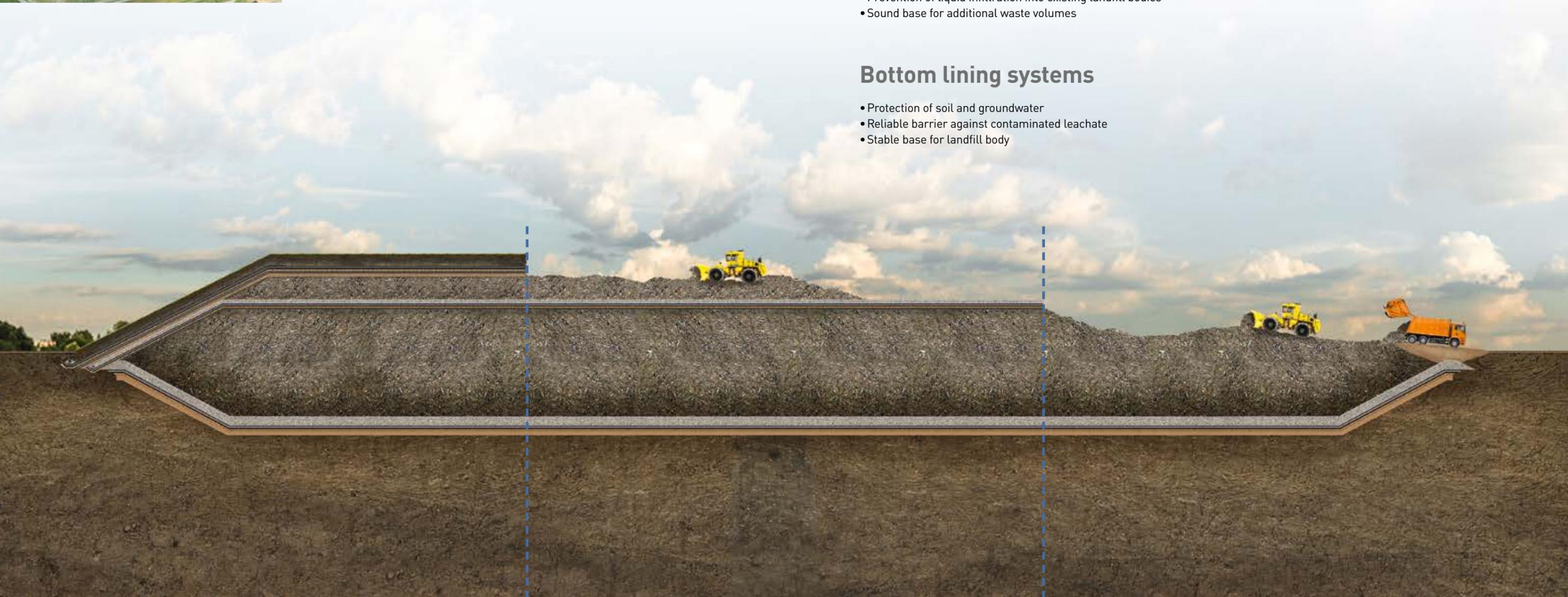
- Prevention of water infiltration and escape of gases
- Lining compliant with all relevant standards and regulations
- Stable base for surface renaturation

## Intermediate sealing systems

- For vertical extension of landfill bodies
- Prevention of liquid infiltration into existing landfill bodies
- Sound base for additional waste volumes

## Bottom lining systems

- Protection of soil and groundwater
- Reliable barrier against contaminated leachate
- Stable base for landfill body



# Our Service Range

Landfills place a variety of demands on sealing systems. Hence the importance of using the correct combination of materials – particularly given that these interact. We would be happy to advise you in the selection of the most suitable products from our fully co-ordinated geosynthetics and systems.



## Structure of cover lining

- Soil cover
- Fortrac** (reinforcement grid for steep slopes)
- Drainage mat** (gravel plus HaTe protective nonwoven as alternative)
- Geomembrane**
- Tektoseal Clay / NaBento** (substitute for mineral components)
- Drainage mat** (gas-permeable regulating layer)
- Regulating layer**

## Structure of intermediate seal

- HaTe separating nonwoven**
- Drainage layer**
- Fortrac** (reinforcement grid for steep slopes)
- HaTe nonwoven** (possibly with sand; Tektoseal Sand as alternative)
- Geomembrane**
- Tektoseal Clay / NaBento** (substitute for mineral components)
- Fortrac** (reinforcement grid to offset settlement)

## Structure of bottom lining

- HaTe nonwoven**
- Drainage layer**
- Fortrac** (reinforcement grid for steep slopes)
- HaTe nonwoven** (possibly with sand; Tektoseal Sand as alternative)
- Geomembrane**
- Tektoseal Clay / NaBento** (substitute for mineral components)
- Mineral liner**

# Application Example

## Hettegger landfill

Work at the Hettegger landfill site in St. Veit, Austria, was initiated to improve the inadequate sealing performance and replace the cover lining with a sealing system manufactured by HUESKER. A system consisting of a geosynthetic clay liner, drainage mat and geogrid was installed. The computational permeability was reduced from  $1 \times 10^{-9}$  m/s to  $7 \times 10^{-11}$  m/s with a layer thickness of 90 cm compared to the previously installed solution.

### FACTS

- 90 cm lower layer thickness
- Non-slip reinforcement on slopes
- Reduction in permeability



# Application Example

## Schönsee landfill

Remediation of the cover lining at the „An der Eslarner Straße“ landfill in the Bavarian town of Schönsee was necessitated by the high levels of leachate contamination brought about by rainwater percolation. The new lining system featured a combination of NaBento geosynthetic clay liners with HaTe nonwovens and drainage mats. Following renaturation of the new cover lining, the former landfill now blends well within the landscape setting.

### FACTS

- Successful remediation with NaBento
- Combination of various geosynthetics
- On-time completion



# Vertical Toe Wall

One striking innovation involves the use of Geosynthetic-Reinforced Soil (GRS) to construct a toe wall at the foot of landfill slopes. This allows landfill bodies to be located closer to the site boundary, thereby creating extra capacity. Here, HUESKER's environmental engineering team and you, as our customer, can benefit from the company's wealth of experience with GRS in Earthworks and Foundations.

## Geosynthetic-Reinforced Soil

Slope stabilisation represents one of the most typical and challenging tasks facing engineers. HUESKER's Geosynthetic-Reinforced Soil (GRS) systems offer cost-effective solutions that combine wide-ranging design options with high stability and rapid on site installation. They allow the trouble free construction of extra steep, settlement resistant slopes. Naturally enough, HUESKER also applies the experience gathered from hundreds of GRS structures worldwide to its landfill projects.



Up to **90°** steep toe wall



# Increased Landfill Capacity

## Steeper slope

Fortrac reinforcement grids enable you to build steeper slopes and thus free up additional landfill capacity. For a final height of 30 m, an increase in slope inclination from 1:3 to 1:2 translates into approx. 450 m<sup>3</sup> extra cubage per metre landfill length.

**Plus 450 m<sup>3</sup>**  
per metre  
landfill length

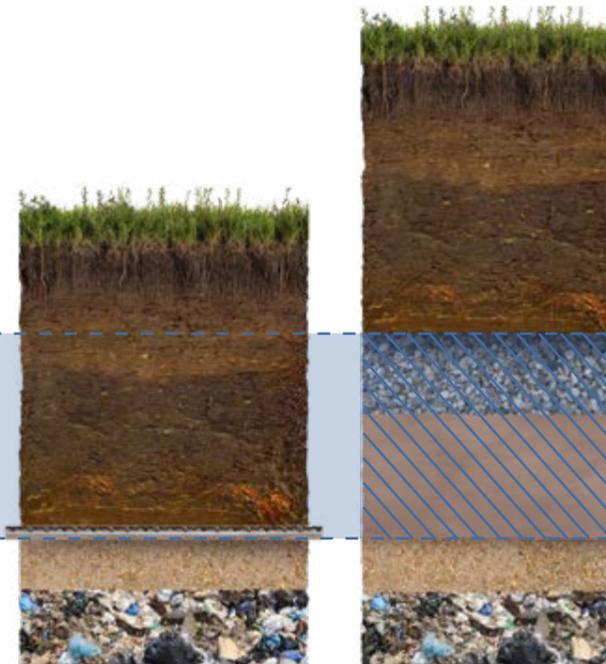


## More slender layer structure

In certain areas, the mineral system components can be replaced by HUESKER's Tektoseal Clay and NaBento Geosynthetic Clay Liners and drainage mats, thus creating extra capacity for waste in the landfill body.

Savings equal to  
**38.500 m<sup>3</sup>** of material  
and 3,900 truckloads

Example: Hettegger landfill (approx. 3.5 ha landfill area)



# Remediation

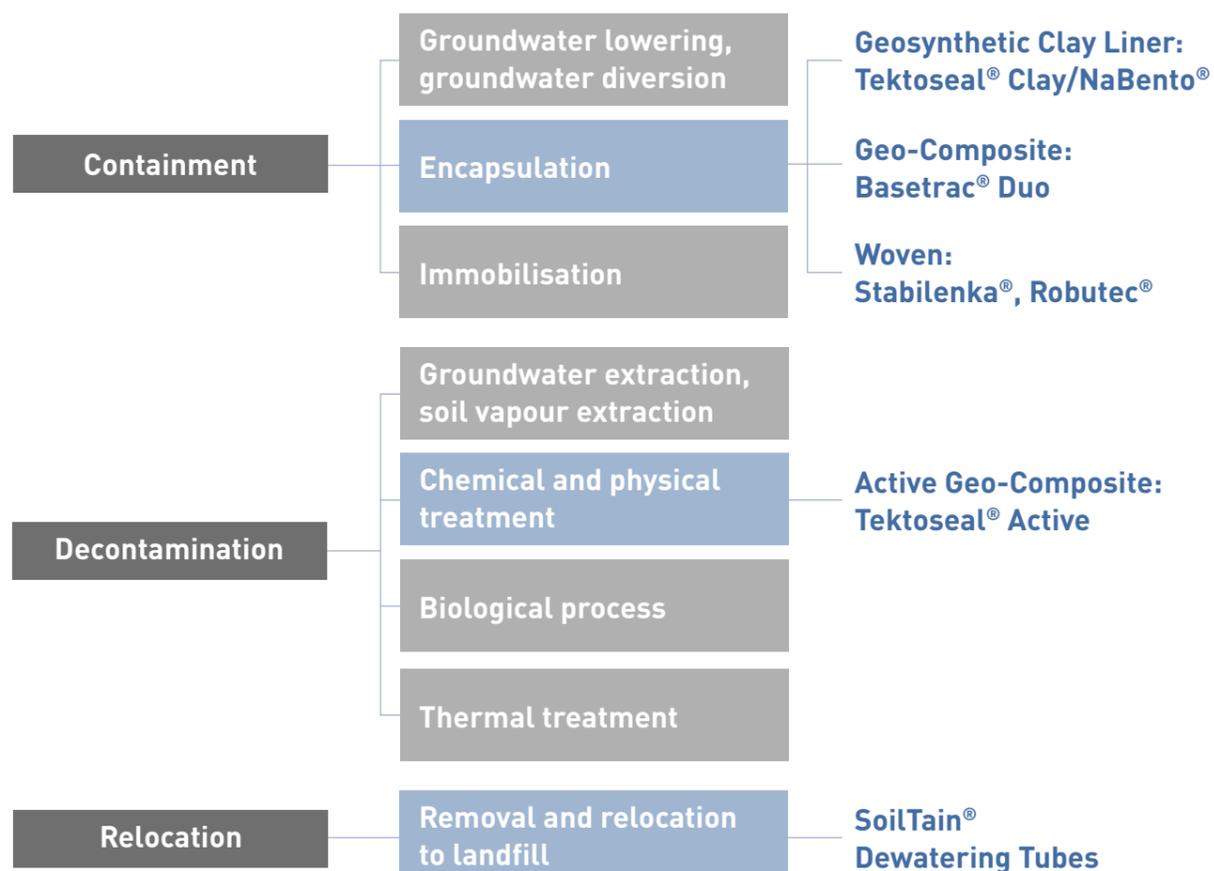
## Containment measures

Remediation projects set out to provide long-term protection for humans and the natural environment by combating urgent risks at sites which, in some cases, are assigned to be reused.

There are essentially three types of solution. In the case of relocation, the contaminated soil is removed and transported to a landfill site. Alternatively, various decontamination measures can be implemented or appropriate precautions – such as encapsulation – taken to limit or prevent the spread of contaminants.

HUESKER's established and innovative containment solutions permanently reduce or halt the dissemination of diverse contaminants by means of absorption or encapsulation.

## Measures for treating contaminated sites



## Sludge Lagoon Remediation

HUESKER offers a variety of geotextile products for capping, stabilizing and overlaying extremely soft, contaminated subgrades. By covering over or encapsulating the sludge, they prevent the escape of contaminants and odours into the air. After remediation, the relevant sites can be operated freely and repurposed.



## Application Example

### Bitterfeld-South sewage sludge lagoons

Geosynthetic products and soil were used to cap two large sludge lagoons on the industrial estate in the town of Bitterfeld in eastern Germany. Up to 6 m deep, with a surface area of 16,000 m<sup>2</sup> and 18,000 m<sup>2</sup>, the lagoons were capped by geotextile panels measuring 220 x 80 m. Each panel was stitched together on site within two days and then pulled over the lagoon in only 20 minutes. The renaturation was then completed through the placement of cover soil.

#### FACTS

- Extremely short time required for capping operation
- High chemical resistance of PVA
- Avoidance of single-sheet laying



# Industrial Wastelands

On industrial site remediation projects, HUESKER's capping systems not only fulfil a sealing and drainage function, but also play a structural role by creating a homogenous geosynthetic foundation level.

## System structure



- Topsoil**
- Drainage mat** (gravel plus HaTe protective nonwoven as alternative)
- Geomembrane**
- Tektoseal Clay / NaBento** (substitute for mineral components)
- Sand/gravel soil**
- Tektoseal Active** (adsorption of contaminants)
- Regulating layer**
- Fortrac** (reinforcement grid)

## Benefits of remediation

The commercial redevelopment of remediated industrial wastelands has obvious advantages in that the reuse of brownfield sites reduces the take-up of greenfield land. Any contaminated areas are environmentally managed as is required.



# Active Capping of Waterbody Beds

Decontamination or relocation is often difficult in cases where contaminated soil lies at the bottom of a waterbody. To reduce the release of contaminants into the water, a filter layer comprising Active Geo-Composites can be used to cover the waterbody bed.

The Active Geo-Composites from the Tektoseal Active product family make the capping of waterbody beds extremely simple, safe and reliable. The resulting separating and filter layer offers high mechanical stability and a uniformly thick layer of active substances. This solution provides an effective substitute for expensive, difficult-to-install mineral barriers.

## Nonwoven

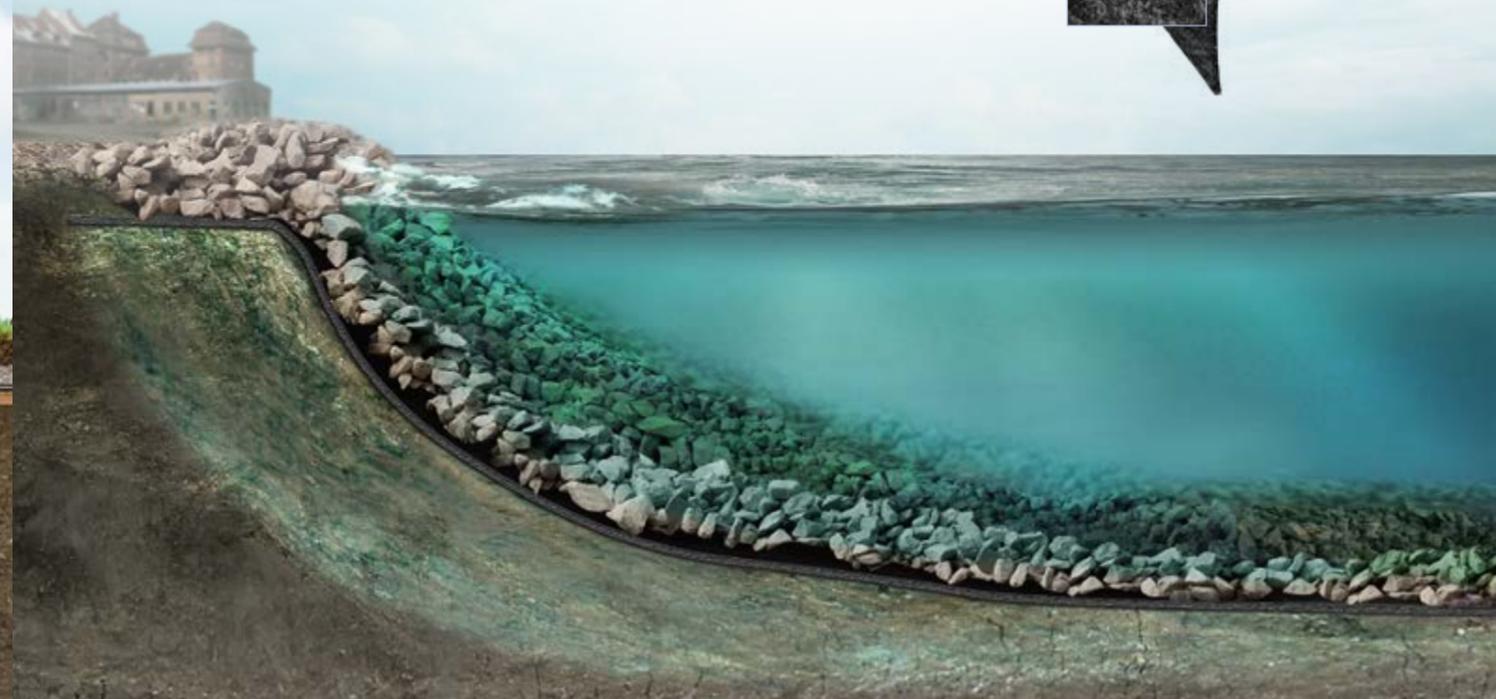
Straightforward installation thanks to polyester material with a greater density per unit area than water

## Activated carbon

Binds wide range of contaminants

## Nonwoven or woven

Can be additionally reinforced by geogrids



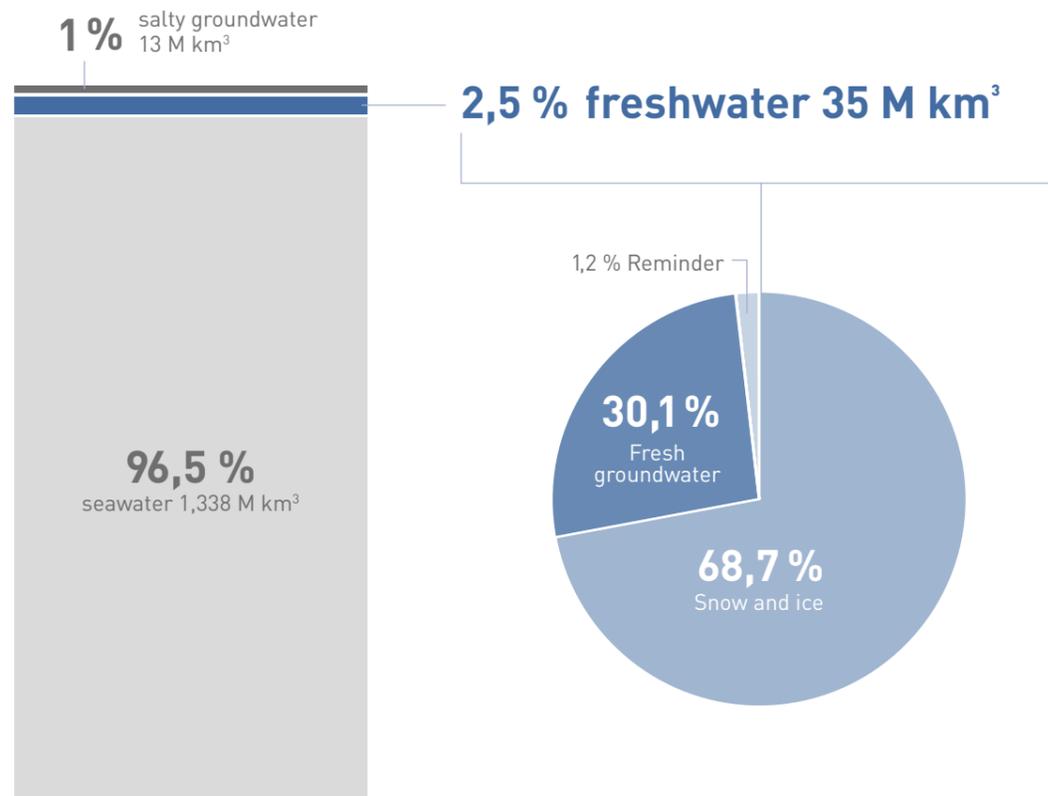
# Groundwater Protection

## Barrier to contaminants

Freshwater accounts for a mere 2.5% of global water resources. With two-thirds bound in ice and only one-third available as groundwater, freshwater is in relatively short supply. It is also subject to increasing contamination by agriculture, industry, transport and individual sources of pollution, such as disused sites and landfills.

The seepage of precipitation can leach contaminants into the groundwater and pollute drinking water reservoirs. By forming a reliable barrier against leachate and contaminants, Tektoseal products help to maintain the purity of groundwater.

## Water resources worldwide



[according to UNESCO]

## Infrastructure Engineering

Precipitation falling on roads, railway lines and airport pavements absorbs contaminants from the hard surfaces. Hence the need to collect and drain off surface water via side channels. The Tektoseal Clay liner can be used to provide a reliable seal for the subgrade below the base course.

### System structure

**Drainage mat** (gravel plus HaTe protective nonwoven as alternative)

**Tektoseal Clay**



# Landscape Construction

Where neither the decontamination nor the relocation of polluted soil offers a cost-effective solution, this material can also be integrated in landscaping works such as noise bunds. HUESKER offers a wide range of geosynthetic products purpose-developed for the reliable containment of contaminated soil.

## System structure



- Vegetation**
- Fortrac 3D** (erosion control grid)
- Topsoil** (uncontaminated)
- Fortrac** (reinforcement grid for steep slopes)
- Drainage mat** (gravel plus HaTe protective nonwoven as alternative)
- Tektoseal Clay**
- Soil** (possibly contaminated)

## Tektoseal solutions to meet all demands

Our engineers will be glad to provide you with project-specific advice – after all, no two landscaping structures are identical. At design stage, it is important to remember that different approval procedures apply for different types of infrastructure projects. We will help you to select a suitable geotextile product which is approved under the relevant regulations.



# Oil Absorption

A single litre of oil can contaminate many thousands of litres of ground-water. The risk of such contamination is particularly acute whenever machinery is used or maintained on unpaved ground. HUESKER's new Geo-Composites contain active components that reliably absorb contaminants such as oil. Being supplied in rolls, Tektoseal Active products are easy to lay and subsequently remove for disposal.

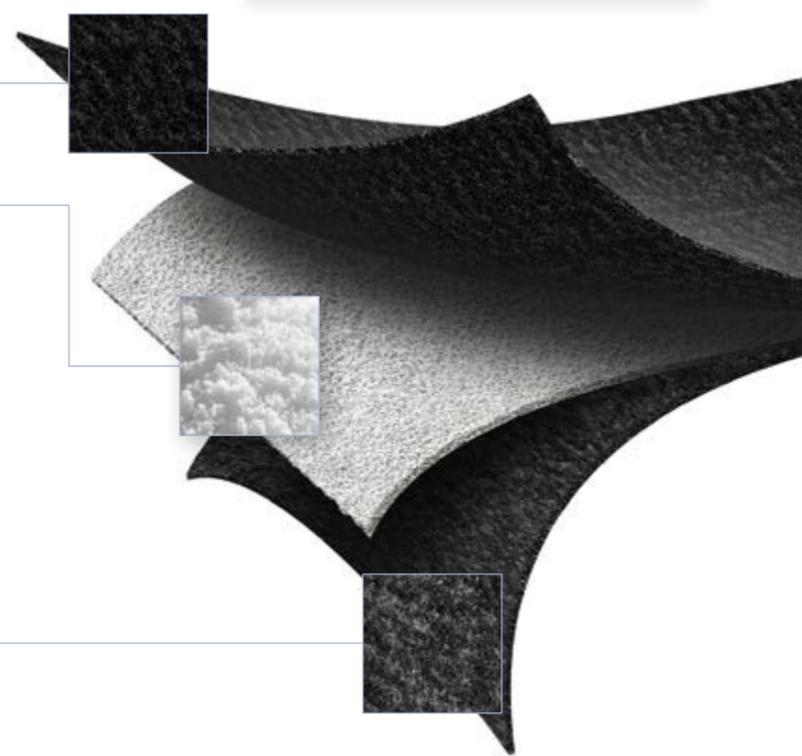
- APPLICATIONS**

  - Preventive oil barrier for ground-water protection
  - Oil barrier in track beds
  - Oil barrier for temporary parking areas
  - Oil barrier for transportable tanks
  - Barrier curtain in water
  - Oil barrier on water surface
  - Absorption mat for workshops and machinery maintenance
  - Oil barrier for traffic, transport and industrial accidents

**Nonwoven**  
Made from Polypropylene or Polyester

**Oil-absorbent polymer**  
Particularly suitable for oil-water separation

**Nonwoven or woven**  
Can be additionally reinforced by geogrids



# Dewatering

## SoilTain Dewatering Tubes

The direct removal of waterlogged sediments and residues from mines, industrial plants, construction sites and sewage works often involves high cost and effort. It therefore tends to be more economical to dewater the sludge prior to any disposal operation.

By providing a fast and economical means of sludge dewatering, SoilTain dewatering tubes can provide the ideal solution. The large-format tubes offer high process capacity and dewatering performance while occupying relatively little area. The tubes can also be used for the permanent containment of the dewatered sludge cake.

### Advantages of SoilTain

- Rapid dewatering within a short period
- Flexible filling capacity through variation of tube size and tube number
- High resource efficiency (low energy, capital and labour requirement)
- High dry residue quantity
- Extremely high hourly processing rates
- Handling without the need for any interim storage
- Stackability of tubes
- Sludge encapsulation prevents rewetting
- Tubes are also suitable for permanent containment
- Low area requirement



### Applications

- Sediments
- Mining residuals
- Industrial sludge
- Infrastructural sludge
- Sewage sludge



# Liquid Storage

The reliable long or short-term impoundment of large water quantities requires storage solutions that are eco-friendly and that blend harmoniously with the landscape.

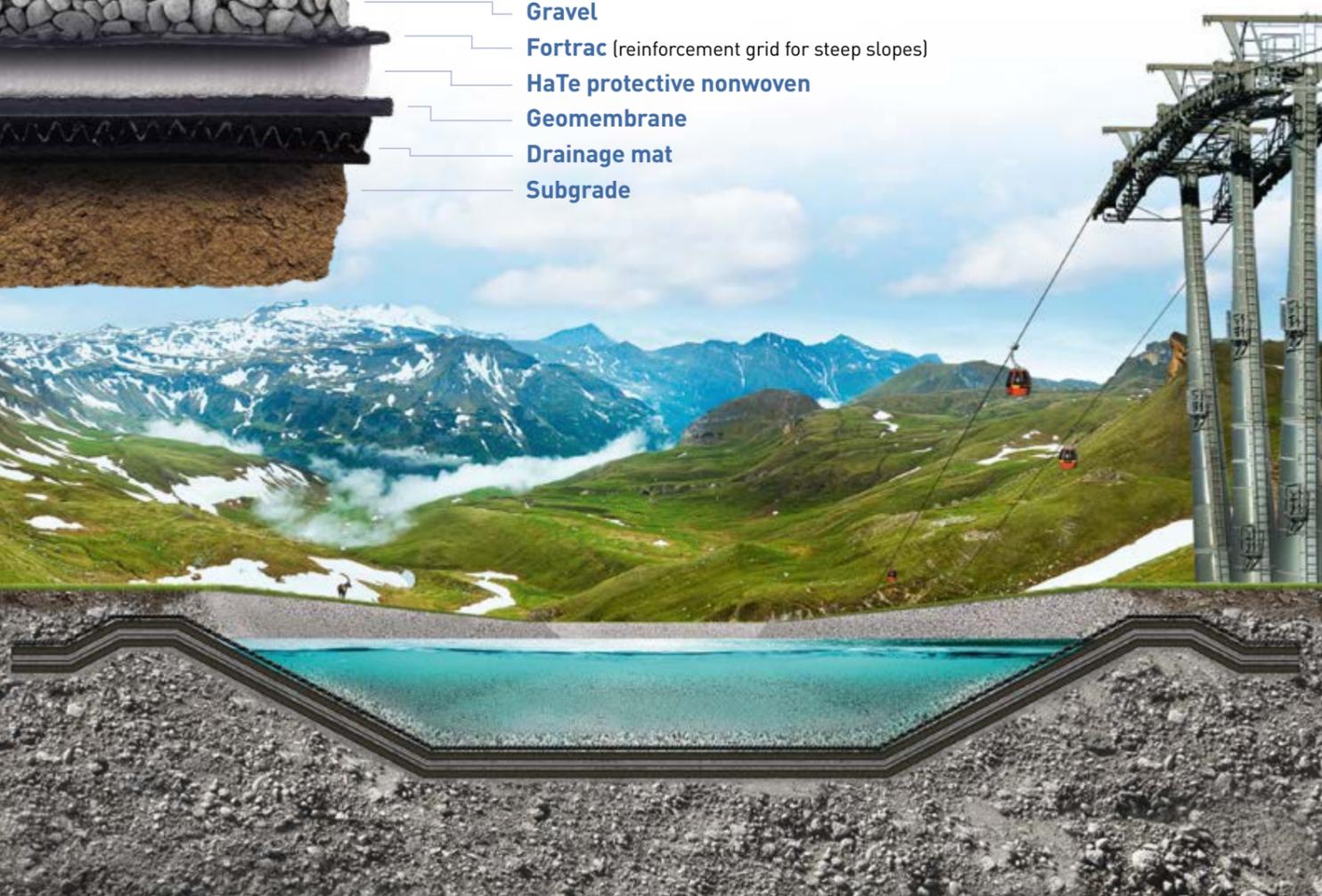
## Water Reservoirs

Reservoirs are artificial storage facilities in which water can be collected and retained over a period of weeks or months until use.

Not only does HUESKER offer geosynthetic products for reservoir linings, our engineers also provide advice and support at the planning and design stage to ensure that the finished facility is fully tailored to the particular geological conditions.

### System structure

- Gravel
- Fortrac (reinforcement grid for steep slopes)
- HaTe protective nonwoven
- Geomembrane
- Drainage mat
- Subgrade

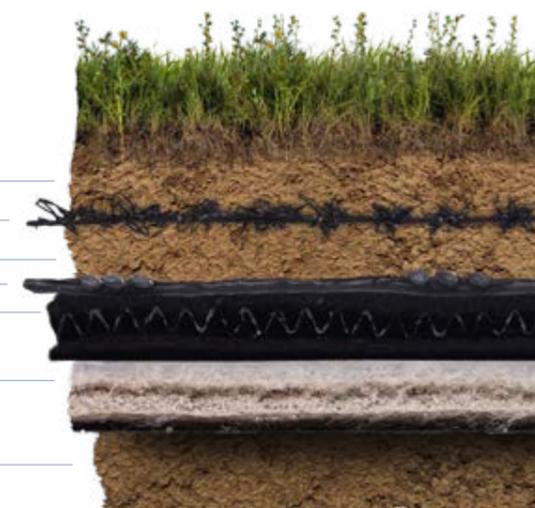


## Stormwater Storage

In case of sudden heavy rainfall, rainwater sewers can be relieved by flooding stormwater holding basins. The impounded water can then be gradually discharged in a controlled fashion from the holding basin into the outfall. Given that the impounded surface water may be contaminated, the basin needs to be lined to protect the groundwater.

### System structure

- Vegetation
- Fortrac 3D (erosion control grid)
- Topsoil
- Fortrac (reinforcement grid for steep slopes)
- Drainage mat (gravel plus HaTe protective nonwoven as alternative)
- Tektoseal Clay
- Subgrade



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HUESKER Synthetic is certified to ISO 9001 and ISO 50001.



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