Capillary barrier for landfill - Construction of a capillary barrier for the surface sealing system of a landfill

LIFE96 ENV/D/000197

Project description

Background

As demonstrated by a number of scientific investigations, capillary barriers are an efficient type of sealing system that can be used as a final cover on landfills and remediation sites. This pilot project, covering two hectares of a sloping section of the landfill at Breinermoor in the German state of Lower Saxony (Niedersachsen), was set up to demonstrate that large-scale capillary barriers will be technologically feasible in a number of landfills in various locations. A capillary barrier consists of two sloping layers. Fine-grained sand is used in the capillary layer, which overlies a coarse-grained layer (the capillary block). The capillary barrier is an innovative sealing system, which exploits the fact that a layer of fine sand has become highly saturated with water from above. Capillary forces counteract the power of gravity and prevent the water in the capillary layer from seeping down into the capillary block. Instead, the water is held just above the interface between the two layers and runs off laterally into a ditch containing a drain at the foot of the slope. In suitable applications, and given the correct choice of materials, a capillary block will provide an efficient surface seal. The capillary barrier effect depends on the relation between the water content, the suction tension of the sand and the hydraulic conduction ability.

Objectives

The project was carried out with two main objectives: · Gather experience on large-scale applications, using a capillary barrier of 2 ha, on the solid waste landfill at Breinermoor. · Prove that the capillary barrier provides sufficient protection with measurements of the seepage carried out at the test field over several years. In the landfill Breinermoor, a pilot demonstration field covering an
area was built as the first part of the surface seal. Particular attention was paid
to the adoption of suitable construction methods, as well as to quality assurance
and quality control. A synthetic liner was laid directly above the capillary barrier,
since combined seals are the legal requirement in Germany. In one part of the 2
ha demonstration field there was a smaller test field with a slope width of 15m.
This field contained a capillary barrier without an overlying synthetic liner, so
that the functional efficiency of this sealing system could be verified.

Results

Capillary barriers are a new type of sealing system with potential for use in solid
waste landfill and remediation sites that have sufficiently steep slopes. A key
benefit of capillary barriers are that they are more reliable in the long term, since
they do not dry out, and they are insensitive to settlement. The key objectives, to
test an alternative capillary barrier system for closed landfills and to gain
technical and economic results for a large-scale application have been achieved.
The technical results of the EU testfield were below expectations: Only in the flat
section of the test field were passable results obtained, with 23 mm
breakthroughs in the year 2000 with an average rainfall of 800 mm. Yet the
breakthroughs were most probably caused by leaks at the edges of the sealing
and will not appear in the large-scale application as there this fault was ruled
out. From the technical and financial point of view, the use of the capillary
barriers could prove to be an advantage to many of the federal states, regional
authorities and commercial landfill operators in Germany. In fact, capillary
barriers could be used in any country where the climatic conditions resemble to
those of Germany.

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Environmental issues addressed:

Themes

Risk management - Pollution control
Waste - End-of-pipe treatment - Landfilling

Keywords

pollution prevention, end-of-pipe technology, landfill

Target EU Legislation

- Waste
- COM(1996)399 - Communication on an updated "Community strategy for
  waste management" (30.07.1996) ...
Natura 2000 sites
Not applicable

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Beneficiaries:

Coordinator: Abfallwirtschaftsbetrieb des Landkreises Leer
Type of organisation: Local authority
Description: The beneficiary, the Abfallwirtschaftsbetrieb Landkreis Leer, is an autonomous operator and performs the duties for the Landkreis Leer concerning public waste management.

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Administrative data:

Project reference: LIFE96 ENV/D/000197
Duration: 27-NOV-1996 to 27-JAN-2002
Total budget: 2,215,682.10 €
EU contribution: 1,107,841.05 €
Project location: Niedersachsen (Deutschland)

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Read more:

Publication:
Title: Bau einer Kapillarsperre im Oberflächenabdichtungssystem einer Deponie
Author: Abfallwirtschaftsbetrieb des Landkreises Leer
Year: 1996
Editor: Abfallwirtschaftsbetrieb des Landkreises Leer
No of pages: 10