

PROJECT

PEREBAR - LONG-TERM PERFORMANCE OF PERMEABLE REACTIVE BARRIERS USED FOR THE REMEDIATION OF CONTAMINATED GROUNDWATER

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DURATION

2000 - 2003

PROJECT TYPE

Research Project within the 5th Framework Programme of the European Union, EVK1-CT-1999-00035

SCOPE

Contaminated land, landfills and sediments pose a serious environmental threat by polluting groundwater in the surrounding area. In 14 European countries contamination caused by uranium represents a particularly serious danger where drinking water resources might be affected. Other heavy metals and organic pollutants can also have a strongly deleterious effect on groundwater. Available technologies (e.g. pump-and-treat) fall short of solving the problem because their performance is not yet adequate for effective remediation. The aim of the project is to elaborate the scientific basis for laboratory and pilot-scale testing of and the practical application of a considerably more efficient and cost-effective in-situ reactive barrier technology targeting the above contaminants. The primary model test site will be an area in Southern Hungary contaminated by uranium mining- thus including a region which is due to become part of the European Union.

OBJECTIVES

The approach taken to meet the project objectives was the characterisation of different reactive materials and relevant attenuation processes in the reactive matrix of the permeable barrier with special respect to their long-term behaviour. The experimental work included laboratory experiments at different scales, going from bench-scale tests up to pilot-scale, and field-scale experiments. Experimental conditions were predetermined by the characteristics of the model site, such as geologic and hydrogeological settings, soil composition, and type, extent and spreading of the contamination. Technological methods to enhance the long-term efficacy and cost-effectiveness of permeable reactive barrier systems were developed and tested under realistic conditions.

MAJOR STEPS

Major steps:

- Selection and characterisation of suitable reactive matrix materials (e.g., zero-valent iron, natural or organophilic zeolites, oxides, phosphates, lime, Mg hydroxide)
- Characterisation of relevant attenuation processes
- Development of contaminant-binding chemical compounds ('ligands')
- Accelerated testing methods to assess the long-term performance of the attenuation mechanisms in PRBs
- Development of a scheme to predict the long-term behaviour of PRBs
- Evaluation of the influence of site characteristics on PRB performance
- Monitoring of existing and new field installations
- Inclusion of electrokinetic techniques to PRB systems
- Field tests

RESULTS AND PRODUCTS

The overall objective of the PEREBAR project was to evaluate and enhance the long-term performance of permeable reactive barrier systems, with focus on systems based on sorption and precipitation of heavy metals and sorption and decomposition of organic compounds, respectively. Processes that impaired the barrier performance during barrier lifetime were studied qualitatively and quantitatively.

The available products are:

- Site Characterisation: Former Uranium Mining and Processing. Site near Pécs, Hungary, and AR&B System, Brunn a. G., Austria (Report)
- Reactive Materials and Attenuation Processes for Permeable Reactive Barriers (Report)
- Properties of Reactive Materials suitable for use in Permeable Reactive Barriers (Report)
- Test Apparatus for Accelerated Testing of Permeable Reactive Material (Report)
- PANSIL - A new material designed to sequester uranium (VI) from contaminated groundwater (Report)
- Metal-sequestering ligand based media for treating contaminated groundwater using porous sequestration barriers (Report)
- Publications: A list of publications produced by the PEREBAR project (Report)
- 'Long-term Performance of Permeable Reactive Barriers', a book containing all major results of the project, was published in 2004 by Elsevier

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PUBLICATIONS

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