

KYT2022-SAFIR2022 Interim Seminar 18.-19.3.2021

SURFACE

Near Surface Disposal in Finland

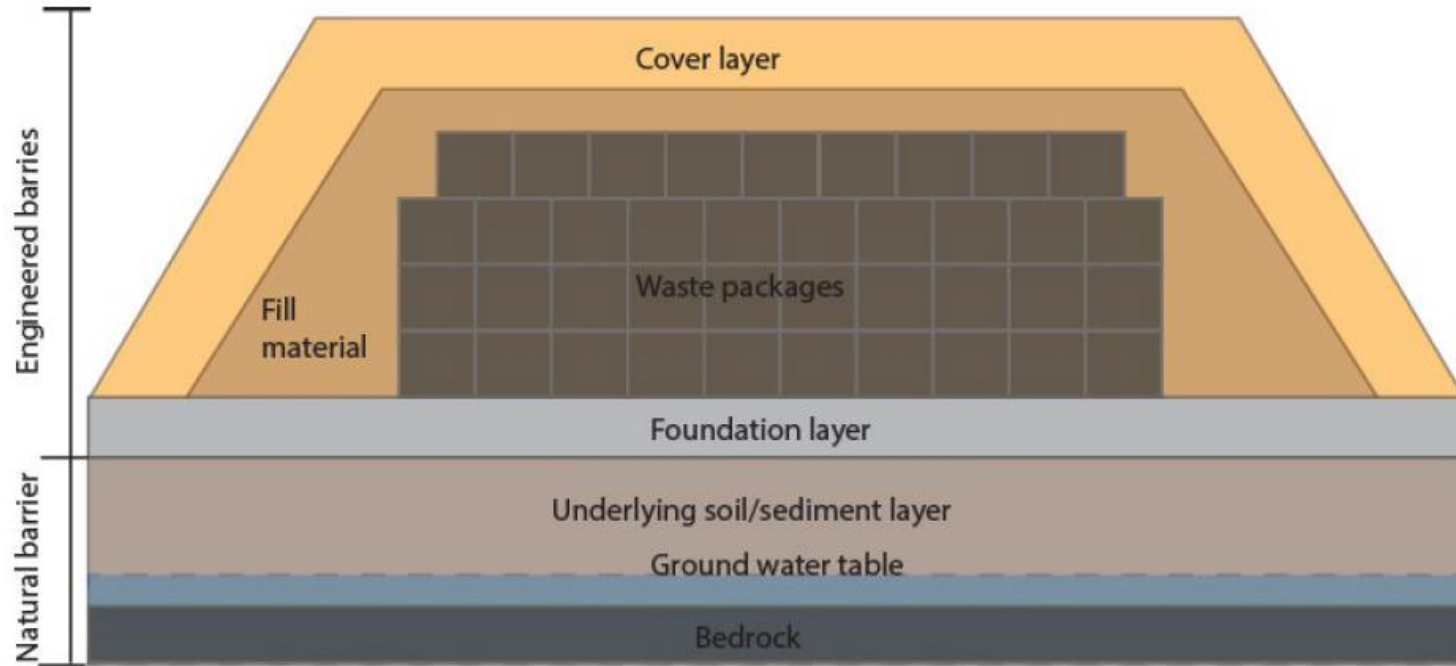
Maaperäloppusijoitus Suomessa

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Project overview

- SURFACE project started in 2019 with the aim to study the applicability of a surface disposal concept in Finland
 - 2019 seminar presentations and VTT technical report VTT-R-00124-20 “Near Surface Repositories in Finland” available at <http://kyt2022.vtt.fi>.
- Finland considers landfill repositories for VLLW (operational waste from NPP’s) following the examples of near surface disposal in Sweden with similar types of waste and geological conditions.

Disposal concept



KYT SURFACE Objectives for Phase 2 and 3

- Task 1: Study the transport and /or potential retention mechanisms, and speciation of key risk-driving radionuclides in selected barrier materials, considering the conditions prevailing in a Finnish near surface repository.
- Task 2: Study the evolution of the waste-form (focusing on corrosion, microbial activity, organic matter degradation, and gas evolution) under the conditions that would prevail in a Finnish near surface repository.
- Task 3: Study the performance of the selected near surface disposal concept and engineered barriers. Give recommendations for the design.

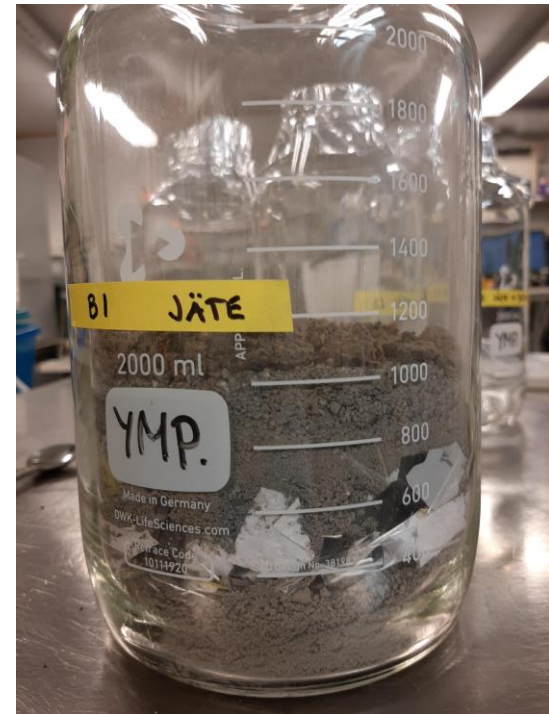
Task 1. Column tests for radionuclide transport & behaviour

- Columns filled with either:
 - Fill material (rock flour)
 - Mineral sealing material (6% bentonite)
- Steel chips also added in subset of columns (representative of waste packages / materials);
 - Radionuclides of interest (2020): ^{90}Sr and ^{36}Cl ;
 - Pumped into columns at a constant rate in synthetic rainwater, which has been formulated to be representative of host region.



Task 2: Biodegradation of waste and steel corrosion

- Biodegradation of the waste and gas generation
- Corrosion rate of carbon steel
- Experimental set-up:
 - Gas head space;
 - Water: simulated rainwater + soil extract;
 - Mineral sealing material (bentonite 6% and crushed rock);
 - Fill material (rock flour);
 - “Waste drums” including simulated waste and carbon steel coupons;
 - Aged concrete.



Task 3: Performance of Engineered Barriers

- Geotechnical characterisation of the test materials.
- Analysis on performance of engineered barriers based on numerical modelling and laboratory testing.
- Studies on effect of near surface processes (e.g. freezing and drying) on performance of mineral sealing materials.
- Discuss design basis and safety functions.
- Give recommendations for the design, implementation, operation and monitoring of the repository.
- Interim report from task 3 "Performance of a Landfill-Type Near Surface Repository" available at <http://kyt2022.vtt.fi>.

Bentonite content of the mixture (%)	Dry density (kg/m ³)	Dry density, kN/m ³	Hydraulic conductivity (m/s)
6	1860	18.56	5.9x10 ⁻¹⁰
8	1870	18.67	3.3x10 ⁻¹⁰
10	1880	18.79	1.9x10 ⁻¹⁰

Continuation of the work

- Data continues to be collected from Task 1 and 2 and will be available later this year.
- Laboratory analysis and numerical modelling in task 3 will focus on effect of surface processes on the performance of barriers.
- Design recommendations updated based on the new data gained in 2020-2021.
- New seminar planned for October-November 2021.

Welcome!