

# Structural drainage

Basement Drainage, Cavidrain, Dounreay Nuclear Decommissioning, UK



## Project Description

Decommissioning of Dounreay is Europe's largest nuclear site closure project. A key part of the decommissioning was the requirement for a facility in which to dispose and safely store 175,000 m<sup>3</sup> of solid low level waste (LLW) expected to be generated during the clean-out and dismantling of the nuclear reactors. A study was commissioned to identify the best practicable environmental option for the new waste facility.

## The Challenge

The radioactive material had to be kept safe for 300 years by which time 95% of the radioactivity will have decayed. An on-site facility was preferred because it avoided the need to transport radioactive material on public roads. Many factors were considered to select a location that had no significant risk of coastal erosion or flooding, avoided geological fault zones, did not affect protected species and would not impact on the ground water. Extensive technical studies, an environmental impact assessment (EIA) and site investigation (SI) led to planning permission for an underground facility.

Graham Construction was awarded the contract to design and build two vaults at a cost of £20M. The vaults are 11m deep, 80m long and 50m wide and involved the excavation of 278,212 m<sup>3</sup> of rock, 51,073 m<sup>3</sup> of subsoil and 31,143 m<sup>3</sup> of topsoil disposed to landfill on site. The concrete vaults are designed to optimise durability and delay the ingress of groundwater. A total of 7600 m<sup>3</sup> of concrete and 1,330 tonnes of reinforcement were used.

## Project Information

Client Nuclear Decommissioning Authority

Contractor Graham Construction

Consultant I&H Brown & Mott MacDonald

Products Cavidrain Std S20U

Quantity 9,000m<sup>2</sup>

Benefits

- High flow capacity in all directions
- Rapid installation
- Proven and reliable system



Cavidrain Std

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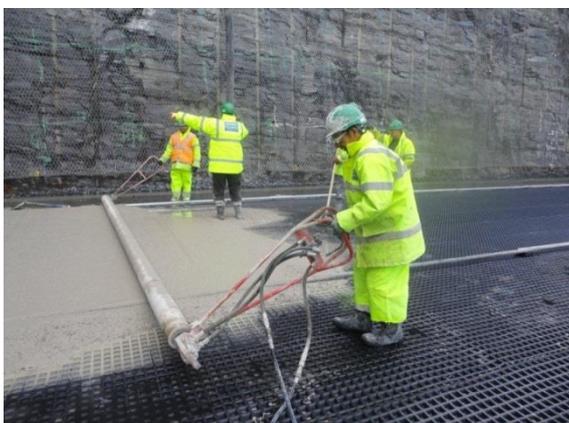


## The Solution

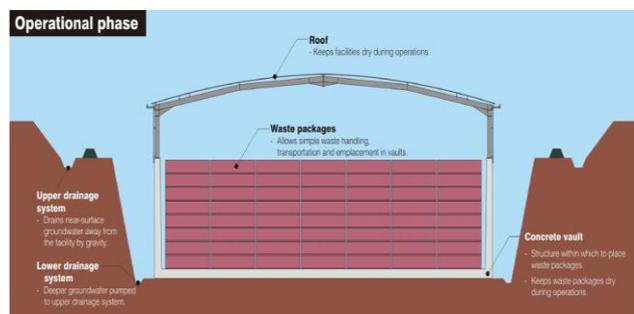
Two features of the design are key to the containment. First, the packaging, backfill and concrete structure restrict groundwater flow through the LLW. The LLW is packed in drums and approx. 200 drums are packed into freight containers, which are then pressure grouted before moving into the storage vault. Secondly, the concrete alters the chemical conditions such that it binds the radionuclides to the concrete to minimise leaching. The concrete walls, floor slab and roof are 500mm thick and an air gap is maintained externally around them. This is achieved under the concrete floor slab by means of **Cavidrain**. **Cavidrain** is an HDPE cusped void former with an impermeable upper surface onto which the concrete slab is cast. The concrete fills the cusps, which means that the **Cavidrain** becomes as strong as the concrete and transfers the loading to the formation. The voids between the cusps ensure that air or groundwater can flow safely through **Cavidrain** in all directions.

## The ABG Service

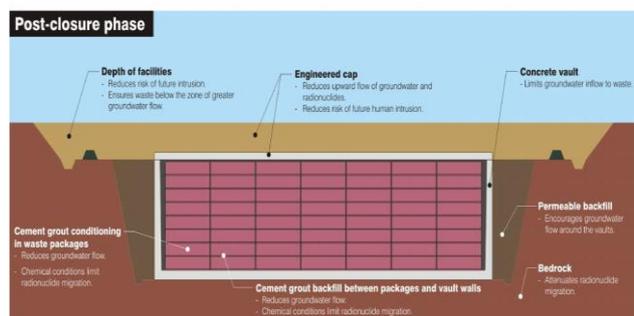
ABG provided technical guidance and manufactured **Cavidrain** in specific lengths to suit the project.



Concrete slab compacted onto the Cavidrain



Location - Achieves balance between short-term environmental impacts and long-term sea inundation and potential erosion (applies to both diagrams)



Note: Dimensions are not to scale and figures are illustrative

## Cross-sections of the LLW facility



Reinforced concrete walls of the LLW facility

Contact ABG today to discuss your project specific requirements and discover how ABG past experience and innovative products can help on your project.