

Proposed New LLW Disposal Facilities at Dounreay 2008 Project Summary

Summary

Dounreay Site Restoration Limited (DSRL)¹ has submitted a planning application to Highland Council to construct new disposal facilities for solid low-level radioactive waste (LLW). This application represents a significant step in securing the future decommissioning programme for Dounreay. This leaflet summarises the background to the application, the need for the facilities, the approach to LLW management, the development proposals and the main safety and environmental issues that have been addressed.

In order to enable decommissioning of the Dounreay site, DSRL needs to manage up to 175,000 m³ of LLW that will be generated. An open and consultative Best Practicable Environmental Option (BPEO) study was undertaken which led to the decision to apply for permission to construct new LLW disposal facilities at Dounreay.

DSRL intends to use the proposed facilities only for disposal of the solid LLW generated by the Dounreay and adjacent Vulcan site. The facilities will consist of up to six shallow, sub-surface concrete vaults, into which the waste will be emplaced. The facilities will be located immediately to the northeast of the Dounreay licensed site.

The planning application is based on independent Environmental Impact Assessment, site investigation work, design and safety studies, and extensive consultation. DSRL has also submitted an application to the environmental regulators for authorisation of the facilities, based on an independently prepared and peer reviewed Environmental Safety Case.

Environmental impacts associated with the proposed facilities will be mitigated through a series of environmental commitments that have been made within the Environmental Statement.

Introduction

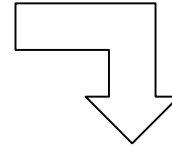
Over the last few decades, nuclear power has met more than a quarter of the UK's electricity needs. The research establishment at Dounreay in Caithness, Scotland, was at the forefront of a national and international nuclear power development programme. The research programme was terminated in 1994 and the site is now being decommissioned (dismantled) by Dounreay Site Restoration Limited (DSRL), on behalf of the Nuclear Decommissioning Agency (NDA). It is estimated that the decommissioning programme will cost around £2.5 billion and will involve the gradual dismantling and removal of plant and facilities on site over the course of the next 20 years.

An integral part of that programme is the requirement to manage the LLW that will be produced during decommissioning. This note summarises the current status of a project initiated in 1999 to identify and implement the best long term solution for managing all of the LLW generated during the restoration of the Dounreay Site.

¹ DSRL was established on 1 April 2008 as part of the restructuring of the United Kingdom Atomic Energy Authority (UKAEA). Work prior to 1 April 2008 was conducted by UKAEA.



Existing
Dounreay Site
Layout



Most plant and buildings on site are to be dismantled and demolished by 2025.



LLW at Dounreay

Solid LLW is generated wherever radioactive material is used. It includes metals and concrete, glass, soils and other materials, such as polythene sheets, plastic gloves and paper that have been lightly contaminated. It is at the low end of the activity level range in the radioactive waste spectrum. It contains less than 0.01% of the radioactivity that is present in radioactive waste on the Dounreay site, but represents 80–90% of the solid radioactive waste by volume that is expected to be created during operation and decommissioning of the site.

Decommissioning Dounreay over the coming decades is expected to generate between 64,000 and 109,000 m³ of packaged LLW. This is equivalent in volume to about 450-760 double-decker buses.

Historically, Dounreay disposed of its own LLW on site in authorised facilities at Dounreay, known as the LLW Pits. It is planned to retrieve that waste and a further 66,000 m³ of packaged waste will be generated by the retrieval and repackaging operations. More recently, LLW has been



Drum showing typical LLW items.

placed in half-height isofreight containers (similar to steel road transport containers) and stored in buildings on-site (below) as an interim measure. Across the rest of the UK, other nuclear operators send their LLW to the national facility near the village of Drigg in Cumbria.

Following consultation with stakeholders and members of the public, the Best Practicable Environmental Option (BPEO) Report on the management of Dounreay LLW was issued in April 2004. The BPEO study involved an assessment of potential management options for the LLW. These options were assessed against a range of criteria, including technical, environmental, cost, health and safety issues. The study was conducted in line with best practice and involved consultation with a range of people, including the local community and organisations with a particular interest in radioactive waste management. The recommendations and conclusions from the study provided the basis for the Dounreay Solid LLW Overall Strategy, which was published in March 2005. A fundamental component of this strategy is the development of new specialised below ground disposal facilities for LLW at Dounreay.

Detailed site investigation, design and assessment studies have since been undertaken and DSRL has applied for planning permission, along with the necessary safety and environmental authorisations, to construct the proposed disposal facilities at Dounreay. A Planning Application was initially submitted to Highland Council in June 2006. The period for the determination of this application was extended to allow the Scottish Environment Protection Agency (SEPA) sufficient time to fully assess the supporting safety case documentation as part of its role as a statutory consultee to Highland Council on the application. The Planning Application was re-activated in May 2008.



The proposal is supported by two key sets of documents:

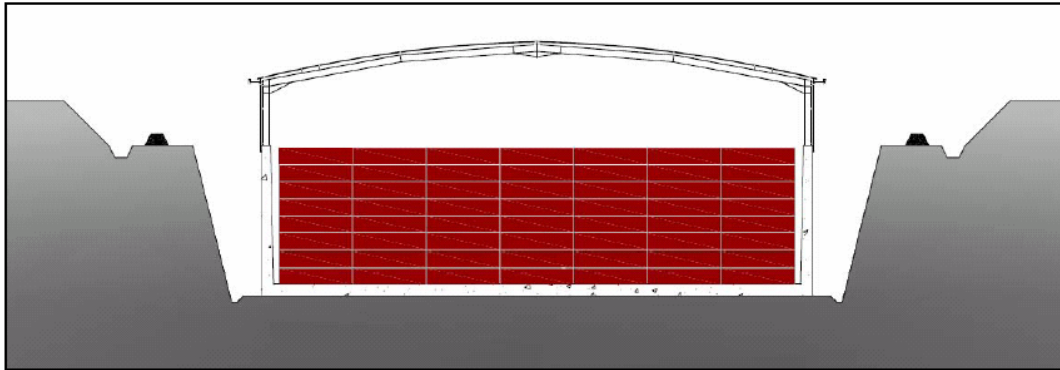
- The Planning Application to Highland Council along with the Environmental Statement and supporting documents.
- The Disposal Application to SEPA along with the Environmental Safety Case and supporting documents.

The Environmental Statement is informed by an Environmental Impact Assessment (EIA), which concentrates on the non-radiological environmental impacts of the proposed disposal facilities, such as those associated with construction noise, traffic and visual impact.

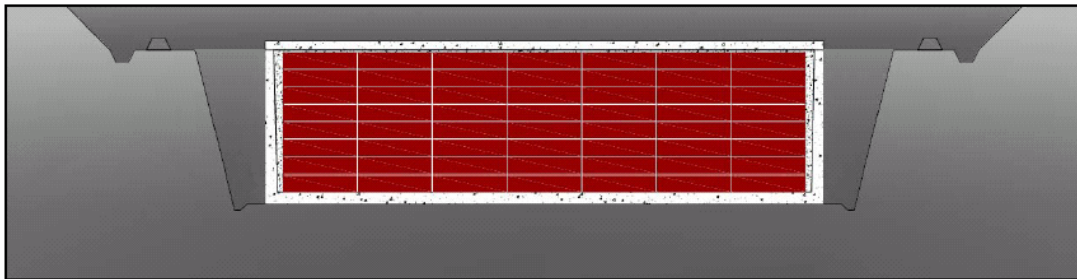
An authorisation from SEPA under the Radioactive Substance Act 1993 is required before LLW can be taken to the proposed facilities for disposal. The Environmental Safety Case (ESC) has been developed to demonstrate that the waste will be disposed of in a manner that protects the public and the environment from hazards associated with LLW, using the best practicable means to do so. An application for the authorisation for the disposal of waste was submitted to SEPA in April 2008.

The Proposed Development

The proposed disposal facilities consist of six concrete, sub-surface vaults, constructed in an excavation into bedrock. During operation the vaults will have roofs to keep the waste dry. The LLW containers will be filled with cement grout to remove voids and so form a stable cemented solid block of waste. The proposal therefore also includes provision for a grouting plant to allow grouting of the waste containers prior to disposal. It also includes a pumping system and control building to remove groundwater from around the vaults to allow the vaults to be kept dry while they are being filled with waste. Other facilities include an administration building and a water treatment area to remove suspended solids from the water being managed from around the site.



Prior to closure of the vaults, any spaces around the waste containers will be backfilled with more grout and the vaults will be capped. The cap will include a layer composed of large blocks of rock and will be covered with soils and grassed over. The capped facility will reinstate the original land surface and will be designed to merge with the surrounding landscape.

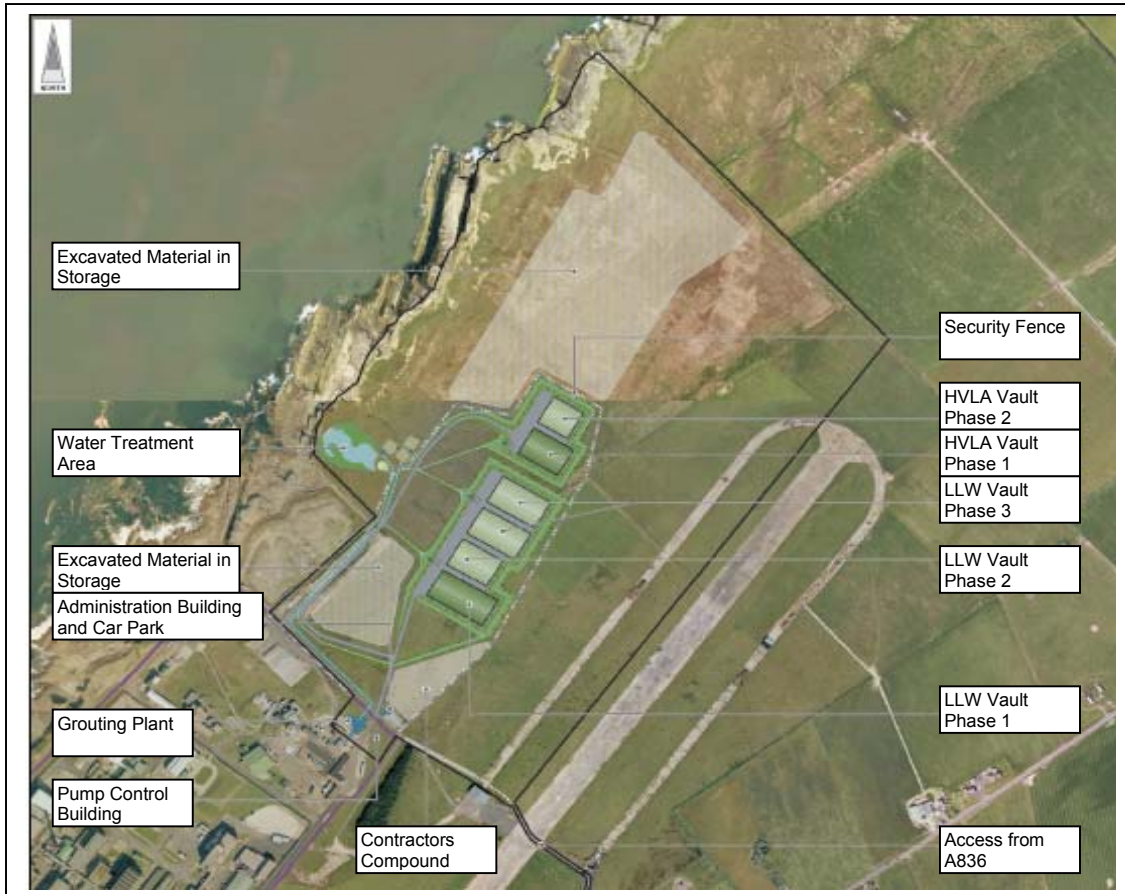


Three Phases of Development

The proposed disposal facilities will be developed in three phases:

- Phase 1 is intended to accept waste in 2014 and will accommodate the minimum predicted waste volumes.
- The full extent of phases 2 and 3 will only be confirmed as the site decommissioning progresses and waste volumes are updated. For example, there may be an opportunity to engineer smaller vault sizes at the start of phase 2 when volumes can be predicted more accurately.
- Phase 3 will accommodate the LLW arising from the planned retrieval of the waste in the existing facilities (the LLW Pits).

The proposed disposal facilities will be located as shown on plan below. The identification of this site as the preferred location for the proposed disposal facilities involved the consideration of a wide range of factors, including environmental issues and technical constraints. It also involved consultation with local residents, representatives and other groups. There has been general agreement that the waste should be disposed of at Dounreay. However, there is not sufficient suitable space to construct the proposed facilities on the licensed site itself, and so the facilities will be sited immediately to the northeast of the existing Dounreay licensed site.



The proposed location strikes a careful balance between long-term safety considerations and the desire to minimise impacts arising from the construction and operation of the facilities. For example, the facilities are located a sufficient distance from the sea to ensure there is no significant risk from erosion or flooding of the facility. The layout has also been adjusted to avoid the main geological fault in the location, the exact position of which has now been determined by site investigation work. At the same time, the facilities have been located to minimise potential noise and visual intrusion for local residents as far as is practicable. Other factors, such as the occurrence of protected species (e.g. Scottish Primrose), archaeological sites (e.g. the Cnoc-na-h'Uiseig chambered cairn), and the need to minimise the overall "footprint" of Dounreay have also been considered.

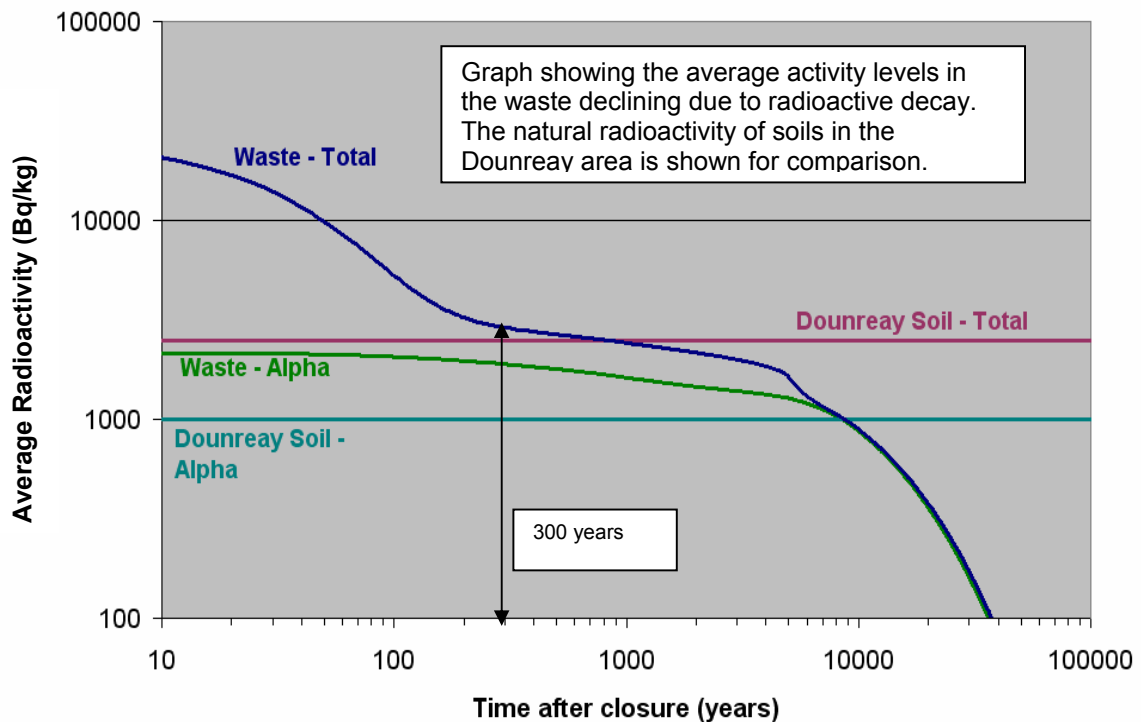
Radiological Safety

The purpose of the proposed design is to contain the radioactive content of the waste within the vaults for as long as is practicable. The radioactivity is contained in two main ways. First, the packaging, concrete backfill and structure of the vaults restrict groundwater flow through the waste, minimising the amount of radioactivity that can leach out. Second, the concrete alters the chemical conditions within the groundwater, effectively binding the radioactivity to the concrete, again minimising the amount that can leach out.

Following capping and closure of the facilities, a period of institutional control and monitoring will follow, to provide assurance that facilities are functioning as intended. Beyond this period of institutional control, there is little or no hazard associated with the waste and the cap will deter any accidental intrusion into the facilities.

The Environmental Safety Case explains in detail why the facilities will be safe and will not present a significant risk to people and the environment. SEPA has to be satisfied with this safety case before they will authorise disposal of waste to the facilities.

The radioactivity within the waste reduces naturally with time due to the process of radioactive decay. This means that the hazard associated with the waste also reduces with time. Much of the activity will decay to insignificant levels in less than 300 years, during which time the proposed facilities and the restored Dounreay area may still be under institutional control. After 300 years, over 95% of the initial activity in the disposed waste will have decayed (see graph).



There are many natural sources of radioactivity within the environment which people are exposed to everyday, e.g. radon gas, rocks, soil and cosmic radiation (from the sun). These naturally occurring sources are termed background radioactivity. Assessments have shown that concentrations of radioactivity in the environment as a result of the waste never exceed levels similar to naturally-occurring background radioactivity. They therefore never reach levels that might be of concern from a public health and safety perspective.

The Environmental Safety Case demonstrates that there is no significant risk to people as a result of the radioactivity within the waste. In addition, the calculated concentrations of radionuclides in the environment are so low there will be no significant impacts to flora and fauna.

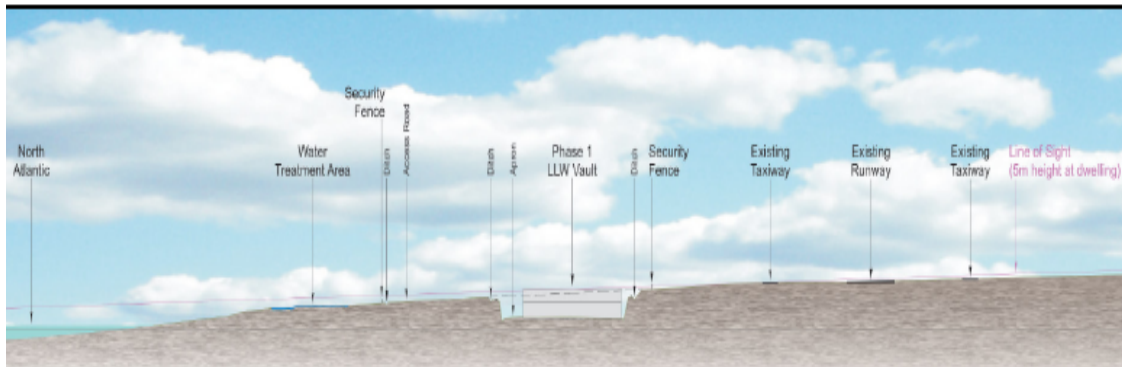
Wider Environmental Impacts

The Environmental Impact Assessment conducted in support of the planning application considers the wider impact of the facilities on the environment throughout their construction, operation, closure and beyond. The site selection process sought to minimise many environmental impacts, but some impacts are inevitable, such as noise, dust and vehicle movement during construction. The most significant of these will occur during the vault construction stage, with no significant impacts during operation, and some impacts during vault closure and restoration of the area.

Noise and visual impacts have been minimised by locating the facilities over the brow of a hill and as far from neighbouring properties as is practicable. Noise will be further reduced through implementation of best working practices such as using quiet plant, shrouding of equipment, switching machinery off when not in use, using non-tonal reversing alarms and temporary screening. It is also planned to excavate the vaults without blasting. A programme of noise monitoring at local receptors will be established to ensure noise levels do not exceed established limits during the construction and closure phases.

Impacts to air quality are mainly anticipated through the generation and spread of dust, particularly during excavation and construction. This will be minimised through best working practices, such as using construction equipment designed to minimise dust generation, ensuring vehicles are clean before leaving site, removal of dust-generating materials as soon as practicable, and cleaning and damping down of roads. The impact has also been minimised by increasing the distance of the facility from the nearest local neighbours.

Transport impacts have been minimised through design and location. Keeping the excavated material at an on-site location has a huge effect in reducing vehicle movements on public roads. Further reduction in potentially negative impacts will be achieved through a Traffic Management Plan. This will include measures such as staggering construction site working to avoid Dounreay peak traffic periods, using on-site materials where possible, and agreeing haulage routes to minimise disruption.



Other environmental impacts have also been assessed and measures proposed to minimise those impacts. For example, potential impacts on areas of coastal heath and local Scottish Primrose have been minimised by leaving a coastal strip that will be fenced off to avoid disturbance. Similarly, the Scheduled Ancient Monument, Cnoc-na-h'Uiseig, will be fenced off to avoid disturbance. Any excavations will undergo archaeological monitoring to identify record and, if appropriate, carefully excavate any archaeological remains of cultural heritage value.

Disturbance to birds will be minimised through the timing of the commencement of construction operations and restoration of habitat when the facilities are closed. Impacts to local water bodies will be minimised through the implementation of a specially designed drainage system based on sustainable principles.

A key undertaking is that the mitigation measures identified in the Environmental Statement Schedule of Environmental Commitments will be taken forward and incorporated into the design and construction contracts to ensure their implementation.

Construction Timescale

Should the proposed development receive planning consent, the proposal will be further developed through a phase of detailed design. This, combined with the contract procurement process for a project of this nature, means the anticipated date for starting construction of the vaults is not until 2011. It is anticipated that it will take up to three years to complete construction of the first phase of the development, with the facility due to be operational in 2014.

Conclusion

In order to enable decommissioning of the Dounreay site, a facility is needed to manage up to 175,000 m³ of solid LLW that will be generated. The best option for managing this waste is new LLW disposal facilities at Dounreay and a proposal has been put forward for their construction.

The facilities will consist of up to six shallow, sub-surface concrete vaults, into which the waste will be emplaced. A planning application has been submitted to Highland Council for the facilities and an application for a disposal authorisation has been submitted to SEPA. Both applications include an independently prepared Environmental Safety Case that confirms that the proposed facilities will be safe.

This is a major capital project estimated to cost several tens of millions of pounds. Most importantly, the proposed LLW facilities are fundamental to the successful and efficient decommissioning of the Dounreay site, upon which many more millions of pounds of investment and hundreds of jobs rely.

Additional Information

For those interested in obtaining further information, non-technical summaries of both the Environmental Statement and Environmental Safety Case have been produced. Summary papers explaining the issues associated with site selection, coastal erosion and mitigation of environmental impacts have also been produced. All of these summary documents, along with the Environmental Statement and Environmental Safety Case and other key project documents are available on the DSRL website: <http://www.dounreay.com/waste--materials-management/low-level-waste/new-low-level-waste-disposal-facilities>.

We welcome comments on these summary papers and other documentation. Contact:

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