Summary of the Environmental Safety Case for Proposed New LLW Disposal Facilities at Dounreay, Scotland

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Introduction

Over the last few decades, nuclear power has met more than a quarter of the UK's electricity needs. The nuclear research site at Dounreay in Caithness, Scotland, was set up by the UK government in 1955 to investigate and demonstrate the feasibility of advanced nuclear reactor designs. The research programme was terminated in 1994, and the buildings are now being emptied and taken down (decommissioned) by Dounreay Site Restoration Limited (DSRL), on behalf of the Nuclear Decommissioning Authority (NDA)[1].

Existing Dounreay Site layout.

Most plant and buildings on site dismantled and demolished by 2025.

[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.

DSRL is committed to minimising the amount of waste produced by its activities; however, activities at Dounreay inevitably produce radioactive waste. The term "radioactive" indicates that the waste contains some unstable elements (radionuclides), which decay (break down) over time until they are stable, emitting radiation (radioactivity) at a level that has the potential to be harmful to man and the environment and, therefore, requires management.

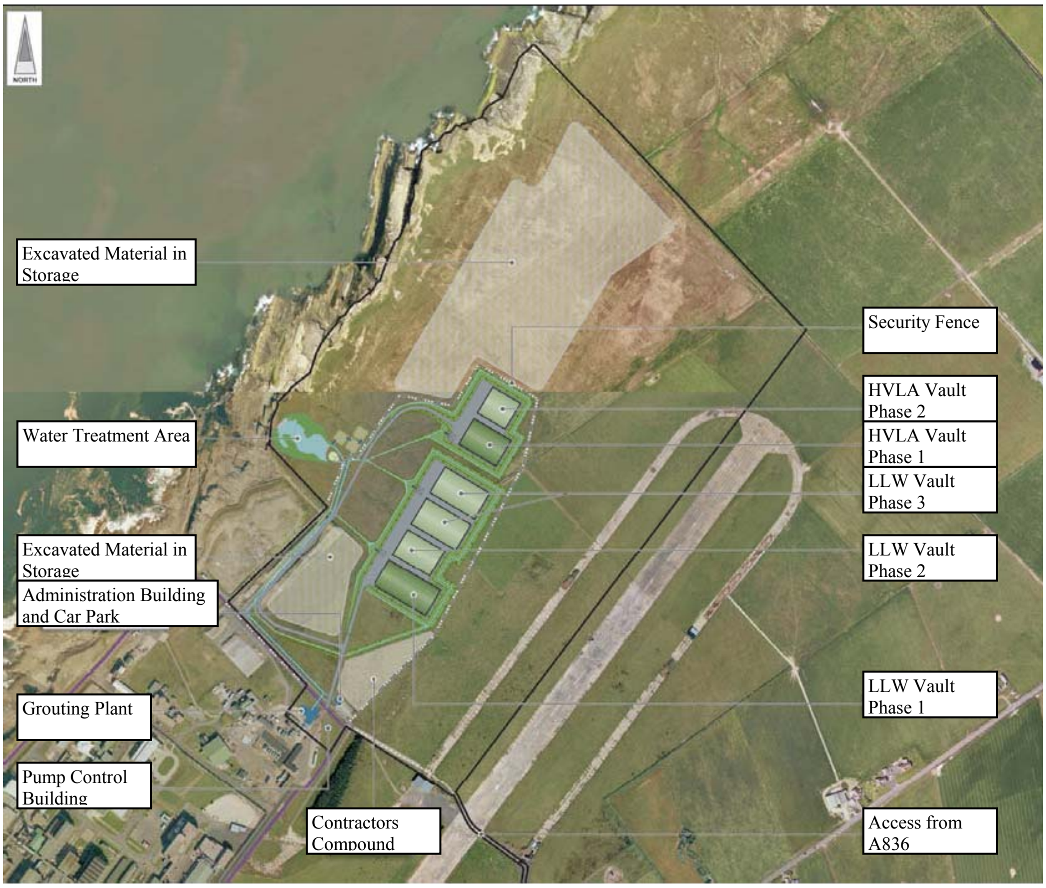
Different radionuclides decay at different rates, varying from seconds to thousands or millions of years. Radioactive waste is categorised and managed according to the magnitude and longevity of its hazard. Low-level radioactive waste (LLW) is waste that is at the lower end of radioactivity in the radioactive waste spectrum, and contains only a minor amount of long-lived radionuclides. DSRL is proposing to dispose of its LLW in new, specialised disposal facilities to be constructed at Dounreay. This document summarises the background to this proposal and the safety case for protection of people and the environment from the radioactive wastes to be placed in the facilities.

Background

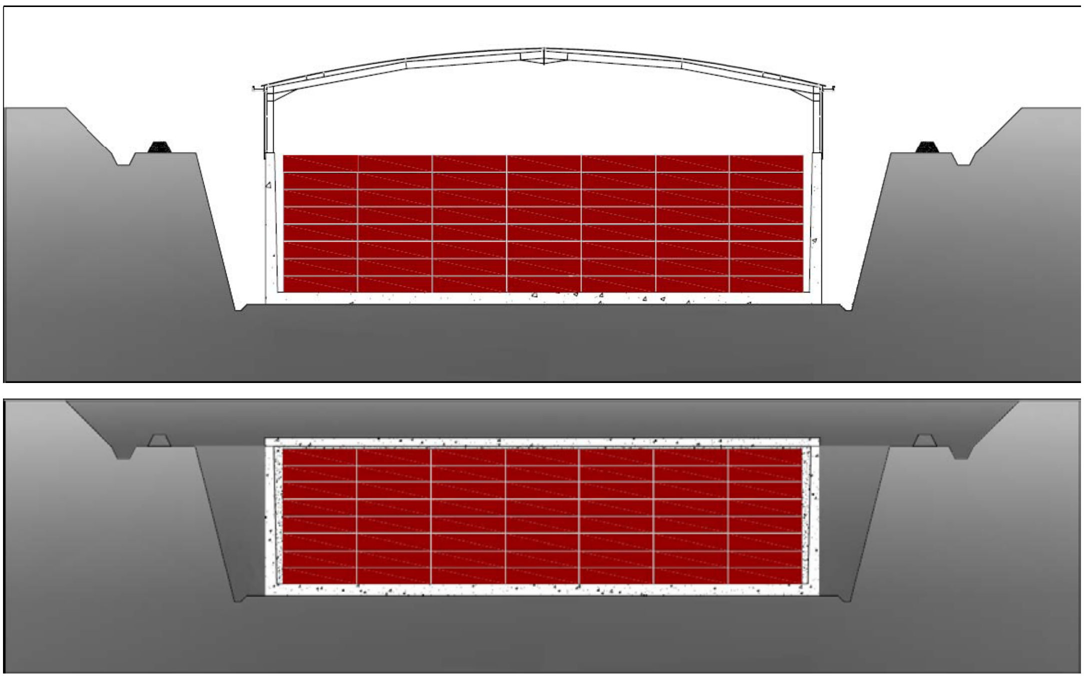
UK national policy requires industrial sites to have a plan for the management of any waste they produce. In the case of nuclear sites, this plan must be based on an assessment of all practicable options for waste management.

In 1999, UKAEA initiated a major strategic project to develop and implement a long-term strategy for managing LLW at Dounreay. Stage 1 of the project culminated in April 2004 with the "Best Practicable Environmental Option (BPEO) Report" on the management of Dounreay LLW. The BPEO study was conducted in line with best practice and was informed by the involvement of a wide range of stakeholders at several points. The study involved the identification and evaluation of issues and options relevant to reaching a decision on the best way to manage Dounreay LLW. The recommendations and conclusions from the BPEO 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 disposal facilities for LLW on UKAEA-owned (now NDA-owned) land at Dounreay. Siting on land at Dounreay avoids any need to transport the LLW away from Dounreay on public roads. Disposal at Dounreay also satisfies the proximity principle of managing the waste at source.

The disposal facilities will be in the form of a series of up to six concrete "vaults" constructed so that the top of the waste is at least four metres below ground level and the base of the vaults about 12 metres below that. The vaults will have a roof over them while they are being filled with waste to keep rainwater out. After they are filled, the roof will be removed and the top of the vaults will be closed off and the original ground profile reinstated.



Map showing location of the proposed new LLW disposal facilities. Black solid line shows site development boundary. The main Dounreay site can be seen in the lower left-hand corner, and the nearest houses and public A836 road in the lower right-hand corner. Figure is around 1,400 m across.



Illustrations of a single disposal vault during operations (top) and after closure and capping (bottom). The red rectangles illustrate individual LLW containers arranged in the vaults in eight-high stacks.

Stage 2 of the project is now underway, with the objective of obtaining the necessary planning permission, and safety and environmental authorisations required to allow the development and use of the proposed New Facilities at Dounreay. There are three principal sets of regulations:

1. *Planning regulations*. The planning application is submitted to the Highland Council, and includes an Environmental Statement. The Environmental Statement is informed by an Environmental Impact Assessment (EIA), which concentrates on the non-radiological environmental impacts of the proposed New Facilities, such as those associated with construction noise, traffic, and material use.

2. *Health and safety regulations for construction and operation*. The proposed disposal facilities may require a nuclear site licence from the Health and Safety Executive (HSE) / Nuclear Installations Inspectorate (NII). Such a licence – among other things – requires the operator to demonstrate that workers and the public are sufficiently protected from radiation during both routine operations and in the event of any accidental releases of radioactivity during operations.

3. *Radioactive waste discharge and waste disposal regulations*. An authorisation from the Scottish Environment Protection Agency (SEPA) under the Radioactive Substance Act 1993 is required for all disposals of radioactive waste. An Environmental Safety Case (ESC) has been developed to demonstrate that people and the environment are sufficiently protected from hazards which could arise as a result of the disposal of radioactive wastes to the proposed facilities. The ESC brings together analyses and evidence that demonstrate safety.

The ESC is the focus of this summary. The Environmental Statement prepared for the Highland Council is summarised elsewhere[2]. The key arguments making the ESC are summarised below in terms of the source-pathway-receptor linkage used in the environmental safety assessment. This considers how radioactivity disposed of in the facilities (the source) might migrate over time through the environment (pathways), and the potential effects of this radioactivity on flora and fauna, including humans (receptors), compared to stringent safety and environmental protection criteria.

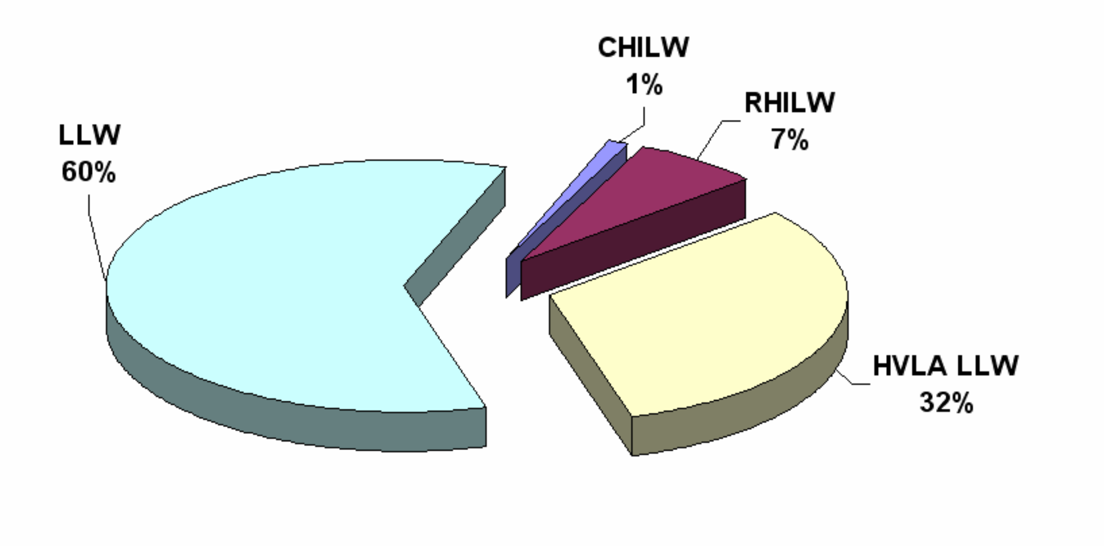
Source

Wastes and Waste Emplacement

For waste to be defined as LLW, its radioactivity level must be below set limits. These limits are prescribed by the Government, and align with current industry practice at the existing National LLW disposal facility near the village of Drigg in Cumbria. The radioactivity content of LLW is consistent with guidance from the International Atomic Energy Agency (IAEA) on waste suitable for disposal in facilities at, or near, the ground surface.

[2] LLW(07) S2/262 March 2008 Issue 1. LLW Facilities Stage 2 – Environmental Statement Addendum Non-Technical Summary.

LLW at Dounreay contains less than 0.01% of the radioactivity that is present in all radioactive waste on the Dounreay site, but comprises about 80-90% of the solid radioactive waste by volume that is expected to result during operation and decommissioning of the site.

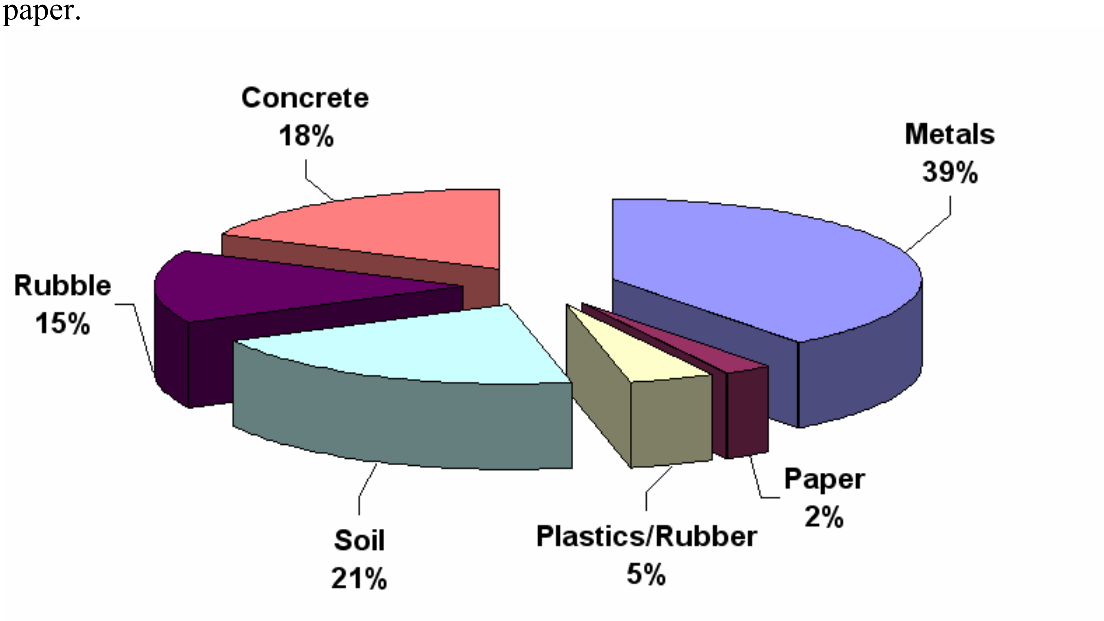


The percentage of estimated total volume by category of waste arising from operation and decommissioning of the Dounreay site. Intermediate-level waste (ILW) is divided into waste that can be directly handled by people (CHILW – contact-handled ILW), and waste whose radioactivity is so great that it can be safely handled only using remote means (RHILW – remote-handled ILW). Here the LLW category has been divided to illustrate the relative amount of LLW that contains only very low levels of radioactivity, termed HVLA LLW (High-Volume, Low-Activity LLW). This figure shows that most of the radioactive waste by volume at Dounreay is LLW – however this waste contains less than 0.01% of the total radioactivity.

The majority of the waste from operations (i.e., research work) at Dounreay is plastic and metal pipework, laboratory glassware, tools, and items of plant equipment.

Photograph showing the typical contents of a Dounreay LLW drum.

The majority of the waste from current and future decommissioning activities is concrete, rubble, metals, and contaminated soil. A breakdown of the total LLW inventory from operations and decommissioning for disposal in the proposed New Facilities shows a dominance of metals (mostly steel), soil, concrete, plastics and paper.



The relative percentage of each material type in Dounreay LLW.

DSRL intends to use the proposed facilities only for disposal of solid LLW from the Dounreay site and the adjacent Vulcan site. Vulcan is a Ministry of Defence site established in 1957 to test the nuclear propulsion plant used in Britain's submarines. No higher activity wastes or non-radioactive wastes, such as putrescible domestic wastes of the type that are typically sent to landfill, will be accepted.

The LLW to be disposed of contains little in the way of non-radioactive hazards. The least contaminated LLW from demolition, termed High-Volume / Low-Activity waste (HVLA), will be segregated for disposal in separate vaults to the rest of the LLW because of its lower hazard potential. This discipline of separation and management of lower-activity wastes is consistent with UK policy for LLW management.

DSRL is committed to following best practice for waste management, including minimising the amount of waste produced. Thus, estimates of the waste inventory to be consigned to the proposed New Facilities are continually being driven downwards, both in terms of volume and radioactivity.

LLW: Much of the LLW is packaged in steel drums (because of its lower hazard potential, the HVLA LLW is packaged and handled differently – see below). The waste is checked to ensure that it meets the criteria for disposal in a specialised facility at Dounreay – the Waste Receipt, Assay, Characterisation & Supercompaction (WRACS) facility.

Photograph of the interior of the Dounreay Waste Receipt, Assay, Characterisation & Supercompaction facility, showing inspection of LLW drums.

Where possible, the drums are compacted to reduce the volume of waste to be disposed of in the proposed facilities. The compacted drums, and LLW that is not compactable, are placed into large steel containers. The containers used for final waste packaging are mainly half-height International Standards Organisation (HHISO) containers similar to those transported on public roads.

Photograph of the interior of the Dounreay Waste Receipt, Assay, Characterisation & Supercompaction facility, showing compaction of LLW drums into thin "pucks" (left), and filling of a HHISO container with compacted LLW drums (right).

Finally, before the waste leaves the Dounreay site for emplacement in the proposed New Facilities, any voids in the HHISO containers will be filled with a liquid cement-based grout. The containers and grout ensure that the waste is isolated and stable.

Photograph showing a cutaway view of a filled and grouted HHISO container (from the existing National LLW disposal facility near the village of Drigg in Cumbria). Note that this container did not contain actual radioactive waste, and the grouting work was performed for demonstration purposes.

The HHISO containers will be transported from the Dounreay site to the proposed New Facilities along a purpose-built private road, and will remain within NDA-owned land throughout. The HHISO container acts as a shield to radiation. It is possible to stand next to a container of waste for extended periods and receive no more exposure to radiation than is received from naturally occurring radiation.

The HHISO containers will be stacked in concrete-lined vaults, similar to what is currently practised at the National LLW disposal facility near Drigg in Cumbria.

Photograph showing HHISO containers disposed of at the National LLW disposal facility near Drigg in Cumbria. Note that this differs from the proposed facilities at Dounreay in that this facility is being operated without a roof and is partly above ground.

Stacking of ISO containers is practised safely and is commonplace at freight-handling facilities around the world. Because the proposed disposal facilities are below ground, there will be minimal visual impact to neighbours and the small amount of radiation that is able to pass through the HHISO containers will be absorbed by the surrounding rock. Through the use of roofs, ditches, and pumps, the interior of the vaults will be kept dry while the wastes are emplaced, ensuring that no water comes into contact with the wastes during operation of the proposed facilities.

The majority of the wastes to be disposed of at the proposed facilities have a radioactivity that is well below the limits for LLW. Over 98% of the raw waste by volume is 100 times less radioactive than the LLW limit for total alpha activity[3], and 90% of the waste is 10 times less radioactive than the LLW limit for beta/gamma activity. The average alpha activity content of the Dounreay LLW is comparable to that disposed of in near-surface facilities in other countries and is consistent with guidance from the International Atomic Energy Agency (IAEA). The beta/gamma content of the Dounreay LLW is considerably less, because overseas facilities accept wastes with higher concentrations of short-lived beta/gamma activity. In terms of total radioactivity, the proposed Dounreay facilities will contain only a few percent of the activity that is forecast to be disposed of at the National LLW disposal facility near Drigg.

HVLA LLW: As noted above, HVLA LLW will be handled and disposed of in separate, but similarly constructed, vaults to the rest of the LLW. HVLA LLW is mainly lightly contaminated building rubble with a very low hazard potential, and will be transferred to the HVLA LLW disposal vaults in large nylon bags. No cement grout will be used, but the HVLA LLW vaults will be closed in a similar way to the other LLW disposal vaults.

Closure of the Vaults

Once all of the wastes have been emplaced, the gaps between adjacent containers and between the containers and the vault walls will be filled with cement grout, a lid placed on the vaults, and a cap built over the facilities. The purposes of this engineering are to restore the original ground profile, isolate the wastes from the surface environment, and act as a deterrent to inadvertent future intrusion of the vaults.

Once the pumps are removed at closure, groundwater will gradually enter the vaults. However, the low permeability of the concrete vaults, and the steel HHISO containers and grout (where used) mean that it will take a long time before the groundwater comes into contact with any radioactivity.

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[3] Radionuclides can decay in different ways, which give rise to different types of nuclear emission, termed alpha decay, beta decay and gamma decay. These emissions have different characteristics when they interact with matter, and generally result from radionuclides having different half lives (alpha – long half lives; beta and gamma – typically short half lives). There are different UK limits set for radionuclides that release beta or gamma activity and (lower limits) for radionuclides that release alpha radioactivity.

The vast majority of the LLW to be disposed of at Dounreay contains mainly short-lived radionuclides (i.e., radionuclides with half-lives[4] shorter than ~30 years). This radioactivity will decay to insignificant levels in less than 300 years, during which time the proposed New Facilities and the restored Dounreay area may still be under care and surveillance. After 300 years, over 95% of the initial radioactivity disposed of will have decayed, and the average radioactivity of the wastes will be similar to that currently found naturally in soils around the Dounreay site (albeit comprised of a different mix of radionuclides).

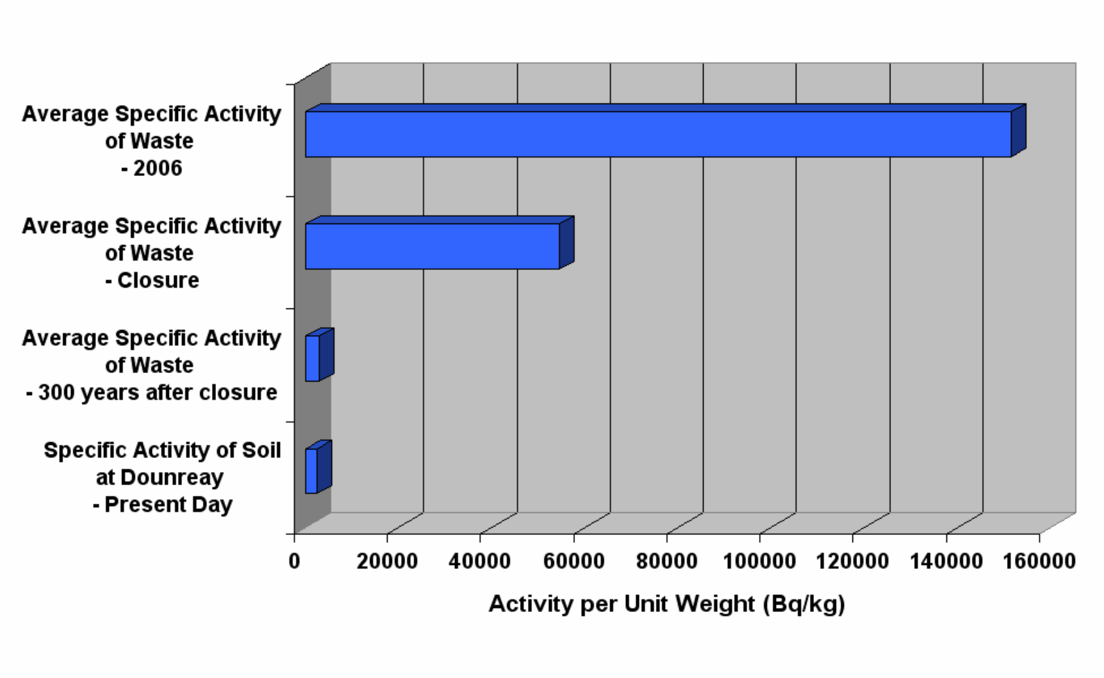


Chart showing the radioactive decay of the Dounreay LLW, compared to the level of naturally-occurring present-day radioactivity in Dounreay soils. The specific activity is defined as the disintegrations per second (Bq – Becquerel) (a measure of decay) per kilogramme of LLW or soil.

Pathways

The specific location of the proposed New Facilities at Dounreay and the detailed design of the facilities have been developed through optioneering workshops involving a combination of DSRL staff and their specialist support teams. These workshops have considered the optimal balance between a range of short-term and long-term safety, environmental, technical and financial impacts – such studies are termed Best Practicable Means (BPM) studies.

Owing to the long half-life of a small proportion of the radioactivity to be disposed of in the proposed facilities, it is not possible to prevent small releases of radioactivity from the concrete vaults over the long term (thousands of years). In terms of safety, the facilities have been designed primarily to provide containment and isolation while the vast majority of the radioactivity decays (a few hundred years). By this time, the

[4] A half-life for a radionuclide is the time taken for half of the activity of the radionuclide to decay.

remaining radioactivity can no longer pose any hazard greater than that associated with naturally-occurring radioactivity in the environment.

However, a further design aim is to slow any subsequent releases of radioactivity such that concentrations of LLW-derived radioactivity in the environment remain significantly below the levels of naturally-occurring radioactivity.

The design of the Dounreay facilities is comparable with the designs for near-surface disposal facilities in other countries, such as those in England, Belgium, France and Spain, and represents best practice.

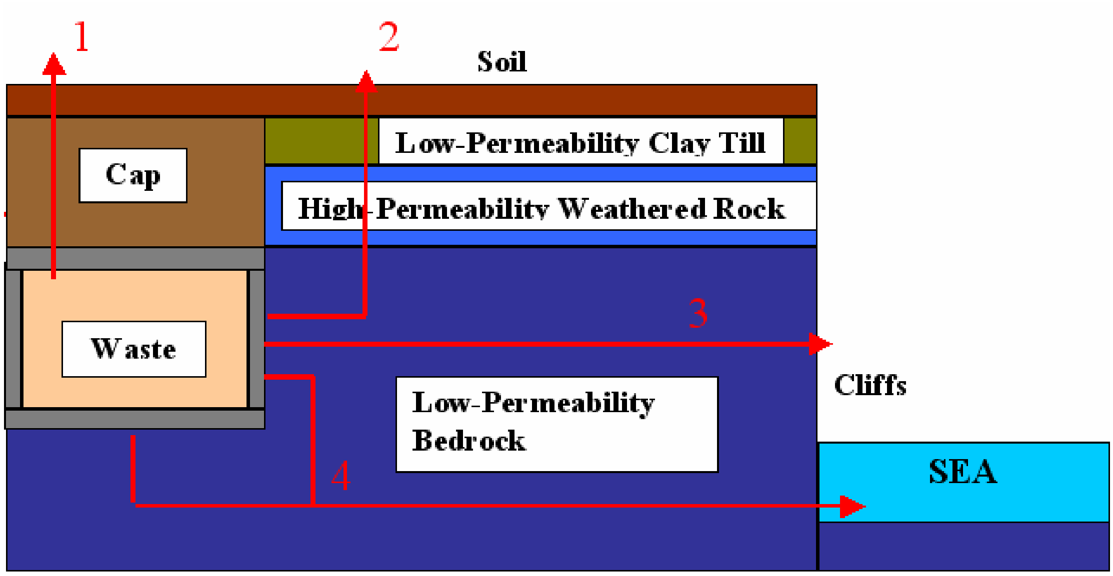
The location of the wastes below the ground surface and keeping the vaults dry during operations prevents the possibility of any exposure to radiation for the public before the facilities are closed. After closure, providing the facilities remain undisturbed, there are essentially four potential paths for migration of radioactivity from the facilities to the environment over the long term:

1. Directly upwards from the wastes as water or gas, migrating through the cap and into the topsoil. Only certain radionuclides comprising a limited amount of the radioactivity in the facilities could be released as gases.

2. Into the groundwater flowing downstream of the facilities and upwards into the topsoil between the facilities and the coast.

3. Into the groundwater flowing downstream of the facilities and through the rock or ditches to the cliffs and foreshore and then into the sea.

4. Into the groundwater flowing downstream of the facilities and down to the sea.



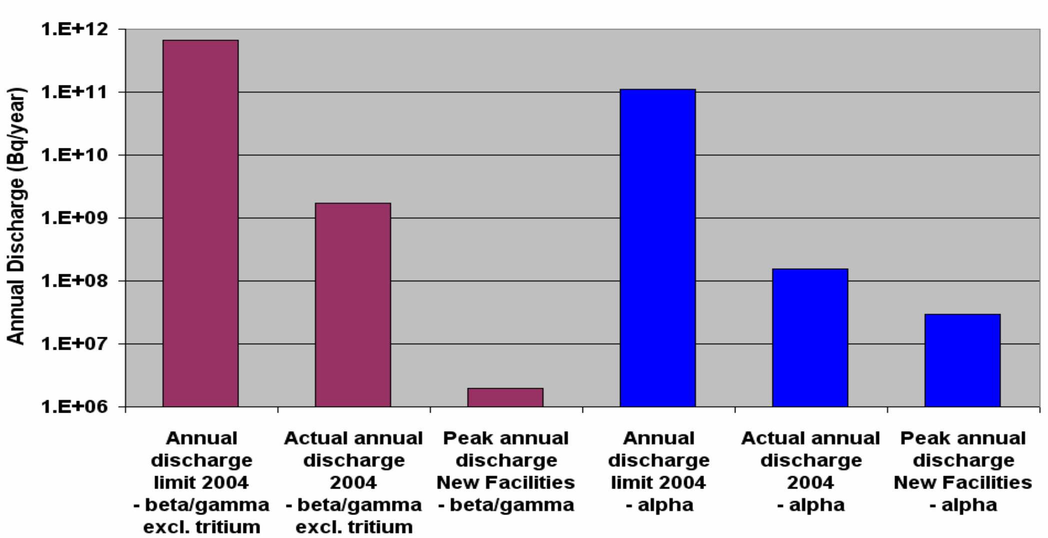
Schematic illustration of the potential pathways for radioactivity to migrate from the proposed New Facilities through the environment to locations where flora and fauna, including humans, might be exposed to the radiation.

Once in the topsoil or sea water, people might be exposed to the radioactivity directly through external exposure or indirectly as the radioactivity is taken up into plants and animals and enters the food chain. People might also inhale radioactive gases; however, gas volumes will be small and construction and occupancy of a building on top of the cap to accumulate gases would be necessary for this exposure pathway.

As well as providing short-term safety and containment over hundreds of years, while the majority of the radioactivity decays, the engineering in the facilities provides additional benefits in reducing the rate of release of long-lived radioactivity from the disposal vaults over thousands of years. Cement creates an alkaline environment that slows the release of radionuclides. As noted earlier, releases in the first few hundred years after closure are very low. Releases slowly rise over thousands of years as water penetrates the facilities and the cement and steel barriers degrade. However, the radioactivity in the facilities is very low by this time, and release rates never exceed the flows of natural radioactivity present in the environment.

The geology and hydrogeology of the area also help to reduce possible releases to the environment. The facilities will be several metres underground in solid Caithness bedrock, providing long-term stability and low volumes of groundwater flow. The majority of rainwater flows downhill to the sea over the surface and in a thin surface zone and does not penetrate to the depth of the wastes. The area is covered by a glacial till, rich in impermeable clay, which acts to separate the surface soils from the deeper groundwater system.

The peak annual releases of alpha and beta/gamma activity from the proposed facilities into the environment and, more specifically, into the sea, are considerably less than current annual liquid discharges from the Dounreay site into the sea which, in turn, are well below the site's discharge authorisation limit. The peak annual discharges from the proposed facilities will occur thousands of years in the future.

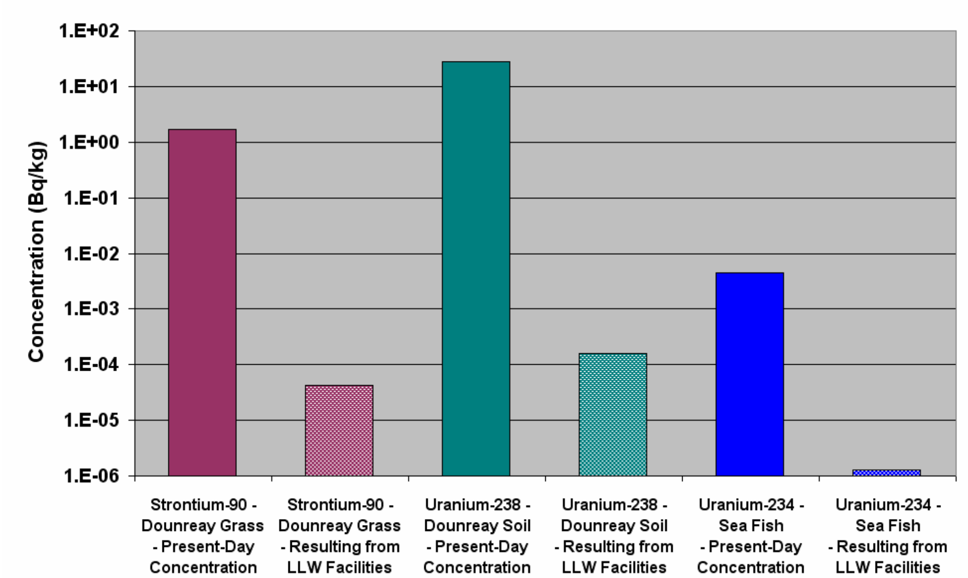


Total annual permitted liquid discharges (as of 2004) of alpha and beta/gamma radioactivity from the Dounreay site, actual discharges in 2004, and the calculated quantity of radioactivity released from the proposed LLW disposal facilities in the year in which the greatest amount is released. Note that the scale is logarithmic, so each bar is 10 times more than the one below it. Note also that discharges from the Dounreay site have decreased by many thousands of times in the last three decades.

Once the short-lived radioactivity has decayed after a few hundred years, the total radioactivity present in the environment, including that left in the facilities, remains fairly constant. This is because the long-lived radioactivity generally decays to daughter radionuclides that are, themselves, radioactive. It will take many thousands of years for the radioactivity in the proposed facilities to decay completely. The long-lived radionuclides will be slowly released and will migrate through the rock. Some of the radionuclides will migrate to the topsoil between the facilities and the coast and some will migrate directly to the sea. However, most of the radioactivity will ultimately reach the sea, where the concentration will be minute owing to dilution, and is only a small fraction of that going to the sea from radioactivity that is presently in the environment around Dounreay.

The future concentrations of radionuclides in the environment around Dounreay from radioactivity released from the proposed facilities will be much lower than present-day measured concentrations. These present-day measured concentrations are mainly naturally-occurring, but with some related to past discharges from the Dounreay site and elsewhere.

The slow release of radionuclides from the facilities and dilution of the releases in groundwater mean that concentrations of short-lived radionuclides reaching the environment will be vanishingly small. For example, the calculated peak concentration in grass of radioactive strontium, one of the main short-lived radionuclides in Dounreay LLW, will be ten thousand times lower than the present-day concentration. The concentration of facility-derived radioactivity in the environment reaches a peak only after thousands of years, and is related to the long-lived radionuclides. Even then, the concentrations of radioactivity are hundreds to thousands of times lower than present-day concentrations.



Present-day concentrations of particular radionuclides in Dounreay grass, soil and in sea fish compared to the corresponding concentrations that might occur as a result of releases from the proposed New Facilities in hundreds or thousands of years. The radionuclides shown are important contributors to the activity in Dounreay LLW. Note that the scale is logarithmic, so each bar is 10 times more than the one below it and concentrations resulting from the facilities are thousands of times lower than the present day concentrations.

The discussion above focuses on the performance of the facilities while they remain undisturbed. However, there is the potential for the facilities to be disturbed, either by natural events such as sea-level rise and coastal erosion, or through human activities if knowledge of the facilities is lost in the far future. Precautions against these possibilities have been taken in the design and location of the facilities.

1. The facilities have been placed sufficiently far inland to be safe from coastal erosion and sea-level rise for at least 10,000 years, by which time the average radioactivity level in the facilities will be below the background level. A summary of the site selection process is presented elsewhere[5].

2. The facilities have been designed to be well below the ground surface. This has a number of functions: it helps minimise the visual impact of the facilities and ensures they are in a zone of low groundwater flow after closure, but a key benefit is that it significantly reduces the potential for inadvertent disruption of the facilities in the far future. At the depth chosen, it is unlikely that any normal construction activity, building a house for example, would be likely to breach the facilities. This risk is further mitigated by ensuring care and surveillance of the facilities as necessary after closure to prevent such actions while the short-lived activity in the facilities decays.

The radiological consequence of releases from the facilities, either through groundwater or through disruption, is discussed in the next section.

Receptors

The consequences of radioactivity released to the environment are regulated in terms of the potential radiation dose to people, and to flora and fauna that might be exposed to the radiation. The regulatory target for disposal of radioactive wastes is a peak radiation dose to the most exposed person 100 times smaller than the average dose received by members of the UK population from natural sources of radiation.

[5] LLW(07)S2/243 Issue 1, March 2008 – New LLW Facilities Project – Stage 2: Position Paper on Selection of the Proposed Location.

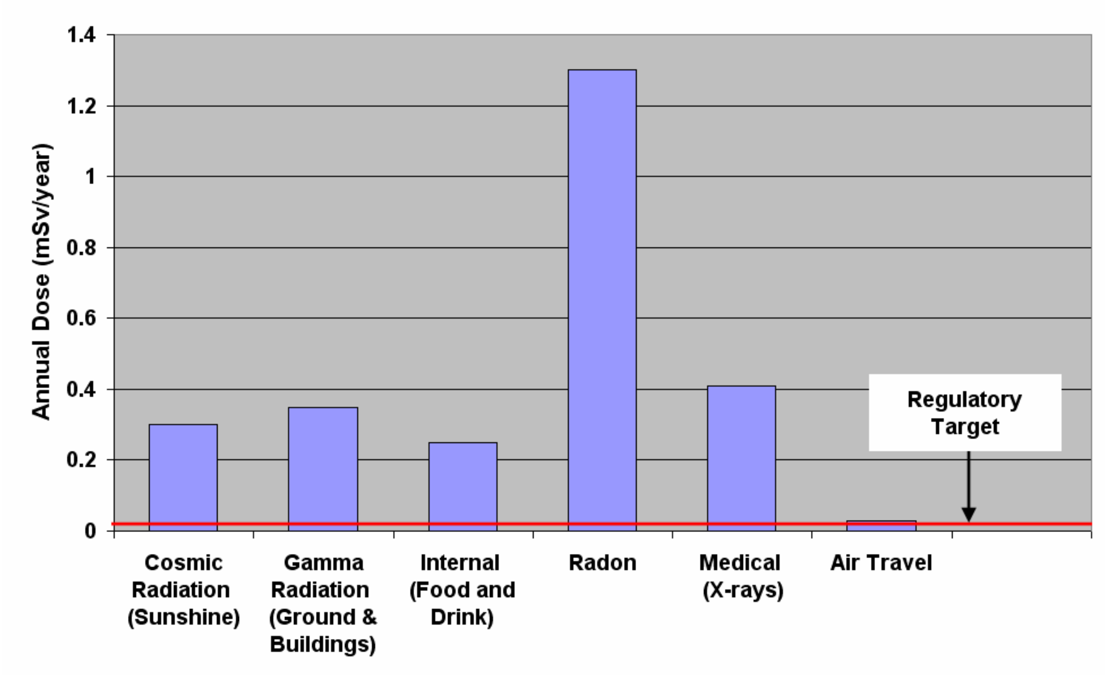


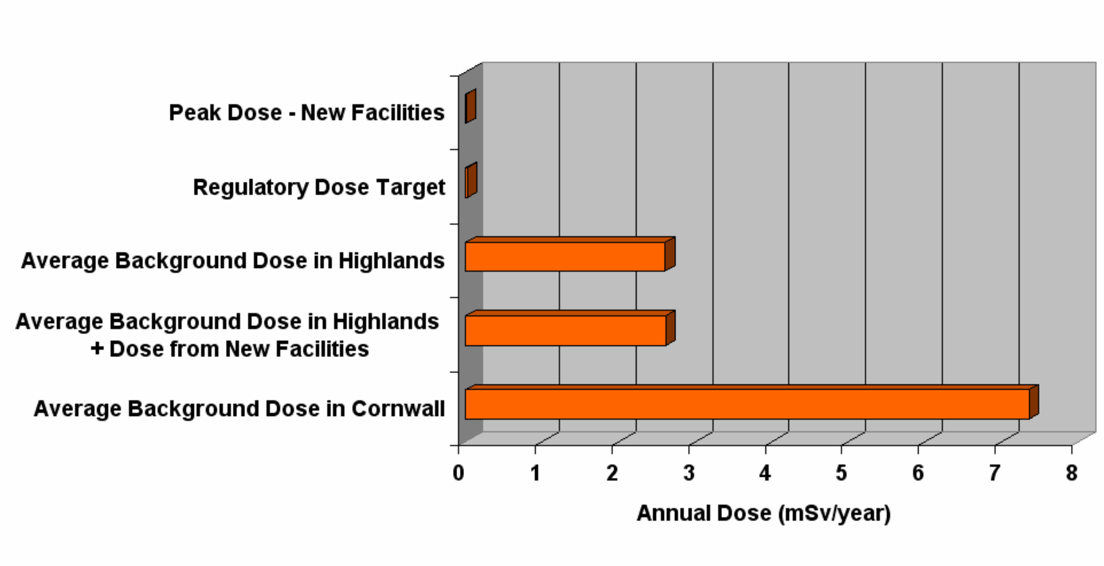
Chart showing the annual radiation dose (measured in millisieverts, mSv) to a typical member of the UK public from various sources of radiation. The solid red line compares these doses to the regulatory target for disposal of radioactive waste to specialised land disposal facilities. The regulatory dose target is approximately 1% of the dose received by a member of the public each year from naturally-occurring sources of radiation.

The extremely small concentrations of radionuclides that will reach the sea and their subsequent dilution mean that calculated doses to users of the marine environment (for example, anglers, swimmers, surfers, seafood collectors and eaters) are vanishingly small. This is reinforced by the observation that radionuclide releases from the proposed New Facilities will be considerably lower than the present-day authorised discharges from the Dounreay site, which have been shown to have negligible impact on people and the environment.

Insignificant doses are also calculated for potential users of the land between the facilities and the coast. Doses rise to a peak over thousands of years, related to the slow release and build-up of long-lived radioactivity discussed earlier. As for the marine pathway, calculated doses from short-lived radioactivity in the soil are vanishingly small. The most important potential exposure pathway is consumption of livestock reared on the small strip of grass between the facilities and the coast - an area of around 12 hectares including the cap over the facilities.

Even with the extremely pessimistic assumption of a complete return to a subsistence economy in the far future, resulting in a single family surviving by living on and working the land around the facilities for all of their food (vegetables, meat, milk, eggs), peak calculated doses would still be below the regulatory target. Such a dose would not be discernible when included in the dose from background radiation. Further, the dose from background radiation in the Highlands is quite low when compared to other areas of the United Kingdom, such as Cornwall, where higher level of radioactivity in the rocks can occur naturally. This helps to put the possible radiological impacts from the proposed New Facilities in perspective - moving to

Cornwall would treble an individual's annual dose, while the dose from the facilities will be indiscernible even with pessimistic assumptions about exposure pathways.



Bar chart showing the calculated maximum dose from the proposed New Facilities, compared to existing background doses in the Highlands and in Cornwall. Even the maximum possible dose from the proposed facilities adds an indiscernible amount to the existing background doses.

Given the location of the facilities several hundreds of metres from the sea and well above sea level, they could only be disrupted by coastal erosion or sea-level rise after tens of thousands of years. By this time, the radioactivity levels in the facilities will be below background levels. The vigorous nature of the ocean at Dounreay means that any eroded material would be rapidly washed out to sea. Calculation of possible doses to users of the cliffs and foreshore while the facilities are eroded at various possible times in the future show very low doses, well below the regulatory target.

The facilities could also be disrupted by development activities undertaken by people in the far future, if the location or nature of the facilities is forgotten. Should the facilities be disrupted by such activities and the waste mixed in with topsoil and spread out over the surface, slightly higher doses could occur. However, even using the worst-case assumptions of a family leading a subsistence lifestyle on the redeveloped land, calculated doses would still be below those from natural background radiation. Other activities, such as use of the area for residential development, a business park, or for leisure, would result in much lower doses.

Assurance

In accordance with current legislation and international best practice, the performance of the proposed New Facilities does not rely on actions by future generations to maintain the integrity of the disposal system. Despite this, for a time after closure, the facilities and surrounding environment will be monitored. This will ensure that the facilities are not disrupted while the short-lived radioactivity decays. It also allows a period to demonstrate that the facilities are functioning as designed.

Approved quality assurance systems and procedures are in place for LLW management activities that are currently ongoing, such as waste characterisation and site investigations. Further quality assurance procedures and programmes will be developed as needed for future activities, such as facility construction and facility monitoring, and will be agreed with the regulators.

DSRL will require authorisation from SEPA before the first waste is received at the proposed New Facilities, planned for around 2014/15. Thereafter, the authorisation will be reviewed by SEPA at regular intervals until authorisation for closure of the facilities is sought by DSRL. Site characterisation, waste characterisation, Best Practicable Means, safety assessment, and confidence-building activities will continue during design, construction and operation of the facilities. DSRL will develop regular updates to the ESC and these will be scrutinised by SEPA.

Summary

Following an evaluation of environmental, safety, social, technical, and financial issues, DSRL is proposing to deal with its LLW at source by developing specialised disposal facilities at Dounreay. The LLW is generally inert and its radioactivity content lies at the lower activity end of the radioactive waste spectrum. The proposed disposal facilities are designed using well-established technology, are consistent with national and international guidance, and are similar to established disposal facilities elsewhere in the UK and Europe. Compared to disposal facilities for non-radioactive waste, the proposed New Facilities use a high level of engineering to ensure that the majority of the radioactivity is contained until it decays. Containment levels are close to 100% for hundreds of years and, even over thousands of years, when the engineering will slowly degrade, the quantities of radioactivity that might be released from the facilities are much lower than quantities of radioactivity that are naturally present in the environment. Consequently, radiological impacts on people and the environment from the facilities will be significantly less than impacts from background radiation that people are exposed to in their everyday lives.

Further Information

Key project references include:

GNGL(04)TR75 April 2004 - Dounreay LLW Strategy Development - Best Practicable Environmental Option Study - Final Report.

GNGL(05)P51 March 2005 - Dounreay Solid LLW Overall Strategy.

LLW(06)S2/61 March 2006 - New LLW Facilities Project - Stage 2 - Environmental Statement.

LLW(07) S2/197 March 2008 - Dounreay New LLW Facilities - RSA93 Environmental Safety Case 2008.

LLW(07)S2/261 March 2008 - New LLW Facilities Project - Stage 2 - Environmental Statement Addendum.

LLW(07)S2/262 March 2008 - LLW Facilities Stage 2 - Environmental Statement Addendum Non-Technical Summary.

These, and other project documents, are all 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 the Environmental Safety Case. Contact:

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