

New LLW Facilities Project – Stage 2

Position Paper on Selection of the Proposed Location

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Introduction

- 1 UKAEA has undertaken a transparent and consultative site selection process resulting in the decision to submit a planning application for new LLW disposal facilities on a site adjacent to the eastern boundary of the existing Dounreay nuclear licensed site. The proposed facilities consist of a series of six below-ground concrete vaults, required to enable the decommissioning and restoration of the Dounreay site.
- 2 Recent site characterisation work¹ has better defined the exact location of major faulting in the local area and has led to a refinement of the preferred site location and layout, as shown in Figure 1.
- 3 UKAEA has consulted widely on the proposals, both in the Best Practicable Environmental Option (BPEO) selection stage² and during the subsequent preparation of the planning application and its associated Environmental Statement³. Some stakeholder views that have arisen during this process have influenced the specific choice of location on UKAEA-owned⁴ land at Dounreay:
 - (i) The facilities should be on or close to the existing Dounreay nuclear licensed site so as to minimise the spread of the site footprint.
 - (ii) The facilities should not be visually intrusive.
 - (iii) More emphasis should be put on the impacts of the facilities during construction and operation, rather than focusing on long-term (post-closure) safety⁵.
- 4 This note summarises the rationale behind the selection of the preferred location on UKAEA-owned land at Dounreay.

Why the selected area was chosen

- 5 The BPEO for the long-term management of Dounreay LLW is near-surface disposal on UKAEA-owned land at Dounreay. This was established through a robust and consultative study published in April 2005².

¹ LLW(07) S2/186 August 2007 - Dounreay New LLW Facilities Site Characteristics and Site Characterisation Plan 2007

² GNGL(04)TR75 April 2004 -Dounreay LLW Strategy Development - Best Practicable Environmental Option Study - Final report

³ LLW(06)S2/61 March 2006 - New LLW Facilities Project – Stage 2 – Environmental Statement

⁴ The land was UKAEA owned during the consultation and this is how it is referred to but ownership has recently transferred to the Nuclear Decommissioning Authority

⁵ This statement recognised the relatively low hazard from LLW in the long-term due to radioactive decay.

- 6 Subsequent to the BPEO being agreed as near-surface disposal on UKAEA-owned land at Dounreay, and the decision by UKAEA and the Scottish Government that new LLW disposal facilities should be located at Dounreay, UKAEA conducted a detailed assessment of siting issues. The benefits and detriments of different areas of UKAEA-owned land were examined and were informed by the results of stakeholder consultations conducted as part of scoping work for the Environmental Assessment. Details of this selection process are documented in two reports⁶. UKAEA divided the UKAEA-owned land adjacent to Dounreay into eight areas, shown in Figure 2, which were then assessed as a potential location for new LLW disposal facilities⁷.
- 7 The following issues were considered to have the potential to discriminate between potential sites in the January 2006 selection exercise⁸:
- (i) Stakeholder views on site location – including the views of Highland Council and local neighbours.
 - (ii) Lifecycle environmental issues - visual, noise, ecological, archaeological, air quality and water quality impacts, property blight, land characterisation (greenfield or brownfield).
 - (iii) Technical issues - hydrogeology, climate change, water management during construction and operations.
 - (iv) Value - capital and operating costs.
 - (v) Construction issues - waste creation, scheduling issues.
 - (vi) Transportation issues - construction and operational periods.
- Only a few of these issues in fact discriminate significantly between the eight areas. This summary paper focuses on the most discriminatory issues, and provides the current project position (as of March 2008).
- 8 It is important to bear in mind the timescale of the hazard, the nature of the UKAEA-owned land that is available for siting, and current regulatory positions on what constitutes Best Practicable Means (BPM) for the management of LLW:
- (i) The radioactivity of the waste declines sharply in the first few hundred years and then only very gradually after about 1000 years. Taken as an average across all of the disposal vaults, the alpha activity in the vaults is likely to be below the level of naturally occurring alpha activity in Dounreay soils (background) at around 10,000 years; that level is approximately 1 Bq/g.
 - (ii) The available UKAEA land extends along the coast and inland for about one kilometre. Part of the available land area is taken up by buildings and services on the existing licensed site. Part of it lies outside the licensed site and is rented out for use by landowners.
 - (iii) Current regulatory guidance on radioactive waste disposal favours containment of radioactivity for as long as practicable (as opposed to dispersion and dilution). Part of the available area towards the coast will be susceptible to sea-level rise and coastal erosion in the future.

⁶ LLW(06)S2/55 March 2006 – LLW Facilities Stage 2 Site Selection Paper & LLW(06)S2/60 March 2006 – LLW Facilities Site Selection Workshop Record January 2006

⁷ Locations on UKAEA-owned land to the south of the A836 were discounted as they would require transport of waste packages on and across a major public road, leading to significant additional project costs for waste packaging and permitting, whilst offering no clear advantages.

⁸ Note that neither operational nor post-closure safety were considered to discriminate between potential sites, and so safety was not considered directly in the site selection exercise.

- 9 UKAEA understands that siting new LLW disposal facilities in a location that is likely to lose containment in the next *few thousand years* owing to sea-level rise and coastal erosion would be unlikely to be seen by the Scottish Environment Protection Agency (SEPA) as representing Best Practicable Means (BPM) and would be unlikely to receive an authorisation from SEPA. UKAEA has therefore adopted a siting objective representing a likely upper bound to sea-level rise and coastal erosion over the *next ten thousand years*. This is to ensure containment of the waste by protection from sea-level rise and coastal erosion during this period. This siting objective is shown as a red line in Figure 1. It effectively rules out a large part of UKAEA-owned land from being selected as the preferred location while at the same time helping to delineate potentially acceptable areas from a long-term sea-level rise and coastal erosion perspective. The coastal erosion issue is addressed more fully in a separate paper⁹.
- 10 UKAEA has assessed those areas to the south of the red line in detail¹⁰. Based on existing knowledge of local geology and hydrogeology, UKAEA believes that it can demonstrate that long-term safety requirements could be met for LLW disposal facilities built in any of these areas.
- 11 The areas adjacent to Sandside Bay (Areas 7 and 8 on Figure 2) are not favoured mainly owing to their environmental impacts on a large number of local receptors, and also for the increased spread of the Dounreay footprint through the creation of a smaller nuclear site some distance away from the existing licensed site.
- 12 The areas to the south and south-west of the licensed site (Areas 3 and 5) are also not favoured, mainly owing to the environmental impacts. Areas 3 and 5 are generally open, of good arable ground, and highly visible from all around the local area.
- 13 The two leading areas are Area 2 (to the south of the red line) and Area 1. Area 2 is preferred over Area 1 as it minimises environmental impacts on receptors during the construction, operation and closure of the facilities. The main receptors are located in a small community (Buldoe) just to the south of Area 1. Selecting Area 2 over Area 1 significantly reduces the visual, noise and air quality impacts on local stakeholders. Selection of Area 2 also accords with the views expressed during stakeholder consultation exercises that the facilities should be as close to the licensed site as possible and should be as distant from the nearest neighbours as possible.
- 14 Area 1 has some potentially positive factors, primarily that it is more distant from the sea and at a higher elevation than Area 2. Selection of Area 1 would reduce the probability that the facilities will be inundated by the sea in the very far future

⁹ LLW(07)S2/195 Issue 1, March 2008 – New LLW Facilities Project – Stage 2: Position Paper on Climate Change and its Impacts. Note that the earlier site selection papers [LLW(06)S2/55 and LLW(06)S2/60] indicated that the red line shown in Figure 1 was a likely upper limit to sea level rise and coastal erosion over 10,000 years and, that thereafter, sea-level would start to fall. The latest information from global climate modelling now suggests that sea-level may not start to fall until several tens of thousands of years in the future. The red line remains appropriate as a siting objective for the proposed new LLW facilities as it is a reasonable bound for preventing disruption by erosion or inundation for 10,000 years.

¹⁰ Areas 4 and 6 lie largely to the north of the red line, and are not considered further here.

(greater than 10,000 years from now). However, for any credible sea-level rise scenario, the time that would pass before a facility in Area 2 would be eroded by the sea is such that radioactive decay alone will have reduced the radiological inventory within the facility to such low levels that radiological doses would be extremely low (whether or not erosion occurs)¹¹.

- 15 The facilities could be safely built in either Area 1 or Area 2, and the slight increase in elevation and distance from the sea is not a significant factor in demonstrating the safety of the facilities. Furthermore, the uncertainties on climate change models and impacts are so large that it is not worth detailed assessment of relative likelihood of disruption - at times tens of thousands of years in the future - between locations that are both sufficiently distant from the sea. In summary, one location brings with it significant near-term impacts on the nearest neighbours (Area 1); the other minimises those impacts as far as is practicable (Area 2).
- 16 It has been suggested by some stakeholders that UKAEA should place the facility on the existing licensed site (Area 4) to further minimise near-term environmental impacts. This issue is addressed more fully in a separate paper¹², but the main reason this siting option has not been taken forward is that there is not sufficient suitable space on the licensed site to construct the proposed new LLW disposal vaults.
- 17 Area 2 is believed to be the best practicable location on UKAEA-owned land at Dounreay, selected through a balanced assessment of siting options. The recent site characterisation work has confirmed that the geology and hydrogeology of this area, which was believed to be suitable during earlier site selection work, does make it an acceptable location for the construction of new LLW disposal facilities at Dounreay.
- 18 The new site characterisation data has indicated that major faults in the area have slightly different locations than was previously understood. UKAEA has therefore made minor adjustments to the precise location of the facilities in Area 2 to avoid locating the facilities directly above the Geodh nam Fitheach Fault Zone (see Figure 1). UKAEA aims to avoid siting the facilities on major geological faults owing to their potential to have increased water flows relative to the surrounding rock mass and their potential to act as conduits for upward water flows, both of which would have a negative impact on ease of construction and operation, and on long-term safety. The facilities have been sited as far from the coast as practicable, while avoiding this major fault zone.

Summary

- 19 UKAEA has assessed the different areas of UKAEA-owned land at Dounreay in an open and transparent manner, and selected an optimum location for the construction of the new LLW disposal facilities. The selected location is land adjacent to the east side of the existing licensed site. UKAEA believes it has characterised this area sufficiently to demonstrate its suitability as the preferred location.

¹¹ LLW(07)S2/193 Issue 2, March 2008 – Dounreay LLW Facilities: Run 2 Performance Assessment: Results

¹² LLW(07)S2/244 Issue 1, March 2008 – New LLW Facilities Project – Stage 2: Position Paper on Why the Proposed New Facilities are not on the Existing Licensed Site

- 20 The preferred location adjacent to the east side of the existing licensed site achieves a sensible balance between various physical constraints and a range of environmental and stakeholder issues. It minimises the spread of the Dounreay footprint, lies as close to the existing licensed site and as far from nearest neighbours as is practical, and is visually unobtrusive.

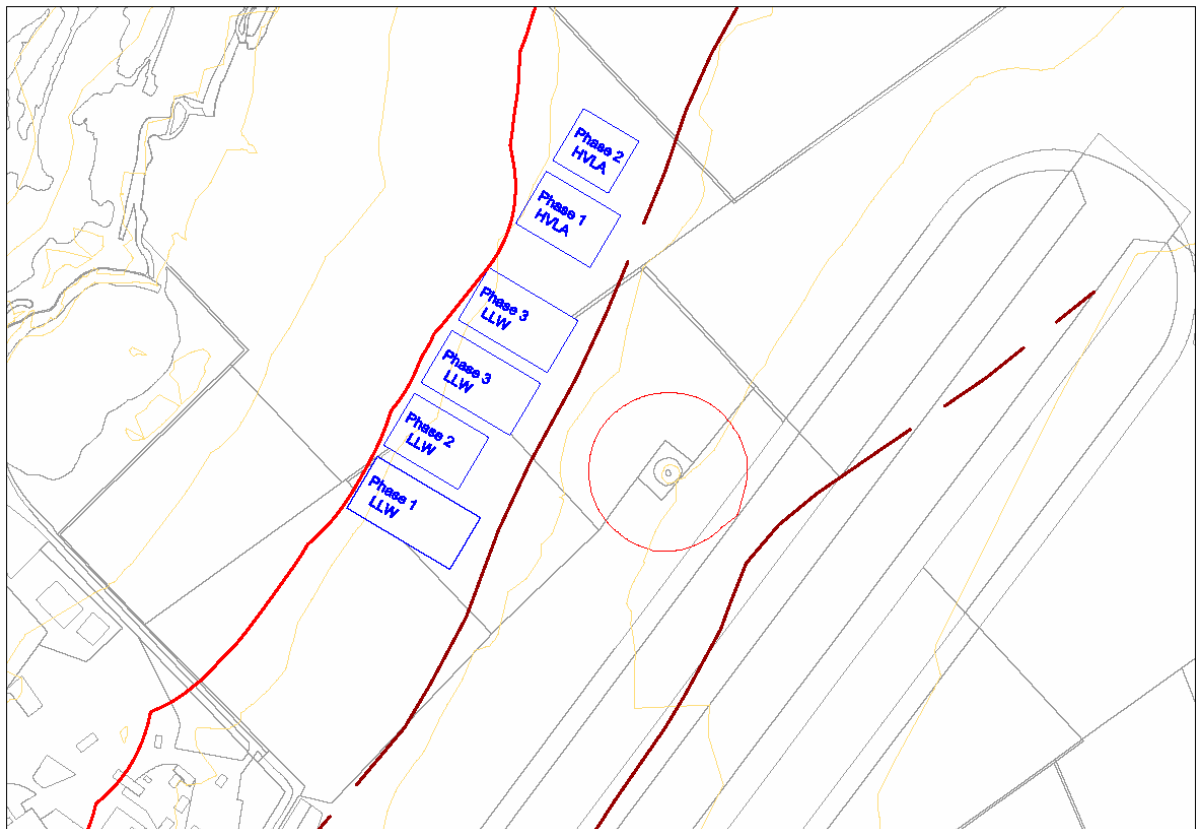


Figure 1. Layout of the proposed new facilities with respect to significant siting features. The Figure represents approximately 950 m (west-east) by 850 m (north-south). The red line represents 100 m inland of the 20 m AOD contour to allow for future sea-level rise and coastal erosion. The brown lines indicate the approximate north-western and south-eastern edges of the Geodh nam Fitheach Fault Zone. The red circle represents a 50-m exclusion area around a chambered cairn. The south-eastern corner of the existing licensed site is seen in the south-western part of the Figure.



Figure 2. Areas (circled numbers 1 to 8) on UKAEA-owned land at Dounreay considered in selecting sites for the proposed new LLW disposal facilities. Also shown is the red line used as a siting objective to avoid areas that could be affected by future sea-level rise and coastal erosion over 10,000 years.