

# **Advice to Environment Agency Assessors on the Disposal of Discrete Items, Specific to the Low Level Waste Repository, Near Drigg, Cumbria**

Issue 1.0

9 January 2014

## **Note**

This is formal Issue 1.0 of this document. It is unchanged in substantive content from draft Version 6a (dated 1 May 2013). Issue 1.0 will be reviewed and revised as and when considered appropriate by the Environment Agency.

## **Introduction & Background**

The Low Level Waste Repository (LLWR), near Drigg, Cumbria, is expected in the absence of intervention to be subject to coastal erosion beginning within a timeframe of a few hundred to a few thousand years from now. This has thus emerged as the expected evolution scenario for the LLWR.

However, it is also an anomalous evolution scenario. Given that it has become the expected evolution scenario, it is doubtful whether the location of the LLWR site would be chosen for a new facility for near-surface radioactive waste disposal if the choice were being made now. It would not be in accordance with current national and international siting practice for new facilities.

Nevertheless, the LLWR is an asset important to the UK for the disposal of low level radioactive waste and, providing a suitable environmental safety case can be made and providing the LLWR can be operated safely in future, there is no regulatory reason why it should not continue to perform its function.

The environment agencies' document *Near-Surface Disposal Facilities on Land for Solid Radioactive Wastes: Guidance on Requirements for Authorisation* ("the GRA") was prepared as general guidance covering all near-surface disposal facilities for radioactive waste in the UK. It was not intended to deal with an anomalous evolution scenario, such as coastal erosion in the near term, as the expected evolution scenario for a near-surface disposal facility.

Given this background, advice to Environment Agency assessors is needed for the LLWR specific to this anomalous scenario and this is the purpose of the present document. The requirements and more detailed guidance in the GRA still stand in every respect. This advice is supplementary to the GRA. It seeks to be consistent with the GRA and to draw from it where this is reasonable.

## **LLWR & Coastal Erosion – the Regulatory Concern**

The particular regulatory concern that has emerged in relation to coastal erosion of the LLWR relates to the potential appearance on the beach and in its accessible surroundings, during the process of erosion, of discrete items carrying a significant burden of radioactivity individually. These could range from particle size up to larger objects that would be visually identifiable and might be of a recognisable type (e.g. a hand tool). Since the beach is

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presumed to be freely open to public access while coastal erosion of the LLWR is taking place, it is possible that members of the public could come into contact with such items. For smaller items or particles, members of the public including children might even ingest them or, for particles, inhale them.

## **Advice to Environment Agency Assessors Specific to the LLWR**

### Particles and Visually Identifiable Objects

#### *Distinction between Particles and Visually Identifiable Objects*

A distinction is made between particles, on the one hand, and visually identifiable objects, on the other. For the purpose of this advice, a particle is defined as a small object that would not be visually identifiable except through a deliberate close search. A person would thus not pick up a particle through casual curiosity. Any encounters with particles would be either random or as a result of a deliberate search.

#### *Criterion for Random Encounters with Particles*

It is considered acceptable to use the GRA risk guidance level as a criterion for random encounters with particles.

#### *Casual Curiosity*

A person might pick up a visually identifiable object through casual curiosity.

#### *Deliberate Searches*

A person might encounter a particle or, indeed, collect multiple particles as a result of a deliberate search. A person might equally encounter a visually identifiable object or, indeed, collect multiple such objects as a result of a deliberate search.

Deliberate searches might involve excavation and/or the use of devices such as metal detectors.

Excavation and the use of detection devices might take place into or near to the face of the eroding disposal facility.

#### *Test of Significance for Casual Curiosity and Deliberate Searches*

It is considered appropriate to use the test of significance set out below (a dose test) for the following:

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- i. A visually identifiable object picked up through casual curiosity or as a result of a deliberate search.
- ii. A particle or multiple particles collected as a result of a deliberate search.
- iii. Multiple visually identifiable objects collected as a result of a deliberate search.

## Past and Future Disposals

A distinction is made between past and future disposals.

### *Past Disposals*

For past disposals at the LLWR it may as a general statement not be regarded as an optimised approach to attempt to retrieve discrete items carrying a significant burden of radioactivity. This is because any or all of the following may not be adequately known: (a) the nature of the items; (b) the burden of radioactivity the items carry; and (c) the location of the items within the LLWR. If LLWR Ltd considers that this general statement is true, it should submit an environmental safety case (ESC) that makes this argument to the Environment Agency. Such an ESC should identify all items that it covers to the extent that the available records make this possible (for timescale, see Footnote 1).

If there are any items in past disposals at the LLWR for which LLWR Ltd considers that the above general statement is not true, it should submit proposals to the Environment Agency for retrieval of such items (for timescale, see Footnote 1). Any such proposals should include the appropriate operational and environmental safety cases for retrieval of the items.

In addition, the Environment Agency may require LLWR Ltd to submit proposals for retrieval of items the Environment Agency may specify.

If individual items from past disposals were to be considered for retrieval, the test of significance would be that given below under the heading *Test of Significance (applicable to casual curiosity and deliberate searches, and also to past and future disposals)*.

For past disposals, it is otherwise proposed that the coastal erosion scenario should be dealt with in accordance with the GRA as it currently stands. In particular, the numerical risk

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<sup>1</sup> Such an ESC and any such proposals should be submitted well in advance of any capping of the wastes, so as to allow time before capping for regulatory assessment of the submissions and retrieval of any wastes. Such submissions are not required immediately, but within two years at most. If necessary, the requirement for such submissions could be specified as an improvement condition.

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guidance level of  $10^{-6}$  per annum, as set out under Requirement R6, should apply after the environmental permit for the site has been withdrawn.

## *Future Disposals*

For future disposals, an optimised approach is likely to entail preventing items individually carrying a significant burden of radioactivity from being disposed of in the LLWR. Equally, an optimised approach is likely to entail preventing any processes within the LLWR or as a result of coastal erosion that might lead to the production of high dose particles. These considerations may require improvements to waste characterisation and segregation, but we consider such improvements themselves to be part of the optimised approach. They are judged to be desirable in view of the expected scenario of coastal erosion.

If, for certain waste streams, it is not considered feasible within an optimised approach to prevent items individually carrying a significant burden of radioactivity from being disposed of in the LLWR in future, LLWR Ltd should submit an ESC that makes this argument for each such waste stream to the Environment Agency following an approach consistent with the GRA and this advice.

## Test of Significance (applicable to casual curiosity and deliberate searches, and also to past and future disposals)

As the test of significance, it is proposed that the assessed effective dose to any person during and after coastal erosion of the LLWR should not exceed a dose guidance level in the range of around 3 mSv/year to around 20 mSv/year. [The doses quoted are effective dose.] This is consistent with the guidance for human intrusion as set out under Requirement R7 in the GRA. As stated there, values towards the lower end of this range are applicable to assessed exposures continuing over a period of years (prolonged exposures), while values towards the upper end of the range are applicable to assessed exposures that are only short term (transitory exposures).

## Severe Deterministic Injury (applicable to past and future disposals)

LLWR Ltd will need to show that dose thresholds for severe deterministic injury to individual body tissues are unlikely to be exceeded through radiation exposure as a result of coastal erosion of the LLWR. Severe deterministic injury means injury that is directly attributable to the radiation exposure, that is irreversible in nature and that severely impairs health and/or the quality of life of that individual, for example, lung morbidity and early death. [Derived from para. 6.3.40 of the GRA.]

## **Notes**

1. It is emphasised that this advice is supplementary to the GRA. None of the requirements or more detailed guidance provided in the GRA is superseded by this

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advice. In particular, GRA Requirement R6, *Risk guidance level after the period of authorisation*, continues to apply to the coastal erosion scenario for both past and future disposals.

2. The proposed test of significance, using a dose guidance level, has been introduced because coastal erosion has become the expected evolution scenario, with a probability of occurrence approaching 1. There is thus some analogy with the human intrusion scenario, for which the GRA states (in para. 6.3.36) that the developer/operator of a near-surface disposal facility should assess the potential consequences of human intrusion into the facility after the period of authorisation against a dose guidance level on the basis that human intrusion is likely to occur.

More specifically, we consider that the risk guidance level is too broad-brush to provide an acceptable radiological assessment tool for discrete items that may become accessible as a result of coastal erosion on the beach, in the eroding cliff, or on the foreshore. We judge that a dose guidance level is needed as an additional assessment tool for such items. Such a dose guidance level should be no less onerous than the one applied to human intrusion into the facility, since the coastal erosion scenario may be regarded as at least as likely as the human intrusion scenario.

3. LLWR Ltd may wish to adjust its waste acceptance criteria for future disposals to the LLWR to make them consistent with the proposed test of significance.

## Concluding Remarks

### *Defensible Position*

Adoption of the proposals in this advice should provide the operator and the Environment Agency with a defensible position that, for both past and future disposals at the LLWR site, an optimised approach to minimising the risks from exposure of members of the public to ionising radiation is being applied.