



Decision Document: Low Level Waste Repository

October 2015

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Executive summary

LLW Repository Ltd has applied to vary an environmental permit to carry on radioactive substances activities at the Low Level Waste Repository (LLWR).

The LLWR is located on the west Cumbrian coast, near to the village of Drigg. The facility is owned by the Nuclear Decommissioning Authority (NDA), but is operated on behalf of the NDA by LLW Repository Ltd. The LLWR is the United Kingdom's principal facility for the disposal of solid low-level radioactive waste (LLW) and receives wastes from a range of producers, including nuclear power stations, defence establishments, general industry, hospitals and universities.

The site is situated on a former Royal Ordnance Factory and radioactive waste was first disposed of at the site in 1959, when United Kingdom Atomic Energy Authority (UKAEA) managed the facility. Between 1959 and 1995, approximately 800,000 m³ of waste was disposed of in 7 trenches. These trenches are now covered by an interim cap.

Disposing of waste in metal containers placed in an engineered concrete vault (Vault 8) began in 1988. The containers of waste are filled with cement grout before being placed in the vault. When full it is intended that the vaults and trenches will be covered by a final engineered cap. Vault 8 has a total capacity of 200,000 m³ of waste and is nearly full. A further Vault 9 has been built, but is currently only used for temporarily storing waste.

In 2002, the former operators of the LLWR submitted environmental safety cases for the site. We reviewed these and found them to be inadequate to support further disposal beyond Vault 8. As a result, in 2006 we issued an authorisation (now environmental permit) for the site, but only allowing disposals into Vault 8. In addition we required the operator to submit an updated environmental safety case (ESC) addressing our concerns by May 2011 (the 2011 ESC). This updated ESC was submitted and we have completed a detailed review of it and published our findings.

LLW Repository Ltd's permit variation application seeks permission to allow for continued radioactive waste disposal by burial at the LLWR into Vault 9 and further vaults, potentially out to Vault 20, including what the company term as the Extended Disposal Area (EDA). The application seeks:

- to allow further disposals of radioactive waste at the site where it meets the Waste Acceptance Criteria (WAC) defined by the ESC and in accordance with the ESC
- to remove annual radiological limits on disposals in the current permit, but instead to limit disposals against a lifetime radiological capacity for the site
- to remove a number of other specific restrictions in the current environmental permit

LLW Repository Ltd supports its application by assessments and evidence presented within its 2011 ESC and other application material provided.

In 2013 we advertised and consulted upon the application. We assessed the application, and considered the consultation responses received. In May 2015 we consulted on a draft decision to grant the application subject to the conditions in a draft varied permit. Having carefully considered all consultation responses received we have now reached a decision that we should grant the application subject to the conditions in the varied permit. A variation notice and consolidated permit, containing appropriate conditions, accompanies this document.

Decision document: application by LLW
Repository Ltd under the Environmental
Permitting (England and Wales) Regulations
2010 to carry on radioactive substances activities
at:

Low Level Waste Repository
Old Shore Road
Drigg
Holmrook
Cumbria
CA19 1XH

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1. About this document

This is a decision document. It explains how we have considered LLW Repository Ltd's application, responses to our consultations on the application and draft decision and why we have included specific conditions in the permit we are issuing. It is our record of our decision-making process, to show how we have taken into account all relevant factors in reaching our decision. Unless the document explains otherwise, we have accepted LLW Repository Ltd's proposals.

This document includes:

- a description of how we process and determine applications
- a summary of the application and brief details of our consultations on the application and draft decision
- a description of our assessment
- a statement of our decision
- a summary of consultation responses

2. How we process and determine applications

The Environment Agency is responsible under the Environmental Permitting (England and Wales) Regulations 2010 (EPR10) for regulating the carrying on of certain radioactive substances activities on nuclear sites in England, namely:

- the receipt of radioactive waste for the purposes of disposing of that waste
- the disposal of radioactive waste on or from the premises
- where the operator is not the nuclear site licensee, the keeping or use of radioactive material
- the keeping or use of mobile radioactive apparatus

“Disposals” of radioactive waste include discharges into the air, the sea, rivers, drains or groundwater, disposals to land and by transfer to another site. A “nuclear site” is one that has a nuclear site licence under the Nuclear Installations Act 1965.

We regulate these sites with the purposes of protecting members of the public from harm from the discharge and disposal of radioactive waste and to protect the wider environment. We regulate within a framework of extensive government policy, strategy and guidance on the management and disposal of radioactive waste. This framework is summarised in the [Government Guidance on Radioactive Substances Regulation \(RSR\)](#)¹. This guidance sets out the government’s position on how RSR should be applied and implemented and how particular terms should be interpreted in England by both the Environment Agency and operators. In summary, we require operators to protect people and the environment by:

- minimising the generation of radioactive waste
- minimising the amount of radioactive waste that has to be discharged into the environment
- discharging that waste in ways that minimise the resulting radiological impact on the public and protect the wider environment
- using the optimal route for the disposal of solid waste

Operators can apply to the Environment Agency for a new permit or a variation to an existing permit at any time. The process we follow in assessing applications is described in government guidance ([Core guidance](#)²) in general and in our guidance on “[the regulation of radioactive substances activities on nuclear licensed sites](#)”³ (RSR RGN2). The process for nuclear sites is shown in outline in Table 1.

We advertised and consulted on this application in accordance with our public participation statement and associated working together arrangements: see our “[Working together: your role in our environmental permitting](#)”⁴. In view of the nature of the application and the degree of public interest, we decided to undertake additional consultation on our draft decision and draft permit.

We have made our decision taking into account all relevant legal, policy and regulatory matters. The [Government Guidance on Radioactive Substances Regulation](#)⁵ describes the legal requirements and government policy in relation to the management of the generation and disposal

¹ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69503/pb13632-ep-guidance-rsr-110909.pdf

² https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/211852/pb13897-ep-core-guidance-130220.pdf

³ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296397/geho0310bsgf-e-e.pdf

⁴ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/309632/Working_together_PS_v2.0_1_.pdf

⁵ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69503/pb13632-ep-guidance-rsr-110909.pdf

of radioactive waste. The government has issued Statutory Guidance to the Environment Agency concerning the regulation of radioactive discharges into the environment (DECC 2009). This states that we should base our decision on the principles set out in the [2009 UK Strategy](#)⁶, namely:

- regulatory justification of practices by the government
- optimisation of protection on the basis that radiological doses and risks to workers and members of the public from a source of exposure should be kept as low as reasonably achievable (the ALARA principle)
- application of limits and conditions to control discharges from justified activities
- sustainable development
- the use of Best Available Techniques (BAT)
- the precautionary principle
- the polluter pays principle
- the preferred use of 'concentrate and contain' in the management of radioactive waste over 'dilute and disperse' in cases where there would be a definite benefit in reducing environmental pollution, provided that BAT is being applied and worker dose is taken into account

Table 1: Overview of the process of determination of applications

| Phase | | Comment |
|-------|--|---|
| 1 | Pre-application | We encourage applicants to discuss applications with us before submission. |
| 2 | Receive application and consult on the application | The applicant makes an application, providing the information as set out in the application form and supporting guidance. We advertise and consult on all applications for new permits. We may also advertise and consult on some variations, depending on the nature of the proposals and the likely degree of public interest. |
| 3 | Assess application and make a draft decision | We carefully assess the application and any responses received from consultation and come to a draft decision on whether to grant the application and, if so, the appropriate permit conditions. |
| 4 | Consultation on draft decision | We may choose to undertake further consultation on our draft decision and draft permit, depending on the nature of the proposals and the likely degree of public interest. We do this using a document that sets out our draft decision. |
| 5 | Review, approval and issue of decision | Where we consult on our draft decision, we carefully consider all relevant information we have received during and after consultation together with existing information. We make a decision whether a new or varied permit should be issued and, if so, what its conditions should be. We publish a document that provides the reasons for our decisions. |

[RSR RGN1 Radioactive Substances Regulation – Environmental Principles](#)⁷ (REPs) set out a consistent and standardised framework for the technical assessments and judgements that we make when regulating radioactive substances.

We have structured our assessment of the application in Section 5.4 to reflect our review of LLW Repository Ltd's 2011 environmental safety case (ESC), the layout and questions in the application form and the principle issues we need to consider.

⁶ <http://www.gov.scot/Resource/Doc/280203/0084414.pdf>

⁷ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296388/geho0709bqsb-e-e.pdf

Table 2 sets out the principle issues for consideration when making a decision on the disposal of radioactive waste and refers to the relevant reference documents and guidance which may be accessed through the www.gov.uk website (<https://www.gov.uk/government/collections/radioactive-substances-regulation-for-nuclear-sites>).

As the application under consideration is one for the disposal of solid radioactive waste by burial near the surface, the principal documents of relevance are the Guidance on Requirement for Authorisation (GRA): Near-surface disposal (Environment Agency et al. 2009) and Supplementary guidance to the GRA related to the implementation of the Groundwater Directive (Environment Agency 2012a). These documents, in particular the GRA, explain the requirements that we expect an operator to fulfil when they apply to us for a permit (or variation to a permit) to operate a near-surface facility for the disposal of radioactive waste. The GRA sets out our radiological protection requirements and explains our regulatory process that leads to a decision on whether to permit radioactive waste disposal. The GRA also describes the ESC we expect from the operator of a disposal facility.

In Section 6 of this document we explain how we have reached our decision against these and any other relevant considerations.

We will place the permit or notice we issue and the reasons for our decision on our public register.

| Table 2 : Principal considerations | |
|---|--|
| Considerations | Documentation |
| General | Government guidance on radioactive substances regulation RSR RGN2 The regulation of radioactive substances activities on nuclear licensed sites RSR RGN1 Radioactive Substances Regulation – Environmental Principles |
| Justification | Justification of practices DECC website ⁸ |
| Euratom Article 37 | Commission Recommendation of 6 December 1999 (EC 1999) |
| Operator and operator competence | RGN 5 Operator Competence ⁹ Management Guidance ¹⁰ |
| Disposal of radioactive waste | Guidance on Requirements for Authorisation (GRA): Near-surface disposal ¹¹ Supplementary guidance to the GRA related to the implementation of the Groundwater Directive ¹² Statutory guidance to the Environment Agency concerning the regulation of radioactive discharges into the environment (DECC 2009) |

⁸ <https://www.gov.uk/government/publications/2010-to-2015-government-policy-radioactive-and-nuclear-substances-and-waste/2010-to-2015-government-policy-radioactive-and-nuclear-substances-and-waste#appendix-2-making-justification-decisions-on-applications-to-use-ionising-radiation>

⁹ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/360290/460_11.pdf

¹⁰ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/299652/RSR_Management_arrangements_at_nuclear_sites.pdf

¹¹ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296507/geho0209bpjl-e-e.pdf

¹² https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296508/LIT_8036_58590a.pdf

| Table 2 : Principal considerations | |
|------------------------------------|--|
| Considerations | Documentation |
| | RSR: principles of optimisation in the management and disposal of radioactive waste ¹³ Criteria for setting limits on the discharge of radioactive waste from nuclear sites ¹⁴ |
| Disposal routes and monitoring | Radiological monitoring technical guidance note 1 ¹⁵ - Standardised reporting of radioactive discharges from nuclear sites Radiological monitoring technical guidance note 2 – Environmental radiological monitoring ¹⁶ |
| Radiological assessments | Principles for the assessment of prospective public doses ¹⁷ |
| Other statutory requirements | RGN 4 setting standards for environmental protection ¹⁸ |

While we will normally determine an application, the Secretary of State can require any application to be sent to them for determination (regulation 62 of the EPR10). As noted in the [Core guidance](#) this would be an exceptional step and likely to be taken only if the application involves issues of more than local importance, for example, if the application:

- is of substantial regional or national significance
- is of substantial regional or national controversy
- may involve issues of national security or of foreign governments

It also says in the [Core guidance](#) that any decision on the need for determination by the Secretary of State would be made solely on those grounds, with no consideration of the substantive merits of the application itself.

The Secretary of State has not “called in” this application.

¹³ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296495/LIT_8452_a9c510.pdf

¹⁴ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296486/geho0612buqp-e-e.pdf

¹⁵ http://www.sepa.org.uk/media/101584/radiological_monitoring_technical_guidance_note_1_standardised_reporting_of_radioactive_discharges_from_nuclear_sites.pdf

¹⁶ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296529/geho0811btvy-e-e.pdf

¹⁷ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296390/geho1202bklh-e-e.pdf

¹⁸ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296475/geho0112bukp-e-e.pdf

3. The application and our consultation on the application and draft decision

LLW Repository Ltd has applied to vary the conditions of a permit to carry on radioactive substances activities at the LLWR. The applicant has provided a description of the proposed changes to the permit and facility in the application (RSR Part C3 Question 2d), although the majority of the detail of the proposals is within the supporting 2011 ESC and other supporting documentation described below.

3.1. Background and application

3.1.1. Activities at the site

We regulate the disposal of radioactive waste at or from the LLWR. The LLWR holds a permit allowing it to dispose and transfer radioactive waste. The LLWR is the United Kingdom's principal facility for the near-surface disposal of LLW and receives waste from a range of producers from around the country, including; nuclear power stations, defence establishments, decommissioning nuclear power stations, general industry, hospitals and universities.

The LLWR is located on a former Royal Ordnance Factory and has been used as a radioactive waste disposal facility since 1959. The site occupies around 100 hectares and waste disposal operations take place in the 40 hectares at the north of the site. In the early days of disposal operations, solid radioactive waste was tipped and buried in shallow trenches. Between 1959 and 1995, approximately 800,000 m³ of waste was disposed of in 7 trenches. These trenches are now covered by an interim cap, which incorporates a plastic membrane, minimising the amount of water getting into the waste.

Disposal of waste in metal ISO freight containers emplaced in an engineered concrete vault (Vault 8) began in 1988. Where possible, this waste is compacted before being packed into the containers. The containers of waste are then filled with cement grout before being placed in the vault. Additionally, some items of waste are disposed of directly into the vaults and may be grouted in place. Vault 8 has a total permitted capacity of 200,000 m³ of waste and is virtually full. A further vault (Vault 9) has been built, but is only currently being used for the storage of waste, along with the storage of waste in higher stack positions in Vault 8.



Figure 1: Aerial view of the LLWR viewed from the north-west (courtesy of LLW Repository Ltd)

When each vault is full, LLW Repository Ltd proposes to contain further and isolate the waste by the placement of a robust engineered cap including low permeability layers. In addition, it is proposed that a low permeability cut-off wall will be constructed around the whole perimeter of the

disposal area extending down to a depth just below that of the waste. This is intended to minimise the horizontal flow of water into and out of the waste.

LLW Repository Ltd proposes to construct and fill a further 12 vaults up to Vault 20. It is predicted that this capacity will be sufficient for the LLWR to accept a significant proportion of the UK's LLW predicted to be generated out to around 2130 (excluding lower activity LLW that could be diverted to other facilities).

During disposal operations LLW Repository Ltd operates a grouting plant to fill the waste containers prior to disposal. The activities of this plant are regulated by Copeland Borough Council. During operations the company is responsible for ensuring ongoing safety, environmental protection and compliance with the permit and nuclear site licence issued by the Office for Nuclear Regulation (ONR). To this end a range of activities are undertaken to manage the waste and discharges resulting from the waste disposal activities, including maintenance of equipment, asset care, quality assurance checks and monitoring.

Periodically, major construction activities have been undertaken on the site related to waste disposal, for example the construction of vaults and the trench cap. If a permit and other relevant permissions are granted for further disposal it is anticipated that major construction activities will take place periodically to construct further vaults and to construct the final cap and cut-off wall.

In addition to the disposal of radioactive waste by burial, activities at the site also include:

- the decommissioning of plutonium contaminated material (PCM) storage magazines on the site and the subsequent management and transfer of the resulting waste (this is within the scope of the permit, but not affected by this permit variation application)
- the characterisation of land affected by contamination on the site resulting from its past use as a Royal Ordnance Factory and for the management of radioactive waste

A further, more detailed description of the site and its activities can be found in our Overview report of our review of the 2011 ESC (Environment Agency 2015a) or in LLW Repository Ltd's Site History and Description report submitted as part of the 2011 ESC (LLW Repository Ltd 2011a).

3.1.2. The 2011 environmental safety case and application documents

The site has operated in accordance with an ESC¹⁹ or environmental assessments in line with contemporary regulatory requirements for a number of decades. In 2002, the former operators of the LLWR submitted ESCs for the site. We reviewed these and considered them incomplete and inadequate to justify disposal of radioactive waste beyond Vault 8 (Environment Agency 2006). As a result, in 2006 we issued an authorisation (now permit) for the site, but this only allowed for disposals to Vault 8 and required the operator to submit an updated ESC addressing our concerns by May 2011 (the 2011 ESC).

Between May 2011 and 2013 we reviewed the 2011 ESC. As part of this review we required LLW Repository Ltd to provide us with responses to a number of questions we raised, that were necessary for us to conclude our review. These questions were documented on Issue Resolution Forms (IRFs) and the same forms were also used by LLW Repository Ltd to provide its response. By autumn 2013 we were able to feed back to LLW Repository Ltd that it had provided sufficient information within the 2011 ESC, combined with the responses to the IRFs, for us to complete our review.

The company submitted an application to vary its permit on 28 October 2013 under the EPR10 as amended (LLW Repository Ltd 2013a). The application was supported by the 2011 ESC, responses to the IRFs, further details on management systems (LLW Repository Ltd 2013b), supporting information on ecology (LLW Repository Ltd 2013c) and a developments document

¹⁹ A collection of arguments, provided by the developer or operator of a disposal facility, that seeks to demonstrate that the required standard of safety for people and the environment, both at the time of disposal and in the future, will be achieved.

(LLW Repository Ltd 2013d) which collated technical work undertaken by LLW Repository Ltd since the submission of the 2011 ESC in May 2011. Together this forms the information supporting LLW Repository Ltd's application to vary its permit. See Table 3 for further details. All of these documents are available on the [LLW Repository Ltd website](#)²⁰.

| Table 3 : Permit variation application documents | |
|---|--|
| Document | Description |
| Application for an environmental permit: Part RSR-A Part RSR-C3 Part RSR-F | Basic application forms: Part RSR-A: About the applicant and their premises Part RSR-C3: Application to vary a bespoke radioactive substance activity permit Part RSR-F: Charging and declarations |
| Application to vary LLW Repository Ltd's Permit | Application document explaining LLW Repository Ltd's request for variation of its permit and providing links to supporting documents which are detailed further below. |
| Developments Since the 2011 ESC | Provides a summary of the technical and management changes since the 2011 ESC, including work undertaken in response to various Environment Agency queries and requests for further information within IRFs. To be read in conjunction with the 2011 ESC. LLW Repository Ltd provide several supporting references at http://llwrsite.com/national-repository/key-activities/permit-application/ |
| LLW Repository Management System Manual | Describes LLW Repository Ltd's management systems. |
| Supporting information on ecology | Supporting information on the ecological impacts of the construction and operation of further disposal vaults at the LLWR. |
| Issue Resolution Forms | Three categories of IRFs were issued: Regulatory Issues, Regulatory Observations and Technical Queries, becoming less significant respectively (Environment Agency 2015a). 70 were issued in total. Each IRF and LLW Repository Ltd's response is summarised in LLW Repository Ltd's developments document . Individual IRFs and LLW Repository Ltd's responses are provided in full at http://llwrsite.com/national-repository/key-activities/permit-application/ , along with other documentation supporting our review of the 2011 ESC. |
| 2011 environmental safety case (ESC) | This is the main set of documents supporting the application and aims to make the case that further disposals at the LLWR will be safe for people and the environment now and in the future, in |

²⁰ <http://llwrsite.com/national-repository/key-activities/esc/>

Table 3 : Permit variation application documents

| Document | Description |
|----------|--|
| | <p>accordance with our requirements detailed in the GRA. It consists of:</p> <ul style="list-style-type: none"> • Level 0 - A non-technical summary • Level 1 - A single top level main report summarising the main arguments and the broad lines of evidence supporting them • Level 2 - 16 topic reports setting out in more detail the evidence to support the main arguments • Key Level 3 - 95 underpinning reports identified by LLW Repository Ltd as being 'key' • Other Level 3 - Several hundred other references referred to in the above documentation but not identified as 'key' <p>The Level 0, 1 and 2 documents plus the 'key' Level 3 documents are available from the LLW Repository Ltd internet site at: http://llwrsite.com/national-repository/key-activities/esc/esc-documentation/ .</p> |

3.1.3. Permit variation application

Currently, LLW Repository Ltd has a permit allowing the disposal of radioactive waste to the environment via: approved outlets (for gaseous and aqueous waste), disposal on the premises and transfer to another operator. The permit does not, however, allow for the disposal of waste on the premises other than into Vault 8 within a height equivalent to four ISO freight containers. All other solid waste held on site within ISO freight containers is currently stored pending permission to dispose, or alternative means of management.

The application to vary its permit submitted by LLW Repository Ltd seeks permission to dispose of further radioactive waste at the LLWR in line with the details provided within the 2011 ESC and into a potential further 12 vaults, out to what LLW Repository Ltd refers to as the Extended Disposal Area (EDA). The EDA includes the trenches and Vaults 8 to 14 (the Reference Disposal Area (RDA)) and Vaults 15 to 20. The company proposes to design, operate and close the facility in accordance with the 2011 ESC and subsequent changes described within the permit variation application and supporting documents. Further details are contained within LLW Repository Ltd's application to vary its permit (LLW Repository Ltd 2013a), however, in summary, the application also requests:

- to stack the disposed waste higher (up to 9 ISO freight containers)
- to allow further disposal of radioactive waste at the site where it meets the waste acceptance criteria (WAC) defined by the 2011 ESC and in accordance with revised waste acceptance procedures to control, amongst other things total radiological and non-radiological capacity and material characteristics and the packaging of waste
- to remove the current annual radiological limits on disposals, but to limit disposals against a lifetime radiological capacity for the site
- to remove a number of specific restrictions in the current permit on materials and items that might have implications for operational safety

- to remove a blanket restriction in the current permit on the disposal of complexing or chelating agents²¹
- permission to dispose of waste currently stored in Vaults 8 and 9, subject to demonstration that this is consistent with the ESC and BAT, that is, it is the optimal management approach

3.1.4. Scope of our considerations

In considering LLW Repository Ltd's application to vary its current permit (Environment Agency 2010) we have restricted our considerations to our regulatory role to protect the environment and to activities on the site affected by the application.

The variation application relates to the disposal of solid radioactive waste by burial only and so this Decision Document does not address other unaffected activities at the LLWR, or only addresses them to the extent that they are affected by the proposed changes. For example, we do not:

- address activities on site related to the decommissioning of PCM facilities and related discharges to the environment
- review the operations of the grout plant, where discharges are regulated by Copeland Borough Council, other than to the extent that operations have had minor modifications related to the 2011 ESC
- address general waste minimisation on site, which remains a standard requirement of the permit
- assess transfers of radioactive waste to other sites
- review other non-radioactive substance regulation permits at the site related to discharges of site leachate and biologically treated sewage effluent containing no trade effluent
- assess in detail aqueous and gaseous discharge routes except to the extent that they are relevant to the variation application and the 2011 ESC

As this is not an application for a new permit we do not fully re-assess operator competence, as LLW Repository Ltd is an established operator currently complying with its permit. However, in Section 5.4.1 we do address LLW Repository Ltd's environmental safety culture and management systems against requirements detailed in the GRA. Similarly, we do not fully re-assess monitoring undertaken by the applicant, but in Section 5.4.5 we do assess whether the company adequately addresses the monitoring requirements detailed within the GRA.

Historical land contamination issues, for example arising from use of the site as a Royal Ordnance Factory, do not fall within the scope of the permit, other than to the extent that contamination may affect impacts arising from disposals. Our approach to historical land contamination issues on nuclear sites is set out in guidance we have produced in conjunction with ONR, Scottish Environment Protection Agency and Natural Resources Wales: [Regulatory Expectations for successful Land Quality Management at Nuclear Licensed Sites](#)²²

In addition to a permit, LLW Repository Ltd is required to gain planning permission from the local waste planning authority (Cumbria County Council) for further development of the site. Further development and disposal beyond Vault 8 cannot proceed without both permissions being in place, although the applicant can choose in what order to apply for them.

In parallel with the permit variation application LLW Repository Ltd is applying for planning permission to allow the construction of further vaults, disposal of further waste, installation of capping and closure engineering and associated storage and handling of materials. Planning permission and permitting decisions are separate but complimentary. Planning permission focuses on land use issues, whereas permitting focuses on the control of processes and emissions to the environment. The Communities and Local Government National Planning Policy Framework provides further guidance (DCLG 2012). However, the range of issues considered under both

²¹ Complexing and chelating agents are chemicals which may enhance the solubility and hence mobility of radionuclides in the environment. Such agents are often used as decontamination agents.

²² <http://www.onr.org.uk/land-quality-management.htm>

processes overlap to an extent and we have worked closely with Cumbria County Council to ensure clarity in our respective roles.

Permitting focuses on activities directly associated with the receipt and disposal of radioactive waste, including discharges to the environment and only considers amenity and visual impacts to a limited extent. Whereas planning permission considerations are generally broader and consider a wider range of issues such as construction, transport to and from site, disposal capacity needs, facility location, amenity, visual impacts and socio-economic issues.

Under both processes habitats and conservation assessments are required, although again the scope of these requirements differ. The permitting process focuses on impacts that may result from the operation of the activity, for example through discharges. The planning process must also consider the impacts of construction activities, including, for example, the establishment of temporary construction compounds.

We note that the timescales of the respective planning application and permit variation also differ. We do not normally time limit permits and therefore the variation application seeks permission for the full scope of the permission LLW Repository Ltd seeks, potentially to dispose of waste out to Vault 20 (the extent of the EDA), which LLW Repository Ltd projects will take over 100 years to complete. We can and will vary the permit as necessary at any point during this period should we consider that it no longer remains relevant or protective of people or the environment. The planning application is time-bound. At the time of writing the details have not been confirmed, but it is anticipated that the application will be for fewer vaults and for a more limited timeframe. This difference reflects the differences in planning legislation where permissions are not so readily varied once issued. At any time both permissions will be required to carry on the proposed activities at the LLWR and so if either one is not granted or is revoked, the proposed activities will be required to cease.

3.2. Site location

The LLWR is located on the west Cumbrian coast about 0.5 km from the Irish Sea coast, near to the village of Drigg. The LLWR sits outside the Lake District National Park, with the Ravenglass Estuary to the south of the site and the Cumbrian mountains to the east. The area along the coast adjacent to the site and the Ravenglass Estuary are designated as a Special Area of Conservation (SAC) under the European Habitats Directive and a Site of Special Scientific Interest (SSSI), known as the Drigg Coast SAC and SSSI. The Drigg stream flows through the site and is joined by the East-West Stream, which originates off the site to the north east and discharges to the tidal reaches of the River Irt after leaving the site to the south. Although a semi-rural area, a number of properties are adjacent to the site boundary, with the largest concentration of properties to the south-east in Drigg village itself.

The northern half of the site is used for waste disposal; the south western boundary of the northern area of the site borders the SAC/SSSI.

3.2.1. Conservation and other environmentally important sites

A number of conservation and environmentally important sites are in the vicinity of the LLWR:

- Of greatest significance is the Drigg Coast SAC, which is immediately adjacent to the LLWR. The Drigg Coast is also designated as a SSSI.
- The Lake District High Fells SAC and Wastwater SAC are within 10 km of the site.
- Two further SSSIs are located within 2 km of the LLWR, Hallsenna Moor and Drigg Holme.
- The Cumbria Coast Marine Conservation Zone (MCZ) lies approximately 500 m to the west of the LLWR.
- The LLWR lies close to the boundary of the Lake District National Park.
- Three local wildlife sites lie within 2 km of the site, Seascale Country Wildlife Site, Panope Bog County Wildlife Site and Addyhouse Wood Ancient Woodland.

Additionally, we have carried out a screening exercise to identify important habitats and species recorded within 2 km of the site. This exercise identified several habitats and species of principle importance within and adjacent to the LLWR (Environment Agency 2014a).

3.3. Consultation

We advertised and consulted on the application from 20 November 2013 to 19 February 2014, in accordance with our Public Participation Statement and Working Together Arrangements. We have placed the responses on our public register, held at the Environment Agency, Ghyll Mount, Penrith except where the person making the response asked us not to do so. See Annex 2 for further details.

Separately we consulted Natural England in July 2014 for 20 days on our Appropriate Assessment that is required under the Conservation of Habitats and Species Regulations 2010 (in accordance with the Habitats Directive) and our assessment of the application under the Wildlife and Countryside Act 1981, as amended by the Countryside and Rights of Way Act (CRoW) 2000. Natural England confirmed its agreement with both assessments by October 2014. See Annex 2 and Section 5.4.8 for further details.

We advertised and consulted on our draft Decision Document and a draft permit from 28 May 2015 to 23 July 2015, in accordance with our Public Participation Statement and Working Together Arrangements. We have placed the responses on our public register, held at the Environment Agency, Ghyll Mount, Penrith except where the person making the response asked us not to do so. See Annex 3 for further details.

Although we were able to consider the application duly made (that is, we considered it was in the correct form and contained sufficient information for us to begin our determination), we needed more information in order to determine it, and issued an information notice as detailed below in Table 4. A copy of the information notice was placed on our public register, as were the responses when received.

| Table 4: Details of further information notice | |
|--|---|
| Further information requested | Response received |
| <p>Notice dated 21 May 2014 (LLWRconsultation/14/001/O – Request for further information to support your application²³ (Environment Agency 2014f)):</p> <p>Further information was requested in relation to:</p> <p>Wells pathway and radiological capacity:</p> <ul style="list-style-type: none"> Well pathway calculations Choice of deterministic or probabilistic calculations in deriving estimates of radiological capacity Coastal erosion radiological capacities Reference cases <p>Habitats Regulations Assessment (HRA) and the Marine and Coastal Access Act:</p> <ul style="list-style-type: none"> Hydrogeological effects Timescales of the HRA Assessment of habitat loss Assessment of radiological impacts Changes to water chemistry Assessment of air quality impacts Assessment of the EDA | <p>Received 6 June 2014:</p> <p>We received several memos and reports from LLW Repository Ltd in response to the further information request. These are available on our public register or on LLW Repository Ltd's website under Application Documentation (supporting documents).</p> <ul style="list-style-type: none"> ESC Memo: LLWR/ESC/MeM(13)240, January 2014, addresses queries about (LLW Repository Ltd 2014a): <ul style="list-style-type: none"> well pathway calculations and the choice of case on which radiological capacities are based the choice of deterministic or probabilistic calculations for deriving radiological capacities radiological capacities derived from assessment calculations for coastal erosion Letter: LLWR/EA/13/0198/03, addresses request for an updated Table 4.1 and Table 4.2 of the main Level 1 ESC report, clarifying assessment cases used in the 2011 ESC and updating presented doses |

²³ <https://consult.environment-agency.gov.uk/portal/npsapp/llwr/dd?pointId=s1431592835614#section-s1431592835614>

Table 4: Details of further information notice

| Further information requested | Response received |
|---|---|
| <ul style="list-style-type: none"> • Marine (intertidal) Habitats and (MCZ) • Amphibian assemblage and dragonfly assemblage | <p>(LLW Repository Ltd 2013i).</p> <ul style="list-style-type: none"> • ESC Memo: LLWR/ESC/MeM(14)248, May 2014 (plus associated schematic), addresses a request for a demonstration that there is no linkage between the surface water features and associated habitats within the Drigg Coast SAC and shallow groundwater as monitored in boreholes located within the SAC, adjacent to the LLWR (LLW Repository Ltd 2014b). • Report: URS, Habitats Regulations Assessment Signposting Document, February 2014, provides an updated 'signposting' document, pointing to a range of further habitats information necessary to complete our assessment. It specifically addresses a number of queries related to habitat loss, radiological impacts, changes to water chemistry, air quality impacts and assessment of the EDA (URS 2014a). • Report: URS, Ecological Information to Address Further Information Notice for Variation Application EPR/YP3293SA/V002, addresses requests for further information on marine (intertidal) habitats and MCZ assessment, amphibian assemblages and dragonfly assemblages (URS 2014b). • ESC Note: Omission of Tritium (H-3) and Radon (Rn-222) from Habitats Risk Assessment, provides clarification of the reasons for not addressing H-3 and Rn-222 in detail within the habitats assessment. |

In addition to the formal further information notice described above, we requested some further information from LLW Repository Ltd on minor issues to support our review of the variation application. A number of the responses are available on the [LLW Repository Ltd web site](https://consult.environment-agency.gov.uk/portal/npsapp/llwr/dd?pointId=s1431592835614#section-s1431592835614) under Application Documentation (supporting documents). Where relevant any further information used in our assessment is referred to in our review of the 2011 ESC (Environment Agency 2015a to g), or our habitats assessment (Environment Agency 2014c). The additional information used was confirmed to LLW Repository Ltd [by letter on 17 December 2014](https://consult.environment-agency.gov.uk/portal/npsapp/llwr/dd?pointId=s1431592835614#section-s1431592835614)²⁴ (Fairhurst 2014).

We describe our assessment of the permit variation application in Section 5.4. This includes reference to those comments received during consultation that have affected our decision.

²⁴ <https://consult.environment-agency.gov.uk/portal/npsapp/llwr/dd?pointId=s1431592835614#section-s1431592835614>

4. Our review of the 2011 environmental safety case

4.1. Relevant guidance

[Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom](#)²⁵, published in 2007, covers aspects of the management of LLW. The policy also provides definitions of categories of LLW and identifies that a suitable end point for LLW that remains following the application of the waste management hierarchy should be disposal to an appropriately engineered facility, either below or above ground, with no intent to retrieve. It identifies that use of a centralised facility may be appropriate.

The policy also identifies that the environment agencies will be providing updated guidance on the near-surface disposal of solid radioactive waste. This updated [Guidance on Requirements for Authorisation \(GRA\): Near-surface disposal](#) was published in February 2009. It applies to existing land-based disposal facilities that have a permit issued under EPR10 and are classed as near-surface facilities, such as the LLWR. It explains the requirements that we expect an operator to fulfil when applying to us for a varied permit to operate such a facility. The guidance sets out our radiological protection requirements and explains our regulatory process that leads to a decision on whether to permit radioactive waste disposal.

LLW Repository Ltd must demonstrate that the LLWR will properly protect people and the environment. The company must show that its approach to developing and operating the facility will meet a series of principle and requirements. The GRA sets out those principles and requirements and describes how we interpret them. It also provides information about the associated framework of legislation, government policy and international obligations, which will not therefore be repeated in detail in this document.

Although the guidance within the GRA is non-statutory it emphasises items that are particularly important from our perspective as regulators and our strong expectation that the operator will need to meet them.

The GRA includes a requirement that the operator of a disposal facility should produce an ESC. This should show how the facility meets the requirements set out in the guidance and show that people and the environment are protected from hazards associated with disposals to the facility.

The GRA is based upon the fundamental protection objective for the disposal of radioactive waste on land. The guidance focuses on 5 principles for solid radioactive waste disposal and 14 more specific requirements which, if fulfilled proportionately to the hazard presented in the waste, should ensure the principles are properly applied. These are summarised below in Table 5.

As this permit variation application relates solely to radioactive waste disposal to a near-surface facility, the GRA provides the basis of our review of the 2011 ESC and for our decision on permitting. The permit requires that the operator maintains a documented ESC. Other guidance, as outlined in Section 2, remains relevant to our decision.

²⁵https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/254393/Low_level_waste_policy.pdf

Table 5: GRA Principle and Requirements

| Principle or Requirement | Title | Description |
|----------------------------------|--|---|
| Fundamental protection objective | | The fundamental protection objective is to ensure that all disposals of solid radioactive waste to facilities on land are made in a way that protects the health and interests of people and the integrity of the environment, at the time of disposal and in the future, inspires public confidence and takes account of costs. |
| Principles | | |
| Principle 1 | Level of protection against radiological hazards at the time of disposal and in the future | Solid radioactive waste shall be disposed of in such a way that the level of protection provided to people and the environment against the radiological hazards of the waste both at the time of disposal and in the future is consistent with the national standard at the time of disposal. |
| Principle 2 | Optimisation (as low as reasonably achievable) | Solid radioactive waste shall be disposed of in such a way that the radiological risks to individual members of the public and the population as a whole shall be as low as reasonably achievable under the circumstances prevailing at the time of disposal, taking into account economic and societal factors and the need to manage radiological risks to other living organisms and any non-radiological hazards. |
| Principle 3 | Level of protection against non-radiological hazards at the time of disposal and in the future | Solid radioactive waste shall be disposed of in such a way that the level of protection provided to people and the environment against any non-radiological hazards of the waste both at the time of disposal and in the future is consistent with that provided by the national standard at the time of disposal for wastes that present a non-radiological but not a radiological hazard. |
| Principle 4 | Reliance on human action | Solid radioactive waste shall be disposed of in such a way that unreasonable reliance on human action to protect the public and the environment against radiological and any non-radiological hazards is avoided both at the time of disposal and in the future. |
| Principle 5 | Openness and inclusivity | For any disposal of solid radioactive waste, the relevant environment agency shall: <ul style="list-style-type: none"> • establish ways of informing interested parties and the public about regulatory goals, processes and issues • consult in an open and inclusive way |
| Requirements | | |
| Requirement R1 | Process by agreement | The developer should follow a process by agreement for developing a disposal facility for solid radioactive waste. |
| Requirement R2 | Dialogue with local communities and others | The developer should engage in dialogue with the planning authority, local community, other interested parties and the general public on its developing environmental safety case. |
| Requirement R3 | Environmental safety case | An application under EPR10 relating to a proposed disposal of solid radioactive waste should be supported by an environmental safety case. |

Table 5: GRA Principle and Requirements

| Principle or Requirement | Title | Description |
|---------------------------------|---|---|
| Requirement R4 | Environmental safety culture and management system | The developer/operator of a disposal facility for solid radioactive waste should foster and nurture a positive environmental safety culture at all times and should have a management system, organisational structure and resources sufficient to provide the following functions: (a) planning and control of work; (b) the application of sound science and good engineering practice; (c) provision of information; (d) documentation and record-keeping; (e) quality management. |
| Requirement R5 | Dose constraints during the period of authorisation | During the period of authorisation of a disposal facility for solid radioactive waste, the effective dose from the facility to a representative member of the critical group should not exceed a source-related dose constraint and a site related dose constraint. |
| Requirement R6 | Risk guidance level after the period of authorisation | After the period of authorisation, the assessed radiological risk from a disposal facility to a person representative of those at greatest risk should be consistent with a risk guidance level of 10^{-6} per year (i.e. 1 in a million per year). |
| Requirement R7 | Human intrusion after the period of authorisation | 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 on the basis that it is likely to occur. The developer/operator should, however, consider and implement any practical measures that might reduce the chance of its happening. The assessed effective dose to any person during and after the assumed intrusion should not exceed a dose guidance level in the range of around 3 mSv/year to around 20 mSv/year. 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). |
| Requirement R8 | Optimisation | The choice of waste acceptance criteria, how the selected site is used and the design, construction, operation, closure and post-closure management of the disposal facility should ensure that radiological risks to members of the public, both during the period of authorisation and afterwards, are ALARA, taking into account economic and societal factors. |
| Requirement R9 | Environmental radioactivity | The developer/operator should carry out an assessment to investigate the radiological effects of a disposal facility on the accessible environment both during the period of authorisation and afterwards with a view to showing that all aspects of the accessible environment are adequately protected. |
| Requirement R10 | Protection against non-radiological hazards | The developer/operator of a disposal facility for solid radioactive waste should demonstrate that the disposal system provides adequate protection against non-radiological hazards. |
| Requirement | Site investigation | The developer/operator of a disposal facility for solid radioactive waste should carry out a programme of site |

| Table 5: GRA Principle and Requirements | | |
|---|--|--|
| Principle or Requirement | Title | Description |
| R11 | | investigation and site characterisation to provide information for the environmental safety case and to support facility design and construction. |
| Requirement R12 | Use of site and facility design, construction, operation and closure | The developer/operator of a disposal facility for solid radioactive waste should make sure that the site is used and the facility is designed, constructed, operated and capable of closure so as to avoid unacceptable effects on the performance of the disposal system. |
| Requirement R13 | Waste acceptance criteria | The developer/operator of a disposal facility for solid radioactive waste should establish waste acceptance criteria consistent with the assumptions made in the environmental safety case and with the requirements for transport and handling and demonstrate that these can be applied during operations at the facility. |
| Requirement R14 | Monitoring | In support of the environmental safety case, the developer/operator of a disposal facility for solid radioactive waste should carry out a programme to monitor for changes caused by construction, operation and closure of the facility. |

4.2. Our review approach and documents

Our review of the 2011 ESC and further information supporting the permit variation application as described in Section 3, forms the basis for our decision on the permitting of the LLWR for further disposal of radioactive waste. The structure and content of our review outputs are detailed further below, but in particular reference should be made to our [Review of LLW Repository Ltd's 2011 environmental safety case: Non-technical summary](#)²⁶ (Environment Agency 2015b), which aims to summarise the outcome of our review in relatively non-technical language and our [Review of LLW Repository Ltd's 2011 environmental safety case: Overview report](#)²⁵ (Environment Agency 2015a), which summarises our review in greater detail.

Our detailed review comprised an assessment of whether the 2011 ESC arguments, outlined in LLW Repository Ltd's Level 1 report, adequately address the requirements of the GRA and whether the evidence provided supports the arguments. We have reviewed lines of evidence and underpinning information, judged by our suitably qualified and experienced reviewers to be of importance to the ESC to the depth considered necessary to determine their validity, including tracing data and assumptions back to original empirical evidence. We have completed a detailed review of the Level 1, Level 2 and important Level 3 documentation, also referring to other Level 3 documents to the extent necessary.

The primary test of the acceptability of the 2011 ESC as a whole, or of an individual document, was whether it satisfies the relevant principles, requirements and guidance in the GRA. Where potential deficiencies or other issues were identified during our review, they were documented on an IRF and their importance categorised. During our review process LLW Repository Ltd was asked to provide a substantive response to the IRFs, so as to provide the information necessary to conclude our review. By the end of our review the company had adequately responded to each IRF and the information provided formed part of the consultation on the permit variation application.

²⁶ <https://www.gov.uk/government/publications/environment-agency-review-of-llwrs-environmental-safety-case>

Our review of the 2011 ESC addressed all aspects of the GRA to the extent necessary to reach a conclusion and was proportionate to the risk or hazard presented by that issue. We therefore focused upon those areas that were either of greatest significance to the outcome of the ESC, or required the greatest attention to satisfactorily conclude our review and to satisfy ourselves that uncertainties had been adequately addressed. A degree of emphasis was also placed upon important changes to the site development plan, for example, significant changes to the proposed repository design, WAC or manner of operations.

We also looked back to recommendations made to the former operator of the LLWR following our review of the 2002 ESCs. Those recommendations were documented on Issue Assessment Forms (IAFs). In a stand-alone document, [Review of LLW Repository Ltd's 2011 environmental safety case: Issue Assessment Forms](#)²⁷ (Environment Agency 2015j), we report our review of LLW Repository Ltd's progress in addressing actions raised in the IAFs.

We recognise that the 2011 ESC is a complex submission involving a wide range of technical assessments that will evolve and improve in the future as technology and understanding advances. Certain details will also be developed further as the site advances, for example towards construction of the final engineered cap over the waste. We have identified important areas which we believe will benefit from further work, development or clarification in the future. These areas are identified as Forward Issues (FIs) and represent areas of work that we believe are important for LLW Repository Ltd to progress as part of its forward improvement plan. FIs address areas where we expect continued improvement in the ESC and its implementation. We will require LLW Repository Ltd to engage with us on these FIs, to put in place formal mechanisms to track and address them and, as necessary, incorporate work to address them in its forward programmes of work. LLW Repository Ltd should also report to us on progress and when it believes the FIs have been fully addressed.

Throughout the review we also made a number of specific recommendations where we see scope for possible improvement or development, but which are comparatively minor in nature relative to FIs. As a matter of good practice we expect LLW Repository Ltd to address these recommendations and will expect a mechanism to be put in place to track them.

The output from our review of the 2011 ESC is a series of review reports that provide a technical basis to this Decision Document. The document hierarchy is illustrated in Figure 2.

The main document is the [overview report](#) and the associated [non-technical summary](#). They provide our conclusions on the extent to which LLW Repository Ltd's 2011 ESC demonstrates to our satisfaction that existing and proposed future disposals meet the requirements set out in the GRA. The overview report includes background information on the history of the LLWR and regulatory requirements. It also describes our review process in greater detail.

The overview report is supported by five technical review reports, which provide more detailed conclusions on the technical adequacy of the 2011 ESC as a basis for permitting future disposals. These reports cover the following topic areas: [Safety Case Management](#)²⁶ (Environment Agency 2015c); [Inventory and Near Field](#)²⁶ (Environment Agency 2015d); [Site Understanding](#)²⁶ (Environment Agency 2015e); [Optimisation and Engineering](#)²⁶ (Environment Agency 2015f); and [Assessments](#)²⁶ (Environment Agency 2015g). Between them the 5 reports address each of the GRA requirements. The [IRFs](#)²⁶ (Environment Agency 2015h) and [FIs](#)²⁶ (Environment Agency 2015i) resulting from each of the topic area reports are collated in standalone reports.

Together the documents describing the review of the 2011 ESC summarise our review and provide information to support our decision about the future permit for the LLWR.

²⁷ <https://www.gov.uk/government/publications/environment-agency-review-of-llwrs-environmental-safety-case>

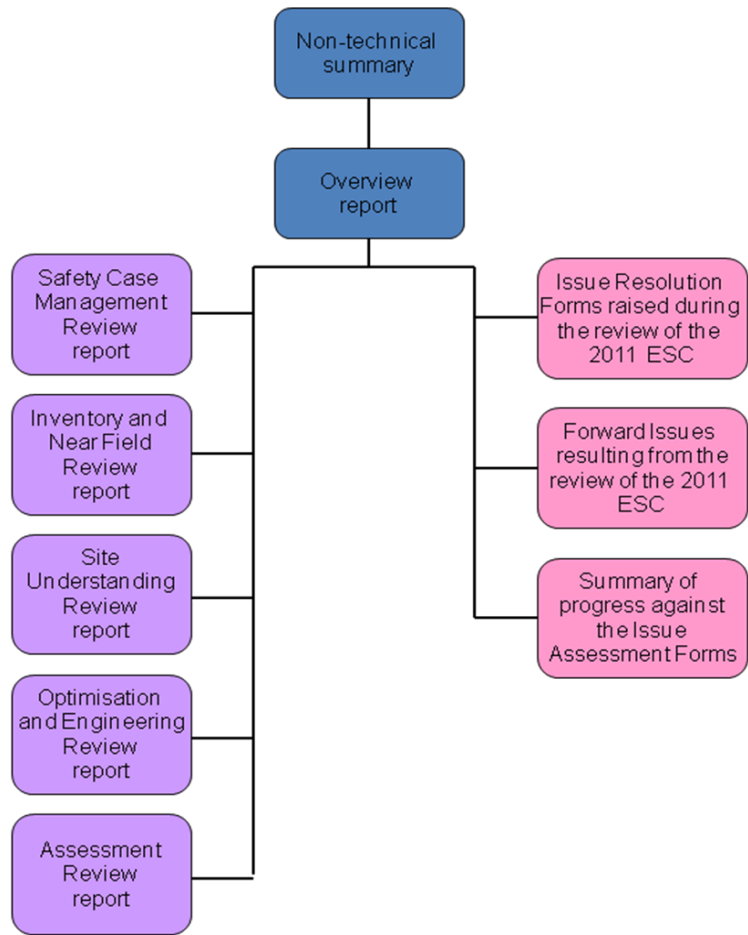


Figure 2: The Environment Agency review of the 2011 ESC: Document structure

5. Our assessment

5.1. Introduction

In this section we set out our decision based on our assessment of the application, in particular the 2011 ESC, and consideration of the responses to consultation. This section covers a range of matters we need to consider before coming to a decision on whether to grant the permit variation application and, if so, subject to what conditions.

Our assessment of the 2011 ESC and associated permit variation application represents a significant body of work and so this document can only provide a high level summary and discussion of important issues and topics. For fuller information please refer to LLW Repository Ltd's application documents (see Section 3), further information provided (see Section 3) and our review of the 2011 ESC (see Section 4), in particular the non-technical summary (Environment Agency 2015b) and overview report (Environment Agency 2015a).

Within this section we consider how the operator proposes to carry out the disposal of waste so as to reduce the radiological impact to members of the public to a level that is ALARA and to protect the environment. We explain how we have had regard to relevant statutory requirements and government policy. We consider the radiological impact on members of the public and the environment and so how a range of environmental legislation is addressed. We also consider a range of other areas relevant to permitting such as monitoring, engineering, non-radiological impacts, impacts on non-human species and a number of wider socio-economic duties including contributing to sustainable development.

In reaching our decision, we have sought to take into account the relevant legislation, government policy and guidance, our own guidance and the responses to consultation. Table 2 in Section 2 summarises the principle documentation that describes these requirements, the principle guidance document relating to the near-surface disposal of radioactive waste being the GRA. Our consideration of responses to consultation that have affected our approach or decision is set out in the relevant parts of this Section. Our consideration of other responses is set out in Annex 2, Table 9 and Annex 3 Table 11.

A number of issues were raised which are outside, or partially outside, our remit and which we have not had regard to in reaching our decision. We have identified these issues in Annex 2, Table 10.

5.2. Justification

The Justification of Practices Involving Ionising Radiation Regulations 2004 ('the Justification Regulations') are not part of the Environmental Permitting regime. But if an application for a permit relates to a practice under Council Directive 96/29/EURATOM (the Basic Safety Standards Directive - BSSD), we can only grant a permit if the practice is justified. The government has published information on the [Justification of Practices](#).

Justification is not required for this application as it relates to the burial of radioactive wastes. The burial of radioactive waste is the inevitable consequence of other justified practices (for example, power generation) and [government guidance](#)²⁸ considers it inappropriate to require separate justification. This does not preclude the need under EPR10 for the demonstration of optimisation to ensure that radiation exposures will be as low as reasonably practicable.

5.3. Euratom Treaty, Article 37

Under Article 37 of the Euratom Treaty, every time a Member State alters the way it plans to dispose of radioactive waste, or has a new nuclear facility that may increase discharges to air,

²⁸ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/256253/justification-guidance.pdf

water or land, it may need to make a submission to the European Commission. An Article 37 submission has to include enough information and data to determine whether such plans are liable to result in the radioactive contamination of the water, soil or airspace of another Member State. The Commission provides its opinion within six months, after consulting the group of experts referred to in Article 31 of the Treaty. Until the European Commission gives its opinion, we cannot grant a permit to allow an operator to proceed with new plans for disposal of radioactive waste or to operate a new facility.

On 24 October 2014 the government submitted data pursuant to Article 37 of the Euratom Treaty in respect of the LLWR. Having examined the data the European Commission concluded in December 2014 that the information provided was in line with the conditions set out under section 5(d) of Recommendation 2010/63 5/Euratom and a formal submission of data for the planned modification was not necessary. The commission reached this decision on the basis that:

- the data submitted concerned only modifications to a plan for the disposal of radioactive waste on which no opinion had been given previously
- the permit variation relates to a permit currently in force
- the permit does not modify the dose constraints applicable to the facility to less restrictive values
- the potential consequences of the unplanned releases which may follow the reference accident(s) evaluated in the licensing procedure remain unchanged

Therefore, an Article 37 submission was not required for this application and we will not need to receive an opinion before granting a variation to the permit.

5.4. Assessment

LLW Repository Ltd has applied to us to vary its permit (see Section 3), supported by an ESC and other documentation. We have assessed this application in line with our guidance, primarily the GRA (see Section 4). Overall, following this detailed review we have concluded that LLW Repository Ltd has met the requirements of the GRA (see text box below which reproduces our conclusions) (Environment Agency 2015a). Therefore, with regards to the GRA requirements, we consider it appropriate to issue a permit variation as requested by LLW Repository Ltd, although within this Section we discuss further more detailed aspects of this decision.

We have prepared the permit taking into account the application and supporting documents, our review of those, consultation comments and our template permits and associated guidance. LLW Repository Ltd's operations involve both the burial of radioactive waste (to which this variation application relates) and other activities addressed by our permits, such as gaseous discharges from decommissioning activities. Therefore, the permit is based upon the standard template permit for radioactive substance activities carried out on a nuclear site, supplemented with additional conditions associated with burial activities (Environment Agency 2012b). These template permits are designed to ensure we meet all our obligations to regulate the sites and to facilitate compliance.

The current permit (Environment Agency 2010) in force at the LLWR was initially issued under the Radioactive Substances Act 1993 (RSA93). In 2010 the EPR10 came into force and with it a number of changes were made to the template permit, although the meaning and intent remained essentially the same. The current LLWR permit remains largely in the older RSA93 format, but will be updated to the EPR10 format following a decision to vary it. The conditions of the permit are described further in Section 6.

In the sections below we discuss our assessment in greater depth where:

- we propose significant changes to the permit (other than changes purely resulting from a move from an RSA93 to an EPR10 permit)
- we addressed significant issues in our review of the 2011 ESC which may impact upon compliance
- we consider it beneficial to describe how the permit conditions have been constructed and their basis in the 2011 ESC

- we have identified further improvement and information requirements, or pre-operational measures for future development within the permit
- we have addressed consultation comments

We will also address some other areas not addressed by the 2011 ESC and GRA, such as wider conservation duties and other statutory duties we hold.

Within this Decision Document we do not systematically address each of the GRA requirements. This is done at a summary level within our overview report (Environment Agency 2015a) and in more detail within each of our technical review reports (Environment Agency 2015c to g).

Conclusions of our review of the 2011 ESC (Environment Agency 2015a)

LLW Repository Ltd submitted an ESC for the LLWR to the Environment Agency on 1 May 2011 (the 2011 ESC) in response to Schedule 9 Requirement 6 of the current LLWR environmental permit. The 2011 ESC covers the period up to withdrawal of control and thereafter. We carried out a detailed technical review of this ESC to determine whether it adequately meets Requirement 6. We also considered whether it meets all the requirements of the GRA. In our review, we have considered the ESC as submitted in 2011, as well as other technical work carried out in the period leading up to LLW Repository Ltd's permit application that we received on 28 October 2013. The outcomes of this review form a major input to our regulatory decision whether to permit the LLWR for further disposal of radioactive waste.

The 2011 ESC submission is of good quality and has generally proved clear and concise. LLW Repository Ltd has directly addressed the GRA requirements with evidence and further supporting evidence has been readily traced. The level of detail in the 2011 ESC is proportionate to the hazard associated with the LLWR. However, during our review we had to request information not included in the original submission and raise a number of issue resolution forms to obtain further information to support our review. With reference to this additional information, the 2011 ESC was sufficient and comprehensive enough to allow us to complete our review.

We consider that LLW Repository Ltd has demonstrated that it has adequately met all the principles and requirements of the GRA at this stage of development of the repository. This is consistent with achieving an appropriate level of environmental safety at the LLWR now and in the future. Appropriate resources and management systems are in place to allow LLW Repository Ltd to continue to operate the site in accordance with the ESC and our requirements.

We expect LLW Repository Ltd to continue to develop its ESC as a live case, with ongoing annual, periodic and major reviews. We expect a forward programme of work to be developed and maintained. We will work with LLW Repository Ltd to make sure that this forward programme of work meets our regulatory expectations with the aim of ensuring continued improvement to the ESC and continued compliance with the requirements of the GRA. In support of this, we raised a number of forward issues on important areas where we see scope for continued improvement in the ESC and its implementation. We will monitor progress against these forward issues and will require further improvements to be made so that the ESC continues to meet our expectations. We have also made recommendations on areas where we see scope for possible improvement or development. These forward issues and recommendations should only be one input into the forward programme of work, which should be informed by LLW Repository Ltd's wider understanding of the site, the 2011 ESC and monitoring data, amongst other inputs.

Overall, we consider that LLW Repository Ltd has met the requirements of the GRA and Schedule 9 Requirement 6 of the current LLWR environmental permit through the 2011 ESC and supporting documents. This evidence is of a suitable standard and quality to support an environmental permit decision on future disposals at the site. We are satisfied that the 2011 ESC and supporting documents demonstrate that further disposal of radioactive waste at the facility will be safe for people and the environment both now and in the long-term.

5.4.1. Management arrangements, safety case management and culture

GRA Requirements 1 to 4 address areas related to the development and presentation of an ESC, management of its production and implementation, effective management of the site against the ESC, environmental safety culture and working with others. We reviewed these areas, which are mainly reported in our safety case management report (Environment Agency 2015c) and summarised in our overview report (Environment Agency 2015a).

In summary our review found that LLW Repository Ltd:

- has engaged effectively with us and others when developing the 2011 ESC (GRA Requirement R2) and has taken the GRA guidance on following a 'process by agreement' (GRA Requirement R1) into account in formulating its engagement with us and others
- has presented an adequate and proportionate ESC addressing the expectations detailed within the GRA (GRA Requirement R3)
- has management systems that are well established and mature, having developed over a number of years. Overall, we consider the management systems to be comprehensive, fully integrated and clearly documented (GRA Requirement R4)
- has adequate resources, competency, knowledge and succession planning in place to ensure the ongoing effective management of the ESC (GRA Requirement R4)
- has effectively used peer review processes to build confidence in the ESC (GRA Requirement R4)

We are satisfied that LLW Repository Ltd has put in place adequate plans to implement the WAC and associated procedures. LLW Repository Ltd must also effectively implement broader aspects of the 2011 ESC on site, such as change control procedures, operational procedures and tools, addressing stored waste and engineering development. We are satisfied that LLW Repository Ltd has demonstrated it will meet these requirements.

Our review concluded that overall LLW Repository Ltd has met the requirements of the GRA in this area. We have not identified any reasons indicating that the applicant would be unable to operate in accordance with the varied permit. General management conditions in the permit will require the company to maintain management systems and resources to operate in compliance with the permit conditions.

On 13 July 2015 we undertook a 'Readiness Review' of LLW Repository Ltd with the objective of examining waste acceptance compliance and ESC implementation, so as to build confidence that arrangements were compliant, suitable and sufficient and that the ESC was being effectively implemented prior to issue of any varied permit. We concluded that the operator is ready and capable of being fully compliant with any varied permit and that adequate systems are in place to maintain compliance.

5.4.2. Coastal erosion

The GRA requires that the operator considers all reasonable scenarios that could lead to the exposure of people and the wider environment to radiation. These considerations must address the period of authorisation and beyond, different groups of people that could be at risk of exposure (potentially exposed groups), sensitive environmental receptors and the uncertainties associated with these potential exposures.

In the 2002 ESCs (BNFL 2002a and b) the potential risk of coastal erosion of the site several 100 years in the future was identified. This risk was assessed and resulted in radiological risks exceeding our then risk targets. This issue was of concern to us and a number of those who responded to our consultations and so in 2006 we issued an authorisation to the operators of the LLWR restricted to disposals in Vault 8 (stacked up to 4 ISO freight containers high) and requiring an updated ESC by May 2011.

Between 2002 and 2011 the site operators carried out significant further work on the projected mechanisms and progression of coastal erosion on the Drigg coast. Utilising this work, more robust assessments were completed of the radiological and non-radiological impacts for people and the wider environment. Given the importance of this issue we have completed detailed reviews in this area using relevant specialists.

In the 2011 ESC LLW Repository Ltd concludes that the repository is almost certain to be eroded by the sea. The coast currently lies approximately 400 metres from the nearest part of the site boundary. The company projects that erosion of the repository is likely to start within a period of a few 100 to a few 1000 years from now. We are satisfied that LLW Repository Ltd has appropriately taken this into account in its assessments, by considering an appropriate range of future scenarios involving coastal erosion of the site and the large uncertainties associated with its exact timing and nature. The 2011 ESC has shown that, irrespective of any future work to prevent coastal erosion, radiological doses and risks remain below regulatory and internationally accepted criteria for the protection of people and the environment should coastal erosion progress as predicted.

Whilst our assessment of the ESC must be based upon scientific evidence and measured against assessment criteria within the GRA, we also recognise that the likelihood of coastal erosion in the future may be of concern. For this reason, in addition to working towards a technical conclusion on the acceptability of the risks resulting from possible future erosion of the site, we are liaising with other relevant regulatory and government bodies to ensure they are aware of the 2011 ESC findings and our assessment of it.

As part of the optimisation process, LLW Repository Ltd has considered the viability of coastal defences in preventing disruption to the site. The nature of coastal erosion, uncertainties in direction and the long timescales predicted before erosion begins mean that these defences may not be viable, but options for their construction are not unnecessarily foreclosed by anything being done today. In the future, the operator, the Environment Agency or others with responsibility for the LLWR may consider sea defences necessary. But, we agree that these defences would be best designed and built closer to the time when they may be required.

Given the central importance of this potential exposure pathway, we expect LLW Repository Ltd to maintain an ongoing forward programme of coastal monitoring and to keep up-to-date with the latest research on long-term climate change.

A summary of our review of this issue is documented in our overview report (Environment Agency 2015a) and is covered in more detail within our review of site understanding (Environment Agency 2015e) and assessments (Environment Agency 2015g).

In response to our consultation on the application several organisations and an individual referred to coastal erosion (see Annex 2). In response to our consultation on the draft decision Friends of the Earth and 2 individuals referred to coastal erosion (see Annex 3). Two individuals commented that the coastal location is less than ideal or that the location of the repository was not appropriate. The Nuclear Legacy Advisory Forum (NuLeAF) commented that members had expressed concerns about the long-term environmental impacts of coastal erosion on local people and the environment, although it also noted that it was, in general terms, reassured by the assessment of risks posed by coastal erosion. As noted above and discussed further elsewhere, we have taken the potential for coastal erosion seriously and completed a thorough assessment of LLW Repository Ltd's predictions for coastal erosion and their potential resulting impacts on people and the environment. Within this assessment we have also taken into account amenity issues, as referred to in the Environment Act 1995 under section 7(1)(c)(ii), although these issues are primarily matters for the waste planning authority. We have taken a broad approach towards amenity within our determination of the variation application, balancing amenity as just one of many factors to be considered, including the benefits of the proposal, our statutory duties and the requirements of the GRA.

5.4.3. Optimisation

Principle 2 and Requirement R8 of the GRA specifically address optimisation requirements.

Solid radioactive waste is required to be disposed of in such a way that the radiological risks to individual members of the public and the population as a whole shall be ALARA under the circumstances prevailing at the time of disposal, taking into account economic and societal factors and the need to manage radiological risks to other living organisms and any non-radiological hazards. Optimisation decisions balance the detriment or harm associated with the radiological risk, together with other benefits and detriments associated with disposing of the radioactive waste, both at the time the decisions are taken and in the future.

Optimisation may relate to the choice of WAC, how the selected site is used and the design, construction, operation, closure and post-closure management of it. The process requires ongoing consideration through to the end of the period of authorisation. Put more simply, optimisation is about finding the best way forward where many different considerations need to be balanced.

In considering the applicant's proposals we have considered Principle 2 and Requirement R8 of the GRA, along with other relevant guidance listed in Section 2.

To address optimisation requirements LLW Repository Ltd has undertaken a number of optimisation studies addressing different aspects of the disposal system to underpin decisions on site development. These studies addressed questions about management options for past disposals, controls for future waste acceptance and the best ways of packaging and conditioning waste for disposal. Other studies addressed controls over the design and operation of the LLWR, including post-closure engineering, waste emplacement strategy and post-closure institutional arrangements. LLW Repository Ltd has also investigated the potential to optimise the LLWR in light of the potential for coastal erosion.

The company has used the output from the 2011 ESC to refine and improve the LLWR WAC and make sure that disposal practices remain optimal. For example, the company proposes to implement a number of emplacement strategies for significant waste streams, including the exclusion of certain high specific activity waste from within 5 metres of the engineered cap surface and emplacement to ensure total potential voidage within waste stacks meets requirements of the ESC. We consider that these proposals are consistent with an optimised approach.

We consider that LLW Repository Ltd is using optimisation appropriately to inform the development of the repository design and to address past disposals. We consider that methods used by LLW Repository Ltd for the generation and assessment of potential options are consistent with good practice and meet our regulatory expectations.

In our review of the 2011 ESC we note that there is further, more detailed design work to be completed prior to any further construction taking place, as is normal for any major engineering development. Also, there remains scope for further optimisation in relation to the protection of waste prior to capping and the effectiveness of the existing interim trench cap (which has been shown by investigations LLW Repository Ltd has undertaken to be less effective in preventing water ingress than expected prior to production of the 2011 ESC).

In relation to the effectiveness of the interim trench cap we are satisfied that LLW Repository Ltd already has programmes of work in place to identify and implement improvements (LLW Repository Ltd 2013d).

With regards to waste protection prior to capping, we consider this important as work undertaken by LLW Repository Ltd has identified that some waste containers within Vault 8 are in a poorer condition than previously thought. This includes the formation of ullage or voidage (space) within some containers and rainwater ingress leading to some limited increased discharges to the environment. Ullage and voidage within the containers have potential implications for waste settlement following capping, which, if not appropriately addressed within engineering designs, could lead to localised failure of the final engineered cap and subsequent water ingress. This issue is discussed further in our review reports (Environment Agency 2015a, d and f), although overall we are satisfied that measures can be implemented to effectively manage settlement potential.

LLW Repository Ltd has started programmes of work to address this issue. Some improvements to container grouting have already been implemented and other tasks are looking at improvements to the condition of Vault 8 containers. Other programmes are examining the optimisation of waste protection so as to minimise discharges to the environment and to minimise container and waste form degradation and therefore cap settlement. This work is, for example, considering measures such as improved container design and the frequency and timing of final waste capping. Because of the importance of minimising further discharges and the need to fully optimise the protection of waste in advance of capping Vault 8, we have included an improvement and information requirement in the permit (IC1) to be completed within 3 months of issue. IC1 aims to ensure that measures are taken by LLW Repository Ltd that will minimise any radiological effects on the environment resulting from waste exposure prior to capping.

In response to our consultation on the application Copeland Borough Council expressed concern at the implications of the additional voidage identified in Vault 8 consignments and urged careful examination of the proposed WAC and waste emplacement strategies to ensure they are fit for purpose and maximise the level of protection offered to the local environment. We carefully examined these issues in reaching our conclusions and are satisfied that both the proposed WAC and emplacement strategies are optimised and so will provide protection to the local environment. Additionally, as discussed above, we will require LLW Repository to further optimise the disposal facility by providing short and long-term protection of exposed waste prior to capping.

Improvement and information requirement IC1

Submit a written plan to the Environment Agency. The plan must contain:

- (a) Proposals for the provision of protection of waste within Vault 8 and Vault 9, up to and including the capping of Vault 8 and a programme for implementation;
- (b) A programme of work to address the protection of waste in the longer-term within Vault 9 and future vaults.

The plan must demonstrate the use of best available techniques and the minimisation of degradation of waste containers and their contents, so as to minimise radiological effects on the environment.

We conclude that LLW Repository Ltd has presented overall optimised designs and proposals and presented sound arguments and reasoning for its optimisation decisions. It has met the requirements of the GRA. The permit will require LLW Repository Ltd to continue to optimise the disposal facility through conditions in Schedules 1 and 2 of the permit, including Condition 1.1.3 which requires maintenance of a documented ESC. Our review is discussed further in our overview (Environment Agency 2015a) and optimisation and engineering reports (Environment Agency 2015f).

5.4.4. Engineering

LLW Repository Ltd has prepared a site development plan and we have reviewed this and wider engineering issues in our optimisation and engineering report (Environment Agency 2015f). It gives LLW Repository Ltd's current view of how the repository will be developed, as well as providing the baseline against which all performance modelling and assessment throughout the 2011 ESC was carried out.

The main components of the future engineered system in the site development plan are:

- additional engineered vaults with low permeability bases and 1 m high side walls
- the grouted ISO freight container waste form
- an interim cap over existing trench disposals
- a final engineered cap over all the waste disposals
- a low permeability cut-off wall dug into the ground surrounding all the waste disposals
- active leachate collection and management throughout the period of authorisation
- passive leachate control after the period of authorisation

There are a number of important changes from the design of both existing vaults and the design proposed in the 2002 ESCs. The engineered design aims to isolate and contain the waste for as long as possible, preventing water ingress into the waste. But, when the cap eventually begins to fail, the design aims to prevent contaminated leachate from entering the near-surface environment by diverting it to deeper geologies and therefore reducing any impact upon people and the environment.

We consider that the design has been appropriately optimised and that the main components are all necessary to minimise impacts on the environment. We are satisfied that the proposed design

can achieve the necessary performance objectives, such as isolation and containment and therefore allow the requirements of the GRA to be met.

However, we note that before the future vaults and the closure engineering are built, a programme of work is needed to determine detailed engineering designs and substantiate the performance of the individual components of the engineered system, as is normal for any major engineering development. Much of this work is addressed in LLW Repository Ltd's engineering forward programme which details engineering work it plans to complete over the coming years up to and including the construction of the closure engineering over Vault 8 and the northern parts of the trenches (Shaw 2013). Additionally, to ensure clarity of our regulatory expectations for further work prior to construction we have raised a number of FIs and recommendations related to engineering design within our review of the 2011 ESC (Environment Agency 2015f).

We will review and inspect any engineering, its design, construction and testing as necessary for compliance with the permit as part of our ongoing regulation of the LLWR. For example, we will seek assurance of the integrity of the waste form and that any engineered cap or cut-off wall has been constructed in a manner that will achieve its design intent and represent BAT. The permit will require LLW Repository Ltd to continue to apply BAT to minimise the radiological effects on the environment and members of the public. IC1 described above requires LLW Repository Ltd to lay out its plans for the protection of waste in the short and long-term, for example, through measures to protect waste containers whilst exposed, or by the capping of the site.

Prior to the disposal of radioactive waste in future vaults LLW Repository Ltd must satisfy us that they have been constructed in accordance with the ESC and are therefore able to minimise radiological effects on the environment and members of the public. We have therefore included a pre-operational measure for future development (PM1) as a requirement in the permit. This requires LLW Repository Ltd to provide assurance of the vaults construction to appropriate standards prior to disposals taking place to that vault. We will not allow disposal to any future vaults unless we are satisfied with the assurance provided.

Pre-operational measure for future development PM1

Prior to the disposal of radioactive waste in each vault, including Vault 9a and higher, a report shall be submitted to the Environment Agency. This report shall:

- a) Provide assurance that the vault has been constructed in accordance with the environmental safety case.
- b) Include Construction Quality Assurance (CQA) validation.

The report shall be agreed in writing by the Environment Agency before disposal takes place.

5.4.5. Monitoring

Requirement R14 of the GRA specifically addresses monitoring and requires that 'the developer/operator of a disposal facility for solid radioactive waste should carry out a programme to monitor for changes caused by the construction, operation and closure of the facility'. Our review of monitoring has considered Requirement R14 of the GRA along with other requirements referred to in Section 2.

LLW Repository Ltd discusses its monitoring approach within a dedicated report in the 2011 ESC (LLW Repository Ltd 2011b). The company refers to a substantial programme of monitoring that covers both environmental monitoring, for example discharges and hydrogeological parameters and performance of engineered barriers. The programme addresses:

- demonstration of compliance with the permit
- development of baseline conditions
- demonstration that the site is not giving rise to unacceptable environmental hazards
- demonstration that the performance of the facility is consistent with assumptions in the ESC

- reduction of uncertainties in monitoring data

We have carried out a detailed review of monitoring provision and proposals for the future. We consider that LLW Repository Ltd has developed and implemented an extensive and high quality monitoring programme that:

- provides sufficient baseline data and understanding
- supports the 2011 ESC and demonstrates that the LLWR is capable of performing within the parameters set out in the 2011 ESC
- can provide environmental understanding throughout the period of authorisation
- will be capable of demonstrating compliance with permitted discharge limits
- is capable of providing assurance of radiological protection to members of the public during the period of authorisation
- uses comprehensive quality systems and procedures

We consider that the company has adequately addressed Requirement R14 of the GRA. We also note in our review areas where we see scope for continued improvement.

In response to our consultation on the application, the North Western Inshore Fisheries and Conservation Authority (NWIFCA) recommended continual long-term monitoring of all aqueous pathways from the LLWR to provide assurance to stakeholders that any releases were acceptably low. We agree with this recommendation and consider that LLW Repository Ltd already has a suitable monitoring programme in place to achieve this. Additionally, the permit will include a standard condition requiring the operator to ‘take samples and conduct measurements, tests, surveys, analyses and calculations to determine compliance with the conditions of this permit’. The permit requires the operator to define and document such a monitoring programme using BAT. It will provide assurance that discharges remain low.

Both the NWIFCA and Marine Management Organisation (MMO) highlight the importance of continued coastal surveying to identify possible release pathways and potential impacts in the future. We agree continued coastal surveying is important and are satisfied that LLW Repository Ltd has committed to a programme of future monitoring sufficient to support the ESC and future impact assessments. Again, this monitoring will be required by the standard permit conditions referred to above. However, in addition, to ensure clarity of our expectations, we have raised a FI. This FI explains the future coastal monitoring we expect to see, including ongoing reviews of models for long-term coastal erosion, along with wider considerations of how any human impacts to the Cumbrian coast could influence the Drigg coastal area.

Overall we consider that the applicant’s proposals for monitoring represent BAT and are in accordance with our guidance.

5.4.6. Inventory

The LLWR waste inventory is important to the 2011 ESC as it provides important source information to inform assessments and ultimately the radiological and non-radiological capacity of the site. LLW Repository Ltd presents much of its work in a dedicated report within the 2011 ESC (LLW Repository Ltd 2011c). We have reviewed this work and report within our inventory and near field report (Environment Agency 2015d).

We note that understanding of the inventory was a cause for concern for some stakeholders in 2006 during our review of the then authorisation (Environment Agency 2006). In particular Cumbria County Council raised concerns about the implications of inventory uncertainty and implications for radiological capacity and the potential need for selective retrieval of waste.

Since 2006 the operators of the LLWR have undertaken significant further work to understand both the past inventory and potential future inventory. With regards to the past inventory (trenches and Vault 8) we are satisfied that LLW Repository Ltd has made good use of all available information to significantly improve understanding. This work has significantly reduced uncertainty within the inventory. Some uncertainties remain, in particular for the trenches, although these uncertainties are unlikely to be reduced further given the historical nature of the disposals and their age. We are

satisfied that inventory information has been used appropriately to inform assessments and that remaining uncertainties have been appropriately accounted for in these assessments. However, we do note in our review that some further work is required prior to final capping of the waste, to address discrete items²⁹ of waste that may carry a significant burden of radioactivity that may have been disposed in the past and to consider if there is a need to retrieve any of them (Environment Agency 2015g and i). We discuss this issue further in Section 5.4.7 along with an improvement and information requirement (IC3) to require this to be addressed within 6 months of issue of the permit.

LLW Repository Ltd has also made substantial progress to improve understanding of future disposals and we consider the data and the range of inventory cases the company use adequate for the purposes of the 2011 ESC.

Good progress has also been made to improve the non-radiological inventory, although we note in our review of the 2011 ESC some significant levels of uncertainty arising from the limited non-radiological data collected on some past disposals. We are satisfied that this uncertainty has been adequately addressed in assessments (Environment Agency 2015g). We are also satisfied that LLW Repository Ltd has put in place improved waste acceptance procedures and WAC to ensure any future disposals are supported by sufficient information on waste form and both radiological and non-radiological composition.

Overall, we conclude that LLW Repository Ltd has provided suitable inventory and processes to collect future inventory data to inform the 2011 ESC.

5.4.7. Radiological assessment: Impact on members of the public

In this section we consider the radiological assessment of impacts on members of the public and based upon the outcome of these assessments, how WAC have been established. We consider the radiological impacts on members of the public in line with GRA requirements and supplementary guidance on the implementation of the Groundwater Directive. These requirements are consistent with those criteria specified in Schedule 23 Part 4 Section 1 (1) and (2) of EPR10. Relevant requirements are summarised in Table 6.

To address these requirements LLW Repository Ltd has undertaken radiological assessments addressing both the period of authorisation (LLW Repository Ltd 2011d) and afterwards, into the long-term (LLW Repository Ltd 2011e). Updates to some of these assessments are reported in its developments document (LLW Repository Ltd 2013d). These assessments are based upon the site development plan and supported by a range of other assessments considering issues such as the near field (LLW Repository Ltd 2011f), optimisation (LLW Repository Ltd 2011g), engineering (LLW Repository Ltd 2011h) and site evolution (LLW Repository Ltd 2011i). The assessments are completed based upon a range of inventory cases (LLW Repository Ltd 2011c) and are used to define safe radiological capacities. These capacities have been updated since submission of the 2011 ESC, to take account of updates to the carbon-14 (C-14) model, minor corrections to the groundwater pathway assessment for Vaults 15 to 20 and proposals to dispose of complexants and chelating agents.

We have undertaken a detailed review of LLW Repository Ltd's assessments against the requirements of the GRA (Environment Agencies 2009), which is summarised in our overview report (Environment Agency 2015a). To complete our review we needed to request further information from LLW Repository Ltd on its assessments of waste heterogeneity and how the company address this within the WAC. This resulted in a significant body of further work from LLWR Repository Ltd and revised WAC, which we discuss further below.

In this section we also consider a collective dose assessment completed by LLW Repository Ltd and a simple prospective dose assessment we have completed. We also consider LLW Repository

²⁹ A discrete Item is defined by LLW Repository Ltd as a distinct item of waste that, by its characteristics, is recognisable as unusual or not of natural origin and could be a focus of interest, out of curiosity or potential for recovery and recycling/re-use of materials should the waste item be exposed after Repository closure.

Ltd's proposed WAC and other waste acceptance procedures related to radiological impacts on people.

Table 6: GRA requirements relevant to radiological assessment of impacts on members of the public

| Requirement | Summary |
|--|---|
| R5 – Dose during the period of authorisation | The effective dose from the facility to a representative member of the critical group should not exceed a source-related dose constraint of 0.3 mSv y ⁻¹ or a site related dose constraint of 0.5 mSv y ⁻¹ . Supplementary guidance arising from incorporation of the Groundwater Directive into EPR10 provides an additional dose guidance level of 0.02 mSv y ⁻¹ for doses arising from groundwater. |
| R6 – Risk guidance level after the period of authorisation | The assessed radiological risk from a disposal facility to a person representative of those at greatest risk should be consistent with a risk guidance level of 10 ⁻⁶ y ⁻¹ (that is, 1 in a million per year). |
| R7 – Human intrusion after the period of authorisation | Human intrusion into a near-surface disposal facility after the end of management control of the site is to be assessed on the basis that it occurs and against a dose guidance level in the range of around 3 mSv y ⁻¹ for exposures continuing over a period of years to around 20 mSv y ⁻¹ for exposures that are of limited duration. |
| R13 – Waste acceptance criteria | The developer/operator of a disposal facility for solid radioactive waste should establish waste acceptance criteria consistent with the assumptions made in the environmental safety case and with the requirements for transport and handling and demonstrate that these can be applied during operations at the facility. |

Period of authorisation assessment

LLW Repository Ltd's assessment for the period of authorisation relates to the environmental safety of the site during operations and closure. It considered discharges to air, surface water, groundwater and direct radiation. The company indicates that it assumes cautious locations and behaviours for exposed persons according to 'critical group' assessment principles, for example applying high occupancy times and local foodstuff consumption rates. We consider that these assessments cover an appropriate range of potential exposure scenarios and are appropriately cautious.

LLW Repository Ltd has used its measured discharges and environmental concentrations to provide evidence that the dose constraints have been met in the past. The company has assessed the impacts from likely future discharges during the period of authorisation to show that future radiological impacts will be below the dose constraints, even when cautious assumptions are made.

Only peak doses resulting from direct radiation are projected to potentially exceed the source-related dose constraint of 0.3 mSv y⁻¹, for a theoretical future resident that lives off-site immediately adjacent to Vault 13. We consider that this scenario is not realistic and that the dose constraint is unlikely to be exceeded in practice as it is based upon pessimistic assumptions and does not take account of the fact that future exposures will be monitored and managed to achieve the required standards. In future, direct radiation exposures will be managed by an appropriate waste emplacement strategy and will be monitored and reported. Assuming continued regulation of the site equivalent to today's standards, these exposure scenarios would not be permitted without further mitigation measures to reduce off-site doses.

In response to our consultation on the application one individual raised a comment related to this issue, indicating that one LLWR may not be 'enough' and that the need to higher stack waste above ground level may indicate more capacity is required elsewhere. We have carefully

considered LLW Repository Ltd's proposals to stack waste higher than they currently do in the vaults and the resulting dose implications (Environment Agency 2015g). As discussed above and in Section 5.4.3, we are satisfied that the proposals are optimised and will ensure relevant dose constraints are met at all times.

LLW Repository Ltd notes that there is generally a decreasing trend in assessed impacts throughout the period of authorisation, mainly due to a combination of decreasing activity in disposals as a result of radioactive decay and the placement of the final capping system. The calculations are also conservative in that the mitigating effects of engineering measures have largely been neglected. The emplacement of closure engineering will further reduce the impact of the LLWR on the surrounding environment.

We accept LLW Repository Ltd's approach, reasoning and conclusions and consider that it has met Requirement R5 of the GRA and the supplementary guidance relating to the implementation of the Groundwater Directive.

Prospective dose assessment

We have tools for the completion of prospective dose assessments used to satisfy ourselves that permitted discharges of radioactive substances will be within dose constraints. These simple tools are designed for direct discharges to air, river, estuary/coast and sewer and do not address disposal by burial, which generally requires more complex models and assessment. Our assessment of radiological impacts on people therefore focuses on the assessment discussed elsewhere in this section.

In the case of aqueous discharges resulting from the disposal of radioactive waste by burial it is possible to derive a reasonable prediction of aqueous discharges based upon future projections and historical sampling and analysis. We assume that recent aqueous discharges to the coastal environment continue throughout the period of authorisation. We consider this a reasonable assumption as at present most discharges arise from the trench disposals which are now complete and will have a final cap progressively installed. Future disposals are expected to be better packaged and contained and so lead to very low discharges during the period of authorisation. Therefore, discharges are expected to decrease over this period. We therefore use recently reported aqueous discharge data to the coastal environment in our assessment. The potential dose rate to the most exposed group calculated at this discharge are around $0.5 \mu\text{Sv y}^{-1}$, which is significantly less than the source-related dose constraint.

Accurate measurement of discharges to air resulting from radioactive waste burial is harder to derive due to their dispersed nature across the disposals. Our assessment of aerial discharges has therefore focussed on our review of LLW Repository Ltd's 2011 ESC. However, using predicted discharges of radioactive gases from the burials presented by LLW Repository Ltd (LLW Repository Ltd 2011d) we have run a simple prospective dose assessment and found that doses are consistent with LLW Repository Ltd's predictions.

To gain additional confidence that discharges to air will not be significant we can review available monitoring data provided by LLW Repository Ltd (LLW Repository Ltd 2011d). LLW Repository Ltd reports that H-3 and C-14 gas is not measured owing to the low concentrations of the radionuclide and low gas flow rates. Rn-222 has been measured in trenches, although measurements are variable and there are no consistent measurements above background levels from monitoring undertaken above the trench cap. The most recent data imply that background concentrations on site are typically less than 10 Bq m^{-3} and that there is no evidence of enhanced Rn-222 concentrations over the trenches resulting from waste disposals.

Risk guidance level after the period of authorisation

LLW Repository Ltd's assessment addresses the environmental safety of the site after the period of authorisation, when there is assumed to be no management control over it. LLW Repository Ltd uses models to assess pathways by which contaminants may be released into the environment and the resulting radiological impacts to people. The assessments consider groundwater pathways, gas pathways, human intrusion and natural disruption and dispersion (coastal erosion). They are based on a number of potentially exposed groups, such as a future smallholder using the

site, local recreational beach users, someone occupying land on the coast or a user of local well water. The assessments take into account uncertainty associated with them (LLW Repository Ltd 2011e).

Our risk guidance level of 10^{-6} y^{-1} is our assessment standard for the expected natural evolution of the disposal facility over time. The value of 10^{-6} per year (or 1 in a million per year) is consistent with advice given by the Health and Safety Executive as 'a very low level of risk' and is used as a guideline above which people are prepared to tolerate risks to secure the benefits from the activities giving rise to the risks and below which risks are broadly accepted by society because they are generally regarded as insignificant (HSE 2001).

We are satisfied that LLW Repository Ltd has demonstrated that radiological risks associated with the reference case³⁰ assumptions for the post-closure period fall below the risk guidance level. Only for several unlikely 'what if' variant calculations are the radiological risks projected to exceed the risk guidance level. However, we consider that these cases should not be given dominant consideration for regulatory purposes as they are unlikely to happen (Environment Agency 2015g). We consider that LLW Repository Ltd has taken into account a reasonable range of cautious assumptions about future scenarios, human habits and behaviour.

In response to our consultation on the application, NuLeaf commented that its members had expressed concerns about the long-term environmental impacts of further disposal at the LLWR, in particular related to coastal erosion, although they also noted that, in general, they were reassured by the assessment of risks posed. As part of our review we have paid significant attention to the long-term environmental impacts due to the long-lived nature of radioactivity and the predictions of likely coastal erosion at the site. We consider that LLW Repository Ltd has demonstrated that radiological risks in the post-closure period associated with the most likely evolution of the LLWR and a suitable range of exposure pathways and situations, will meet GRA Requirement R6 and the supplementary guidance relating to the implementation of the Groundwater Directive.

Collective dose assessment

Collective dose is the sum of all the doses received by the members of a population. It can be useful when considering the protection of the public. Collective doses are measured in man-sieverts (manSv). There are no limits or constraints for collective dose. However, the International Atomic Energy Agency (IAEA) has set a level for collective doses of less than 1 man-sievert per year of discharge as part of its criteria for discharges that do not require regulatory control.

The UK Health Protection Agency³¹, Radiation Protection Division, has provided additional guidance on assessing how important the collective doses are. They advise calculating an average dose to members of the population ("per person doses"). The per person doses may be very small, often in the range of a few nano-sieverts (nSv) to a few micro-sieverts (μSv). The Health Protection Agency has advised that if the average per person doses for a population group are only a few nSv per year, we can consider them to be of limited importance when we make our decisions on discharges. If the per person doses increase above this level, we need to start looking more carefully at the discharge options.

LLW Repository Ltd makes the case that collective dose is not a useful attribute or concept to help discriminate between the various options considered when optimising the LLWR and we agree that any assessment of collective dose must be treated with caution. However, given that coastal erosion is expected to destroy the site within a few 100 to a few 1000 years, we requested a collective dose assessment, covering the anticipated period of coastal erosion. The resultant collective dose assessment employs conservative assumptions and is truncated to a time of 500 years after the assumed time at which erosion leads to the first releases of radionuclides from the site direct into the marine environment (Soetens and Jackson 2013).

³⁰ The baseline set of assumptions about the disposal facility and its evolution with time that is used in the calculations of dose and risk.

³¹ The Health Protection Agency is now part of Public Health England, an executive agency of Department of Health, which began operating on 1 April 2013.

The results show that the average individual dose rates leading to these collective doses are no more than a few tens of nSv per year. Doses of this order fall into the range that ICRP would describe as 'trivial' and the UK Health Protection Agency would consider being of limited importance.

Waste heterogeneity

Radioactive waste consigned to the LLWR is not evenly mixed and some fractions of waste will be more radioactive than others. This could be on a large scale or down to the small particulate level. As part of its 2011 ESC and further information provided in support of the permit variation application LLW Repository Ltd provided information addressing the possible variability in radioactivity at a variety of levels (heterogeneity) (LLW Repository Ltd 2011c and e, 2013d). This work examined radiation doses people may receive as a result of being exposed to higher activity wastes, for example following intrusion into the waste in the future or by exposure on the beach following coastal erosion. In particular this work considered sealed sources, particulate materials and discrete items that could carry a significant burden of radioactivity.

Our GRA assessment criteria for scenarios occurring after the end of regulatory control of the LLWR are generally defined in terms of 'annual risk' to an individual. On this risk basis, we believe the risks of harm from encountering these sources, particles or items are acceptable (that is, the risks are less than $1 \times 10^{-6} \text{ y}^{-1}$). We have also produced supplementary guidance to Environment Agency assessors on the disposal of discrete items and particles to the LLWR (Smith 2014). This guidance includes a 'test of significance' that should apply to potential exposure to these items as a result of casual curiosity or deliberate searches. This new test of significance considers the effective dose to any person during and after coastal erosion of the LLWR and should not exceed a dose guidance level in the range of around 3 mSv y^{-1} to around 20 mSv y^{-1} (consistent with the existing guidance for human intrusion under Requirement R7 of the GRA). We reviewed LLW Repository Ltd's assessment against these tests and consider that the projected doses associated with exposure to sources, particles and discrete items from the LLWR during coastal erosion or human intrusion are consistent with them.

The supplementary guidance to Environment Agency assessors also stated that '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 Agency³². Such an ESC should identify all items that it covers to the extent that the available records make this possible.' And '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 Any such proposals should include the appropriate operational and environmental safety cases for retrieval of the items.'

To address this requirement we have included an improvement and information requirement in the permit (IC3) to be completed within 6 months of issue. Through IC3 we set a reasonable timescale to identify an optimised approach for the management of discrete items and particles carrying a significant burden of radioactivity in past disposals, allowing adequate time before capping of Vault 8 and the trenches for retrievals, if necessary, to take place.

³² Only relevant parts of an ESC need be submitted.

Improvement and information requirement IC3

Submit a written report to the Environment Agency identifying an optimised approach for the management of discrete items and particles carrying a significant burden of radioactivity in past disposals. This report should identify all items and particles that it covers to the extent that available records make this possible.

Radiological waste acceptance criteria and controls

The GRA requires the operator of a disposal facility to establish WAC consistent with the assumptions made in the ESC and with the requirements for transport and handling and demonstration that these can be applied during operations at the facility (Requirement R13). Here we address the WAC for radiological properties. We address non-radiological WAC in section 5.4.9.

LLW Repository Ltd addresses its development of WAC within a waste acceptance document (LLW Repository Ltd 2011j). The company updates its WAC within its developments document submitted as part of the permit variation application (LLW Repository Ltd 2013d). These documents make reference to the various assessment cases and information considered within the 2011 ESC as a whole. Specifically LLW Repository Ltd proposes revised WAC for radiological capacity management, controls on individual consignments (emplacement strategies), controls on heterogeneity (sealed sources, discrete items and particles), complexants and fissile material controls.

We consider these proposals in more detail within our assessments report (Environment Agency 2015g) and safety case management report (Environment Agency 2015c) and summarise our findings within our overview report (Environment Agency 2015a). Overall we conclude that we are satisfied that the proposed changes to the LLWR WAC are consistent with the assumptions made in the 2011 ESC and subsequent updates. We consider these will be enough to prevent unacceptable doses and risks to people and the environment.

Radiological capacity management

LLW Repository Ltd proposes the removal of current annual radiological limits within the permit and to introduce a new approach to setting limits on the total quantities and specific activities of radionuclides that can be safely disposed at the repository. The company proposes the use of an IAEA approach commonly referred to as the 'sum-of-fractions' methodology and details its proposals in its waste acceptance report (LLW Repository Ltd 2011j), developments document (LLW Repository Ltd 2013d) and permit variation application (LLW Repository Ltd 2013a).

The sum-of-fractions approach is based on derivation of values of radiological capacity for each assessment case³³ and for each radionuclide. The radiological capacity for radionuclide (n) is the activity or activity concentration (as appropriate for the assessment being considered) at which the peak impact from that radionuclide alone would be equal to the appropriate regulatory criterion (as defined in the GRA). In order to limit the total impact from all radionuclides such that it does not exceed the regulatory criterion, the following summation is required:

$$\sum_n \frac{I_n}{L_n} \leq 1$$

where I_n is the disposed activity or activity concentration of each radionuclide and L_n is the radiological capacity.

³³ An assessment case is defined in the 2011 ESC as a specific combination of events, circumstances, conditions or their evolution, including specification of model boundary conditions and data, which represents a particular realisation of the disposal system, its evolutions and radionuclide contaminant release, migration and exposures.

To ensure regulatory criteria are met, total disposals to a facility must be such that the sum-of-fractions values for each assessment case, based on total inventory, are less than 1

This approach can be used for both the operational and post-closure periods of a disposal facility, with sets of radiological capacity values derived for each assessment case. The IAEA notes that this approach is cautious as no account is taken of the likelihood that the dose contributions from different radionuclides will arise at different times.

The derived radiological capacity values for different assessment cases then need to be considered in order to establish a set of radiological limits. LLW Repository Ltd has proposed a sub-set of assessment cases that represent the most limiting cases against which to set radiological limits. These include each important radionuclide within that case, along with 'other' radionuclides which cover all other radionuclides other than those with less than 3 months half-life. An example of the sum-of-fractions approach, for a single assessment case is given in the box below.

LLW Repository Ltd proposes limiting against 5 separate cases. Three of these require limiting using the sum-of-fractions approach and cover assessment cases for groundwater, coastal erosion (recreational beach user) and coastal erosion (marine foodstuffs case). There are also limits of 130 TBq for C-14 and 18,000 TBq for H-3 derived from consideration of potential impacts arising from the release of radioactive gases. Sum-of-fractions calculations are not required for these capacity limits because only a single radionuclide is calculated to cause a potentially significant impact in the assessment cases from which they are derived. Each of the 3 sum-of-fractions and 2 individual radionuclide limits apply independently.

We consider that the removal of current annual limits is appropriate as they are not dictated by safety or environmental performance requirements and we agree that they have no current basis in the 2011 ESC. We also consider a move away from annual limits for radiological capacity control to the sum-of-fractions approach to be appropriate and robust. We consider the sum-of-fractions approach has several advantages over annual limits. It is a robust and more comprehensive approach in that it addresses all relevant radionuclides with significant contributions to radiological impacts. It is also a cautious, yet flexible approach which will allow consignors increased flexibility to dispose of waste as and when generated and not artificially restricted by annual limits that do not represent the overall site capacity.

In response to our consultation on the application several responses were received which were supportive of the move to a sum-of-fractions approach. One consultee pointed out that the current annual limits can lead to waste having to be stored until disposal capacity is available, in conflict with Nuclear Licence Condition 32 regarding accumulation of waste. However, one response, although agreeing that the current annual limits were not appropriate, recommended that revised annual limits should be retained. The consultee considered that arguments around flexibility were not strong and that the proposed approach would not easily show how control was being exercised.

We recognise that the sum-of-fractions approach to radiological capacity limitation is not as simple as annual limits. However, this approach is internationally recognised and applied, being used in France, Spain and the USA. It can be effectively controlled by use of relatively simple spreadsheets or tools that track the totality of radionuclides disposed and complete calculations to demonstrate, at any one time, how much of the sum-of-fractions (capacity) for each assessment case has been utilised. If any one case reaches 1 the capacity has been used.

To ensure transparency we will require regular reporting by LLW Repository Ltd against the capacity usage and this information will be made publicly available. We will inspect LLW Repository Ltd's processes and capacity management approaches periodically. If at any point radiological capacity management is inconsistent with the ESC or the company is not demonstrating robust control we are able to vary the permit and impose different or additional limits or controls.

Consequently, we accept LLW Repository Ltd's proposals to move to a sum-of-fractions approach to radiological capacity management and we will require the company to manage disposals against these limits. As these limits are fundamental to the safety of the site and the 2011 ESC we have

included each of the 5 assessment cases and their respective limits within Schedule 3 of the permit.

Example of the use of the sum-of-fractions methodology (LLW Repository Ltd 2011j)

This example is based on a simple inventory for a disposal facility for the four radionuclides given below plus additional radionuclides that have lesser impacts per unit quantity of activity disposed. Impacts have been assessed for the assessment case of leaching of activity giving doses to an exposure group based on agricultural use of the land adjacent to the facility³⁴. Based on the assessment results, radiological capacity values have been derived, that is the quantity of each radionuclide that alone would give rise to a peak impact equivalent to the appropriate regulatory criterion, for example a risk of 10^{-6} y^{-1} . Application of the sum-of-fractions methodology is by dividing the inventory of each radionuclide by its radiological capacity, summing the resulting values and ensuring that the sum of the contributions is less than 1.

| Radionuclide | Inventory (TBq) | Radiological capacity (TBq) | Contribution to sum-of-fractions |
|--------------|-----------------|-----------------------------|----------------------------------|
| C-14 | 2 | 10 | 0.2 |
| Ru-106 | 100 | 50,000 | 0.002 |
| Cs-137 | 30 | 3000 | 0.01 |
| U-238 | 0.1 | 2.5 | 0.04 |
| Others | 50 | 1,000,000 | 0.00005 |
| TOTAL | | | 0.25 |

In this example, the highest inventory is for Ru-106 but, due to its relatively short half-life and slow rate of transport in groundwater, it has a relatively high radiological capacity value and its contribution to the sum-of-fractions is therefore small. In contrast, C-14 has a much lower inventory but its impact per unit of activity for this assessment case is much greater because of its unretarded transport in groundwater and subsequent uptake in foodstuffs. C-14 therefore makes the largest contribution to the sum-of-fractions. Cs-137 is intermediate between Ru-106 and C-14 in terms of inventory and radiological capacity and therefore in its contribution to the sum-of-fractions. U-238 is the second most significant radionuclide, despite having the lowest inventory, due to its relatively low radiological capacity value.

The total sum-of-fractions value is 0.25, demonstrating that the sum of the impacts from these radionuclides is equivalent to about a quarter of the regulatory criterion, that is their combined impact is about $2.5 \times 10^{-7} \text{ y}^{-1}$ compared to the regulatory criterion of 10^{-6} y^{-1} .

Controls on individual consignments

LLW Repository Ltd proposes to identify individual consignments of waste that need to be managed under an emplacement strategy. The proposals are that some containers with relatively high concentrations of certain radionuclides will not be placed at the top of waste stacks or they will be distributed between stacks. LLW Repository Ltd's developments document (LLW Repository Ltd 2013d) details the assessment cases on which this limitation is based using a sum-of-fractions approach and further discusses how it will be managed.

We consider that the proposals represent an optimised approach to managing the waste as they reduce the risk of people in the future being exposed to some of the more radiologically hazardous wastes (Environment Agency 2015a, c and g).

LLW Repository Ltd also proposes that the current permit activity concentration limits of 4 GBq t^{-1} for alpha emitting radionuclides and 12 GBq t^{-1} for all other radionuclides, applied to each

³⁴ Note that this example does not represent the limiting cases proposed by LLW Repository Ltd in their application and is presented only to illustrate how the sum-of-fractions methodology operates.

consignment disposed of, which can be up to 40 m³ in volume, continue to be applied. These activity concentration limits provide additional control against individual consignments and ensure that activity remains relatively evenly distributed across the repository. The limits prevent the need for further, more specific controls on certain radionuclides and are consistent with the wider 2011 ESC assessments. Although not a requirement, the limits are consistent with the LLW definition within the UK LLW policy (Defra et al. 2007) and the UK Strategy for the management of LLW (NDA 2010).

We consider the limits of 4 GBq t⁻¹ for alpha emitting radionuclides and 12 GBq t⁻¹ for all other radionuclides, when averaged over a consignment, as essential to ensure consistency with the 2011 ESC as presented. On that basis we have included these limits within Schedule 3 of the permit.

Controls on sealed sources, discrete items and particles

As discussed above, the 2011 ESC addresses the issue of waste heterogeneity and considers issues associated with sealed sources, discrete items and particles that may be within the waste and exposed at some point in the future. We are satisfied with LLW Repository Ltd's assessment of these issues (Environment Agency 2015a and g).

For sealed sources and discrete items LLW Repository Ltd has used the results from these assessments to develop controls based on effective doses for external radiation and internal radiation an individual might receive from deliberate close contact with such items. Quantitative limits are set for groups of radionuclides that present broadly similar potential for effective doses. For radioactive particles LLW Repository Ltd has developed controls based on identifying and restricting the disposal of wastes that could contain radioactive particles that could individually give rise to a significant effective dose.

The details of these proposed controls are further explained in LLW Repository Ltd's waste acceptance report (LLW Repository Ltd 2011j) and developments document (LLW Repository Ltd 2013d). Controls are based upon:

- Sealed sources: Radionuclides and activity limits, supplemented by other controls such as packaging, numbers of sources allowed, numbers of source packages within consignments and pre-treatment.
- Discrete items: A sum-of-fractions approach which takes account of the radionuclides on or in the item, the item mass and its activity.
- Particles: Identification of waste that may contain particles that individually carry an activity sufficient to give rise to a significant effective dose and assessment of these wastes against our guidance.

We are satisfied that these proposed controls are necessary and consistent with the 2011 ESC. We consider that they provide for adequate protection of people and the environment from issues associated with waste heterogeneity, when combined with proposed emplacement strategies and the consignment concentration limits of 4 GBq t⁻¹ for alpha emitting radionuclides and 12 GBq t⁻¹ for all other radionuclides. We consider that these WAC can be adequately controlled using LLW Repository Ltd's waste acceptance procedures as defined in its application and 2011 ESC.

In response to our consultation on the permit variation application we received a number of comments related to discrete items. EDF Energy and Magnox Ltd supported the changes. EDF Energy also commented that it did not wish to see overly conservative discrete item limits. PHE referred to a review of LLW Repository Ltd's work in this area that it undertook on our behalf and the fact that it was satisfied with the assessment.

Sellafield Ltd noted concerns with the discrete item limits proposed, indicating that they would have significant impacts on decommissioning activities, potentially increasing dose uptake of Sellafield workers and timescales for decommissioning. Sellafield Ltd did not fully accept the basis of the proposed limits and considered the application counter-intuitive in some ways (see Table 9, entry 80). We have since discussed these concerns with Sellafield Ltd. Although we recognise these concerns we consider the limits necessary to meet dose criteria detailed within the GRA and supplementary guidance to assessors (Smith 2014). We consider the limits necessary to protect

people and the environment in the future and are satisfied that they have been appropriately set without undue conservatism.

We note the views of LLW Repository Ltd that it is challenging to define appropriate controls that meet the GRA requirements whilst also allowing for pragmatic implementation without overly onerous information requirements and waste acceptance processes. We are satisfied that an appropriate balance has been reached, but are open to potential improvements to the WAC in future where they continue to demonstrate compliance with the GRA. We are satisfied that LLW Repository Ltd's waste acceptance processes and WAC can adequately implement these requirements so do not propose to specify them within the permit, relying on conditions requiring LLW Repository Ltd to maintain and operate to a documented ESC and WAC (see conditions 1.1.1, 1.1.3, 2.3.2 and 3.1.8).

Fissile material controls

LLW Repository Ltd undertook a revised criticality assessment and has developed revised fissile material controls and WAC (LLW Repository Ltd 2013d). LLW Repository Ltd considers that, because the existing and proposed fissile inventory of the LLWR is very small, the possibility of criticality is remote and we agree (Environment Agency 2015g). We are satisfied with the proposed controls and that they are controlled through LLW Repository Ltd's waste acceptance procedures and the ESC.

5.4.8. Impact on non-human species and other conservation duties

In this section we consider the radiological and non-radiological impact of disposals on the wider environment including non-human species and habitats. We also consider the impact in relation to our duties under various statutory provisions as set out in Table 7 below and in our conservation duties assessment reports (Environment Agency 2014a to e). We call these 'conservation duties', for convenience.

| Table 7 : Summary of conservation duties | |
|---|--|
| Provision | Duty |
| Section 6(1)(b) of Environment Act 1995 (EA95) | We have a duty, to such extent as we consider it desirable, generally to promote the conservation of flora and fauna which are dependent on an aquatic environment. |
| Section 7(1)(b) of EA95 | We have a duty to have regard to the desirability of conserving flora, fauna and geological or physiographical features of special interest. |
| Section 7(1)(c)(ii) of EA95 | We have a duty to take account of the effect any proposal would have on the beauty or amenity of any rural or urban area or any flora, fauna, features or sites. |
| Section 8(3) of EA95 | We take account of any notification and/or consultation responses received under section 8(3) of EA95 (relating to sites of special interest). |
| Section 9 of EA95 | In discharging our duties under section 6(1), 7 or 8 of EA95, we must have regard to any code of practice approved under section 9. |
| The Conservation of Habitats and Species Regulations 2010 | <p>Before deciding to undertake, or give a permit which:</p> <ul style="list-style-type: none"> (a) Is likely to have significant effect on an European site or an European offshore marine site (either alone or in combination with other plans or projects), and (b) Is not directly connected with or necessary to the management of that site, <p>we must make an appropriate assessment of the implications for that site in view of that site's conservation objectives.</p> <p>And we must consult Natural England if there is a significant effect.</p> |

Table 7 : Summary of conservation duties

| Provision | Duty |
|--|--|
| Section 28G of the Wildlife and Countryside Act 1981 | We must take reasonable steps, consistent with the proper exercise of its functions, to further the conservation and enhancement of the flora, fauna, or geological or physiographical features, by reason of which a site of special scientific interest (SSSI) is of special interest. |
| Section 28I of the Wildlife and Countryside Act 1981 | We are under a duty to consult Natural England/Countryside Council for Wales before permitting any operation which is likely to damage any flora, fauna or geological or physiographical features by reason of which a SSSI is of special interest. |
| Section 85 of the Countryside and Rights of Way Act 2000 | In exercising or performing any functions in relation to, or so as to affect, land in an area of outstanding natural beauty, a relevant authority shall have regard to the purpose of conserving and enhancing the natural beauty of the area of outstanding natural beauty. |
| Section 40 of the Natural Environment and Rural Communities Act 2006 | We must have regard to the purpose of conserving biodiversity when deciding whether to grant an authorisation (and what conditions to impose). Biodiversity includes, in relation to a living organism or type of habitat, restoring or enhancing a population or habitat. |
| Section 11A of the National Parks and Access to the Countryside Act 1949 | We must have regard to the purposes of conserving and enhancing the natural beauty, wildlife and cultural heritage of specified areas and of promoting opportunities for the understanding and enjoyment of the special qualities of those areas by the public. |
| Sections 58, 125 and 126 of the Marine and Coastal Access Act 2009 | Any authorisation decision taken must be in accordance with the appropriate marine policy document. We must exercise our functions in a manner which best furthers the conservation objectives stated for the Marine Conservation Zone. We must be satisfied that there is no significant risk of the act hindering the achievement of the conservation objective stated for the Marine Conservation Zone. |
| Regulation 9 of the Marine Strategy Regulations 2010 | We must have regard to the marine strategy (in so far as it has been developed and published to date). |

Although our conservation duties cover those in Table 7, the GRA also requires the applicant to address similar issues. GRA Principle 1 states that ‘Measures are needed not only to protect people but also to protect the environment. The aim is to maintain biological diversity, conserve species and protect the health and status of natural habitats and communities of living organisms. For non-human species the general intent is to protect ecosystems against radiation exposure that would have adverse consequences for a population as a whole, as distinct from protecting individual members of the population.’

Requirement R9 Environmental radioactivity states that ‘The developer/operator should carry out an assessment to investigate the radiological effects of a disposal facility on the accessible environment both during the period of authorisation and afterwards with a view to showing that all aspects of the accessible environment are adequately protected. Discharges and migration of radionuclides from a disposal facility might have a detrimental effect on the accessible environment, through effects on non-human species or more general environmental effects such as damaging habitat quality. This requirement aims to ensure that all aspects of the accessible environment are protected.’

Criteria for comparison with assessment in relation to environmental impact

The European research project, 'Framework for Assessment of Environmental Impact (FASSET)' Project concluded that the threshold for statistically significant effects on organisms is about 100 microgray per hour ($\mu\text{Gy h}^{-1}$). Allowing for the dose rate from natural background, which is at most about $60 \mu\text{Gy h}^{-1}$, we have adopted a value of $40 \mu\text{Gy h}^{-1}$ as the level below which we consider there will be no adverse effect on non-human species. We consider that $40 \mu\text{Gy h}^{-1}$ is an action level relating to total impacts from all permitted discharges (aerial and liquid discharges) that may affect a protected site such as the Drigg Coast SAC. If the dose rates predicted to wildlife inhabiting a particular site exceed $40 \mu\text{Gy h}^{-1}$ then we need to consider possible action which may include reducing permitted capacity limits.

A generic screening criterion has also been defined at $10 \mu\text{Gy h}^{-1}$ in accordance with the recommendations of a European Union EURATOM Framework 6 funded project: 'Protection of the Environment from Ionising Radiation in a Regulatory Context' (PROTECT) (Andersson et al. 2008). We consider that this screening dose rate is appropriate to use in situations where doses from other discharges are uncertain (for example other nuclear licensed sites such as Sellafield that may affect the Drigg Coast SAC). It is well below the $40 \mu\text{Gy h}^{-1}$ action level that we have defined to protect the whole ecosystem.

Applicant's assessment

As required by the GRA the 2011 ESC included an assessment of the impact of disposals of radioactive waste on non-human species (LLW Repository Ltd 2011k). The assessment was based upon generic reference organisms, which are representative of relevant ecosystems (terrestrial, freshwater and marine). LLW Repository Ltd calculates whole-body dose rates for these reference organisms and compares them with threshold dose rates for various broad categories of organism, determined from a critical review of the relevant literature.

To the west and south the site is contiguous with or lies close to the Drigg Coast SSSI, which is also designated as a SAC. The latter is a Natura 2000 classification.

LLW Repository Ltd undertook a range of assessments on non-human biota addressing both the period of authorisation and various scenarios after closure including impacts potentially arising from coastal erosion, groundwater pathways, release of gas and human intrusion into the site. These assessments were undertaken using the ERICA software tool³⁵. The company concluded that:

- During the period of authorisation phase of the LLWR, discharges will be managed and radionuclide concentrations in the local environment due to the LLWR are expected to decline. These concentrations have been assessed, paying specific attention to the Drigg Coast SSSI. Taking all sources of radionuclides into account, it is found that dose rates to non-human biota are generally less than $1 \mu\text{Gy h}^{-1}$ and are very unlikely to exceed the threshold dose rate of $10 \mu\text{Gy h}^{-1}$.
- In the cases of groundwater-mediated pathways, maximum whole body dose rates after the period of authorisation are several orders of magnitude less than the threshold dose rate of $10 \mu\text{Gy h}^{-1}$.
- For the coastal erosion pathway and taking account of the habitats and organisms present, the highest dose rates are of the order of $80 \mu\text{Gy h}^{-1}$ for molluscs and crustaceans inhabiting and gaining sustenance from the storm beach area. Invertebrates and insects permanently residing on the cliff and beach could receive absorbed dose rates of up to about $100 \mu\text{Gy h}^{-1}$, but such organisms are relatively insensitive to radiation. The cliff and beach are transient environments with continual turnover, migration and movement of organisms between the potentially contaminated area adjacent to the LLWR, other areas of beach and further afield. Thus, even if

³⁵ The ERICA tool (Environmental Risks from Ionising Contaminants: Assessment and Management) provides a framework for assessing the effects of ionising radiation on the structure and function of ecosystems. It was developed under the EURATOM Framework 6.

there is potential for radiological detriment to individual organisms, there is no potential for significant harm to local populations, or at local colony levels.

- For the gas pathway, the principal consideration is the release of C-14 and its uptake in vegetation by photosynthesis. Assessed dose rates to plants and animals are in the range 3 to about 9 $\mu\text{Gy h}^{-1}$. C-14 concentrations in plants and animals are derived using a specific activity approach, which provides upper bounds to the C-14 concentrations in organisms.
- Possible whole-body dose rates to non-human biota following human intrusion into the facility will be of a similar magnitude to those for non-human biota exposed following coastal erosion, but have not been explicitly assessed.

Our assessments

Our assessment of the LLWR with regards to conservation duties has been broad and several separate assessments have been undertaken. We have reviewed LLW Repository Ltd's assessments against the GRA, the primary guidance relevant to the variation application for further disposal of radioactive waste (Environment Agency 2015g).

We have considered the potential effects of discharges of radioactive waste from the LLWR on plant and animal life at the relevant designated 'European sites' (SACs) under the Conservation of Habitats and Species Regulations 2010, which implements the Habitats Directive. Where appropriate we have used an assessment tool based on the methods published in our [Research & Development Report 128, 'Impact Assessment of Ionising Radiation in Wildlife'](#)³⁶ (English Nature and Environment Agency 2002). We developed these methods jointly with English Nature (now Natural England) and they enable us to fulfil our current responsibilities under the Conservation of Habitats and Species Regulations 2010. We can also use them to determine the potential effects that proposed discharges could have on designated areas and ecosystems in general, in support of our other conservation duties. The methods calculate dose rates to a wide variety of species including those which would be of conservation interest near the site.

As the Drigg Coast SAC is immediately adjacent to the LLWR we undertook an [assessment of likely significant effects](#)³⁷ (HR01) and an [Appropriate Assessment \(HR02\) under the Conservation of Habitats and Species Regulations 2010](#)³⁶ on which we consulted Natural England (Environment Agency 2014b and c).

As the Drigg Coast SSSI is immediately adjacent to the LLWR we undertook a specific [assessment under Section 28I of the Wildlife & Countryside Act 1981 as amended by the Countryside and Rights of Way Act \(CROW\) 2000 Section 85](#)³⁶ (the CROW assessment) (Environment Agency 2014d).

We have also taken into account the duties placed upon us under the Marine and Coastal Access Act 2009. One of the duties is set out in Part 3, Chapter 4, section 58 and requires that any authorisation decision taken by a public authority must be in accordance with the appropriate marine policy document, that is the relevant Marine Plan or the Marine Policy Statement (MPS); unless relevant considerations indicate otherwise. Other duties are set out in Sections 125 and 126 as summarised in Table 7.

The MPS outlines the government's policies for achieving sustainable development in the marine environment around the UK, while at a local level, Marine Plans will be developed to provide the statutory basis for decision making on activities within that area. The Drigg Coast SAC lies within the Northwest Inshore Marine Plan Area, although this plan has not yet been drafted. Within the Marine Plan Area a Cumbria Coast Marine Conservation Zone (MCZ) has been defined, which is an inshore site that stretches for approximately 27 km along the coast of Cumbria. We have completed an [assessment of potential impacts upon this MCZ](#)³⁶ (Environment Agency 2014e).

³⁶ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/290300/sr-dpub-128-e-e.pdf

³⁷ <https://consult.environment-agency.gov.uk/portal/npsapp/llwr/dd?pointId=s1431592835614#section-s1431592835614>

In relation to Regulation 9 of the Marine Strategy Regulations 2010 we have had regard to the marine strategy (in so far as it has been developed and published to date) and consider that there is nothing in it which would lead us to any different conclusions from those we have already reached through our other marine assessment.

We have also prepared a record of our assessment which considers the whole range of our conservation duties in addition to the more significant assessments described above (Environment Agency 2014a).

Each of these assessments are discussed further below.

LLW Repository Ltd's 2011 ESC assessment

We reviewed LLW Repository Ltd's assessment of impacts on non-human species in detail and report this within our assessments report (Environment Agency 2015g), summarised in our overview report (Environment Agency 2015a). We accept LLW Repository Ltd's conclusions that the present day effects on non-human biota from the LLWR are at levels below regulatory concern, and that the effects are unlikely to increase significantly during the period of authorisation. After closure of the LLWR, LLW Repository Ltd reports that dose rates to some organisms may exceed the $10 \mu\text{Gy h}^{-1}$ screening level. In particular, during the onset of early coastal erosion, plants and invertebrates inhabiting the storm beach could receive dose rates slightly in excess of $100 \mu\text{Gy h}^{-1}$. However, we have reviewed the evidence LLW Repository Ltd submitted regarding the relative radio-insensitivity of these species, and we conclude that these doses will cause no perceptible harm at a population scale.

We consider that LLW Repository has demonstrated that the radiological effects of the LLWR on the accessible environment both during the period of authorisation and afterwards are low and that the environment is adequately protected. We conclude that GRA Requirement R9 has been met.

Impact assessment of ionising radiation on wildlife

Using the tools described above we completed an assessment of potential dose rates to plant and animal life where appropriate. As the variation application relates to the disposal of radioactive waste by burial, input data for these simplified tools is not readily available and more detailed assessments are generally required, as described elsewhere in this section. Our guidance on completion of prospective radiological assessments for wildlife and habitats presents a staged approach (stages 1 to 4) which becomes progressively more detailed and site specific. The assessment tool addresses discharges to air, river, estuary/coast and sewer, but cannot address disposal by burial directly.

In the case of the disposals at LLWR by burial it is possible to derive a reasonable prediction of aqueous discharges based upon future projections and historical sampling and analysis. We assume that recent aqueous discharges to the coastal environment continue throughout the period of authorisation. We consider this a reasonable assumption as at present most discharges arise from the trench disposals which are now complete and will have a final cap progressively installed. Future discharges are expected to be better packaged and contained and lead to very low discharges during the period of authorisation and so discharges are expected to decrease over this period. We therefore use recently reported aqueous discharge data to the coastal environment in our assessment. The potential dose rates to plant and animal life calculated at these discharges are $0.005 \mu\text{Gy h}^{-1}$ or less. We assessed the dose rates to a range of species of plant and animal life, this dose rate being for the species that could be most affected by discharges into water. This dose rate alone is significantly less than the value of $40 \mu\text{Gy h}^{-1}$, below which we consider there will be no adverse effect on non-human species.

Accurate measured discharges to air resulting from radioactive waste burial are harder to derive due to their dispersed nature across the disposals. Our assessment of aerial discharges has therefore focussed on our review of LLW Repository Ltd's 2011 ESC and our Appropriate Assessment under the Conservation of Habitats and Species Regulations 2010, equivalent to a Stage 4 site-specific radiological assessment on wildlife and habitats. However, to gain additional confidence that discharges to air will not be significant we can review available monitoring data provided by LLW Repository Ltd (LLW Repository Ltd 2011d).

LLW Repository Ltd reports that H-3 and C-14 bearing gases are not measured owing to the low concentrations and low gas flow rates. Rn-222 has been measured in trenches, although measurements are variable and there are no consistent measurements above background above the cap. The most recent data imply that background concentrations on site are typically less than 10 Bq m^{-3} and that there is no evidence of enhanced Rn-222 concentrations over the trenches resulting from waste disposals. Based on these data we consider it unlikely that the protected sites near to or adjacent to the LLWR will be significantly affected by aerial radiological emissions when dilution is also taken into account.

Appropriate Assessment under the Conservation of Habitats and Species Regulations 2010

In our assessment under the Conservation of Habitats and Species Regulations 2010 we identified relevant protected sites and interest features within 10 km of the LLWR. The Lake District High Fells SAC and West Water SAC are within 10 km of the repository but were screened out as not likely to be significantly affected by the proposals. The Drigg Coast SAC was taken forward for a full Appropriate Assessment. For the Drigg Coast SAC we screened a number of potential hazards that could affect the interest features to identify those with 'no likely significant effect', which were not progressed further and those with a 'likely significant effect'. We also considered possible in-combination effects, for example with the authorisation discharges from the Sellafield site (Environment Agency 2014b).

A number of 'likely significant effects' were identified for a range of hazards and we therefore completed an Appropriate Assessment under the Conservation of Habitats and Species Regulations 2010 to consider the impacts of these alone and with identified in-combination effects (Environment Agency 2014c).

The purpose of the Appropriate Assessment is to ensure that the granting of a variation to the permit does not result in an adverse effect on the site integrity of the SAC. An Appropriate Assessment is a legal requirement to determine whether activities (not necessary for nature conservation) could adversely affect the integrity of the conservation site(s), either alone or in combination with other activities, given the prevailing environmental conditions. It is required before the Environment Agency, as a competent authority, can grant permission for the proposal. An adverse effect on integrity is one that undermines the coherence of a site's ecological structure and function and across the whole area that enables the site to sustain the habitat, complex of habitats and/or levels of populations of the species for which the site is designated.

The Appropriate Assessment was carried out in line with the conservation objectives for the Drigg Coast SAC, as determined by Natural England and having due regard to their advice through a consultation process detailed in Annex 3 of the Appropriate Assessment (Environment Agency 2014c). It follows Environment Agency guidance and procedures, which were devised in conjunction with Natural England.

In line with Defra guidance (Defra, 2012) we have worked closely with Cumbria County Council and Natural England in developing the scope for the Appropriate Assessment. We aimed to ensure that all activities associated with this application and the associated planning submission which Cumbria County Council are considering are assessed by the most relevant competent authority in order to limit any duplication of work required by the applicant or the competent authorities.

Potentially significant effects taken forward into the Appropriate Assessment and considered further are listed in Table 8. Assessments of the potential to cause an adverse effect on site integrity were completed considering radiological and non-radiological criteria explained within the assessment.

Within our Appropriate Assessment we conclude that, for all hazards considered, there will be no adverse effect on site integrity to the Drigg Coast SAC from the permitted activities alone or in-combination. The radiological impact assessment predicts dose thresholds above the action levels of $40 \mu\text{Gy h}^{-1}$ in the marine environment, post closure of the repository (1000 years beyond present) following predicted coastal erosion of the SAC interest feature back to the repository boundary. However, we have reviewed the evidence LLW Repository Ltd submitted regarding the relative radio-insensitivity of the species affected, and we conclude that these doses will have no adverse effect on the site integrity of the Drigg Coast SAC alone or in-combination.

Table 8 : Appropriate Assessment areas assessed

| Effect | In-combination effects considered |
|---|---|
| Potential for habitat loss (for example due to coastal erosion) | <ul style="list-style-type: none"> Existing LLWR sea pipeline (following advice from Natural England) |
| Radiological impacts (via groundwater, surface water, air and direct radiation) | <ul style="list-style-type: none"> Coastal erosion Sellafield site authorised discharges |
| Non-radiological water chemistry (via groundwater and surface water) | <ul style="list-style-type: none"> LLWR marine discharges, groundwater, sewerage treatment plant Sellafield site authorised discharges Background contamination (historical) |
| Changes to groundwater and hydrological regime | |
| Air quality (non-radiological) | <ul style="list-style-type: none"> Sellafield site authorised discharges |
| Smothering and dust | <ul style="list-style-type: none"> Sellafield site authorised discharges LLWR grout plant authorised discharges |

We consulted Natural England starting 4 July 2014 for 20 days. After addressing a number of comments received, Natural England formally signed off the conclusions of the Appropriate Assessment on 20 October 2014.

Countryside and Rights of Way Act

We completed an assessment in accordance with Requirements of Section 28I of the Wildlife & Countryside Act 1981 as amended by the Countryside and Rights of Way Act (CRoW) 2000 (Environment Agency 2014d). This identified aspects of the proposed permit variation that could potentially damage interest features of affected SSSIs. Three SSSIs were identified within 2km of the LLWR: Hallsenna Moor, Drigg Holme and Drigg Coast. The same hazards were assessed as those used in the Habitats Regulations Assessment and focused on interest features that were not considered within the Appropriate Assessment. The assessment used Natural England's Conservation Objectives and definitions of Favourable Condition.

We concluded that the proposed permit variation is not likely to damage any flora, fauna or physiological features which are special interests at Hallsenna Moor, Drigg Holme or Drigg Dunes SSSIs. We consulted Natural England on our assessment on 4 July 2014 and on 20 October 2014 Natural England advised that the operation could go ahead. It was agreed that the main potential impacts to protected species would occur as a result of construction activities and will be considered by Cumbria County Council.

Marine Conservation Zone

As required by the Marine and Coastal Access Act 2009 with respect to MCZs we have a duty to assess the potential impact of granting any permit on the features of the MCZ and to consider conservation objectives for the MCZ (in so far as they have been published). The Cumbria Coast MCZ lies approximately 500 m from the repository boundary. The applicant has considered the potential effects of the proposal on the MCZ (URS 2014b).

Despite the lack of current guidance and defined conservation objectives for the MCZ, we have completed our own MCZ assessment of this permit variation application (Environment Agency 2014e). We considered all relevant risks, such as radiological risks, and pathways such as groundwater, discharges to sea and air, as well as in-combination effects associated with the Sellafield site and coastal erosion. We considered the relevant ecological features of the MCZ.

We conclude that the permit variation application will not result in damage to, or effects on, the MCZ ecological features including sabellaria reefs. We believe that our decision is in accordance with the MPS and Northwest Inshore Marine Plan.

Other conservation duties

We have applied the same approach to our other conservation duties (listed in Table 7) and also conclude that for the same reasons as identified in our Appropriate Assessment the radiological dose rate will have no effect on species and habitats considered. By definition there can be no effect on purely physical features, such as the geology, physiographical features or the built environment.

We have completed a further assessment that considered specifically some of these other conservation duties (Environment Agency 2014a). The assessment considered in totality all protected sites including SACs, SSSIs, the MCZ, the Lake District National Park and Local Wildlife Sites. It also considered habitats and species of principle importance (NERC duty including relevant Section 41 Species).

The assessment made reference to the Appropriate Assessment and CROW assessment, and where relevant assessed against the same effects as those shown in Table 8. We conclude that the activities proposed under permit variation application would not damage or pollute the habitats or species that they support.

Summary

We are satisfied that, through the assessments described above, LLW Repository Ltd has met the requirements of the GRA and that radiological impacts on the accessible environment, both during the period of authorisation and afterwards, are low enough and that the environment is adequately protected. We are also satisfied that we have addressed our conservation duties as set out in Table 7 in relation to discharges of radioactivity and also non-radioactive impacts on relevant protected habitats and species. Assessments were made against the proposed radiological disposals in the permit variation application and therefore we consider that the proposed radiological capacity limits within the permit (see Section 5.4.7) will be sufficiently protective to comply with our conservation duties.

5.4.9. Non-radiological assessment

Requirement R10 of the GRA refers to protection against non-radiological hazards: 'The developer/operator of a disposal facility for solid radioactive waste should demonstrate that the disposal system provides adequate protection against non-radiological hazards'. It requires that a level of protection should be provided that is 'no less stringent' than would be provided by the nationally accepted standards for disposing of hazardous waste. The operator is also required to comply with supplementary guidance to the GRA related to compliance with the Groundwater Directive (Environment Agency 2012a).

Assessment

LLW Repository has completed an assessment against these requirements using what we consider to be a conservative approach, which adequately takes account of the uncertainty in the non-radioactive inventory. The company has considered the period of authorisation and afterwards and has, in some cases, gone further than the requirements to assess impacts arising following the potential for human intrusion and coastal erosion of the site. LLW Repository Ltd's non-radiological assessment is presented in one main report (LLW Repository Ltd 2011i) and is further updated in the developments document submitted with the permit variation application (LLW Repository Ltd 2013d). We have completed a detailed review of this assessment. Our review reports address aspects related to inventory (Environment Agency 2015d) and assessments (Environment Agency 2015g) as well as overall management and waste acceptance (Environment Agency 2015c).

LLW Repository Ltd's assessment demonstrates that for the period of authorisation, discharges of non-radioactive contaminants are expected to remain low. After the period of authorisation has ended it is predicted that concentrations of some non-radioactive contaminants could increase in groundwater. However, we conclude that, given the conservative nature of the assessed non-radiological inventory and associated uncertainties, any impacts in the long-term are likely to be localised, with no discernible impact at a groundwater body scale and will not contravene the requirements of the Groundwater Directive or result in a net environmental dis-benefit. We

consider that the proposals are optimised regarding radiological impacts and that this optimisation process has appropriately taken account of non-radiological impacts and their projected timing.

LLW Repository Ltd's non-radiological contaminant assessment for the groundwater pathway was carried out using a similar approach to the radiological assessment for the groundwater pathway. Both of these assessments considered the impacts of complexants upon discharges (LLW Repository Ltd 2013d). We consider that this approach was suitable and sufficient to meet the requirements of the GRA. However, we have identified scope for improvement and have therefore raised a FI on this topic and have included an improvement and information requirement (IC6) within the permit for LLW Repository Ltd to update the non-radiological hydrogeological risk assessment by 1 October 2017, taking into account comments we have made in our review of the 2011 ESC.

Improvement and information requirement IC6

Submit an updated non-radiological hydrogeological risk assessment taking into account the Environment Agency's review of the 2011 environmental safety case.

In its assessment LLW Repository Ltd has also considered the potential impacts of asbestos. The current regulatory framework for the disposal of asbestos to landfills does not specifically require an assessment of the risk associated with the exposure of asbestos by any mechanism during the whole lifetime of the site. Instead, all asbestos disposals must meet the specific requirements of EPR10 and the Landfill Directive, which detail a number of prescriptive requirements on the manner of disposals and which aim to ensure effective isolation of the asbestos hazard (for example, minimum cover depths over the asbestos). The GRA requires that the LLWR must meet standards that are 'no less stringent' than would be provided by the nationally accepted standards for disposing of hazardous waste.

LLW Repository Ltd has compared its approach to asbestos disposal with that of current landfills and shown to our satisfaction that its disposal practices offer equivalent or better protection than that which would be provided at a landfill. Nonetheless, the company has carried out further work to assess the hazards presented by asbestos from the LLWR in the future, following coastal erosion or human intrusion and this work continues.

In response to our consultation on the application the Committee on the Medical Aspects of Radiation in the Environment (COMARE) states there is a need to consider hazardous chemical aspects, particularly asbestos since there will be significant quantity of this coming from the dismantled Magnox stations. We agree with this statement, although note that much of the asbestos expected to arise from the decommissioning of power stations is expected to have low activity levels and be suitable for disposal at appropriately permitted landfills. We consider that LLW Repository Ltd has completed a sufficient assessment, addressing both hazardous chemical aspects and asbestos, controls on which are discussed further below.

In response to consultation of the draft Decision Document Friends of the Earth and Individual (3) raise concerns with regards to how historical contamination on the site from the Royal Ordnance Factory had been considered and also any influence on radioactive waste disposals. We note that non-radiological ground contamination arising from the prior activities of the site as a Royal Ordnance Factory do not fall within the scope of the permit under consultation, other than to the extent that the contamination may impact upon the safety of disposals. We note this issue and recognise that contamination arising from the ROF could potentially have implications for radioactive waste disposals. As explained further in Annex 3 we are satisfied that LLW Repository Ltd has adequately considered these issues within the ESC and supporting information provided. In terms of the wider potential environmental impacts associated with historic land contamination issues, such as the previous use of the LLWR site as a ROF, our expectations are set out in joint guidance we have produced with ONR, Scottish Environment Protection Agency and Natural Resources Wales: "Regulatory expectations for successful land quality management on nuclear

licensed sites” (see footnote 22). Also, LLW Repository Ltd continues to undertake non-radioactive land contamination characterisation activities across the LLWR site, for example, gathering relevant information during trial pitting campaigns or excavations to support site infrastructure projects.

Non-radiological waste acceptance criteria

Based upon its non-radiological assessment LLW Repository Ltd has proposed an approach to limiting the environmental impacts of LLW with non-radiological toxic properties (LLW Repository Ltd 2011l and 2013d). Where necessary this has taken account of proposals to dispose of complexing agents (see Section 5.4.10). In this approach the company divides non-radiological contaminants into 3 categories within the WAC (LLW Repository Ltd 2014c), based upon 4 original categories explained within its developments document (LLW Repository Ltd 2013d) (Category 4 material, asbestos, was included in Category 3 within the WAC):

- Category 1: Materials not subject to control, as control would be disproportionate, although their quantities need to be recorded. For example iron.
- Category 2: Materials for which a site capacity is defined, where substances give rise to potentially the most environmental harm. For example lead.
- Category 3: All other Hazardous Waste, Hazardous Substances and Non-Hazardous Pollutants (including asbestos). These will require further assessment under LLW Repository Ltd's variation process if identified in proposed disposals and may be controlled by requiring a particular approach to waste management.

For substances in category 2, LLW Repository Ltd has calculated site capacities. This approach is based around defining safe repository capacities for individual materials, consistent with the approach used for radiological capacity, although the sum-of-fractions approach is not used. They are based upon the most limiting assessments for the groundwater pathway, human intrusion pathway or coastal erosion pathway. Category 3 substances will be assessed prior to receipt.

To ensure continued consistency with the 2011 ESC, the GRA and taking into account LLW Repository Ltd's assessment work on asbestos disposal, LLW Repository Ltd requires each potential consignment of asbestos (category 3) to be assessed on a case by case basis. This assessment will take into account the amount, concentration, type and form of the asbestos. Based on this, the company will determine whether or not it can accept the consignment.

The WAC also include a number of other controls of non-radioactive substances such as complexants (discussed in Section 5.4.10) and oils, which LLW Repository Ltd will require to be fixed in a solid matrix before disposal. LLW Repository Ltd has also established increased requirements for information provision on non-radiological substances disposed to the site, to allow confirmation of their acceptability and also to allow construction of an improved non-radiological waste inventory for future assessment.

We have reviewed LLW Repository Ltd's proposals for the control of the non-radiological component of disposals (Environment Agency 2015a, c and g). We accept these proposals as reasonable and consistent with the requirements of the GRA and the 2011 ESC and consider that they will allow protection of people and the environment from potential non-radiological impacts.

The current permit does not place specific controls on the disposal of non-radiological substances other than some specific types such as oxidising agents and chemical complexing or chelating agents, which we discuss further in Section 5.4.10. We do not propose to include any new specific requirements within the varied and updated permit. However, through standard conditions within the permit, LLW Repository Ltd will be required to maintain and operate to an ESC and ensure that radioactive waste is only disposed of where all relevant waste acceptance procedures have been completed and it fulfils the relevant WAC as defined in the ESC.

In response to our consultation on the application, one individual stated that there should be numerical limits in the permit on non-radioactive constituents of wastes. We do not consider that numerical limits on non-radioactive constituents of the waste are necessary within the permit and that the permit conditions referred to, along with other standard conditions such as those to notify us of proposed changes to the ESC or WAC, will allow the effective control of non-radiological

substances and therefore their environmental impacts, whilst avoiding additional complex permit conditions.

In response to our consultation on the application, both EDF Energy and Magnox Ltd expressed views that the non-radiological limits should not be applied without due consideration of the practicalities of characterising waste and that there should be pragmatism, particularly with regards to the characterisation of older decommissioning materials. We note that within the permit we do not plan to impose any more stringent requirements than those defined by LLW Repository Ltd within its waste acceptance procedures to ensure disposals are consistent with the 2011 ESC. We consider that the waste acceptance procedures defined by LLW Repository Ltd are appropriate and necessary to ensure impacts resulting from the disposal of radioactive waste at the LLWR are acceptable and consistent with requirements of the GRA. Consignors will need to comply with those procedures to dispose of radioactive waste at the LLWR and we do not propose to enforce any further changes. However, we note and accept the comments as valid as there are practical limits to the extent waste, and in particular some decommissioning waste, can be characterised for non-radiological components without disproportionate costs or radiological doses being incurred. We consider that the waste acceptance procedures proposed are pragmatic and do not necessarily demand disproportionate effort to characterise waste, for example allowing estimation of components in some cases. LLW Repository Ltd must continue to require the information necessary to achieve compliance with the requirements of the GRA and consignors must demonstrate use of BAT for their waste characterisation.

In summary, we consider that the current assessment of the non-radiological inventory adequately demonstrates that GRA requirement R10 is being met. Plus, appropriate WAC and waste acceptance procedures have been put in place to control disposals and therefore non-radiological impacts on people and the environment. Non-radiological discharges via the Marine Holding Tank will continue to be controlled and limited by the extant non-radiological permit (Reference NPSWQD002191).

5.4.10. Other permit and waste acceptance changes

In this section we discuss a number of other proposed changes to the permit and also developments of the WAC. In general we note that LLW Repository Ltd is seeking more (and more accurate) information from consignors with regards to their disposals than previously, in particular to support non-radiological capacity control. We consider this appropriate and supportive of the ESC and continued improvements in inventory understanding.

Overall we consider that the proposed changes to the WAC are consistent with the assumptions made in the 2011 ESC and subsequent updates and will be sufficient to avoid unacceptable doses and risks to people and the environment.

Materials and items with implications for operational safety

In its application LLW Repository Ltd requests removal of restrictions in its current permit on the disposal of a number of materials and items that might have implications for operational safety. The materials and items referred to are listed in paragraph 2 of Schedule 8, b(i) to b(vi) of the current permit (Environment Agency 2010) and include:

- metals and other materials which readily react either with water or air with the evolution of heat or flammable gases
- explosive materials
- liquids with flashpoint less than 21 °C absorbed on solid materials
- strong oxidising agents
- pressurised gas cylinders or pressurised aerosol containers
- materials which generate or are capable of generating toxic gases, vapours or fumes harmful to persons handling the waste

LLW Repository Ltd makes the case that such restrictions are best derived from LLWR's operational safety cases and implemented through the WAC (LLW Repository Ltd 2013a). In response to our consultation on the permit variation application some responses supported this change, COMARE considered that more objective proposals were required and one individual was

not convinced by the proposals and considered that there was a good case for continuing to include these restrictions.

We have considered both LLW Repository Ltd's proposals and the consultation comments carefully. While we could regulate these restrictions through our permit, given their potential impact on the LLWR facility, we have concluded that they can be effectively controlled via the WAC, including the WAC for the waste compaction facility, WAMAC, located at Sellafield, as well as within the operational safety case regulated by ONR. Furthermore, such restrictions are not considered within our template radioactive waste burial permit.

We therefore propose to remove these specific restrictions from the permit and are satisfied that the issues are adequately addressed within the WAC defined by LLW Repository Ltd.

Complexing or chelating agents

In its application LLW Repository Ltd proposes removal of the current permit restriction on any disposals of complexing and chelating agents. Complexing and chelating agents are currently prohibited as they have the potential to enhance contaminant mobility in groundwater. In its 2011 ESC and developments document (LLW Repository Ltd 2013d) LLW Repository Ltd makes the case that some complexants can be safely disposed of, whilst sufficient control on others can be exercised within the waste acceptance process.

Specifically, LLW Repository Ltd proposes that all disposals should continue to be subject to BAT and limited as far as possible, but that most complexants and chelating agents can be disposed of except in bulk quantities (> 1 kg per consignment). However, in the case of 1 group of complexing agents (aminopolycarboxylic acids) the company proposes that capacity control should be used, with disposals to the whole of the EDA limited to 1500 kg. At these levels LLW Repository Ltd presents evidence that there will be little impact on calculated risks via the groundwater pathway. However, it notes there will be some impact and radiological and non-radiological capacities have been modified accordingly to take account of this.

In response to our consultation on the permit variation application some responses supported this change, COMARE considered that more objective proposals were required and one individual agreed with the removal of blanket restrictions, but considered that controls may not be best implemented through the WAC.

We considered LLW Repository Ltd's proposals and the consultation comments carefully. We are satisfied that LLW Repository Ltd has objectively considered its proposals, supported by some detailed assessment work (LLW Repository Ltd 2012a and 2013e to h). We have concluded that the case presented supports this change to the WAC (Environment Agency 2015a and g). We are also satisfied that the controls can be effectively controlled through the WAC, rather than specifically through the permit, relying on conditions requiring LLW Repository Ltd to maintain and operate to a documented ESC (see conditions 1.1.3, 2.3.2 and 3.1.8).

In response to our consultation on the draft Decision Document Friends of the Earth and Individual (3) raise concerns with regards to how historical contamination on the site from the Royal Ordnance Factory had been considered and also any influence on radioactive waste disposals. We note this issue and recognise that contamination arising from the ROF could potentially have implications for radioactive waste disposals, for example by acting as complexing or chelating agents. As explained further in Annex 3 we are satisfied that LLW Repository Ltd has adequately considered these issues within the ESC and supporting information provided.

Controls on waste form, physical composition and biogeochemical properties of waste

Within the 2011 ESC waste acceptance report (LLW Repository Ltd 2011j) and developments document (LLW Repository Ltd 2013d) LLW Repository Ltd considers a range of issues related to waste form, physical composition of waste and its biogeochemical properties in relation to environmental safety. We review this work in our inventory and near field (Environment Agency 2015d), site understanding (Environment Agency 2015e), optimisation and engineering (Environment Agency 2015f), safety case management (Environment Agency 2015c) and overview reports (Environment Agency 2015a). These issues are of relevance as they may influence the performance of the disposal system and the rate of release of contaminants into the environment.

As a result of these studies LLW Repository Ltd has proposed to keep many of the controls within the WAC unchanged, other than those discussed elsewhere within this Decision Document. However, a number of changes have been proposed and implemented, for example those related to:

- maintaining acceptable levels of total potential voidage within containers, made up of inaccessible voidage, voidage formed from biodegradation of materials and voidage formed by the compression of materials
- exclusion of materials that could cause significant corrosion of containers

Resulting from these considerations changes have also been made with regards to the minimisation of ullage and voidage through the grouting process and implementation of emplacement strategies, for example to keep total voidage within any one stack of waste within 20 to 35% unless otherwise assessed as acceptable.

We are satisfied with the changes proposed to the WAC and site operations and that they are adequately controlled through the ESC without the need for specific permit conditions.

5.4.11. Management against the ESC

In its application (LLW Repository Ltd 2013a) LLW Repository Ltd requests permission to manage the LLWR in accordance with the ESC. This included the granting of capacity to use the whole of the EDA, potentially out to Vault 20, which is predicted to provide the necessary capacity for relevant arisings of LLW until around 2127.

In response to our consultation on the application a number of consultees supported these proposals and also proposals to primarily place acceptance criteria within the WAC and not the permit.

One individual responded with a number of concerns related to these proposals, which we summarise as follows:

- Concerns that granting permission out to 2127 would be premature given that over the years technology, understanding, approaches and policy may evolve.
- Concerns that management in accordance with the ESC will not in itself ensure that there are adequate controls on design, operation and closure of the facility, including controls on waste acceptance. That more specific permit requirements will be needed.
- Concerns around proposals that WAC and other controls on waste acceptance are excluded from the revised permit as far as possible. That it is for the Environment Agency to define necessary controls as considered appropriate, including those associated with radiological and non-radiological capacity and other controls such as emplacement strategies and complexant disposal.

In relation to granting permission within a permit that provides capacity out to around 2127 and for vaults out to around Vault 20, we consider that this is consistent with our standard permitting approach under EPR10. We note that the permit will not be time limited and we will only grant permission for a specific radiological capacity, not specific vaults. The standard permit contains conditions that require disposals to remain optimised at all times and that operators continue to use BAT to dispose of radioactive waste. We will require regular review and update of the ESC and WAC and if at any point this no longer applies the operator will need to update the ESC and WAC and change operations as necessary. If at any point we are not satisfied that operations continue to be optimised we can and will vary the permit, applying appropriate limits and conditions. Granting a permit for a capacity which may last out to 2127 or even beyond is based upon current understanding and we do expect updates to be made following future reviews. Based on current best understanding we consider that the requested capacity is supported by the ESC and granting it will give the industry an increased understanding of the viability of the site, in relation to environmental safety and availability of disposal capacity.

With regards to the adequacy of management against the ESC and the inclusion of controls within the permit rather than WAC we note that the template burial permit is constructed to facilitate this as far as possible. However, we agree firmly with the consultee that it is for the Environment Agency to specify controls within the permit where it is deemed necessary and for the operator to

ensure compliance with those conditions through application of the WAC and waste acceptance procedures.

A number of important conditions within parts 1 to 4 of the permit ensure:

1. that the operators manage and operate the activities in accordance with a written management system that is sufficient to achieve compliance with the conditions of the permit (condition 1.1.1).
2. that the operator must maintain a documented ESC (condition 1.1.3). The ESC is part of the management system
3. that this uses BAT and demonstrates the optimisation of disposals (conditions 1.1.3 and 2.3.2)
4. that WAC and waste acceptance procedures are defined from the ESC and that disposals can only take place in accordance with these (conditions 3.1.8)
5. that where changes are made to the ESC or WAC that might have or might be seen to have significant repercussions for the management of the disposal of radioactive waste by burial, that we are notified (condition 4.3.3). Regulatory Guidance Series, No. RSR2 (Environment Agency 2012c) provides guidance on the meaning of “significant repercussions”, indicating that, for example, it includes where a change affects control measures (BAT), put in place to ensure that impacts remain ALARA and the environment is protected
6. that any other change to management systems which might have or might be seen to have a significant impact on how compliance with the conditions of the permit is achieved is notified to the Environment Agency (condition 4.3.6). This includes, for example, changes to criteria and procedures derived from and/or underpinned by the ESC

Through these standard permit conditions we can ensure that LLW Repository Ltd operates to the latest ESC and WAC defined through it. This negates the need to define further specific permit limits or conditions. These standard conditions require updates to be made, continued implementation of optimisation and provide for notification to us of any proposed changes. Through this notification we can review any changes and as necessary accept, reject or condition those changes within the permit. Any information on this process will be available on the public register.

Based upon this approach we have determined what limits or conditions we consider necessary to stipulate within the permit and which we are satisfied can be controlled via the conditions referred to above. So, for example we consider the radiological capacity as fundamental to the environmental safety of the site and the primary control and so include conditions within Schedule 3. However, we consider that emplacement strategies can be adequately controlled through LLW Repository Ltd's procedures which we will periodically inspect against.

In recognition of the importance of condition 4.3.3 which requires notification of changes to the ESC or WAC we have included an improvement and information requirement in the permit (IC2) to be completed within 6 months of issue. IC2 will ensure clarity of procedures and provides a clear mechanism for LLW Repository Ltd to liaise with us regarding our expectations for notification of changes.

Following comments from an individual on IC2 within our draft Decision Document (see Annex 3 consultation comment 110), we have decided to clarify the wording slightly from “The operator shall develop a procedure for determining what changes to the environmental safety case, including the waste acceptance criteria, might have, or might reasonably be seen to have, significant repercussions for the management of the disposal of radioactive waste by burial.” To “The operator shall develop a procedure for determining what changes to the environmental safety case and waste acceptance criteria, might have, or might reasonably be seen to have, significant repercussions for the management of the disposal of radioactive waste by burial.”.

Improvement and information requirement IC2

The operator shall develop a procedure for determining what changes to the environmental safety case and waste acceptance criteria, might have, or might reasonably be seen to have, significant repercussions for the management of the disposal of radioactive waste by burial.

5.4.12. Implementation and future management against the permit and ESC

Implementation of the ESC and waste acceptance

LLW Repository Ltd is required to implement the 2011 ESC and updated WAC and has been doing this wherever consistent with the extant permit since 2011. Following issue of a varied permit LLW Repository Ltd will further update the WAC and complete implementation in line with it. So, for example, LLW Repository Ltd will only be able to implement its proposals on complexants after issue of any varied permit, whereas emplacement strategies are already being implemented as required by the permit and 2011 ESC. LLW Repository Ltd's implementation proposals are addressed in its waste acceptance (LLW Repository Ltd 2011j) and management and dialogue reports (LLW Repository Ltd 2011m). We have reviewed its proposals in our safety case management report (Environment Agency 2015c), summarised in our overview report (Environment Agency 2015a).

LLW Repository Ltd addresses implementation requirements within an implementation plan. It addresses topics such as production of procedures, management tools, change control processes, necessary training and development of forward programmes of work. Many of the requirements are addressed through a new Repository Site Procedure on development and application of the ESC.

We are satisfied with LLW Repository Ltd's implementation plans and progress to date, which we have reviewed through regular ESC liaison meetings. On 13 July 2015 we undertook a 'Readiness Review' of LLW Repository Ltd with the objective of examining waste acceptance compliance and ESC implementation, so as to build confidence that arrangements were compliant, suitable and sufficient and that the ESC was being effectively implemented prior to issue of any varied permit. We concluded that the operator is ready and capable of being fully compliant with any varied permit and that adequate systems are in place to maintain compliance. We will continue to review progress through our ongoing routine regulation of the site.

Following consultation on our draft Decision Document an individual (see Annex 3 consultation comment 112) queried how the permit ensured that the operator managed and operated the LLWR in such a way as to be consistent with the ESC. Condition 1.1.1 of the permit requires management and operation of activities in accordance with a written management system that is sufficient to achieve compliance with the conditions of the Permit. Condition 1.1.3 of the permit requires maintenance of a documented environmental safety case, which is part of the management system. Therefore, to operate in accordance with the management system LLW Repository Ltd must also operate in accordance with the ESC that they maintain. Condition 1.1.3 makes it clear that this should apply throughout the life-cycle of the facility. Additionally, Condition 3.1.8 of the permit is relevant. It requires that radioactive waste is only disposed of by burial if all relevant radioactive waste acceptance procedures as defined by the environmental safety case have been completed, unless otherwise agreed in writing by the Environment Agency.

Management of stored waste

In its application to vary its permit LLW Repository Ltd requests permission to convert waste currently stored within Vault 8 and Vault 9 into disposals. The wastes were accepted against the WAC that were applicable at the time of receipt. In disposing of this waste LLW Repository Ltd recognises that the waste must be consistent with the 2011 ESC and that its disposal must be demonstrated to be BAT, in other words it is the optimal management approach. We also emphasise that disposal must continue to be consistent with the permit in force.

In response to our consultation on the application 2 comments were received that were supportive of the conversion of stored waste to disposal if it is demonstrated as the BAT. However, one consultee also comments that LLW Repository Ltd had failed to recognise that it may not be possible to make the case that disposal was BAT in all cases and that a fallback plan should be prepared.

We agree that stored waste should be allowed to be disposed of at the LLWR where it can be demonstrated to be consistent with the 2011 ESC and demonstrated to be the BAT for that waste. We consider that this will ensure protection of people and the environment to the same standards as for new waste disposals, consistent with the GRA and also minimise any wider environmental impacts that might result from alternative management of stored waste. We agree that LLW Repository Ltd should consider plans for the management of any waste stored on site that cannot be disposed to the LLWR.

LLW Repository Ltd has requested at least 12 months to deal with the management of stored waste. We accept that it is a large task to assess several 1000 waste containers against the 2011 ESC and permit and to consider the optimised disposal option and route. We have included an improvement and information requirement in the permit (IC5) to be completed within 12 months of issue of the permit. IC5 will ensure that LLW Repository Ltd progresses the management of stored waste to reasonable timescales and also considers alternative options should disposal at the LLWR not be the BAT.

Improvement and information requirement IC5

Submit a written plan to the Environment Agency. The plan must describe in suitable detail how stored wastes held on site in Vaults 8 and 9 are to be disposed of and must provide the programme for disposal. This plan must be supported by an assessment of all stored wastes against the requirements of the environmental safety case, waste acceptance criteria and this permit. The management option chosen must be an optimised solution.

Implementation of the permit

In its application to vary its permit LLW Repository Ltd states that it may take both the company and consignors some time to implement any new conditions or requirements in the revised permit and any resulting new WAC or other controls. It is suggested that consignors may wish to send some waste months after the issue of a new permit that are not compliant with the conditions set out in the revised permit. We assume that this is because some ISO freight containers can take consignors months and even years to fill if they generate only small volumes of waste. LLW Repository Ltd proposes that a similar process to that applied to stored waste (see section above) is applied, or alternatively the revised permit is not implemented for at least 3 months after issue.

In response to the permit variation application EDF Energy and Magnox Ltd both express concern that more time is needed to adapt their systems to any revised permit. One individual comments that transition arrangements may be required if the revised permit differs significantly and that waste consignors should move as quickly as possible to procedures that comply with the revised permit. We note all of these comments. However, due to the content of the varied permit we do not consider that implementation timescales will be an issue to waste consignors or LLW Repository Ltd.

As required by the permit, LLW Repository Ltd has already implemented significant elements of the updated 2011 ESC in the March 2014 WAC (LLW Repository Ltd 2014c) and associated procedures, where they are consistent with the extant permit. This has included implementation of aspects of the 2011 ESC that have tightened controls or required additional information necessary for disposal, such as implementation of discrete item limits, non-radiological capacity controls and additional information on radiological contents to meet the sum-of-fractions methodology for radiological capacity control. The varied permit does not require any new additional controls beyond those already implemented and only confirms requirements already being implemented

through the March 2014 WAC and associated procedures (for example the radiological capacity limits) or removes restrictions, such as those on complexants and chelating agents. Any lessening of restrictions can be implemented to any timescale without threatening compliance with the permit.

At the time of writing we do not anticipate being able to determine this permit variation application until around early autumn 2015 at the earliest. On these timescales consignors will have had around 18 months since issue of the updated WAC in March 2014 to implement new requirements. We consider that this offers adequate time for consignors to adjust procedures for waste disposal and therefore we do not propose to include any implementation period within the varied permit, which will become effective on the date of issue or soon after.

Future management of the ESC

In its application to vary its permit LLW Repository Ltd recognises the need to continue to update the ESC and reference is made to Repository Site Procedures written to address this. LLW Repository Ltd suggests major updates should be undertaken every 10 years if a review shows this to be necessary. In response to our consultation on the application Copeland Borough Council welcomes the ESC being treated as a 'living' document. An individual comments that LLW Repository Ltd must ensure they have an up to date ESC at all times and should also carry out major reviews at appropriate intervals, at least every 10 years.

We expect LLW Repository Ltd to continue to develop its ESC as a live case and are satisfied that the company has recognised this requirement and implemented it through its Repository Site Procedures (Environment Agency 2015a and c). The permit requires this through condition 1.1.3. LLW Repository Ltd's procedures provide for ongoing update of the ESC, for example as updates are made, new information becomes available or additional assessments are completed. These updates will be managed as part of the ESC. LLW Repository Ltd has also planned annual, periodic and major reviews:

- Annual reviews will collate and review information against assumptions in the ESC, record significant monitoring, summarise significant changes and their implications and updated records of uncertainties addressed within the ESC.
- Periodic reviews will be undertaken at least every 3 years unless there is a need for a major review. This review will address the adequacy of the ESC up to the next expected Major review, taking account of significant activities such as construction. The review will consider the cumulative effect of changes since the last major revision of the ESC.
- Major reviews will be completed approximately 10 years after the last Major review or as required by us. Additionally, Major reviews may be initiated by significant cumulative changes to the ESC, or as required to address a new construction phase or major changes to the function of the repository. Major reviews will include a detailed analysis of all aspects of the ESC and relevant aspects of the LLWR's activities and future plans and programmes, with the objective of ensuring that the LLWR is safely operated and developed in the period up to the next Major review and then beyond during the period of active institutional management and after final closure of the site.

We are satisfied that these plans meet our requirements. We agree that the ESC should undergo a major review approximately every 10 years but accept that there should be some flexibility in this timescale to accommodate the outcome of periodic reviews and any planned major activities at the site such as construction of new vaults. So for example, a Major review could be delayed slightly to align with a construction phase or brought forward if deemed necessary. Due to the importance of the Major review of the ESC we have included an improvement and information requirement in the permit (IC7) to be completed 10 years after the last major update was due, that is 01 May 2021. This will ensure the ESC is updated in line with any extant guidance and also the findings of our 2011 ESC review. We have fixed the date of this requirement, however, the permit allows for us to agree changes to these requirements in writing. Therefore should LLW Repository Ltd consider it has justification to delay this Major review it may apply to us to do so.

In support of the ESC and with the aim of ensuring continued improvement and continued compliance with the requirements of the GRA we expect LLW Repository Ltd to develop and

maintain a forward programme of work. LLW Repository Ltd has done this and we have reviewed its proposals in our safety case management report (Environment Agency 2015c). In support of this, we raised a number of forward issues on important areas where we see scope for continued improvement in the ESC and its implementation. These are discussed in each of our ESC review reports (Environment Agency 2015c to g) and collated in our forward issue report (Environment Agency 2015i). We have also made recommendations on areas where we see scope for possible improvement or development. These forward issues and recommendations should only be one input into the forward programme of work, which should be informed by LLW Repository Ltd's wider understanding of the site, the 2011 ESC and monitoring data, amongst other inputs.

Improvement and information requirement IC7

Submit an update to the environmental safety case for the site based upon a comprehensive review, covering the full life-cycle of the facility. The review shall demonstrate that all the requirements of the latest version of the environment agencies guidance on requirements for authorisation for near-surface disposal facilities on land for solid radioactive waste have been met. The review shall address the findings of the Environment Agency's review of the 2011 ESC.

As continuous improvement and a robust, comprehensive forward programme of work in support of the ESC are vital to ensuring its development we have included an improvement and information requirement in the permit (IC4) to be completed within 10 months of issue of the permit.

Improvement and information requirement IC4

Submit a written plan to the Environment Agency. The plan must contain the operator's comprehensive forward programme of work to support the environmental safety case. The plan should address, but not necessarily be limited to:

- The Environment Agency's review of the 2011 environmental safety case.
- Conditions and limits in this permit.
- Learning from development and implementation of the 2002 and 2011 environmental safety cases.
- Monitoring data.
- Uncertainties identified within the environmental safety case.
- Peer review comments on the environmental safety case.

The plan must be implemented unless otherwise agreed in writing by the Environment Agency.

Also of importance to the future management of the ESC and compliance with the permit is the recording of data associated with:

- environmental monitoring
- coastal change
- engineering performance monitoring and construction quality assurance
- discharges
- disposals

Standard conditions in the permit require the monitoring and recording of such data, in addition to reporting information as required in writing to us. Within the Compilation of Environment Agency Requirements (CEAR) which will support any varied permit, we will detail our requirements to report such data to us periodically and place this on the public register.

5.4.13. BAT, discharge routes and waste receipt

LLW Repository Ltd's variation application is limited to disposals of waste by burial and therefore has limited implications for wider aspects of the site's permitted activities and the permit. Conditions within the permit not related to disposal by burial will be unchanged, other than change from an RSA93 style permit to an EPR10 style as discussed in Section 5.4. However, we have also considered a number of wider issues related to the permitted activities to the extent that they are affected by the proposed variation.

BAT

There is a requirement under the EPR10, arising from the BSSD³⁸, that we exercise our functions to ensure that all exposures to ionising radiation of any member of the public and of the population as a whole resulting from the disposal of radioactive waste are kept ALARA, taking into account economic and social factors.

We do this by requiring the operator to use BAT in the operation of the facility to:

- prevent and minimise (in terms of radioactivity) the creation of radioactive waste
- minimise (in terms of radioactivity) discharges of gaseous and aqueous radioactive wastes
- minimise the impact of those discharges on people and adequately protect other species
- minimise (in terms of mass/volume) solid and non-aqueous liquid radioactive wastes
- select the optimal disposal routes (taking account of the waste hierarchy and the proximity principle) for those wastes

By 'operation' we mean how the facility has been designed, built, maintained, operated and dismantled.

BAT is therefore applied to such aspects as minimising waste creation (for example, through avoiding contamination of materials and taking opportunities to reuse or recycle materials which might otherwise be disposed of as waste), abating discharges and monitoring of plant, discharges and the environment. It takes account of such factors as the availability and cost of relevant measures, operator safety and the benefits of reduced discharges and disposals. If the operator is using BAT, radiation risks to members of the public will be ALARA. The environment will also be adequately protected.

In considering the applicant's proposals, we have taken into consideration the statutory guidance to the Environment Agency concerning the regulation of radioactive discharges into the environment (DECC 2009), issued under section 4 of the Environment Act 1995 and we have had regard to other relevant government policy.

The applicant must also demonstrate, for any wastes created for which there is no currently available disposal route (for example intermediate level waste or LLW not suitable for near-surface disposal):

- their suitability for eventual disposal
- how they will be managed in the interim, so as not to prejudice their ultimate disposal

In relation to the burial of radioactive waste the BAT requirements addressed above are met if the GRA is fully applied. LLW Repository Ltd's application of the GRA is discussed in other sections of this Decision Document. However, in disposing of radioactive waste LLW Repository Ltd undertakes some other limited activities such as the handling and movement of waste packages on site and the filling of waste packages with grout. In Sections 5.4.3 and 5.4.4 we discuss the optimisation of disposals, including consideration of the generation of gaseous and aqueous waste as a result.

As a result of the permit variation application only limited changes are proposed to the operations of the grouting facility and there are no proposed changes to gaseous or aqueous discharge routes on site. We consider that these operations continue to represent BAT. We have also considered

³⁸ Council Directive 96/29/Euratom.

whether BAT continues to be applied to the creation of radioactive waste. Routine operations at the LLWR related to the burial of radioactive waste generate only small quantities of radioactive waste and we are satisfied that no significant changes are implied by the permit variation and that operations remain BAT.

The [UK Strategy](#)³⁹ for Radioactive Discharges has the objectives:

- to implement the UK's obligations, rigorously and transparently, in respect of the [OSPAR Radioactive Substances Strategy \(RSS\)](#)⁴⁰ intermediate objective for 2020
- to provide a clear statement of government policy and a strategic framework for discharge reductions, sector by sector, to inform decision making by industry and regulators

with the expected outcomes by 2020 of:

- progressive and substantial reductions in radioactive discharges [to the extent described in the strategy]
- progressive reductions in concentrations of radionuclides in the marine environment resulting from radioactive discharges, such that by 2020 they add close to zero to historical levels
- progressive reductions in human exposures to ionising radiation resulting from radioactive discharges, as a result of planned reductions in discharges

In the statutory guidance to the Environment Agency concerning the regulation of radioactive discharges into the environment (DECC 2009), the government provides guidance on how we should pursue these objectives, namely through applying the environmental principles in the UK Strategy, as listed in Section 2 of this document. The statutory guidance also requires us to take account of other government objectives, such as the safe and timely decommissioning of redundant facilities, clean-up of the historical legacy of radioactive wastes, security of energy supply and maintaining Defence nuclear capabilities.

We have assessed the applicant's proposals and are satisfied that they represent the use of BAT, and the other environmental principles as appropriate, to minimise discharges to the environment. We have set disposal limits (see Section 5.4.7) based on the use of BAT, the optimisation of disposals by burial and normal operation of the facility. We consider this is consistent with our duties in relation to the UK Strategy.

We are satisfied that the applicant's proposals demonstrate the use of BAT and the optimisation of the management of the generation and disposal of radioactive waste, having regard to relevant statutory requirements, plus government guidance and policy, subject to any improvement conditions in the permit.

Discharge routes

The current permit (Environment Agency 2010) specifies the types and routes by which radioactive waste may be disposed. No proposals have been made to change these routes and they will remain in the permit, along with requirements to monitor and report discharges.

It is important to note that under EPR10 leachate and gaseous waste generated as a result of radioactive waste disposal by burial is not regulated as radioactive waste but instead as directive waste. Discharge routes or limits are therefore not specified within the permit and discharges are instead controlled by the limitation and control of the manner of disposals by burial through the permit, ESC and WAC. In other words the disposals are required to be optimised. The acceptability of the disposals is assessed in the ESC against the GRA criteria and monitoring and reporting of discharges and the environment is required to ensure they remain consistent with the ESC and to provide reassurance that no adverse trends are being observed. Aqueous discharges to sea are controlled by a separate permit (reference NPSWQD002191) which is not being varied at this time.

³⁹ <http://www.gov.scot/Resource/Doc/280203/0084414.pdf>

⁴⁰ http://www.ospar.org/html_documents/ospar/html/revise_d_ospar_strategies_2003.pdf

Waste receipt

The permit authorises the receipt of radioactive waste. We have considered the applicant's proposals in relation to the receipt of radioactive waste as part of our consideration of optimisation. The permit contains standard conditions requiring the operator to provide information to potential consignors about the wastes which can be accepted under this permit, to ensure that consignors only send waste which the operator can receive.

The application includes the proposal to receive radioactive waste for the purpose of final disposal into the environment. In accordance with government policy, the permit contains conditions [2.6.4 and 2.6.5] requiring the operator to inform the local authority before the first receipt of radioactive waste from any new consignors.

5.4.14. Other statutory considerations

EA95 – Section 4 Principal Aim of the Environment Agency ('sustainable development')

We have considered the principal aim of the Environment Agency, set out in section 4 of the Environment Act 1995 (EA95), which relates to sustainable development and the guidance issued to the Environment Agency in December 2002 ([The Environment Agency's Objectives and Contributions to Sustainable Development: Statutory Guidance, December 2002](#)⁴¹) and links to the UK Sustainable Development Strategy (A Better Quality of Life: A strategy for sustainable development in the UK (May 1999), Cm 4345) though we note that this strategy has now been updated, see below.

The statutory guidance provides guidance to us on such matters as the formulation of approaches that we should take to our work, decisions about our priorities and our allocation of resources. We are required under section 4(4) of EA95 to have regard to the statutory guidance in delivering our functions, but they are not directly applicable to our individual regulatory decisions.

The guidance states that our main contribution to sustainable development will be to deliver our various objectives in a way that takes account (subject to and in accordance with EA95 and any other enactment) of economic and social considerations. In respect of radioactive substances regulation, the guidance refers to the objective of regulating aerial and liquid radioactive discharges and solid radioactive waste disposal in accordance with statutory duties, statutory guidance and UK government policy.

The UK Sustainable Development Strategy was updated in 2005 with the publication of The UK Government's Sustainable Development Strategy (March 2005), Cm 6467. This states that: 'Our [UK] Strategy for sustainable development aims to enable all people throughout the world to satisfy their basic needs and enjoy a better quality of life without compromising the quality of life of future generations' and introduces five guiding principles. These are:

- Living Within Environmental Limits: respecting the limits of the planet's environment, resources and biodiversity – to improve our environment and ensure that the natural resources needed for life are unimpaired and remain so for future generations.
- Ensuring a Strong, Healthy and Just Society: meeting the diverse needs of all people in existing and future communities, promoting personal wellbeing, social cohesion and inclusion, and creating equal opportunity for all.
- Achieving a Sustainable Economy: building a strong, stable and sustainable economy which provides prosperity and opportunities for all and in which environmental and social costs fall on those who impose them (polluter pays) and efficient resource use is incentivised.
- Using Sound Science Responsibly: ensuring policy is developed and implemented on the basis of strong scientific evidence, whilst taking into account scientific uncertainty (through the precautionary principle) as well as public attitudes and values.
- Promoting Good Governance: Actively promoting effective, participative systems of governance in all levels of society – engaging people's creativity, energy and diversity.

⁴¹ <http://archive.defra.gov.uk/corporate/about/with/ea/documents/ea-susdev-guidance.pdf>

The government published further guidance on “[mainstreaming sustainable development](#)⁴²” in 2011.

In relation to radioactive substances, our contribution to sustainable development is as set out in the statutory guidance and is to regulate aerial and liquid radioactive discharges and solid radioactive waste disposal in accordance with statutory duties, statutory guidance and government policy.

We consider that the overall approach described in this document and in particular the application of BAT and optimisation, which takes into consideration social and economic factors and the assessment of the impact of the discharges on members of the public and the environment, contribute appropriately to the aim of achieving sustainable development, having regard to the statutory guidance.

EA95 - Pollution control powers

Section 5 of EA95 sets out the statutory purpose for which the Environment Agency’s pollution control powers, including our powers under EPR10, must be exercised, namely: 'preventing or minimising, or remedying or mitigating the effects of, pollution of the environment'.

We consider that we have properly exercised our pollution control powers contained in section 5 of EA95, in that:

- we have set limits and conditions based on BAT, as specified in the statutory guidance, having regard to government policy
- the impact of the permitted discharges on members of the public is ALARA
- the environment is protected

EA95 - Well being of local communities

Under section 7(1)(c)(iii) of EA95, we must have regard to the effect our proposals may have on the economic and social well-being of local communities in rural areas.

We have had regard, as appropriate, to the potential effect on the economic and social well being of the local community as part of:

- our assessment of the operator’s proposals in relation to the use of BAT, which involves consideration of costs and benefits
- our considerations in relation to the principal aim of the Environment Agency (sustainable development)
- and our assessment of the impact of disposals

EA95 – Likely costs and benefits

We have taken into account the likely costs and benefits in accordance with section 39 of EA95 in our assessment of BAT and optimisation. We are satisfied that the conditions in the permit are proportionate.

Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 and Groundwater Directive (schedule 22 to EPR10)

Under the Water Environment (Water Framework Directive) Regulations we must exercise our functions to secure compliance with the Water Framework Directive (Directive 2000/60/EC), which seeks to protect ground and surface water on an integrated river basin basis. We have considered the applicant’s proposals in relation to the use of BAT and optimisation to minimise discharges of radioactivity to the environment and the impact of these discharges on members of the public and the environment. And, as described earlier, we consider that the applicant’s proposals and the permit conditions represent the use of BAT to reduce the impact to as low as reasonably

⁴² https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/183409/mainstreaming-sustainable-development.pdf

achievable. We are therefore satisfied that the conditions are sufficient in relation to these regulations.

Schedule 22 of EPR10 implements the Groundwater Directive and requires the taking of all necessary measures to prevent the input of any hazardous substances (which includes radioactive substances) to groundwater and to limit the input of non-hazardous pollutants into groundwater to ensure such pollutants do not cause pollution. These requirements are addressed in the GRA and supplementary guidance to the GRA related to the implementation of the Groundwater Directive (Environment Agency 2012a).

LLW Repository Ltd has addressed these requirements within the 2011 ESC (LLW Repository Ltd 2011d, e and I), its application to vary its permit (LLW Repository Ltd 2013a) and supporting documentation (LLW Repository Ltd 2013d). We have reviewed this information in relation to both hazardous substances (including radioactive substances) and non-hazardous pollutants and are satisfied that the requirements of the Groundwater Directive have been met (Environment Agency 2015g). We are satisfied that the permit conditions provide adequate control and are proportionate. We discuss these requirements further in Sections 5.4.7 and 5.4.9.

Human Rights Act 1998 (HRA98)

We have considered potential interference with rights addressed by the European Convention on Human Rights in reaching our decision. We consider that our decision is compatible with our duties under the Human Rights Act 1998. In particular, we have considered the right to life (Article 2), the right to a fair trial (Article 6) (which here includes the right to a reasoned decision – as provided in this document), the right to respect for private and family life (Article 8) and the right to protection of property (Article 1, First Protocol).

Duty to Involve

Regulation 59 of EPR10 requires the Environment Agency to prepare and publish a statement of its policies for complying with its public participation duties. The Environment Agency has published such a document, "[how we work together](#)"⁴³ and this application is being consulted upon in line with our public participation statement, as well as with the Environment Agency's [RGN6 on Sites of High Public Interest](#)⁴⁴. RGN6 specifically addresses extended consultation arrangements for determinations where public interest is particularly high. This satisfies the requirements of the Public Participation Directive.

Section 23 of the Local Democracy, Economic Development and Construction Act 2009 requires us, where we consider it appropriate, to take such steps as we consider appropriate to secure the involvement of interested persons in the exercise of our functions by providing them with information, consulting them or involving them in any other way.

We have described our consultation in relation to this application in Section 3 of this document. We have described the way in which we have taken account of representations we have received in Section 5 and Annex 2 and 3.

5.4.15. Other considerations

Convention on Safety of Spent Fuel and Radioactive Waste Management

The IAEA [Joint Convention on Safety of Spent Fuel and Radioactive Waste Management](#)⁴⁵ relates to spent fuel and radioactive waste resulting from civilian nuclear reactors and applications, and spent fuel and waste from military or defence programmes if and when such materials are transferred permanently to and managed within exclusively civilian programmes. The Convention

⁴³ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/309632/Working_together_PPS_v2.0_1_.pdf

⁴⁴ <https://www.gov.uk/government/publications/rgn-6-determinations-involving-sites-of-high-public-interest>

⁴⁵ <http://www.iaea.org/Publications/Documents/Conventions/jointconv.html>

also applies to planned and controlled releases into the environment of liquid or gaseous radioactive materials from regulated nuclear facilities.

The objectives of the convention are:

1. to achieve and maintain a high level of safety worldwide in spent fuel and radioactive waste management, through the enhancement of national measures and international cooperation, including where appropriate, safety-related technical co-operation
2. to ensure that during all stages of spent fuel and radioactive waste management there are effective defences against potential hazards so that individuals, society and the environment are protected from harmful effects of ionizing radiation, now and in the future, in such a way that the needs and aspirations of the present generation are met without compromising the ability of future generations to meet their needs and aspirations
3. to prevent accidents with radiological consequences and to mitigate their consequences should they occur during any stage of spent fuel or radioactive waste management

Our responsibilities under EPR10 relate to limited aspects of the Convention: other regulators, such as the ONR, are responsible for other parts. We have reviewed the implications of this Convention and consider that we are meeting the relevant objectives. Details of national arrangements are set out in periodic national reports that are reviewed by the Contracting Parties, including the UK.

5.4.16. Matters which are outside the Environment Agency's permitting remit

Matters such as location of the facility, traffic movements and flood risk are outside the Environment Agency's permitting remit. Where consultees have raised issues relating to such matters, we provide more information at the end of Annex 2 in Table 10.

6. Our decision

Our decision is that we should grant the application and issue a varied permit and variation notice. A consolidated permit, containing appropriate conditions, accompanies this document.

6.1. Conditions of the permit

The permit is based on our standard template permit for radioactive substances activities carried out on a nuclear site, supplemented with additional conditions associated with burial activities. We have developed these standard templates over a number of years and we regularly review them to make sure that they are up to date and effective and that permits for specific sites properly protect people and the environment and are consistent with the relevant government policies. The permit templates and their conditions are described more fully in the document [“How to comply with your environmental permit for radioactive substances on a nuclear licensed site”⁴⁶](#).

The standard permit template consists, principally, of:

- an introductory note (this is not part of the permit)
- a certificate page granting the permit
- Parts 1-4, being standard conditions about management, operations, disposals and monitoring and provision of information
- Schedule 1, defining the activities permitted
- Schedule 3, specifying routes for and limits on, disposals
- Schedule 7, a site plan showing the geographical extent of the regulated facility

The conditions in Parts 1 – 4 of the permit have not been modified from the standard conditions of our templates other than:

- To merge the standard template permit for radioactive substances activities carried out on a nuclear site with the standard template permit for the burial of radioactive waste. It therefore contains a number of additional conditions compared to a standard permit and some of the condition numbers have changed. This is necessary as in addition to the disposal of radioactive waste by burial, LLW Repository Ltd also undertakes other radioactive substances activities, such as decommissioning of nuclear facilities on site.
- We have not included an optional burial permit template condition (2.3.6) requiring the operator to use appropriate measures to avoid pollution or hazards related to pests, noise or odours. We consider that these issues are either unlikely to arise due to the nature of the radioactive waste and the facilities operations, or because (in the case of noise) they will be more appropriately controlled by any permission granted by the waste planning authority.
- Condition 4.3.3 has been re-worded to state ‘Where the operator proposes to make a change to the environmental safety case, including a change to the waste acceptance criteria, which might have, or might reasonably be seen to have significant repercussions for the management of the disposal of radioactive wastes that can be buried, the operator shall:…’, rather than ‘Where the operator proposes to make a change to the environmental safety case, including a change to the waste acceptance criteria, which might have, or might reasonably be seen to have, a significant impact on the quantity or nature of radioactive wastes that can be buried, the operator shall:……’. This change encompasses the previous meaning and broadens it, for example now including the manner in which radioactive waste is disposed as well as its quantity and nature.
- Condition 2.6.2 which requires the visual inspection of radioactive waste has been re-worded so as not to require inspection at the point of burial. This takes into account the fact that the majority of waste disposed at the LLWR is containerised and therefore cannot be visually inspected.

⁴⁶ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296431/geho0812buss-e-e.pdf

- Conditions 4.3.6 and 4.3.7 of the standard template permit for radioactive substances activities carried out on a nuclear site are not included. These conditions relate to Weekly Advisory Levels and Quarterly Notification Levels from outlets and are not relevant to the LLWR permit due to the low discharges of radioactive waste.
- Condition 3.1.8(a) has been modified from “all relevant radioactive waste acceptance procedures have been completed and it fulfils the relevant radioactive waste acceptance criteria as defined in the environmental safety case, unless otherwise agreed in writing by the Environment Agency.”. To “all relevant radioactive waste acceptance procedures have been completed and it fulfils the relevant radioactive waste acceptance criteria as defined by the environmental safety case, unless otherwise agreed in writing by the Environment Agency.”. This is to clarify the status of the WAC as a separate document from the ESC, but underpinned by it (see Annex 3 consultation comment 110).
- In response to our consultation on the draft Decision Document an individual commented that WAC had not been defined in the permit (see Annex 3 consultation comment 110). For clarity we will include the following definition for waste acceptance criteria in Schedule 6 of the permit: “Qualitative and/or quantitative criteria, specified by the operator of a disposal facility, for solid radioactive waste to be accepted for disposal”.

In Schedule 1, we have included:

- 7 improvement or information requirements (IC1 to IC7)
- 1 pre-operational measure for future development (PM1)

for the reasons explained in Section 5.4.

Schedule 3 specifies the approved waste types and disposal routes and, as relevant, the limits that apply to specific radionuclides or groups of radionuclides for each of the approved disposal routes. Schedule 3 Table S3.2 ‘Specified disposals to water’ does not specify discharges to Drigg stream under exceptional storm conditions as it does in the current permit, Schedule 4 condition 3 (Environment Agency 2010). Under the new EPR10 permit format this same approval will be included as an Approved outlet and details specified within the CEAR.

We are of the view that our decision and permit conditions are consistent with the relevant legislation and that we have determined the application having regard to the statutory guidance concerning the regulation of radioactive discharges into the environment and relevant government policy.

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8. Abbreviations

| | |
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| ALARA | As low as reasonably achievable |
| BAT | Best available techniques |
| BSSD | Basic Safety Standards Directive (Directive 96/29/EURATOM) |
| C-14 | Carbon-14 |
| CEAR | Compilation of Environment Agency requirements |
| COMARE | Committee on the Medical Aspects of Radiation in the Environment |
| CQA | Construction quality assurance |
| CRoW | Countryside and Rights of Way Act 2000 |
| DCLG | Department for Communities and Local Government |
| DECC | Department of Energy and Climate Change |
| Defra | Department for Environment, Food and Rural Affairs |
| EA95 | Environment Act 1995 |
| EC | European Commission |
| EDA | Extended disposal area |
| EPR10 | Environmental Permitting (England and Wales) Regulations 2010, as amended |
| ERICA | Environmental Risks from Ionising Radiation in the Environment: Assessment and Management (EU project and software tool) |
| ESC | Environmental safety case |
| EURATOM | European Atomic Energy Community |
| FI | Forward issue |
| FSA | Foods Standards Agency |
| GBq | Gigabequerel |
| GRA | Guidance on requirements for authorisation (of near-surface disposal facilities on land for solid radioactive wastes) |
| H-3 | Tritium |
| HRA | Habitats Regulations Assessment or Human Right Act |
| IAEA | International Atomic Energy Agency |
| IAF | Issue assessment form |
| ICRP | International Commission on Radiological Protection |
| ILW | Intermediate level radioactive waste |
| IRF | Issue resolution form |
| ISO | International Standards Organization |
| LLW | Solid Low level radioactive waste |
| LLWR | Low Level Waste Repository near Drigg, Cumbria |

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| MBGWS | Miscellaneous Beta Gamma Waste Store |
| MCZ | Marine Conservation Zone |
| MBq | Megabequerel |
| MMO | Marine Management Organisation |
| MPS | Marine Policy Statement |
| mSv | Millisievert |
| NDA | Nuclear Decommissioning Authority |
| NWIFCA | North Western Inshore Fisheries and Conservation Authority |
| NuLeAF | Nuclear Legacy Advisory Forum |
| ONR | Office for Nuclear Regulation |
| OSPAR | Oslo/Paris Convention (for the Protection of the Marine Environment of the North-East Atlantic) |
| PCM | Plutonium contaminated material |
| PHE | Public Health England |
| PROTECT | Protection of the Environment from Ionising Radiation in a Regulatory Context |
| RDA | Reference disposal area |
| REP(s) | Radioactive Substance Regulation – Environmental Principles |
| RGN | Regulatory Guidance Note |
| ROF | Royal Ordnance Factory |
| Rn-222 | Radon-222 |
| RSA93 | Radioactive Substances Act 1993 (as amended) |
| RSR | Radioactive Substances Regulation |
| RSRL | Research Sites Restoration Ltd |
| SAC | Special area of conservation |
| SSSI | Site of special scientific interest |
| Sv | Sievert |
| TBq | Terabequerel |
| TNT | Trinitrotoluene |
| VLLW | Very Low Level Waste |
| WAC | Waste acceptance criteria |
| WAMAC | Waste Monitoring and Compaction Plant at Sellafield |
| µSv | Microsievert |
| µGy | Microgray |

9. Glossary

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| Absorbed dose | The quantity of ionising radiation absorbed by a body, measured (usually in grays) as the energy absorbed per unit mass. |
| Activity | In radioactive-decay processes, the number of disintegrations per second, or the number of unstable atomic nuclei that decay per second in a given sample. Or, a generic title for the practices or operations which require to be permitted (unless exempted from the need for a permit). |
| ALARA | As Low as Reasonably Achievable (economic and social factors being taken into account). Radiation doses comply with ALARA when they have been reduced to a level that represents a balance between dose and other factors (including economics). This is a statement of the optimisation principle. |
| Appropriate Assessment | Under conservation legislation, an assessment of potential impacts upon protected natural habitats as required by Regulation 61 of the Conservation of Habitats and Species Regulations (in accordance with the Habitats Directive (92/43/EEC)). |
| Assessment case | A specific combination of events, circumstances, conditions or their evolution, including specification of model boundary conditions and data, which represents a particular realisation of the disposal system, its evolutions and radionuclide contaminant release, migration and exposures. |
| Becquerel (Bq) | Becquerel is the derived SI unit of radioactivity equal to one disintegration per second. Activities are commonly documented in terms of megabecquerels (MBq or 10^6 Bq), gigabecquerels (GBq or 10^9 Bq) and terabecquerels (TBq or 10^{12} Bq). |
| Best available techniques (BAT) | <p>BAT is defined as:</p> <p>The use of the best available techniques shall emphasise the use of non-waste technology, if available. The term "best available techniques" means the latest stage of development (state of the art) of processes, of facilities or of methods of operation which indicate the practical suitability of a particular measure for limiting discharges, emissions and waste. In determining whether a set of processes, facilities and methods of operation constitute the best available techniques in general or individual cases, special consideration shall be given to:</p> <ul style="list-style-type: none"> • comparable processes, facilities or methods of operation which have recently been successfully tried out • technological advances and changes in scientific knowledge and understanding • the economic feasibility of such techniques • time limits for installation in both new and existing plants • the nature and volume of the discharges and emissions concerned <p>It therefore follows that what is "best available techniques" for a</p> |

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| | <p>particular process will change with time in the light of technological advances, economic and social factors, as well as changes in scientific knowledge and understanding.</p> <p>If the reduction of discharges and emissions resulting from the use of best available techniques does not lead to environmentally acceptable results, additional measures have to be applied.</p> <p>"Techniques" include both the technology used and the way in which the installation is designed, built, maintained, operated and dismantled.</p> |
| Biodegradation | Natural decay without the need for any specific chemical treatment. |
| Cap | Engineered layer covering waste in the trenches and vaults to limit the amount of water entering the disposed waste and minimise the risk of intrusion from human and animal activities. |
| Compilation of Environment Agency Requirements (CEAR) | A compilation of Environment Agency Requirements. Environment Agency Requirements are further detailed requirements, approvals or agreements allowed for in permit conditions. We will only use these to set out matters of detail, and these will be clearly linked to the original permit condition. We will place these on the public register subject to the normal considerations of confidentiality and national security. |
| Chelating agents | A chelating agent is a substance whose molecules can form several bonds to a single metal ion. |
| Closure engineering | Engineering that must be put in place to ensure radioactive waste disposals remain safe after the period of authorisation, such as the final cap, a cut-off wall or drainage features. |
| Collective dose | Collective dose is the sum of all the effective doses received by an exposed population. |
| Complexant | 'Complexing agents' are chemicals that can bind strongly to metal ions and significantly increase their solubility or decrease their ability to adsorb onto solids. They may be an individual atom, molecule or functional group that binds to metal with one or more bonds. The bonding may be ionic or coordinate bonds. |
| Conservative (of assumptions and data) | Cautious in the sense that impacts would be overestimated. |
| Consignment | A consignment is a container or item of waste sent by a waste producer (consignor) to a disposal facility (such as LLWR). |
| Consignor (of waste) | An organisation or person that sends waste to the repository. |
| Critical group | A group of members of the public that is reasonably homogeneous with respect to its exposure for a given radiation source, such as a near-surface disposal facility, and is typical of individuals receiving the highest effective dose or equivalent dose (as applicable) from that source. |
| Criticality | A condition in which a sufficient quantity of fissile material is assembled in the right arrangement for a self-sustaining neutron chain reaction to take place. |

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| Cut-off wall | A generic term for a low hydraulic conductivity wall constructed below ground level that is intended to reduce (cut-off) lateral water seepage into or out of part of a site. |
| Deterministic | A deterministic analysis is one in which each input parameter is assigned a single numerical value, leading to a single value for the result. |
| Direct radiation | Direct radiation (or shine) is the exposure of workers or members of the public to radiation which comes directly from the operations taking place on the site and which does not involve ingestion, inhalation or direct contact with radioactive materials deposited on the ground or via the food chain. |
| Discrete items | Discrete items are distinct items of waste that may in future be recognisable as unusual or not of natural origin and so could be a focus of curiosity or interest and potentially recovered, recycled or re-used by persons. |
| Disposal | Disposal is the emplacement of waste in a specialised land disposal facility without intent to retrieve it at a later time; retrieval may be possible but, if intended, the appropriate term is storage. |
| Dose constraint | A restriction on annual dose to an individual, which may either relate to a single source or to a complete site, in order to ensure that when aggregated with doses from all sources, excluding natural background and medical procedures, the dose limit is not exceeded. The dose constraint places an upper bound on the outcome of any optimisation study and, therefore, limits any inequity which might otherwise result from the economic and social judgements inherent in the optimisation process. The Government has set a maximum dose constraint value of 0.3 mSv y^{-1} when determining applications for discharge authorisations from a single new source, and a dose constraint value of 0.5 mSv y^{-1} for a complete site (which may include several sources with more than one operator). |
| Dose guidance level (for human intrusion) | In the context of near-surface disposal facilities, the dose standard against which the radiological consequences of human intrusion are assessed. It indicates the standard of environmental safety expected but does not suggest that there is an absolute requirement for this level to be met. |
| Dose rates | The radiation dose (dosage) absorbed per unit of time. |
| Effective dose | The sum of the equivalent doses from internal and external radiation in all tissue and organs of the body, having been weighted by their tissue weighting factors. The unit of effective dose is the sievert (Sv). |
| Empirical | Based on or verifiable by observation or experience rather than theory. |
| Emplacement | The placement of a waste package in a designated location for disposal, with no intent to reposition or retrieve it subsequently. |
| Emplacement strategy | A strategy to control the locations in which certain waste streams and waste consignments are emplaced in the vaults. For example, not placing certain waste in the upper levels of stacks in the vaults in order to reduce the probability of |

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| | inadvertent human intrusion into such waste. An emplacement strategy may be necessary to meet dose constraints and dose guidance levels, or it might be an optimisation measure to minimise the environmental impact of disposals to the LLWR. |
| Engineered barrier | A barrier that is designed to protect from human intrusion into disposed waste and minimise the release of contaminants, both radiological and non-radiological, from the disposal facility, consequently minimising the dose to humans and non-human biota. |
| Environmental permit (permit) | A permit issued under the Environmental Permitting (England and Wales) Regulations 2010. |
| Environmental safety | The safety of people and the environment both at the time of disposal and in the future. |
| Environmental safety case (ESC) | The collection of arguments, provided by the developer or operator of a disposal facility, that seeks to demonstrate that the required standard of safety for people and the environment, both at the time of disposal and in the future, will be achieved. |
| Exposed group | For a given source, any group of people within which the exposure to radiation is reasonably homogeneous; where the exposure is not certain to occur, the term 'potentially exposed group' is used. |
| Exposure pathway | An exposure pathway refers to the way a person can come into contact with a hazardous substance. There are three basic exposure pathways: inhalation, ingestion, or direct contact. A person can also receive dose from radioactive substances via external irradiation. |
| Extended disposal area (EDA) | An extended area of the repository, beyond but including the Reference Disposal Area, which is considered in the 2011 ESC to be sufficient to dispose of all waste requiring vault disposal in the United Kingdom Radioactive Waste Inventory. |
| External radiation | Irradiation arising from outside the body, for example direct irradiation from proximity to a radiation source. |
| Fissile | Fissile material is material capable of sustaining a nuclear fission chain reaction. By definition, fissile material can sustain a chain reaction with neutrons of any energy (as opposed to 'fissionable' material requiring high-energy neutrons). |
| Flashpoint | The temperature at which a particular organic compound gives off sufficient vapour to ignite in air. |
| Forward issue (FI) | Areas of work that we believe it is important for LLW Repository Ltd to progress as part of its forward improvement plan. Areas where we see scope for continued improvement in the ESC and its implementation. |
| Gray (Gy) | A measure of absorbed dose in the body, with one Gray equivalent to one joule of energy absorbed per kilogram of body weight. A microgray is equivalent to a millionth of a Gray. |
| Groundwater | Water which is below the surface of the ground in the saturated zone and in direct contact with the ground or subsoil. |
| Half life | For a radionuclide, the time taken for the activity to decrease, by a radioactive decay process, to half of its initial value. |

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| Hazardous substance | Defined in Article 2(29) of the EU Water Framework Directive as meaning a substance or groups of substances that are toxic, persistent and liable to bio-accumulate, and other substances or groups of substances which give rise to an equivalent level of concern. |
| Hazardous waste | Hazardous waste is essentially waste that contains hazardous properties which if mismanaged has the potential to cause greater harm to the environment and human health than non-hazardous waste. |
| Heterogeneity (of radioactive waste) | A measure of the extent to which waste is composed of unrelated or differing parts or is not of the same kind or type. Or, the variability of the concentration and types of radionuclides throughout the waste. |
| Human intrusion | Any human action that accesses the waste or that damages a barrier providing an environmental safety function after the period of authorisation. |
| Internal radiation | Irradiation arising from within the body, for example as a result of the ingestion or inhalation of radioactive material. |
| Inventory (of waste or radionuclides) | A record of the totality of waste or radionuclides disposed. |
| ISO freight container | A steel container built to standard dimensions defined by the International Standards Organization (ISO), which can be loaded and unloaded, stacked and transported efficiently over long distances without being opened. Currently, most wastes intended for disposal in the vaults at LLWR are placed in half-height ISO containers licensed for LLW transport. The 2011 ESC assumes that this will continue to be the case. |
| Issue assessment form (IAF) | Issues raised during our review of the 2002 ESCs, which the operators of the LLWR were required to address as part of the development of the 2011 ESC. |
| Issue resolution form (IRF) | A template form used to record and track issues raised as part of the 2011 ESC review, along with their resolution. Each form provides a record of concerns or questions along with one or more actions for LLW Repository Ltd. LLW Repository Ltd recorded or summarised its response on the form, which was then reviewed by the Environment Agency and closed when a satisfactory response was received. |
| Justification | The benefits and detriments of any practice which could result in exposure to ionising radiation must be assessed prior to the practice being permitted. If the benefits outweigh the detriments, the practice is justified. |
| Leachate | Any liquid which has been in contact with waste. Leachate is collected in the base of vaults and trenches and arises as a result of the infiltration of rainwater or groundwater. |
| Low level waste (LLW) | In government policy, low level waste is defined as 'radioactive waste having a radioactive content not exceeding four gigabecquerels per tonne (GBq te ⁻¹) of alpha or 12 GBq te ⁻¹ of beta/gamma activity'. It consists largely of paper, plastics and scrap metal items that have been used in the nuclear industry, hospitals and research establishments. In future, there will also be large volumes of LLW in the form of soil, concrete and steel, |

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| | as existing nuclear facilities are decommissioned. |
| Monitoring | Taking measurements so as to be aware of the state of the disposal system and any changes to that state. This may include measuring levels of radioactivity in samples taken from the environment, and also measuring geological, physical and chemical parameters that are relevant to environmental safety and which might change as a result of construction of the disposal facility, waste emplacement or closure. |
| Near field | In the context of the assessments in support of the LLWR ESC, the near field consists of the waste and engineered barriers. |
| Non-hazardous pollutant | All substances which are not determined to be hazardous are potentially non-hazardous pollutants. |
| Optimisation | Optimisation is the principle of ensuring that radiation exposures are as low as reasonably achievable (ALARA) in the given circumstances. It is a key principle of radiation protection recommended by the International Commission on Radiological Protection (ICRP) and incorporated into UK legislation. |
| OSPAR | Oslo and Paris Convention for the protection of the marine environment in the north-east Atlantic. The UK is a signatory to this Convention, whose Strategies aim to prevent pollution of the maritime by continuously reducing discharges, emissions and losses of chemically hazardous substances and radioactive substances. |
| Oxidising agent | A substance that oxidises another substance, being itself reduced in the process. A common oxidising agent is ferric salt. |
| Particles | A small object that would not be visually identifiable except through a deliberate close search. LLW Repository Ltd define 'Active Particle' as a particle in the size range of 0.6 to 2.0 mm of high-specific activity material such that a single particle could bear of the order of 1 MBq or more of alpha-emitting radionuclides or 0.01 MBq or more of radium-226. This implies a fragment of a high-activity material, typically more than about 100 MBq g ⁻¹ of most alpha-emitting radionuclides or 10 MBq g ⁻¹ of radium-226. |
| Pathway | A route or means by which a receptor could be, or is exposed to, or affected by a contaminant. Four pathways are considered in the 2011 LLWR ESC: groundwater, gas, natural disruption (coastal erosion) and human intrusion. |
| Peer review | A formally documented examination of a technical programme or specific aspect of work by a suitably qualified expert or group of experts who have not been directly involved in the programme or aspect of work. |
| Period of authorisation | The period of time during which disposals are taking place and any period afterwards while the site is under active institutional control. |
| Permeability | A measure of the capability of a porous rock or sediment to permit the flow of fluids through its pore spaces. |

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| Potentially exposed groups (PEGs) | For a given source, such as a near-surface disposal facility, an exposed group is any group of people within which the exposure to radiation is reasonably homogeneous. Where the exposure is not certain to occur, the term 'potentially exposed group' is used. |
| Precautionary Principle | Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation. |
| Probabilistic | Based on a theory of probability; subject to or involving chance variation. |
| Prospective dose assessment | An assessment of radioactive doses which might be received by members of the public in the future (as opposed to doses as a result of discharges that have already been made). |
| Proximity Principle | The proximity principle seeks to avoid excessive and unnecessary transportation of wastes for disposal. It means enabling waste to be disposed of in one of the nearest appropriate installations. |
| Radioactive decay | Spontaneous disintegration of a radionuclide accompanied by the emission of ionising radiation in the form of alpha or beta particles or gamma rays. |
| Radioactivity | The emission of alpha particles, beta particles, neutrons and gamma or x-radiation from the transformation of an atomic nucleus. |
| Radiological capacity | An inventory of radioactive material that the facility is capable of accepting based on the ESC. |
| Radionuclide | An unstable form of an element that undergoes radioactive decay. |
| Receptor | Something that could be adversely affected by a contaminant, such as people, an ecological system, property or water body. |
| Reference case | The baseline set of assumptions about the disposal facility and its evolution with time that is used in the calculations of dose and risk. |
| Reference disposal area (RDA) | The disposal area including the trenches and Vaults 8 to 14. |
| Reference organism | A series of imaginary entities that provide a basis for the estimation of radiation dose rate to a range of organisms which are typical, or representative, of a contaminated environment. These estimates, in turn, would provide a basis for assessing the likelihood and degree of radiation effects. |
| Risk guidance level | A level of radiological risk from a disposal facility that provides a numerical standard for assessing the environmental safety of the facility after the period of authorisation. |
| Scenario | One of several possible descriptions of the evolution of the disposal facility and its surroundings from the time of site closure as a result of natural and human-induced, events and processes. |
| Sealed sources | A source of ionising radiation in the form of radioactive material which is encapsulated. |

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| Sievert (Sv) | The International System of Units (SI) unit of effective dose, obtained by weighting the equivalent dose in each tissue in the body with ICRP-recommended tissue-weighting factors, and summing over all tissues. Because the Sievert is a large unit, effective dose is commonly expressed in milli-Sieverts (mSv) – that is, one thousandth of one Sievert, micro-Sieverts (μ Sv) – that is, one thousandth of one milli-Sievert and nano-Sieverts (nSv) – that is, one thousandth of one micro-Sievert. |
| Site Development Plan | Sets out proposals and assumptions about operations, remedial activities, vault design, capacity and future waste disposal practice, closure design and management up to the end of the period of authorisation. Forms the basis of assessment of repository performance. |
| Specific activity | Radioactivity per unit mass of a waste. |
| Sum of fractions | An approach to setting limits on the total quantities and specific activity of radionuclides that may be disposed of at a radioactive waste repository. The approach is based on derivation of values of radiological capacity for each assessment case and for each radionuclide. A key characteristic of the approach is that it addresses the additive contributions of different radionuclides to overall impacts. |
| Sustainable development | Development which meets the needs of the present without compromising the ability of future generations to meet their own needs. Specific to radioactive waste, the Government's policy is to 'ensure that radioactive waste is managed safely and that the present generation, which receives the benefit of nuclear power, meets its responsibilities to future generations'. |
| Template (burial) permit | A template which contains standard permit conditions suitable for most nuclear sites with the addition of any relevant site specific limits and conditions. Template permits exist for nuclear sites which do not dispose of waste by burial and separately for those that do. |
| Trench | A trench is an excavation in the ground into which loose waste was tumble tipped. |
| Ullage | The unfilled space at the top of a grouted ISO freight container, immediately below the lid. |
| Uncertainty | Lack of certainty. A state of limited knowledge that precludes an exact or complete description of past, present or future. |
| Vault | A space constructed of reinforced concrete base slabs and walls where wastes are emplaced. |
| Waste acceptance criteria (WAC) | Quantitative and qualitative criteria, specified by the operator of a disposal facility, for solid radioactive waste to be accepted for disposal. WAC form part of the set of waste acceptance arrangements that ensure the safety of waste disposal at the site. |
| Waste form | The waste and its immediate packaging (for example grout and container) that is disposed of at the LLWR. |
| Waste hierarchy | A principle of waste management which requires that (in order of preference) wastes be: Avoided; Minimised; Reused; Recycled; Disposed of. |

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| Waste stream | Waste streams are designated in the UKRWI to summarise waste or a collection of waste items at a particular site, usually in a particular facility or from particular processes or operations. A waste stream is often distinguishable by its radioactive content and, in many cases, also by its physical and chemical characteristics. |
| What-if scenario | A scenario put forward to explore the consequences of a defined set of assumptions that have a low likelihood of occurring. |

Annex 1 – Enforcement and recent regulatory history

Securing compliance with environmental permits is an important part of our regulation of nuclear sites. We expect full compliance with our permits and we will use our enforcement powers, including prosecution when necessary, to ensure that relevant action is taken by the operator. Our Enforcement and Sanctions Statement provides a high-level view of our approach to enforcement: further details are in the associated Guidance and Offence Response Options documents.

The methods of enforcement available to us include enforcement notices (to secure compliance with permit conditions), suspension notices where there is a risk of serious pollution, revocation of a permit, variation of permit conditions and the use of injunctions. Where we believe an offence has been committed, we will consider prosecution, formal caution or a warning according to the circumstances.

The only recent significant enforcement matter at the LLWR was a Warning Letter issued on 17 February 2014 in relation to release of site effluent into Manhole 11 of the LLWR sea discharge pipeline. The Warning Letter was issued due to failures to comply with the permit with regards to ill-conceived modifications to plant, lacking arrangements for examination, maintenance, inspection and testing and poor record keeping.

In response LLW Repository Ltd responded effectively to the event, notifying us of its occurrence and the organisations immediate actions to investigate further and minimise the risk of further releases. The company initiated a fundamental review of leachate management systems at the LLWR and how they and other engineering systems are managed, which remains ongoing. An engineering improvement programme was also undertaken and other actions on site initiated to secure compliance and good operations, such as work on standards and expectations and conduct of operations.

We conclude that this record does not indicate that the applicant is unwilling or unable to comply with the permit conditions. LLW Repository Ltd has demonstrated an open and honest approach and a willingness to correct shortfalls found in its management arrangements. Significant efforts have been and continue to be employed by LLW Repository Ltd to secure compliance with its permit.

Annex 2 – Consultation on the application

The application has been advertised and consulted upon in accordance with the Environment Agency's Public Participation Statement. The way in which this has been carried out, the results of our consultation, and how we have taken consultation responses into account in reaching our decision are summarised in this annex. Copies of all consultation responses have been placed on the Environment Agency public register, except where the person making the response asked us not to do so.

How we publicised the consultation on the application

The consultation on the application was advertised by a notice on the Environment Agency website, from 20 November 2013 to 19 February 2014. The notice provided brief details of the application and told people where and when they could see a copy of the application and where to send any comments. Copies of the application were made available for public inspection by placing them on the Environment Agency public register at Ghyll Mount, Gillan Way, Penrith, CA11 9BP. We emailed information to our stakeholder list at the start of our consultation providing information on where the application material was available from. We provided copies of the application by e-mail or on compact disk or in hard copy, on request.

In the run up to consultation we published a number of update bulletins on our web site informing stakeholders of progress with our review of the 2011 ESC and progress towards the anticipated consultation on the permit variation application. We emailed these bulletins to our stakeholder list.

On 11 December 2013 we held a seminar at the Rheged Centre near Penrith at which we invited a range of stakeholders to discuss our future regulation of radioactive waste disposal at the LLWR and to present information on the 2011 ESC, our review, the permit application and also the parallel planning application submitted by LLW Repository Ltd to Cumbria County Council. On 12 December 2013 we held a public drop-in session at Drigg Village Hall to explain our role and review and to answer any questions from members of the public. The drop-in session was advertised via a press release, adverts in the local press, on local radio, via posters in the local area, flyers sent to local residents and via Facebook and Twitter feeds.

Throughout our review of the 2011 ESC and during our consultation and determination process we have kept the West Cumbria Site Stakeholder Group and the associated LLWR Sub-committee informed of our progress and plans. Additionally we have communicated with and provided presentations to a number of organisations such as Copeland Borough Council, Cumbria County Council, Drigg and Carleton Parish Council, the Committee on the Medical Aspects of Radiation in the Environment (COMARE), the Department of Energy and Climate Change Non-governmental Organisation forum and UK Nuclear Industry LLW Strategy.

The start of the consultation was publicised via Facebook, Twitter feeds and a press release.

Who we consulted

We sent links to the application to the following bodies, with whom we have 'Working Together Agreements':

Office for Nuclear Regulation

Food Standards Agency

Copeland Borough Council

Public Health England

United Utilities plc

We also wrote to the following organisations and individuals, informing them of the consultation, providing links to the application and inviting them to participate:

Beckermet Parish Council

Bootle Parish Council

Centre for Environment Fisheries and Aquaculture Science

Committee on Medical Aspects of Radiation in the Environment

Committee on Radioactive Waste Management

Copeland Borough Council

Cumbria County Council

Cumbrians Opposed to a Radioactive Environment

Department of Energy and Climate Change

Department of Environment, Food and Rural Affairs

Department of Health

Drigg and Carleton Parish Council

Friends of the Earth

Gosforth Parish Council

Greenpeace

Industry representatives including consignors to LLWR:

- Archive Collection Bureau
- BAE Systems
- Babcock Marine Ltd
- BNS Nuclear Services Ltd
- Capenhurst Nuclear Services Ltd
- Cristal Pigment UK Ltd
- Devonport Royal Dockyard Ltd
- Doosan Power Systems
- Dounreay Site Restoration Ltd
- EDF Energy
- Energy, Safety and Risk Consultants Ltd
- Euro Dismantling Services Ltd
- GE Healthcare
- HM Naval Base Clyde
- Inutec Ltd
- LLW Repository Ltd
- Magnox Ltd
- Medical Research Council
- Millennium Inorganic Chemicals
- Ministry of Defence, Atomic Weapons Establishment
- Ministry of Defence, Faslane

- Ministry of Defence, Rolls Royce Power Ltd
- National Nuclear Laboratory
- Nuclear Industry Association
- Nuvia Ltd
- Police National CBRN Centre
- Primarc
- Research Sites Restoration Ltd
- Science and Technologies Facilities Council
- Selffield Ltd
- Serco Ltd
- Springfields Fuels Ltd
- Studsvik UK Ltd
- Talisman Sinopec Energy UK Ltd
- United Kingdom Atomic Energy Authority
- Umicore Coating
- Unitech Services Group Ltd
- Urenco UK Ltd

Irton with Santon Parish Council

Isle of Man Government

Lake District National Park Authority

Landfill operators that receive LLW:

- Augean plc
- FCC Environment
- SITA UK Ltd

Local MPs (Copeland and Allerdale)

Local Ward Councillors

Low Level Waste Repository Site Stakeholder Group

Marine Management Organisation

Muncaster Parish Council

National Farmers Union

Natural England

Natural Resources Wales

NHS Primary Care Trust

Northern Ireland Environment Agency

Northwest Inshore Fisheries and Conservation Authority

Nuclear Decommissioning Authority

Nuclear Legacy Advisory Forum

Nuclear Waste Advisory Associates

Radiation Free Lakeland

Radiological Protection Institute of Ireland

Scottish Environment Protection Agency

Scottish Government

Seascale Parish Council

Welsh Assembly Government

West Cumbria Sites Stakeholder Group

Other individuals or groups who requested sight of the consultation or have otherwise indicated an interest

Responses to the consultation on the application

We received 28 responses, some indicating that the consultee had no comment to make. These are summarised below, where relevant issues were raised, together with our consideration of them and reference to where any further discussion can be found within this document.

Responses are ordered in the first table (Table 9) alphabetically by consultee. Where similar comments are made we refer back to previous responses. In the following table (Table 10) matters which were raised, but which fall outside the Environment Agency's permitting remit, or are partially outside the Environment Agency's permitting remit, are highlighted and our considerations discussed.

| Table 9: Responses to consultation comments on the application | | | |
|--|---|--|-------------------------------------|
| Summary of issues raised | | Our consideration of the issues | Further addressed in Section |
| Committee on Medical Aspects of Radiation in the Environment (COMARE) | | | |
| 1 | COMARE accepts the proposed shift to a radiological capacity approach. | We agree that a total radiological capacity approach is appropriate, more accurately reflects the 2011 ESC assessment of impacts and allows greater flexibility in the timing of disposals, whilst retaining appropriate controls within the permit. | 5.4.7 |
| 2 | COMARE recommends that, where possible, consignors attempt to segregate waste by half-life and alpha or beta/gamma content. This would permit more intelligent packaging and placement at site. | <p>We consider that LLW Repository Ltd has established appropriate WAC, consistent with the 2011 ESC, with which consignors must comply. We are satisfied that LLW Repository Ltd has demonstrated that these WAC can ensure that the relevant requirements of the GRA, for example dose criteria, can be met and are optimised.</p> <p>The proposed waste acceptance processes do move towards this suggestion, requiring for example the identification of packages with relatively high concentrations of certain radionuclides which will not be placed at the top of waste stacks, or will be distributed between stacks.</p> <p>We have passed this issue on to the NDA and are considering it further within the Environment Agency, as we consider that there may be benefits more widely to focus on the disposability of a waste at a specific</p> | 5.4.3 |

Table 9: Responses to consultation comments on the application

| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
|--------------------------|--|------------------------------|
| | facility, rather than its segregation purely by established radioactive waste categories. | |
| 3 | <p>COMARE state that there is a need to make more objective proposals with regard to acceptance of oxidising and complexing/chelating agents.</p> <p>With regards to oxidising agents we consider that their acceptance is more related to operational safety, rather than environmental safety and therefore the issue is better addressed through the operational safety case and WAC. We do not plan to restrict oxidising agents through our permit.</p> <p>With regards to complexing and chelating agents we are satisfied that LLW Repository Ltd has objectively considered their proposals, supported by some detailed assessment work.</p> | 5.4.10 |
| 4 | <p>COMARE state there is a need to consider hazardous chemical aspects, particularly asbestos since there will be significant quantity of this coming from the dismantled Magnox stations.</p> <p>We agree and recognise that there may be significant volumes of radioactively contaminated asbestos requiring disposal in the UK over the coming decades. The GRA requires the assessment of impacts arising from the disposal of hazardous chemical materials including asbestos. LLW Repository Ltd has assessed these issues in its 2011 ESC and we have reviewed this work.</p> | 5.4.9 |
| 5 | <p>COMARE note that on-site compaction does not appear to have been considered.</p> <p>LLW Repository Ltd's WAC require that waste is volume reduced or otherwise treated wherever possible prior to disposal. Consignors of waste must ensure that the BAT has been adopted. This may involve compaction or other treatments such as incineration. At present LLW Repository Ltd provides compaction services through the WAMAC facility on the Sellafield site and other compaction facilities are used by some consignors. Whilst compaction facilities (or other suitable volume reduction techniques) are available in the UK we do not consider it necessary for on-site compaction to be considered as part of an optimised approach. Should this situation change we would expect LLW Repository Ltd to re-consider.</p> | |
| 6 | <p>COMARE note that erosion calculations ought to be double-checked in light of recent storm data.</p> <p>We assume COMARE are referring to the significant storms experienced in early 2014 across much of the UK. Following these storms LLW Repository Ltd undertook beach inspections to establish the impact and did note dune cliff recession of 3 to 4 m in some places. However, we note that models</p> | |

Table 9: Responses to consultation comments on the application

| Summary of issues raised | Our consideration of the issues | Further addressed in Section | |
|---------------------------------|--|---|--------|
| | <p>predicting coastal recession factor in such storm events by considering the long-term average erosion rate and not by specifically factoring in a particular high magnitude event in any given year, which cannot be predicted. So, for example one year (such as 2014) may see significant recession, whereas other years may see limited or no recession occurring. We are therefore satisfied that LLW Repository Ltd has adequately considered this particular storm event and the likelihood of storm events more generally.</p> | | |
| Copeland Borough Council | | | |
| 7 | <p>Copeland Borough Council expressed concern at the implications of the additional voidage identified in Vault 8 consignments and urged careful examination of the proposed WAC and waste emplacement strategies to ensure they are fit for purpose and maximise the level of protection offered to the local environment.</p> | <p>We have carefully examined these issues in reaching our conclusions and are satisfied both the proposed WAC and emplacement strategies are optimised and so will provide protection to the local environment. Additionally, we will require LLW Repository Ltd to further optimise the disposal facility by providing short and long-term protection of exposed waste prior to capping (see improvement and information requirement IC1).</p> | 5.4.3 |
| 8 | <p>Given the long timescales involved in the permit application and uncertainty around some information, such as coastal erosion, Copeland Borough Council welcome the ESC being treated as a 'living document' with allowance for break clauses over time and review of information to allow for technological advances and changes in the environment.</p> | <p>We agree that the ESC should be treated as a 'living case' and that an ongoing process of review should be used to update the ESC in line with various developments.</p> <p>We note that there will not be 'break clauses' as such within the permit, but instead requirements for ongoing maintenance and periodic review. Additionally, we have powers to vary the permit at any point should we consider it necessary.</p> <p>Two relevant improvement and information requirements have been included in the permit addressing forward programmes of work (IC4) and update of the ESC (IC7).</p> | 5.4.12 |
| 9 | <p>The Council will continue to issue the Part B Environmental Permit for the grouting plant used to fill the ISO containers on site prior to storage and disposal.</p> | <p>We note the fact that Copeland Borough Council is the responsible authority for the Park B Environmental Permit required for the operation of the LLW grouting plant.</p> | |

Table 9: Responses to consultation comments on the application

| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
|--|--|-------------------------------------|
| 10 The Council has limited resources and capacity in reviewing the technical aspects of this permitting application and entrusts the EA to fulfil its obligations to protect human health and mitigate any environmental impacts associated with the operations and site closure works of the LLWR site. | Through our review of the 2011 ESC and permit variation application we have taken seriously our regulatory responsibility to ensure the protection of people and the environment both during operation of the site but also after closure. We will only allow further disposal if we are satisfied that it is safe to do so and that all of our regulatory criteria in the GRA are met. In doing this we have restricted our consideration to those that fall within our regulatory remit as explained further in Section 3.1.4. | 3.1.4 |
| Drigg and Carleton Parish Council | | |
| 11 Drigg and Carleton Parish Council wish to make no adverse comments or objections with respect to the LLWR Environmental Safety Case. | Noted. | |
| EDF Energy | | |
| 12 EDF Energy notes that they are reliant upon the storage and disposal services supplied by LLW Repository Ltd and that they are supportive of the permit variation that would allow them to operate the repository in accordance with their ESC. They consider this an improvement against the annual activity limits currently within the permit. | We note EDF Energy's support for LLW Repository Ltd's ability to operate in accordance with the ESC. We consider this appropriate in general and standard conditions within the permit will allow this. However, we do stipulate what we consider to be particularly important limits and conditions within the permit itself, as discussed further in Section 5.4.11. In Section 5.4.7 we explain why we agree that removal of annual activity limits in favour of total radiological capacity control is appropriate. | 5.4.7 5.4.11 |
| 13 EDF Energy is keen that the permit does not place any unnecessary constraints on the operators of the repository which will affect their ability to manage the facility in accordance with the ESC. | We do not consider that the permit places any unnecessary constraints on the operator. The permit largely relies upon standard permit conditions requiring operations in accordance with an up to date ESC and associated WAC. Therefore the majority of constraints arise directly from the 2011 ESC and are necessary to address GRA requirements. | 5.4.7 5.4.11 |
| 14 EDF Energy agrees with LLWR Ltd's proposal to not include acceptance criteria in the permit, but to include them within LLW Repository Ltd's | We note EDF Energy's support for LLW Repository Ltd's ability to operate in accordance with the WAC and not to include acceptance criteria in the permit. Our permit must be robust in ensuring LLW Repository | 5.4.7 5.4.11 |

Table 9: Responses to consultation comments on the application

| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
|---|---|------------------------------|
| <p>WAC. EDF Energy believes this will make optimisation of operations more efficient and responsive to change.</p> <p>EDF Energy believes that the permit should include a requirement for the operators of the LLW Repository to consult the industry on any future changes to the WAC to ensure they are managed in a systematic manner.</p> | <p>Ltd complies with all the relevant requirements. In general we have achieved this by use of standard permit conditions which require the operator to maintain an ESC and associated WAC and procedures and to operate to these, notifying us of any significant changes. This requires and facilitates optimisation and is an efficient and robust way to regulate the site. However, as we consider necessary, we have included specific limits and conditions within the varied permit where we consider them particularly important, for example the radiological capacity limits detailed in Schedule 3.</p> <p>We do not consider it appropriate for the permit to include a specific requirement for the operators of the LLWR to consult the industry on any future changes to the WAC. The permit relates to compliance with EPR10 at the LLWR only. However, LLW Repository Ltd must have suitable management arrangements sufficient to achieve compliance with the conditions of the permit. As part of these arrangements we expect LLW Repository Ltd to consult with consignors to the extent necessary to achieve compliance. We note that LLW Repository Ltd's procedures do currently include consultation with consignors prior to updating the WAC.</p> | |
| <p>15 It is the view of EDF Energy that the permit should allow for LLWR Ltd to dispose of waste accepted under a superseded version of the WAC if it can be demonstrated that the environmental safety case will not be threatened. This would avoid the unnecessary uptake of dose as a result of having to repackage waste to comply with the latest version of the WAC.</p> | <p>Disposals at the LLWR must always be consistent with the permit and the latest ESC, which is prepared in accordance with our guidance, the GRA. WAC are defined from the permit requirements and the ESC.</p> <p>The WAC allow for some flexibility, allowing 'variations' to the WAC in some cases, where demonstrated to remain consistent with the ESC and permit. Any consideration will need to take into account optimisation of the disposal, for example considering wider impacts such as dose uptake. We believe this achieves the same outcome as requested.</p> | <p>5.4.11 5.4.12</p> |
| <p>16 EDF Energy believes that a grace period of 3 months following the issue of the new permit is insufficient time for the company to adapt to the</p> | <p>As required by the permit, LLW Repository Ltd has already implemented significant elements of the updated 2011 ESC in the March 2014 WAC and associated procedures, where they are consistent with</p> | <p>5.4.12</p> |

Table 9: Responses to consultation comments on the application

| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
|--|--|------------------------------|
| <p>anticipated changes. A minimum of 12 months would be more appropriate as this would allow time to implement the significant changes to plant and process required to meet the increased radiological and non-radiological characterisation requirements.</p> | <p>the extant permit. This has included implementation of aspects of the 2011 ESC that have tightened controls or required additional information necessary for disposal, such as implementation of discrete item limits, non-radiological capacity controls and additional information on radiological contents to meet the sum-of-fractions methodology for radiological capacity control. The varied permit does not require any new additional controls beyond those already implemented and only confirms requirements already being implemented through the March 2014 WAC and associated procedures (for example the radiological capacity limits) or removes restrictions, such as those on complexants and chelating agents. Any lessening of restrictions can be implemented to any timescale without threatening compliance with the permit.</p> <p>At the time of writing we do not anticipate being able to determine this permit variation application until around early autumn 2015 at the earliest. On these timescales consignors will have had around 18 months since issue of the updated WAC in March 2014 to implement new requirements. We consider that this offers adequate time for consignors to adjust procedures for waste disposal and therefore we do not propose to include any grace period within the varied permit, which will become effective on the date of issue or soon after.</p> | |
| <p>17 The introduction of discrete item limits is considered a useful and pragmatic enhancement to aid categorisation of radioactive wastes. This will help avoid the over categorisation of light, low activity waste items as intermediate level waste, enabling optimisation of the radiological capacities at both the LLWR and the future Geological Disposal Facility (GDF). It will also reduce the operator dose associated with the interim storage of waste at the site of arising. We would</p> | <p>We note the comments and agree that introduction of discrete item limits is a positive development. We recognise the comments about the limits not being set so as to be overly conservative and discuss this matter in Section 5.4.7 and in response to consultation comment 80.</p> | <p>5.4.7</p> |

Table 9: Responses to consultation comments on the application

| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
|---|---|------------------------------|
| <p>like to avoid a situation where the discrete item limits are overly conservative which would result in having to seek unnecessary waste acceptance criteria variations for waste that does not threaten the safety case. We agree these controls on discrete items should feature in the WAC and not the permit.</p> | | |
| <p>18 EDF Energy believes that the proposal to apply new limits for the disposal of LLW with non-radiological toxic properties will need to be applied with due consideration of the practicalities of characterising the waste.</p> | <p>We note that within the permit we do not plan to impose any more stringent requirements than those defined by LLW Repository Ltd within its waste acceptance procedures to ensure disposals are consistent with the 2011 ESC. We consider that the waste acceptance procedures defined by LLW Repository Ltd are appropriate and necessary to ensure impacts resulting from the disposal of radioactive waste at the LLWR are acceptable and consistent with requirements of the GRA. Consignors will need to comply with those procedures to dispose of radioactive waste at the LLWR and we do not propose to enforce any further changes.</p> <p>However, we note and accept the comments as valid as there are practical limits to the extent waste and in particular some decommissioning waste can be characterised for non-radiological components without disproportionate costs or worker doses being incurred. We consider that the waste acceptance procedures proposed are pragmatic and do not necessarily demand disproportionate effort to characterise waste, for example allowing estimation of components in some cases. LLW Repository Ltd must continue to require the information necessary to achieve compliance with the requirements of the GRA and consignors must demonstrate use of BAT for their waste characterisation.</p> | <p>5.4.9</p> |
| <p>19 EDF Energy agrees that the waste should only be disposed of to LLWR if it can be demonstrated as the Best Available Technique (BAT). This is a requirement of the</p> | <p>We agree that it is the responsibility of consignors to the LLWR to demonstrate that the proposed disposals to the LLWR (or elsewhere) demonstrate application of BAT. This is not the responsibility of LLW Repository Ltd and the permit will not</p> | |

Table 9: Responses to consultation comments on the application

| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
|--|--|------------------------------|
| <p>environmental permits of each site and regulated by the Environmental regulators. EDF Energy is of the opinion that the LLWR permit should not place any responsibility on LLWR Ltd for determining whether or not a disposal at the repository is BAT. This would avoid the introduction of second line of regulation providing better consistency for the industry. The permit should limit LLWR Ltd's role to ensuring disposals are made within the bounds of the repository's ESC.</p> | <p>impose any requirements to determine whether or not a disposal to the repository is BAT. LLW Repository Ltd will be responsible for compliance with the permit and, through that, ensuring that disposals are consistent with the latest ESC and WAC.</p> <p>All consignments to the LLWR must be consistent with the WAC in force, or an agreed variation to the WAC, in line with the latest ESC.</p> <p>Out with the requirements of the permit, LLW Repository Ltd may choose to require demonstration that BAT has been adopted by consignors to the LLWR.</p> | |
| <p>20 EDF Energy supports the change of purpose of Vault 9 from storage to disposal. We also support the construction of any future vaults required to meet the LLW disposal requirements of the UK nuclear industry.</p> | <p>Noted.</p> | <p>5.4.7 5.4.12</p> |
| <p>21 EDF Energy supports the removal of the restrictions in the existing permit on the disposal of certain items that may affect operational safety. These controls should, where deemed necessary by the repository's operational nuclear safety case, be specified in the WAC.</p> | <p>We accept LLW Repository Ltd's position that these matters are more related to operational safety and not environmental safety. They are therefore better addressed within the operational safety case and as necessary controlled through the WAC.</p> <p>We have therefore removed these specific restrictions from the permit and are satisfied that the issues are adequately addressed within the WAC defined by LLW Repository Ltd.</p> | <p>5.4.10</p> |
| <p>22 EDF Energy agrees with the removal of the blanket ban on complexing agents, replacing it with a risk based approach which is underpinned by the ESC. These risk based restrictions should appear in the WAC and not the permit.</p> | <p>We have considered LLW Repository Ltd's proposals and have concluded that the case presented supports this change to the permit and WAC. We are satisfied that the requirements can be effectively controlled through the WAC, rather than specifically through the permit.</p> | <p>5.4.10 5.4.11</p> |
| <p>23 EDF Energy is of the opinion that the title for wastes historically accepted and now stored at the LLWR rests with LLWR Ltd. It is LLWR Ltd's</p> | <p>We agree that it is LLW Repository Ltd's responsibility to carry out the assessment necessary to dispose of stored waste, or to implement alternative waste management options should they be necessary.</p> | |

Table 9: Responses to consultation comments on the application

| Table 9: Responses to consultation comments on the application | | |
|--|--|-------------------------------------|
| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
| responsibility to carry out the assessment necessary to dispose of stored wastes. It would therefore not be appropriate for EDF Energy to be involved in this assessment process. Should this assessment process identify any waste for which disposal at the LLWR is not BAT then LLWR Ltd should be responsible for funding and implementing the alternative strategy. | Also see Table 10. | |
| The Food Standards Agency (FSA) | | |
| 24 The Food Standards Agency notes that there are likely to be run-off water and off gases produced, but these are likely to be very low in terms of volume or levels of radioactivity. They note that LLW Repository Ltd is required to manage such releases, for which the operator would have to demonstrate effective management to ensure that any discharges are as low as reasonably practical. | We note the Food Standards Agency's comments and agree that aqueous and gaseous discharges are relatively low in terms of levels of radioactivity. We are satisfied that LLW Repository Ltd has demonstrated that any resulting impacts meet the requirements of the GRA and that the disposals have been optimised. | 5.4.3 5.4.7 5.4.8 5.4.9 |
| 25 The Food Standards Agency note that there are current uncertainties with regard to future coastal erosion and possible impacts to the food chain arising from these events. | We agree there are uncertainties around coastal erosion and possible impacts. We are satisfied that LLW Repository Ltd has adequately taken these uncertainties into account in the 2011 ESC. | 5.4.2 5.4.7 5.4.8 5.4.9 |
| 26 As the ESC currently stands and pending further information and the Environment Agency Assessment, the Food Standards Agency would have no objection to the granting of a new permit arising from the proposed ESC. | Noted. | |
| GE Healthcare (UK) Ltd | | |
| 27 GE Healthcare note that the LLWR is of strategic | Noted. | |

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| | importance to their business and the country. They support the need for continued, commercially accessible LLW disposal routes in the UK. | | |
| 28 | GE Healthcare welcome transparent dialogue with the Environment Agency and the LLWR as the implementation of the ESC necessitates changes to the repositories WAC. | Noted. | |
| Individual (1) | | | |
| 29 | There is a need for LLW Repository but my feeling is that the one at Drigg is not "enough". If there is a need to stack higher than ground level, which I would not consider Best Practice, then more capacity is needed. I am not convinced it should be made available at Drigg. | <p>We have carefully considered LLW Repository Ltd's proposals to stack waste higher than it currently does in the vaults and the resulting dose implications. We are satisfied that the proposals are optimised and will ensure relevant dose constraints are met at all times. Aspects relevant to higher stacking have been considered such as doses, waste stability and leachate management. The permit requires monitoring to ensure that dose constraints are met and to identify any increasing trend in doses arising from disposals. Matters related to visual impacts fall within Cumbria County Council's remit as the waste planning authority.</p> <p>However, we recognise concerns that more capacity may be required than the LLWR can accommodate and so we have made NDA aware of this comment such that they can consider radioactive waste disposal capacity requirements as part of the national nuclear LLW strategy. We consider that plans should be prepared for alternative disposal routes in the eventuality that the LLWR becomes unavailable.</p> | 5.4.3 5.4.7 |
| 30 | The coastal location and need for a wall to safeguard from future erosion/flooding is less than ideal...especially as it is to be constructed piecemeal rather than as part of a well planned project that has an end date. | We have taken the potential for coastal erosion seriously and completed a thorough assessment of LLW Repository Ltd's predictions for coastal erosion and their potential resulting impacts on people and the environment. LLW Repository Ltd has shown in the 2011 ESC that, irrespective of any future work to prevent coastal erosion, radiological doses and risks remain below regulatory and internationally accepted | 5.4.2 |

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| | <p>criteria for the protection of people and the environment should coastal erosion progress as predicted.</p> <p>As part of the optimisation process, LLW Repository Ltd has considered the viability of coastal defences in preventing disruption to the site. The nature of coastal erosion, uncertainties in direction and the long timescales predicted before erosion begins mean that these defences may not be viable, but options for their construction are not unnecessarily foreclosed by anything being done today. In the future, the operator, the Environment Agency or others with responsibility for the LLWR may consider sea defences necessary. But, we consider that these defences would be best designed and built closer to the time when they may be required.</p> | |
| Individual (2) | | |
| <p>31 <i>Permission to Use the Whole EDA</i></p> <p>It is stated that LLW Repository Ltd would like permission to dispose of LLW within the Extended Disposal Area (EDA). This implies that there will be 13 new disposal vaults (up to number 22) and that the site could be open until about 2127 (depending on where very low level waste (VLLW) is disposed and on treatment methods for LLW). I think it would be premature for the Environment Agency to grant such permission. My reasons are as follows.</p> <p>2127 is over a century away. Over such a long time period there could well be scientific and technical advances that will change the assumptions and data in the ESC and influence estimates of the radiological and non-radiological capacities of the LLWR, other aspects of waste</p> | <p>We consider that granting capacity for the whole Extended Disposal Area (EDA) as applied for is consistent with our standard permitting approach under EPR10. We note that the permit will not be time limited and will only grant permission for a specific radiological capacity, not specific vaults. The standard permit contains conditions that require disposals to remain optimised at all times and that disposals continue to use BAT. We will require regular review and update of the ESC and WAC and if at any point this no longer applies the operator will need to update the ESC and WAC and change operations as necessary. If at any point we are not satisfied that operations continue to be optimised we can and will vary the permit, applying appropriate limits and conditions. Granting a permit for a capacity which may last out to 2127 or even beyond is based upon current understanding and we do expect updates to be made following future reviews. Based on current best understanding we consider that the requested capacity is supported by the ESC and granting it will give the industry an increased understanding of the viability of the site, in relation to environmental safety.</p> | <p>5.4.11 5.4.12</p> |

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| <p>acceptance, vault numbers, sizes and designs, and views on the BAT for site closure. Furthermore, over the period there will probably be many reviews of UK strategies for the management of nuclear and non-nuclear LLW. These could involve reconsideration of the types of waste for which disposal in the LLWR is the BAT. It is also possible that it may become desirable, or even necessary, to close the LLWR and establish either a new national LLW disposal facility at another site or several regional facilities at various sites. The arguments that granting permission for disposal in the whole EDA will provide reassurance and be helpful in planning decommissioning are not persuasive. What is needed for such purposes is the knowledge that a disposal route will be available, not that it is to one particular facility.</p> | | |
| <p>32 <i>Progressive Installation of Engineered Barriers for Site Closure</i></p> <p>It seems reasonable to allow LLW Repository Ltd to begin the progressive installation of engineered barriers necessary to eventually close the site, starting with the extension of the cut-off wall and final capping of Vault 8 and the trenches. It is important, however, that nothing is done that could preclude early closure of the site.</p> | <p>We agree with the comment and are satisfied that no actions will be taken that could potentially preclude early closure of the site without considering the implications.</p> | |
| <p>33 <i>Removal of Annual Limits on Activities for Disposal</i></p> <p>It is obvious that the annual activity disposal limits for radionuclides and groups of radionuclides in the current environmental permit are not</p> | <p>We consider that the removal of current annual limits is appropriate as they are not dictated by safety or environmental performance requirements and we agree that they have no current basis in the 2011 ESC.</p> <p>We also consider a move away from annual</p> | <p>5.4.7</p> |

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| <p>appropriate. As LLW Repository Ltd state (Section 3.2, p15 para 6), these limits have no basis in the 2011 ESC and subsequent developments.</p> <p>However, it is far from obvious that there should be no annual activity limits at all in the revised environmental permit. The argument that removing such limits will provide more flexibility for waste producers is not a strong one. Of greater importance is the need for transparency in how the LLWR is operated and regulated. In my view, the proposed approach of allocating a portion of site capacity to each waste stream will make the regulation and the reporting of disposals more difficult. It will not be easy to show how control is being exercised over the rate at which site capacity is being used up, not least because there are three sets of radiological capacity values for all radionuclides and extra values for tritium and carbon-14.</p> <p>My preference is for there to be annual activity limits in the revised environmental permit. These could be based on the most restrictive of the values for each radionuclide or group of radionuclides and the volumes expected to be disposed annually.</p> | <p>limits for radiological capacity control to the sum-of-fractions approach to be appropriate and robust. We consider the sum-of-fractions approach has several advantages over annual limits. It is a robust and more comprehensive approach in that it addresses all relevant radionuclides with significant contributions to radiological doses. It is also a cautious, yet flexible approach which will allow consignors increased flexibility to dispose of waste as and when generated and not artificially restricted by annual limits that do not represent the overall site capacity or have a direct impact upon environmental safety.</p> <p>We recognise that the sum-of-fractions approach to radiological capacity limitation is not as simple as annual limits and is on the face of it more complex. However, the approach is internationally recognised and applied, being used in France, Spain and the USA. It can be effectively controlled against by use of relatively simple spreadsheets or tools that track the totality of radionuclides disposed and complete simple calculations to demonstrate, at any one time, how much of the sum-of-fractions (capacity) for each assessment case has been utilised. If any one case reaches 1 the capacity has been used.</p> <p>To ensure transparency in the process we will require regular reporting by LLW Repository Ltd against the capacity usage and this information will be made publicly available. We will inspect LLW Repository Ltd's processes and capacity management approaches periodically. If at any point radiological capacity management is inconsistent with the ESC or is not demonstrating robust control we are able to vary the permit and impose different or additional limits or controls.</p> <p>We therefore accept LLW Repository Ltd's proposals to move to a sum-of-fractions approach to radiological capacity management and will require the company to manage disposals against these limits. As these limits are fundamental to the safety of the site and the 2011 ESC we have included each of the 5 assessment cases and their</p> | |

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| | respective limits within Schedule 3 of the varied permit. | |
| <p>34 <i>Disposals of Materials and Items with Implications for Operational Safety</i></p> <p>It is not clear to me that restrictions on the disposal of particular materials and items are best implemented through the LLWR waste acceptance criteria (WAC), whether the restrictions are derived from LLWR’s operational nuclear safety cases or from the ESC. It is for the Environment Agency to determine whether it wishes to impose restrictions through the environmental permit but it appears to me that there is a good case for doing so. (See also my later comments on WAC.)</p> | See response to comment 21 and 40. | 5.4.10 5.4.11 |
| <p>35 <i>Disposal of Chemical Complexing Agents</i></p> <p>I agree that the blanket restriction on chemical complexing agents should be removed. However, I am not convinced that it is appropriate to control such substances only through the WAC and the LLWR waste acceptance process. (See also later comments on WAC.)</p> | See response to comment 22 and 40. | 5.4.10 5.4.11 |
| <p>36 <i>Management According to the ESC</i></p> <p>My understanding is that the current environmental permit requires that the LLWR be managed according to the “most recent safety cases” and that this includes the operational safety case (OSC) as well as the ESC. This is a general requirement that is supplemented by more specific requirements in the permit. I do not agree with the LLW Repository Ltd statement</p> | <p>For clarity, in relation to the permit, the only safety case applicable is the 2011 ESC.</p> <p>We agree that standard template permit conditions requiring operation in accordance with the ESC are general requirements and that they may be supplemented by more specific requirements in the permit as we deem necessary. In this Decision Document we discuss where we consider additional limits or conditions to be necessary. We discuss more generally the role of the standard template conditions in Section 5.4.11.</p> <p>We are satisfied that LLW Repository Ltd</p> | 5.4.11 5.4.12 |

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| <p>(Section 3.3, p16 para 2) that a general requirement about managing the LLWR in accordance with the ESC will in itself ensure that there are adequate controls on design, operation and closure of the facility, including controls on waste acceptance. I believe that more specific requirements are also needed.</p> <p>I also have some difficulties with LLW Repository Ltd's statements about updating the ESC. These seem to confuse the general need to have an up-to-date ESC at all times and the specific need to carry out a major review of the ESC at appropriate intervals. The revised environmental permit should address both of these needs.</p> <p>The general need entails both relatively frequent minor updates to the ESC in the light of experience, and major revisions when necessitated by events such as the construction of new vaults. I would suggest that, by analogy with Periodic Safety Reviews, the Environment Agency should require major reviews of the ESC to be submitted to it at least every 10 years, whether or not there have been significant changes to the ESC by LLW Repository Ltd as a result of the general need for updating. These major reviews should address technical and scientific developments that may affect any aspect of the ESC, including what is regarded as BAT and</p> | <p>has recognised the need for both ongoing updates to the ESC and for major reviews approximately every 10 years. These matters are addressed more fully by LLW Repository Ltd in supporting documents to its application and in Repository Site Procedures⁴⁷ which detail Annual, Periodic and Major reviews.</p> <p>Due to the importance of the Major review of the ESC we have included an improvement and information requirement in the permit (IC7) to be completed 10 years after the last major update was due, that is 01 May 2021. This will require that the ESC is updated in line with any extant guidance and also the findings of our 2011 ESC review.</p> | |

⁴⁷ Specifically Repository Site Procedure RSP02.25 on the Development and Application of LLWR's Environmental Safety Case.

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| | compliance with any policy, strategy or regulatory developments. | | |
| 37 | <p><i>Status of Wastes Stored in Vaults 8 and 9</i></p> <p>It seems reasonable for the Environment Agency to allow LLW Repository Ltd time to show that conversion of the storage of wastes in Vaults 8 and 9 to disposal would be the BAT. What is missing, however, is any recognition that it may not be possible to make the case, to the satisfaction of the Agency, that conversion to disposal would be the BAT. LLW Repository Ltd should be required to make a fallback plan, for implementation if a satisfactory case for conversion cannot be made.</p> | <p>We agree that LLW Repository Ltd should be allowed time to demonstrate where stored waste can be disposed if consistent with the 2011 ESC and demonstrated to be the BAT for that waste. We also agree that LLW Repository Ltd should consider plans for the management of any waste that cannot be disposed to the LLWR. An improvement and information condition (IC5) will require consideration of alternative options should disposal at the LLWR not be the BAT.</p> | 5.4.12 |
| 38 | <p><i>Implementation of Requirements and Conditions in Revised Permit</i></p> <p>If the requirements and conditions in the revised environmental permit differ significantly from those in the current permit then formal transition arrangements will be needed. This seems to me to be a separate issue to that of waste stored in Vaults 8 and 9. The aim should be for waste consignors to move as quickly as possible to procedures that comply with the revised permit. It is not clear to me that what LLW Repository Ltd proposes will achieve this aim.</p> | See response to comment 16. | 5.4.12 |
| 39 | <p><i>Relationship between WAC and ESC</i></p> <p>The current WAC are based on the 2011 ESC but LLW Repository Ltd state that new WAC have been drafted that take into account subsequent</p> | As discussed in Section 5.4.12 we require LLW Repository Ltd to keep the ESC as a 'living case'. However, this does not mean that the entire ESC is updated every time there is a change, but instead changes and updates will be recorded and tracked using change control procedures explained within | 5.4.11 5.4.12 |

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| <p>work. There should be a transparent relationship between the WAC and the ESC, with each version of the WAC corresponding to one version of the ESC. This will need to be addressed in LLW Repository Ltd's change control procedures for the WAC and the ESC.</p> | <p>Repository Site Procedures. Periodically (around every 10 years) we expect all updates to be compiled into a fully updated ESC.</p> <p>Therefore LLW Repository Ltd may update the WAC in line with work completed subsequent to the 2011 ESC, but must clearly record the basis for these changes. Additionally, in accordance with condition 4.3.3 of the permit we must be informed of any such changes where they might have, or might reasonably be seen to have significant repercussions for the management of the disposal of radioactive waste by burial. This allows us to review proposed changes and to take action to refuse or condition changes if we deem it necessary, making any such information available on the public register.</p> <p>We are satisfied that these issues are adequately addressed in LLW Repository Ltd's change control procedures.</p> | |
| <p>40 <i>Exclusion of WAC from the Environmental Permit</i></p> <p>LLW Repository Ltd proposes that, as far as possible, WAC and other controls on waste acceptance are excluded from the revised environmental permit. The main reason given is that WAC could then be changed without the need for a permit variation.</p> <p>This proposal seems to me to be based on a misunderstanding of the roles of and relationship between, an Environment Agency environmental permit and an operator's WAC. It is the permit, not the WAC, that takes precedence. It is the operator's responsibility to derive and apply WAC such that compliance with them ensures compliance with the requirements and conditions in the environmental permit, as well as compliance with the</p> | <p>We agree with the comment that it is for the Environment Agency to specify controls within the permit where it is deemed necessary and for the operator to ensure compliance with those conditions through application of the WAC and waste acceptance procedures. As stated, the permit takes precedent over the WAC.</p> <p>However, in Section 5.4.11 we discuss further standard conditions within the permit related to the ESC, WAC and waste acceptance procedures. These conditions require operation against the ESC, WAC and waste acceptance procedures and also notification of changes to us. By making use of these conditions, in many instances we do not include specific controls within the permit. We discuss further within Section 5 of this Decision Document where we have chosen to include specific permit conditions or limits, or have chosen to make use of the standard permit conditions.</p> | 5.4.11 |

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| <p>ESC. This may or may not entail including some of the requirements and conditions in the environmental permit directly in the WAC. If a permit variation is needed, this must be obtained before any related change is made to the WAC, because the WAC should be consistent with the permit at all times.</p> <p>Given these points, I do not agree with the LLW Repository Ltd proposal about exclusion of controls on waste acceptance from the environmental permit. It is for the Environment Agency to determine what controls it wishes to include in the permit, regardless of what may or may not be in LLW Repository Ltd's WAC. This applies to numerical limits related to radiological capacity (Section 3.5.2) and to toxic properties of waste that are not related to its radioactivity (Section 3.5.3). For the reasons I gave earlier, I would favour including in the permit annual limits on activities disposed, as well as radionuclide concentration limits that are necessary in relation to the risks associated with inadvertent human intrusion post closure. There should also be numerical limits in the permit on non-radioactive constituents of wastes.</p> | | |
| <p>41 <i>Waste Emplacement Strategy</i></p> <p>Presumably the Environment Agency will wish to address emplacement strategy in the revised environmental permit. This could be achieved by including in the permit maximum radionuclide concentration levels in wastes</p> | <p>We have reviewed the emplacement strategies proposed and consider them to be consistent with an optimised approach.</p> <p>We do not consider it necessary to impose specific permit conditions to address this issue. As discussed in response to comment 40 and in Section 5.4.11, we are satisfied that in many instances the requirements of the ESC and WAC can be effectively</p> | <p>5.4.3 5.4.11</p> |

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| that are to be emplaced at the top of stacks (Section 3.5.4, p21 para 3). | controlled through standard template permit conditions related to the ESC, WAC and waste acceptance procedures. | |
| Magnox Ltd (similar comments received from several Magnox sites) | | |
| 42 Magnox Ltd note that a relatively small proportion of the LLW they generate requires disposal in an engineered vault, and the LLW Repository near Drigg in Cumbria is the only facility that can accept this. Without the facility Magnox would not be able to achieve its mission. The national LLW Repository is a strategic asset within the UK that supports the operation of many nuclear sites and facilities across the country. | Noted. | |
| 43 In broad terms, Magnox Ltd indicate they are supportive of LLW Repository Ltd's application for a variation to their site permit. In particular, Magnox notes that it is important that the permit should allow LLW to be disposed of at the repository rather than stored. This gives reassurance to Magnox and indeed the nuclear industry as a whole that there is a long-term, available and appropriate disposal route for waste that requires engineered disposal, where other treatment and disposal routes are not an option. | Noted. We agree that where it can be demonstrated as safe for people and the environment in accordance with our guidance, disposal of waste is preferable to storage. | |
| 44 Magnox is supportive of the request to remove annual radionuclide limits on disposals. As stated by LLWR, the limits are not based on meeting any specific risk criteria and potentially limit, arbitrarily, the waste that can be sent to the repository on an annual basis. For decommissioning sites in | In Section 5.4.7 we explain why we agree that removal of annual activity limits in favour of total radiological capacity control is appropriate. We note Magnox Ltd's comment that decommissioning wastes can come in peaks and troughs and consider that removal of annual limits could help facilitate the early management of waste. We do not consider that our decision conflicts with Nuclear Site | 5.4.7 |

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| particular, where the waste generating activities can come in peaks and troughs, this could result in waste having to be stored until it can be disposed, which is in conflict with Nuclear Site Licence Condition 32 regarding accumulation of waste. In addition, the majority of Magnox sites are no longer limited by annual activity limits in their site disposal permits (sites in England and Wales) and authorisations (Scottish sites). | Licence Condition 32. | |
| 45 Magnox agrees that any controls on acceptance of waste are best kept to the derived WAC and underpinned by the ESC. Additionally, Magnox is supportive of the removal of restrictions on complexing and chelating agents where it is deemed safe to do so. | See response to comments 14 and 22. | 5.4.10 5.4.11 |
| 46 With regard to the WAC changes, Magnox accepts that the 2011 ESC and revised permit are going to result in additional information requirements and new controls, although they hope that these do not have a disproportionate impact on their ability to manage wastes with their current resources. | We accept that the outcome of the 2011 ESC has led to needs for increased information requirements and some new controls. We consider these to be necessary for the continued safe operation of the LLWR and also to ensure the requirements of the GRA can be met. We do not consider that any of the requirements are disproportionate. | |
| 47 The introduction of discrete item limits is welcomed, although it is noted that for some waste items this could result in waste previously considered as LLW no longer being classed as disposable and therefore potentially having to be stored for disposal. | We note the comments and agree that the introduction of discrete item limits is a positive development. We accept that these new limits may lead to some waste no longer being accepted at the LLWR where they previously were. However, we consider this a necessary step to protect people and the environment and to allow continued disposal of radioactive waste at the LLWR. | 5.4.7 |
| 48 Magnox note that the introduction of additional controls on non-radiological | See response to comment 18. | 5.4.9 |

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| <p>properties of waste is of some concern, for example, quantities of impurities in metals. Magnox notes that many of the waste materials on their decommissioning sites would have been manufactured decades ago, so there is very limited information on their constituents. Hence, Magnox urge that pragmatism be applied to the requirement for this information.</p> | | |
| <p>49 Magnox note that the issue of implementation time is a concern. Magnox note that many of the WAC changes and information requirements anticipated either before or after the issue of a revised permit will result in considerable efforts to change processes and procedures, to develop and adopt new ways of working, to provide more, detailed information than ever before. Magnox believe that a three month transition time is very short and request that six to twelve months would be more reasonable and achievable.</p> | <p>See response to comment 16.</p> | <p>5.4.12</p> |
| <p>Marine Management Organisation (MMO)</p> | | |
| <p>50 The MMO understands that no part of the proposed construction activities to be enabled by the permit will impact upon the UK Marine Area. The MMO will not require LLW Repository Ltd to apply for a Marine Licence to undertake such works as the variation of this permit will permit. This is because no licensable works, as defined within the Marine and Coastal Access Act 2009, will be undertaken within the UK Marine Area.</p> | <p>We agree that the variation of this permit does not require any works within the UK Marine Area.</p> | |

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| 51 In regards to the potential for dispersion of substances from the site into groundwater, the MMO is content that discharge of substances to water courses falls within and is regulated by the Environment Agency. As such, the MMO has no further comment to make upon this matter. | Noted. | |
| 52 With respect to the issue of potential future coastal erosion. The MMO understands that this is unlikely to become an issue at this site within the short to medium term. The MMO would therefore expect that the applicant would undertake a monitoring programme of coastal erosion rates and contact the relevant agencies for permits to undertake remedial works if this should become necessary. | We discuss the potential for future coastal erosion in Section 5.4.2. We agree continued coastal surveying is important and are satisfied that LLW Repository Ltd has committed to a programme of future monitoring sufficient to support the ESC and future impact assessments. This monitoring will be required by the standard permit conditions. | 5.4.2 5.4.5 |
| Natural England | | |
| 53 Natural England note that it's key role in the permit process is to advise on the Environment Agency's Habitats Regulations Assessment (HRA) and SSSI CRoW assessment, particularly in relation to Drigg Coast SAC and SSSI. | At the point of consultation on the application (November 2013 to February 2014) we were still drafting these assessments and Natural England was unable to comment in detail at that time. However, subsequent to the consultation on the application we consulted Natural England directly on the HRO1, HRO2 and CRoW assessment documents (see Section 5.4.8) and after addressing a number of comments from Natural England, it was able to accept the assessments. | 5.4.8 |
| North Western Inshore Fisheries and Conservation Authority (NWIFCA) | | |
| 54 The NWIFCA recommends that continual long term environmental monitoring of all aqueous pathways from the LLWR continue, including via the marine pipeline, freshwater bodies and groundwater routes. This is to provide assurance to stakeholders that any releases are acceptably | We agree with this recommendation and consider that LLW Repository Ltd already has a suitable monitoring programme in place to achieve this. Additionally, the permit will include a standard condition requiring the operator to 'take samples and conduct measurements, tests, surveys, analyses and calculations to determine compliance with the conditions of this permit'. The permit requires the operator to define and | 5.4.5 |

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| | low and levels of contaminants are not released that may affect biota and consumers. | document such a monitoring programme using BAT. It will provide assurance that discharges remain low. | |
| 55 | The NWIFCA highlights the importance of continued coastal surveying to monitor coastal erosion in the LLWR area. The purpose being to monitor possible release pathways that could impact upon biota, the local environment and in turn humans. | See response to comment 52. | 5.4.2 5.4.5 |
| 56 | The NWIFCA has no objection to the application for this permit variation, subject to the above recommendations. | Noted. | |
| Nuclear Decommissioning Authority (NDA) | | | |
| 57 | The NDA indicate that they support LLW Repository Ltd's application to continue disposal at the LLWR under the arrangements set out in the 2011 ESC. They consider that there are a wide range of factors that lend weight to a successful application, not least of all a robust ESC in alignment with UK Regulations that underpins the application. | Noted. Our review of the 2011 ESC concluded that it met the requirements of the GRA. | 5.4 |
| 58 | The NDA note their role as owners of the LLWR and in developing and implementing the strategy for the management of nuclear industry LLW in the UK. They recognise that LLW disposal should be a last resort, but that continued LLW disposal capacity is essential to the delivery of their mission for civil nuclear site decommissioning and restoration and that of other producers and owners of LLW, including the non-nuclear industry. They indicate that the LLWR is essential to UK Policy and strategy for the | Noted. We agree that disposal of waste by burial should be a last resort, but recognise that there is a continuing need for radioactive waste disposal capacity. | |

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| <p>management of LLW and that a strategic Environmental Assessment published in 2010 in support of the UK Nuclear Industry LLW Strategy demonstrated that it was right for the LLWR to continue to play a role in the management of the UK's LLW.</p> | | |
| <p>59 The NDA believe that the ESC produced by LLW Repository Ltd demonstrates the safety of continued disposals at the LLWR and meets the requirements of the GRA and therefore firmly underpins their application to vary the environmental permit for the site.</p> | <p>Noted. Our review of the 2011 ESC concludes that it meets the requirements of the GRA and supports the proposed permit variation application.</p> | <p>5.4</p> |
| <p>60 The NDA indicate that failure to receive a permit for continued disposal would have significant short-term implications for their sites and other LLW producers who would have to find alternatives for dealing with LLW that cannot be managed higher up the waste hierarchy. They consider it is possible this would lead to accumulation and storage of large amounts of LLW on some sites, which they consider unsatisfactory for all concerned. They consider an alternative disposal site would need to be developed at significant cost to the UK taxpayer and that there would be other community impacts resulting from waste storage, the difficulty of locating a new site and satisfying stakeholders about the suitability of past disposals.</p> | <p>Noted. However, we note that the permit variation application has been considered on its own merits, in accordance with the requirements of the GRA, without taking into account any potential implications of failure to receive a permit for further disposals at the LLWR.</p> | |
| <p>61 The NDA consider it important that LLW Repository Ltd is able to implement the capping of historical disposals at the LLWR.</p> | <p>We agree that capping of past disposals is important to provide protection to the waste and to minimise environmental impacts and to protect people. We consider that LLW Repository Ltd has now demonstrated that it has appropriately optimised the repository</p> | <p>5.4.3 5.4.4</p> |

Table 9: Responses to consultation comments on the application

| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
|---|--|---|
| | design and that it is therefore appropriate to start construction of the final cap over past disposals, subject to final detailed design substantiation. | |
| 62 | The NDA consider it important that a renewed environmental permit can provide certainty for local communities and LLW producers to support their long range planning, particularly in the decommissioning arena. | We accept that a clear decision based upon good evidence will provide increased certainty for local communities and LLW producers, supporting longer term planning. |
| 63 | The NDA consider that the UK Nuclear Industry LLW Strategy, the National LLW Programme and LLW Repository Ltd's approach to operating the site have all sought to optimise the use of disposal at the LLWR. They indicate that it is now commonly recognised that the LLW disposal capacity is a precious resource and they believe they have put in place what is needed to effectively manage it in alignment with the ESC and ensure that it is used carefully and not casually by LLW Repository Ltd's customers. It is NDA's view that this demonstrable optimisation of the use of the site lends support to the application to continue disposal. | We note NDA's comments and agree that significant steps have been taken over recent years to recognise the importance of disposal capacity at the LLWR and to take steps to utilise it efficiently and only where necessary. Nonetheless any disposal at the LLWR must meet the requirements of the GRA and we consider this to be the case. |
| Nuclear Legacy Advisory Forum (NuLeAF) | | |
| 64 | NuLeAF welcome the preparation of an updated ESC for the LLWR. Our members have expressed concerns about the long term environmental impacts of further LLW storage and disposal at the Drigg site, and in particular the risk to local people and the environment posed by coastal erosion. | As part of our review we have paid significant attention to the long-term environmental impacts due to the long-lived nature of radioactivity and the predictions of likely coastal erosion at the site. We consider that LLW Repository Ltd has demonstrated that risks in the post-closure period associated with the most likely evolution of the LLWR and a suitable range of exposure pathways and situations will meet GRA Requirements and supplementary guidance relating to the implementation of the Groundwater Directive. |

Table 9: Responses to consultation comments on the application

| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
|--|--|-------------------------------------|
| <p>65 NuLeAF are in general terms reassured by the assessment of the risk posed by coastal erosion and other environmental impacts. While they understand that the ESC assesses such risk in the absence of any significant investment in sea defences or other mitigation measures, we believe it is vital that coherent plans and funding for such measures is allocated as and when required.</p> | <p>As required by the GRA, LLW Repository Ltd has assessed risks presented by the LLWR resulting from coastal erosion on the assumption that no sea defences or other mitigation measures are put in place.</p> <p>However, as part of the optimisation process, LLW Repository Ltd has considered the viability of coastal defences in preventing disruption to the site. The nature of coastal erosion, uncertainties in direction and the long timescales predicted before erosion begins mean that these defences may not be viable, but options for their construction are not unnecessarily foreclosed by anything being done today. In the future, the operator, the Environment Agency or others with responsibility for the LLWR may consider sea defences necessary. But, we consider that these defences would be best designed and built closer to the time when they may be required.</p> <p>As LLW Repository Ltd has demonstrated that sea defences or other mitigation measures are not required to protect people and the environment we do not consider it appropriate for us to require plans for their development. However, we have made NDA aware of these comments as the owners of the LLWR responsible for funding any future work.</p> | <p>5.4.2</p> |
| <p>66 NuLeAF recognise and agree with the wider concerns of Cumbria County Council regarding issues such as visual impact, transport, noise and dust and hydrogeology. These must be addressed effectively through the permitting and planning processes.</p> | <p>We have considered those issues listed that are within our regulatory remit. We have considered matters such as amenity, the safety impacts of dust and hydrogeology as it relates to groundwater transport of contaminants and impacts upon protected habitats. We conclude that LLW Repository Ltd has adequately addressed these issues and demonstrated that the requirements of the GRA have been met. Other matters are relevant considerations for the grant of planning permission, but do not form part of the environmental permit decision making process.</p> | <p>3.1.4 5.4.7 5.4.8</p> |
| <p>67 NuLeAF welcome the fact that the ESC will set a limit on disposal at LLWR in terms of the type and volume of</p> | <p>We are satisfied that LLW Repository Ltd's proposals for the site are optimised. LLW Repository Ltd has proposed limits on disposals which we accept as being</p> | <p>5.4.3 5.4.7</p> |

Table 9: Responses to consultation comments on the application

| Table 9: Responses to consultation comments on the application | | | |
|--|---|---|-------|
| Summary of issues raised | Our consideration of the issues | Further addressed in Section | |
| <p>material. We agree that the national LLW repository should be used in the optimal way, but do have concerns about how LLW, and in particular VLLW/LALLW⁴⁸ that is diverted from the LLWR is being managed. We believe that environmental best practice should be applied to the management of all LLW, including waste sent to landfill elsewhere. The management of such waste should be based on the application of the waste hierarchy and proximity principle.</p> | <p>consistent with the GRA requirements. We have included the radiological capacity limits within our permit.</p> <p>We note the comments regarding the management of waste other than at the LLWR but consider them to be outside the scope of this decision document. We have made relevant bodies aware of these comments.</p> | | |
| 68 | <p>We support the steps being taken to develop a more accurate inventory of likely LLW arisings, both in terms of quantity and timing. We also welcome the development of a NORM strategy and attempts to better quantify the potentially significant amounts of such waste and their management.</p> | <p>Noted. We consider that continued work to support development of accurate inventories is important to the ESC. We conclude that LLW Repository Ltd has provided a suitable inventory and processes to collect future inventory data to inform the ESC.</p> | 5.4.6 |
| Office for Nuclear Regulation (ONR) | | | |
| 69 | <p>ONR notes the strategic importance of LLWR's operations in facilitating the disposal of LLW arising from operations and decommissioning of nuclear licensed sites.</p> | Noted. | |
| 70 | <p>ONR note they would be pleased to see further disposal operations secured and the status of waste stored in Vault 8 clarified, as the continued ability of nuclear site operators to be able to dispose of LLW arisings contributes to the management of radioactive waste on the sites</p> | Noted. | |

⁴⁸ Low activity LLW

Table 9: Responses to consultation comments on the application

| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
|---|---|-------------------------------------|
| 71 ONR notes the proposal for disposal of different radionuclides within specified limits, applied through a sum-of-fractions approach, such that the total radiological capacity of the site is not exceeded. This may lead to opportunities for more flexibility, for example the possibility of planning for in situ decay and would be pleased to discuss the possibilities with the Environment Agency. | We note ONR’s comments and agree that the proposed radiological capacity management approach is expected to lead to increased flexibility, whilst retaining robust control. We would be pleased to discuss opportunities where they could serve to protect the environment whilst achieving other benefits. | |
| 72 ONR foresees no obvious tensions between the changes LLWR have requested and ONR’s safety requirements. | Noted. We welcome this confirmation that the proposals do not impact upon ONR’s safety requirements. | |
| Public Health England (PHE) | | |
| 73 PHE note that they provided a detailed review of certain documents submitted by LLW Repository Ltd as part of the ESC and they refer to the main conclusions of that report (Oatway and Higgins 2013, Environment Agency 2015g). They note their main conclusion that “the assessments generally follow the approach used by HPA ⁴⁹ ... on assessing radiological consequences from the use of beaches contaminated by radioactive objects. The reviewers found that the methodologies used in the assessment generally employ a suitable level of caution and include the most significant exposure scenarios, pathways and groups of people likely to be most exposed.”. PHE indicate that they are satisfied with updates made to the ESC to address comments from the | We welcome PHE’s comments and note that we have taken them into account in reaching our conclusions on the adequacy of controls proposed by LLW Repository Ltd in relation to sealed sources, discrete items and particles. | 5.4.7 |

⁴⁹ The HPA (Health Protection Agency) has since been re-organised into Public Health England (PHE).

Table 9: Responses to consultation comments on the application

| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
|--|--|-------------------------------------|
| <p>Environment Agency, in particular changes made to the methodology used by LLW Repository Ltd in the assessment of radiological consequences during the period of authorisation.</p> | | |
| Research Sites Restoration Ltd (RSRL) | | |
| <p>74 RSRL note that the ability to dispose LLW at LLWR is of strategic importance to RSRL's programme of work. Also that the variation to LLWR's Permit is necessary to continue the safe disposal of LLW, which in turn supports RSRL's decommissioning programme.</p> | <p>Noted.</p> | |
| <p>75 RSRL note that the proposed variations to LLWR's Permit would remove restrictions on the quantity of radioactivity that may be disposed at LLWR and that the radiological inventory would be managed using a sum-of-fractions approach implemented through limits within LLW Repository Ltd's WAC and through forecasting of waste disposal. RSRL consider this sensible and are content with the approaches proposed.</p> | <p>Noted. In Section 5.4.7 we explain why we agree that removal of annual activity limits in favour of total radiological capacity control is appropriate.</p> | <p>5.4.7</p> |
| <p>76 RSRL strongly support the proposal to remove the blanket restriction on complexing or chelating agents, having due regard for the evidence presented in the document 'Developments since the 2011 ESC'. Whereas RSRL does not require to dispose of appreciable quantities of complexing or chelating agents, the current wording of the Permit is unnecessarily restrictive.</p> | <p>See response to comment 22.</p> | <p>5.4.10</p> |
| <p>77 RSRL consider that the removal of restrictions from the</p> | <p>See response to comment 21.</p> | <p>5.4.10</p> |

Table 9: Responses to consultation comments on the application

| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
|--|---|------------------------------|
| <p>Permit regarding items that can be managed through LLWR's operational nuclear safety case is a sensible move.</p> | | |
| Rolls Royce Marine Power Operations | | |
| <p>78 Rolls Royce Marine Power Operations confirm that they are supportive of approval of the variation.</p> | <p>Noted.</p> | |
| Sellafield Ltd | | |
| <p>79 Sellafield Ltd fully support the application for a permit variation as the LLWR is a key enabler to the safe and timely decommissioning of the Sellafield Site.</p> | <p>Noted.</p> | |
| <p>80 Sellafield Ltd note an issue of concern with regards to discrete item limits proposed to be implemented through the WAC, driven by the ESC. Sellafield Ltd comment: "Historically activities within consignments have been managed to ensure that the consignment activity limits comply with the LLWR permit limits of 4 and 12 GBq/te of alpha and beta/gamma contaminated wastes respectively. Compliance with these limits does mean that there is some averaging of activity across a consignment and in some respects is analogous to other regulated disposal regimes such as the 'hotspot' limits in the Clearance and Exemption Code of Practice and the disposal limits in the Clifton Marsh LLW permit which allow items up to five times the permit limits as long as the consignment average is within the permitted limits. The introduction of discrete</p> | <p>Although we recognise these concerns we consider the limits necessary to meet dose criteria detailed within the GRA and supplementary guidance to assessors. We consider the limits necessary to protect people and the environment in the future and are satisfied that they have been appropriately set without undue conservatism. We note the views of LLW Repository Ltd that it is challenging to define appropriate controls that meet the GRA requirements whilst also allowing for pragmatic implementation without overly onerous information requirements and waste acceptance processes. We are satisfied that an appropriate balance has been reached, but are open to potential improvements to the WAC in future where they continue to demonstrate compliance with the GRA. We are satisfied that LLW Repository Ltd's waste acceptance processes and WAC can adequately implement these requirements so do not propose to specify them within the permit, relying on conditions requiring LLW Repository Ltd to maintain and operate to a documented ESC (see conditions 1.1.1, 1.1.3, 2.3.2 and 3.1.8).</p> | <p>5.4.7</p> |

Table 9: Responses to consultation comments on the application

| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
|--|---------------------------------|------------------------------|
| <p>item limits is, as we understand it, designed to protect future human intrusion/dose uptake scenarios assuming coastal erosion and materials from the repository being scavenged from the beach. This dose uptake protection is based on differing limits for differing groups of radionuclides and a sum of fractions calculations. This is further complicated by having different limits for different item masses, the maximum mass for specific activity being 100kg.</p> <p>We have undertaken detailed work to understand the impact of these proposed changes on waste management practices at Sellafield and have determined that the changes will have a significant impact on decommissioning activities, for example for wastes from First Generation Magnox Storage Pond, application of the discrete item limits would mean that the maximum permitted activity for all items greater than 100kg would be 5015 MBq, significantly less than the LLW limit. Similarly for wastes from the Pile Fuel Storage Pond the maximum activity would be 8771 MBq and obviously the heavier the item the lower the specific activity.</p> <p>The result of this would mean that for wastes which cannot be routed to an alternative treatment route and had to be disposed of to LLWR, we would be unable to consign them as they would fail the discrete item limit and would have to be consigned to Miscellaneous Beta Gamma Waste Store (MBGWS). In order to meet the acceptance</p> | | |

Table 9: Responses to consultation comments on the application

| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
|--|---------------------------------|------------------------------|
| <p>criteria for MBGWS the items would require size reduction to fit inside a MBGWS liner. This would incur increased dose exposure for workers, however if the item was size reduced to pieces of less than 100kg the individual pieces would meet the discrete item definition and would be suitable for consignment to LLWR for disposal.</p> <p>This would seem to be counter intuitive in that the same item and same levels of activity would be present within the container as if the whole item were placed within the container. Perversely the action of size reduction would seem to make the items more recoverable in some future exposure/scavenger scenario increasing potential for dose uptake.</p> <p>Whilst we understand that there is a requirement to adequately assess any potential future impact of radioactive waste disposals the current proposals for discrete item limits would increase dose uptake for current workers and increase the time taken to decommission aging facilities in order to theoretically reduce potential dose uptake at some stage in the future.”</p> | | |

Table 10: Responses to consultation comments on the application, outside the Environment Agency's remit

| Summary of issues raised outside the Environment Agency's permitting remit | Our consideration of the issue |
|---|--|
| Copeland Borough Council | |
| <p>Alongside this consultation is the Cumbria County Council consultation on the Planning Application for the LLWR site to allow for the disposal of waste in Vaults 9 – 14 and the site closure works. Many of the impacts associated with the site operations in relation to its operation and closure will be controlled through strict planning conditions on any permission granted for the site. However, there may be areas where the permit and the planning application, areas for concern, are interlinked and the Council would urge the EA to use its powers through the permitting process to control the period and duration of operational and site closure works to limit its impact on nearby residential properties and the village of Drigg, particularly in relation to noise management and air pollution.</p> | <p>We note Copeland Borough Council's comment and agree that many areas of the permitting and planning process are interlinked and for that reason we have worked closely with Cumbria County Council, throughout the planning and permitting process.</p> <p>We have considered amenity issues within our determination and air pollution resulting from operation of the activities (see Section 5). However, matters of operational hours and noise management are relevant considerations for the granting of planning permission and do not form parts of our environmental permit decision making process.</p> <p>We have made Cumbria County Council aware of these comments.</p> |
| <p>Clarification is sought in relation to the proposed rail movements, regarding the usage of the temporary rail head in Millom and whether it is to be used again? And if allowed by Network Rail for live loading overnight?</p> | <p>These are relevant matters for the granting of planning permission, but do not form part of the environmental permit decision making process.</p> <p>We have made Cumbria County Council aware of these comments.</p> |
| EDF Energy | |
| <p>EDF Energy is of the opinion that the title for wastes historically accepted and now stored at the LLWR rests with LLWR Ltd. It is LLWR Ltd's responsibility to carry out the assessment necessary to dispose of stored wastes. It would therefore not be appropriate for EDF Energy to be involved in this assessment process. Should this assessment process identify any waste for which disposal at the LLWR is not BAT then LLWR Ltd should be responsible for funding and implementing the alternative strategy.</p> | <p>As noted in Table 9, we agree that it is LLW Repository Ltd's responsibility to carry out the assessment necessary to dispose of stored wastes or to implement alternative waste management options should they be necessary.</p> <p>As funding matters are of interest to the NDA as owners of the LLWR we have made them aware of this comment.</p> |
| Individual (1) | |
| <p>It also concerns me that because LLWR at Drigg is the only facility (apart from the new one at Dounreay) then instead of disposing of LLW appropriately there is more emphasis on getting as much LL radioactive waste downgraded so it can be disposed of to landfill (albeit a site with licence to take it). I have no doubt the application will be granted for Vault 9, but</p> | <p>Decisions about the national nuclear LLW strategy are matters for government and the NDA. We wish to see sufficient and appropriate disposals routes in place for radioactive waste to allow prompt and appropriate management in line with our requirements. We are responsible for ensuring that disposals of radioactive waste are carried out such that</p> |

Table 10: Responses to consultation comments on the application, outside the Environment Agency's remit

| Summary of issues raised outside the Environment Agency's permitting remit | Our consideration of the issue |
|---|---|
| <p>would recommend that Government should be considering new LLW facilities in more suitable locations to better protect LLW from flooding etc, reduce transport distances and share the community burden of hosting such facilities.</p> | <p>people and the environment are protected. We have made NDA aware of this comment.</p> |
| <p>NuLeAF</p> | |
| <p>We appreciate that this consultation is on the ESC rather than the granting of a permit or of planning permission. However, NuLeAF believes that community benefits packages should be provided to local areas supporting nuclear facilities of regional or national significance. This issue will become more significant in the coming year due to the increase in radioactive waste arising. We therefore support the delivery of a suitable community benefits fund under S106 and believe steps should be taken to further maximize the positive socio-economic impacts of the operation of LLWR. We back the view of Cumbria County Council that there should be 'break points' for reconsideration of the development, assuming planning permission is granted.</p> | <p>These are relevant considerations for the granting of planning permission and for the NDA as owners of the LLWR, but do not form part of the environmental permit decision making process.</p> <p>We have made Cumbria County Council and NDA aware of these comments.</p> |
| <p>Sellafield Ltd</p> | |
| <p>Whilst we understand that there is a requirement to adequately address any potential future impact of radioactive waste disposals the current proposals for discrete item limits would increase dose uptake for current workers and increase the time taken to decommission ageing facilities in order to theoretically reduce potential dose uptake at some stage in the future.</p> | <p>See response to comment 80. As this comment also relates to ONR's responsibilities we have made ONR aware of this comment.</p> |

Annex 3 – Consultation on the draft decision

The draft decision has been advertised and consulted upon in accordance with the Environment Agency's Public Participation Statement. The way in which this has been carried out, the results of our consultation, and how we have taken consultation responses into account in reaching our decision are summarised in this annex. Copies of all consultation responses have been placed on the Environment Agency public register, except where the person making the response asked us not to do so.

How we publicised the consultation on the draft decision

The consultation on the draft decision was advertised and hosted on the Environmental Agency consultation portal from 28 May 2015 to 23 July 2015⁵⁰. These web pages provided brief details of the application, access to important consultation documents and informed people how and when they could comment. Further notices of the consultation were posted on the GOV.UK web page covering our regulation of the LLWR⁵¹ and the GOV.UK consultations page, as well as the LLW Repository Ltd web site.

Copies of the application were made available for public inspection by placing them on the Environment Agency public register at Ghyll Mount, Gillan Way, Penrith, CA11 9BP.

We emailed information to our stakeholder list at the start of our consultation providing information on where the application material was available from. We provided copies of the application by e-mail or in hard copy, on request.

The start of the consultation was publicised via adverts in the local press, Twitter feeds and a press release.

In the run up to consultation we published a number of update bulletins on the GOV.UK LLWR web page informing stakeholders of progress with our review of the 2011 ESC and progress towards the anticipated consultation on the permit variation application. We emailed these bulletins to our stakeholder list and made them available on our GOV.UK LLWR web page.

On 18 June 2015 we held a public drop-in session at Drigg Village Hall to explain our role, our draft decision and to answer any questions from members of the public. The drop-in session was advertised via a press release, adverts in the local press, via posters in the local area, flyers sent to local residents, Twitter feeds and emails to our stakeholder list.

Throughout our review of the 2011 ESC and during our consultation and determination process we have kept the West Cumbria Site Stakeholder Group and the associated LLWR Sub-committee informed of our progress and plans. Additionally we have communicated directly with a number of organisations such as Cumbria County Council, Drigg and Carleton Parish Council, the Department of Energy and Climate Change and the Office for Nuclear Regulation.

Who we consulted

We sent links to the consultation material, including the draft Decision Document, draft permit and other supporting information to the following bodies, with whom we have 'Working Together Agreements':

Office for Nuclear Regulation

⁵⁰ <https://consult.environment-agency.gov.uk/portal/npsapp/llwr/dd>

⁵¹ <https://www.gov.uk/government/collections/low-level-waste-repository>

Food Standards Agency
Copeland Borough Council
Public Health England
United Utilities plc

We also wrote to the following organisations and individuals, informing them of the consultation, providing links to the consultation material and inviting them to participate:

Beckermet Parish Council
Bootle Parish Council
Centre for Environment Fisheries and Aquaculture Science
Committee on Medical Aspects of Radiation in the Environment
Committee on Radioactive Waste Management
Copeland Borough Council
Cumbria County Council
Cumbrians Opposed to a Radioactive Environment
Department of Energy and Climate Change
Department of Environment, Food and Rural Affairs
Department of Health
Drigg and Carleton Parish Council
Friends of the Earth (West Cumbria & North Lakes local group)
Gosforth Parish Council
Greenpeace
Industry representatives including consignors to LLWR:

- Archive Collection Bureau
- BAE Systems
- Babcock Marine Ltd
- BNS Nuclear Services Ltd
- Capenhurst Nuclear Services Ltd
- Cavendish Nuclear
- Cristal Pigment UK Ltd
- Devonport Royal Dockyard Ltd
- Doosan Power Systems
- Dounreay Site Restoration Ltd
- EDF Energy
- Energy, Safety and Risk Consultants Ltd
- Euro Dismantling Services Ltd
- GE Healthcare
- HM Naval Base Clyde
- Inutec Ltd

- LLW Repository Ltd
- Magnox Ltd
- Medical Research Council
- Millennium Inorganic Chemicals
- Ministry of Defence, Atomic Weapons Establishment
- Ministry of Defence, Faslane
- Ministry of Defence, Rolls Royce Power Ltd
- National Nuclear Laboratory
- Nuclear Industry Association
- Nuvia Ltd
- Police National CBRN Centre
- Primarc
- Research Sites Restoration Ltd
- Science and Technologies Facilities Council
- Sellfield Ltd
- Serco Ltd
- Springfields Fuels Ltd
- Studsvik UK Ltd
- Talisman Sinopec Energy UK Ltd
- United Kingdom Atomic Energy Authority
- Umicore Coating
- Unitech Services Group Ltd
- Urenco UK Ltd

Irton with Santon Parish Council

Isle of Man Government

Lake District National Park Authority

Landfill operators that receive LLW:

- Augean plc
- FCC Environment
- SITA UK Ltd

Local MPs (Copeland and Allerdale)

Local Ward Councillors

Low Level Waste Repository Site Stakeholder Group (sub-committee of the West Cumbria Sites Stakeholder Group)

Marine Management Organisation

Muncaster Parish Council

National Farmers Union

Natural England

Natural Resources Wales

NHS Primary Care Trust
Northern Ireland Environment Agency
Northwest Inshore Fisheries and Conservation Authority
Nuclear Decommissioning Authority
Nuclear Legacy Advisory Forum
Nuclear Industry Association
Nuclear Waste Advisory Associates
Ponsonby Parish Council
Radiation Free Lakeland
Radiological Protection Institute of Ireland
Scottish Environment Protection Agency
Scottish Government
Seascale Parish Council
Welsh Assembly Government
West Cumbria Sites Stakeholder Group
Other individuals or groups who requested sight of the consultation or have otherwise indicated an interest

Responses to the consultation on the draft decision

We received 19 responses. These are summarised below in Table 11, together with our consideration of them and reference to where any further discussion can be found within this document.

Responses are ordered alphabetically by consultee. Where similar comments are made we refer back to previous responses.

| Table 11: Responses to consultation comments on the draft decision | | |
|---|---|--|
| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
| AWE | | |
| 81 | AWE would like it noted that they rely on the disposal and transfer services provided by the LLWR and that they are supportive of the Permit variation. | Noted. |
| 82 | It is noted that in Table S3.3 of the draft Permit, the LLWR are permitted to transfer VLLW, LLW, Plutonium Contaminated Material and Radioactive Waste. VLLW and LLW are defined in Schedule 6 and the definition of Radioactive Waste is specified within Table S3.3 as | We consider that the term Plutonium Contaminated Material is self defining and therefore does not need to be defined within Schedule 6. We are satisfied that LLW Repository Ltd has adequate definitions and controls on Plutonium Contaminated Material within their management system. Plutonium Contaminated Material is included within the permit, Table S3.3, for transfer to the Sellafield Site Operator specifically to |

Table 11: Responses to consultation comments on the draft decision

| Table 11: Responses to consultation comments on the draft decision | | |
|--|--|--|
| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
| that in the Transfrontier Shipment of Radioactive Waste and Spent Fuel Regulations 2008, however, Plutonium Contaminated Material does not appear to be defined anywhere in the document. Would it be possible to define this term under Schedule 6? | allow the transfer of historical Plutonium Contaminated Material held on site back to Sellafield for management. Management of Plutonium Contaminated Material is not part of this variation application. | |
| Capenhurst Nuclear Services Ltd (CNS) | | |
| 83 | CNS welcomes the opportunity to review and comment on the EA's Draft Decision Document. However, we have no specific comments or concerns to raise. We support the approach taken, the conclusions made and the proposal to issue an amended permit. | Noted. |
| Committee on Medical Aspects of Radiation in the Environment (COMARE) | | |
| 84 | COMARE has concerns as to why the error of underestimating assessments of direct radiation and dust inhalation in the 2011 submission occurred. There are no concerns over the revised doses as the site boundary assumption appears highly conservative - the concerns are with why the error occurred. | <p>We note and accept this concern and have taken the occurrence of this error seriously. We have liaised with LLW Repository Ltd on its investigation into this matter and are satisfied that the error has been fully and appropriately investigated. We are also satisfied that the error has no overall implications for the conclusions of the ESC.</p> <p>The initial error occurred due to the calculation author (a contractor) making an incorrect assumption regarding the date to which inventory data had been decay corrected. Although the data were then checked according to procedures the checker did not identify the erroneous assumption of the author, despite being suitably qualified to complete the check. Additionally, high-level order-of-magnitude sanity checks did not identify an error as the implications were of less than one order of magnitude.</p> <p>We are satisfied that LLW Repository Ltd has appropriate procedures in place to minimise the risk of similar re-occurrences,</p> |

Table 11: Responses to consultation comments on the draft decision

| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
|---|---|------------------------------|
| | <p>for example by:</p> <ul style="list-style-type: none"> • Requiring independent checking of all calculations • Contractual specification of checking requirements • Use of a range of checking measures including 'sense' checking • Undertaking auditing, which includes examination of contractors' checking processes and records • Collection of checking records from contractors <p>These steps have led to some further improvements in the checking of work.</p> | |
| <p>85 COMARE also noted that the consideration of coastal defences being deferred to an indeterminate point in the future may not be the most appropriate course of action. Inclusion of a defined point for reconsideration would be welcomed, perhaps in the major (10 year) reports.</p> | <p>We are satisfied that the evidence presented within the 2011 ESC indicated that there is no requirement for coastal defences now or in the future. Specifically, LLW Repository Ltd has presented a case that even if coastal erosion of the site were to occur on the shortest predicted timescales, the resulting impacts would be consistent with criteria detailed within the GRA and meet safety criteria for people and the environment.</p> <p>However, we accept that evidence could change, or future generations could take the decision that coastal defences are needed. We therefore require the operator to continue to undertake monitoring of coastal evolution to understand and take account of any changes and to develop a plan of action if necessary. We will also require developing technologies to be kept under review. Any new information must be reviewed and addressed within the ESC and if at any point an optimised approach was to develop coastal defences this would be required. Therefore consideration of this issue is required on an ongoing basis.</p> <p>We will also require new evidence, requirements and guidance to be considered as part of ongoing Annual and Periodic reviews (at 1 and 3 years) and in particular during Major reviews every 10 years. Optimisation is an important requirement of the GRA and must be considered fully at this Major review, thus requiring re-consideration of any need for coastal defences amongst a</p> | <p>5.4.2</p> |

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| | range of other optimisation issues. | |
| <p>86 COMARE welcomes the retention of consignment limits; however the values chosen are not regarded as conservative.</p> <p>[Comment further clarified by COMARE on 11/08/2015 indicating that the comment was supportive of the setting of consignment limits which COMARE did not consider to be overly conservative.]</p> | <p>Noted. We consider that the combination of consignment limits and total activity disposal limits within the permit, combined with further controls implemented through the ESC, such as discrete item limits, are proportionate and appropriate for the control of the radiological inventory.</p> | 5.4.7 |
| <p>87 Although COMARE agrees with the conclusion that plants and invertebrates inhabiting the storm beaches are relatively radio-insensitive, it has questioned whether the estimated dose rates of 100 µGy/h on a storm beach are cause for concern.</p> <p>[Comment further clarified by COMARE on 07/08/2015: COMARE consider the dose rates are conservatively derived and the reasons for the conclusions reached to be valid. Therefore COMARE considers that the initial identification of cause for concern based on a partial analysis, using a single screening value, to perhaps not be warranted.]</p> | <p>We note and agree with the comment. We consider that the dose rates that could be received by non-human species will have no effect on the site integrity of the Drigg Coast SAC alone or in-combination as described further in Section 5.4.8.</p> | 5.4.8 |
| <p>88 COMARE feels that the Environmental Safety Case (ESC) deals comprehensively with the radiation related concerns and wider environmental issues which have emerged through the consultation process.</p> | Noted. | |
| <p>89 COMARE agrees that the draft permit conditions are wisely constructed to be as future proof as possible with a stated pattern for reviews</p> | Noted. | |

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| <p>against an open time line (at least 100 years). It was encouraging to note the cordial co-operative relationship between consultee's and operators of the site from the outset of this phase of the process. Key concerns have been addressed through an open interactive process between regulators and consultees to the satisfaction of the various parties.</p> | | |
| <p>90 COMARE welcomes improvement and information requirement IC3 (a written report identifying an optimal approach for the management of discrete items and particles carrying a significant burden of radioactivity in past disposals).</p> | <p>Noted.</p> | <p>5.4.7</p> |
| <p>91 In addition it is felt that the selection of 10 µGy/h as a screening value is justified and is appropriate.</p> | <p>Noted.</p> | <p>5.4.8</p> |
| <p>92 COMARE previously commented on compaction. Although the response notes that on-site compaction is unnecessary, it is important to ensure that consignors utilise the technique to minimise voids. This point could be included in the Waste Acceptance Criteria (WAC).</p> | <p>We agree that the minimisation of voids within the waste is important. This issue is addressed comprehensively within the ESC and appropriate requirements have been carried forward into the WAC which state:</p> <p>“It is important to control <i>Total Potential Voidage</i> in wastes to limit the settlement of wastes and hence the final cap of the <i>Low Level Waste Repository</i>. <i>Total Potential Voidage</i> is the sum of <i>Inaccessible Voidage</i>, <i>Compression Voidage</i> and <i>Biodegradation Voidage</i>.</p> <p>Customers shall use <i>Best Available Techniques</i> in order that wastes are treated so as to minimise the <i>Total Potential Voidage</i> in each <i>Waste Consignment</i> and in any case the <i>Total Potential Voidage</i> shall not exceed 20% of the <i>Internal Volume</i> of the <i>Disposal Container</i> unless approved in advance by <i>LLW Repository Ltd.</i>”</p> <p>It is the responsibility of consignors to the</p> | <p>5.4.3 5.4.10</p> |

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| | | LLWR to ensure they comply fully with the WAC. We will check compliance through our regulation of consigning sites. | |
| 93 | COMARE recommends that all changes to the WAC are included in the annual report. | We agree with this comment. Significant changes to the ESC or WAC will be notified to us on an ongoing basis, as required by permit condition 4.3.3. However, the Annual Review will also be used to collate changes. Furthermore, a Periodic Review (every 3 years) will undertake a more detailed review of changes to the WAC and the necessity as a result for a major update to the ESC. | 5.4.12 |
| Copeland Borough Council | | | |
| 94 | Copeland Borough is host to the Low Level Waste Repository, the only national facility to store and dispose Low level Radioactive Waste (LLW) and as such have a particular interest in this permit application in relation to reassuring our constituents that the facility is being adequately monitored. | Noted. | |
| 95 | The Planning Application, for the LLWR site to allow for the disposal of waste in Vaults 9 – 14 and the site closure works, will address many of the social economic and spatial impacts that Copeland Council has a particular interest in, including the impacts associated with the site operations in relation to its operation and closure. The planning application was running in parallel to the permitting process and was withdrawn in 2014 and is due to be resubmitted soon, at which time Copeland Borough Council will expect to be further engaged with the process and will make further representations at that time. | Noted. We will also engage with the planning application process as a statutory consultee once an application is resubmitted. We note the wider social, economic and spatial impacts that are of interest to Copeland Borough Council. The planning application also addresses certain environmental aspects, on which we have liaised closely with Cumbria County Council. | 3.1.4 |
| 96 | Taking into consideration the long-time scales involved in | We consider it important that the ESC is treated as a living document which is | 5.4.12 |

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| <p>this permitting application and the level of uncertainty caused due to the available information e.g. in relation to coastal erosion due to climate change. The Council welcomes the concept that the Environmental Safety Case (ESC) is a living document and the allowance for break clauses over time to review the information will allow for technology advances and changes in the environment.</p> | <p>updated and changes assessed on an ongoing basis to take account of the best available information at that time.</p> <p>The ESC will be reviewed at 1, 3 and 10 year timescales where developments will be considered and reviewed by us. We will also require notification of any significant changes affecting the ESC at any time, allowing for review as necessary.</p> | |
| 97 | <p>The Council has limited resources and capacity in reviewing the technical aspects of this permitting application and trusts the EA to fulfil its obligations to protect human health and mitigate any environmental impacts associated with the operations and site closure works of the LLWR site. As such we have no further comment to make on the draft permit and welcome the open and transparent way the permitting process has been consulted upon.</p> | Noted. |
| EDF Energy | | |
| 98 | <p>As a result of our nuclear power station operations we generate Low Level Waste (LLW) and we are therefore reliant on the storage and disposal services provided by Low Level Waste Repository Limited (LLWR Ltd).</p> | Noted. |
| 99 | <p>EDF energy is supportive of the Environment Agency's decision to grant LLWR Limited's application and issue a valid permit. This decision is consistent with the Government's Low Level Waste (LLW) policy and the</p> | Noted. |

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| <p>UK Strategy for the management of Low Level Waste (LLW) from the nuclear industry.</p> | | |
| <p>100 EDF Energy supports the inclusion in the draft permit of enabling conditions that provide a mechanism for permitting the disposal of radioactive waste in vault 9 and any additional vaults that may be constructed in the future. This is critical for meeting the current and longer term LLW disposal requirements of EDF Energy and the wider UK nuclear industry, including power generation, medical, defence and scientific research users of radioactive substances.</p> | <p>Noted.</p> | |
| <p>101 EDF energy supports the total capacity management approach presented in the draft permit and feel it is a significant improvement on managing the facility against annual radiological limits which have no basis in the repository's Environmental Safety Case (ESC). The benefits that can be gained from this change of approach are however limited by the inclusion of the 4 gigabecquerels per tonne (alpha emitting radionuclides) and 12 gigabecquerels per tonne (other radionuclides) limits. EDF Energy feel these limits are unnecessary and will make it difficult to take a risk based approach to managing the facility within the boundaries of the ESC.</p> | <p>The permit variation application submitted by LLW Repository Ltd does not request a change to the existing permitted consignment limits of 4 gigabecquerels per tonne (alpha emitting radionuclides) and 12 gigabecquerels per tonne (other radionuclide's) when averaged across a consignment.</p> <p>We regulate and permit the site against levels of radioactivity that are demonstrated to be safe for disposal at the LLWR within the ESC, not by radioactive waste category. The consignment limits of 4 gigabecquerels per tonne (alpha emitting radionuclides) and 12 gigabecquerels per tonne (other radionuclide's) when averaged across a consignment are based upon the ESC presented to us and assumptions made within it.</p> <p>These consignment limits protect against unacceptable levels of heterogeneity within the waste, when combined with discrete item limits and other controls. Such impacts are particularly important taking into account risks of human intrusion into the waste and the potential for future coastal erosion of the site. They are set on a risk based approach, against GRA criteria derived from wider</p> | <p>5.4.7</p> |

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| | | <p>legislation and guidance.</p> <p>Where LLW Repository Ltd was able to make the case, a degree of flexibility in the disposal of higher activity material has been implemented through discrete item limits. We consider this an important step forward in addressing impacts associated with waste heterogeneity, whilst allowing flexibility where justified by the ESC.</p> | |
| 102 | EDF Energy supports the removal of unnecessary restrictions from the permit and their transfer where appropriate to the Waste Acceptance Criteria (WAC). | Noted. | 5.4.10 |
| 103 | EDF Energy is keen that LLWR Ltd is given adequate time to consult industry on any changes to the WAC that may result from the varied permit to ensure they are implemented in a pragmatic way which avoids delaying future disposals, encourages implementation of the waste hierarchy and provides further clarity for the management of wastes on the boundary between LLW and Intermediate Level Waste (ILW). | <p>As explained in Table 9 (consultation comment 16) we do not consider that the varied permit poses any immediate issues to implementation of the WAC as any tighter controls required by the ESC (and the varied permit) were implemented in March 2014 following consultation with consignors. Any further changes to the WAC resulting from the issue of a varied permit will involve the lessening of restrictions (for example on complexants), which can be implemented to any timescale without threatening compliance with the permit.</p> <p>We will continue to work with LLW Repository Ltd and consignors as far as possible to ensure effective implementation of the WAC to ensure that the ESC is met whilst consignors can continue to implement the waste management hierarchy and meet BAT for disposals.</p> | |
| Friends of the Earth (West Cumbria & North Lakes local group) | | | |
| 104 | The characterisation of the site is inadequate with regard to its historic use. There is no evidence to demonstrate that the site has been characterised with regard to the effects of its previous use as an Explosive Royal Ordnance Factory during World War Two, from 1940 – 1945. During this time hundreds of tons per week of | <p>We note that non-radiological ground contamination arising from the prior activities of the site as a Royal Ordnance Factory do not fall within the scope of the permit under consultation, other than to the extent that the contamination may impact upon the safety of radioactive waste disposals. These issues are therefore not directly addressed within the ESC or our review of it.</p> <p>Site history is described in LLW Repository Ltd's Level 2 Site History and Description Report (LLW Repository Ltd 2011a). Non-</p> | <p>3.1.4</p> <p>5.4.9</p> <p>5.4.10</p> |

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| <p>TNT (trinitrotoluene) were produced at its peak, and post-1945 the site was used for decommissioning. The resulting solid and liquid wastes from these operations were disposed of, and discharged via pipelines on-site and into the Irish Sea. There will also have been leakages, and wastes will have returned to the land. The contamination that will have resulted should be characterised with regard to its composition, magnitude, and relationship with subsequent contaminants. This is not demonstrated.</p> <p>The Review of the Environmental Safety Case indicates a programme of 650 borehole investigations, but there is no modelling of the impact of ROF activities on the site; no targeted investigations with regard to the specific wastes associated with these operations, and nothing about the possible interactions between such wastes and post-1959 radioactive wastes, such as are known about, and such as ought to be estimated.</p> | <p>radiological contamination on site, including that related to historical site activities, is described in the Level 2 Assessment of Non-radiological impacts Report (LLW Repository Ltd 2011).</p> <p>We have reviewed non-radiological contamination and the quality of the assessment, as it relates to this application, within our assessments report (Environment Agency 2015g). Both ourselves and LLW Repository Ltd recognise the presence of non-radiological contamination resulting from past site uses, including, for example, the potential presence of chemicals such as TNT and toluene.</p> <p>This issue has been considered in relation to non-radiological impacts resulting from the disposal of radioactive waste and also potential impacts upon the movement of radioactivity in the environment, if for example chemicals were to enhance mobility in groundwater. These assessments of impacts have been supported by a comprehensive environmental monitoring programme and wider studies into the possible impact of complexants and chelating agents (LLW Repository Ltd 2013d). Within LLW Repository Ltd 2013d LLW Repository Ltd reports work completed to identify potential complexants and chelating agents.</p> <p>Comprehensive monitoring on the site over many years, of both radioactive and non-radioactive determinands, which remains ongoing, provides important evidence of the behaviour of historical disposals and land-uses. Wide ranging analysis has been undertaken at the LLWR with a view to identifying potentially harmful chemicals in the environment or leachate and materials that could influence contaminant migration.</p> <p>Issues associated with land contamination at the LLWR are dealt with under a separate safety assessment (LLW Repository Ltd 2006).</p> <p>As part of future vault development LLW Repository Ltd will characterise excavated materials and will be required to manage or dispose of these appropriately.</p> | |

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| | <p>We are satisfied that LLW Repository Ltd has adequately taken these matters into account to the extent necessary to understand potential impacts resulting from radioactive waste disposal on the site.</p> <p>In terms of the wider potential environmental impacts associated with historic land contamination issues, such as the previous use of the LLWR site as a ROF, our expectations are set out in joint guidance we have produced with ONR, Scottish Environment Protection Agency and Natural Resources Wales: “Regulatory expectations for successful land quality management on nuclear licensed sites” (see footnote 22). Also, LLW Repository Ltd continues to undertake non-radioactive land contamination characterisation activities across the site, for example, gathering relevant information during trial pitting campaigns or excavations to support site infrastructure projects.</p> | |
| <p>105 Friends of the Earth considers that the 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) is unsatisfactory, on the grounds that the existing vaults themselves cannot properly be characterised with regard to their radiological content due to the absence of proper record keeping in the early years of operation when alpha emitters were classified as low level waste.</p> | <p>The Advice to Environment Agency Assessors (Smith, 2014) referred to provides further advice to Environment Agency assessors and is supplementary to the GRA and therefore must be read and used in conjunction with it. The focus of the advice is to take a precautionary approach to future disposals of items that may carry a significant burden of radioactivity.</p> <p>The ESC (LLW Repository Ltd 2011c) and our review reports (Environment Agency 2015d) recognise the difficulties in fully characterising the past radiological inventory, particularly for the trenches, when records kept were not as good as they are today.</p> <p>However, we are satisfied that LLW Repository Ltd has done all they reasonably can to interrogate records and to better understand past disposals (subject to some further work which we have required under Improvement Condition IC3, described further below). For example, in addition to reviewing paper and electronic records, the operator has undertaken a RECALL exercise, used to elicit the knowledge of past site operators and those disposing of waste to the LLWR. This has led to what we</p> | <p>5.4.7</p> |

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| | <p>consider to be a reasonable understanding of the past inventory, particularly for important radionuclides. We are also satisfied that LLW Repository Ltd has adequately considered the uncertainty associated with the inventory and taken account of this uncertainty within assessments (Environment Agency 2015g) so as to result in suitably conservative assessments, including consideration of alpha emitters that are known to have been disposed of in the past.</p> <p>Within the permit (Improvement Condition IC3) we require LLW Repository Ltd to identify an optimised approach for the management of discrete items and particles carrying a significant burden of radioactivity in past disposals, as required by the advice to assessors. We require this to be reported to us within 6 months of issue of a varied permit.</p> | |
| <p>106 We submit that this repository, as the Environment Agency itself admits, is not in an appropriate location. It was situated at Drigg on an Explosive Royal Ordnance site selected in World War Two because of its remoteness from large centres of population, its proximity to huge amounts of pure water and a disposal route into the Irish Sea for waste. This proximity to the Irish Sea is now a cause for major concern due to climate change. Disposal at sea (dilute and disperse) is a discredited policy and prohibited under international treaty obligations. Coastal erosion is a certainty within the lifetime of this facility, and the characterisation of historic contamination from the site's days as an Ordnance Factory and later as a radioactive waste dump is unknown. Therefore it is highly likely</p> | <p>The location of the LLWR makes the demonstration of environmental safety more challenging. However, we are required to consider each application on its merits and taking the submitted ESC into account.</p> <p>We consider that LLW Repository Ltd has made the case for the safety of continued disposals of radioactive waste at the site, meeting all the relevant criteria detailed within the GRA, as derived from relevant guidance and legislation.</p> <p>Within its assessments LLW Repository Ltd makes it very clear that coastal erosion of the site is nearly certain to start to occur within several 100 to a few 1000 years and as a result this scenario forms a central part of the assessments presented.</p> <p>We have reviewed matters associated with coastal erosion very carefully and concluded that we agree with the operator's assessment. We also accept LLW Repository Ltd's conclusions that despite the likelihood of coastal erosion in the distant future, the safety of people and the environment will be protected against relevant dose and risk criteria. These assessments have considered, for example, impacts presented by items or particles that</p> | <p>5.4.2 5.4.7</p> |

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| | that radioactive objects will appear on a newly constituted beach at some point in the future and present a danger to anyone picking them up. | <p>people could interact with in the future on any beach following or during coastal erosion of the site (LLW Repository Ltd 2013d).</p> <p>We do not consider disposal by near-surface burial at the LLWR to be disposal at sea. Coastal erosion of the facility is considered highly likely in the distant future, but is not a certainty and the ESC demonstrates that all impacts will be acceptable at the point any erosion occurs, even making conservative assumptions around timescales and other matters. Environment Agency 2015e and 2015g discuss these matters further.</p> <p>As referred to against consultation comment 104 above, we consider that past disposals and the implications of potential contamination arising from historic land uses of the site have been adequately characterised and uncertainties associated with this characterisation understood and assessed in terms of the permitted activities.</p> | |
| Individual (2) | | | |
| 107 | My response to the consultation is in two parts: issues that I have identified in the draft environmental permit and my suggestions for resolving them. In reviewing the draft permit I have taken into account the Environment Agency's responses to my comments on the application by LLW Repository limit to vary its permit, as given in the draft Decision Document. I would like to thank the Agency for these responses. | Noted. | |
| 108 | <p>1. Issues in the Draft Environmental Permit</p> <p>1.1 Types of Numerical Activity Limits in the Permit</p> <p>With the removal of annual limits on the activities of radionuclides disposed, there are two types of activity limits in the draft permit:</p> | <p>It is correct that the permit specifies two types of activity limits on total radiological capacity and concentration limits (when averaged over a consignment). However, we would like to emphasise that the structure of the permit also requires the operator to comply fully with the ESC and WAC and therefore with any further controls required by them, for example:</p> <ul style="list-style-type: none"> • Condition 1.1.1 requires the operator to | <p>5.4.7</p> <p>5.4.11</p> |

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| <ul style="list-style-type: none"> • concentration limits taken from the UK definition of LLW (4GBq/t alpha and 12 GBq/t other radionuclides) • limits on total disposals of radionuclides (Table S3.4). <p>The former bear little relationship to the operational or post-closure risks of the LLWR. The latter are based on continuing to dispose of waste at the site for more than 100 years (see comments in Section 1.2 below). Together the two types of limits imply a level of regulatory control on disposal operations that is considerably lower than that implied in permits for radioactive discharges from nuclear installations (which typically contain radionuclide-specific annual limits on discharges and quarterly notification levels). I accept that annual limits are probably not appropriate for the LLWR but I take the view that something more than limits based on estimated total capacity is needed for a facility with such a long projected operational life.</p> <p>The draft Decision Document states that the Environment Agency will require LLWR Ltd to make regular reports of the activities of disposals in terms of capacity usage and that these reports will be published. It also indicates that the Agency will inspect LLWR Ltd's capacity management processes periodically. These commitments are welcome and go some way towards</p> | <p>manage and operate activities in accordance with a written management system and as part of this management system, condition 1.1.3 requires a documented environmental safety case to be maintained which demonstrates best available techniques are used to protect members of the public and the environment.</p> <ul style="list-style-type: none"> • The ESC addresses further activity limits, for example those related to discrete items and sealed sources. • Conditions 4.3.3 and 4.3.6 require that we are notified of any proposed changes to these limits within the ESC or wider management system. <p>The concentration limits (when averaged across a consignment) of 4GBq/t alpha and 12 GBq/t other radionuclides are included within the permit not because they are derived from the UK definition of LLW, but because they form the basis of LLW Repository Ltd's ESC assessments and are requested by the applicant as part of the application for variation of the permit. This limit serves in part to limit total activity, but also to limit the final heterogeneity of the radioactive waste to some extent and therefore impacts that may arise from human intrusions or as a result of coastal erosion in the future. The ESC presented has not otherwise demonstrated that these limits are not required.</p> <p>We do not agree that the limits imposed by the permit imply a lesser level of control than that from radioactive discharges from other nuclear installations as:</p> <ul style="list-style-type: none"> • Our permits allow us to continually monitor and assess disposals, taking action if necessary. • Discharges to air or water from most nuclear installations result in very different impact pathways to the environment and people compared to the impact pathways for a radioactive waste burial site. Discharges to air and water can impact over very short time periods and large discharges over short periods can cause significant detriment, hence why we impose annual limits and | |

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| <p>meeting my concerns. However, I think that there should be a condition about capacity usage in the permit itself.</p> | <p>quarterly notification levels on many nuclear sites. Whereas, for a burial site, the total impacts from disposal are broadly similar whether disposals occur in one year or over several years, as most processes which release the radioactivity are gradual and occur over many years.</p> <ul style="list-style-type: none"> Disposals by burial at LLWR are unlikely to significantly increase beyond the predicted disposals over a short period as the process of waste generation and disposal by consignors is a slow one, dictated by decommissioning progress and funding for example. Significant or unplanned increases in rates of disposal to the LLWR are likely to be identified by other indicators, for example, levels of NDA funding, major accidents, policy changes or acceleration of decommissioning. <p>We do require reporting of disposals on a regular basis through standard permit condition 4.2 and will specify reporting requirements within our Compilation of Environment Agency Requirements (CEAR) that supports the permit and is legally enforceable as written specifications against individual permit requirements. Within the CEAR we will include requirements to report on capacity usage as suggested. These requirements are legally binding. We therefore do not propose to place a specific condition on capacity usage within the permit itself, but will within the CEAR which will be available on the public register.</p> <p>The CEAR will require reporting of capacity usage on an annual basis and also should defined triggers related to significant disposals be reached, ensuring we are notified of any significant changes from routine rates of disposal. Additionally, we can inspect the capacity management process and data at any time. We have already undertaken an inspection on 13 July 2015, considering capacity management, in preparation for issue of a varied permit.</p> | | |
| 109 | 1.2 Long Operational Life of the LLWR | The permit and ESC are constructed on the assumption that no significant evidence or requirements change through to circa 2127, | 5.4.11 5.4.12 |

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| <p>The draft permit implies that the LLWR can continue to be used for disposals until about 2127, over which time there will be several phases of construction. There is no explicit link in the draft permit between reviews of the environmental safety case (ESC) and decisions to construct new vaults. There is a requirement to submit a report to the Agency after each new vault has been constructed and before any waste is emplaced in it (item PM1 in Table S1.3B). This relates to what has been done at the LLWR, not to plans for the future. There is also a requirement to carry out a comprehensive review of the facility and updating of the ESC by 1 May 2021 (item IC7 in Table S1.2). This date is chosen to be 10 years from that of the current (2011) ESC and is again not clearly related to planned use of the LLWR. This is also true of the draft permit condition (4.3.3) about notifying the Environment Agency of changes to the ESC that could have significant repercussions for the management of disposals.</p> <p>The draft Decision Document states that LLWR Ltd intends to carry out major reviews of the ESC approximately every 10 years and to align these reviews with construction phases. It also states that there would be a major review of the ESC if there was a proposal to make a substantial change to the function of the LLWR. Although the draft Decision Document indicates that the</p> | <p>in other words they are based on what is known today. However, it is expected that evidence, requirements and understanding will actually change over the years. Where changes do occur they must be assessed and notified to us in accordance with conditions 4.3.3 and 4.3.6 of the permit and the overall case for disposal and capacity reassessed.</p> <p>There is a large degree of uncertainty over the timing and requirements for the construction of new vaults. Vault 9 capacity is currently expected to last many years longer than initially envisaged. It would therefore be inappropriate to set a review date to align with anticipated construction of future vaults. It is also possible that LLW Repository Ltd choose to significantly alter the approach to disposals or to seek changes to the purpose of the LLWR. We therefore consider it appropriate to maintain flexibility within the requirement for major reviews.</p> <p>We require update of the ESC periodically irrespective of major construction phases. IC7 in Table S1.2 requires a Major review at 10 years. However, IC7 is linked to condition 2.4.1 that specifies the Environment Agency can, in writing, alter the requirement and its timing. It is our intent to do this where appropriate to align with construction phases or other changes of use, or to delay or bring forward reviews should this be appropriate due to significant changes in requirements or evidence, or as a result of steady state operations. We consider that this is the most flexible approach that can be used to adapt to changing circumstances over the decades. Additionally, we consider it possible that construction may not need to trigger a Major review of the ESC, if for example plans remain wholly consistent with the current ESC.</p> <p>We will determine the need to alter IC7 based upon LLW Repository Ltd's Annual and Periodic reviews, as well as our ongoing liaison with the operators on progress and plans. The Periodic reviews to be undertaken every 3 years will be particularly important as they will indicate the extent of</p> | |

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| <p>Environment Agency agrees with these plans for ESC reviews, this is not reflected in the draft environmental permit.</p> <p>I would have expected the environmental permit for a facility with such a long operational life to indicate that the Environment Agency will impose hold points at which the operator has to submit its future construction and disposal plans to the Agency for assessment. I understand that, in effect, this will be the approach under the Planning regime, where planning permissions for new vaults will be granted in stages rather than granting permission for all new vaults at the outset.</p> | <p>change that has occurred and the extent of likely future change and therefore the need or otherwise for a Major review of the ESC to be undertaken and its timing.</p> <p>Condition 4.3.3 is included within the permit to require notification of any significant changes to the ESC or WAC that could impact upon disposals. It requires notification of changes to construction plans, but also any other significant changes. IC2 has been included to ensure clarity over what is notified to us.</p> <p>LLW Repository Ltd is required to apply BAT at all times and to ensure optimised disposals. Through the permit and our regulation of the site we liaise regularly with the site, such that we maintain a good understanding of their plans and proposals. Under condition 4.2.2 we can require any information and we will ‘call-in’ any information necessary, such as construction and disposal plans, for assessment.</p> <p>Reference is made to the planning regime using a hold point approach. We note that an important difference between the two regimes is that under the planning regime permissions cannot be readily revoked once granted. Whereas in the permitting regime, if justified, we may vary or revoke a permit at any time, require further information, or alter certain requirements specified within the permit. Such ‘hold points’ are therefore not necessary for us to effect change to the permit.</p> | |
| <p>110 1.3 Waste Acceptance Criteria</p> <p>The term “waste acceptance criteria” (WAC) is used in the draft permit but not defined in it. This omission should be rectified.</p> <p>There is also a need to clarify in the permit or the Decision Document the procedure for Environment Agency “approval” of WAC, as mentioned in the definition of WAC in the Guidance on Requirements for</p> | <p>We agree that there is value in defining the term “waste acceptance criteria (WAC)” within the permit. We will include the definition “Qualitative and/or quantitative criteria, specified by the operator of a disposal facility for solid radioactive waste, to be accepted for disposal” within Schedule 6 of the permit.</p> <p>We consider the definition of WAC in the Guidance on Requirements for Authorisation (GRA) to be inappropriate for the permit and in need of update at the next review of the GRA, as it contains the term “approved by the regulator”. Our approach to regulation is not to approve documents such as the</p> | <p>5.4.11 6.1</p> |

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| <p>Authorisation (GRA). There is a requirement for LLWR Ltd to notify the Agency of proposed changes to the WAC that would have significant repercussions for the management of disposals and to wait for agreement in writing for a change, if the Agency indicates that this will be needed (condition 4.3.3). However, it is unclear which set of WAC form the baseline against which future changes will initially be judged.</p> <p>I also note that in the draft permit WAC are referred to as being defined in the ESC (condition 3.1.8) or included in the ESC (condition 4.3.3 and item IC2 in Table S1.2). The GRA indicates that WAC are separate from an ESC but underpinned by it. My understanding is that this is also the LLWR Ltd position.</p> | <p>WAC, but to “accept” them where we consider them to be appropriate. Where we do not consider them to be appropriate we will inform the operator and require changes where necessary, taking regulatory action as appropriate.</p> <p>Condition 4.3.3 requires the operator to notify us of changes which may have significant repercussions for the management of disposals. We will notify the operator if we do not accept the change, which they must not then implement until we have given agreement in writing.</p> <p>No one set of WAC form a baseline against which all future changes are judged. The WAC are defined by the ESC and are used to control safe disposals. The ESC and WAC must remain current and all subsequent changes assessed. LLW Repository Ltd is required to keep the ESC as a ‘live’ document, along with the associated WAC on an ongoing basis. Changes are therefore assessed incrementally against the previous version. All changes will be recorded in a Change Register managed by LLW Repository Ltd, which we can inspect at any time.</p> <p>The GRA states “The developer/operator of a disposal facility for solid radioactive waste should establish waste acceptance criteria consistent with the assumptions made in the environmental safety case and with the requirements for transport and handling and demonstrate that these can be applied during operations at the facility.”. We consider that operationally the WAC is a separate document underpinned by the ESC, as, for example, it contains criteria which are not defined by the ESC, such as for transport matters. Additionally, the operator can choose to apply additional controls in the WAC on a commercial basis, so long as these are consistent with other requirements. However, relevant environmental elements of the WAC are defined by the ESC and are also contained within it. We also note that any changes to the WAC must be supported by the ESC where relevant.</p> <p>For clarity we will alter Condition 3.1.8(a) to</p> | |

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| | <p>read: “all relevant radioactive waste acceptance procedures have been completed and it fulfils the relevant radioactive waste acceptance criteria as defined by the environmental safety case, unless otherwise agreed in writing by the Environment Agency.”</p> <p>Also, we will alter Table S1.2, IC2 to read: “The operator shall develop a procedure for determining what changes to the environmental safety case and waste acceptance criteria might have, or might reasonably be seen to have, significant repercussions for the management of the disposal of radioactive waste by burial.”</p> | |
| <p>111 1.4 Emplacement Procedures and Strategy</p> <p>The draft Decision Document states that the Environment Agency will inspect against LLWR’s procedures for waste emplacement. There is no explicit mention of the Agency satisfying itself that these procedures are consistent with the ESC, either now or when changes are made to the ESC. The draft Decision Document only states that the Agency considers the procedure for dealing with individual consignments via an emplacement strategy to be an optimised approach. The permit itself does not mention emplacement procedures or an emplacement strategy, although these can be as important for long-term safety as WAC.</p> | <p>We can confirm that we are satisfied that the emplacement strategies proposed by LLW Repository Ltd are consistent with the ESC. We have considered each of the emplacement strategies in our review of the ESC and concluded that LLW Repository Ltd has demonstrated them to be appropriate to achieve optimised disposals. We address the strategies in various reports (Environment Agency 2015d to g). Should changes be made to the ESC we will be notified and consider LLW Repository Ltd’s assessment of whether these changes impact upon any of the emplacement strategies.</p> <p>We have inspected (on 13 July 2015 as part of a Readiness Review) LLW Repository Ltd’s procedures for implementing emplacement strategies and we are satisfied that they are consistent with the ESC and can be effective. However, due to the fact that at present the operators are not placing containers in their final disposal positions, the procedures have, as yet, not been used. We will inspect and audit again once they are implemented fully.</p> <p>We do not consider it appropriate or necessary to include emplacement procedures within the permit itself, although we do agree that they can be important to long-term safety. As with many aspects of site operations that have long-term safety implications we will regulate these matters primarily against conditions 1.1.1 and 1.1.3. Condition 1.1.1 requires management and</p> | <p>5.4.3 5.4.4 5.4.7</p> |

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| | | operation of activities in accordance with a written management system that is sufficient to achieve compliance with the conditions of the Permit. Condition 1.1.3 requires maintenance of a documented environmental safety case, which is part of the management system. Therefore LLW Repository Ltd must operate to the ESC. The ESC identifies the various emplacement strategies as an optimised approach and so failure to implement them would be a contravention of conditions 1.1.1 and 1.1.3. | |
| 112 | <p>1.5 Management According to the ESC</p> <p>The draft Decision Document states that LLWR Ltd is at present required to “implement the 2011 ESC”. I could find no corresponding requirement in the draft environmental permit. There is a requirement to maintain an ESC (condition 1.1.3) but there is no explicit mention of managing and operating the LLWR in such a way as to be consistent with the ESC (which is presumably what is meant by “implementing” an ESC).</p> | <p>Condition 1.1.1 requires management and operation of activities in accordance with a written management system that is sufficient to achieve compliance with the conditions of the Permit. Condition 1.1.3 requires maintenance of a documented environmental safety case, which is part of the management system. Therefore, to operate in accordance with the management system LLW Repository Ltd must also operate in accordance with the ESC that they maintain. Condition 1.1.3 makes it clear that this should apply throughout the life-cycle of the facility.</p> <p>This represents a change in wording from previous permits, but with the same effect of requiring LLW Repository Ltd to implement the ESC (in other words, operate to it).</p> <p>Additionally, Condition 3.1.8 is relevant. It requires that radioactive waste is only disposed of by burial if all relevant radioactive waste acceptance procedures as defined by the environmental safety case have been completed, unless otherwise agreed in writing by the Environment Agency.</p> | <p>5.4.11</p> <p>5.4.12</p> |
| 113 | <p>2. Suggestions for Resolving Issues</p> <p>My suggestions are in the order of the relevant sections in the draft environmental permit.</p> | Noted. | |
| 114 | <p>2.1 General Management of the LLWR</p> <p>I suggest that a condition be added to the permit to require</p> | As described above against consultation comment 112 we consider that the conditions already in place within the permit robustly address requirements for LLW Repository Ltd to manage and operate the | <p>5.4.11</p> <p>5.4.12</p> |

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| <p>LLWR Ltd to manage and operate the facility so as to be consistent with its ESC. This would deal with the issue identified in Section 1.5 above.</p> | <p>facility in accordance with the ESC.</p> | |
| <p>115 2.2 Disposals of Radioactive Waste</p> <p>I suggest that a condition be added to the permit to require LLWR Ltd to:</p> <ul style="list-style-type: none"> • report annually to the Environment Agency on the capacity remaining in the LLWR, in terms of percentages of the radionuclide activity limits in Schedule 3 • notify the Environment Agency if more than a given percentage of the capacity limit for each radionuclide in Schedule 3 is used in a year. <p>This would address the issue identified in Section 1.1 above.</p> | <p>We agree that LLW Repository Ltd should be required to report annually to the Environment Agency on the radiological capacity remaining in the LLWR in terms of percentages of limits in Schedule 3. Also that we should be notified if more than a given percentage of the capacity limit in Schedule 3 is used in a year.</p> <p>However, as discussed in response to consultation comment 108 above, we do not consider that it is necessary to include any further conditions within the permit to achieve this. We will use Condition 4.2 of the permit to specify these requirements in writing to LLW Repository Ltd, using the CEAR. This approach is equally legally robust and is consistent with our template permitting approach.</p> <p>We note that in Table S3.4 of Schedule 3 no individual radionuclide limits are specified. Instead a sum-of-fractions approach is taken to total capacity as described further in Section 5.4.7. This approach considers capacity across several assessment cases, considering the relative impact of a range of radionuclides.</p> | <p>5.4.7 5.4.11</p> |
| <p>116 2.3 Notifications</p> <p>To deal with my comments in Sections 1.3 and 1.4 above, I suggest that condition 4.3.3 in the permit be generalised to cover changes to the ESC and changes to criteria and procedures derived from and/or underpinned by the ESC. The latter would include not only WAC but also emplacement strategy, emplacement procedures and capacity management procedures. The baseline against which changes are judged should be indicated in</p> | <p>Also see responses to consultation comments 110 and 111 above.</p> <p>We agree with the outcomes of the proposed changes, but consider that they are already addressed by conditions in the permit and also by supporting guidance as explained further below.</p> <p>We note that Condition 4.3.3 in the permit relates specifically to the ESC and WAC and is included to provide increased clarity over the importance of these documents and the requirements for notifying significant changes.</p> <p>Condition 4.3.6 of the permit addresses more generalised requirements, encompassing all management systems,</p> | <p>5.4.3 5.4.4 5.4.7 5.4.11 6.1</p> |

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| <p>each case, either in a schedule to the permit or in the Decision Document.</p> <p>I also suggest that the significance test for such changes should be related to both the repercussions for the management of disposals and the implications for the radiological impact of the LLWR on the public and the environment.</p> <p>Item IC2 in Table S1.2 of the permit would need to be amended to be consistent with the revised condition 4.3.3.</p> | <p>which will include criteria and procedures derived from and/or underpinned by the ESC, for example emplacement strategies and capacity management procedures. The condition requires proposed changes to be notified to us. We may then take action to prevent changes being affected should that be necessary and appropriate.</p> <p>As discussed in response to consultation comment 110, the ESC and WAC must remain current at all times and so changes must be assessed incrementally against the previous version. All changes will be recorded in a Change Register managed by LLW Repository Ltd which we can inspect at any time. Additionally, Annual and Periodic reviews will be used to assess the scale and scope of incremental change, driving a Major review where necessary to collate changes into a fully updated ESC.</p> <p>Condition 4.3.3 of the permit refers to “significant repercussions”. This term is further defined in Regulatory Guidance Series, No RSR 2. The Regulation of Radioactive Substance Activities on Nuclear Licensed Sites, published by the Environment Agency (Environment Agency 2012c).</p> <p>This guidance indicates that a change may have “significant repercussions” with respect to the management of the generation and disposal of waste where it:</p> <ul style="list-style-type: none"> • results in the generation and disposal of new waste forms; • results in the need to apply for a variation to disposal limits or any other condition of the permit; • affects control measures (BAT) put in place to ensure that impacts remain ALARA and the environment is protected; • alters the amount and timing of the generation and disposal of radioactive waste. <p>We therefore consider that the condition already adequately addresses implications for the radiological impact of the LLWR on the public and the environment, in particular</p> | |

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| | | <p>through the third bullet point above.</p> <p>Additionally, Appendix B of that guidance provides further information on what changes may have significant repercussions, such as:</p> <ul style="list-style-type: none"> • Management system changes • Modifications which may alter or affect techniques used for: <ul style="list-style-type: none"> ○ Minimising discharges ○ Minimising the impact of discharges on people and protecting other species • New facts and knowledge <p>As we do not consider that Condition 4.3.3 of the permit requires modification for the reasons outlined above, we do not consider changes are required to IC2 in Table S1.2.</p> | |
| 117 | <p>2.4 Schedule 1</p> <p>I suggest that item IC7 in Table S1.2 be generalised to require a comprehensive review and updating of the ESC approximately every 10 years and to coincide with proposals to begin phases of construction or to make a substantial change to the function of the LLWR. The date of 1 May 2021 could be given as the first deadline for such a review, unless specified otherwise in writing by the Environment Agency. Such a generalisation would help to meet the concerns I express in Section 1.2 above.</p> | See response to consultation comment 109. | 5.4.11 5.4.12 |
| Individual (3) | | | |
| 118 | Where is there any mention of the implications of wartime and postwar activity at the site? Until 1957 Drigg was a Royal Ordnance Factory which means that the whole area is contaminated with volatile reagents like Toluene. | <p>See response to consultation comments 104 and 105.</p> <p>As part of LLW Repository Ltd's ESC assessment work it has considered the effects of rising sea level and changing hydrogeology on radioactive waste disposals (see LLW Repository Ltd 2011i and 2011n). We are satisfied that LLW</p> | 5.4.2 5.4.6 5.4.7 5.4.9 |

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| <p>Some people consider the continued excess of childhood cancers locally to be the result of inadequate precautions in wartime and the total absence of appropriate decontamination measures when, in 1959 UKAEA took it over.</p> <p>From 1941 they made 400 tons per week of TNT there, using a million gallons of water a day. It looks as though this would be mainly used for washing, creating huge volumes of 'red water' with all manner of impurities. This seems to have been discharged into the Irish Sea. There may also have been quantities of solid waste that was scooped into trenches.</p> <p>Also from 1945 the factory was used to de-commission weapons and to render the TNT harmless. Again this would be producing large amounts of toluene and associated carcinogens. I wonder that maybe the pipeline froze and cracked in winter 46/47 or something like that. There appear to be various pits and holes where stuff was dumped both at ROF Drigg and at ROF Sellafield.</p> <p>The problems associated with this toxic heritage are compounded by the prospect of rising sealevel and consequent changes to underground patterns of waterflow. It has been acknowledged that incomplete records exist for what was buried by UKAEA . No worst case scenario has been rehearsed in the extensive documentation</p> | <p>Repository Ltd has completed a realistic assessment of the possible future effects of coastal erosion, sea level and hydrogeology changes and shown that the resulting impacts remain acceptable.</p> <p>We are satisfied that the ESC does address reasonable worst case scenarios so as to demonstrate, even making conservative assumptions, that impacts will be acceptable to people and the environment now and in the long term future. For example, LLW Repository Ltd has considered scenarios associated with coastal erosion, human intrusion, groundwater impacts and gaseous impacts, taking into account inventory uncertainty (LLW Repository Ltd 2011c, d and e).</p> <p>For example, the assessments do consider the possibility of coastal erosion starting at the earliest predicted timescales (several 100 years), which we consider a suitable conservative assumption.</p> <p>We are satisfied that LLW Repository Ltd has followed relevant good practice for assessment of radioactive waste disposal facilities and that their assessment is consistent with our requirements in the GRA (Environment Agency 2015a and g).</p> | |

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| | drawn up for this proposal. | | |
| 119 | <p>"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," According to Ian Parker, the EA's nuclear regulation group manager in Cumbria, the agency had reached its latest conclusions after detailed technical assessments. "It's highly probable the coast will erode and the waste will be disrupted," he said. These are not just my views but yours.</p> <p>EA are not only lending their name to environmental degradation, but also failing to protect future populations by their stewardship of UK coastal environment.</p> | <p>See response to consultation comment 106.</p> <p>As summarised within our Decision Document and assessments (Environment Agency 2015a) we are satisfied that LLW Repository Ltd has demonstrated that people and the environment will be adequately protected and that strict standards of radiological and non-radiological protection detailed in government guidance and legislation will be met both in the short, but also the long-term, taking into account the likelihood of coastal erosion of the site.</p> | <p>5.4</p> <p>5.4.2</p> <p>5.4.7</p> |
| Individual (4) | | | |
| 120 | <p>Coastal erosion is a concern to me in the context of the Drigg facility. Coastal erosion is discussed in the document.</p> <p>On page 30 reference is made to "The nature of coastal erosion, uncertainties in direction and long timescales predicted before erosion begins...."</p> <p>On page 38 it is stated "... given that coastal erosion is expected to destroy the site within a few 100 to a few 1000 years....."</p> <p>On page 30 it is stated "In the future, the operator, the Environment Agency or others with responsibility for the LLWR may consider sea defences necessary. But, we agree that these defences would be best designed and</p> | <p>We note the concern raised and agree that sustainable development requirements must be met. However, it is important to emphasise that LLW Repository Ltd has presented an assessment, with which we agree, that demonstrates that future impacts, irrespective of coastal erosion, will be consistent with dose and risk criteria detailed within the GRA. On those grounds we do not consider that coastal defences are required now, or at any point in the future, as part of an optimised approach. Unless requirements (for example legislation, policy or guidance) change, or new information becomes available that alters the conclusions of the current ESC, we will not require coastal defences to be put in place.</p> <p>We note in our assessments and this Decision Document that this situation should be reviewed on an ongoing basis based upon the latest technology and understanding and if the situation changes options reconsidered. In particular this</p> | <p>5.4.2</p> <p>5.4.7</p> |

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| <p>built closer to the time when they may be required."</p> <p>My perspective on all this is that rather than putting off the aspect of necessary sea defences a long way into the future, it might be better to start tackling the aspect more immediately. Spreading the effort of providing sea defences to protect the Drigg facility over a prolonged period could help to make the provision of such defences more affordable? In any event, providing sea defences sooner rather than later would be consistent with Sustainable Development principles. It would be prudent to address coastal erosion in the current generation, rather than leaving problems for future generations to address. It would be unhelpful to leave the situation at Drigg site worse for future generations than it is now.</p> <p>In this respect I refer to page 82, where in the section on Sustainable Development it is stated "Specific to radioactive waste, the Government's policy is to 'ensure that radioactive waste is managed safely and that the present generation, which receives the benefit of nuclear power, meets its responsibilities to future generations' "</p> | <p>situation should be considered at Major reviews of the ESC anticipated every 10 years.</p> <p>We made the point on page 30 of the draft Decision Document that in the future, others with responsibility for the LLWR may consider sea defences necessary, but this is only a decision that can be taken in the future based upon requirements and evidence available at that time. Nothing we are aware of precludes the possibility of this in the future.</p> <p>On page 30 of the draft Decision Document we also made the point that any such defences (if required) would be best designed and built closer to the time when they may be required. Again we note that at this point in time we do not consider that any such defences are required. If others in the future considered that coastal defences were required we agree that early implementation may offer some benefit in making them more affordable. However:</p> <ul style="list-style-type: none"> • Current evidence indicates that coastal erosion will not commence for several 100 years at the earliest. Any defences would therefore need to be maintained and potentially replaced over this period prior to their need, if ever, being realised. • Due to uncertainty over the nature and direction of erosion there would be uncertainty over the necessary size and placement of any defences. • Any defences would most likely need to be constructed within (or affect) the Special Area of Conservation and Site of Special Scientific Interest that is currently adjacent to the LLWR. <p>We therefore consider that on balance any defences would be more appropriately designed and if needed, constructed closer to the time they are required to minimise unnecessary maintenance costs and to ensure they are informed by increased certainty over the nature, scale and direction of coastal erosion.</p> <p>We address matters related to site</p> | |

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| | | | | optimisation and coastal evolution further in our review reports (Environment Agency 2015e and 2015f). | | | |
| Individual (5) | | | | | | | |
| 121 | <p>Due to the chaotic nature of the natural environment, disasters happening in the vicinity of the site cannot be guaranteed to have no impact. New radioactive waste is guaranteed to be a long term hazard, if exposed by natural or man-made disasters. I am therefore in principle against all nuclear waste storage and believe it should not be generated in the first place. There is no longer a need for the storage to be balanced against the risk since wind power is now cheaper than nuclear power, even without out taking into account the long-term environmental impact of nuclear and under-stated decommissioning costs.</p> | | <p>We agree that disasters in the vicinity of the site cannot be guaranteed to have no impact and recognise that radioactive waste can present a long-term hazard if not handled and managed correctly. Through the assessments presented by LLW Repository Ltd in its ESC we are satisfied that the company has considered a suitable range of possible future scenarios, such as coastal erosion, human intrusion into the waste (for example drilling), or major accidents. These assessments have demonstrated to our satisfaction that potential impacts are acceptable and consistent with dose and risk criteria detailed in the GRA.</p> <p>We consider each application on its own merits in line with existing legislation and guidance as detailed in Section 2. This application only relates to proposals for radioactive waste disposal at the LLWR.</p> | | | 2 | 5.4.7 |
| Magnox Ltd | | | | | | | |
| 122 | <p>Magnox has welcomed the opportunity to be involved in the overall consultation on LLWR's permit variation application and we are supportive of the EA's decision to grant this permit.</p> <p>In particular, permitting further disposal at the repository gives reassurance to Magnox that there is a long term, available, and appropriate disposal route for waste that requires engineered disposal. Allowing LLWR to manage the total lifetime radiological capacity rather than imposing annual limits aligns better with our site permits and helps us to gain approval of</p> | | Noted. | | | | |

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| | wastestream inventories as a whole. Magnox is supportive of controls on acceptance of waste being detailed in the WAC rather than the permit. | | |
| 123 | With regard to the increasing information requirements on consignors Magnox recognises that the additional information is required to support the continued safe operation of the repository and comply with the GRA but we are reassured that the EA acknowledges that there are some practical limitations to the extent of physical characterisation that is possible for some wastes/materials. | Noted. | |
| 124 | Following a period of uncertainty regarding future disposal of LLW asbestos, we are pleased that the permit does not prohibit this - whilst the volumes of LLW asbestos are low, it is reassuring that this material will not become an 'orphan' waste. | Noted. | |
| 125 | Magnox is supportive of EA's expectation that LLWR continue to consult with its consignors over future changes to the WAC and we look forward to working with LLWR on this matter in due course. | Noted. | |
| Marine Management Organisation (MMO) | | | |
| 126 | The MMO is responsible for issuing marine licences under the Marine and Coastal Access Act 2009 in England. Amongst other things, a marine licence may be needed for activities involving the construction, alteration or improvement of any works, dredging, or a deposit or | Noted. | 5.4.8 |

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| <p>removal of a substance or object below the mean high water springs mark or in any tidal river to the extent of the tidal influence.</p> <p>Alongside marine licences, we also issue consents under the Electricity Act 1989 (as amended) for offshore generating stations between 1 and 100 megawatts in England and parts of Wales. We are also the authority responsible for processing and determining harbour orders in England and for some ports in Wales and for granting consent under various local Acts and orders regarding harbours.</p> <p>The applications we receive may be subject to various forms of assessment. This includes environmental impact assessment, Habitats Regulations assessment, marine conservation zone assessment and assessment for compliance with the Water Framework Directive. Early consultation with the MMO is always advised and we would encourage applicants to engage early with the MMO alongside any application for planning consent to ensure that the consenting process is as efficient as possible. We will look to follow the principles set out in the Coastal Concordat in considering any application which is linked to an application for planning consent.</p> <p>We are also an advisor to the Planning Inspectorate, Secretary of State and other consenting bodies for various consents affecting the marine</p> | | |

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| <p>area. This includes Nationally Significant Infrastructure Projects under the Planning Act 2008.</p> <p>If you have any questions or need any further information please just let me know. More information on the role of the MMO can be found on our website www.gov.uk/mmo</p> | | |
| Natural England | | |
| <p>127 Drigg Coast SAC, SSSI and Cumbria Coast MCZ - No objection</p> <p>This application is immediately adjacent to Drigg Coast Special Area of Conservation (SAC), Site of Special Scientific Interest (SSSI) and the Cumbria Coast Marine Conservation Zone (MCZ). Natural England is satisfied that the proposed development, carried out in strict accordance with the details of the application, as submitted, will not damage or destroy the interest features for which the sites have been notified. We agree with the relevant assessments that you have undertaken in this regard.</p> | <p>Noted.</p> | <p>5.4.8</p> |
| <p>128 Protected Species</p> <p>Issues regarding protected species are being addressed through the new planning permission expected to be submitted to Cumbria County Council in the next couple of months. These relate primarily to the construction process rather than operational activities. As such we are content that the permit does not need to consider protected species in further detail.</p> | <p>Noted. We have also worked closely with Cumbria County Council to ensure clarity over the respective scopes of our assessments. We will continue to work with Cumbria County Council and Natural England as necessary to ensure ongoing environmental protection.</p> | <p>5.4.8</p> |

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| | <p>Extensive discussions and meetings have taken place over the details of this permit application, and the assessment of the impacts on the designated sites, with yourselves and the applicant. We are satisfied that our concerns regarding the permit application have been addressed. We are continuing to work closely with LLWR Ltd and Cumbria County Council in anticipation of a new planning application being submitted shortly for the construction work proposed at this site.</p> | | |
| Nuclear Decommissioning Authority (NDA) | | | |
| 129 | <p>NDA is responsible for the decommissioning and site remediation of current civil nuclear liabilities in the UK and also for the development and management of the UK nuclear industry LLW strategy on behalf of Government. The continued availability of LLW disposal capacity is essential to the successful completion of the NDA mission and as the UK's principal near surface disposal facility the LLWR is a key strategic asset for the UK and we fully support the decision to grant the application and issue a varied permit and variation notice.</p> | Noted. | |
| 130 | <p>We have no specific comments to add regarding the decision document. On the draft permit we note that table S1.2 lists a number of improvement and information requirements and would comment that these should realistically reflect the priorities of the</p> | <p>The improvement and information requirements in Table S1.2 have been set on a risk based approach. The timescales allocated to each condition reflect priorities. We consider that all of the conditions are necessary to ensure continued compliance with the permit. We also consider that all of the conditions are more generally necessary to ensure effective implementation and continued operation to the ESC. As such we</p> | |

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| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
|---|--|------------------------------|
| improvements, recognising the constraints on the site with respect to capacity and funding. | anticipate that many aspects within the conditions will already be within the scope of LLW Repository Ltd's forward programme of work. | |
| Nuclear Industry Association (NIA) | | |
| <p>131 The NIA is the trade association and information and representative body for the civil nuclear industry in the UK. It represents over 270 companies operating in all aspects of the nuclear fuel cycle, including the current and prospective operators of the nuclear power stations, the international designers and vendors of nuclear power stations, and those engaged in decommissioning, waste management and nuclear liabilities management. Members also include nuclear equipment suppliers, engineering and construction firms, nuclear research organisations, and legal, financial and consultancy companies.</p> <p>The UK's nuclear power stations have been making a major contribution to the UK's energy supplies for over 50 years. Their provision of secure, large scale and reliable generation has played a major role both in meeting our growing electricity demands and in protecting our energy security – reducing dependence on imported energy and insulating the UK from fuel supply interruptions overseas. They have also made a major contribution to reducing our carbon emissions.</p> <p>However in generating electricity nuclear stations also produce relatively small</p> | Noted. | |

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| <p>quantities of radioactive waste, including some solid low level waste (LLW). As the consultation paper notes the principal facility for disposing of these wastes has been the LLWR, and much of the nuclear industry’s LLW has been sent there, along with wastes from a range of other producers including defence establishments, general industry, hospitals and universities.</p> <p>For the reasons outlined above continued nuclear generation is consistent with the Government’s energy policy objectives and it follows, as with the other producers, that it is in the national interest that a disposal route should be available for its wastes. Given the EA’s confirmation that all the requirements of the relevant legislation and statutory guidance on radioactive discharges are met we strongly support the Environment Agency’s draft decision to approve the permit variation.</p> | | |
| Office for Nuclear Regulation (ONR) | | |
| <p>132 ONR remains supportive of the disposal of different nuclides through a sum of fractions approach and will continue the engagement with yourselves and NDA to explore the possibility of in situ decay storage prior to disposal.</p> <p>ONR has no reservations relating to the issue of the permit.</p> | <p>Noted.</p> <p>We would be pleased to discuss how the operator of the LLWR can take advantage of radioactive decay in the management of radioactive waste, when this could serve to protect the environment whilst achieving other benefits.</p> | <p>5.4.7</p> |

Table 11: Responses to consultation comments on the draft decision

| Summary of issues raised | Our consideration of the issues | Further addressed in Section | |
|---|---|--|--|
| Public Health England – Centre for Radiation, Chemical and Environmental Hazards | | | |
| 133 | <p>Public Health England agrees with the conclusions of the review of the Environmental Safety Case put forward by LLWR Ltd in its application to carry on radioactive substances activities at the low level waste repository near Drigg. In particular PHE is satisfied that the assessment of the radiological impact of the radioactive waste disposed of at LLWR included in the ESC follows current state of the art methodology to assess radiological risks and doses. PHE agrees with the EA review that LLWR Ltd has provided sufficient evidence to demonstrate that the potential radiological effects on public health and the environment will be low and below the current radiological risk guidance level of $1 \times 10E-06$ during the operational and post-closure periods.</p> | Noted. | |
| 134 | <p>PHE notes that the doses from direct radiation and inhalation of dust submitted in the 2011 ESC were subsequently revised because of an error in the assumptions made and that the doses in the 2013 version of the ESC were higher by a factor of 4. PHE accepts the argument put forward by LLWR Ltd that the revised doses in the 2013 ESC are based on very cautious assumptions and that mechanisms will be in place to safeguard against exposure of people to excessive dose rates. PHE also believes that there</p> | See response to consultation comment 84. | |

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| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
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| <p>is an uncertainty associated with the calculation of doses and radiological risks from the disposal of radioactive which can be quite significant and that a factor of 4 is reasonably consistent with the level of uncertainty expected in this type of assessment. While PHE considers that the revised doses from direct radiation and inhalation of dust does not affect the overall assessment in the ESC, we believe that this discrepancy could have been identified at an earlier stage of the review of the ESC.</p> | | |
| Sellafield Ltd | | |
| <p>135 The LLWR has a key role in supporting the management of LLW arising from the operation and decommissioning of nuclear sites, as well as a range of other key establishments. The detailed work programme conducted by LLWR Ltd, to establish a comprehensive Environmental Safety Case, and the provision of the draft permit demonstrates that the repository can continue to undertake this role without due harm to the public or the wider environment.</p> <p>We welcome the proposed removal of annual radiological limits, the removal of a number of specific restrictions (including those on complexing agents), that the permit supports higher stacking of containerised waste and the development of additional disposal vaults beyond vault 9. We note that the document indicates a</p> | <p>Noted.</p> | |

Table 11: Responses to consultation comments on the draft decision

| Summary of issues raised | Our consideration of the issues | Further addressed in Section |
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| <p>number of changes to the associated WAC and your expectation that LLWR Ltd appropriately consult on any changes with their consignors. We look forward to continue working with LLWR Ltd to support operation of the repository in line with the requirements of the ESC, and to support any ESC development.</p> | | |
| Studsvik UK Ltd | | |
| <p>136 After a thorough review Studsvik UK Ltd supports the granting of the varied permit to LLW Repository Ltd. By providing certainty to our customers and ourselves that waste disposals of non-treatable waste will be able to continue into the future whilst maintaining a good level of environmental protection enables Studsvik to continue to support Low Level Waste Policy and the endeavours of the waste hierarchy through the provision of LLW treatment services.</p> <p>Studsvik UK Ltd has three areas of comment:</p> | <p>Noted.</p> | |
| <p>137 LLW Repository Limited seeks to restrict the location of higher specific activity waste in the disposal stack. There is a concern that as a greater amount of waste is diverted away from the Low Level Waste Repository (LLWR), leaving only that which cannot be treated or disposed of elsewhere for burial and thus likely having a higher specific activity, that there will be an impact on the Waste Acceptance Criteria (WAC), or a limit on the types and volumes of waste which</p> | <p>The emplacement strategies described are based upon the outcome of the ESC for the site and as such are considered necessary to ensure optimised disposals.</p> <p>We recognise the possibility that over time the waste form and concentrations of radionuclides within the waste could change. This was also recognised by LLW Repository Ltd in their inventory cases used for assessments (LLW Repository Ltd 2011c) and so this issue has already been considered to an extent.</p> <p>We are satisfied that Annual, Periodic and Major reviews of the ESC will continue to analyse disposals and the future predicted inventory with a view to identifying any</p> | <p>5.4.6</p> |

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| <p>can be disposed of from each consignor. We seek reassurance that this will not occur or consultation on any changes in WAC, including restrictions on disposal activities before they come into force in the future.</p> | <p>significant deviation from assumptions made within the ESC, including those which could impact on emplacement strategies. In future reviews of the ESC we expect LLW Repository Ltd to use the most up to date inventory predictions, therefore ensuring that the WAC and ESC maintain linkage.</p> <p>Should the situation arise where the WAC needed to be changed to address this issue LLW Repository Ltd would need to assess the impacts and we would be notified of any proposed changes. We would expect the company to consult consignors appropriately. Additionally, should any changes result in a need to change the permit, dependent upon the significance of the change we may consult upon it.</p> | |
| <p>138 The definition of what constitutes a discrete item appears to not be well defined in current LLW Repository Ltd WAC. The definition of what is a discrete item requires additional clarification to prevent Studsvik Metal Recycling Facility from accepting or creating a waste that cannot be disposed of, and allow us to characterise waste created to suitable extent to enable disposal. Studsvik UK Ltd is seeking clarification on what makes up a discrete item from LLW Repository Ltd, and who holds responsibility for their creation and management; especially under the waste treatment contracts held between Studsvik and LLW Repository Ltd where wastes under treatment are contractually owned by LLW Repository Ltd.</p> | <p>A definition of a discrete item is provided in LLW Repository Ltd's WAC, as derived from the ESC. It is broadly consistent with our own definition in our advice to assessors (Smith 2014).</p> <p>A discrete item, by its nature, is not readily amenable to precise definition. It is likely that the definition of what is a discrete item will always require a degree of judgement. This is because this issue is about an item being 'recognisable', 'not of natural origin' or likely to be a 'focus of interest'. This requires a degree of judgement and would be problematic to define consistently for the varied range of wastes disposed of at the LLWR.</p> <p>We are satisfied with the current definition and consider the assessment of discrete items in the ESC and their inclusion within the WAC to be a significant step forward in controlling waste heterogeneity to ensure the future protection of people who may contact waste following, for example, human intrusion into the waste or coastal erosion. However, we also consider it important that LLW Repository Ltd continue to work with consignors to help them understand the definition and the background to it, but also to help by clarifying and refining the definition (or guidance supporting it) where possible. We note that any significant changes to the WAC must be notified to us</p> | <p>5.4.7</p> |

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|--------------------------|--|--|------------------------------|
| | | <p>before being implemented.</p> <p>We encourage Studsvik to continue engagement on this topic. We note that it is Studsvik’s responsibility to ensure any waste disposed to the LLWR (including whether discrete items are contained within it) is compliant with the WAC, taking into account, where necessary, advice from LLW Repository Ltd.</p> <p>We note that contractual matters over waste ownership under waste treatment contracts are a matter for Studsvik and other parties involved.</p> | |
| 139 | <p>As limits and conditions to meet the environmental safety case are to be controlled through the WAC, Studsvik UK Ltd request that consignors are to be provided with suitable notice to allow containers to be packed to meet the new WAC and a grace period to be in place for containers packed under the previous WAC to be disposed of.</p> | <p>See response to consultation comment 16 (Table 9) and comment 103 (this table).</p> | 5.4.12 |
| 140 | <p>In conclusion Studsvik UK Ltd agrees with the consultation document and the granting of the permit variation to LLW Repository Ltd but does seek reassurance regarding the comments made above.</p> | <p>Noted.</p> | |

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