

Wylfa Newydd Project

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7 Soils and geology

7.1 Introduction

- 7.1.1 This chapter describes the assessment of potential soils and geology effects resulting from the construction, operation and decommissioning of the Logistics Centre at Parc Cybi (hereafter referred to as the 'Logistics Centre').
- 7.1.2 Please refer to chapter B7 (soils and geology) (Application Reference Number: 6.2.7) for the technical basis for the assessment including a summary of legislation, policy and guidance; key points arising in consultation that have guided the soils and geology assessment; and assessment methodologies and criteria.

7.2 Study area

- 7.2.1 This section describes the study area relevant to the soils and geology assessment for the Logistics Centre.
- 7.2.2 The potential effects on soils and geology receptors from the construction, operation and decommissioning of the Logistics Centre are likely to be associated with direct disturbance of ground conditions on-site or the migration of contaminants to/from areas immediately adjacent to the site. As a result, the study area has been limited to a 250m buffer around the Logistics Centre; this is shown on figure H7-1 (Application Reference Number: 6.8.29).

7.3 Baseline environment

- 7.3.1 This section provides a summary of the baseline conditions for soils and geology within the study area described in section 7.2.
- 7.3.2 Further details on the baseline conditions for soils and geology are provided in appendix H7-1 (Soils and Geology Baseline Conditions Report, Application Reference Number: 6.8.15).

Soil quality

Soil type

- 7.3.3 The site area is reported to be underlain by soils belonging to the East Keswick 1 association [RD1]. These soils are characterised by deep, fine loamy soils with slowly permeable subsoils and low natural fertility, although the thickness varies and rocky exposures may be observed.
- 7.3.4 East Keswick 1 soils are also mapped for the wider study area [RD1], although natural soils would be absent in some areas such as in the north of the study area, beneath the railway line and A55 road.

Agricultural Land Classification (ALC)

- 7.3.5 The ALC system set out within *Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land* [RD2] defines six grades of soils: Grade 1 (excellent quality), Grade 2

(very good quality), Subgrade 3a (good quality), Subgrade 3b (moderate quality), Grade 4 (poor quality) and Grade 5 (very poor quality). Grades 1 to Subgrade 3a are determined as Best and Most Versatile land. Best and Most Versatile agricultural land is the most flexible land in terms of the range of crops that can be grown, the level and consistency of yield and the cost of obtaining it, and offers the best prospect for both food and non-food crop production.

- 7.3.6 Information on ALC grade for the site is limited to that gained from a desk-based appraisal of available data [RD3], supplemented by data obtained through a site walkover. Intrusive data from the ground investigation previously undertaken at the site (see the 'artificial geology' section) are not suitable to inform the assessment of ALC. A summary of the ALC appraisal is presented below, whilst the report itself [RD3] is included in appendix H7-1 (Application Reference Number: 6.8.15).
- 7.3.7 Under the climatic conditions of the site, the East Keswick 1 soils present would be limited to Grade 2 or Subgrade 3a (depending on the soil texture) due to wetness and workability limitations. However, during the site walkover, wetland vegetation was observed in the north-western extent of the site, indicative of chronic poor drainage. Grade 4 was therefore considered appropriate for this area. A large band of Subgrade 3a was mapped to the south of this across the north and northeast of the site. This was due to a potential moderate droughtiness limitation owing to predicted shallow soil depths and high stone contents. It was noted that some of this band of Subgrade 3a is likely to be limited by wetness and workability, rather than droughtiness, to Subgrades 3a or 3b or Grade 4. There may also be a gradient limitation [RD2] to Subgrade 3b in this area, as a moderately steep slope aligned southeast to northwest was observed during site reconnaissance. Subgrade 3a is considered to be a conservative assessment of the ALC grade in the absence of intrusive survey data to inform the conclusions.
- 7.3.8 Rock exposures were observed in the centre of the site, with soil depths likely to be particularly shallow. In addition, the rock exposures would render it difficult to farm land between them in practical terms. Therefore, Grade 4 land was mapped in this area. Land across the south of the site was mapped as non-agricultural due to the presence of hardstanding and rock exposures, with natural soils mostly absent. Figure H7-1 (Application Reference Number: 6.8.29) shows the distribution of ALC grades across the site.
- 7.3.9 The desk-based appraisal of ALC grades at the site [RD3] is considered adequate for the purposes of the Environmental Impact Assessment based on the limited presence of natural soils and the nature of the ALC limitations posed.

Artificial geology

- 7.3.10 Published geological mapping [RD4] [RD5] does not indicate the presence of artificial/made ground. However, the site reconnaissance indicated the presence of hardstanding cover in the southern areas of the site, including an approximately 10m² remnant concrete foundation for the Tre-fignarth farmstead. Two additional small areas of concrete foundations (for signposts)

are located in the northern area of the site. Two areas of discarded material exist in the southern area of the site, including a spoil heap and an area of discarded material comprising soil, demolition rubble and small scale fly tipping.

- 7.3.11 A ground investigation and preliminary risk assessment for the site were undertaken to support the design of a vehicle storage area previously proposed for the site [RD6]. During the ground investigation, a number of trial pits and boreholes returned made ground. This was encountered from ground level to depths between 0.3m and 1.3m below ground level and was limited to the southern, western and northern extents of the site. Encountered made ground was described as black-brown clayey gravelly cobbly medium sand, with anthropogenic material including slate, concrete and tile.
- 7.3.12 Within the study area, artificial/made ground is expected to be confined to areas associated with roads, nearby rail track and a business park.

Superficial geology

- 7.3.13 Published geological mapping indicates the majority of the site to be underlain by Devensian glacial till, described as diamicton [RD7]. A small area extending from the centre of the site across the southwestern boundary is listed as glaciofluvial deposits consisting of sand and gravel. Figure H7-2 (Application Reference Number: 6.8.29) presents the superficial geology for the site.
- 7.3.14 Glacial till was encountered in all boreholes and trial pits during the ground investigation for the previous assessment. Till occurred between ground level and 4.7m below ground level, with a maximum thickness of 3.9m. The glacial till deposits were described as laterally and vertically heterogeneous brown and grey slightly clayey medium to coarse sand with boulders. Materials consistent with glaciofluvial deposits were encountered in the northeast of the site. Deposits were encountered between 2.0m and 3.6m below ground level, with a maximum thickness of 1.6m. Glaciofluvial deposits were described as light brown silty fine sand with closely spaced laminations and light brown slightly gravelly fine to coarse sand.

Bedrock geology

- 7.3.15 Published geological mapping indicates that the site is underlain by rocks belonging to the New Harbour Group, comprising mica schist and psammite derived from metamorphism of sea floor sediments [RD7]. The South Stack formation, comprising psammite and pelite, is mapped to be present approximately 60m west of the site. Approximately 90m southwest of the site, a 150m-long Jasper bed, belonging to the New Harbour Group, is indicated to be present. Figure H7-3 (Application Reference Number: 6.8.29) presents the bedrock geology for the site.
- 7.3.16 Geological mapping indicates that the site is bisected by a northwest–southeast striking fault.

Land contamination

Historical and current land use – potential sources of contamination

- 7.3.17 The former land use of the site has been reviewed using historical Ordnance Survey maps from the Groundsure report [RD4] (refer to appendix H7-1, Application Reference Number: 6.8.15, for a copy of the report). The maps show that the majority of the site has remained undeveloped agricultural land since the earliest available historical maps, with the only developed portions of the site comprising the Tre-fignarth farmstead in the south-eastern extent and the Parc Cybi road running across the southern extent of the site. A small area in the centre of the site is covered by trees and shrubs. There is a large area of hardstanding in the south of the site, as well as two areas of discarded materials; a rubble heap and an area of discarded materials comprising soil; demolition rubble and small scale fly tipping. A full summary of historical uses on-site is presented in appendix H7-1 (Application Reference Number: 6.8.15).
- 7.3.18 The land surrounding the site within the study area has also remained largely undeveloped agricultural land. The most significant development was the construction of the A55 road shown as completed on mapping from 2002, and a railway line immediately to the north of the site which pre-dates the earliest historical maps (1887). Other nearby development includes Penrhos Business Park in the northwest extent of the study area. Only one building within the business park, an unlisted warehouse, is located within the study area. At the north-eastern extent of the study area, a historical aluminium works is present (now listed as an energy centre). Only tanks and a car park associated with the works are listed within the study area.
- 7.3.19 The *Explosive Ordnance Desktop Threat Assessment* advised that the risk of unexploded ordnance at the site is medium [RD8]. This conclusion was reached through analysis of historical information, including information regarding German air attacks on Holyhead, troop manoeuvres and the presence of an allied pillbox 240m southeast of the site (not indicated on historical maps). The report indicates that the risk of encountering discarded or buried ammunition from allied troops either stationed or undertaking exercises in the area cannot be ruled out, and therefore there remains a medium risk of unexploded ordnance being encountered [RD8].
- 7.3.20 The ground investigation undertaken by Tier Environmental in 2015 [RD6] identified the following:
- made ground in the south-eastern areas of the site (described as anthropogenic material including slate, concrete and tile);
 - a very low risk of carbon dioxide accumulation in enclosed spaces, potentially leading to asphyxiation; and
 - no contaminants of concern above Generic Assessment Criteria relevant to the proposed use of the site at that time (a commercial warehouse and car park).

- 7.3.21 A site walkover was conducted in May 2017, which provided further information on current site conditions.
- 7.3.22 Based on the results of the ground investigation, site walkover and desk-based review of historical and current land uses, the potential sources of contamination below were identified.
- On-site:
 - made ground associated with hardstanding of tarmac and concrete and the road running through the south of the site;
 - farming activities (including potential isolated sheep dips, cess pits, etc., if present);
 - rubble heap, located south of the wooded area (brick, stone and rubble); and
 - potential unexploded ordnance.
 - Off-site:
 - railway land to the north of the site.

- 7.3.23 Figure H7-4 (Application Reference 6.8.29) presents a plan showing these potential contamination sources. Further details on the site history, ground investigation and potential contamination sources are provided in appendix H7-1 (Application Reference Number: 6.8.15).

Potential receptors of contamination

- 7.3.24 Relevant receptors of contamination for the purposes of this assessment include human health, controlled waters (surface water and groundwater) and property (which includes buildings and infrastructure). These receptors are aligned with the key receptor groups set out within the *Contaminated Land Statutory Guidance for Wales 2012* [RD9].
- 7.3.25 Human health receptors have been subdivided into key groups, with different characteristics. These groups are set out below.
- Construction workers: during earthworks there is a high likelihood of contact with site soils and contact with groundwater is likely.
 - Future site users: contact with site soils and groundwater would be unlikely (due to abundance of hardstanding cover).
 - Maintenance workers: for routine maintenance work, contact with site soils is likely whilst there is a low likelihood of contact with groundwater.
 - Adjacent land users: primarily agricultural land use, with future plans for a large industrial park to populate the surrounding area. There is a low likelihood of inhalation of wind-blown dusts and contaminants migrating from site (due to abundance of hardstanding cover).
- 7.3.26 Controlled waters comprise the receptors set out below:
- surface water: small watercourses in the northern area of the site (low value receptor); and
 - groundwater: Secondary aquifers (low value receptor).

Refer to chapter H8 (surface water and groundwater) (Application Reference Number: 6.8.8) for further details.

7.3.27 Property receptors comprise:

- buildings and infrastructure of the Logistics Centre.

7.3.28 Given the proposed use of the Logistics Centre and wider area as a business park, other property receptors (crops and livestock) are not considered relevant, and are not discussed further.

7.3.29 Although not a receptor of contamination as such, potential effects on the soil quality receptors identified earlier in this section are considered under the 'land contamination' headings within section 7.5, since land contamination could act to reduce soil quality.

Conceptual site model

7.3.30 Potential sources, receptors and pathways of contamination have been identified and developed into a conceptual site model. The conceptual site model outlines the potential pollutant linkages, for which a qualitative risk assessment has been undertaken in accordance with guidance outlined in *Contaminated Land Report 11: Model Procedures for the Management of Land Contamination* [RD10] and *Contaminated land risk assessment: A guide to good practice* (C552) [RD11].

7.3.31 The conceptual site model indicated that moderate risks may be posed to site users and buildings by unexploded ordnance and moderate/low risks associated with the accumulation of ground gases on-site. However, for ground gases, this is the lowest possible risk outcome based on the severity of the risk.

7.3.32 Moderate/low risks may also be posed to human health and environmental receptors from contamination associated with the demolition of buildings or farming activities that were not identified during the ground investigation. Moderate/low risks from contamination to human health and environmental receptors were also identified from potential contaminants within the rubble heap.

7.3.33 The full conceptual site model is presented within appendix H7-1 (Application Reference Number: 6.8.15).

Sites of geological importance

7.3.34 The Isle of Anglesey was designated as a European Geopark (the GeoMôn Geopark) in 2009 as a result of its outstanding geodiversity and geological heritage. Furthermore, in November 2015, the GeoMôn Geopark was designated as a United Nations Educational, Scientific and Cultural Organisation Global Geopark [RD12]. The new designation is intended to raise awareness and promote respect for the environment and integrity of the landscape. The status also expresses governmental recognition of the importance of holistic management of the Geoparks. The designation is not legislative, but the key heritage sites within the Geoparks should be protected under local, regional or national legislation as appropriate.

- 7.3.35 As noted in chapter B7 (Application Reference Number: 6.2.7), sites of geological importance within the Geopark have been identified as the receptors for soils and geology across the Environmental Statement. No sites of geological importance are present within the study area, and thus they are not considered further in this chapter.

Geological resources

- 7.3.36 Geological resources are defined as geological deposits that have a potentially viable economic value by virtue of the resource type or the amount of a specific deposit present.
- 7.3.37 The site and the southwestern and eastern extents of the study area have been identified as a Category 1 Aggregate Safeguarding Area for sand and gravel [RD13]. Category 1 Aggregate Safeguarding Areas are resources considered to be of national importance.
- 7.3.38 The Aggregates Safeguarding Area identified within the study area was not recommended for safeguarding within *Hard Rock and Sand & Gravel Safeguarding Areas in Ynys Môn* [RD14].

Evolution of the baseline

- 7.3.39 Soil quality is the only aspect of the baseline environment likely to naturally and significantly evolve in the foreseeable future.
- 7.3.40 The UK Climate Projections published in 2009 indicate that increases in annual, summer and winter temperatures are likely for Wales through to at least 2100 [RD15], whilst mean precipitation levels would likely decrease for summers and increase for winters, according to most modelling scenarios.
- 7.3.41 Taken in isolation, climate is not currently a limiting factor to ALC within the study area and is unlikely to become one in the future based on projections [RD15] [RD16].
- 7.3.42 The predominant limiting factors for ALC at the Logistics Centre are currently wetness and workability, and droughtiness [RD3]. A general subtle trend towards drier soils across England and Wales is predicted [RD15] [RD16], which could result in soil wetness becoming less of a limitation for the site. In contrast, droughtiness is predicted to become a greater limiting factor across Wales due to warmer and drier summers [RD15] [RD16], which could affect shallow and stony soils at the site.
- 7.3.43 Limiting factors for soil quality across the wider study area are not known but would likely be similar; thus, the potential effects of climate change are anticipated to be similar.
- 7.3.44 Potential changes in ALC grade may be localised and variable, such that there may be both improvements and deteriorations in ALC grade across the study area.
- 7.3.45 For further discussion of the effects of climate change on the Wylfa Newydd Project, refer to chapter B1 (introduction to the assessment process) (Application Reference Number: 6.2.1).

7.4 Design basis and activities

- 7.4.1 This section sets out the design basis for the assessment of effects. It sets out where any assumptions have been made to enable the assessment to be carried out at this stage in the evolution of the design. This section also identifies the embedded and good practice mitigation that will be adopted to reduce adverse effects as inherent design features or by implementation of standard industry good working practice.
- 7.4.2 As described in chapter H1 (proposed development) (Application Reference Number: 6.8.1), the application for development consent is based on a parameter approach. The assessment described within this chapter has taken into consideration the flexibility afforded by the parameters. A worst case scenario has therefore been assessed from a soils and geology perspective within the parameters described in chapter H1 (Application Reference Number: 6.8.1).

Construction

- 7.4.3 The design and construction of the Logistics Centre would be in accordance with the description provided in chapter H1 (Application Reference Number: 6.8.1). The main activities that could affect soils and geology receptors comprise the following:
- stripping and temporary stockpiling of topsoil and subsoil (as required);
 - bulk earthworks to create a platform for construction of the Logistics Centre;
 - installation of drainage and other utility works;
 - installation of new hard landscaping and constructions of buildings; and
 - completion of soft landscaping.

Basis of assessment and assumptions

- 7.4.4 For the purposes of this assessment, the assumptions listed below have been made.
- Topsoil would be stripped from the footprint of the proposed hardstanding and from areas affected by construction works to a depth of 300mm below ground level.
 - Stripped topsoil would be removed from site for sustainable reuse within the Wylfa Newydd Project or at a suitable third-party receptor site. Small volumes of topsoil would be retained for use within the soft landscaping on-site.
 - There would be a need for cut and fill across the site to provide a level platform for construction. This would involve subsoil stripping in areas of higher elevation (in the southwest of the site), followed by its reuse in areas of lower elevation (in the northeast of the site), although quantities of subsoil cut and fill are yet to be determined. It is assumed that subsoil in areas of lower elevation would remain *in situ*. The reuse of subsoil on-

site is subject to its geo-environmental and geotechnical suitability. If the subsoil is found unsuitable for reuse due to geo-environmental or geotechnical limitations, it would be removed for sustainable reuse within the Wylfa Newydd Project or at a suitable third-party receptor site.

- While the majority of the rock exposure in the southeast of the site would be retained, some excavation of rock from this outcrop is required. This would be reused sustainably on-site as fill material.
- The rubble heap and fly tipped material would be removed from site prior to construction works commencing.

Embedded mitigation

7.4.5 No embedded mitigation measures have been identified for construction.

Good practice mitigation

7.4.6 The good practice mitigation measures identified for construction are set out below.

Land contamination

7.4.7 Section 9 of the Wylfa Newydd Code of Construction Practice (CoCP) (Application Reference Number: 8.6) sets out the management strategies for dealing with land contamination which would apply to the Logistics Centre site.

7.4.8 Good practice mitigation during construction would include the preparation of an unexpected contamination scheme of measures prior to the commencement of any activities that involve ground disturbance in order to address any areas of unexpected contamination encountered. Processes and procedures would be established that clearly set out the method for dealing with any material affected by contamination encountered during construction works.

Pollution prevention

7.4.9 The water management strategy (section 10) of the Wylfa Newydd CoCP (Application Reference Number: 8.6) sets out the overarching pollution management principles and pollution prevention techniques to be applied throughout the construction period. Good practice mitigation during construction would include measures such as good equipment maintenance and repair and containment systems for all fuel storage areas to reduce leaks and spills.

Materials management

7.4.10 Good practice mitigation would include the implementation of materials management measures in accordance with the materials management strategy set out in section 9 of the Wylfa Newydd CoCP (Application Reference Number: 8.6).

7.4.11 The reuse of materials would be managed in accordance with *The Definition of Waste: Development Industry Code of Practice* [RD17]. This would allow

the reuse of excavated materials as far as possible without them being defined as waste.

Waste management

- 7.4.12 Section 9 of the Wylfa Newydd CoCP (Application Reference Number: 8.6) includes a site waste management strategy which sets out a framework for the management of wastes to reduce the amount of waste disposed to landfill. Further details on waste management are also provided in chapter C6 (waste and materials management) (Application Reference Number: 6.3.6).

Soil management

- 7.4.13 Topsoil and subsoil (where necessary) would be stripped from where construction activities would otherwise affect (e.g. compact or seal) it, as identified above. This would be undertaken towards the start of the construction works. The topsoil (and subsoil) would then be reused sustainably within the Wylfa Newydd Project or at a suitable third-party receptor site (e.g. via the CL:AIRE Register of Materials).

- 7.4.14 Good practice mitigation during construction would follow guidance on soil management such as the *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites* [RD18]. The measures would include:

- appropriate procedures for soil handling, such as stopping works when soil moisture exceeds certain limits;
- appropriate segregation of soils, including the segregation of topsoils and subsoils, as well as soils of distinctly different qualities, types or composition;
- soils would be stockpiled using methods appropriate to the soil moisture conditions;
- the height of topsoil storage mounds would be limited to 2m in order to reduce potential adverse effects on topsoil quality and suitability for reuse;
- soil storage mounds would have slopes of one in two (approximately 25°) or less wherever practicable; and
- where soils would be stored for longer than 60 days, stockpiles would be seeded with an appropriate low-maintenance seed mix.

- 7.4.15 Implementation of the soil management measures set out within section 9 of the Wylfa Newydd CoCP (Application Reference Number: 8.6) would reduce effects on soil quality resulting from the stripping, handling and reuse of soil during construction works (this includes soil potentially reused elsewhere within the Wylfa Newydd Project).

Operation

- 7.4.16 The operation of the Logistics Centre has the potential to cause effects on soils and geology receptors discussed in section 7.3. No activities in particular are considered to need highlighting.

Basis of assessment and assumptions

- 7.4.17 No assumptions have been identified for operation beyond the information set out in chapter H1 (Application Reference Number: 6.8.1).

Embedded mitigation

- 7.4.18 No embedded mitigation measures have been identified for operation.

Good practice mitigation

- 7.4.19 Pollution prevention strategies would be implemented during operation in accordance with the surface water and groundwater strategy (section 10) of the Wylfa Newydd Code of Operational Practice (Application Reference Number: 8.13). These aim to reduce the risk of accidental leaks and spills occurring and any effects on receptors, should they occur.

Decommissioning

- 7.4.20 The vehicle scanner and kiosk building would be removed during decommissioning. The soft landscaping and hardstanding would remain *in situ*. Activities associated with decommissioning have the potential to cause effects on soils and geology receptors, as discussed in section 7.3.

Basis of assessment and assumptions

- 7.4.21 No assumptions have been identified for decommissioning beyond the information set out in chapter H1 (Application Reference Number: 6.8.1).

Embedded mitigation

- 7.4.22 No embedded mitigation measures have been identified for decommissioning.

Good practice mitigation

- 7.4.23 No good practice mitigation measures have been identified for decommissioning.

7.5 Assessment of effects

- 7.5.1 This section presents the findings of the assessment of effects associated with the construction, operation and decommissioning of the Logistics Centre.

Construction

Soil quality

Stripping of topsoil

- 7.5.2 Topsoil would be stripped from the majority of the site prior to reuse off site or in landscaping, with limited temporary topsoil storage during construction, as identified in section 7.4. During topsoil stripping, storage and handling, the effects set out below may occur.

- Soil deformation could occur through compaction and smearing, as a result of trafficking and handling of the soil.
 - Stripping topsoil too deeply, thereby incorporating subsoil, or stripping to too shallow a depth could respectively lead to a degradation of soil quality or result in the loss of valuable topsoil.
 - If soils of different types or quality are found to be present and are mixed during topsoil stripping and storage, higher quality soils may be degraded.
 - If topsoil is stored incorrectly, there is a potential for degradation to occur as a result of physical, chemical or biological changes due to compaction or anaerobism.
- 7.5.3 The implementation of the good practice soil management measures identified in section 7.4 would reduce the potential for these effects to occur. For instance, stopping works when soil moisture exceeds specific limits would reduce the potential for compaction and smearing, and the appropriate segregation of soils would reduce the potential for mixing. As such, only a small magnitude of change would occur. This would result in a minor adverse effect on the high value (Subgrade 3a) and low value (Grade 4) topsoils identified on-site.
- 7.5.4 It should be noted that with regards to the topsoil removed from site, the effects would be largely reversible at the receptor site to which the topsoil is reinstated, provided appropriate handling and aftercare measures are implemented.
- Retention of subsoil***
- 7.5.5 As per section 7.4, some subsoil would be stripped from areas of higher elevation and reused to raise levels elsewhere, whilst subsoil in areas of lower elevation would remain *in situ*. It is expected that all of this subsoil would subsequently be covered with hardstanding. This would lead to the permanent loss of the subsoil as a resource. The magnitude criteria set out in tables B7-10 and B7-11 (see chapter B7, Application Reference Number: 6.2.7) suggest that the loss of Subgrade 3a (high value) and Grade 4 (low value) soils would result in large and medium magnitudes of change respectively.
- 7.5.6 However, the total estimated areas of Subgrade 3a and Grade 4 soils are limited to approximately 1.3ha and 1.1ha respectively, with subsoils likely of limited depth across much of these areas due to shallow rock. As such, the volume of subsoil likely to be lost is considered to be relatively limited. In addition, the loss of subsoils does not represent the total loss of the soil resources *per se*, since topsoils would be stripped and reused sustainably. Therefore, it is considered appropriate to downgrade the magnitudes of change to medium and small for the Subgrade 3a and Grade 4 soils respectively using professional judgement, leading to a minor adverse effect across both ALC grades present.

Remaining construction activities

- 7.5.7 The remaining construction activities, such as drainage and utility works and soft landscaping, are considered unlikely to create any additional effects upon soils, beyond those identified above. This is because topsoil would be stripped from areas affected by construction works (the effect of which has been assessed above), and the potential effects on retained subsoil are assessed above.

Land contamination

Unexpected contamination

- 7.5.8 Previous investigations have not identified significant sources of ground contamination at the site. The ground investigation by Tier Environmental [RD6] included comparison of chemical testing results from made ground encountered on-site against Generic Assessment Criteria, and all results were found to be below levels at which they could potentially pose risks to human health receptors. See appendix H7-1 (Application Reference Number: 6.8.15) for further information.
- 7.5.9 Nevertheless, there remains the potential for the exposure or mobilisation of unexpected contamination during construction which could affect construction workers (high value), Subgrade 3a soils (high value), Grade 4 soils (low value) or controlled waters (low value). Given the site history has been primarily agricultural, it is considered unlikely that pollutant linkages would occur, with the implementation of the good practice mitigation measures identified in section 7.4 also lowering the likelihood. For Subgrade 3a soils, Grade 4 soils and controlled waters, the magnitude of change would be negligible based on the low risks posed and the effect would be negligible. The risks to construction workers would be higher than for soils and controlled waters in the unlikely event that unexpected contamination were encountered, but they remain very low. Therefore, a small magnitude of change and minor adverse effect has been identified for construction workers.
- 7.5.10 No effects have been identified for adjacent land users (high value) from unexpected contamination, as it is very unlikely that pollutant linkages would occur.

Pollution incidents causing soil contamination

- 7.5.11 During construction, there is the potential for activities and pollution incidents to cause new contamination on-site. This could be as a result of leaks or spills from construction plant, or fuel and chemical storage facility leaks. Any contamination resulting from such events has the potential to pose risks to construction workers (high value), Subgrade 3a soils (high value) or Grade 4 soils (low value).
- 7.5.12 However, the implementation of pollution prevention strategies in accordance with the Wylfa Newydd CoCP (Application Reference Number: 8.6), e.g. bunding of any fuel tanks and good maintenance of equipment would reduce this risk. As such, the magnitude of change would be negligible across the

range of the identified high and low value receptors and the resulting effects would be negligible.

- 7.5.13 For effects that occur to surface water and groundwater, including leaks and spills, reference should be made to chapter H8 (Application Reference Number: 6.8.8).

Encountering buried unexploded ordnance

- 7.5.14 An *Explosive Ordnance Desktop Threat Assessment* [RD8] of the site area concluded that the risk of encountering unexploded ordnance was medium.
- 7.5.15 Whilst an intrusive ground investigation has occurred on-site, the risk of encountering unexploded ordnance during the construction works required for the Logistics Centre cannot be ruled out. It is therefore considered that the magnitude of change would be moderate (given the low likelihood of a risk occurring) for construction workers (high value receptor), who may be harmed by any unexploded ordnance encountered. Accordingly, the effect would be moderate adverse.

Geological resources

- 7.5.16 Due to the relatively shallow nature of the proposed excavations, it is unlikely that the Category 1 Aggregates Safeguarding Area identified in the south of the site would be excavated during the construction works. There would be a loss of access to the resource, but the proportion affected would be minor (<50%) and the length of time that access would be restricted during construction would be relatively short.
- 7.5.17 Accordingly, the magnitude of change for the high value geological resources resulting from construction would be negligible and the degree of effect would also be negligible.

Operation

Soil quality

- 7.5.18 No adverse effects are anticipated on soil quality during operation as the majority of topsoil would have been removed from site. The loss of subsoil is considered within the construction phase assessment.

Land contamination

Unexpected contamination

- 7.5.19 Although there remains the potential for unexpected contamination to be present which may affect receptors during operation, e.g. as a result of mobilisation during in-ground maintenance works, the likelihood of this occurring is very low. This is due to the fact that ground investigations have not identified any contamination and any unexpected contamination encountered during construction would be appropriately managed as set out within the Wylfa Newydd CoCP (Application Reference Number: 8.6). It is therefore considered that any magnitude of change would be negligible for the receptors: maintenance workers (high value), future site users (high value),

buildings and infrastructure (medium value) and controlled waters (low value). The degree of effect from this change would be negligible.

Pollution incidents causing soil contamination

- 7.5.20 During the operation of the Logistics Centre, the only receptors that might be affected by pollution incidents would be the limited soils remaining on-site in landscape areas (conservatively assumed to be Subgrade 3a and high value), maintenance workers and future site users (high value). However, the implementation of pollution prevention strategies by way of the Wylfa Newydd CoCP (Application Reference Number: 8.6) would reduce the risk of potential leaks and spills, such that soils are unlikely to be affected by pollution incidents, and the likelihood of contaminants in soils then posing risks to human health is very low. As such the magnitude of change across the receptors would be negligible and any potential effects would be negligible.

Encountering buried unexploded ordnance

- 7.5.21 There is the possibility of disturbing unexploded ordnance that is not encountered during the construction phase, e.g. the maintenance of the tank, but this is very low as the ground in the vicinity of the tank would be disturbed during construction. It is therefore considered that any magnitude of change would be negligible (due to the fact that unexploded ordnance is very unlikely to be present) for maintenance workers (high value), future site users (high value) and buildings and infrastructure (medium value). Accordingly, the effect would be negligible.

Geological resources

- 7.5.22 The presence of hardstanding associated with the Logistics Centre (which is not proposed to be removed upon decommissioning) would permanently sterilise a minor part (<50%) of the Category 1 Aggregates Safeguarding Area (high value). A small magnitude of change is predicted resulting in a minor adverse effect.

Decommissioning

Soil quality

- 7.5.23 No adverse effects on soil quality are predicted to occur during decommissioning as any remaining soil in landscaped areas is anticipated to remain *in situ*.

Land contamination

Unexpected contamination

- 7.5.24 As decommissioning would be limited to the removal of structures with no excavations expected to be required, there would not be any disturbance or mobilisation of any remaining unexpected contamination. Therefore, no effect would occur in this regard.

Pollution incidents

- 7.5.25 There is the potential for accidental pollution incidents during the decommissioning works. However, it is expected that appropriate procedures would be implemented to reduce the potential for, and the scale of, any pollution incidents. The receptors, magnitude of change and effect would be as described for the operational phase, and as such, the effect would be negligible.

Encountering buried unexploded ordnance

- 7.5.26 As there are very limited works associated with the decommissioning (hardstanding would remain in place), it is very unlikely that unexploded ordnance would be encountered. As such, no effects would occur in this regard.

Geological resources

- 7.5.27 No further effects to geological resources (beyond the sterilisation during operation) would occur during the decommissioning of the Logistics Centre.

7.6 Additional mitigation

- 7.6.1 In accordance with chapter B1 (Application Reference Number: 6.2.1) of this Environmental Statement embedded and good practice mitigation measures relevant to soils and geology were taken into account when determining the 'pre-mitigation' significance of effects. These are detailed in the design basis and activities section of this chapter.
- 7.6.2 Additional mitigation measures would be implemented to address the potential significant effect identified in the assessment of effects section. These additional mitigation measures are summarised in table H7-1. No additional mitigation measures have been identified for operation or decommissioning.

Construction

Table H7-1 Additional mitigation measures – construction

Additional mitigation measures	Objective	Achievement criteria and reporting requirements
Prior to undertaking any works on the Logistics Centre site, Horizon would undertake a non-intrusive magnetometer survey across the Logistics Centre site to further investigate the potential for unexploded ordnance.	To mitigate the potential for unexploded ordnance to affect construction workers during excavations.	The magnetometer survey would typically locate buried ordnance to a depth of up to 4m for a 50kg bomb (the smallest used by the Luftwaffe) and deeper for large bombs [RD8]. This would provide a strong indication of whether unexploded ordnance is present.
Horizon would ensure an explosive ordnance disposal engineer is present on site during the shallow intrusive works in the southeast of the site where hardcore is present, see section 4 of the Logistics Centre sub-CoCP (Application Reference Number: 8.11).	To mitigate the potential for unexploded ordnance to affect construction workers during excavations.	The role of the explosive ordnance disposal engineer would be to provide support including monitoring works using visual recognition and instrumentation, immediate response, and providing advice to staff including safety and awareness briefings; and providing advice to staff on the modification of working practices to take account of the ordnance threat [RD8].

7.7 Residual effects

- 7.7.1 No significant residual effects have been identified for soils and geology. One significant effect was identified prior to the application of additional mitigation, and this is summarised in table H7-2.
- 7.7.2 The minor adverse residual effects identified are summarised in appendix I3-1 (master residual effects table) (Application Reference Number: 6.9.8) and include:

- degradation of Subgrade 3a and Grade 4 topsoils during construction (minor adverse);
- permanent loss of Subgrade 3a and Grade 4 subsoils during construction (minor adverse);
- potential exposure of construction workers to unexpected contamination (minor adverse);
- potential harm from unexploded ordnance (minor adverse) – this would be mitigated from moderate adverse through the identified additional mitigation, as the likelihood of occurrence would be reduced; and
- permanent sterilisation of a minor part of a Category 1 Aggregates Safeguarding Area during operation (minor adverse).

Table H7-2 Summary of residual effects

Receptor (or group of receptors)	Value of receptor(s)	Description of potential effect	Nature of effect	Potential magnitude of change	Potential significance of effect	Additional mitigation	Post-mitigation magnitude of change	Significance of residual effect
Construction								
Construction workers	High	Potential harm from unexploded ordnance	Direct Adverse Local Short-term	Medium	Moderate adverse	<ul style="list-style-type: none"> • Magnetometer survey. • Presence of explosive ordnance disposal engineer. 	Small	Minor adverse

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7.8 References

Table H7-3 Schedule of references

ID	Reference
RD1	Soil Survey of England and Wales. 1983. <i>Soils of England and Wales, Sheet 2. Wales.</i>
RD2	Ministry of Agriculture, Fisheries and Food. 1988. <i>Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land.</i> London: Her Majesty's Stationery Office.
RD3	Reading Agricultural Consultants Ltd. 2017. <i>Parc Cybi Logistics Centre, Holyhead, Anglesey: Agricultural Land Classification Appraisal.</i>
RD4	Groundsure. 2017. Enviro Insight, Geo Insight and Large and Small Scale Historical Maps Report Pack (GS-3851522, 3851523 and 3851524).
RD5	British Geological Survey. 1974. <i>1:50,000 Scale 'Solid and Drift Geology' Geological Map of Anglesey</i> (Special Sheet 092).
RD6	Tier Environmental Ltd. 2015. A Ground Investigation Report for Zone 7, Parc Cybi, Holyhead, Anglesey.
RD7	British Geological Survey. 2017. <i>Geology of Britain Viewer.</i> [Online]. [Accessed: 21 April 2017]. Available from: http://mapapps.bgs.ac.uk/geologyofbritain/home.html .
RD8	Dynasafe. 2017. <i>Explosive Ordnance Desktop Threat Assessment.</i> Parc Cybi, Holyhead.
RD9	Welsh Government. 2012. <i>Contaminated Land Statutory Guidance for Wales 2012.</i> [Online]. [Accessed: 19 May 2017] Available from: http://gov.wales/topics/environmentcountryside/epq/contaminatedland/guidance2012/?lang=en .
RD10	Department for Environment, Food and Rural Affairs and Environment Agency. 2004. <i>Model Procedures for the Management of Land Contamination: Contaminated Land Report 11 (CLR11).</i> Bristol: Environment Agency.
RD11	Rudland, D.J, Lancefield, R.M. and Mayell, P.N. 2001. <i>Contaminated land risk assessment: A guide to good practice</i> (C552). London: CIRIA.
RD12	The United Nations Educational, Scientific and Cultural Organization (UNESCO). 2016. <i>New UNESCO programme recognises the UK's seven 'Global Geoparks'.</i> [Online]. [Accessed: 10 January 2016]. Available from: http://www.unesco.org.uk/news/new-unesco-programme-recognises-the-uks-seven-global-geoparks/

ID	Reference
RD13	British Geological Survey and Welsh Assembly Government. 2012. <i>North West Wales Aggregates Safeguarding Map</i> . [Online]. [Accessed: April 2017]. Available from: http://nora.nerc.ac.uk/20133/1/NW_Wales_FINAL.pdf .
RD14	Capita Symonds. 2010. <i>Hard Rock and Sand & Gravel Safeguarding Areas in Ynys Môn</i> .
RD15	HR Wallingford. 2012. <i>A Climate Change Risk Assessment for Wales. Defra Project Code GA0204</i> . [Online]. [Accessed: 18 May 2017]. Available from: http://gov.wales/docs/desh/publications/120126climateriskassess_en.pdf .
RD16	Keay, C.A., Jones, R.J.A., Procter, C., Chapman, V., Barrie, I. 2014. <i>SP1104 the Impact of Climate Change on the Capability of Land for Agriculture as Defined by the Agricultural Land Classification</i> . [Online]. [Accessed: 18 May 2017]. Available from: http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=16929
RD17	Contaminated Land: Applications in Real Environments (CL:AIRE). 2011. <i>The Definition of Waste: Development Industry Code of Practice</i> . Version 2. London: CL:AIRE.
RD18	Department for Environment, Food and Rural Affairs. 2009. <i>Construction Code of Practice for the Sustainable Use of Soils on Construction Sites</i> . London: Defra.