HORIZON NUCLEAR POWER

WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

# Wylfa Newydd Project

## 6.7.7 ES Volume G - A5025 Off-line Highway Improvements G7 - Soils and geology

PINS Reference Number: EN010007

Application Reference Number: 6.7.7

June 2018

Revision 1.0

Regulation Number: 5(2)(a)

Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Horizon Internal DCRM Number: WN0902-JAC-PAC-CHT-00079

[This page is intentionally blank]

# Contents

[This page is intentionally blank]

# 7 Soils and geology

## 7.1 Introduction

7.1.1 This chapter describes the assessment of potential effects associated with soils and geology resulting from the construction and operation of the A5025 Off-line Highway Improvements.

7.1.2 Project-wide waste implications of the A5025 Off-line Highways Improvements have been assessed in chapter C6 (waste and materials management) (Application Reference Number: 6.3.6).

7.1.3 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 during consultation that have guided the soils and geology assessment; and assessment methodologies and criteria.

## 7.2 Study areas

7.2.1 This section describes the study areas relevant to the soils and geology assessment for the A5025 Off-line Highway Improvements.

7.2.2 The potential effects on receptors from the A5025 Off-line Highway Improvements relevant to soils and geology 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. The assessment of the effects on soils and geology receptors has therefore been limited to 250m buffer zones around each section of the A5025 Off-line Highways Improvements, termed the ‘study areas’ for the remainder of this chapter.

7.2.3 The study areas are shown as green dashed lines in figures G7-1 (Application Reference Number: 6.7.48), G7-2 (Application Reference Number: 6.7.48) and G7-3 (Application Reference Number: 6.7.48). They comprise four highway sections and the Power Station Access Road Junction, as detailed below.

### *Section 1: Valley*

7.2.4 Section 1 covers the junction between the A5025 and the A5 to the east of the village of Valley. A Construction Compound, including plant and materials storage areas, is to be located in the north of the section. An area west of the proposed new highway alignment has been identified as a flood compensation area in which ground levels are proposed to be lowered by up to 1.2m. The study area around section 1 is identified in figure G7-1 (Application Reference Number: 6.7.48).

### *Section 3: Llanfachraeth*

7.2.5 Section 3 bypasses the village of Llanfachraeth to the east. In addition to the road alignment, the section also comprises three proposed attenuation ponds. A Construction Compound, including plant and materials storage areas, is to

be located near the south of the section. The study area, as identified in figure G7-1 (Application Reference Number: 6.7.48), includes most of the village of Llanfachraeth in the west.

### *Section 5: Llanfaethlu*

7.2.6 The study area for Section 5 is identified in figure G7-2 (Application Reference Number: 6.7.48). The north of section 5 is located immediately east of the village of Llanfaethlu. In addition to the new road alignment, the section also includes three proposed attenuation ponds. A Construction Compound, including plant and materials storage areas, is to be located in the south of the study area.

### *Section 7: Cefn Coch*

7.2.7 Section 7 runs immediately to the west of the existing A5025 alignment north of Llanrhuddlad. It includes the new road alignment and three attenuation ponds. A Construction Compound, including plant and material storage areas, would be located in the south of the section. The study area is identified in figure G7-2 (Application Reference Number: 6.7.48).

### *Power Station Access Road Junction*

7.2.8 The Power Station Access Road Junction is proposed to be located north of the dwelling named Groes-fechan and would connect the Power Station Access Road to the A5025. The Construction Compound for section 7 would be used for the Power Station Access Road Junction. The study area is identified in figure G7-3 (Application Reference Number: 6.7.48).

## 7.3 Baseline environment

7.3.1 This section provides a summary of the baseline conditions for soils and geology within the study areas described in section 7.2.

7.3.2 This section includes a review of baseline land contamination information as it relates to human health and controlled waters receptors. Specific risks with respect to ground or surface water contamination are considered in chapter G8 (surface water and groundwater) (Application Reference Number 6.7.8).

7.3.3 The baseline conditions for soils and geology have been determined through a combination of desk-based research, commercially and publically available data, site walkovers and interpretation of conditions encountered during site-based surveys and Ground Investigations (GIs). The key sources of information used in determining the baseline were:

- National Soil Resource Institute soils site reports for the study areas [RD1]; [RD2]; [RD3]; [RD4]; and [RD5];
- British Geological Survey (BGS) mapping [RD5];
- Agricultural Land Classification (ALC) surveys undertaken within the study areas and Wylfa Newydd Development Area [RD6]; [RD7];

- preliminary sources study reports for the A5025 Off-line Highway Improvements produced by RSK [RD8]; [RD9]; [RD10]; [RD11];
- factual reports from the Structural Soils Ltd. (SSL) GI for the A5025 Off-line Highway Improvements [RD12]; [RD13]; [RD14]; and [RD15];
- GI reports produced by AECOM using data from the SSL GI [RD16]; [RD17]; [RD18]; and [RD19];
- Groundsure MapInsight report (historical Ordnance Survey maps) for the study areas [RD20];
- *North West Wales Aggregates Safeguarding Map* [RD21]; and
- *Hard Rock and Sand and Gravel Safeguarding Areas in Ynys Môn* report produced by Capita Symonds for the Isle of Anglesey County Council (IACC) [RD22].

7.3.4 The preliminary sources study reports produced by RSK [RD8 – RD11] present a desk-based assessment of potential risks from land contamination and have been used to inform the discussions for each section presented below. In addition, following the GI works undertaken by SSL [RD12 – RD15], AECOM undertook an assessment of GI data against generic criteria for considering chronic risks to human health [RD16 – RD19]. The outcome of these assessments have also been used to inform the baseline presented below.

7.3.5 It should be noted that the GI did not cover the Power Station Access Road Junction, as this section became part of the A5025 Off-line Highway Improvements after the GI had taken place.

7.3.6 Reference to other specific documents are provided in the sections below. A comprehensive list of all data sources used in the assessment is provided in appendix G7-1 (*A5025 Off-line Highway Improvements Baseline Condition Report*) (Application Reference Number: 6.7.19).

### *The Agricultural Land Classification System*

7.3.7 The ALC system set out within *Agricultural Land Classification of England and Wales, Revised Guidelines and Criteria for Grading the Quality of Agricultural Land* [RD23] 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).

7.3.8 Grades 1 to Subgrade 3a are determined as Best and Most Versatile (BMV) land. BMV 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 the yield, and offers the best prospect for both food and non-food crop production.

## *Sites of geological importance*

7.3.9 The Isle of Anglesey was included in the European Geopark Network in 2009 as a result of its outstanding geodiversity and geological heritage. The Anglesey Geopark (called the 'GeoMôn Geopark') covers the 720km$^2$ of the Isle of Anglesey and has approximately 200km of coastline.

7.3.10 In November 2015, the GeoMôn Geopark was designated as a United Nations Educational, Scientific and Cultural Organisation (UNESCO) Global Geopark at UNESCO's 38th General Conference [RD24]. The 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 statutory, but key heritage sites within the Geoparks should be protected under local, regional or national legislation as appropriate.

7.3.11 However, there are currently no listed or notified Geological Conservation Review sites or geological Sites of Special Scientific Interest within the study areas and no such sites have been identified that are likely to be affected by the A5025 Off-line Highway Improvements [RD25]. Similarly, there are currently no Regionally Important Geodiversity Sites within the study areas and no such sites have been identified that are likely to be affected by the A5025 Off-line Highway Improvements [RD26]. Based on the above, sites of geological importance have not been considered further for the purpose of this assessment.

## *Section 1: Valley*

### Soil quality

#### *Soil type*

7.3.12 Section 1 is underlain by Brickfield 2 soils [RD1]. Further information on this soil type is provided in appendix G7-1 (Application Reference Number 6.7.19).

#### *Soil quality*

7.3.13 The ALC survey found the predominant topsoil texture to be sandy loam, with the occasional presence of clay loam and sandy clay loams; the subsoil is of a loamy sand or sand texture. Soil within low-lying land was found to be limited to ALC Grade 4 by flooding. The remainder of section 1 is limited to ALC Subgrade 3b due to the presence of irregular slopes which would pose access restrictions for some machinery [RD6]. The ALC Grades for soils in section 1 are identified in figure G7-1 (Application Reference Number: 6.7.48).

## Artificial geology

### *Published*

7.3.14 BGS geological mapping [RD5] does not indicate the presence of artificial geology (made ground or filled ground) across section 1.

### *Encountered*

7.3.15 Structural Soils Ltd. (SSL) undertook a GI along a previously proposed route alignment, which ran approximately 60m further west in the central part of section 1. No made ground was encountered in any of the exploratory locations during the investigation [RD12]. However, made ground is likely to be present beneath and near man-made features that were not investigated during the GI, such as the existing roads, residential properties, fuel filling station and garage site and a potentially infilled stream. Localised made ground is also likely to be present within the adjacent cemetery and car park.

## Superficial geology

### *Published*

7.3.16 BGS geological mapping [RD5] shows much of the western and southwestern parts of section 1 to be underlain by tidal flat deposits, as identified in figure G7-4 (Application Reference Number: 6.7.48). These were also mapped across the central part of the section, associated with a stream running northeast to southwest.

7.3.17 The remaining central and eastern parts of section 1 comprise diamicton glacial till. Whilst no alluvium is shown on the BGS geological mapping [RD5], it is likely that localised shallow thicknesses of alluvium will be present along existing streams and former stream alignments.

7.3.18 In addition, there are isolated areas where no superficial deposits are mapped.

### *Encountered*

7.3.19 The SSL GI confirmed the presence of tidal flat deposits, comprising either fine or coarse-grained material, at all exploratory locations along the previously proposed alignment. Strata thicknesses ranged from 0.25m to 5.80m.

7.3.20 The fine-grained materials were typically described as very soft to firm, locally stiff, dark grey, mottled orange brown, silty, sandy, gravelly clay. They were locally found to be interbedded with silt [RD16].

7.3.21 The coarse-grained tidal flat deposits were typically described as loose to medium dense, orange brown, mottled grey, slightly clayey, slightly gravelly, fine to coarse sand with rare shell fragments. These were occasionally found to be interbedded with fine-grained deposits [RD16].

7.3.22 Glacial till was encountered within the central and eastern parts of the previously proposed alignment within section 1 at thicknesses between 1.55m and 6.69m [RD12]. The glacial till was typically described as firm to stiff, dark

grey slightly sandy to sandy locally very sandy slightly gravelly silty clay with medium cobble content [RD16].

## Bedrock geology

### *Published*

7.3.23 Section 1 is underlain by strata of the New Harbour Group, comprising mica schist and psammite [RD5], as indicated in figure G7-7 (Application Reference Number: 6.7.48). BGS geological mapping [RD5] did not indicate the presence of geological bedrock faults beneath the study area.

### *Encountered*

7.3.24 No bedrock outcrops were observed within the section. The SSL GI did not generally encounter bedrock in section 1 (up to a maximum drilled depth of 10.89 meters below ground level (mbgl)). Possible bedrock, described as medium strong, dark blueish grey, fine-grained fresh psammite [RD12], was recorded at a single exploratory location at a depth of 3.25mbgl, although this was not confirmed as competent rockhead [RD16].

## Land contamination

7.3.25 A review of the historical and present day Ordnance Survey mapping [RD20] identified that land use within section 1 has remained relatively unchanged from the earliest available historical mapping (approximately 1880) to the present day, with fields and agricultural land dominating the area. However, historical mapping and a site walkover indicated that potentially contaminative land uses may have occurred within the section, comprising a petrol filling station, a garage/vehicle testing centre, a cemetery and railway sidings and a goods yard, referred to as a 'freight yard' on Ordnance Survey mapping. These potential sources of contamination are identified in figure G7-1 (Application Reference Number: 6.7.48).

7.3.26 In addition, the IACC identified several potentially infilled pond and stream areas. One of these is located in the west of the section, others are identified in the northwest and southeast of the section (refer to appendix G7-1, Application Reference Number: 6.7.19).

7.3.27 RSK derived a preliminary conceptual site model for section 1 [RD8], which was revised by AECOM to include the findings of the SSL GI [RD16]. Both reports are provided in appendix G7-1 (Application Reference Number 6.7.19). The GI for section 1 and AECOM's assessment were undertaken for a previously proposed alignment to the west of that currently proposed. However, the findings of the assessment were reviewed and not found to be significantly affected by the change in proposed alignment and addition of the flood compensation area, as the review of historical mapping did not identify additional or different potential contaminative land uses associated with the area of the new alignment.

7.3.28 AECOM identified that human health receptors comprise site users, including maintenance workers and the public who are present on-site for a limited time, using pavements, roadsides and verges. With regard to chronic risks to these

receptors from contaminants of potential concern (CoPC) within shallow soils and made ground or within groundwater and leachate, the assessment has identified low or very low risks [RD16].

7.3.29 AECOM did not include adjacent land users as human health receptors for the purpose of the risk assessment and conceptual site model. The study area for section 1 includes part of the village of Valley in the west. If contamination was present on-site, residents from properties adjacent to the construction area could be affected through contamination from dust or vapour. However, the public open space and commercial/industrial land use exposure scenarios applied during the risk assessment, although undertaken for on-site users, are considered to also be protective of adjacent land users due to the similarity in dust and vapour exposure scenarios for these receptor groups. Thus, no risks to these receptors have been identified.

7.3.30 AECOM did not include an assessment of acute risks to human health receptors; however, given the typically low concentrations of contaminants recorded, acute risks to human health are not considered further within this assessment.

7.3.31 With regard to controlled waters, AECOM concluded that there is a moderate risk from CoPC in soils and leachate to surface water receptors, namely the Afon Alaw, its tributaries and other unnamed streams, field drains and ponds. Groundwater was not considered a sensitive receptor within the risk assessment as no groundwater abstractions were recorded within 2km of the site and the bedrock is classified as a Secondary A aquifer [RD16].

7.3.32 In addition to the receptors outlined above, this assessment also considers risks to property. For section 1, this could comprise livestock, crops and the highway within section 1 itself, and properties adjacent to the site. However, no significant contamination that would be likely to affect these receptors has been identified within section 1, and thus no significant risks are likely to be present.

7.3.33 A preliminary Unexploded Ordnance (UXO) risk assessment was undertaken for the previously proposed road alignment by 6 Alpha Associates Ltd. [RD27], which concluded that the probability of encountering UXO at the site is low/medium and that no further action is warranted. Following the change in the alignment, a further preliminary UXO risk assessment was undertaken by Dynasafe BACTEC Ltd. [RD28]. This identified the UXO risk for the section to be negligible and recommended no further action. UXO risks have therefore not been considered further for section 1. The preliminary UXO risk assessment report is included within appendix G7-1 (Application Reference Number 6.7.19).

### Geological resources

7.3.34 A Category 2 Aggregates Safeguarding Area, which contains resources considered to be of local or regional importance, has been identified beyond the north-eastern corner of the section to the west of Cleifiog Isaf [RD21], as shown in figure G7-10 (Application Reference Number: 6.7.48). The Aggregates Safeguarding Area is associated with sands and gravels but is not identified as a Minerals Safeguarding Area [RD22].

## *Section 3: Llanfachraeth*

### Soil quality

#### *Soil type*

7.3.35 Section 3 is underlain by East Keswick 1 and Brickfield 2 soils [RD3]. East Keswick 1 soils are present in the centre of the section, from where the A5025 crosses the Afon Alaw to the Pen Y Craig junction. Brickfield 2 soils are present to the north and south of this, as identified in figure G7-1 (Application Reference Number: 6.7.48).

#### *Soil quality*

7.3.36 The ALC survey in section 3 identified that both topsoil and subsoil comprise mainly medium clay loam or medium silty clay loam. Most of the assessment points are limited by wetness and workability, in conjunction with climatic factors and topsoil textures, to ALC Grade 2, Subgrade 3a or Subgrade 3b. A small area in the middle of the section is limited to Grade 4 due to flood risk [RD6]. The distribution of soil grades is identified in figure G7-1 (Application Reference Number: 6.7.48).

### Artificial geology

#### *Published*

7.3.37 BGS geological mapping [RD5] does not indicate the presence of artificial geology (made ground or filled ground) in section 3. However, made ground is likely to be present beneath and near man-made features, including existing roads, potentially infilled former quarries, a potential filter bed associated with wastewater treatment and field entrances.

#### *Encountered*

7.3.38 The SSL GI confirmed the sporadic presence of made ground with a maximum thickness of 0.80m in six out of 45 exploratory locations [RD13]. The made ground was typically described as firm, light brown, slightly sandy, gravelly clay including gravels of ceramic, rare brick and coal [RD17].

### Superficial geology

#### *Published*

7.3.39 BGS geological mapping [RD5] identifies deposits of glacial till covering most of section 3, with alluvium recorded along the Afon Alaw, its tributaries and drainage areas, as identified in figure G7-4 (Application Reference Number: 6.7.48). Superficial deposits are noted to be absent around Llanfachraeth and in isolated areas south of the A5025 bridge across the Afon Alaw.

### *Encountered*

7.3.40 The SSL GI confirmed the presence of glacial till, comprising both fine-grained (cohesive) and coarse-grained (granular) materials with thicknesses ranging between 0.20m and 10.47m, in the majority of exploratory locations [RD13].

7.3.41 Materials described as alluvium, with thicknesses of between 2.20m and 3.00m, were recorded at four exploratory locations. The deposits were primarily encountered within the corridor of the Afon Alaw watercourse and were described as soft to firm, occasionally stiff, greyish brown, slightly sandy, slightly gravelly clay, sandy clayey silt or dense, dark grey, clayey, sandy gravel [RD17].

## Bedrock geology

### *Published*

7.3.42 BGS geological mapping [RD5] shows the New Harbour Group, primarily comprising mica schist and psammite with small localised areas of jasper and lava, underlying section 3, as indicated by figure G7-7 (Application Reference Number: 6.7.48). No bedrock faults are identified beneath the section.

### *Encountered*

7.3.43 Bedrock was noted to outcrop close to the surface along parts of the alignment. The SSL GI recorded bedrock in 18 of the 20 exploratory boreholes drilled and five of the 22 trial pits dug. Depth to bedrock ranged from 0.95m to 10.77mbgl. Strata generally consisted of psammite and phyllite, with breccia encountered in two boreholes [RD17].

## Land contamination

7.3.44 A review of historical mapping [RD20], information received from the IACC (refer to appendix G7-1, Application Reference Number 6.7.19) and observations made by RSK during a site walkover [RD9], identified the following historical or current potentially contaminating land uses (which are identified in figure G7-1, Application Reference Number: 6.7.48).

- wool mill located north of the Afon Alaw evident from the earliest available mapping (1887) until approximately 1959;
- filter beds and tank north of Afon Alaw;
- four former ground workings/quarries, at least one of which, to the west of the route, has been inferred from the available information to have been infilled; and
- two burial features, comprising a graveyard and a burial ground, both located west of the route.

7.3.45 AECOM revised the preliminary conceptual site model developed by RSK in the PSSR. The revised conceptual site model identified that human health receptors for section 3 comprise site users, including maintenance workers and the public, and assessed chronic risks to these from CoPC within shallow

soils and made ground, or within groundwater and leachate, to be low or very low [RD17].

7.3.46 AECOM did not include adjacent land users as human health receptors. However, the exposure scenarios applied during the risk assessment are considered to also be protective of adjacent land users, and no significant risks to these receptors have been identified.

7.3.47 AECOM did not include an assessment of acute risks to human health receptors; however, given the typically low concentrations of contaminants recorded, acute risks to human health are not considered further within this assessment.

7.3.48 AECOM did not include groundwater as a sensitive receptor, and thus no risks were identified for this. The primary controlled waters receptors were considered to be the surface water courses of the Afon Alaw and its tributaries, other unnamed streams, field drains and ponds. The risk from contamination to these through migration via shallow groundwater was assessed to be moderate [RD17].

7.3.49 With regard to risks to property receptors, section 3 includes crops or livestock, the highway within the section and properties located adjacent to the site within the study area. However, significant risks are unlikely from contamination within section 3 to these receptors as no significant contamination sources were identified that would be affected by construction of the road or be likely to affect property receptors.

7.3.50 RSK identified the risks associated with encountering UXO within section 3 to be low to moderate [RD9]. In 2017, a preliminary UXO risk assessment was undertaken by Dynasafe BACTEC Ltd. [RD29], which identified the UXO risk for section 3 to be negligible and recommended no further action. UXO risks have therefore not been considered further for section 3. The preliminary UXO risk assessment report is included within appendix G7-1 (Application Reference Number 6.7.19).

### Geological resources

7.3.51 Section 3 includes two Aggregates Safeguarding Areas, as identified in figure G7-10 (Application Reference Number: 6.7.48).

7.3.52 The glacio-fluvial deposits located at Pen-yr-orsedd are designated as a Category 1 Aggregates Safeguarding Area, which contains resources considered to be of national importance.

7.3.53 The alluvial deposits surrounding the Afon Alaw are classed as a Category 2 Aggregates Safeguarding Area.

7.3.54 Neither of these Aggregates Safeguarding Areas have been identified for safeguarding as Minerals Safeguarding Areas [RD22].

## *Section 5: Llanfaethlu*

### Soil quality

#### *Soil type*

7.3.55 The National Soil Resources Institute indicates that the central part of section 5 around Llanfaethlu is underlain by East Keswick 1 soils. The north and the south of section 5 are noted to be underlain by Brickfield 2 soils [RD3].

#### *Soil quality*

7.3.56 The ALC survey determined that the soil profiles generally comprised medium clay topsoils and clay or clay loam subsoils. Wetness and workability were the primary limiting factors. Soils were assessed as being ALC Grade 2, Subgrade 3a or Subgrade 3b. Areas of Grade 5 were mapped due to microrelief limitations [RD6]. The distribution of soils is identified in figure G7-2 (Application Reference Number: 6.7.48).

### Artificial geology

#### *Published*

7.3.57 BGS geological mapping [RD5] does not indicate the presence of artificial geology (made ground or filled ground) across section 5. However, made ground is likely to be present beneath or near man-made features, including those identified below as sources of potential contamination.

#### *Encountered*

7.3.58 The SSL GI works confirmed the presence of made ground, with a maximum thickness of 0.40m, in seven out of 27 exploratory locations [RD14]. The made ground was typically described as soft, brown, slightly gravelly, slightly sandy clay topsoil with occasional rootlets and fragments of glass, metal, nails, ceramics and brick and was primarily encountered to the east and northeast of Llanfaethlu within the northern part of section 5 [RD18].

### Superficial geology

#### *Published*

7.3.59 Figure G7-5 (Application Reference Number: 6.7.48), identifies the superficial deposits underlying section 5. BGS geological mapping [RD5] notes superficial deposits to be absent in the area around Llanfaethlu. The remainder of the section is underlain by glacial till.

#### *Encountered*

7.3.60 The SSL GI works recorded glacial till at all exploratory locations, with a maximum thickness of 9.65m. The glacial till was found to comprise either cohesive or granular deposits [RD14].

## Bedrock geology

### *Published*

7.3.61 BGS geological mapping [RD5] identifies that the majority of section 5 is underlain by the Gwna Group, with Church Bay Tuffs and Skerries Grits of the Skerries Group present in the southwest, as indicated by figure G7-8 (Application Reference Number: 6.7.48). Metabasaltic intrusions and isolated deposits of the Central Anglesey Shear Zone and Berw Shear Zone (undifferentiated) Glaucophane Schist are also indicated as present.

7.3.62 A number of outcrops, including quartzite and jasper, are identified in the northeast and east of section 5 respectively.

### *Encountered*

7.3.63 The SSL GI works encountered bedrock in six of the seven exploratory boreholes drilled, and two of the 11 trial pits dug [RD14]. Depth to bedrock ranged from 0.38m to 9.95mbgl and with rock types typically comprising phyllite, psammite and schist of the Gwna Group, with sandstone and tuff of the Church Bay Tuffs and Skerries Grits of the Skerries Group encountered in the north of the section.

## Land contamination

7.3.64 A review of historical mapping, observations made during the site walkover and information provided by the IACC and Natural Resources Wales identified the following potentially contaminative historical or current land uses within the study area (which are identified in figure G7-2, Application Reference Number: 6.7.48).

- former quarry, identified on first available mapping (1889); Natural Resources Wales indicates this to have been subsequently used as an inert landfill under licence number EAWML37136, which was surrendered in March 2010;
- sewage works present since approximately 1974;
- car garage and bus depot, pre-1974 to present;
- burial ground present since first available mapping (1889); and
- two former lime kilns, marked from first available mapping and approximately 1900 respectively.

7.3.65 AECOM revised the conceptual site model, originally developed by RSK in the PSSR, for section 5 and identified that human health receptors comprise site users, including maintenance workers and the public, and assessed chronic risks to these from CoPC within shallow soils and made ground or within groundwater and leachate, to be low or very low [RD18].

7.3.66 The study area of section 5 includes part of the village of Llanfaethlu and a number of farmsteads. In addition, a new community primary school, Ysgol Rhyd Y Llan, opened in autumn 2017. Residents of properties adjacent to the construction area and occupants of the new school are, therefore, considered

as adjacent land users for the assessment of potential human health risks, in addition to the receptors identified by AECOM. The exposure scenarios applied by AECOM during the risk assessment included a public open space land use. This is considered protective of adjacent land users, and thus, no additional risks to this receptor group have been identified.

7.3.67 AECOM did not include an assessment of acute risks to human health receptors; however, given the typically low concentrations of contaminants recorded, acute risks to human health are not considered further within this assessment.

7.3.68 With regard to risks to controlled waters, AECOM did not identify significant linkages to groundwater, based on the site being underlain by Secondary aquifers without recorded groundwater abstractions. The risks from site soils and leachate to the Secondary aquifers was assessed as being very low. Risks to surface water receptors, in the form of adjacent drainage channels, ditches and streams, were assessed as low [RD18].

7.3.69 The property receptors considered for the assessment of effects include livestock and crops, the highway within the section and adjacent buildings. No significant contamination was identified within section 5, and thus no significant risks to these property receptors are considered to be present.

7.3.70 RSK identified the risks associated with encountering UXO within section 5 to be low [RD10]. UXO risks for section 5 have therefore not been considered further.

### Geological resources

7.3.71 Section 5 includes two Category 2 Aggregates Safeguarding Areas, as identified in figure G7-11 (Application Reference Number: 6.7.48); one associated with igneous rocks (Skerries Group) and the other for sandstone with silica potential (Gwna Group) [RD21].

7.3.72 Neither of these Aggregates Safeguarding Areas have been identified for safeguarding as Minerals Safeguarding Area [RD22].

## *Section 7: Cefn Coch*

### Soil quality

#### *Soil type*

7.3.73 The predominant soil type within section 7 is Brickfield 2. East Keswick 1 soils are present in a small part in the south of the section [RD4].

#### *Soil quality*

7.3.74 The ALC survey identified both topsoil and subsoil to comprise clay loam. Most of the section was classed as ALC Subgrades 3a and 3b, limited by wetness, workability and slope. In addition, small areas of Grade 4 and Grade 5 are mapped [RD6]. The distribution of soils is identified in figure G7-2 (Application Reference Number: 6.7.48).

## Artificial geology

### *Published*

7.3.75 BGS geological mapping [RD5] does not indicate the presence of artificial geology (made ground or filled ground) across section 7. However, made ground is likely to be present beneath or near man-made features such as roads, two potentially infilled ponds and a potentially infilled former sand and gravel quarry.

### *Encountered*

7.3.76 The SSL GI confirmed the presence of made ground, with a maximum recorded thickness of 0.52m, in two out of 25 exploratory locations [RD15]. The made ground encountered comprised cohesive material, described as soft to firm, brown, slightly sandy, slightly gravelly clay with rare brick fragments, and less frequently, granular material described as dark brown to black and red, slightly clayey sand and gravel of brick, sandstone and phyllite [RD19].

## Superficial geology

### *Published*

7.3.77 BGS geological mapping [RD5] identifies deposits of glacial till across the majority of the section, with the exception of isolated areas in the west and south, where superficial deposits are absent. The published superficial geology is identified in figure G7-5 (Application Reference Number: 6.7.48).

### *Encountered*

7.3.78 The SSL GI works encountered glacial till at all exploratory locations, apart from at one trial pit in the south, where superficial deposits were absent. Strata thicknesses of between 0.20m and 10.15m were recorded. The glacial till was found to comprise fine-grained material, interbedded with coarse-grained deposits [RD19].

## Bedrock geology

### *Published*

7.3.79 Most of the northern part of section 7 is underlain by mica schist and psammite of the New Harbour Group, as identified in figure G7-8 (Application Reference Number: 6.7.48) [RD5]. This includes northwest to southeast trending gabbro, microgabbro and diorite intrusions and serpentinite outcrop intrusions of unknown ages [RD11].

7.3.80 Southern parts of the section are underlain by the Church Bay Tuffs and Skerries Grits, schist and a small area of quartzite of the Gwna Group and Ordovician interbedded mudstone, sandstone and quartzite. Bedrock outcrops at the surface in several locations, particularly towards the central western part of the section [RD5].

***Encountered***

7.3.81 The SSL GI encountered bedrock in five out of nine exploratory boreholes and one of the six trial pits. The findings of the investigation confirmed the presence of the New Harbour Group in the northern and central areas of the section, with the Gwna Group encountered in the south. The New Harbour Group was found to consist of often interbedded psammite and phyllite, while the Gwna Group was recorded to comprise quartzite, schist and psammite [RD19].

## Land contamination

7.3.82 A review of historical mapping, observations made during the site walkover and information provided by the IACC and Natural Resources Wales, identified the following potentially contaminative historical or current land uses within the study area (identified in figure G7-2, Application Reference Number: 6.7.48.

- woollen mill and mill pond, present from first available map (1889); the mill pond appears to have been infilled by 1924;
- disused pit, present approximately from 1973; and
- former mill, although identified as disused on the 1889 historical map edition.

7.3.83 AECOM assessed the chronic risks to site users, including maintenance workers and the public, from CoPC in shallow soils and made ground or groundwater and leachate to be low or very low [RD19].

7.3.84 Although not specifically included within the risk assessment, the public open space exposure scenarios applied are considered to also be protective of adjacent land users. Therefore, no significant risks to adjacent land users, including the farmsteads within the section 7 study area, have been identified.

7.3.85 AECOM did not include an assessment of acute risks to human health receptors; however, given the typically low concentrations of contaminants recorded, acute risks to human health are not considered further within this assessment. With regard to risks to controlled waters, AECOM did not include groundwater as a sensitive receptor, and thus no risks were identified for this. The primary controlled waters receptors were considered to be the surface water courses of the Afon Alaw and tributaries, other unnamed streams, field drains and ponds. The risks from contamination of these through migration via shallow groundwater was assessed to be moderate [RD19].

7.3.86 In addition to the receptors outlined above, this assessment also includes property, in the form of crops or livestock, the highway within the section and adjacent buildings. No significant sources of contamination were identified that would be likely to affect crops, livestock or the highway. A potentially infilled mill pond was identified in the north of the section which could be a source of ground gas. However, due to the age of the potential fill (pre-1924), any gas generation potential is likely to be low. Furthermore, the highway itself is not considered a receptor for risks from potential ground gas due to the absence of enclosed spaces, and there is not likely to be a pathway from

the pond to buildings adjacent to the route. Therefore, no risks to property receptors have been identified.

7.3.87 RSK identified the risks associated with encountering UXO within section 7 to be low to moderate [RD11]. A preliminary UXO risk assessment undertaken for section 7 by 6 Alpha Associates Ltd., concluded that the probability of encountering UXO at the site is low/medium and that no further action is warranted [RD30]. UXO risks have therefore not been considered further for section 7. The preliminary UXO risk assessment report is included within appendix G7-1 (Application Reference Number 6.7.19).

### Geological resources

7.3.88 Section 7 includes two Category 2 Aggregates Safeguarding Areas, as identified in figure G7-11 (Application Reference Number: 6.7.48). The Aggregates Safeguarding Areas are associated with sandstone with silica potential from the Gwna Group and igneous rocks from Church Bay Tuffs and Skerries Grits respectively [RD21].

7.3.89 Neither of the Category 2 Aggregates Safeguarding Areas have been identified for safeguarding [RD22].

## *Power Station Access Road Junction*

### Soil quality

#### *Soil type*

7.3.90 The Power Station Access Road Junction is underlain by East Keswick 1 soils [RD4].

#### *Soil quality*

7.3.91 The ALC survey identified that topsoil beneath the Power Station Access Road Junction primarily comprises medium clay loam, although heavy clay loam and sandy clay loam were also encountered. The average thickness of topsoil was 0.32m. Subsoil was primarily clay, although heavy clay loam and sandy clay were also found. Soils were found to be limited by wetness and workability to ALC Subgrade 3b, as identified in figure G7-3 (Application Reference Number: 6.7.48) [RD7], included in appendix D7-1 (Wylfa Newydd Development Area) (Application Reference Number 6.4.24).

### Artificial geology

#### *Published*

7.3.92 BGS geological mapping [RD5] does not indicate the presence of artificial geology (made ground or filled ground) across the Power Station Access Road Junction. However, made ground will be present beneath the existing A5025 and the access road and may be present in field entrances.

## Superficial geology

### *Published*

7.3.93 BGS geological mapping [RD5] identifies deposits of glacial till beneath the Power Station Access Road Junction. The published superficial geology is identified in figure G7-6 (Application Reference Number: 6.7.48).

## Bedrock geology

### *Published*

7.3.94 The Power Station Access Road Junction is underlain by mica schist and psammite of the New Harbour Group, as identified in figure G7-9 (Application Reference Number: 6.7.48) [RD5].

## Land contamination

7.3.95 Historical mapping indicates the study area to have been used as agricultural land, with the current A5025 present since the earliest available edition from 1888. The only potential contaminative historical or current land uses identified are quarries to the northwest of the Power Station Access Road Junction, which were present from 1899 but were marked as inactive on the 1924 map edition and might have been infilled.

7.3.96 Relevant human health receptors for potential contamination have been identified as construction workers, future maintenance workers and future site users. Exposure pathways could comprise inhalation, ingestion and direct contact of soils, groundwater, dust or vapours. The preliminary risk assessment, included within appendix G7-1 (Application Reference Number: 6.7.19), considered that the risks from CoPC at the Power Station Access Road Junction to these human health receptors are low.

7.3.97 In addition, risks to human health receptors in the form of adjacent land users, from inhalation of potentially contaminated windblown dust and vapours, were assessed as very low. An assessment of potential general dust-related effects is included in chapter G5 (Air quality) (Application Reference Number 6.7.5).

7.3.98 With regard to controlled waters, relevant receptors have been identified as groundwater within the Secondary aquifers beneath the Power Station Access Road Junction, and drains/streams leading into the Caerdegog Isaf stream to the west (surface water). The preliminary risk assessment, included in appendix G7-1 (Application Reference Number: 6.7.19), considered the risks to the groundwater receptor to be low. No direct pathway from the Power Station Access Road Junction to the surface water receptors was identified, other than through migration via shallow groundwater, which is considered in chapter G8 (Application Reference Number 6.7.8).

7.3.99 With regard to property receptors, risks to crops and livestock from potential contamination at the site were considered to be very low as set out in the preliminary risk assessment in appendix G7-1 (Application Reference Number: 6.7.19).

### Geological resources

7.3.100 The Power Station Access Road Junction is underlain by one Category 2 Aggregates Safeguarding Area associated with igneous rocks, as indicated in figure G7-12 (Application Reference Number: 6.7.48) [RD21]. It has not been identified for safeguarding as a Minerals Safeguarding Area [RD22].

### *Evolution of the baseline*

7.3.101 Soil quality is the only aspect of the baseline environment likely to naturally and significantly evolve in the foreseeable future.

7.3.102 The UK Climate Projections published in 2009 (UKCPO9) indicate that increases in annual, summer and winter temperatures are likely for Wales through to at least 2100 [RD31], whilst mean precipitation levels would likely decrease in summer and increase in winter according to most modelling scenarios.

7.3.103 Taken in isolation, climate is not currently a limiting factor to ALC within the study areas and is unlikely to become one in the future based on projections [RD31]; [RD32].

7.3.104 The predominant limiting factor for ALC in all study areas is currently wetness, and hence workability. A general subtle trend towards drier soils across England and Wales is predicted [RD31]; [RD32], which could result in soil wetness becoming less of a limitation within the study areas.

7.3.105 In contrast, droughtiness is predicted to become a greater limiting factor across Wales, due to warmer and drier summers [RD31]; [RD32]. Soils currently limited to ALC Grade 4 due to droughtiness in the northeast of section 7 may be affected by this trend. However, the droughtiness limitation in this section is noted to originate from severe compaction, which could be alleviated through changes to land use/management.

7.3.106 Soils in parts of section 1 and in small areas of sections 3 and 7 are currently limited to ALC Grade 4 by flooding; with flooding predicted to increase in Wales [RD31] the proportion of the study areas limited by flooding in the future may increase. The risk of erosion is also likely to increase, which could present a limiting factor in the future [RD31]; [RD32].

7.3.107 Overall, 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 areas.

7.3.108 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 would 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 G1 (proposed development) (Application Reference Number: 6.7.1), the application for development consent for the A5025 Off-line Highway Improvements is based on the designs shown on the Works Plans (Application Reference Number: 2.3) within the limits of deviation specified. This chapter has assessed a worst case scenario from a soils and geology perspective, taking into account the flexibility afforded by the Works Plans (Application Reference Number: 2.3) and limits of deviation described in chapter G1 (Application Reference Number: 6.7.1).

## *Construction*

### Basis of assessment and assumptions

7.4.3 The activities of key relevance to this assessment are as follows:

- vegetation clearance and field boundary removal;
- topsoil and subsoil stripping and storage;
- bulk earthworks;
- installation of drainage and attenuation ponds; and
- reinstatement works to include soft landscaping and seeding.

7.4.4 As part of the earthworks, ground levels along the proposed route of the highway would be reduced (for cuttings) or built-up (for embankments) to create the required vertical alignment. Existing ground levels may be lowered by up to 6.0m or raised by up to approximately 7.0m. In addition, ground levels within the area identified for flood compensation are proposed to be lowered by up to 1.2m. Ground excavations are anticipated to comprise mainly superficial deposits or rock. Informed by the findings of the GI, it has been assumed that 90% of excavated material from cuttings, drainage runs, attenuation ponds and the flood compensation area would be deposited and compacted into areas on site where the existing ground levels require raising, or reused within the Wylfa Newydd Project or elsewhere via the CL:AIRE Register of Materials. The remaining 10% of cut materials is assumed to be unsuitable for reuse for structural reasons.

### 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 overarching management strategies for dealing with land contamination. Section 9 of the A5025 Off-line

Highway Improvements sub-CoCP (Application Reference Number: 8.12) sets out the specific requirements associated with the construction of the A5025 Off-line Highway Improvements.

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 strategies set out in section 10 of the Wylfa Newydd CoCP (Application Reference Number: 8.6) and A5025 Off-line Highway Improvements sub-CoCP (Application Reference Number: 8.12) set 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.

***Waste and materials management***

7.4.10 Good practice mitigation would include the implementation of materials management measures in accordance with the 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* [RD33]. This would allow the reuse of excavated materials as far as practicable without them being defined as waste. Refer to section 9 of the Wylfa Newydd CoCP (Application Reference Number: 8.6) for details.

***Soil management***

7.4.12 Topsoil and subsoil (where necessary) would be stripped from all areas where construction activities would otherwise affect (e.g. compact or seal) it, with the exception of environmental buffer areas. The soils would be temporarily stockpiled adjacent to the road alignment and construction compounds and then reused on-site in landscape areas and batter slopes, elsewhere within the Wylfa Newydd Project, or at a suitable third-party receptor site (e.g. via the CL:AIRE Register of Materials). It has been assumed that topsoil and subsoil stripped from the flood compensation area would be reinstated to the area following excavation of underlying geology to lower the landform. These reuses prevent the potential loss of topsoil and subsoil resources in areas where they would otherwise be heavily disturbed or covered with hardstanding.

7.4.13 Section 9 of the Wylfa Newydd CoCP (Application Reference Number: 8.6) sets out good practice mitigation measures following guidance on soil

management such as the *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites* [RD34]. 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 1 in 2 (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.

7.4.14 Implementation of the soil management measures set out in section 9 of the Wylfa Newydd CoCP (Application Reference Number: 8.6) and A5025 Off-line Highway Improvements sub-CoCP (Application Reference Number: 8.12), would reduce effects on soil resulting from the stripping, handling and reuse of soil during construction works.

### *Operation*

#### Basis of assessment and assumptions

7.4.15 Construction of the A5025 Off-line Highway Improvements would involve placement of soils in landscaped areas and on batter slopes. This would comprise soils previously stripped and stockpiled from within the section. It has therefore been assumed that the soils would be reinstated to approximately their source locations such that their qualities would be maintained and the ALC grades would be broadly consistent with those currently mapped.

#### Embedded mitigation

7.4.16 No embedded mitigation specific to soils and geology during operation has been identified.

#### Good practice mitigation

7.4.17 No good practice mitigation specific to soils and geology during operation has been identified.

## 7.5 Assessment of effects

7.5.1 This section presents the findings of the assessment of effects associated with the construction and operation of the A5025 Off-line Highway Improvements.

7.5.2 Assessments were completed for each section; where effects are common to all sections, they have been described in detail in the assessment of effects for section 1. The effects are included in subsequent sections for completeness and to provide an overview of all effects identified for individual sections. However, for the avoidance of repetition, the reader is referred back to section 1 for a detailed description of the effect.

7.5.3 In addition to the assessment of effects on soil, land quality and geological resources receptors detailed below, an assessment of effects on materials in terms of their depletion and embodied carbon, and effects on waste management infrastructure, has been undertaken.

## *Section 1: Valley*

### Construction

#### *Soil quality*

7.5.4 Construction activities could adversely affect soil resources in the following ways:

- soil deformation 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 lead to a degradation of soil quality or result in the loss of valuable topsoil respectively;
- if soils of different types or quality are mixed during soil stripping and storage, higher quality soils may be degraded; or
- if soils are stored incorrectly there is the potential for degradation to occur as a result of physical, chemical or biological changes due to compaction or anaerobism.

7.5.5 Based on the available ALC data, the value/sensitivity of the soil resources within section 1 ranges from medium (Subgrade 3b) to low (Grade 4). As the effect would result in a reduction in quality of non-BMV soils, the magnitude of change is considered to be small. In accordance with the criteria set out in chapter B7 (Application Reference Number: 6.2.7), the potential effect on the soil receptors is considered to be minor adverse.

#### *Land contamination*

7.5.6 Data obtained for section 1 through desk-based review, GI and risk assessment did not identify ground contamination that would be likely to adversely affect human health or property receptors. It is noted that the alignment of the road within section 1 has been changed and a flood compensation area added since the GI and production of the risk assessment by AECOM. However, due to the locations of the alignment and flood compensation area in agricultural land, which are not indicated to have undergone significant land-use changes, the findings of the assessments are not considered to be affected.

7.5.7 The risk assessment undertaken by AECOM identified potential moderate risks from contamination in groundwater and leachate from section 1 to affect surface water receptors, via lateral migration in shallow groundwater. This was based on the detection of concentrations of certain determinands recorded in both groundwater and surface water samples [RD16] which exceeded assessment criteria. The effect of groundwater contamination on surface water receptors is considered in chapter G8 (Application Reference Number 6.7.8).

7.5.8 There is potential for the exposure or mobilisation of unexpected contamination to affect human health (high value) and controlled waters receptors (low value). Based upon the findings of the desk-based assessments and GIs, the likelihood of this is considered to be low. If encountered, unexpected contamination would be managed through implementation of the good practice mitigation measures, such as stopping works and sampling the affected area to inform an assessment of risks or to identify suitable management or disposal options (should they be required). Therefore, the magnitude of change that would affect construction workers (high value/sensitivity) would be small. Based on this, a minor adverse effect has been identified for construction workers.

#### *Geological resources*

7.5.9 The construction activities could affect geological resources through loss or sterilisation. Part of a medium value/sensitivity Category 2 Aggregates Safeguarding Area is located within the study area of section 1 but outside the land-take of the highway. Therefore, no effect is predicted from construction works in section 1 on this resource.

### Operation

#### *Soil quality*

7.5.10 No topsoil or subsoil would be present beneath the road as they would have been stripped prior to construction. Soils present in verges and landscape areas would not likely be affected by operation of the road. As such, no effects are anticipated on soil resources across the majority of section 1.

7.5.11 Topsoil and subsoil reinstated to the flood compensation area following lowering of the landform would likely be more frequently affected by flooding than is currently the case. However, soils within this area are already limited to ALC Grade 4 by flooding and, therefore, the magnitude of change affecting these low value soils is considered to be negligible. A negligible effect has therefore been identified.

#### *Land contamination*

7.5.12 During the operational phase of the A5025, soils within verges and landscaped areas close to the road could be affected by contaminated run-off from vehicle spillages, road salt or leaking drainage. However, these would be primarily captured by the drainage system, which has been assessed in chapter G8 (Application Reference Number 6.7.8). The magnitude of change affecting soil

resources in section 1 (medium and low value/sensitivity) is therefore considered to be negligible, and thus, a negligible effect has been identified.

#### *Geological resources*

7.5.13 A Category 2 Aggregates Safeguarding Area (medium value/sensitivity) is located in the northeast of the study area but outside the land-take of the highway. As access to the resource would be possible and the reserve would not be affected, no effect is predicted.

## *Section 3: Llanfachraeth*

### Construction

#### *Soil quality*

7.5.14 Details of construction activities that could adversely affect soil resources reflect those detailed for section 1 and are not repeated here. The majority of soils within section 3 have been identified as BMV land (Grade 2 and Subgrade 3a) with a high value/sensitivity. In addition, soils of medium (Subgrade 3b) and low value/sensitivity (Grade 4) were identified within the section. In accordance with the criteria set out in chapter B7 (Application Reference Number: 6.2.7), reduction in quality of the BMV soil resources would be considered a medium magnitude of change and reduction in quality of the other soils a small magnitude of change.

7.5.15 Implementation of the good practice mitigation measures outlined in section 9 of the Wylfa Newydd CoCP (Application Reference Number: 8.6) would reduce the identified effects, 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. These measures would largely mitigate adverse effects on soil, such that only small magnitudes of change would occur. Therefore, a minor adverse effect has been identified for the soil receptors.

#### *Land contamination*

7.5.16 Human health and property receptors are both potentially high value/sensitivity receptors. However, the assessments undertaken for section 3 did not identify significant risks from contamination to human health or property receptors, indicating a negligible magnitude of change and thus a negligible overall effect.

7.5.17 The effect of groundwater contamination on the surface water receptors is considered in chapter G8 (Application Reference Number 6.7.8).

7.5.18 A minor adverse effect has been identified for construction workers (high value/sensitivity), associated with potential exposure to unexpected contamination as outlined for section 1.

#### *Geological resources*

7.5.19 Part of a Category 1 Aggregates Safeguarding Area (high value/sensitivity) is located within the study area of section 3 but outside the land-take of the highway. No effect is predicted from construction works in section 3 on this resource.

7.5.20 Part of a Category 2 Aggregates Safeguarding Area (medium value/sensitivity) is present beneath section 3 near the crossing of the Afon Alaw. During the construction phase, this effect would only be temporary and is therefore considered to result in a negligible magnitude of change, resulting in a negligible effect.

### Operation

#### *Soil quality*

7.5.21 As detailed for the majority of soil resources within section 1, no effects on soil quality receptors have been identified.

#### *Land contamination*

7.5.22 Soils in section 3 include BMV soil with a high value/sensitivity. However, the effect on this resource from contaminated run-off from the road, as detailed for section 1, is still considered to be negligible, as this run-off would be controlled by the drainage system.

#### *Geological resources*

7.5.23 The presence of the road would permanently sterilise a minor part of the Category 2 Aggregates Safeguarding Area within section 3 (medium value/sensitivity). This is considered to be a small magnitude of change, resulting in a minor adverse effect. However, this Category 2 Aggregates Safeguarding Area is not currently identified for safeguarding [RD22], such that this assessment is likely to represent a worst-case.

## *Section 5: Llanfaethlu*

### Construction

#### *Soil quality*

7.5.24 Details of construction activities that could adversely affect soil resources reflect those detailed for section 1 and are not repeated here. In accordance with the criteria set out in table B7-12 in chapter B7 (Application Reference Number: 6.2.7), a reduction in quality of high value/sensitivity BMV soil resources would be considered a medium magnitude of change. Implementation of the good practice mitigation measures outlined in chapter 9 of the Wylfa Newydd CoCP (Application Reference Number: 8.6) would reduce these effects, 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. These measures would largely mitigate potential adverse effects on soil.

7.5.25 Based on this, the magnitude of change is considered to be small across the identified soil receptors. A minor adverse effect is therefore predicted on high value/sensitivity BMV (ALC Grade 2 and Subgrade 3a), Subgrade 3b (medium value/sensitivity) and Grade 5 (low value/sensitivity) soils present within section 5.

#### *Land contamination*

7.5.26 The assessment of available data for section 5 did not identify significant risks from ground contamination on human health, controlled waters or property receptors. Therefore, no effects are predicted.

7.5.27 A minor adverse effect has been identified for construction workers (high value/sensitivity) associated with potential exposure to unexpected contamination, as outlined for section 1.

#### *Geological resources*

7.5.28 Two Category 2 Aggregates Safeguarding Areas (medium value/sensitivity) are located within the land-take for construction of section 5. For both, small parts of the overall resources would be affected. During the construction phase, this effect would only be temporary and is therefore considered to result in a negligible magnitude of change, resulting in a negligible effect.

### Operation

#### *Soil quality*

7.5.29 No effects have been identified on soils during operation in section 5. The assessment conclusions reflect those outlined for section 1.

#### *Land contamination*

7.5.30 A negligible effect has been identified. The assessment conclusions reflect those outlined for section 3.

#### *Geological resources*

7.5.31 Minor parts of two Category 2 Aggregates Safeguarding Areas (medium value/sensitivity) would be permanently sterilised during operation of the road. The magnitude of change associated with this is considered to be small and the effect minor adverse. However, as identified for section 3, this is likely to represent a worst-case assessment, as the resource is currently not identified for safeguarding [RD22].

## *Section 7: Cefn Coch*

### Construction

#### *Soil quality*

7.5.32 Details of construction activities that could adversely affect soil resources reflect those detailed for section 1 and are not repeated here. The available

ALC data indicate that soil resources within section 7 have high (Subgrade 3a), medium (Subgrade 3b) and low (Grades 4 and 5) values/sensitivities.

7.5.33 Implementation of the good practice mitigation measures outlined in chapter 9 of the Wylfa Newydd CoCP (Application Reference Number: 8.6) would reduce the adverse effects on soil, 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. These measures would largely mitigate adverse effects on soil.

7.5.34 Based on this, the magnitude of change is predicted to be small. Construction works are therefore considered to have a minor adverse effect on the soil resources.

#### *Land contamination*

7.5.35 Human health and property receptors are both potentially high value/sensitivity receptors. However, the assessments undertaken for section 7 did not identify significant risks from contamination to human health or property receptors, indicating a negligible magnitude of change and thus a negligible overall effect.

7.5.36 As per section 1, AECOM identified potential moderate risks from contamination in groundwater and leachate from section 7 to surface water receptors [RD19]. The potential effect on the surface water receptors is considered in chapter G8 (Application Reference Number 6.7.8) and is thus not discussed here further.

7.5.37 A minor adverse effect has been identified for high value/sensitivity construction workers associated with potential exposure to unexpected contamination, as outlined for section 1.

#### *Geological resources*

7.5.38 Small parts of a Category 2 Aggregates Safeguarding Area that are located within section 7 would be affected by construction of the section. For the construction phase, these effects would be temporary and as a small part of the overall reserve would be affected, the magnitude of change would be negligible, causing a negligible effect.

### Operation

#### *Soil quality*

7.5.39 No effects have been identified as described for section 1.

#### *Land contamination*

7.5.40 A negligible effect has been identified as described for section 3.

#### *Geological resources*

7.5.41 Operation of the road would permanently sterilise minor parts of a Category 2 Safeguarding Area (medium value/sensitivity). A small magnitude of change and minor adverse effect have been predicted for this. However, as identified

for section 3, this is likely to be a worst-case assessment, as the resource is currently not identified for safeguarding [RD22].

## *Power Station Access Road Junction*

### Construction

#### *Soil quality*

7.5.42 Details of construction activities that could adversely affect soil resources reflect those detailed for section 1 and are not repeated here. The magnitude of change and the potential effect are considered to be small and minor adverse respectively, as all soils are classed as Subgrade 3b (medium value/sensitivity).

#### *Land contamination*

7.5.43 Human health and property receptors are both potentially high value/sensitivity receptors. However, the preliminary risk assessment, which was conservative in nature and assumed a worst-case scenario for identified contaminant sources, did not indicate significant risks to human health, controlled waters or property receptors. As such, the magnitude of change is considered to be negligible and the resultant overall effect is therefore also negligible.

7.5.44 As set out within section 9 of the Wylfa Newydd CoCP (Application Reference Number: 8.6), a GI would be undertaken prior to construction in order to provide information on potential risks from land contamination. On this basis, a minor adverse effect has been identified for construction workers (high value/sensitivity), associated with potential exposure to unexpected contamination, as outlined for section 1.

#### *Geological resources*

7.5.45 A Category 2 Aggregates Safeguarding Area (medium value/sensitivity) is located within the land-take for construction of the Power Station Access Road Junction. A small part of the overall Safeguarding Area would be affected. During the construction phase, this effect would only be temporary and is therefore considered to result in a negligible magnitude of change, resulting in a negligible effect.

### Operation

#### *Soil quality*

7.5.46 No effects have been identified, as described for section 1.

#### *Land contamination*

7.5.47 A negligible effect has been identified, as described for section 1.

***Geological resources***

7.5.48 A small part of a Category 2 Safeguarding Area (medium value/sensitivity), would be permanently sterilised by the presence of the road. The magnitude of change associated with this is small and the effect minor adverse. However, as identified for section 3, this is likely to be a worst-case assessment, as the resource is currently not identified for safeguarding [RD22].

## 7.6 Additional mitigation

7.6.1 In accordance with chapter B1 (Application Reference Number: 6.2.1), 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 No potential significant effects have been identified in the assessment of effects section and therefore no additional mitigation is required.

## 7.7 Residual effects

7.7.1 No significant effects have been identified on soils and geology receptors for the A5025 Off-line Highway Improvements. However, the following minor (non-significant) effects would occur:

- degradation of BMV soils (Grade 2 and Subgrade 3a) in sections 3, 5 and 7 during construction (minor adverse);
- degradation of Subgrade 3b and Grades 4 and 5 soils in sections 1, 3, 5 and 7 and the Power Station Access Road Junction during construction (minor adverse);
- potential exposure of construction workers to unexpected contamination during construction in all sections (minor adverse); and
- permanent sterilisation of small parts of Category 2 Aggregates Safeguarding Areas in sections 3, 5 and 7 and the Power Station Access Road Junction during operation (minor adverse).

## 7.8 References

**Table G7-1 Schedule of references**

| ID | Reference |
|---|---|
| RD1 | National Soil Resources Institute. 2015. *Soils Site Report, Full Site Report 5km x 5km for* SH3057680287. |
| RD2 | National Soil Resources Institute. 2015. *Soils Site Report, Full Site Report 5km x 5km for SH3267088793*. |
| RD3 | National Soil Resources Institute. 2015. *Soils Site Report, Full Site Report 5km x 5km for SH3160184581*. |
| RD4 | National Soil Resources Institute. 2015. *Soils Site Report, Full Site Report 5km x 5km for SH3591792942*. |
| RD5 | British Geological Survey. 1974. 1:50,000 Scale 'Solid and Drift Geology' Geological Map of Anglesey (Special Sheet 092). |
| RD6 | Reading Agricultural Consultants Ltd. 2017. *Off-line Improvements to the A5025, Anglesey: Agricultural Land Classification and Soil Resources*. |
| RD7 | Reading Agricultural Consultants Ltd. 2016. *Wylfa Nuclear Power Station Anglesey – Agricultural Land Classification and Soil Resources*. |
| RD8 | RSK. 2014. *Wylfa 'off-line' Highways Improvement Project; Site 1: Junction 2 A55 Valley Improvements. Preliminary Sources Study Report*. |
| RD9 | RSK. 2014. *Wylfa 'off-line' Highways Improvement Project; Site 2: Llanfachraeth Improvements. Preliminary Sources Study Report* |
| RD10 | RSK. 2014. *Wylfa 'off-line' Highways Improvement Project; Site 3: Llanfaethlu Improvements. Preliminary Sources Study Report*. |
| RD11 | RSK. 2014. *Wylfa 'off-line' Highways Improvement Project; Site 4: Llanrhwydrus Improvements. Preliminary Sources Study Report*. |
| RD12 | Structural Soils Ltd. 2016. *Site 1 – Junction 3 A55 Valley Improvements, Task Order 4, A5025 Off-line Highways Improvements Ground Investigation. Factual Report*. |
| RD13 | Structural Soils Ltd. 2016. *Site 2 – Llanfachraeth Improvements, Task Order 4, A5025 Off-line Highways Improvements Ground Investigation. Factual Report*. |
| RD14 | Structural Soils Ltd. 2016. *Site 3 – Llanfaethlu Improvements, Task Order 4, A5025 Off-line Highways Improvements Ground Investigation. Factual Report*. |

| ID | Reference |
|---|---|
| RD15 | Structural Soils Ltd. 2016. *Site 4 – Cefn Coch Bend Improvements, Task Order 4, A5025 Off-line Highways Improvements Ground Investigation.* Factual Report. |
| RD16 | AECOM. 2016. *A5025 Wylfa. Ground Investigation. Section 1 Valley. Ground Investigation Report*. Report No 60473802-MN-GEO-RP-001. |
| RD17 | AECOM. 2016. *A5025 Wylfa. Ground Investigation. Section 3 Llanfachraeth. Ground Investigation Report*. Report No 60473802_MN-GEO-RP-002. |
| RD18 | AECOM. 2016. *A5025 Wylfa. Ground Investigation. Section 5 Llanfaethlu. Ground Investigation Report*. Report No 60473802-MN-GEO-RP-003. |
| RD19 | AECOM. 2016. *A5025 Wylfa. Ground Investigation. Section 7 Cefn Coch. Ground Investigation Report*. Report No 60473802-MN-GEO-RP-004. |
| RD20 | Groundsure. 2014. *MapInsight: All Scales GS-1797586*. |
| RD21 | British Geological Survey and Welsh Assembly Government. 2012. *North West Wales Aggregates Safeguarding Map*. [Online]. [Accessed: 20 April 2017]. Available from: http://www.bgs.ac.uk/mineralsuk/planning/resource.html#MRW |
| RD22 | Capita Symonds. 2010. *Hard Rock and Sand & Gravel Safeguarding Areas in Ynys Môn*. Unpublished report on behalf of Isle of Anglesey County Council. |
| RD23 | Ministry of Agriculture, Fisheries and Food (MAFF). 1988. *Agricultural Land Classification of England and Wales: Revised Guidelines and Criteria for Grading the Quality of Agricultural Land*. [Online]. [Accessed: 12 October 2016]. Available from: http://webarchive.nationalarchives.gov.uk/20130402151656/http:/archive.defra.gov.uk/foodfarm/landmanage/land-use/documents/alc-guidelines-1988.pdf. |
| RD24 | United Nations Educational, Scientific and Cultural Organization (UNESCO). 2015. *UNESCO Global Geoparks*. [Online]. [Accessed: 24 November 2015]. Available from: http://www.unesco.org/new/en/natural-sciences/environment/earth-sciences/global-geoparks/. |
| RD25 | Natural England. 2017. *Magic Map*. [Online]. [Accessed: 20 April 2017]. Available from: http://www.magic.gov.uk/. |
| RD26 | Wood, M. 2007. *Developing a Methodology for Selecting Regionally Important Geodiversity Sites (RIGS) in Wales and A RIGS Survey of Anglesey & Gwynedd*. Vol.2. |

| ID | Reference |
|---|---|
| RD27 | 6 Alpha Associates Ltd. 2015. *Preliminary Unexploded Ordnance (UXO) Risk Assessment. Site: Valley – Wylfa off line Highways*. |
| RD28 | Dynasafe BACTEC Ltd. 2017. *Preliminary Unexploded Ordnance Risk Assessment.* Report reference: 502282. |
| RD29 | Dynasafe BACTEC Ltd. 2017. *Preliminary Unexploded Ordnance Risk Assessment.* Report reference: 502283. |
| RD30 | 6 Alpha Associates Ltd. 2015. *Preliminary Unexploded Ordnance (UXO) Risk Assessment. Site: Llanrhyddlad – Wylfa off line Highways*. |
| RD31 | HR Wallingford. 2012. *A Climate Change Risk Assessment for Wales*. Defra Project Code GA0204. [Online]. [Accessed: 18 May 2017]. Available from: http://gov.wales/docs/desh/publications/120126climateriskassessen.pdf. |
| RD32 | Keay, C.A., Jones, R.J.A., Procter, C., Chapman, V., Barrie, I., Nias, I., Smith, S. and Astbury, S. 2014. *SP1104 The Impact of Climate Change on the Capability of Land for Agriculture as Defined by the Agricultural Land Classification*. [Online]. [Accessed: 18 May 2017]. Available from: http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=16929. |
| RD33 | Contaminated Land: Applications in Real Environments (CL:AIRE). 2011. *Definition of Waste: Development Industry Code of Practice*. Version 2. London: CL:AIRE. |
| RD34 | Department for Environment, Food and Rural Affairs. 2009. *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites*. London: Department for Environment, Food and Rural Affairs. |