HORIZON NUCLEAR POWER

WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

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 Park and Ride facility at Dalar Hir (hereafter referred to as 'Park and Ride').

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 Park and Ride.

7.2.2 The potential effects on soils and geology receptors from the construction, operation and decommissioning of the Park and Ride 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 Park and Ride as shown on figure F7-1 (Application Reference Number: 6.6.38).

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 F7-1 (Soils and Geology Baseline Conditions Report) (Application Reference Number: 6.6.15).

Soil quality

Soil type

7.3.3 The site is underlain by soils of the Brickfield 2 association [RD1] [RD2]. These are slowly permeable, fine loamy soils, which are typically prone to seasonal waterlogging, with a minor risk of flooding. The soil type has a low natural fertility, most suitable to supporting pastures and woodland.

7.3.4 In the western, southern and southwestern extents of the site area, where roads and associated roundabouts are located, natural soils would be absent.

Agricultural Land Classification

7.3.5 The Agricultural Land Classification (ALC) system set out within *Agricultural Land Classification of England and Wales: Revised Guidelines and Criteria for Grading the Quality of Agricultural Land* [RD3] defines six grades of soils as follows:

- 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).

7.3.6 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 it, and offers the best prospect for both food and non-food crop production.

7.3.7 An ALC survey was undertaken for the Park and Ride site in 2016 [RD4] which comprised ten auger observations and one observation pit. The topsoil was mostly either medium clay loam or sandy clay loam, of an average depth of 0.33m. A heavy clay loam texture was present in the east of the site. Two types of subsoil were present; the first is poorly permeable clay and the second is a sandy clay loam. Mottles, indicative of gleying, were common throughout the subsoil, which indicates poor permeability. The whole site is limited to Subgrade 3b on this basis due to a wetness, and hence workability limitation. The ALC for the site is shown on figure F7-1 (Application Reference Number: 6.6.38).

7.3.8 According to Provisional ALC data for Wales [RD5], the remainder of the study area mainly comprises Grade 4 (poor quality) agricultural land, with Grade 3[1] (good to moderate quality) land located to the southwest.

Artificial geology

7.3.9 Published geological mapping [RD6] does not indicate the presence of artificial/made ground.

7.3.10 However, made ground is likely to be present in association with the Dalar Hir farmstead and the roads and roundabouts present in western, southern and southwestern extents of the site. Within the wider area, artificial/made ground is expected to be confined to areas associated with roads, nearby land uses (e.g. the Cartio Môn Go-Karting centre) and small areas of infilled ground associated with surface ground workings.

Superficial geology

7.3.11 The site is underlain by glacial till[2] with the exception of a small area towards the centre of the southern boundary of the site where superficial deposits are absent [RD6].

[1] Provisional ALC data provide no differentiation between Subgrade 3a and Subgrade 3b.

[2] Unsorted glacial material typically comprising clay with bands of sand and gravel and larger rock fragments up to boulder size (formerly referred to in the UK as ‘boulder clay’).

7.3.12 British Geological Survey historical exploratory hole records (located to the south of the site) generally record the glacial till in this area as firm to stiff sandy silty clay with subangular gravel of mixed lithologies [RD7]. Figure F7-2 (Application Reference Number: 6.6.38) illustrates the superficial geology for the study area.

Bedrock geology

7.3.13 The majority of the site is underlain by rocks belonging to the New Harbour Group, comprising mica schist and psammite derived from the metamorphism[3] of sea floor sediments [RD6]. The New Harbour Group was recorded as green slightly weathered mica schist. Two lens-shaped areas of igneous rock are present in the central section of the site, trending in a northeast to southwest direction; these are mapped as pelitic lava units of the New Harbour Group.

7.3.14 The eastern portion of the site is underlain by undifferentiated Ordovician[4] rocks, recorded as interbedded sandstone and conglomerate. This was described as blueish highly fractured iron-stained slightly to moderately weathered breccia (rock consisting of angular fragments of stones cemented by finer calcareous material). Figure F7-3 (Application Reference Number: 6.6.38) illustrates the bedrock geology for the study area.

7.3.15 There are no recorded faults within the study area.

Land contamination

Historical and current land use – potential sources of contamination

7.3.16 The former land use of the site has been reviewed using historical Ordnance Survey maps from the Groundsure report [RD8]. The maps show that the vast majority of the site has remained undeveloped agricultural land since the earliest available historical maps, with the Dalar Hir farmstead and the roundabouts associated with the A5/A55 the only developed portions of the site. There were several small old pits in the central southern portion of the site, but these were no longer shown on mapping from 1924 onwards, suggesting they may have been infilled. A quarry was also shown within the south of the site until 1900, but was annotated as a pond from 1973; this may have been infilled.

7.3.17 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 and realignment of the A5 immediately to the south of the site, shown as completed on mapping from 2002. Other nearby development within the study area has included the Cartio Môn Go-Karting centre to the east of the site, and a Driver and Vehicle Standards Agency (DVSA) vehicle checkpoint area to the west – both still present. A transmitting

[3] Application of varying degrees of heat and/or pressure, which lead to physical and chemical changes.

[4] Geological period beginning approximately 488 million years ago and ending 444 million years ago.

station has been present approximately 180m south of the site from 1973 and a scrap yard approximately 230m southeast of the site from 2010 according to historical mapping. A pond (to the northwest of the site) was also present prior to 1924 and may have been infilled. A full summary of historical uses within the study area is presented in appendix F7-1 (Application Reference Number: 6.6.15).

7.3.18 A site walkover was conducted in January 2016, which provided further information on current site conditions; refer to appendix F7-1 (Application Reference Number: 6.6.15) for more details.

7.3.19 The desk-based review and site walkover have resulted in the identification of key sources of contamination and potential contaminants associated with them. These are summarised below, with their locations shown on figure F7-4 (Application Reference Number: 6.6.38).

- On-site:
  - roads and potentially infilled pits, ponds and a former quarry (potential made ground), pre-1887 to 2002: heavy metals, hydrocarbons, asbestos and ground gas;
  - farm activities (historical farm activities, could include cesspits and sheep dips), pre-1887 to present: heavy metals, hydrocarbons pesticides/herbicides and insecticides and ground gases;
  - soil heap with waste material inclusions (tyres, plastic, bricks, stones and concrete visible) in yard around Dalar Hir farmhouse, identified during site reconnaissance: heavy metals, hydrocarbons and asbestos; and
  - possible burnt material (ash) in field adjacent to the south of the farmhouse, identified during site reconnaissance: heavy metals and hydrocarbons.
- Off-site:
  - made ground (potential for made ground associated with infilled quarries, ponds and construction of roads adjacent): heavy metals, hydrocarbons and ground gas;
  - DVSA centre (potential made ground, fuels, lubricating oils etc. associated with vehicular use) 2010 to present: heavy metals and hydrocarbons; and
  - Cartio Môn Go-Karting centre (potential made ground, fuels, paints, lubricating oils etc. associated with vehicle use and repair) 2010 to present: heavy metals, hydrocarbons and volatile organic compounds.

Potential receptors of contamination

7.3.20 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 *Contaminated Land Statutory Guidance* [RD9].

7.3.21 Human health receptors (high-value) 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.
- Maintenance workers: for routine maintenance work, contact with site soils is likely whilst there is a low likelihood of contact with groundwater.
- Future site workers: contact with site soils and groundwater unlikely (due to abundance of hardstanding). Low likelihood of inhalation of vapours/ground gases.
- Future site users: contact with site soils and groundwater would be unlikely (due to the abundance of hardstanding).
- Adjacent land users: primarily agricultural land use. Low likelihood of inhalation of wind-blown dusts and contaminants from site (due to the abundance of hardstanding).

7.3.22 Controlled waters comprise the receptors set out below (refer to chapter F8, surface water and groundwater, Application Reference Number: 6.6.8, for further details):

- surface water: Nant Dalar Hir and small (tertiary) drainage networks and ponds on-site and within study area (medium value receptors); and
- groundwater: Secondary aquifers (low value receptor).

7.3.23 Property receptors comprise:

- buildings and infrastructure of the Park and Ride (medium value receptors).

7.3.24 Given the proposed use of the Park and Ride, other property receptors (crops and livestock) are not considered relevant, and are not discussed further.

7.3.25 It is noted that a private water supply has been identified outside the study area. Reference should be made to chapter F8 (Application Reference Number: 6.6.8) for further details and the assessment of effects upon this receptor.

7.3.26 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 receptors' headings within section 7.5, since land contamination could act to reduce soil quality.

Conceptual site model

7.3.27 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].

7.3.28 The conceptual site model indicated that risks associated with the identified potential pollutant linkages are considered to be low or very low for all identified receptor groups, with the exception of risks to construction workers and maintenance workers who have increased likelihood of contact with soils and groundwater: for these moderate/low risks were identified from on-site sources. Moderate/low risks were also identified for ground gases; however, this is the lowest possible risk outcome based on the severity of the risk. Based upon the sources identified, ground gas generation rates (if present) are likely to be very low, whilst enclosed spaces in which ground gases could accumulate would be limited for the Park and Ride.

7.3.29 A specialist desk study found that risks from unexploded ordnance were considered to be negligible, with no further action recommended [RD12].

7.3.30 The conceptual site model and risk assessment is presented in full within appendix F7-1 (Application Reference Number: 6.6.15).

Sites of geological importance

7.3.31 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 UNESCO Global Geopark [RD13]. 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.

7.3.32 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

7.3.33 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.

7.3.34 The eastern portion of the site and study area, corresponding with the area of Ordovician bedrock geology, has been identified as a Category 2 Aggregates Safeguarding Area for sandstone on the *North West Wales Aggregates Safeguarding Map* [RD14]. Category 2 Aggregates Safeguarding Areas are defined as areas that contain resources considered to be of local or regional importance.

7.3.35 None of the mineral resources identified within the study area were recommended for safeguarding within *Hard Rock and Sand & Gravel Safeguarding Areas in Ynys Môn* [RD15].

Evolution of the baseline

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

7.3.37 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 [RD16], whilst mean precipitation levels would likely decrease for summers and increase for winters according to most modelling scenarios.

7.3.38 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 [RD16, RD17].

7.3.39 The predominant limiting factor for ALC within the Park and Ride site is currently wetness, and hence workability. A general subtle trend towards drier soils across England and Wales is predicted [RD16, RD17], which could result in soil wetness becoming less of a limitation within the site.

7.3.40 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.

7.3.41 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 F1 (proposed development) (Application Reference Number: 6.6.1), 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 F1 (Application Reference Number: 6.6.1).

Construction

7.4.3 The design and construction of the Park and Ride would be in accordance with the description provided in chapter F1 (Application Reference Number: 6.6.1). The main activities that could affect soils and geology receptors are:

- stripping of topsoil and subsoil (as required), with temporary storage on-site;
- installation of drainage and other utility works; and

- installation of new roads and walkways.

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 in all areas outside buffer zones, to a depth of 300mm below ground level. The majority of the stripped topsoil would be removed from site, but limited quantities may be reused in landscaping.
- Subsoil would be stripped for roads, bus drop-off areas, pedestrian footways and flood storage basins. It is currently anticipated that all excavated subsoil would be removed from site, although limited quantities may be reused in landscaping.
- Car park areas would have permeable paving on top of a drainage layer which would be built up from topsoil strip depth (300mm).
- Temporary soil storage is anticipated to be limited in terms of both volume and length of time, although a worst-case scenario of soil storage through the duration of the construction phase is assumed for the purposes of the assessment.

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 Park and Ride site.

7.4.8 Good practice mitigation during construction would include measures to reduce risks to human health and the environment. These measures are set out below.

7.4.9 Horizon will assess and manage land contamination in accordance with guidance within the *Model Procedures for the Management of Land Contamination* [RD10]. This will include undertaking appropriate ground investigation, assessment and where necessary, remediation, to deal with any risks from land contamination that are identified.

7.4.10 In order to address any areas of unexpected contamination encountered, an unexpected contamination scheme of measures would be prepared prior to the commencement of any activities that involve ground disturbance. 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

7.4.11 The water management strategy in 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

7.4.12 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).

7.4.13 The reuse of materials would be managed in accordance with the *Definition of Waste: Development Industry Code of Practice* [RD18]. This would allow the reuse of excavated materials as far as practicable without them being defined as waste.

Waste management

7.4.14 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

7.4.15 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 Contaminated Land: Applications in Real Environments (CL:AIRE) Register of Materials).

7.4.16 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* [RD19]. 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; and
- where soils would be stored for longer than 60 days, stockpiles would be seeded with an appropriate low-maintenance seed mix.

7.4.17 Implementation of the soil management measures set out within section 9 of the Wylfa Newydd CoCP (Application Reference Number: 8.6) and Park and Ride sub-CoCP (Application Reference Number: 8.10) 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

7.4.18 The operation of the Park and Ride has the potential to cause effects on the soils and geology receptors discussed in section 7.3; no activities in particular are considered to need highlighting.

Basis of assessment and assumptions

7.4.19 The Park and Ride would be operated as described in chapter F1 (Application Reference Number: 6.6.1). No further assumptions relevant to soils and geology receptors have been identified.

Embedded mitigation

7.4.20 No embedded mitigation has been identified for operation.

Good practice mitigation

7.4.21 Pollution prevention strategies would be implemented during operation in accordance with section 10 (surface water and groundwater strategy) 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

7.4.22 The decommissioning of the Park and Ride would involve the removal of the facility and the restoration of the site to its previous state, as far as is reasonably practicable. Activities associated with this have the potential to cause effects on soils and geology receptors discussed in section 7.3.

Basis of assessment and assumptions

7.4.23 For the purposes of this assessment, it has been assumed that upon decommissioning, suitable topsoil, and subsoil as required (e.g. for former building footprints), would be imported to restore the site.

Embedded mitigation

7.4.24 No embedded mitigation has been identified for decommissioning.

Good practice mitigation

7.4.25 No good practice mitigation has 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 Park and Ride.

Construction

Soil quality

Stripping of topsoil and subsoil

7.5.2 Topsoil and subsoil would be stripped from certain areas and temporarily stored during construction, as identified in section 7.4. During stripping and storage, the effects set out below may occur.

- 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 respectively lead to a degradation of soil quality or result in the loss of valuable topsoil.
- Although only one ALC grade of soil (Grade 3b) has been identified on site, if soils of different types or quality are found to be present and are mixed during soil stripping and storage, higher quality soils may be degraded.
- During storage, a number of biological, chemical and physical changes may occur as a result of natural compaction and anaerobic conditions in the core of the stockpile, although these would be largely reversible upon reinstatement.

7.5.3 The implementation of good practice soil management measures, as 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 on the medium value (Subgrade 3b) soils identified on site. Accordingly, a minor adverse effect would result.

7.5.4 It should be noted that the effects should be largely reversible at the receptor site to which the soils are reinstated, or within landscaping on-site, provided appropriate handling and aftercare measures are implemented.

Remaining construction activities

7.5.5 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.

Land contamination

Exposure of areas of unexpected contamination

7.5.6 As identified in section7.4, a ground investigation and risk assessment would be completed, followed by a remediation strategy and the remediation of contamination (if required) prior to construction works commencing. This would reduce the likelihood of contaminated soils (if present) posing risks to receptors during construction.

7.5.7 Nevertheless, there remains the potential for the exposure or mobilisation of unexpected contamination during construction which could affect construction workers (high value), Subgrade 3b soils (medium value), surface water (medium value) and groundwater (low value). Given the site history has been primarily agricultural, it is considered unlikely that pollutant linkages would occur, with the implementation of the identified good practice mitigation measures (see section 7.4) also lowering the likelihood. For soils and controlled waters, the magnitude of change would be negligible based on the low risks posed, and the effects 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.

7.5.8 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

7.5.9 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, fuel, or chemical storage facilities. Any contamination resulting from such events has the potential to pose risks to construction workers (high value) or Subgrade 3b soils (medium value).

7.5.10 However, the implementation of pollution prevention strategies e.g. bunding of any fuel tanks and good maintenance of equipment, by way of the Wylfa Newydd CoCP (Application Reference Number: 8.6) would reduce this risk. As such, the magnitude of change would be negligible for both receptors and the resulting effects would be negligible.

7.5.11 For effects that occur to surface water and groundwater, including leaks and spills, reference should be made to chapter F8 (Application Reference Number: 6.6.8).

Geological resources

7.5.12 Due to the relatively shallow nature of the proposed excavations, it is unlikely that the Category 2 Aggregates Safeguarding Area identified in the eastern portion 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 for during construction would be relatively short.

7.5.13 Accordingly, the magnitude of change for the medium value geological resources resulting from construction would be negligible and the effect would also be negligible.

Operation

Soil quality

7.5.14 Topsoil would have been removed during construction from the areas in which it may be affected during operation. In the areas under roads, footways and buildings, the majority of the subsoil would also have been removed from site as part of the excavation to place suitable sub-base materials; additional subsoil would have been removed from the flood storage basins.

7.5.15 Under the majority of the car parks, subsoil would have been left *in situ* beneath the installed drainage and permeable paving, which should retain subsoil moisture. Adverse effects are likely to be limited to compaction over the operational duration of the Park and Ride.

7.5.16 Effects upon the medium value Subgrade 3b soils during operation of the Park and Ride are therefore considered to be of small magnitude and minor adverse.

Land contamination

Unexpected contamination

7.5.17 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. It is therefore considered that any magnitude of change would be negligible for the receptors: maintenance workers (high value), future site users (high value), any remaining Subgrade 3b soils (medium value), surface water (medium value), buildings and infrastructure (medium value) and groundwater (low value). The effect associated with this change would be negligible.

Pollution incidents causing soil contamination

7.5.18 During the operation of the Park and Ride, the only receptors that might be affected by pollution incidents would be maintenance workers and future site users (high value), and any Subgrade 3b (medium value) soils remaining on site. However, the implementation of pollution prevention strategies identified in section 7.4 would reduce the risk of potential leaks and spills, such that soils are unlikely to be affected by pollution incidents, whilst the likelihood of

contaminants 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.

Geological resources

7.5.19 The operation of the Park and Ride would prevent access to a minor part (<50%) of the medium value Category 2 Aggregates Safeguarding Area for a period of up to ten years. During this period, exploitation of this resource would not be possible and thus the aggregates could not be made available for use should a need arise. Given its temporary nature, the change would be of negligible magnitude and the effect would be negligible.

Decommissioning

Soil quality

7.5.20 Upon decommissioning, the site is proposed to be returned to agricultural land use. This would require the importation and placement of soil of a similar quality (or better) than currently at the site, to ensure the ALC grade is returned to Subgrade 3b.

7.5.21 Imported soils could be adversely affected during handling and reinstatement, primarily through compaction and smearing. Effects upon subsoils remaining *in situ* would involve compaction as car parking areas were removed.

7.5.22 As a result of the above, a small magnitude of change is predicted on the medium value (assumed to be Subgrade 3b) imported soils and soils remaining *in situ*. As such, the decommissioning works would result in a minor adverse effect on soil quality.

Land contamination

Unexpected contamination

7.5.23 Construction workers (high value) involved with the decommissioning of the Park and Ride may be exposed to residual contamination on site. However, given the likelihood that any contamination (if present) would have been addressed before or during construction, the change would be of negligible magnitude and the effect would be negligible.

Pollution incidents

7.5.24 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. As such, the potential magnitude of change for construction workers (high value) and Subgrade 3b soils (medium value) would be negligible and the effect would be negligible.

7.5.25 For effects that occur to surface and groundwater, including leaks and spills, reference should be made to chapter F8 (Application Reference Number: 6.6.8).

Geological resources

7.5.26 The decommissioning works would reinstate access to the identified Category 2 Aggregates Safeguarding Area. This would make the resource available for exploitation again, which would be beneficial. However, no effect is predicted as the site would simply be returned to its current condition.

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 adverse effects were identified for soils and geology.

7.7.2 Minor effects identified in the assessment of effects section are summarised in appendix I3-1 (master residual effects table) (Application Reference Number: 6.9.8).

7.7.3 The following non-significant effects are likely:

- degradation of Subgrade 3b soil during construction (minor adverse);
- potential exposure of construction workers to unexpected contamination (minor adverse);
- degradation of Subgrade 3b subsoil during operation (minor adverse); and
- degradation of Subgrade 3b soil during decommissioning (minor adverse).

7.8 References

Table F7-1 Schedule of references

ID	Reference
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RD18	Contaminated Land: Applications in Real Environments (CL:AIRE). 2011. *The Definition of Waste: Development Industry Code of Practice*. Version 2. London: CL:AIRE.
RD19	Department for Environment, Food and Rural Affairs. 2009. Construction Code of Practice for the Sustainable Use of Soils on Construction Sites. London: Defra.

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