

## Contents

<b>11.</b>	<b>Ground Conditions</b>	<b>11-2</b>
11.1	Introduction	11-2
	Limitations and assumptions	11-3
11.2	Relevant legislation, planning policy and technical guidance	11-3
	Legislation	11-3
	Planning Policy	11-6
	Technical Guidance	11-8
11.3	Consultation and Engagement	11-12
	Overview	11-12
	Scoping Opinion	11-12
	Technical Engagement	11-14
11.4	Data gathering methodology	11-14
	Study area	11-14
	Desk Study	11-14
	Survey work	11-17
11.5	Overall baseline	11-18
	Current baseline	11-18
	Future baseline	11-23
11.6	Embedded measures	11-24
11.7	Scope of the assessment	11-32
	The Proposed Development	11-32
	Spatial Scope	11-32
	Temporal Scope	11-32
	Potential Receptors	11-33
	Likely significant effects	11-34
11.8	Assessment methodology	11-38
	Assessment of Ground Conditions effects	11-38
	Assessment methodology: Soils and agricultural land	11-40
	Assessment methodology: Land Contamination	11-43
11.9	<b>Preliminary assessment of soils (including agricultural land) effects</b>	5
	Assessment of Soils Effects (including agricultural land): Construction phase	5
11.10	<b>Preliminary assessment of Land Contamination Effects</b>	6
11.11	<b>Preliminary assessment of cumulative (inter-project) effects</b>	7
11.12	<b>Preliminary significance conclusions</b>	10
11.13	Further work to be undertaken	16
	Baseline	16
	Assessment	16
	Environmental measures	16

# 11. Ground Conditions

---

## 11.1 Introduction

11.1.1 This chapter presents the preliminary assessment of the likely significant effects of the Project with respect to Ground Conditions, including geology, land contamination, and soil receptors. The assessment is based on information obtained to date. It should be read in conjunction with the Project description provided in **Chapter 4: Description of the Proposed Development** and with respect to relevant parts of the following chapters:

- **Chapter 8: Biodiversity** - a large proportion of the biodiversity in terrestrial ecosystems is present in soil, and pollutants associated with land contamination have the potential to impact on biodiversity, this chapter should therefore be read in conjunction with **Chapter 8** which considers the potential for significant effects on biodiversity.
- **Chapter 10: Water Environment** - the water environment chapter considers the likely significant effects of the Project on water resources, there are common receptors between water environment and land contamination receptors, and there is interaction between the water environment and soil resources e.g., in relation to land drainage, soil compaction, and erosion/runoff.

11.1.2 This chapter describes:

- the legislation, policy and technical guidance that has informed the assessment (**Section 11.2**);
- consultation and engagement that has been undertaken and how comments from consultees relating to Ground Conditions have been addressed (**Section 11.3**);
- the methods used for baseline data gathering (**Section 11.4**);
- overall baseline (**Section 11.5**);
- embedded measures relevant to Ground Conditions (**Section 11.6**);
- the scope of the assessment for Ground Conditions (**Section 11.7**);
- the methods used for the assessment (**Section 11.8**);
- the preliminary assessment of Ground Conditions effects for soils (**Section 11.9**);
- the preliminary assessment of Ground Conditions effects for land contamination (**Section 11.10**);
- preliminary assessment of cumulative (inter-project) effects (**Section 11.11**);
- a summary of the preliminary significance conclusions (**Section 11.12**);
- additional measures proposed (**Section Error! Reference source not found.**);
- Ground Conditions residual effects assessment (**Section Error! Reference source not found.**); and
- an outline of further work to be undertaken for the Environmental Statement (ES) (**Section 11.13**).

## Limitations and assumptions

- 11.1.3 The information provided in this Draft ES is preliminary, the final assessment of likely significant effects will be reported in the final ES. The Draft ES has been produced to fulfil Pennant Walters’s consultation duties and enable consultees to develop an informed view of the likely significant effects of the Project.
- 11.1.4 There are no limitations relating to Ground Conditions that affect the robustness of the preliminary assessment of the potential likely significant effects of the Project.
- 11.1.5 The requirement for soil resources survey to be completed prior to the final ES is noted (see **Section 11.4.6**), however whilst the findings of this survey will inform the detailed soil handling and management measures in the Soil Management Plan and Materials Management Plan (see embedded measures in **Table 11.6**), the assessment outcomes are not anticipated to change.

## 11.2 Relevant legislation, planning policy and technical guidance

- 11.2.1 This section identifies the legislation, planning policy and technical guidance that has informed the assessment of effects with respect to Ground Conditions. Further information on policies relevant to the Project is provided in **Chapter 5: Legislation and policy overview**.

### Legislation

- 11.2.2 A summary of the relevant legislation is given in **Table 11.1**.

**Table 11.1 Legislation relevant to the Ground Conditions assessment**

Legislation	Legislative context
<b>Environment (Wales) Act 2016<sup>1</sup></b>	The Act makes provisions within Wales for the planning and managing of natural resources at national and local level, with natural resources including animals, plants and other organisms, water and soil, minerals, and geological features and processes.
<b>Well-being of Future Generations (Wales) Act (2015)<sup>2</sup></b>	The Act does not refer explicitly to soils or land contamination; however, it requires public bodies in Wales to think about the long-term impact of their decisions. It requires them to act in accordance with sustainable development principles, with the aim of achieving well-being goals, including maintaining and enhancing a biodiverse natural environment with healthy functioning ecosystems that support social, economic, and ecological resilience and the capacity to adapt to change (for example climate change).
<b>Environmental Protection Act (1990)<sup>3</sup></b>	Part 2 of the Act makes provision for the improved control of pollution arising from certain industrial and other processes. Part 2A of the Act

<sup>1</sup> UK Government (2016). Environment (Wales) Act 2016. (Online). Available at: <https://www.legislation.gov.uk/anaw/2016/3/contents/enacted>. (Accessed October 2023).

<sup>2</sup> UK Government (2015). Well-being of Future Generations (Wales) Act 2015. (Online). Available at: <https://www.futuregenerations.wales/wp-content/uploads/2017/01/WFGAct-English.pdf>. (Accessed October 2023).

<sup>3</sup> UK Government (1990). Environmental Protection Act 1990. (Online). Available at: <https://www.legislation.gov.uk/ukpga/1990/43/contents>. (Accessed October 2023).

Legislation	Legislative context
	<p>provides the regulatory basis for the identification, designation, and remediation of contaminated land.</p> <p>The potential for the Proposed Development to be built on land potentially affected by historical contamination requires assessment to ensure it is suitable for the proposed land-use and that, where necessary, remediation is carried out to ensure that following development, the land cannot be determined as Contaminated Land under the Act.</p> <p>Appropriate embedded environmental measures have been put in place as detailed in <b>Section 11.6</b> of this chapter to address risks associated with potential land contamination.</p>
<p><b>Water Resources Act 1991<sup>4</sup> as amended by the Water Act 2003<sup>5</sup></b></p>	<p>The Water Resources Act 1991 states that it is an offence to cause or knowingly permit polluting, noxious, poisonous or any solid waste matter to enter controlled waters.</p> <p>The Act was revised by the Water Act 2003, which provides the definition of and regulatory controls for the protection of water resources, including the quality standards expected for controlled waters.</p> <p>The 2003 Act sets out the definition of controlled waters, which has been used to define the scope of receptors for the assessment in <b>Section</b> Error! Reference source not found..</p> <p>Appropriate embedded environmental measures have been put in place as detailed in <b>Section</b> Error! Reference source not found. of this chapter to help ensure the protection of controlled waters.</p>
<p><b>The Environmental Damage (Prevention and Remediation) (Amendment) (Wales) Regulations 2015<sup>6</sup></b></p>	<p>Regulations implementing the European Union (EU) Directive on environmental liability setting out the principles for prevention and remedy of environmental damage. These Regulations amend the Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009<sup>7</sup>.</p> <p>Construction and operational activities for the Proposed Development have the potential to cause pollution and the regulations place emphasis on businesses to proactively implement pollution prevention measures so that damage to the environment does not arise.</p> <p>Appropriate embedded environmental measures have been put in place as detailed in <b>Section</b> Error! Reference source not found. of this chapter to help ensure the prevention of pollution.</p>
<p><b>Health and Safety at Work etc. Act 1974</b></p>	<p>The Health and Safety at Work etc. Act and regulations made under the Act place responsibilities upon employers to carry out a risk assessment for every work activity and to document it. Besides</p>

<sup>4</sup> UK Government (1991). Water Resources Act 1991. (Online). Available at: <https://www.legislation.gov.uk/ukpga/1991/57/contents>. (Accessed October 2023).

<sup>5</sup> UK Government (2003). Water Act 2003. (Online). Available at: <https://www.legislation.gov.uk/ukpga/2003/37/contents>. (Accessed October 2023).

<sup>6</sup> Welsh Government (2015). The Environmental Damage (Prevention and Remediation) (Amendment) (Wales) Regulations 2015. (Online). Available at: <https://www.legislation.gov.uk/wsi/2015/1394/made>. Accessed October 2023).

<sup>7</sup> Welsh Government (2009). The Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009. Available at: <https://www.legislation.gov.uk/wsi/2009/995/contents>.

Legislation	Legislative context
	<p>carrying out a risk assessment, employers also need to: make arrangements for implementing the health and safety measures identified as necessary by the risk assessment; appoint competent people to help them implement the arrangements; set up emergency procedures; provide clear information and training to employees; and work together with other employers sharing the same workplace.</p> <p>Land contamination poses a hazard to groundworkers and potentially others in proximity to the construction work. Appropriate risk assessments must be carried out and arrangements made to protect the health and safety of workers directly involved in groundworks for the Proposed Development and other human receptors who could be affected.</p> <p>Compliance with the Act during construction and operation is an embedded measure considered in the assessment and detailed in <b>Section</b> Error! Reference source not found..</p>
<p><b>The Construction (Design and Management) Regulations 2015</b></p>	<p>The Construction (Design and Management) Regulations (CDM) place specific duties on clients, designers, and contractors, so that health and safety is considered throughout the life of a construction project from its inception to its subsequent final demolition and removal.</p> <p>They include the requirement to appoint a Principal Designer and Principal Contractor to co-ordinate health and safety aspects during construction.</p> <p>Under the CDM regulations, designers must avoid foreseeable risks so far as reasonably practicable by: eliminating hazards from the construction, cleaning, maintenance, and proposed use and demolition of a structure; reducing risks from any remaining hazard; and giving collective safety measures priority over individual measures.</p> <p>Construction of the Proposed Development will fall under the requirements of the Regulations requiring consideration of health and safety to be incorporated into the design of the Proposed Development components and at construction stage.</p> <p>Compliance with CDM during construction is an embedded measure considered in the assessment and detailed in <b>Section</b> Error! Reference source not found..</p>
<p><b>Control of Asbestos Regulations 2012</b></p>	<p>The Control of Asbestos Regulations 2012 (CAR 2012) apply to employers who carry out work which disturbs, or is likely to disturb, asbestos. This includes groundworks where there is asbestos present or suspected to be present in the ground as loose fibres or as asbestos containing materials (ACMs).</p> <p>To comply with CAR 2012, in respect of asbestos-contaminated soil and construction and demolition materials, employers must consider people other than their own employees in the risk assessment required by Regulation 6, and in the action taken to prevent or control exposure required by Regulation 11. The other key regulation relevant to the Proposed Development is the requirement under Regulation 16 to prevent or reduce the spread of asbestos. Every employer must prevent or, where this is not reasonably practicable, reduce to the</p>

Legislation	Legislative context
	lowest level reasonably practicable, the spread of asbestos from any place where work under the employer's control is carried out.
	During construction works for the Proposed Development there is the potential for localised asbestos containing materials or soils to be encountered in the ground. Asbestos can be found on agricultural land or in any made ground e.g., due to historical ad hoc waste disposal to land, incorporation of demolition material into made ground or releases of fibres from Asbestos Containing Materials ('ACM') structures in poor condition, and subsequent spread by vehicle movements.
	Compliance with CAR 2012 during construction is an embedded measure considered in the assessment and detailed in <b>Section Error!</b> Reference source not found..

## Planning Policy

11.2.3 A summary of the relevant national and local planning policy is given in **Table 11.2**.

**Table 11.2 Planning policy relevant to the Ground Conditions assessment**

Technical guidance document	Context
<b>National planning policy</b>	
<b>Planning Policy Wales, Edition 11, 2021<sup>8</sup></b>	<p>The 2021 Planning Policy Wales document, Distinctive and Natural Linkages chapter, page 124, states that decisions on planning applications must consider the policy topics of the Distinctive and Natural Places theme, including “<i>opportunities in all areas to improve the resilience of ecosystems by addressing building on floodplains, diffuse pollution, soil compaction and sealing, ensuring the protection of peat resources</i>” and “<i>opportunities to improve health and well-being are taken, in particular, to... ensure water sensitive design, address soil carbon management... so as to improve capacity for adaptability to the challenges of climate change such as flood risk and increased temperatures</i>”.</p> <p>Chapter 6, Section 6.4 Biodiversity and Ecological Networks states that development proposals must consider the need to: “<i>safeguard protected and priority species and existing biodiversity assets from impacts which directly affect their nature conservation interests and compromise the resilience of ecological networks and the components which underpin them, such as water and soil, including peat</i>”.</p> <p>Chapter 6, Section 6.9.16 Land Contamination states that “<i>Whenever development or re-development potential exists the planning system will be the preferred means of addressing potential land contamination.</i>” 6.9.17 states that where land potentially meets the definition of contaminated land under Part 2A, the onus will remain with the developer to ensure that the land is suitable for its proposed</p>

<sup>8</sup> Welsh Government (2021) Planning Policy Wales, Edition 11, February 2021. (Online). Available at: [https://www.gov.wales/sites/default/files/publications/2021-02/planning-policy-wales-edition-11\\_0.pdf](https://www.gov.wales/sites/default/files/publications/2021-02/planning-policy-wales-edition-11_0.pdf). (Accessed October 2023).

Technical guidance document	Context
	<p>use and would not meet the legal definition of contaminated land under Part 2A. Section 6.9.19 states that “Where land contamination issues arise, the planning authority will require evidence of detailed investigation and risk assessment prior to the determination of the application” as well as “If contamination cannot be overcome satisfactorily, the authority may refuse planning permission.”</p> <p><b>Minerals</b> See ‘Minerals’ note below in relation to the Caerphilly County Council Development Plan.</p>
<p><b>Welsh Government (2019) Future Wales: the national plan 2040: Our National Development Framework<sup>9</sup></b></p>	<p>Policy 9 – Resilient Ecological Networks and Green Infrastructure states that the Welsh government will work with partners “to identify areas which should be safeguarded and created as ecological networks for their importance for adaptation to climate change, for habitat protection, restoration or creation, to protect species, or which provide key ecosystems services, to ensure they are not unduly compromised by future development; and, identify opportunities where existing and potential green infrastructure could be maximised as part of placemaking, requiring the use of nature-based solutions as a key mechanism for securing sustainable growth, ecological connectivity, social equality and well-being”.</p> <p>Protection of soil resources during development, in the context of protecting existing habitats or soil reuse for habitat restoration / improvement is therefore of relevance to the Project and the embedded measures in <b>Table 11.6</b> include measures to minimise effects on soil and to protect soil health.</p> <p>Policy 17 – Renewable and Low Carbon Energy and Associated Infrastructure states that all proposals should demonstrate that “they will not have an unacceptable adverse impact on the environment”. The embedded measures in <b>Table 11.6</b> includes measures to avoid or minimise effects on soils and to avoid construction activities resulting in land contamination.</p> <p>Policy 18 – Renewable and Low Carbon Energy Developments of National Significance states that the following criteria should be met for such developments: that “there are acceptable provisions relating to the decommissioning of the development at the end of its lifetime, including the removal of infrastructure and effective restoration”. <b>Table 11.6</b> details the embedded measures to minimise the loss of in situ soils from the Project and to prevent land contamination impacts during construction, operation and decommissioning.</p>
<p><b>Local planning policy</b></p>	<p>No specific policies in relation to soil or peat.</p> <p>A key objective of the LDP is to “encourage the re-use and/ or reclamation of appropriate brownfield and contaminated land and prevent the incidence of further contamination and dereliction”.</p>

<sup>9</sup> Welsh Government (2019) Future Wales: the national plan 2040: Our National Development Framework, setting the direction for development in Wales to 2040, 14 August 2019, updated 24 February 2021. Available at: <https://www.gov.wales/future-wales-national-plan-2040>. [online]. Accessed October 2023.



**Adopted November 2010<sup>10</sup>**

In relation to geodiversity, policy CW4 states that development proposals that affect locally designated natural heritage features, will only be permitted “*within, or in close proximity to sites designated as ... Regionally Important Geological Sites (RIGS), ..., where proposals either: conserve and where appropriate enhance the ... geological importance of the designation, or are such that ... harm is minimised by mitigation measures and offset as far as practicable by compensation measures designed to ensure that there is no reduction in the overall value of the area or feature*”.

**Minerals**

Policy SP8 relates to minerals safeguarding and states that the Council will contribute to regional demand for a continuous supply of minerals by “safeguarding known resources of coal, sand and gravel and hard rock”. “*Proposals for permanent development uses within identified mineral safeguarding areas will not be approved unless:*

- i The applicant can demonstrate that the mineral is no longer of any value or potential value, or*
- ii The mineral can be extracted satisfactorily prior to the development taking place, or*
- iii There is an overriding need for the development, or*
- iv The development comprises infill development within a built up area or householder development or an extension to an existing building.”*

The Proposed Development site, and most of the land within the Caerphilly boundary, is located within a sandstone resource area shown on the local plan constraints map<sup>11</sup>.

**Caerphilly County Borough Council, Caerphilly County Borough  
Local Development Plan –  
Review Report<sup>12</sup>**

The Review Report considers the progress made in implementing the adopted Local Development Plan (LDP) and considers the issues that inform the decision on whether the adopted LDP needs to be revised. The report concluded that a full review of the adopted LDP should commence immediately.

In relation to natural resources, including geodiversity, minerals and land contamination, no requirement for policy change was identified in the review. In relation to the protection and enhancement of nature conservation, earth science interest and biodiversity, the objective to identify, protect and enhance sites was assessed as not being met as proposed.

The Strategic Environmental Assessment/Sustainability Appraisal (SEA/SA) monitoring review found that the objective to “*make the most efficient use of land and to reduce contamination and safeguard soil quantity, quality and permeability*” was generally not met during the nine years up to 2019.

<sup>10</sup> [https://www.caerphilly.gov.uk/business/planning-and-building-control-for-business/local-development-plan/local-development-plan-2010-\(adopted\)/the-adopted-ldp](https://www.caerphilly.gov.uk/business/planning-and-building-control-for-business/local-development-plan/local-development-plan-2010-(adopted)/the-adopted-ldp). [online]. Accessed October 2023.

<sup>11</sup> <http://caerphilly.opus3.co.uk/ldf/maps>. [online]. Accessed October 2023.

<sup>12</sup> <https://www.caerphilly.gov.uk/business/planning-and-building-control-for-business/local-development-plan/2nd-replacement-ldp-up-to-2035/local-development-plan-review>. [online]. Accessed October 2023.



## Technical Guidance

11.2.4 A summary of the technical guidance for Ground Conditions is given in **Table 11.3**.

**Table 11.3 Technical guidance relevant to the Ground Conditions assessment**

Technical guidance document	Context
<b>The Development of Land Affected by Contamination: A Guide for Developers, version 3</b> <sup>13</sup>	<p>The guidance outlines the information planning authorities require on the land contamination status of proposed development sites and how associated planning conditions will be discharged. The document sets out best practice for land contamination management procedures, these follow a phased approach, and require the development and refinement of a conceptual model. The process starts at initial desk based assessment, then may progress to site investigation, to remediation options appraisal, development of a remediation strategy and implementation and verification of remediation, as set out in the Model Procedures for the Management of Land Contamination CLR 11 (Defra &amp; Environment Agency 2004), Guidance for the Safe Development of Housing on Land Affected by Contamination R&amp;D 66 (NHBC and Environment Agency 2010)*. For sites where preliminary risk assessment identifies potentially unacceptable risks, or requiring site investigation.</p> <p>*The CLR 11 guidance has been withdrawn and replaced by the Environment Agency Land Contamination Risk Management Guidance (see below), which outlines a similar approach to land contamination assessment as in CLR 11.</p>
<b>Welsh Government, Contaminated Land Statutory Guidance – 2012</b> <sup>14</sup>	<p>This guidance outlines the legal framework for dealing with contaminated land in Wales under Part 2A of the Environmental Protection Act 1990. It elaborates on the remediation provisions of Part 2A, such as the goals of remediation, and how enforcing authorities should ensure that remediation requirements are reasonable.</p>
<b>Environment Agency, Land Contamination Risk Management (LCRM)</b> <sup>15</sup>	<p>In addition to the above guidance, Natural Resources Wales refers developers or those seeking to voluntarily remediate a site to the Environment Agency LCRM guidance<sup>16</sup>, which provides the technical framework for applying a risk management process when dealing with land affected by contamination.</p>
<b>CAR-SOIL: Control of Asbestos Regulations 2012, Interpretation for Managing and Working with Asbestos in Soil</b>	<p>Provides interpretation and guidance to all involved in the management of asbestos in both soils and construction and demolition arisings in accordance with the Control of Asbestos Regulations 2012</p>

<sup>13</sup> Welsh Local Government, Natural Resources Wales & Welsh Government (2017) The Development of Land Affected by Contamination: A Guide for Developers, version 3 May 2017. (Online). <https://www.clare.co.uk/useful-government-legislation-and-guidance-by-country/81-project-management-info-pm/193-guidance-specific-to-particular-industrial-or-commercial-sectors-info-pm1>. (Accessed October 2023).

<sup>14</sup> Welsh Government (2012), Welsh Government Guidance Document, Contaminated Land Statutory Guidance – 2012, Number: WG19243. (Online). Available at: <https://www.clare.co.uk/useful-government-legislation-and-guidance-by-country/175-useful-government-legislation-and-guidance-by-country>. (Accessed October 2023).

<sup>15</sup> Environment Agency (2020). Guidance: Land contamination risk management (LCRM) (Online) Available at: <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>. (Accessed October 2023).

<sup>16</sup> Natural Resources Wales (2021). Land Contamination. (Online) Available at: <https://naturalresources.wales/guidance-and-advice/business-sectors/planning-and-development/advice-for-developers/land-contamination/?lang=en&msckid=f31e500cc14d11ec96571fe68fd7786f>. (Accessed October 2023).

Technical guidance document	Context
<b>and Construction and Demolition Materials (2016)</b> <sup>17</sup>	<p>(CAR 2012)<sup>18</sup>. Requirements include the use of measures to prevent the spread of asbestos during construction work. As made ground and demolished buildings are present within the Proposed Development application boundary, there is potential for asbestos to be encountered during groundworks and suitable management measures are, therefore, needed.</p> <p>These are included in the embedded environmental measures in <b>Section 11.6</b>.</p>
<b>Welsh Assembly Government, Environment Department, Environment Agency Land Quality Department., Appraisal of state, pressures and controls on the sustainable use of soils: executive summary 2002</b> <sup>19</sup>	<p>This document notes that the treatment of stripped soil materials is covered in guidance to the mineral extraction industry, but no such guidance is given to the building and construction industry. To date no guidance specifically for the management of soils during construction has been published for Wales.</p>
<b>CL:AIRE, Definition of Waste: Development Industry Code of Practice (DoWCoP), Version 2, 2011</b>	<p>The Definition of Waste: Development Industry Code of Practice (DoWCoP) is a voluntary Code launched in September 2008 (applicable to England and Wales) and updated in 2011 to provide a clear, concise, and auditable process to enable the sustainable remediation and development of land and suitable reuse of recovered materials/resources, including topsoil, subsoil, and potentially contaminated soil, that may initially be classified as waste/contaminated, by the use of a Materials Management Plan (MMP).</p> <p>The development and use of an MMP is an embedded measure, as detailed in <b>Section 11.6</b>.</p>
<b>Defra Construction Code of Practice for the Sustainable Use of Soils on Construction Sites</b> <sup>20</sup>	<p>Outlines guidance and legislation concerning the use of soil in construction projects, before offering stage by stage guidance on the use, management, and movement of soil on site, and the completion of appropriate soil resource surveys to inform the site working strategy (e.g., Site Waste Management Plan or Material Management Plan) and for the construction phase preparation of a Soil Resource Plan. The document is out of date regarding the legislation and guidance it references, however it still provides best practice guidance for the protection of soil resources on construction projects.</p> <p>Measures to avoid damage to soil health/soil structure are an embedded measure in the Construction Environmental Management Plan (CEMP), as detailed in <b>Section 11.6</b>.</p>

<sup>17</sup> CL:AIRE (2016). CAR-SOIL: Control of Asbestos Regulations 2012, Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials (Online). Available at: <https://www.clare.co.uk/projects-and-initiatives/asbestos-in-soil>. (Accessed October 2023).

<sup>18</sup> UK Government (2012). The Control of Asbestos Regulations 2012. (Online). Available at: <https://www.legislation.gov.uk/ukxi/2012/632/contents/made>. (Accessed October 2023).

<sup>19</sup> Welsh Assembly Government, Environment Department, Environment Agency Land Quality Department., Appraisal of state, pressures and controls on the sustainable use of soils: executive summary 2002. (Online). Available at: <https://www.gov.wales/appraisal-state-pressures-and-controls-sustainable-use-soils-executive-summary-html>. (Accessed October 2023).

<sup>20</sup> Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites. (Online). Available at: <https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils-on-construction-sites>. (Accessed: October 2023).

Technical guidance document	Context
<b>CIRIA C665 Assessing risks posed by hazardous ground gases to buildings<sup>21</sup></b>	<p>Provides guidance on ground gas monitoring and assessing the level of risk posed by ground gas, including mine gas, to developments.</p> <p>Consideration of the risks to the built environment from ground gas (in particular, enclosed spaces where ground gas can accumulate) is an embedded measure through compliance with LCRM, as detailed in <b>Section 11.6</b>.</p>
<b>Welsh Government, Predictive Agricultural Land Classification Map (Wales) The Hollington Map, Guidance Note Version 2.1 - May 2021<sup>22</sup></b>	<p>Provides guidance on how to use the Predictive Agricultural Land Classification Map (ALC) Map. The Predictive ALC replaces the Welsh 'Provisional' 1:250,000 Series of maps produced between 1967 and 1974. The guidance note states that where the Predictive ALC Map identifies grades 1, 2 or 3a, a survey will be required to determine the grades present and in what proportion. For grades 3b, 4 or 5, a survey is not required.</p> <p>The baseline status of the Proposed Development site in relation to ALC grade is detailed in <b>Section 11.5</b>.</p>
<b>Highways England, Design Manual for Roads and Bridges LA 109 - Geology and Soils<sup>23</sup></b>	<p>Sets out the approach to assessing and reporting the effects of highway projects on geology and soils used on Highways England projects. As a published approach to assessing the effects of developments on soil in EIA, this can be adapted for use on other projects. The guidance stops short of providing a methodology to assess the effects of a project on agricultural land and soil functions. This guidance informs the assessment methodology for soils as set out in <b>Section 11.8</b>.</p>
<b>Institute of Environmental Management &amp; Assessment (IEMA) (2022) IEMA Guide: A New Perspective on Land and Soil in Environmental Impact Assessment<sup>24</sup></b>	<p>Provides information and guidance on how the practical implications of soil functions, soil biodiversity, soil health, ecosystem services and natural capital should be applied within the overarching framework of climate change, to incorporate them effectively into the EIA process. This guidance informs the assessment methodology for soils as set out in <b>Section 11.8</b>.</p>
<b>Institute of Civil Engineers (ICE), The Environmental Impact Assessment Handbook - A Practical Guide for Planners, Developers and Communities (3rd Edition)<sup>25</sup></b>	<p>Provides an approach to assessing the potentially significant effects of development projects on soil and defines the sensitivity of different soil types to handling during construction projects. The guide notes that soil is a non-renewable resource, and that disturbance should be limited as far as possible, that soil is particularly prone to structural degradation if it is handled when too wet, and that adverse effects can be mitigated by following best practice guidance, such as the Defra 2009 Code of Practice for the Sustainable Use of Soils on Construction Sites.</p>

<sup>21</sup> CIRIA (2007) Assessing risks posed by hazardous ground gases to buildings (C665).

<sup>22</sup> Welsh Government (2021). Predictive Agricultural Map (Wales), The Hollington Map, Guidance Note, Version 2.1 – May 2021. (Online). Available at: <https://gov.wales/sites/default/files/publications/2021-05/agricultural-land-classification-predictive-map-guidance.pdf> .(Accessed September 2022).

<sup>23</sup> Highways England (2019). Design Manual for Roads and Bridges LA109 Sustainability & Environment Appraisal LA 109 Geology and soils (Online). Available at: <https://www.standardsforhighways.co.uk/dmrb/search/adca4c7d-4037-4907-b633-76eaed30b9c0> (Accessed September 2022).

<sup>24</sup> Institute of Environmental Management & Assessment (IEMA) (2022) IEMA Guide: A New Perspective on Land and Soil in Environmental Impact Assessment. IEMA; March, UK

<sup>25</sup> Institute of Civil Engineers (ICE) (2019). The Environmental Impact Assessment Handbook - A Practical Guide for Planners, Developers and Communities (3rd Edition). ICE Publishing; London, UK.

## 11.3 Consultation and Engagement

### Overview

- 11.3.1 The assessment has been informed by consultation responses and ongoing stakeholder engagement. An overview of the approach to consultation is provided in **Section 2.4 of Chapter 2: Approach to preparing the Environmental Statement**.

### Scoping Opinion

- 11.3.2 A Scoping Direction was issued by the Planning Inspectorate, on behalf of the Welsh Ministers, on 02 December 2022. A summary of the relevant responses received in the Scoping Opinion in relation to Ground Conditions and confirmation of how these have been addressed within the assessment to date is presented in **Table 11.4**.
- 11.3.3 The information provided in the Draft ES is preliminary and not all of the Scoping Direction comments have been addressed at this stage, however, all comments will be addressed within the ES.

**Table 11.4 Summary of EIA Scoping Direction Responses for Ground Conditions**

Consultee	Consideration	How addressed in this Draft ES
Welsh Government	Peat: It is welcomed that the Peatlands of Wales map has been used to inform the scoping report and that the Welsh Government agreed definition of peatland is used. It is also welcome that this has been supported by a peat depth survey on site that confirms no peatland is present in the application area.	Agreement with the approach to assessing effects on peat is noted. The peat survey was completed at 100m x 100m grid points across the Proposed Development site in 2021 and is included as an appendix to the Phase 1 Geoenvironmental Desk Study ( <b>Appendix 11A</b> ).
PEDW	Agricultural land quality: PEDW agrees that an agricultural land classification (ALC) survey is not needed, however requests that a proportionate summary of desktop findings is included in the ES.	Agreement to exclude ALC survey is noted. The baseline information in <b>Section 11.5</b> summarises the NRW data on ALC for the study area.
Welsh Government	Peat and soil: The Soil, Peatland & Agricultural Land Use Planning Unit notes that mineral, organo-mineral and peat soils are finite resources and provide crucial ecosystem services.  In relation to the potential impacts on soil functions of the Project, it is unclear how the likely impacts on soils have been assessed and the Department therefore cannot have confidence that there will	A peat survey was completed for the Proposed Development site in 2021 and is included as an appendix to the Phase 1 Geoenvironmental Desk Study ( <b>Appendix 11A</b> ). This concluded that the site is not underlain by true peat, as defined by the Welsh Government <sup>26</sup> .  A soil resources survey is to be completed prior to submission of the

<sup>26</sup> Peat is defined as having a thickness of more than 40cm of organic material within the upper 80cm of a soil profile. Welsh Government, DataMapWales. [online]. Available at: [https://datamap.gov.wales/layers/geonode:peatlands\\_of\\_wales\\_scg8](https://datamap.gov.wales/layers/geonode:peatlands_of_wales_scg8).

Consultee	Consideration	How addressed in this Draft ES
	not be adverse significant effects on soils (services and functions). To enable this assessment, a Soil Physical Characteristics Report is required for any areas of proposed infrastructure siting to confirm the soil resources available, and a specification for the soil resource survey is provided. This is to inform a soil management scheme.	<p>final ES. The findings of this will be used to inform a site-specific Soil Management Plan (SMP) for the Project. The soil survey and the SMP are embedded measures in <b>Table 11.6</b>. Embedded measures to avoid effects on soils (such as minimisation of infrastructure footprints, reuse of existing tracks) are also detailed in <b>Table 11.6</b></p> <p>The method for the assessment of the effects of the Project on soils (and soil functions) is provided in <b>Section 11.8</b> and the assessment is provided from <b>Section 11.9</b>.</p>
Natural Resources Wales (NRW)	Construction Environmental Management Plan: NRW advises that the CEMP should provide detail on the pollution prevention measures to be put in place to minimise impacts to the water environment during construction and should comply with all relevant Guidance for Pollution Prevention (GPPs). A water quality monitoring plan should be included to manage effects on water quality during construction, and information provided in the CEMP on the location of potential construction sources of pollution such as oil storage points.	The embedded measures in <b>Table 11.6</b> include measures to prevent construction activities resulting in pollution of land or the water environment.
NRW	Land contamination: NRW recommends the use of LCRM in the risk assessment of potential land contamination, for desk based, intrusive investigation and land remediation.	The use of LCRM in the assessment of land contamination is an embedded measure, see <b>Table 11.6</b> . A Phase 1 Geoenvironmental Desk Study has been completed for the site in line with LCRM and is included as <b>Appendix 11A</b> .
NRW	Ground conditions: NRW states that it is unclear why decommissioning phase activities have been scoped out of the ES and considers that they should be included.	Consideration of decommissioning effects is included in <b>Sections 11.9</b> and <b>11.10</b> .
The Coal Authority	Coal mining: the Coal Authority notes that there are coal outcrops running through part of the site and that these could have been subject to unrecorded shallow workings.	Consideration of the potential for shallow unrecorded workings is given in the Coal Mining Risk Assessment in which is appended to the Phase 1 Geoenvironmental Desk Study ( <b>Appendix 11A</b> ).
The Coal Authority	Minerals: The Coal Authority also advises that: those authorities with responsibility for minerals planning and safeguarding will have identified where	Consideration of the surface coal resource in relation to the potential for effects resulting from the Project, such



Consultee	Consideration	How addressed in this Draft ES
	they consider minerals of national importance are present and the planning decision making process should consider the presence of the surface coal resource.	as sterilisation of the resource, is given in <b>Section 11.7</b> .
The Coal Authority	Ground stability and coal mining risks: The Coal Authority notes that land stability in relation the ground conditions on the site is to be addressed through embedded measures rather than assessed in the ES, and welcomes the inclusion of a Geo-environmental Phase 1 Desk Study and a Coal mining Risk Assessment with the ES.	The embedded measures to avoid or control geotechnical risks associated with land instability and the coal mining legacy of the Proposed Development site and study area are detailed in <b>Table 11.6</b> .

## Technical Engagement

- 11.3.4 No additional technical engagement with consultees has taken place in relation to ground conditions.

## 11.4 Data gathering methodology

### Study area

- 11.4.1 The study area for Ground Conditions for land contamination receptors includes the Proposed Development application boundary (the Site) and a 250m buffer area beyond the boundary. The conceptual model considers the environmental setting (including geology, hydrogeology and hydrology) and the nature and extent of the identified potential contamination sources, potential receptors and available pathways for receptors to be exposed to contaminants.
- 11.4.2 The likely significant effects of the Proposed Development on soil receptors include temporary effects during construction activity, such as vehicle/plant movements, soil handling, storage, and reinstatement, and permanent effects (e.g., permanent removal or sealing of soil for construction of buildings), that will occur within the Site. Effects on geology receptors could include permanent damage during construction, or permanent change to geological features or public access to these features due to construction of buildings or other structures in or around the geological feature(s). Based on the nature of the Proposed Development and the baseline conditions described below in **Section 11.5**, no external zone of influence for soil has been identified beyond the Proposed Development application boundary for soils or geology. The rationale for the study area is that the soils and geology are geographically discrete and are unlikely to be substantially influenced by changes to their surroundings or vice versa. However, in relation to excavations, the hydrogeological effects of dewatering could potentially extend beyond the Proposed Development site. Assessment of hydrogeological effects is included in **Chapter 10: Water Environment**.



## Desk Study

11.4.3 A summary of the organisations that have supplied data, together with the nature of that data is outlined in **Table 11.5**.

**Table 11.5 Data sources used to inform the Ground Conditions assessment**

Organisation	Data source	Data provided
<b>British Geological Survey (BGS)</b>	British Geological Survey (BGS) Onshore GeoIndex <sup>27</sup> for geological information, including exploratory hole records (available online <a href="https://www.bgs.ac.uk/map-viewers/geoindex-onshore/">https://www.bgs.ac.uk/map-viewers/geoindex-onshore/</a> ; accessed October 2023);	Information on superficial and bedrock geology, historical borehole records.
<b>Coal Authority</b>	Consultants Coal Mining Report: Mynydd Maen (Ref: 51002544611001).	Site specific coal mining information identifying potential mining related risks.  This report provides coverage of the Proposed Development Site. It should be noted that the Consultants Coal Mining Report was commissioned prior to refinement of the Proposed Development Site boundary, and it includes an area to the south of the Site which no longer forms part of the red line boundary for the Proposed Development.
<b>Coal Authority</b>	Interactive Map for mining information <sup>28</sup>	Coal mining information including recorded mine entries, shallow coal mining workings, coal outcrops, fissures and breaklines, and Development High Risk Areas.
<b>Landmark</b>	Envirocheck: Order ref: 315136209_1_1, 3 August 2023 (Central and South Parcel) Order ref: 315135944_1_1, 3 August 2023 (North Parcel)	Environmental dataset and historical maps for the Proposed Development Site, plus a minimum 500m buffer.
<b>LandIS</b>	Soilscapes Map <sup>29</sup>	Regional soil mapping and information on soil types
<b>National Library of Scotland</b>	Historical maps <sup>30</sup>	Historical OS maps available to view online.

<sup>27</sup> BGS GeoIndex. Available at: <https://www.bgs.ac.uk/map-viewers/geoindex-onshore/>. Accessed November 2023.

<sup>28</sup> Coal Authority. Available at: <https://mapapps2.bgs.ac.uk/coalauthority/home.html>. Accessed November 2023.

<sup>29</sup> LandIS. Soilscapes. Available at: <https://www.landis.org.uk/soilscapes/>; Accessed November 2023.

<sup>30</sup> National Library of Scotland. Map Viewer. Available at: (available online <https://maps.nls.uk/>). Accessed November 2023.

Organisation	Data source	Data provided
Welsh Government	Datamap Wales <sup>31</sup> <ul style="list-style-type: none"> <li>Predictive Agricultural Land Classification Map</li> <li>Unified Peat Map of Wales</li> <li>Geological Conservation Review (GCR) Site Boundaries</li> <li>Regionally Important Geodiversity Sites (RIGS)</li> <li>Aggregates Resource Areas</li> <li>Sites of Special Scientific Interest and other statutory and non-statutory environmental conservation designations</li> </ul>	Main source of public sector environmental data for Wales, available to view on the online map viewer or to download.
Wood (2021)	Trecelyn Wind Farm – Peat Depth Survey Report (Ref. 807379-WOOD-RP-OG-00001_P01.01, November 2021).	Peat depth survey results for land within the Proposed Development application boundary. It should be noted that the peat survey was completed prior to refinement of the Proposed Development Site boundary, and it includes an area to the south of the Site which no longer forms part of the red line boundary for the Proposed Development. .  This report is included as an appendix to the Phase 1 Geo-environmental desk study, included in Appendix 11A.
WSP (2023)	Phase 1 Geoenvironmental Desk Study	Desk study to assist in determining whether the Proposed Development site is suitable for its proposed use, included in <b>Appendix 11A</b> . The report includes a review of selected contemporary information including geological, environmental, hydrological and hydrogeological data, review of historical mapping for the Site and its surroundings, and a walkover of the key elements of the site (conducted in October 2023) to identify potential evidence of contamination and verify desk study information as necessary. It includes the development of a Conceptual

<sup>31</sup> Welsh Government. Available at: available online at: <https://datamap.gov.wales/>. Accessed November 2023.

Organisation	Data source	Data provided
		Model (CM) and a Tier 1: Preliminary Risk Assessment, to assess the status of potential contamination and identify potentially significant contaminant linkages that require further consideration in line with current guidance including Land Contamination Risk Management (LCRM) guidance published by the Environment Agency. It also identifies information gaps, geo-environmental development constraints, and requirements for further assessment.
WSP (2023)	Coal Mining Risk Assessment	<p>Mining risk assessment to assist in defining the level of risk associated with historical mining activities within the Proposed Development site and to determine if further assessment is needed to quantify the risk and define mitigation measures.</p> <p>This report is included as an annex to the Phase 1 Geo-environmental desk study, included in <b>Appendix 11A</b>.</p>

## Survey work

- 11.4.4 A Phase 1 peat depth survey was conducted by WSP (then known as Wood) during September 2021 within the Proposed Development Site to determine whether deep peat (defined by the Welsh Government as >0.4m of organic material within the upper 0.8m of a soil profile - see **Table 11.6**) is present on the Site. The findings are reported in the Peat Depth Survey Report (Wood, 2021) (Appended to the Phase 1, **Appendix 11A**).
- 11.4.5 During October 2023, a walkover was carried out by WSP of the Proposed Development Site, to inform the Phase 1 Geo-environmental desk study (**Appendix 11A**) and Coal Mining Risk Assessment (CMRA) (appended to the Phase 1, **Appendix 11A**). The walkover was completed by an experienced contaminated land consultant and a geotechnical consultant. Photographs were obtained of key features identified through desk-based review or observed during the walkover, and observations from the Site walkover are recorded in the Phase 1 Geo-environmental desk study (as an appendix to the Phase 1 Geoenvironmental Desk Study (**Appendix 11A**)).
- 11.4.6 A soil survey is required for the Proposed Development. The survey will be completed in early 2024 by a suitably qualified and experienced soil surveyor and reported with the Final ES.

## 11.5 Overall baseline

### Current baseline

#### Current and historical land use within the Proposed Development site and study area

- 11.5.1 Current activities within the Site are limited to agricultural use. Glan Shon Farm in the south land parcel currently farms cattle and poultry. Ty Oakley Farm at the north parcel comprises a sheep farm. The main land use across the Site is sheep grazing, predominantly on improved or semi-improved moorland. Small developments are present within the Site including other farms and public rights of way. An active sandstone quarry (thought to be extracting material for local dry-stone walls) is present in the north parcel, in a field to the east of Pen Y Caeau Farm.
- 11.5.2 There has been former coal mining activity within the Proposed Development Site boundary and in the wider study area (see below). Quarrying has taken place on a small-scale on the Site, and a large quarry is present adjacent to the Site. Agricultural activities on the Site include a former sheep wash in the North Land Parcel. Potential infilling of excavations / small quarries has taken place in the South Land Parcel.
- 11.5.3 In the surrounding area land use includes agricultural fields (grazing and orchards), woodland, Hafod Fach Quarry, Tarmac Hafod Asphalt plant (indicated to be operational at Hafod Fach Quarry) and the Hallets Cider site, which is part of Blaengawny Farm. Aerial photography indicates that a small portion of land used as an orchard is located immediately south of the Northern Parcel. Residential developments are present along the route of the A467 road to the west, at Cwmcarn, Abercarn, Newbridge, Crumlin and Swffryd, and at Hafodryns to the north on the A472. The Afon Ebwy river is beyond the A467 road to the west and runs roughly parallel to the road. In addition to coal mining, other industry has been present historically in the surrounding area in the form of quarries, including the large Hafod quarry. Further information on the historical land uses is provided in the Land Contamination section from **11.5.23** onwards.

#### Topography

- 11.5.4 The north land parcel is at an approximate elevation of between 310m and 410m AOD and slopes down from east to west. The centre land parcel is at an approximate elevation of between 345m and 355m, with a gradual fall from east to west towards the Nant Hafod-fach valley. The south land parcel is at an approximate elevation of between 290m and 350m AOD and slopes down from northeast to southwest towards the Nant Hafod-fach valley. The lowest in the surrounding area are associated with the Ebwy valley, which ranges from 110m AOD to the north and 80m AOD to the south.
- 11.5.5 The south and central land parcels are located near the top of the ridge between Nant Gwyddon, to the east, and Cwm Hafod Fach, to the west. The summit of the ridges is 472m AOD, approximately 0.3km east of the Proposed Development Site.

#### Soils (including peat)

- 11.5.6 Information reviewed on the LandIS Soils map indicates the soil type within the Proposed Development Site boundary predominantly comprises freely draining acid loamy soils over rock, with a loamy texture and medium carbon content (type 13), in the northeast of the Proposed Development Site there is an area shown as having very acid loamy upland soils with a wet peaty surface, a peaty texture and high carbon content (type 16).

- 11.5.7 The Unified Peat Map of Wales and Peatlands of Wales Thickness maps shows no peat onsite or within the study area. The Peatlands of Wales Thickness map updates information in the Unified Peat Map of Wales to 2022 based on current evidence sources, including detailed soil survey records and point survey observations of peat presence. The data layers were created on a 50m grid whereby the presence and thickness of peat are estimated from a range of sources for each 50m grid cell across Wales. A peatland evidence score defines the level of confidence in the presence of peat in any given grid cell, with those cells scoring more than 2 on this scale of 1-10, captured in the map.
- 11.5.8 However, given the potential for peat to be present, as identified through the soil mapping, a Phase 1 peat survey was undertaken in 2021 in accordance with best practice guidance document "Peatland Survey. Guidance on Developments on Peatland" which is published by the Scottish Government and NatureScot (Scottish guidance has been adopted as it is noted there is no Welsh equivalent).
- 11.5.9 The survey was on a 100m x 100m grid of points across the Site with peat depth measurement taken at each survey point. A total of 143 probes were completed and these found potential peat depths in the range of 0.0m to 0.1m. A copy of the survey report is included as an appendix to the Phase 1 Geoenvironmental Desk Study (**Appendix 11A**).
- 11.5.10 The Welsh Government defines deep peat as having a thickness of >0.4m organic material in the upper 0.8m of a soil profile. Based on the survey results, land within the Site can therefore be considered as not being underlain by peat.

### Agricultural land classification

- 11.5.11 The Predictive Agricultural Land Classification (ALC) Map indicates that the agricultural land classification within the Proposed Development is Grade 4 and, therefore, is not likely to include any 'best and most versatile' (BMV) land (categories 1, 2 or 3a). The Welsh Government only requires an agricultural land classification survey where the Predictive ALC Map identifies Grades 1, 2 or 3a.

### Geology

- 11.5.12 The British Geological Survey (BGS) 1:50,000 scale mapping available on the GeoIndex, shows the bedrock underlying the Proposed Development Site to be the Hughes Member Sandstone (Pennant Sandstone Formation). This comprises green-grey, lithic arenites with thin mudstone/siltstone and seatearth interbeds, and mainly thin coals. A fault is shown running southwest to northeast through the Northern Parcel.
- 11.5.13 The BGS mass-movement layer shows a mapped landslide deposit (sandstone) north of the Proposed Development Site, within the study area approximately ~100m north of the Northern Parcel.
- 11.5.14 The BGS 1:50,000 scale superficial geology mapping shows no superficial deposits on the site. This indicates potential for outcropping rock to be present, and soils present on the Proposed Development Site may be thin. No superficial deposits are shown in the study area, however beyond this, superficial deposits are consistent with the valley floors. The Afon Ebwy flows across alluvium (clay, silt, sand, and gravel) and occasional glaciofluvial deposits (sand and gravel). The lower reaches of Nant Gawny (tributary of Afon Ebwy) are underlain by head deposits (clay, silt, sand and gravel). The Trosnant Brook is underlain by head (clay, silt and gravel) and alluvium (clay, silt, sand, and gravel) superficial deposits, the latter of which is characteristic of the Afon Lwyd valley.
- 11.5.15 There are no BGS borehole records within the Proposed Development Site. A borehole ~40m west of the Northern Parcel recorded coal from 8.5m below ground level (bgl) to 8.7m bgl, the soil or rock encountered in the top 8.5m is not detailed. A 1983 borehole

~45m southwest of the Southern Parcel at 'Hafod Quarry, Abercarn', records gritstone encountered at 2.6m bgl and extending to 12.9m bgl, the soil or rock encountered in the top 2.6m is not detailed. A borehole close to this, from 1982, records red-brown clay and grit to 4.5m bgl, becoming greyer from 3.0m bgl, underlain by gritstone with 3mm coal layers and coal fragments in rock from 5.25m bgl.

## Geodiversity

- 11.5.16 There are no sites of special scientific interest (SSSI) designated for geological or biological features within the Proposed Development Site or the study area.
- 11.5.17 According to Datamap Wales there are no Regionally Important Geological Sites (RIGS) or Geological Conservation Review sites within the Proposed Development Site or the study area.

## Minerals

- 11.5.18 DataMap Wales information shows that the Proposed Development Site and study area are not located in an Aggregates Resource Area.
- 11.5.19 The Proposed Development Site, and most of the land within the Caerphilly boundary, is located in a sandstone resource area shown on the Caerphilly County Borough Council local plan constraints map. No proposals to extract sandstone are currently active within the Site or study area.
- 11.5.20 The Coal Authority Interactive map shows the Proposed Development Site and study area within a Coal Mining Reporting Area. There are no mine entries recorded within the Proposed Development Site however several shafts and adits are recorded in the study area, the nearest is ~290m to the north, close to the A472, and several shafts are recorded ~905m to the west of the Southern Parcel. There are entries in the Abandoned Mines Catalogue for the Proposed Development Site and study area. Areas identified as Development High Risk Areas are shown within the Proposed Development Site, these are limited to the northern extent of the Northern Parcel and the western extent of the Southern Parcel and correspond to coal outcrops. The Proposed Development Site and entire study area, as well as the surrounding land in Caerphilly, are within a surface coal resource area. No surface coal mining is recorded within the Proposed Development Site or in the study area. No mine entry zones of influence are identified within the Proposed Development Site; however, several are present to the north of the Northern Parcel, the nearest ~310m north, and ~525m south and ~950m west of the Southern Parcel.
- 11.5.21 A Coal Authority Consultants Coal Mining Report (CCMR) was obtained for the Site (and an additional area to the south which does not form part of the red line boundary for the Proposed Development) and is appended to the CMRA which forms an annex to the Phase 1 Geo-environmental Desk Study (**Appendix 11A**). This identifies eight coal seams worked beneath the site at depths of between 179m and 516m below ground level. No investigative or remedial activity is recorded within the site or within 50m of it.
- 11.5.22 Hafod Fach Quarry is immediately northwest of the Southern Parcel, and a former quarry is shown on OS mapping in the Northern Parcel, this is the same feature described in **11.5.1**. Hafod Fach quarry is at a lower elevation than the site and is still active. Further details are provided in the Land Contamination section below.

## Land contamination

- 11.5.23 The Phase 1 Geo-environmental desk study (WSP, 2023) has identified potential sources of land contamination on the Proposed Development Site including potential residual mine



waste/ spoil (likely to be limited in extent if present), current and former agricultural activities, active diesel tanks, potentially asbestos containing waste in stockpiles, infilled ground (made ground) and a burning pit. The sources identified are small-scale and localised or diffuse in nature. The coal mining history of the Site also means that there is potential for mine gas to be present. Locations of the identified potential sources are shown in Figure 2.5 of the Phase 1 Geo-environmental desk study (**Appendix 11A**). No specific areas of agricultural chemical or fuel storage have been identified.

- 11.5.24 During the walkover in 2023, no evidence of major spillages of chemicals or oils (staining or vegetation die back) were noted across the Site. Occasional empty disused drums or barrels were noted across both farms (Ty Oakley Farm and Glan Shon Farm) with limited numbers of filled drums observed within barns on hardstanding, none stored externally. Drip trays for chemicals were noted as in use on both farms.
- 11.5.25 At the north parcel an active sandstone quarry is present however no evidence of infilling of quarried areas was noted. A stockpile of waste material was observed near the barn in the northwest of the farm (E:322841, N:198390) containing building materials, aggregate, wood, metals, plastics, disused silos, and farm machinery. No potential asbestos containing material was observed.
- 11.5.26 An underground septic tank was present in the northwest, close to the farmhouse (E:322849, N:198305), of unknown capacity. An above ground storage tank (diesel) was also observed, north of the barn (E:322877, N: 198363), comprising a 5,000L self-bunded plastic tank positioned straight onto the ground (not on a plinth/platform).
- 11.5.27 At the south parcel two separate stockpiles of building waste were observed, containing brick, stone, tile, ceramics and possible asbestos containing materials. The first stockpile was located east of the farm buildings and at the field boundary (E:322677, N:196004) and measuring approximately 2m x 15m x 70m (circa 2,100m<sup>3</sup> of material). This stockpile presented as a deposit of waste made ground used to build up the bank on which it was situated, sitting at approximately 2m high. The second stockpile was situated north of the farm buildings adjacent to some trees (E:322496, N:196073) and comprised a cluster of piles of building waste with several suspected asbestos containing fragments (cement bonded roofing/cladding) observed.
- 11.5.28 A burn pit was observed at Glan Shon Farm, adjacent to the farm track leading northeast from the buildings (E:322729, N:196070). The pit contained plastics, wood, metal and other domestic waste seen partially combusted.
- 11.5.29 An above ground storage tank (diesel) was noted at the farm in the form of a 2,500L self-bunded plastic tank inside a cage adjacent to a barn (E:322493, N: 195969). This was on a concrete plinth.
- 11.5.30 Suspected asbestos containing materials were noted as present in building structures including gutters, cladding and roofing on barns.
- 11.5.31 A spring was present running south-westwards (downhill) along the boundary of the field and copse south of the sheepfold (E: 323586, N: 197877). Waterlogged ground was observed up to 10m north of the treeline and water was seen occasionally pooled on the ground surface. A stream was noted in the northeast of the farm, running from south to north and bisecting the site adjacent to the copse (E: 323586, N: 197877) and continuing northwards offsite.
- 11.5.32 The adjacent active sandstone quarry (Hafod Fach quarry) has been identified as a potential offsite source of contamination, however given the location of the quarry activities downgradient of the Site, potential impacts on land quality at the Site are limited to possible impacts on deep groundwater in the bedrock aquifer.

- 11.5.33 The environmental risk assessment is included in the Phase 1 Geo-environmental desk study (Phase 1 Geo-environmental desk study (**Appendix 11A**)). In regard to human health receptors relating to potential contaminants in soils arising from mining waste and agricultural operations, the risks are assessed to be very low. Low risks have been assigned to human health risk from potential contaminants associated with active diesel tanks and waste stockpiles in the northern parcel. A low risk to current site users is assigned for mine gas. Risks associated with the infilled land and burning ground in the south have been allocated a moderate/low risk for current site users associated with waste stockpiles (potentially with asbestos content), and infilled ground and the burning ground in the south land parcel.
- 11.5.34 In regard to controlled waters, risks to surface water are assessed to be very low, as surface water receptors are either not located near potential sources, or the source, if present, is likely to be of limited extent and unlikely to result in significant degradation of water quality. The risks to groundwater from the identified sources are assessed to be very low for onsite sources, and low for the offsite quarry, given the nature of the sources and the likelihood that groundwater in the bedrock aquifer is likely to be at depth and likely to have been impacted by historical mining activities in the wider area.
- 11.5.35 Risks to future buildings and infrastructure have been assessed as low to very low given the generally limited nature of the sources and the distance from sources to the proposed buildings and infrastructure.
- 11.5.36 Risks to current agricultural property (including cattle, poultry, sheep, and possible future crops, considered given the adjacent orchards) associated with possible mining wastes are assessed as very low.

#### Environmental setting: hydrogeology, hydrology and sensitive land uses

- 11.5.37 The Hughes Member bedrock on the Site and alluvium deposits in the valleys surrounding the Site are classified by NRW as Secondary A Aquifers which by definition are *“permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers”*. Groundwater vulnerability is classed as high due to the shallow bedrock, absence (<3m thickness) of low permeability deposits above it, and potential for a productive aquifer in well-connected fractures. Further details of the hydrogeology on the Proposed Development Site and in the surrounding area is provided in **Chapter 10: Water Environment**.
- 11.5.38 Given the likelihood that soils within the Proposed Development Site are thin and superficial deposits absent on the Site, there would be potential for contaminants released to ground to reach the underlying Secondary A aquifer in the Hughes Member.
- 11.5.39 Information reviewed in the Phase 1 Geoenvironmental Desk Study records that there are no licensed groundwater abstractions on the Site. The closest groundwater abstraction is recorded 13m northeast, operator unknown, listed as for agricultural use. A further six groundwater abstractions are recorded (all within 250m) associated with dust suppression at Hafod Quarry. One other groundwater abstraction is recorded 575m northwest at The Old Rectory, Crumlin operated by Mr L Harriott for water bottling.
- 11.5.40 Two wells are identified on OS mapping, one ~75m southwest of the Northern Parcel at Blaengwrney Farm (aka Blaengawney Farm) / Halletts Cider, and one at Cwm Gwyddon ~550m the east of Parcel Two, indicating the possibility that groundwater is abstracted for drinking water supply or other uses in the study area. The BGS Geindex identifies five in the vicinity of Hafod Fach Quarry. The wells were advanced in 1983 and between 35m and 170m deep. They are screened in the Pennant Sandstone Formation.

- 11.5.41 The Afon Ebwy river flows from north to south through the Ebwy valley, to the west of the site (~795m west of the Southern Parcel).
- 11.5.42 Within the Site, the North Parcel intersects the Nant Gawni, a tributary of the Afon Ebwy, and one tributary (unnamed watercourse) of the Trosnant Brook.
- 11.5.43 The Central Parcel does not intersect any identified watercourses, ponds, or springs. The nearest hydrology feature is the Nant Hafod-fach, (tributary of Afon Ebwy), located 200m to the west.
- 11.5.44 The South Parcel does not intersect any watercourses. The closest watercourses, Nant Hafod-fach and Nant Gwyddon, are tributaries of Afon Ebwy which flow 200m to the west and 300m to the east of the Southern Parcel, respectively. There is one pond within the land parcel, identified as Pwllgwinau in the OS mapping (NGR: ST 23144 96403). The pond is approximately 0.03km<sup>2</sup> in area and at an elevation of around 345mAOD.
- 11.5.45 Due to the proximity of tributaries of the Afon Ebwy River to the Proposed Development Site, surface water is identified as a potential receptor of contaminants on, or released to, land within the Proposed Development Site.
- 11.5.46 There are no areas with statutory ecological conservation designations within the Proposed Development site and no areas of Ancient Semi-natural Woodland, however these, and other Sites of Importance for Nature Conservation (SINCs) are present adjacent to the Site. No ecological features with international, European or national statutory designation have been identified in the study area that could potentially be significantly affected by land contamination on the Proposed Development site. Details of ecological receptors are provided in **Chapter 8: Biodiversity**.

## Future baseline

- 11.5.47 In the absence of the Proposed Development, the current agricultural land use (mainly sheep grazing, some cattle grazing and poultry rearing, with potential for limited crop growing) and localised quarrying are likely to continue at the Proposed Development Site.
- 11.5.48 With respect to land contamination, this is managed in Wales by Part 2A of the Environmental Protection Act 1990. Part 2A requires county councils to identify potentially contaminated land in their area and ensure potential risks from historical contamination are assessed and mitigated accordingly. For future developments, The Town and Country Planning Act 1990 requires the consideration of the potential for contamination to be present and ensure a site is suitable for the proposed end use.
- 11.5.49 Climate change due to continued emission of greenhouse gases is ongoing globally and will result in further rises in the earth's temperature and long-lasting changes in the climate, such as increased frequency and duration of heatwaves and more intense rainfall. In Wales, as in the rest of the UK, the climate is already variable, however it is expected that there will be more intense rainfall, more flooding in low-lying coastal areas and hotter, drier summers, also more extremely warm days, milder and wetter winters, less snowfall and frost as well as lower groundwater levels.<sup>32</sup>
- 11.5.50 For the Proposed Development Site, the potential effects of climate change are expected to relate to greater variation in river flows (low flows and high flows) with associated flooding during high flow, and the effects on soils and agricultural land of longer dry spells. Consideration of the flood risk at the Site is detailed in **Chapter 10: Water Environment**. Lack of water availability could limit crop production (which could take place at the site

---

<sup>32</sup> Natural Resources Wales (2023). Climate change overview. Available at: <https://naturalresourceswales.gov.uk/about-us/what-we-do/our-roles-and-responsibilities/climate-change/climate-change-overview/?lang=en>. Accessed November 2023.

given adjacent current land use), and the BGS state that soil characteristics such as “soil chemistry, erosion, saturation and regeneration could all be affected by climate change”<sup>33</sup>. As the Site is in agricultural use the land and soil is already managed to an extent, and as such, there is scope for alternative management approaches to both mitigate negative effects and promote positive effects of climate change.

- 11.5.51 The effects on soils (soil health and soil functions) are overall likely to be negative rather than positive, however it is not possible to quantify these at present given the lack of baseline information on soil health regionally and lack of models to predict the likely changes on a regional basis.
- 11.5.52 Climate change effects will interact with land contamination, potentially resulting in new contaminant migration pathways and distribution of contaminants. However, given the Proposed Development Site’s elevated position, the surrounding land uses, and the localised or diffuse nature of the identified potential contamination sources, significant changes to the Site’s land contamination status as a result of climate change are not likely to occur.
- 11.5.53 Therefore, it is reasonable to conclude that in the absence of the Proposed Development there would not be a significant change in ground conditions with regard to land contamination, or significant change with regard to the condition of the soil / the agricultural land quality status, within the study area, up to and within the period of operation.
- 11.5.54 In regard to land stability, which may be affected by climate change, **Table 11.6** includes an embedded measure that the design of the Proposed Development will account for the expected ground conditions and design loads, accounting for the effects of climate change.

## 11.6 Embedded measures

- 11.6.1 A range of environmental measures have been embedded into the Proposed Development as outlined in **Section 4.4**. **Table 11.6** outlines how these embedded measures will influence the Ground Conditions assessment.

**Table 11.6 Summary of the embedded environmental measures**

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
<b>Construction</b>			
<b>Soil</b>			
<b>Soil and agricultural land</b>	Compaction of soil by vehicles or during stockpiling during construction leading to damage to soil structure resulting in damage to/loss of soil	A soil resources survey will be completed by a soil scientist / experienced soil specialist prior to construction and the findings of the soil resources survey will be used to inform the construction phase Soil Management Plan (SMP) and Soil Resources Plan (which may be part of a Materials Management Plan).	SMP, MMP and CEMP secured via DNS condition

<sup>33</sup> BGS (2023) Soil and agriculture. Available at: <https://www.bgs.ac.uk/about-bgs/services/climate-change-and-geohazards/sector-profiles-soil/>. Accessed November 2023.

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
	functions / damage to soil resources, and degradation of agricultural land	<p>Storage and handling of soil will be informed by the Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites to avoid damage to soil structure and help to minimise soil compaction, and associated measures will be detailed in the SMP. The SMP will be submitted to the local authority for comment prior to construction.</p> <p>If ground conditions require it, a temporary trackway of either metal, wood, or plastic, would be used for vehicles to access the working areas. This would be removed once construction is complete.</p> <p>During topsoil stripping, machinery with low ground pressure will be used to minimise soil compaction, including during construction of the access tracks, the tracks will then be available for heavier vehicles to use to avoid impacts on other areas.</p> <p>Temporary storage of soils will be carried out in accordance with a Materials Management Plan (MMP). This document will outline where excavated non-waste materials will be reused in line with the CL:AIRE Definition of Waste Code of Practice (DoWCoP). The MMP will include a declaration by a Qualified Person that the MMP has been completed in accordance with the DoWCoP and that best practice is being followed. The CEMP refers to the MMP.</p>	
<b>Soil and agricultural land</b>	Erosion of soil during construction, leading to loss of organic matter in runoff	<p>A soil resources survey will be completed by a soil scientist / experienced soil specialist prior to construction and the findings of the soil resources survey will be used to inform the construction phase Soil Management Plan (SMP) for soil handling and measures to minimise soil erosion.</p> <p>Storage and handling of soil will be informed by the Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites to avoid damage to soil structure and help to minimise soil erosion from surface water runoff. Details of measures required will be in the SMP. The SMP will be submitted to the local authority for comment prior to construction.</p> <p>Measures to avoid soil compaction (which can result in soil erosion by increasing surface</p>	SMP, MMP and CEMP secured via DNS condition



Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
		<p>run-off) are integrated into the CEMP to avoid damage to soil.</p> <p>The CEMP refers to the MMP which will detail how temporary storage of soils is to be managed.</p> <p>Soil stockpiles will be stored for the shortest amount of time possible.</p>	
<b>Soil and agricultural land</b>	<p>Permanent loss of soil and associated soil functions due to construction of the wind farm</p>	<p>Elements of the Proposed Development which require removal of topsoil during construction and where topsoil cannot be reinstated will be kept to the minimum footprint required for the Proposed Development.</p> <p>Storage and handling of soil will be informed by the Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites to avoid damage to soil structure. This measure is integrated into the CEMP.</p> <p>Permanently displaced soil will be reused within the Proposed Development Site where practicable in accordance with the MMP, as referenced in the CEMP.</p> <p>A soil resources survey will be completed by a soil scientist / experienced soil specialist prior to construction and the findings of the soil resources survey will be used to inform the construction phase Soil Management Plan (SMP) for soil handling and storage, which will allow excavated soil that is surplus to the Proposed Development to be retained in good condition and potentially reused offsite (in accordance with the MMP).</p>	<p>SMP, MMP and CEMP secured via DNS condition</p>
<b>Soil and agricultural land – excavated soils</b>	<p>Degradation of soil functions and agricultural land quality due to cross-contamination of topsoil with contaminated soil/material excavated/disturbed during construction work</p>	<p>A soil resources survey will be completed by a soil scientist / experienced soil specialist prior to construction and the findings of the soil resources survey will be used to inform the construction phase Soil Management Plan (SMP) for soil handling and storage, which will allow excavated soil that is surplus to the Proposed Development to be retained in good condition and potentially reused offsite (in accordance with the MMP).</p> <p>A Phase 1 geo-environmental desk study has been completed for the Proposed Development (<b>Appendix 11A</b>). This has identified potential contamination sources within agricultural areas.</p>	<p>SMP, CEMP, MMP secured via DNS condition</p>



Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
		<p>A Phase 2 geo-environmental ground investigation will be completed at the pre-construction stage to characterise soil chemistry at target areas. This will include environmental testing of soil for potential contaminants, including metals and hydrocarbons as identified in the Phase 1 Geo-environmental desk study, in addition to geotechnical testing to inform the design and material selection. The results of the soil testing will be used to carry out a contaminated land risk assessment to confirm that the soils are suitable for use in the Proposed Development. The contaminated land risk assessment will be completed in accordance with the Environment Agency LCRM guidance.</p> <p>Prior to construction, an MMP will be prepared outlining where excavated non-waste materials will be reused in line with the CL:AIRE Definition of Waste Code of Practice (DoWCoP).</p> <p>The CEMP includes a procedure for encountering unexpected contamination or suspected contamination, which will require additional testing and risk assessment to determine appropriate measures. Materials will be segregated where possible to prevent cross-contamination occurring and will only be reused if confirmed to be suitable for use and in accordance with other requirements of the MMP.</p> <p>Any temporary onsite storage of excavated materials suspected or confirmed to be contaminated will be placed on impermeable sheeting, covered over and with adequate leachate/ runoff drainage to prevent migration of contaminants from the stockpile.</p>	
<b>Land contamination</b>			
<p><b>Contaminated land receptors: Site workers/site users including construction workers</b></p>	<p>Impacts on human health due to land contamination</p>	<p>A Phase 1 geo-environmental desk study has been completed for the Proposed Development (<b>Appendix 11A</b>).</p> <p>Phase 2 intrusive geo-environmental ground investigation will be completed during the pre-construction phase, including soil sampling and chemical testing, to confirm the ground conditions.</p>	<p>CEMP, MMP and DNS condition</p>

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
<b>Contaminated land receptors: soil, groundwater, surface water, humans (site users)</b>	Groundwater is expected to be limited within the design depth of the Proposed development but may be encountered during construction and may require pumping from excavations. Due to the site's historical uses, there is potential for localised contamination to be present. Uncontrolled releases of contaminated groundwater could impact on soil, groundwater or	<p>Potential risks to human health from any known, suspected or unexpected ground contamination will be avoided by adopting appropriate working methods and all aspects of construction will be completed in compliance with the Construction (Design and Management) Regulations 2015, CAR 2012 and the Health and Safety at Work Act (1974) and regulations made under the Act. These legal obligations include the requirement for risk assessments and method statements for all construction related activities and the use of appropriate working methods, training and Personal Protective Equipment (PPE).</p> <p>Temporary storage of excavated materials will be in accordance with the MMP.</p> <p>Contamination if found will be subject to appropriate risk assessment and if necessary, either removed, treated and/or mitigated as part of the Proposed Development. The CEMP includes an unexpected contamination protocol.</p> <p>Best practice air quality management measures will be applied as described in Institute of Air Quality Management (IAQM) (2014) guidance on the Assessment of Dust from Demolition and Construction 2014, version 1.1.</p> <p>A Phase 1 geo-environmental desk study has been completed for the Proposed Development and the report is appended (<b>Appendix 11A</b>).</p> <p>Generally, the Phase 1 Geo-environmental desk study indicates that shallow groundwater is unlikely to be encountered. However, if water is present and requires to be pumped from excavations and is suspected to be contaminated, appropriate measures will be taken in accordance with NRW guidance and the Environmental Permitting Regulations to prevent uncontrolled or unauthorised releases of this water to ground or to the water environment.</p> <p>Phase 2 intrusive geo-environmental ground investigation will be completed during the pre-construction phase, including soil sampling and chemical testing, to confirm the ground conditions.</p>	CEMP and DNS condition

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
	surface water quality.		
<b>Contaminated land receptors: soil and groundwater, humans (site users)</b>	Leaks or spills or fuels or oils from construction vehicles or plant	During construction, vehicle maintenance and refuelling of machinery will be undertaken within designated areas where spillages can be easily contained, and machinery will be routinely checked to ensure it is in good working condition. These areas at risk of spillage or containing hazardous materials, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils and chemicals) will comply with industry good practice, be bunded, have appropriate containment and segregation. Additionally, the bunded areas will have impermeable bases to limit the potential for migration of contaminants into groundwater following any leakage/spillage.	CEMP
<b>Built environment (buildings, structures, services)</b>	<p>Unstable ground conditions with potential to cause damage to buildings/structures due to ground movement.</p> <p>Potential ground gas associated with former mine workings.</p>	<p>A Phase 1 geo-environmental desk study has been completed for the Proposed Development and the report is appended to the Draft ES (<b>Appendix 11A</b>).</p> <p>The Phase 1 Geoenvironmental Desk Study and the Coal Mining Risk Assessment (CMRA) have identified mining hazards within the Proposed Development site, including possible shallow workings. This additional assessment forms an embedded measure to be completed preconstruction and pre – ground investigation. The Phase 1 Geoenvironmental Desk Study and CMRA will inform a programme of Phase 2 intrusive investigation and testing to allow better quantification of the identified constraints in the proposed wind farm infrastructure locations.</p> <p>Consideration of the risks from ground gas will be given in the design of the preconstruction Phase 2 ground investigation, in areas of the Proposed Development where there could be potential for ground gas accumulation to take place in enclosed spaces (this depends on the detailed design of these buildings/structures in addition to the presence of ground gas).</p> <p>All aspects of the Proposed Development from construction to operation will comply with the Health and Safety at Work etc. Act and regulations made under the Act.</p>	DNS condition

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
		The design for the Proposed Development will comply with good practice in structural design including compliance with the Eurocodes and relevant British Standards. The design will account for the expected ground conditions and design loads, accounting for the effects of climate change. The design of the Proposed Development will be completed in accordance with CDM 2015.	
<b>Built environment (buildings, structures, services)</b>	Aggressive ground conditions with potential to cause damage to buildings/structures due to chemical attack.	A Phase 1 geo-environmental desk study has been completed for the Proposed Development and the report is appended to the ES ( <b>Appendix 11A</b> ).  Phase 2 intrusive geo-environmental ground investigation will be completed during the pre-construction phase, including soil sampling and chemical testing, to confirm the ground conditions. The design for the Proposed Development will be based on the data obtained from the investigation and will comply with good practice in structural design to mitigate risks from aggressive ground conditions.	DNS condition
<b>Operation</b>			
<b>Soils</b>			
<b>Soils/agricultural land</b>	Damage to soil during maintenance activities requiring excavation	Maintenance activities requiring ground disturbance will be infrequent and limited in extent and are therefore likely to require minimal disturbance to soil.	Standard operating procedures (SOPs)
<b>Contaminated land receptors: soil and groundwater, humans (site users)</b>	Leaks or spills of fuels or oils from vehicles or plant during maintenance	During operation, vehicle maintenance and refuelling of machinery will be undertaken within defined areas where spillages can be easily contained, and machinery will be routinely checked to ensure it is in good working condition. These areas at risk of spillage or containing hazardous materials, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils, and chemicals) will comply with industry good practice, be bunded, have appropriate containment and segregation. Additionally, the bunded areas will have impermeable bases to limit the potential for migration of contaminants into groundwater following any leakage/spillage.	Standard operating procedures (SOPs)
<b>Contaminated land receptors: humans (site users)</b>	Impacts on site users' health due to encountering contaminants in soil	A Phase 1 geo-environmental desk study has been completed for the Proposed Development and the report is appended to the Draft ES ( <b>Appendix 11A</b> ).	DNS planning condition

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
		<p>A Phase 2 geo-environmental ground investigation will be completed at the pre-construction stage to assess the presence of contaminants in the shallow soil that could subsequently be mobilised e.g., as dust or loose (asbestos) fibres that can be inhaled, or tracked back into vehicles/enclosed spaces. this will include a human health risk assessment to confirm whether additional measures are needed. The contaminated land risk assessment will be completed in accordance with the Environment Agency LCRM guidance. The assessment will determine whether the soil is suitable for use and this information will inform the MMP. If material is not suitable for use, then it will be disposed of offsite in accordance with the Waste Management Regulations.</p> <p>All aspects of construction will be completed in compliance with the Construction (Design and Management) Regulations 2015, CAR 2012 and the Health and Safety at Work Act (1974) and regulations made under the Act.</p> <p>The Draft CEMP includes an unexpected contamination protocol.</p>	
<b>Contaminated land receptors: humans (site users), buildings</b>	Accumulation of mine gas within enclosed spaces leading to potentially toxic and/or explosive atmospheres in enclosed spaces.	<p>A Phase 1 geo-environmental desk study has been completed for all elements of the Proposed Development and the report is appended to the Draft ES (<b>Appendix 11A</b>).</p> <p>A Phase 2 geo-environmental ground investigation will be completed at the pre-construction stage where the potential for gas accumulation in enclosed spaces is identified (e.g., substation buildings). This will include adequate gas monitoring so that a ground gas risk assessment can be completed in accordance with CIRIA C665<sup>34</sup>, which is likely to entail a minimum of six monitoring rounds over a minimum period of three months.</p>	DNS planning condition
<b>Built environment (buildings, structures, services)</b>	Aggressive or unstable ground conditions with potential to cause damage to buildings/structures due to ground movement or chemical attack.	The Coal Mining Risk Assessment has identified that an area of identified instability/mass movement of the valley side slope approximately 200 m to the north of the Proposed Development site. To ensure that land stability issues are understood and adequately addressed in the design, intrusive investigation will be completed during the pre-construction phase e.g., boreholes.	DNS planning condition

<sup>34</sup> CIRIA (2007) Assessing risks posed by hazardous ground gases to buildings (C665). CIRIA; UK

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
		<p>Remediation may subsequently be needed. The design of the intrusive investigation will be based upon the findings of the further desk study work. The planned intrusive investigations and any remediation work required based on the findings of these investigations will be communicated to the Coal Authority in advance of undertaking the works.</p> <p>The basis of the structural design for the Proposed Development will be completed in general accordance with design standards to minimise the risk of future structural or geotechnical instability.</p>	
<b>Decommissioning</b>			
The embedded environmental measures for the decommissioning phase are anticipated to be similar to those for the construction phase.			

## 11.7 Scope of the assessment

### The Proposed Development

- 11.7.1 This section sets out the scope of the assessment for Ground Conditions, specifically in relation to soils and land contamination. This scope has been developed as the design of the Proposed Development has evolved, and in response to the feedback to date as set out in Section 11.3.

### Spatial Scope

- 11.7.2 The spatial scope of the assessment of Ground Conditions covers the area of the Proposed Development contained within the red line boundary, together with the Zones of Influence (Zols) that have formed the basis of the study area described in **Section 11.4**.
- 11.7.3 This study area for Ground Conditions for land contamination receptors is a reduction from the 1km buffer applied in the Scoping Report, and this is considered appropriate based upon professional experience in land contamination assessment and consideration of the site conceptual model in relation to the potential for contaminants to migrate from the Site to offsite receptors through the soil or in groundwater, or to migrate onto the site through soil or in groundwater from offsite sources.

### Temporal Scope

- 11.7.4 The temporal scope of the Ground Conditions assessment in relation to land contamination is consistent with the period over which the Proposed Development would be carried out and, therefore, covers the construction (approximately 24 months), operational (30 years) and decommissioning (approximately 6 months) periods.
- 11.7.5 In relation to effects on soils and agricultural land, the highest potential for significant effects applies to the construction of the Proposed Development (period of approximately



24 months). Consideration is also given in the assessment to potential effects on soils during the operation and maintenance (30 years), and decommissioning phases (approximately 6 months).

## Potential Receptors

11.7.6 The principal Ground Conditions receptors that have been identified as being potentially subject to effects are summarised in **Table 11.7**.

**Table 11.7 Ground Conditions receptors subject to potential effects**

Receptor	Reason for consideration
<b>Soils</b>	
Soil resources and agricultural land	<p>Land within the Site is predominantly in agricultural use. There is no BMV agricultural land within the study area, however, grazing of sheep and cows and some crop growing and poultry farming take place and the land may be Grade 4 (poor quality agricultural land). Peat survey has found that the Site is not underlain by peat, the soils present are therefore likely to be predominantly mineral soils.</p> <p>Key soil functions on the land include supporting livestock grazing and crop growth, storage of organic carbon, providing habitat and supporting terrestrial biodiversity and a role in the hydrological cycle.</p>
<b>Land contamination</b>	
<p>Humans – site users (agricultural workers, maintenance workers), public open space users</p> <p>Humans – construction workers</p> <p>Humans - future site users (agricultural workers, maintenance workers/operatives (e.g., wind farm workers), public open space users)</p>	<p>Potential for human health impacts to these receptors has been identified due to the potential presence of localised land contamination. Effects could occur either during construction or operation.</p>
Controlled water - Groundwater – Secondary A aquifer (Hughes Member Sandstone)	<p>Groundwater has been identified as a potential receptor due to the presence of a bedrock Secondary A aquifer and the likelihood that rockhead is shallow i.e., the aquifer is not protected by overlying superficial deposits. Effects on the water environment due to land contamination could occur either during construction or operation.</p>
Controlled water; Surface water – tributaries of the Afon Ebwy river	<p>Surface water has been identified as a potential receptor in <b>Section 10.3</b>. Effects on the water environment due to land contamination could occur either during construction or operation.</p>
<b>Buildings and services</b>	
	<p>Potential for impacts on the built environment (future wind farm development) due to land contamination have been identified based on the review of current and historical land uses in <b>Section 11.5</b>.</p> <p>Potential for impacts on the built environment (future wind farm development) due to land instability have been identified based on the presence of former mining activity and the presence of Development High Risk Areas within the Proposed Development site.</p>

Receptor	Reason for consideration
<b>Geology and geodiversity</b>	
Geology and geodiversity	Potential for impacts on geological features due to permanent damage caused by construction activities or permanent loss of or change to geological features due to permanent development.
<b>Mineral resources</b>	
Mineral resources	Potential impacts include sterilisation of mineral resources, preventing future exploitation of the mineral resource.

## Likely significant effects

11.7.7 The effects on Ground Conditions receptors which have the potential to be significant and have been taken forward for detailed assessment are summarised in **Table 11.8**.

**Table 11.8 Likely significant effects on Ground Conditions receptors**

Receptor	Reason for consideration	Likely significant effects
<b>Construction and decommissioning</b>		
Soil resources and agricultural land	Land within the Proposed Development Site is in agricultural use. There is no BMV agricultural land within the study area, however, grazing of sheep and cattle takes place, also some poultry rearing and potentially crop growing (small scale).	Compaction of soil by construction vehicles or during stockpiling leading to damage to soil structure, damage to/loss of soil functions and degradation of agricultural land.
	Key soil functions on the land include supporting grassland / forage plant growth, storage of organic carbon, providing habitat and supporting biodiversity and a role in the hydrological cycle.	Erosion of soil during construction, leading to loss of organic matter in runoff, causing degradation of soil function and agricultural land quality.
<b>Construction</b>		
Soil resources and agricultural land	Land within the Proposed Development Site is in agricultural use. There is no BMV agricultural land within the study area, however, grazing of sheep and cattle takes place, also some poultry rearing and potentially crop growing (small scale).	Permanent loss of agricultural land, soil, and associated soil functions when soil is removed from the Proposed Development Site for construction of the permanent features of the Proposed Development: turbine foundations, crane pads, access tracks, kiosks and substation.
	Key soil functions on the land include supporting grassland / forage plant growth, storage of organic carbon, providing habitat and supporting biodiversity and a role in the hydrological cycle.	

Receptor	Reason for consideration	Likely significant effects
<b>Operation</b>		
<b>Land Contamination receptors:</b>		
Humans – site users (agricultural workers, maintenance workers), public open space users)	Potential sources of land contamination have been identified in the Phase 1 geo-environmental desk study and receptors. The site includes farm properties and public rights of way. Mobilisation of contaminants can occur due to ground disturbance e.g., dust generation or contaminated run-off from excavated (contaminated) material, creation of new pollutant migration pathways during excavation or construction.	Exposure to land contamination via numerous pathways (e.g., inhalation, direct contact, ingestion) resulting in health effects to site users.
Humans - future site users (agricultural workers, maintenance workers/operatives (e.g., wind farm workers), public open space users)		
<b>Land Contamination receptors: future site users (maintenance workers/operatives), future buildings and services</b>	New enclosed structures will be built for the Proposed Development and the site has been identified as having a risk of mine gas being present.	Accumulation of mine gas within enclosed spaces leading to potentially toxic and/or explosive atmospheres in enclosed spaces.
<b>Decommissioning</b>		
<b>The potential effects during decommissioning are similar to (but not greater than) those during construction.</b>		

11.7.8 The effects on Ground Conditions receptors which do not have the potential to be significant and have been scoped out of the assessment are summarised in **Table 11.9**.

**Table 11.9 Summary of effects scoped out of the Ground Conditions assessment**

Receptors/potential effects	Justification
<b>Construction</b>	
Soil resources and agricultural land - <b>degradation of soil functions and agricultural land quality due to cross-contamination of topsoil with contaminated soil/material excavated/disturbed during construction work</b>	Degradation of soil functions and agricultural land quality due to cross-contamination of topsoil with contaminated soil/material excavated/disturbed during construction work. Given the limited and localised potential contamination sources present on the Site, and the likelihood that the Proposed Development can avoid disturbance of these, and with the embedded measures in <b>Table 11.6</b> including compliance with LCRM in risk assessment, completion of a pre-construction Phase 2 intrusive geo-environmental ground investigation, including soil sampling and chemical testing, to confirm the ground conditions, soil survey and development of a Soil

<b>Receptors/potential effects</b>	<b>Justification</b>
	Management Plan (SMP) and use of an MMP in accordance with The Definition of Waste: Development Industry Code of Practice (DoWCoP), there is little likelihood that agricultural and soil will become degraded during construction due to the mixing of clean soil resources with material affected by contamination.
<b>Operation</b>	
Soil resources and agricultural land – damage to soil resources or agricultural land	Maintenance activities requiring ground disturbance will be infrequent and limited in extent and are therefore likely to require minimal disturbance to soil.
<b>Construction, operation and decommissioning</b>	
<b>Geology (geodiversity) – damage to notable geological feature</b>	There are no geological features with statutory or non-statutory designations for conservation of geodiversity within the study area.
<b>Minerals – including sterilisation of resources</b>	Although the Site is within an Aggregates Safeguarding Area, there are no known proposals for mineral extraction within the study area. Additionally, in relation to coal resources, Welsh Government planning policy is to move away from the extraction of energy minerals.
<b>Peat - degradation or loss of peatland</b>	There is no deep peat* on the Site. Effects on peatland are, therefore, scoped out. Effects on peaty soils are incorporated into the assessment of effects on soil resources.  *The Welsh Government defines deep peat as having a thickness of >0.4m organic material in the upper 0.8m of a soil profile <sup>35</sup> .
<b>Construction workers – impacts on human health from known, suspected or unexpected land contamination</b>	Risks to construction workers will be dealt with under the Health and Safety at Work Act (1974) and regulations made under the act. Site-specific contamination data obtained from all site investigations will be included in the pre-construction information (requirement of Construction Design and Management Regulations, 2015) for the proposed works, to enable appointed contractors to address and manage potential risk from contamination as necessary in their risk assessments and method statements.
<b>Contaminated land receptors: soil and groundwater, humans (site users - agricultural workers, maintenance workers, public open space users) – impacts on human health or the water environment due to leaks or spills or fuels or oils from construction vehicles or plant</b>	The embedded measures include limitations on where and how refuelling/maintenance of plant and vehicles can take place. During construction, vehicle maintenance and refuelling of machinery will be undertaken within designated areas where spillages can be easily contained, and machinery will be routinely checked to ensure it is in good working condition. These areas at risk of spillage or containing hazardous materials, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils, and chemicals) will comply with industry good practice, be bunded, have appropriate containment and segregation. Additionally, the bunded areas will have impermeable bases to limit the potential for migration of contaminants into groundwater following any leakage/spillage.
<b>Controlled waters receptors: Surface water – Nant Gwyddon,</b>	There is limited potential for shallow groundwater to be present on the Site, although it is present in valleys surrounding the Proposed

<sup>35</sup> Natural Resources Wales (2022), Peatland Data Portal Map Layers (Online), Available at: <https://naturalresourceswales.gov.uk/evidence-and-data/maps/peatland-data-portal-map-layers/?lang=en>. (Accessed April 2022).

Receptors/potential effects	Justification
<p><b>Nant Hafod-fach and Nant Gawni</b> Groundwater – Secondary A aquifer (Hughes Member), Secondary A aquifer (Alluvium)</p>	<p>Development Site. Groundwater is likely to be present at depth within the Hughes Member below the Site and its quality is likely to have been impacted by historical mining activities. Given the very low risks assessed to groundwater in the Phase 1 Geoenvironmental Desk Study and the limited potential sources present (which are typically in areas that should not require to be disturbed by the Proposed Development), and with the embedded measures in <b>Table 11.6</b> including compliance with LCRM in risk assessment, completion of a pre-construction Phase 2 intrusive geo-environmental ground investigation, including soil sampling and chemical testing, to confirm the ground conditions, and use of an MMP in accordance with The Definition of Waste: Development Industry Code of Practice (DoWCoP), there is little likelihood that the site's groundwater quality could be significantly altered by the Proposed Development.</p> <p>The Afon Ebwy river flows from north to south through the Ebwy valley, approximately 750m to the west of the Proposed Development at its closest point. Tributaries of the Afon Ebwy are present within the Proposed Development Site boundary, including the Nant Gawni (within the Northern Parcel), Nant Hafod-fach and Nant Gwyddon, which generally flow to the west. There is one pond within the Site boundary and a spring was noted during the walkover at a field boundary. The risks to surface water are assessed to be very low, as surface water receptors are either not located near potential sources, or the source, if present, is likely to be of limited extent and unlikely to result in significant degradation of water quality. Given this scenario and the embedded measures described above and including use of measures detailed in the CEMP to ensure that stockpiled excavated materials are well controlled to prevent release to ground or contaminated surface run-off, there is little likelihood that the Proposed Development will impact significantly on surface water quality in the study area either during construction or during operation when soils have been restored.</p>
<p>Agricultural property (cattle, poultry, sheep, possible crops)</p>	<p>Agricultural receptors are present on the Site including cattle, poultry, sheep, and there is potential for future crops, as described in the Phase 1 geo-environmental desk study. Given the very low risks assessed to agricultural property in the Phase 1 Geoenvironmental Desk Study and the limited potential sources present (which are typically in areas that should not require to be disturbed by the Proposed Development), and with the embedded measures in <b>Table 11.6</b> including compliance with LCRM in risk assessment, completion of a pre-construction Phase 2 intrusive geo-environmental ground investigation, including soil sampling and chemical testing, to confirm the ground conditions, and use of an MMP in accordance with The Definition of Waste: Development Industry Code of Practice (DoWCoP), there is little likelihood that agricultural receptors will be significantly affected by the Proposed Development.</p>
<p><b>Built environment (buildings, structures, services) – Land instability with potential to result in subsidence</b></p>	<p>The stability of the ground, in so far as it affects land use, is a material consideration that is taken into consideration in planning application decisions. Land stability in relation to the ground conditions on the Proposed Development site will be addressed throughout the design and construction process by compliance with the Construction (Design and Management) Regulations 2015 and will be informed by the Phase 1 geo-environmental desk study, the coal mining risk assessment, and any further relevant surveys undertaken. It is not</p>

Receptors/potential effects	Justification
	considered in the assessment in <b>Sections 11.9 to 11.10</b> . These actions are embedded measures in <b>Table 11.6</b> .
<b>Built environment (buildings, structures, services) - Aggressive ground conditions with potential to cause damage to buildings/structures due to chemical attack.</b>	The embedded measures in <b>Table 11.6</b> include a commitment to the basis of the structural design for the Proposed Development being completed in general accordance with design standards. Localised peaty soils may be present on the Site. The potential for aggressive ground conditions will be assessed through ground investigation completed during the pre-construction to determine the requirements for in ground concrete structures. Therefore, no significant effects are likely relating to chemical attack on structures.

## 11.8 Assessment methodology

- 11.8.1 The generic project-wide approach to the assessment methodology is set out in **Chapter 2: Approach to Preparing the Environmental Statement**, and specifically in **Sections 2.7 to 2.10**. However, whilst this has informed the approach that has been used in this Ground Conditions assessment, it is necessary to set out how this methodology has been applied, and adapted as appropriate, to address the specific needs of this Ground Conditions assessment.
- 11.8.2 The approach to assessment is set out in **Section 0** for geology, agricultural land and soils, and land contamination. The methodology for land contamination considers the change in risk level to various land contamination receptors because of the Proposed Development, whereas the approach to agricultural land and soil assessment considers the magnitude/consequence of potential effects on soils caused by the Proposed Development.

## Assessment of Ground Conditions effects

### Overview

- 11.8.3 The assessments in this chapter for Ground Conditions receptors, including soils and land contamination receptors, is based on the maximum design scenario to establish the potential maximum (worst-case) adverse effect on ground condition receptors. During construction of the Proposed Development some soil would be removed and not reinstated. These areas are summarised below and detailed in **Chapter 4: Description of the Proposed Development**.

### *Proposed Development*

- 11.8.4 The permanent development features of the Proposed Development comprise the following:
- Up to four wind turbines will each require foundations, likely to be formed by a reinforced concrete slab base approximately 20m in diameter, the total area required for all four turbine foundations will therefore be 1,257m<sup>2</sup> (0.13) ha.
  - Each turbine will also require a transformer; in some instances, this can be incorporated into the base of the tower itself, however, for a worst-case assessment it is assumed that an external kiosk is needed to house the transformer and that this



would have a maximum area of 5.0m x 2.5m (12.5m<sup>2</sup>). The four kiosks will, therefore, require a total area of 50m<sup>2</sup> (0.005ha).

- Each wind turbine requires an adjacent area of hardstanding for use as a crane pad, and these will be left in place during the operational phase for use during maintenance / replacement of parts and could also be used during decommissioning. Each crane pad will require approximately 2,640m<sup>2</sup> in area; the maximum total area of the eight crane pads will therefore be 1.06ha.
- The wind farm will require internal access tracks, new track of approximately 2.40km in length, and 1.06km widening of existing road (i.e., a total 3.46km of new or widened track is needed). Works will include widening, earthworks, and vegetation clearance. The access tracks will be approximately 5.5m wide and will have a 2m wide grassed verge on either side. It is also assumed that new verges will be needed for roads being widened. The total new track (including road widening) for the Proposed Development will therefore require an area 1.53ha and the verges will occupy an area of 1.38ha. Soil will be disturbed / removed to construct the verges however it is likely that some will be reused within the verge. The assessment assumes a worst case figure of 2.91ha as the maximum area of soil loss associated with access tracks and widening of existing roads.
- The Proposed Development requires an internal substation in the northern parcel to connect the wind farm into the national distribution system. This may require a transformer within the substation compound within a stoned area of approximately 37.5m x 35m. The substation building will be a single storey building, approximately 14m x 10m, housing metering, protection and control equipment, storage and welfare facilities. To provide a worst-case assessment it is therefore assumed that the substation building, and transformer compound will require a total area of 0.14ha.
- The substation welfare facilities will include a water supply system which is likely to be rainwater fed, no connection to mains water supply is proposed.

11.8.5 Based on the above details, the total area of permanent development where soil is likely to be permanently removed or sealed will be 4.25ha (this includes the verges in order to provide a worst-case assessment).

11.8.6 In addition to long term/permanent loss of soil due to the Proposed Development, some elements of the Proposed Development require the temporary removal of soil that can be stockpiled and reinstated on completion of construction. These features are summarised below:

- Temporary use of land will be required for a construction compound, there will be one compound requiring an area of around 50 x 50m (0.25ha). Once the erection and commissioning of the wind turbines is complete, the compound would be removed, and the soil reinstated during the construction phase.
- A temporary site office will be needed, occupying approximately 65m<sup>2</sup> (0.0065ha) during the construction works.
- Temporary ground disturbance will be required to install the underground cables running between the turbines and the substation, this will require up to 5m width either side of the cable trench. The cables will be placed in cable trenches approximately 0.45m wide and 0.75m deep, however for the purposes of the assessment, a maximum width has been applied for the cable trench at ground surface of 1.5m. The length of cable is not known, therefore, the length of the new and widened access track of 3.5km has been used as a likely total given the turbine layout, giving a total cable trench area of 3.33ha.

- 11.8.7 Based on the above details, in addition to the permanent development area, the maximum area of soil that would be disturbed and/or temporarily displaced because of the Proposed Development would be approximately 3.58 hectares.
- 11.8.8 The maximum area of land and soil likely to be affected either by temporary soil disturbance / soil displacement or permanent development (generally requiring some soil removal and / or sealing) because of the Proposed Development is therefore estimated at 7.83ha.
- 11.8.9 As detailed in **Section 11.5** desk based information indicates the soil type in the Proposed Development Site boundary is mainly freely draining acid loamy soils over rock, with a loamy texture and medium carbon content. In the northeast of the Proposed Development Site there is an area shown with very acid loamy upland soils with a wet peaty surface, a peaty texture and high carbon content.
- 11.8.10 Disturbance of soil cannot be avoided by the Proposed Development and soil is a living material which is vulnerable to damage during handling and storage, even if the effect is only temporary, with some soil types being less resilient to handling than others. However, where soil is handled carefully and replaced, it is expected that over time the original functions of the soil will be restored. For the purposes of the assessment, soil sensitivity is assessed on a soil function basis rather than the soil's structural qualities. However, it is acknowledged that during the construction phase of the Proposed Development, the soil type and its structural qualities can influence its sensitivity to handling, storage and placement. Soil's resilience to structural damage during soil handling (including soil stripping, storage in stockpiles and restoration) is correlated to the interaction between soil texture and soil moisture. These differences will be addressed through the embedded measures in **Table 11.6**.

## Assessment methodology: Soils and agricultural land

- 11.8.11 The magnitude/consequence of the loss or damage to soil resources and agricultural land is based upon the:
- Likely nature and scale of soils effects (positive, neutral, or negative) during the construction and operational phases of the project, and during decommissioning (which is anticipated to have the potential for similar effects as the construction phase but smaller in scale);
  - Likelihood of the Proposed Development to result in significant effects; and
  - Issues requiring further assessment and the methods to be applied.
- 11.8.12 The sensitivity of the soil on the Proposed Development Site has been assigned based on the findings of the Phase 1 peat survey and the desk-based information detailed in **Section** Error! Reference source not found. Error! Reference source not found. The sensitivity of the geology has been assigned based on the desk-based information detailed in **Section** Error! Reference source not found.. The classifications in **Table 11.10** are intended to reflect the importance of soils in relation to their soil organic matter content and climate change resilience and mitigation, biodiversity, and flood management functions, as well as the Welsh Government's Peatland Policy<sup>36</sup>.

---

<sup>36</sup> Welsh Government (2020). Welsh Government launches National Peatlands Action Programme to help lock in carbon and reinvigorate vital habitats. (Online) Available at: <https://gov.wales/welsh-government-launches-national-peatlands-action-programme-help-lock-carbon-and-reinvigorate> (Accessed April 2022).

**Table 11.10 Sensitivity classifications for soils (including agricultural land) and geology**

Value / Sensitivity	Description Example
<b>Very high</b>	<p>Geology: Very rare and of international importance with no potential for replacement (e.g., UNESCO World Heritage Sites, UNESCO Global Geoparks, SSSI's and GCR where citations indicate features of international importance). Geology meeting international designation citation criteria which is not designated as such.</p> <p>Soils: soils (<i>other than peat</i>) directly supporting an EU designated site (e.g., SAC, SPA, Ramsar) <i>designated peatlands (any statutory designation including SSSI)</i></p> <p>Agricultural land: Grade 1 and 2 agricultural land<sup>37</sup> according to the Agricultural Land Classification (ALC) system<sup>38</sup></p>
<b>High</b>	<p>Geology: Rare and of national importance with little potential for replacement (e.g., geological SSSI, ASSI, National Nature Reserves (NNR)). Geology meeting national designation citation criteria which is not designated as such.</p> <p>Soils: soils (<i>other than peat</i>) directly supporting a UK designated site (e.g., SSSI) <i>peat: deep peat with no designation</i></p> <p>Agricultural land: Grade 3a agricultural land<sup>39</sup> according to the ALC system</p>
<b>Medium</b>	<p>Geology: Of regional importance with limited potential for replacement (e.g., RIGS). Geology meeting regional designation citation criteria which is not designated as such.</p> <p>Soils: soils (<i>other than peat</i>) supporting non-statutory designated sites (e.g., Local Nature Reserves (LNR), LGSs, Sites of Nature Conservation Importance (SNCIs)) <i>peat: peaty soils</i></p> <p>Agricultural land: Grade 3b agricultural land according to the ALC system</p>
<b>Low</b>	<p>Geology: Of local importance / interest with potential for replacement (e.g., non designated geological exposures, former quarry's / mining sites).</p> <p>Soils:</p>

<sup>37</sup> Grade 1: Excellent quality agricultural land with no or very minor limitations to agricultural use. Grade 2: Very good quality agricultural land with minor limitations which affect crop yield, cultivation or harvesting.

<sup>38</sup> Welsh Government (2021) Agricultural land classification, frequently asked questions, May 2021. (Online). Available at: <https://gov.wales/sites/default/files/publications/2021-05/agricultural-land-classification-frequently-asked-questions.pdf>. (Accessed February 2022).

<sup>39</sup> Subgrade 3a: Good quality agricultural land capable of producing moderate to high yields of a narrow range of arable crops or moderate yields of a wider range of crops.

Value / Sensitivity	Description Example
	soils ( <i>other than peat</i> ) supporting non-designated notable or priority habitats
	Agricultural land: Grade 4 <sup>40</sup> and 5 agricultural land according to the ALC system
<b>Very Low</b>	Geology: No geological exposures, little / no local interest.  Soils: soils ( <i>other than peat</i> ) on previously developed land formerly in 'hard uses' with little potential to return to agriculture

11.8.13 The approach to assigning the consequence of any damage or loss is based on the DMRB LA 109 guidance and IEMA guidance and is summarised in **Table 11.11**.

**Table 11.11 Magnitude classifications soils (including agricultural land) and geology**

Magnitude	Description Example
<b>Major</b>	Geology: loss of geological feature / designation and/or quality and integrity, severe damage to key characteristics, features or elements.  Soils and agricultural land: physical removal or permanent sealing of >20 ha soil resource or agricultural land.
<b>Moderate</b>	Geology: partial loss of geological feature / designation, potentially adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.  Soils: permanent loss / reduction of one or more soil function(s) and restriction to current or approved future use of 1ha to 20ha (e.g., through degradation, compaction, erosion of soil resource.)
<b>Minor</b>	Geology: minor measurable change in geological feature / designation attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.  Soils: temporary loss / reduction of one or more soil function(s) and restriction to current or approved future use (e.g., through degradation, compaction, erosion of soil resource.)
<b>Negligible</b>	Geology: very minor loss or detrimental alteration to one or more characteristics, features or elements of geological feature / designation. Overall integrity of resource not affected.  Soils:

<sup>40</sup> Grade 4: Land with severe limitations which significantly restrict the range of crops and/or the level of yields. It is mainly suited to grass with occasional arable crops (e.g., cereals and forage crops) the yields of which are variable. In moist climates, yields of grass may be moderate to high but there may be difficulties in utilisation. The grade also includes very droughty arable land.

Magnitude	Description Example
	no discernible loss / reduction of soil function(s) that restrict current or approved future use.
<b>No change</b>	Geology: no temporary or permanent loss / disturbance of characteristics features or elements.  Soils: no loss / reduction of soil function(s) that restrict current or approved future use.

11.8.14 The determination of significance combines the sensitivity and magnitude using the matrix presented in **Table 11.12**.

**Table 11.12 Geology and soil effects significance evaluation matrix**

		Magnitude of change				
		No change	Negligible	Minor	Moderate	Major
Sensitivity/importance/value	Very high	Neutral	Slight	<b>Moderate or large</b>	<b>Large or very large</b>	<b>Very large</b>
	High	Neutral	Slight	Slight or moderate	<b>Moderate or large</b>	<b>Large or very large</b>
	Medium	Neutral	Neutral or slight	Slight	Moderate	<b>Moderate or large</b>
	Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
	Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

Note: Significant effects are those identified as 'Very large' or 'large'. 'Moderate' effects have the potential to be significant, and they would normally be deemed to be significant, however in some instances these are deemed to be acceptable based on professional judgment.

## Assessment methodology: Land Contamination

11.8.15 For land contamination receptors, the effect of the Proposed Development has been assessed through desk-based studies to understand the baseline condition land contamination status within the Proposed Development Site and the Zol. This information is then used to inform the assessment of the likely land contamination status resulting from the Proposed Development.

### Risk assessment

11.8.16 The process of managing land contamination, as set out in the Environment Agency guidance *Land Contamination: Risk management (LCRM)*, is based on risk assessment. The assessment of risks from land contamination is based upon the identification and subsequent assessment of a contaminant linkage. A contaminant linkage requires the presence of a:

- Source of contamination;

- Receptor that can be adversely affected by the contamination; and
  - Pathway capable of exposing a receptor to the contaminant.
- 11.8.17 The risk assessment aims to assess the significance of each potential contaminant linkage. The key to the classification is that the designation of risk is based upon the consideration of both of the following.
- The magnitude of the potential consequence (for instance, severity). It considers both the potential severity of the hazard and the sensitivity of the receptor; and
  - The magnitude of probability (for instance, likelihood). It considers both the presence of the hazard and receptor and the potential for a pathway to be realised between them.
- 11.8.18 The definitions for the qualitative risk assessment have been taken from "*Guidance for the Safe Development of Housing on Land Affected by Contamination*" Annex 4 R&D Publication 66: 2008 Volume 2.
- 11.8.19 The likelihood classifications for the contaminant linkages being realised is presented in **Table 11.13**.

**Table 11.13 Likelihood classifications for contaminant linkages**

Classification	Definition	Examples
<b>High Likelihood</b>	There is contaminant linkage, and an event would appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution	a) Elevated concentrations of toxic contaminants are present in soils in the top 0.5m in a residential garden. b) Ground/groundwater contamination could be present from chemical works, containing several USTs, having been in operation on the same site for over 50 years.
<b>Likely</b>	There is contaminant linkage, and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term.	a) Elevated concentrations of toxic contaminants are present in soils at depths of 0.5-1.0m in a residential garden, or the top 0.5m in public open space. b) Ground/ groundwater contamination could be present from an industrial site containing a UST present between 1970 and 1990. The tank is known to be single skin. There is no evidence of leakage although there are no records of integrity tests.
<b>Low Likelihood</b>	There is contaminant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a long period such an event would take place and is less likely in the shorter term.	a) Elevated concentrations of toxic contaminants are present in soils at depths >1m in a residential garden, or 0.5-1.0m in public open space. b) Ground/groundwater contamination could be present on a light industrial unit constructed in the 1990s containing a UST in operation over the last 10 years – the tank is double skinned but there is no integrity testing or evidence of leakage.



---

<b>Classification</b>	<b>Definition</b>	<b>Examples</b>
<b>Unlikely</b>	There is contaminant linkage, but circumstances are such that it is improbable that an event would occur even in the very long-term.	a) Elevated concentrations of toxic contaminants are present below hardstanding. b) Light industrial unit <10 years old containing a double skinned UST with annual integrity testing results available.

---

11.8.20 The classification of consequence is presented in **Table 11.14**.

**Table 11.14 Classification of consequence**

Classification	Human Health	Controlled Water	Ecology	Property / Structures/ Crops and animals	Examples
<b>Severe</b>	Highly elevated concentrations likely to result in “significant harm” to human health as defined by the EPA 1990, Part 2A, if exposure occurs.	Equivalent to Environment Agency (EA) Category 1 pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce.	Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long-term maintenance of the population.	Catastrophic damage to crops, buildings or property.	Significant harm to humans is defined in the Contaminated Land Statutory Guidance as death, life threatening diseases (e.g. cancers), other diseases likely to have serious impacts on health, serious injury, birth defects, and impairment of reproductive functions. Major fish kill in surface water from large spillage of contaminants from site. Highly elevated concentrations of Hazardous or priority substances present in groundwater close to small potable abstraction (high sensitivity). Explosion, causing building collapse (can also equate to immediate human health risk if buildings are occupied).
<b>Medium</b>	Elevated concentrations which could result in “significant harm” to human health as defined by the EPA 1990, Part 2A if exposure occurs.	Equivalent to EA Category 2 pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce.	Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population.	Significant damage to crops, buildings or property.	Exposure could lead to acute or chronic health effects which are significant as defined in the Contaminated Land Statutory Guidance . Damage to building rendering it unsafe to occupy e.g., foundation damage resulting in instability. Ingress of contaminants through plastic potable water pipes.

Classification	Human Health	Controlled Water	Ecology	Property / Structures/ Crops and animals	Examples
<b>Mild</b>	Exposure to human health unlikely to lead to "significant harm".	Equivalent to EA Category 3 pollution incident including minimal or short-lived effect on water quality; marginal effect on amenity value, agriculture, or commerce.	Minor or short-lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long-term maintenance of the population.	Minor damage to crops, buildings, or property.	Exposure could lead to slight short-term effects (e.g., mild skin rash). Surface spalling of concrete.
<b>Minor</b>	No measurable effects on humans.	Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems.	Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems.	Repairable effects of damage to buildings, structures and services.	The loss of plants in a landscaping scheme.  Discoloration of concrete.

11.8.21 The risk matrix to link the likelihood and consequence is shown in **Table 11.15**.

**Table 11.15 Risk Matrix**

Likelihood \ Potential Consequence	Unlikely	Low	Likely	High
Severe	Moderate/Low Risk	Moderate Risk	High Risk	Very High Risk
Medium	Low Risk	Moderate/Low Risk	Moderate Risk	High Risk
Mild	Very Low Risk	Low Risk	Moderate/Low Risk	Moderate Risk
Minor	Very Low Risk	Very Low Risk	Low Risk	Low Risk

11.8.22 The overall risk definitions are summarised in **Table 11.16**.

**Table 11.16 Risk Definitions**

Risk	Definition
<b>Very High</b>	There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without remediation action OR there is evidence that severe harm to a designated receptor is already occurring. Realisation of that risk is likely to present a substantial liability to the site owner/or occupier. Investigation is required as a matter of urgency and remediation works likely to follow in the short-term.
<b>High</b>	Harm is likely to arise to a designated receptor from an identified hazard at the site without remediation action. Realisation of the risk is likely to present a substantial liability to the site owner/or occupier. Investigation is required as a matter of urgency to clarify the risk. Remediation works may be necessary in the short-term and are likely over the longer term.
<b>Moderate</b>	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely, that the harm would be relatively mild. Further investigative work is normally required to clarify the risk and to determine the potential liability to site owner/occupier. Some remediation works may be required in the longer term.
<b>Low</b>	It is possible that harm could arise to a designated receptor from identified hazard, but it is likely at worst, that this harm if realised would normally be mild. It is unlikely that the site owner/or occupier would face substantial liabilities from such a risk. Further investigative work (which is likely to be limited) to clarify the risk may be required. Any subsequent remediation works are likely to be relatively limited.
<b>Very Low</b>	It is a low possibility that harm could arise to a designated receptor, but it is likely at worst, that this harm if realised would normally be mild or minor.

### Significance evaluation methodology

11.8.23 There is no established guidance on how to use the LCRM risk assessment approach as the basis for the evaluation of the significance of effects within the EIA process.

- 11.8.24 The methodology used in this assessment has, therefore, been developed using professional judgment, evaluating the change in risk from baseline conditions to those during and following the Proposed Development. To define the baseline risk, the initial assessment and classification of risk is carried out for the study area in its pre-development state. A separate assessment of risk will then be conducted based on the Proposed Development taking place (including environmental measures inherently embedded in the development) to enable an evaluation of the change in risk due to the Proposed Development.
- 11.8.25 **Table 11.17** uses the risk classification pre- and post-development as the basis for a significance evaluation matrix for the purposes of EIA.

**Table 11.17 Land contamination effects significance evaluation matrix**

			Risk Post-development (including embedded environmental measures)					
			Very Low	Low	Moderate / Low	Moderate	High	Very High
Risk Pre-development	Existing Receptors	Very High	Major Positive (Significant)	Major Positive (Significant)	Moderate Positive (Potentially Significant)	Moderate Positive (Potentially Significant)	Minor Positive (Not Significant)	Negligible (Not Significant)
		High	Major Positive (Significant)	Moderate Positive (Potentially Significant)	Moderate Positive (Potentially Significant)	Minor Positive (Not Significant)	Negligible (Not Significant)	Minor Negative (Not Significant)
		Moderate	Moderate Positive (Potentially Significant)	Moderate Positive (Potentially Significant)	Minor Positive (Not Significant)	Negligible (Not Significant)	Minor Negative (Not Significant)	Moderate Negative (Potentially Significant)
		Moderate / Low	Moderate Positive (Potentially Significant)	Minor Positive (Not Significant)	Negligible (Not Significant)	Minor Negative (Not Significant)	Moderate Negative (Potentially Significant)	Moderate Negative (Potentially Significant)
		Low	Minor Positive (Not Significant)	Negligible (Not Significant)	Minor Negative (Not Significant)	Moderate Negative (Potentially Significant)	Moderate Negative (Potentially Significant)	Major Negative (Significant)
		Very Low	Negligible (Not Significant)	Minor Negative (Not Significant)	Moderate Negative (Potentially Significant)	Moderate Negative (Potentially Significant)	Major Negative (Significant)	Major Negative (Significant)
	No Receptor Present Pre-development	N/A	Minor Negative (Not Significant)	Moderate Negative (Potentially Significant)	Moderate Negative (Potentially Significant)	Major Negative (Significant)	Major Negative (Significant)	Major Negative (Significant)



		<b>Risk Post-development (including embedded environmental measures)</b>					
		<b>Very Low</b>	<b>Low</b>	<b>Moderate / Low</b>	<b>Moderate</b>	<b>High</b>	<b>Very High</b>
		<p>Risks that remain at moderate, high or very high post-development may require further measures during the construction phase to mitigate those risks depending on the specific circumstances (for example remediation in line with LCRM).</p> <p>Where effects are indicated to be Potentially Significant in EIA terms based on the change in risk from pre- to post-development, professional judgement will be applied in this ES to determine whether they are Significant or Not Significant.</p>					

## 11.9 Preliminary assessment of soils (including agricultural land) effects

### Assessment of Soils Effects (including agricultural land): Construction phase

- 11.9.1 As described in **Section** Error! Reference source not found., the agricultural classification for the Site, is assumed, for the purposes of the assessment, to be Grade 4, and based on the criteria in Error! Reference source not found. the agricultural land sensitivity is Low.
- 11.9.2 Based on the potential localised presence of peaty soils with high carbon content in the northeast of the Site, combined with freely draining acid loamy soils over rock with medium carbon content, the soil sensitivity is assessed based on the criteria in **Table 11.10** to be Low to Medium.

#### Compaction of soil by vehicles or during stockpiling during construction leading to damage to soil structure resulting in damage to/loss of soil functions

- 11.9.3 The maximum area of soil to be disturbed and/or temporarily displaced because of the Proposed Development would be approximately 3.58 hectares. Embedded environmental measures include the use of machinery with low ground pressure during topsoil stripping to minimise soil compaction, including during construction of the access tracks, the tracks will then be available for heavier vehicles to use to avoid impacts on other areas.
- 11.9.4 The Outline CEMP includes measures for the storage and handling of soil based on the Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites to avoid damage to soil structure and help to minimise soil compaction.
- 11.9.5 Based on the Low sensitivity of the agricultural land receptor and potential for a Minor magnitude of change, this results in a **Neutral or Slight negative** effect which is not significant.
- 11.9.6 For soils, based on Low to Medium sensitivity of the soil and a Minor magnitude of change, the effect is **Neutral or Slight negative** or **Slight negative**. For the temporarily displaced soil the embedded mitigation measures will limit the potential for soil to be damaged during handling, storage, and reinstatement. No significant effects are therefore anticipated.

#### Erosion of soil during construction, leading to loss of organic matter in runoff

- 11.9.7 The maximum area of soil to be disturbed and/or temporarily displaced because of the Proposed Development would be approximately 3.58 hectares. Soil stripping and stockpiling will be needed for the permanent development elements which cover an area of approximately 4.25 hectares, giving a total area of 7.83 hectares where soil would be temporarily or permanently removed. Embedded environmental measures include measures defined in the Outline CEMP to avoid soil compaction in the areas of the Proposed Development where temporary disturbance to soils will occur, as soil compaction can cause/exacerbate soil erosion. Embedded measures also include measures to minimise surface runoff from stockpiles.
- 11.9.8 Based on the Low sensitivity of the agricultural land receptor and potential for a Minor magnitude of change, this results in a magnitude of change of **Neutral or Slight negative**, which is not significant in EIA terms.

- 11.9.9 For soils, based on Low to Medium sensitivity of the soil and a Minor magnitude of change, the effect is **Neutral or Slight negative** or **Slight negative**. For the temporarily displaced soil, the embedded mitigation measures will limit the potential for soil erosion to occur during handling and storage, or because of soil compaction. No significant effects are therefore anticipated.

Permanent loss of agricultural land, soil, and associated soil functions when soil is removed from the Proposed Development site for construction of the permanent features of the Proposed Development: turbine foundations, crane pads, access tracks, kiosks and substation

- 11.9.10 The maximum area of potential permanent/long-term loss of soil/agricultural land due to the Proposed Development is 4.25 hectares. The area of permanent loss of soil is less than 20 hectares and the magnitude of impact is assessed to be Moderate. Embedded environmental measures include the requirement to keep the permanent removal of topsoil to the minimum footprint required for the Proposed Development.
- 11.9.11 Based on the Low sensitivity of the agricultural land receptor this results in a magnitude of change of **Slight negative**, which is not significant in EIA terms.
- 11.9.12 For soils, based on the Low to Medium sensitivity of the soil and a Moderate magnitude of change, the effect is **Slight negative**, which is not significant in EIA terms, or **Moderate negative**, which is potentially significant in EIA terms. Given the embedded measures and the layout of the Proposed Development, which means that the natural soils and existing land use can be maintained around wind farm structures or tracks where soil will need to be removed or covered, based on professional judgement the overall effect is considered to be not significant.

## 11.10 Preliminary assessment of Land Contamination Effects

Operation phase: Exposure to land contamination via numerous pathways (e.g., inhalation, direct contact, ingestion) resulting in health effects for site users.

- 11.10.1 The embedded measures (**Table 11.6**) during the construction phase include development and implementation of an MMP for the reuse of soils within the Proposed Development Site and a protocol in the CEMP for dealing with potentially contaminated soils requiring disposal as opposed to reuse. There is also a commitment to ensure that the land subject to construction will be suitable for the proposed future use in line with LCRM guidance (Environment Agency, 2020). This means that any contaminated soils encountered during the construction phase that are not suitable for reuse on the Site will be removed or otherwise remediated. The associated risk assessments, waste documentation and remediation verification reports will demonstrate that the land is suitable for the future use and there are no significant risks to human health.
- 11.10.2 The current risk level to site users from the identified potential sources of contamination on the Site (excluding mine gas), ranges from very low to low, based on a mild or medium consequence, and a likelihood of unlikely for the identified sources. Due to the limited potential sources present on the Proposed Development Site, and with implementation of the embedded measures including the Phase 1 Geoenvironmental Desk study (**Appendix 11A**) completed in line with LCRM, the risk level will remain very low to low, based on a mild or medium consequence, and a likelihood of unlikely for the identified sources. On this basis, there is no change to the risk level as a result of the Proposed Development, and the effect is **Negligible** which is Not Significant in EIA terms.

Operation phase: Human health impacts due to accumulation of mine gas within enclosed spaces leading to potentially toxic and/or explosive atmospheres in enclosed spaces.

- 11.10.3 The Phase 1 Geoenvironmental Desk study (**Appendix 11A**) produced in line with LCRM has identified a Moderate/low risk to future site users in regard to mine gas, which is a higher risk than in the current scenario, as explained further below.
- 11.10.4 The current risk level to site users from mine gas is low, based on a medium hazard and likelihood of unlikely, given there are limited enclosed spaces currently on the Site and no recorded mine gas issues. The Proposed Development will introduce new enclosed spaces, although these will not be routinely occupied. In this scenario, the hazard therefore increases to a severe consequence, due to potential for gas accumulation in enclosed spaces to result in asphyxiation or explosion/fire risk. With a likelihood of unlikely, the risk to future site users with the Proposed Development if no mitigation were to be applied would be moderate/low.
- 11.10.5 However, the embedded measures (**Table 11.6**) include a commitment to ensure that the land subject to construction will be suitable for the proposed future use in line with LCRM guidance (Environment Agency, 2020) and the recommendations in the Phase 1 Geoenvironmental Desk study (**Appendix 11A**), completed in line with LCRM, include monitoring for ground gas which should be undertaken at the proposed turbine and substation locations. Consideration of the risks from ground gas (in particular, enclosed spaces where ground gas can accumulate) is therefore an embedded measure through compliance with LCRM and obtaining ground investigation data pre construction to confirm the risk level from mine gas.
- 11.10.6 Based on implementation of this mitigation, either the ground investigation data will demonstrate that the hazard from mine gas is absent at levels that could result in explosion or asphyxiation (in which case both the pre- and post-development risks would be very low (based on a mild consequence and unlikely likelihood) which represents a negligible effect which is not significant in EIA terms) or it will identify that a post development mine gas risk is present and there is the need for physical gas protection mitigation measures to be incorporated into the design of structures.
- 11.10.7 In the absence of ground investigation data at this stage, a conservative assessment has been considered to ensure the EIA identifies the potential worst case. In this scenario, the worst case is considered to be a situation where mine gas risks are identified by the ground investigation and whilst gas protection measures are incorporated into the Proposed Development, the likelihood of realising a worst case severe consequence is not reduced below 'unlikely'. This would result in the pre- to post development risk changing from low risk to Moderate/low risk, which based on **Table 11.17** is a **minor negative** effect, which is **Not Significant** in EIA terms.

## 11.11 Preliminary assessment of cumulative (inter-project) effects

- 11.11.1 A preliminary cumulative effects assessment (CEA) has been undertaken for the Project which considers the combined impacts with other developments on the same single receptor or resource (inter-project effects). The detailed method followed in identifying and assessing potential cumulative effects is set out in **Section 2.9 of Chapter 2**.
- 11.11.2 Effects on soil and agricultural land are limited in extent within the Proposed Development Site. There are no high sensitivity soil or agricultural land receptors present. With the embedded environmental measures, there will be limited permanent effects on soil and agricultural land from the Proposed Development.

- 11.11.3 A windfarm development, known as Mynydd Maen Wind Farm is being proposed by RES on adjacent land to the east of the Proposed Development site. The available details for the Mynydd Maen Wind Farm<sup>41</sup> indicate there will be 15 turbines and that the design has been updated during 2023 to design around various constraints, including topography, watercourses, and sensitive habitats. The Mynydd Maen Wind Farm is likely to result in similar effects on soils and agricultural land to the Proposed Development, albeit on a larger scale. The soil type according to the LandIS Soils map viewer mainly comprises of very acid loamy upland soils with a wet peaty surface, a peaty texture and high carbon content (type 16) in the land where the wind farm is proposed. The assessment of the Proposed Development's effects on soils includes consideration of these same peaty soils as they are likely to be present locally within the Proposed Development site in its north-eastern area. The Predictive Agricultural Land Classification Map 2<sup>42</sup> shows the agricultural land where the wind farm is proposed is of similar quality to that on the Proposed Development site (grade 4).
- 11.11.4 There will be some cumulative effect on soils and agricultural land in terms of a relatively small-scale loss of some local and national soil resource / agricultural land resource, with the Proposed Development in combination the Mynydd Maen Wind Farm, as both require construction work which will permanently remove or seal localised areas of existing *in situ* soils on agricultural land (which is not best and most versatile land). However, given the similar characteristics of both developments, the similar baseline conditions, the embedded measures in **Table 11.6** being used for the Proposed Development (and the likelihood that similar measures will be needed for the Mynydd Maen Wind Farm development) and the fact that the current surrounding agricultural land use can continue around both wind farm developments once constructed, it is unlikely that there will be any effects from the Proposed Development which could act cumulatively with effects from the Mynydd Maen Wind Farm development to produce significant cumulative effects on soil functions or agricultural land at a local or national level.
- 11.11.5 A solar scheme, the Mynydd Maen Solar Scheme<sup>43</sup>, is proposed on land adjacent to the Proposed Development Site, immediately northwest of and slightly overlapping the central land parcel. Soil and ALC conditions are also similar to the Proposed Development Site. The scale and type of effects during construction are likely to be similar to those of the Proposed Development (e.g., involving some permanent development such as substations and temporary compounds), albeit with a different development layout (lots of small permanent features in the form of the piles supporting photovoltaic (PV) panels). The medium and long-term effects of solar panels placed on soils (soil health, soil functions etc.) and agricultural land quality (i.e., ALC grade) are not well documented. However, the Welsh Government has commissioned a study which includes consideration of operational phase effects of solar schemes on soils and agricultural land (in particular best and most versatile land). This notes that activities such as sheep grazing can continue around panels: *“Land between and underneath the PV panels is often grazed by sheep and where there are high numbers of sheep a solid compaction layer 2 cm to 6 cm over a wide area may result... There is likely to be some instances of run-off from the solar panels, which could result in the compaction of soils at the base of the panels... Over time rivulets can form along the trailing edge of the panel with potential risk of soil erosion creating rills and gullies across the site. The sand bed could act as a drain, especially on heavy textured soils, leading to drainage discharges or wet patches at the down slope end*

<sup>41</sup> RES, Mynydd Maen Wind Farm, public information. Available at: <http://www.mynyddmaen-windfarm.co.uk/consultation/public-exhibitions-june-2023/>. Accessed November 2023.

<sup>42</sup> Welsh Government, DataMap Wales, Predictive Agricultural Land Classification (ALC) Map 2. Available at: [https://datamap.gov.wales/layers/inspire-wg:wg\\_predictive\\_alc2](https://datamap.gov.wales/layers/inspire-wg:wg_predictive_alc2). Accessed November 2023.

<sup>43</sup> Reference: DNS CAS-02446-R8X8W2 - Cil-Lonydd Solar Farm Planning Casework (gov.wales). Accessed November 2023.



of each trench<sup>44</sup>.” Decommissioning effects on soils also occur e.g., when the small piles used to support the panels are removed. However, these effects will be localised, and it is likely that all or most of the land proposed for solar scheme development could be entirely restored to agricultural use (and to the original ALC grade) with sufficient soil protection measures taken during construction, and measures to restore the land at decommissioning. It is therefore unlikely that there will be any effects from the Proposed Development which could act cumulatively with effects from the Mynydd Maen Solar Scheme development to produce significant cumulative effects on soil functions or agricultural land at a local or national level.

- 11.11.6 For land contamination receptors, a ZoI of 500m from the edge of the Proposed Development Site has been applied for the CEA to assess the potential for direct and indirect cumulative effects. This study area accounts for shared receptors that could experience an effect due to the Proposed Development and other developments. As above, the Mynydd Maen Wind Farm is being proposed by RES on adjacent land to the east of the Proposed Development Site. No offsite potential contamination sources were identified within 500m of the Proposed Development Site on land where the Mynydd Maen Wind Farm development is proposed. The planning application for the Mynydd Maen Wind Farm will need to provide evidence of compliance with the contaminated land regime for planning, as set out in the Welsh guidance *The Development of Land Affected by Contamination: A Guide for Developers*<sup>45</sup>, and, given the similar land uses on both sites, to take into consideration potential effects on a similar set of contaminated land receptors and to mitigate any potential effects adequately so that the development does not result in a significant effect on a receptor. It is therefore unlikely that there will be any effects from the Proposed Development which could act cumulatively with effects from the Mynydd Maen Wind Farm development to result in significant cumulative effects on land contamination receptors.
- 11.11.7 The proposed Mynydd Maen Solar Scheme, like the Proposed Development Site, is adjacent to the Hafod Fach quarry, which is identified as a potential offsite source of contamination that could affect the Proposed Development Site, although only in relation to the potential for the deep groundwater on the Proposed Development Site to be impacted by contamination arising due to quarrying activity. There will be no interaction between the proposed solar scheme and the quarry, and therefore no cumulative impacts relating to groundwater quality are likely. The land quality within the proposed solar scheme is likely to be similar to that on the Proposed Development Site, with limited potential for land contamination to be present given the agricultural land use. The planning application for the Mynydd Maen Solar Scheme will also need to provide evidence of compliance with the contaminated land regime for planning. It is therefore unlikely that there will be any effects from the Proposed Development which could act cumulatively with effects from the Mynydd Maen Solar Scheme development to result in significant cumulative effects on land contamination receptors.

<sup>44</sup> ADAS on behalf of Welsh Government (2023) The impact of solar photovoltaic (PV) sites on agricultural soils and land Quality, Date: March 2023, Report code: Work Package Three SPEP2021-22/0 <https://www.gov.wales/sites/default/files/publications/2023-08/impact-solar-photovoltaic-sites-agricultural-soils-land-spep21-22-03-work-package-3.pdf>. Accessed November 2023.

<sup>45</sup> Welsh Local Government, Natural Resources Wales & Welsh Government (2017) *The Development of Land Affected by Contamination: A Guide for Developers*, version 3 May 2017. (Online). <https://www.clare.co.uk/useful-government-legislation-and-guidance-by-country/81-project-management-info-pm/193-guidance-specific-to-particular-industrial-or-commercial-sectors-info-pm1>. (Accessed October 2023).

## 11.12 Preliminary significance conclusions

11.12.1 A summary of the results of the preliminary Ground Conditions assessment is provided in **Table 11.18**.



**Table 11.18 Preliminary summary of significance of effects: soils and agricultural land**

Receptor and summary of predicted effects	Sensitivity / importance / value of receptor <sup>1</sup>	Magnitude of change <sup>2</sup>	Significance <sup>3</sup>	Summary rationale
<b><u>Agricultural land</u></b> <b>Compaction of soil by vehicles or during stockpiling during construction leading to damage to soil structure resulting in damage to/loss of soil functions</b>	Low	Minor	Neutral or Slight negative effect  (Not significant)	The assessment is based upon the area of soil to be disturbed and/or temporarily displaced, and the embedded environmental measures to limit and avoid soil compaction.
<b><u>Soil</u></b> <b>Compaction of soil by vehicles or during stockpiling during construction leading to damage to soil structure resulting in damage to/loss of soil functions</b>	Low to Medium	Minor	Neutral or Slight negative  or  Slight negative  (Not significant)	The assessment is based upon the area of soil to be disturbed and/or temporarily displaced, and the embedded environmental measures to limit and avoid soil compaction.
<b><u>Agricultural land</u></b> <b>Erosion of soil during construction, leading to loss of organic matter in runoff</b>	Low	Minor	Neutral or Slight negative effect  (Not significant)	For the temporarily displaced soil, the embedded mitigation measures will limit the potential for soil erosion to occur during handling and storage, or because of soil compaction.

Receptor and summary of predicted effects	Sensitivity / importance / value of receptor <sup>1</sup>	Magnitude of change <sup>2</sup>	Significance <sup>3</sup>	Summary rationale
<b>Soil</b> <b>Erosion of soil during construction, leading to loss of organic matter in runoff</b>	Low to Medium	Minor	Neutral or Slight negative  or  Slight negative  (Not significant)	For the temporarily displaced soil, the embedded mitigation measures will limit the potential for soil erosion to occur during handling and storage, or because of soil compaction.
<b>Agricultural land</b> <b>Permanent loss of agricultural land, soil, and associated soil functions when soil is removed from the Proposed Development site for construction of the permanent features: turbine foundations, crane pads, access tracks, kiosks and substation.</b>	Low	Moderate	Slight negative effect  (Not significant)	The assessment is based upon the area of soil to be permanently lost and the embedded measures which include minimising the footprint required for the Proposed Development, it assumes that the soil will be removed from the Site as waste and not reused within the Proposed Development.
<b>Soil</b> <b>Permanent loss of agricultural land, soil, and associated soil functions when soil is removed from the Proposed Development site for construction of the permanent features: turbine foundations, crane pads, access tracks, kiosks and substation.</b>	Low to Medium	Moderate	Slight negative  (Not significant)  or  Moderate negative  (Potentially significant)	The assessment is based upon the area of soil to be permanently lost and the embedded measures which include minimising the footprint required for the Proposed Development, it assumes that the soil will be removed from the Site as waste and not reused within the Proposed Development.  Measures in the detailed design, based on information from the peat survey (appended within <b>Appendix 11A</b> ), supplemented by the pre-construction ground investigation, such as avoidance of areas with peaty soils, and reuse of existing tracks, can be employed once additional information on ground conditions is available, to bring the overall effect down to Slight negative.

The sensitivity of a receptor is defined using the criteria set out in Section 11.8 and is defined as very low, low, medium, high and very high.

The magnitude of change on a receptor resulting from activities relating to the development is defined using the criteria set out in Section 11.8 and is defined as no change, negligible, minor, moderate, and major.

The significance of the environmental effects is based on the combination of the sensitivity of a receptor and the magnitude of change and is expressed as large/very large (significant), moderate (potentially significant) or minor/negligible/no change (not significant), subject to the evaluation methodology outlined in Section 11.8.

**Table 11.19 Preliminary summary of significance of effects: land contamination**

Potential effect	Baseline Assessment			Assessment with Proposed Development			
	Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	Change in Risk (Significance)
<b>Operational phase:</b>							
<b>Human health Exposure to land contamination via numerous pathways (e.g., inhalation, direct contact, ingestion) resulting in health effects for site users</b>	Medium / Mild	Unlikely	Low / Very low	Medium / Mild	Unlikely	Low / Very low	Negligible (Not significant)  Embedded measures (Error! Reference source not found.) include ground investigation pre-construction, including soil, groundwater and gas monitoring, and during construction, measures include development of an MMP for the reuse of soils within the Proposed Development and a protocol in the Outline CEMP for dealing with potentially contaminated soils requiring disposal as opposed to reuse. There is a commitment to ensure that the land subject to construction will be

Potential effect	Baseline Assessment			Assessment with Proposed Development			Change in Risk (Significance)
	Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
							suitable for the proposed future use in line with LCRM guidance (Environment Agency, 2020). This will demonstrate the land is suitable for the future use and there are no significant risks to human health.
<p><b><u>Human health</u></b>  <b>Accumulation of mine gas within enclosed spaces leading to potentially toxic and/or explosive atmospheres in enclosed spaces.</b></p>	Medium	Unlikely	Low	Severe	Unlikely	Moderate/low	<p>Minor Negative (Not significant)</p> <p>Embedded measures (Error! Reference source not found.) include ground investigation pre-construction, including gas monitoring at the proposed turbine and substation locations. There is a commitment to ensure that the land subject to construction will be suitable for the proposed future use in line with LCRM guidance (Environment Agency, 2020). This will demonstrate the land is suitable for the future use and there are no</p>

Potential effect	Baseline Assessment			Assessment with Proposed Development			Change in Risk (Significance)
	Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
							<p>significant risks to human health. Consideration of the risks to the built environment from ground gas (in particular, enclosed spaces where ground gas can accumulate) is an embedded measure through compliance with LCRM.</p> <p>Assessment has been made using a worst case scenario where ground investigation identifies the presence of mine gas as a hazard and even with implementation of gas protection measures, the likelihood cannot be reduced below unlikely.</p>

The approach to assessment of the significance is based on the change in the level of risk from the baseline condition, as a result of the Proposed Development, subject to the evaluation methodology outlined in **Section** Error! Reference source not found..

## 11.13 Further work to be undertaken

- 11.13.1 The information provided in this Draft ES is preliminary, the final assessment of likely significant effects will be reported in the ES. This section describes the further work to be undertaken to support the Ground Conditions assessment presented in the ES.
- 11.13.2 A soil resources survey is to be completed prior to ES submission. The results of the survey will inform a Soil Management Plan which will also be provided with the ES.

### Baseline

- 11.13.3 The baseline soil conditions in Section 11.5 will be updated based on the findings of the soil resources survey.

### Assessment

- 11.13.4 No update to the assessment is anticipated to be required once the soil resources survey is completed. This is because the sensitivity of the soils on the Proposed Development site, based on the criteria in **Table 11.10** is unlikely to change.

### Environmental measures

- 11.13.5 No additional environmental measures are anticipated to be required. Detailed soil management measures will be provided in the Soil Management Plan.