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11. Ground Conditions

11.1 Introduction

11.1.1 This chapter presents the assessment of the likely significant effects of the Proposed Development with respect to Ground Conditions. It includes consideration of geology, land contamination, mineral resources, 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**, healthy soil is in itself biodiverse, and soil health is integral to supporting terrestrial ecology. Sensitive ecological sites can also be potential land contamination receptors and relevant sites are discussed in this chapter;
- **Chapter 10: Water Environment**, soil carries out important hydrological cycle functions such as filtering run-off and floodwater attenuation, and groundwater and surface water are potential land contamination receptors, where relevant (e.g., where they are in proximity to a land contamination source), receptors identified in the Water Environment assessment are considered in the assessment in this chapter.

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 assessment of Ground Conditions effects for geology and soils (**Section 11.8.2**);
- The assessment of Ground Conditions effects for land contamination (**Section 11.10**);
- Assessment of cumulative (inter-project) effects (**Section 11.11**);
- A summary of the significance conclusions (**Section 11.12**);
- Additional measures proposed (**Section Error! Reference source not found.**); and
- An outline of further work to be undertaken for the Final Environmental Statement (ES) (**Section Error! Reference source not found.**).

Limitations and assumptions

11.1.3 There are no limitations relating to Ground Conditions that affect the robustness of the assessment of the potential likely significant effects of the Proposed Development.

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 Proposed Development 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
Environment (Wales) Act 2016¹	The Act makes provisions within Wales for the planning and managing of natural resources at national and local level.
Well-being of Future Generations (Wales) Act (2015)²	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).
Environmental Protection Act (1990)³	<p>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 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 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 Section 11.5.37 of this chapter to address risks associated with potential land contamination.</p>
Water Resources Act 1991⁴ as amended by the Water Act 2003⁵	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.

¹ UK Government (2016). Environment (Wales) Act 2016. (Online). Available at: <https://www.legislation.gov.uk/anaw/2016/3/contents/enacted>. (Accessed August 2024).

² 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 August 2024).

³ UK Government (1990). Environmental Protection Act 1990. (Online). Available at: <https://www.legislation.gov.uk/ukpga/1990/43/contents>. (Accessed August 2024).

⁴ UK Government (1991). Water Resources Act 1991. (Online). Available at: <https://www.legislation.gov.uk/ukpga/1991/57/contents>. (Accessed August 2024).

⁵ UK Government (2003). Water Act 2003. (Online). Available at: <https://www.legislation.gov.uk/ukpga/2003/37/contents>. (Accessed 01 August 2024).

Legislation	Legislative context
	<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 Section 11.7.</p> <p>Appropriate embedded environmental measures have been put in place as detailed in Section 11.5.37 of this chapter to help ensure the protection of controlled waters.</p>
<p>The Environmental Damage (Prevention and Remediation) (Amendment) (Wales) Regulations 2015⁶</p>	<p>Regulations implementing the European Union (EU) Directive on environmental liability setting out the principles for prevention and remedy of environmental damage.</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 Section 11.5.37 of this chapter to help ensure the prevention of pollution.</p>
<p>Health and Safety at Work etc. Act 1974</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 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 Section 11.5.37.</p>

Planning policy

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

⁶ Welsh Government (2015). The Environmental Damage (Prevention and Remediation) (Amendment) (Wales) Regulations 2015. (Online). Available at: <https://www.legislation.gov.uk/wsi/2015/1394/introduction/made>. Accessed August 2024).

Table 11.2 Planning policy relevant to the Ground Conditions assessment

Policy	Policy context
National planning policy	
Planning Policy Wales, Edition 12, 2024⁷	<p>The 2024 Planning Policy Wales document, Distinctive and Natural Linkages chapter, page 125, states that development proposals should look to the long term protection and enhancement of <i>“habitats, biodiversity, geodiversity... as well as... water resources”</i>, and on page 129 that achieving Desired Distinctive and Natural outcomes will be based on sustaining and creating places where <i>“sites designated for their ...biodiversity or geodiversity importance are fully considered and their special characteristics and features protected and enhanced* and that opportunities should be taken to <i>“improve the resilience of ecosystems ... by addressing problems such as, building on floodplains, diffuse pollution, soil compaction and sealing, ensuring the protection of peat resources...”</i></i></p> <p>Chapter 6, Section 6.4 Biodiversity and Ecological Networks on page 144 states that development proposals must consider the need to: <i>“safeguard protected species and ... existing biodiversity assets from direct, indirect or cumulative adverse impacts that 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>, and on page 157 that <i>“Where peat is identified within proposed developments considerable weight should be given to its protection because of its special importance in underpinning and supporting national natural resources such as soil carbon, biodiversity and flood management”</i>.</p> <p>Chapter 6, Section 6.9 Unlocking Potential by Taking a De-risking Approach requires on page 179 that <i>“new development is not undertaken without an understanding of the risks, including those associated with the previous land use, pollution, groundwater, flood risk, subsidence, landslips, rock falls, mine and landfill gas emissions and rising groundwater from abandoned mines”</i>; and that <i>“development does not take place without appropriate remediation or precautions”</i>. Page 180 states that: <i>“Responsibility for determining the extent and effects of surface and subsurface hazards remains with the developer. It is for the developer to ensure that the land is suitable for the development proposed.”</i></p>
Local planning policy	
Blaenau Gwent Local Development Plan (LDP) up to 2021⁸	<p>The western parts of the Site are located in the Blaenau Gwent county boundary. The LDP identifies where allocations for new developments such as housing, employment, community facilities, and roads have been made. It provides a framework for local decision making and brings together both development and conservation interests to ensure that any changes in the use of land are coherent and provide maximum benefits to the community.</p> <p>Policy DM1 requires new development to demonstrate sustainable design, including minimising construction waste and pollution and no adverse impact upon the water environment or an unacceptable risk to the quality</p>

⁷ Welsh Government (2024) Planning Policy Wales, Edition 12, February 2024. (Online). Available at: <https://www.gov.wales/sites/default/files/publications/2024-07/planning-policy-wales-edition-12.pdf>. (February 2024).

⁸ Blaenau Gwent County Borough Council (2012) Local Development Plan up to 2021. (Online). Available at: [Adopted LDP | Blaenau Gwent CBC \(blaenau-gwent.gov.uk\)](https://www.blaenau-gwent.gov.uk/adopted-ldp) (Accessed August 2024).

Policy	Policy context
	<p>of controlled waters, and that the land is made stable and capable of supporting the development without risk of damage to buildings on the site or adjoining land, and that practicable and effective measures are taken to treat, contain or control any contamination.</p> <p>Section 7.14 notes that much of the Blaenau Gwent area was subject to past underground mining activities and is therefore within a Coal Mining Referral Area. Responsibility for determining the extent and effects of these constraints rests with the developer. Where development is proposed in these areas, the developer should consult with the Coal Authority. The Local Planning Authority will be guided by advice from the Coal Authority and the Council's own technical staff whether development is acceptable and whether conditions requiring ground stability precautions should be attached to permissions. In other instances, development may affect landslip areas. In such instances, applications will need to be supported by a geotechnical investigation and stability report to identify any remedial measures to deal with any instability.</p> <p>Section 7.15 notes that the disturbance of contaminated land can have risks to public health and the environment. Where development is proposed on sites known, or suspected to be contaminated, or where the site is in the vicinity of a former landfill site, the developer will be required to carry out a risk assessment at the planning application stage. This must establish any possible pollutant pathways and identify all necessary mitigation measures, if any, to reduce the risks and allow development to proceed.</p>
<p>Torfaen LDP (2013)⁹</p>	<p>Most of the Site including its central and eastern areas are in the North Torfaen area. The LDP seeks to protect and enhance biodiversity resources including Site of Special Scientific Interest (SSSIs), SINCs (Sites of Importance for Nature Conservation) and Local Nature Reserves (Section 2.4.4) and promote the remediation of contaminated sites (Section 2.4.5).</p> <p>Policy BW1 states that development proposals will be considered favourably where they comply with the listed criteria, including:</p> <ul style="list-style-type: none"> • B Natural Environment i) The proposal does not result in unacceptable adverse effects in respect of land contamination, instability or subsidence; ...landfill gas; water pollution; or flooding, from or to the proposal, ..vi) The proposal does not have an unacceptable adverse impact upon the water environment or pose an unacceptable risk to the quality ... of controlled waters, ... • C Built Environment ...iii) Where practicable, existing construction materials on the site are re-used or recycled. <p>Section 6.1.7 notes that landscape features covered by Policy BW1 include ... peat bogs... which are... important features of the biodiversity network.</p> <p>In relation to geodiversity (the variety of soils, rocks, fossils, minerals and natural processes that make up the Earth's physical landscape and structure) and designated geological sites (either an SSSI or Regionally</p>

⁹ Torfaen County Borough Council (2013). Local Development Plan (to 2021), Adopted December 2013, Written Statement. (Online). Available at: <https://www.torfaen.gov.uk/gsl/en/ForwardPlanning/LocalDevelopmentPlan/Local-Development-Plan.aspx> (Accessed August 2024).

Policy	Policy context
	<p>Important Geological Site (RIGS)), proposals affecting geodiversity assets will be assessed against Policy BG1.</p> <p>Policy BG1 states that development proposals will not be permitted where they would cause significant adverse effects to local nature conservation designated sites (including the features of SINCS or RIGS unless it can be demonstrated that: a) the development could not reasonably be located elsewhere and the benefits of the Development outweigh the nature conservation or geological value of the site; and b) adequate mitigation and/or compensatory provision is made proportionate to; or an enhancement to the value of the ecological resources or geological site lost.</p> <p>Section 8.48.3 notes that the RIGS identified in the Proposals Map, which include Llanhilleth Quarry (Tirpentwys) are mainly exposures of geological formations and that it would be easier to mitigate/compensate for their loss locally, for example by exposing other parts of the formation as part of the development proposal or a restoration scheme. The Adopted Torfaen Local Development Proposals Plan shows the Site is partially within a Special Landscape Area, includes areas designated as SINCS and a Regionally Important Geological Site (RIGS) Tirpentwys.</p> <p>Minerals</p> <p>The Proposal Map shows the Site is in a Coal Safeguarding Area and an Aggregate Safeguarding Area, and includes the Tirpentwys Preferred Area for Aggregates (includes the former Llanhilleth Quarry and adjacent land to the south, south-east), where proposals for the extraction of 7.2 million tonnes of aggregates may be permitted.</p> <p>Policy M1 Minerals Safeguarding states that Development proposals will not be permitted which would permanently sterilise important mineral resources within the Aggregate Safeguarding Areas or Coal Safeguarding Areas identified on the Proposals Map, unless there is an overriding need for the proposed development and: -</p> <ul style="list-style-type: none"> a) the Mineral resource is recovered before the proposed development commences; or b) the developer has satisfactorily demonstrated that the extraction of the mineral is impracticable, uneconomic or environmentally unacceptable. <p>Section 8.31.1 states that in accordance with national policy the LDP should safeguard aggregates and shallow coal resources from permanent development that would prevent their future extraction, and it is noted that, according to Minerals Planning Policy Wales (MPPW - paragraph 13), safeguarding “does not necessarily indicate an acceptance of working, but that the location and quality of the mineral is known, and that the environmental constraints associated with extraction have been considered.”</p> <p>Section 8.31.2 clarifies that Aggregate Safeguarding Areas (ASAs) have been identified to safeguard potential high quality sandstone and limestone aggregate resources within the County Borough, which are shown on the Proposals Map. It is noted that the Torfaen ASAs, are based upon the Welsh Government’s recently published ‘Aggregates Safeguarding Map of Wales - 2012’, which includes a 200m ‘safeguarding margin’ around the aggregate resource. Therefore, the Torfaen ASAs do</p>

Policy	Policy context
	not align with the ASAs of neighbouring LDPs, which were designated before the publication of the Torfaen map and only safeguard the aggregate resource itself.

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
<i>Development of Land Affected by Contamination: A Guide for Developers, version 4</i> ¹⁰	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 (phase 1, preliminary risk assessment), then may progress to site investigation (phase 2), to remediation options appraisal, development of a remediation strategy and implementation and verification of remediation, as set out in the Land Contamination Risk Management (LCRM) (Environment Agency 2020).
<i>Contaminated Land Statutory Guidance</i> ¹¹	This 2012 guidance from the Welsh Government 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.
<i>Environment Agency, Land Contamination Risk Management (LCRM)</i> ¹²	Natural Resources Wales ¹³ refers developers or those seeking to voluntarily remediate a site to the Environment Agency LCRM guidance, which provides the technical framework for applying a risk management process when dealing with land affected by contamination.
<i>CAR-SOIL: Control of Asbestos Regulations 2012, Interpretation for Managing and Working</i>	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 (CAR 2012) ¹⁵ . Requirements include the use of measures to prevent the spread of

¹⁰ Welsh Land Contamination Working Group and Natural Resources Wales (2023) Development of Land Affected by Contamination: A Guide for Developers, version 4 September 2023. (Online). <https://naturalresources.wales/guidance-and-advice/business-sectors/planning-and-development/advice-for-developers/land-contamination/?lang=en#:~:text=Land%20contamination%20can%20have%20significant%20adverse%20effects%20on,planning%20permission%20or%20as%20part%20of%20the%20development>. (Accessed August 2024).

¹¹ Welsh Government (2012), Welsh Government Guidance Document, Contaminated Land Statutory Guidance – 2012, Number: WG19243. (Online). Available at: <https://gov.wales/contaminated-land-guidance-local-authorities>. (Accessed August 2024).

¹² Environment Agency (2021). Guidance: Land contamination risk management (LCRM). (Online). Available at: <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>. (Accessed August 2024).

¹³ 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&mssckid=f31e500cc14d11ec96571fe68fd7786f>. (Accessed August 2024).

¹⁵ UK Government (2012). The Control of Asbestos Regulations 2012. (Online). Available at: <https://www.legislation.gov.uk/uk/si/2012/632/contents/made>. (Accessed August 2024).

Technical guidance document	Context
<i>with Asbestos in Soil and Construction and Demolition Materials</i> ¹⁴	<p>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 Table 11.7.</p>
Welsh Assembly Government, Environment Department, Environment Agency Land Quality Department, <i>Appraisal of state, pressures and controls on the sustainable use of soils: executive summary 2002</i> ¹⁶	<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>
CL:AIRE, <i>Definition of Waste: Development Industry Code of Practice (DoWCoP), Version 2, 2011</i> ¹⁷	<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 Table 11.7.</p>
Defra, <i>Construction Code of Practice for the Sustainable Use of Soils on Construction Sites</i> ¹⁸	<p>Outlines current 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.</p> <p>Measures to avoid damage to soil health/soil structure are an embedded measure in the Outline Construction Environmental Management Plan (CEMP), as detailed in Table 11.7.</p>
CIRIA, <i>Assessing risks posed by hazardous</i>	<p>Provides guidance on ground gas monitoring and assessing the level of risk posed by ground gas, including mine gas, to developments.</p>

¹⁴ Joint Industry Working Group (JIWG) (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 August 2024).

¹⁶ 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://gov.wales/appraisal-state-pressures-and-controls-sustainable-use-soils-executive-summary.html>. (Accessed August 2024).

¹⁷ CL:AIRE (2011). *Definition of Waste: Development Industry Code of Practice (DoWCoP), Version 2*. (Online). Available at: https://www.clare.co.uk/projects-and-initiatives/38-costar/index.php?option=com_content&view=category&layout=blog&id=27&Itemid=183. (Accessed August 2024).

¹⁸ Defra (2009). *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites*. (Online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/716510/pb13298-code-of-practice-090910.pdf (Accessed: August 2024).

Technical guidance document	Context
<i>ground gases to buildings (C665)</i> ¹⁹	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 Table 11.7 .
Welsh Government, Predictive Agricultural Land Classification Map (Wales) The Hollington Map, Guidance Note Version 2.1 - May 2021 ²⁰	Provides guidance on how to use the Predictive ALC Map. The Predictive Agricultural Land Classification Map replaces the Welsh 'Provisional' 1:250,000 Series of maps produced between 1967 and 1974. 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. The baseline status of the Proposed Development site in relation to ALC grade is detailed in Section 0 .
Highways England, Design Manual for Roads and Bridges, LA 109 - Geology and Soils ²¹	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 Section 11.8 .
Institute of Environmental Management & Assessment (IEMA) (2022) IEMA Guide: A New Perspective on Land and Soil in Environmental Impact Assessment ²²	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 Section 11.8 .
Institute of Civil Engineers (ICE), The Environmental Impact Assessment Handbook - A Practical Guide for Planners, Developers and Communities (3rd Edition) ²³	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. Compliance with the Defra (2009) guidance is an embedded measure in Table 11.7 .
Scottish Government, Scottish Natural Heritage (SNH), Scottish Environment Protection Agency (SEPA) (2017)	The Scottish Government, SNH (now NatureScot) and SEPA guidance for peatland survey sets out a phased approach to quantifying and qualifying peat material on site and provides advice on how to publish peat surveys as part of wider site investigations for development management applications, with a particular focus on win farm developments.

¹⁹ CIRIA (2007) Assessing risks posed by hazardous ground gases to buildings (C665).

²⁰ 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 August 2024).

²¹ 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 August 2024).

²² Institute of Environmental Management & Assessment (IEMA) (2022) IEMA Guide: A New Perspective on Land and Soil in Environmental Impact Assessment. IEMA; March, UK

²³ 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.

Technical guidance document	Context
Peatland Survey. Guidance on Developments on Peatland²⁴	<p>This defines peat as: “the partially decomposed remains of plants and soil organisms which have accumulated at the surface of the soil profile. Peat accumulates where the rate of input of organic material from the surface exceeds the rate of decomposition and ‘turn-over’ of this new material. A peat layer does not include a mineral fraction (hence being differentiated from topsoil)” and, states that: “Peat soil is an organic soil which contains more than 60 per cent of organic matter and exceeds 50 centimetres in thickness”.</p>
CIRIA C809 Sustainable Management of Surplus Soils	<p>CIRIA C809 provides guidance on the avoidance and management of surplus soils and aggregates arising during construction and development projects, to help projects comply with the principles of the Waste Hierarchy, circular economy, sustainability, zero landfill, and net zero objectives.</p> <p>As waste policy is devolved in the UK, CIRIA C809 sets out relevant legislation, guidance and tools for the sustainable management of surplus soils for the devolved administrations.</p>

11.3 Consultation and engagement

Overview

- 11.3.1 The assessment has been informed by consultation responses and stakeholder engagement undertaken during the preparation and submission of the information which accompanied the now withdrawn application. Those consultation responses have been included below where relevant following the removal of Turbine 5 and the minor alteration of the grid connection location for the resubmission that this ES supports. 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 Planning and Environment Decisions Wales (PEDW), on behalf of the Welsh Ministers, on 6 August 2021. 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 ES has addressed the comments in the Scoping Direction.

Table 11.4 Summary of EIA Scoping Direction responses for Ground Conditions

Consultee	Consideration	How addressed in this ES
PEDW	PEDW welcomes the assurance that a mining risk assessment will be undertaken and notes that the Coal Authority, as a	A CMRA has been produced for the Proposed Development, which is provided in Appendix 11A, Annex B . Available

²⁴ Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey. Guidance on Developments on Peatland. (Online). Available at: <https://www.gov.scot/publications/peatland-survey-guidance/>. (Accessed August 2024).

Consultee	Consideration	How addressed in this ES
	<p>Specialist Consultee, have also provided a response included in the Scoping Direction.</p> <p>The Inspectorate does not agree that effects on ground conditions receptors due to accidental spillage or leakage during construction can be scoped out, this in relation to the response from NRW who have identified groundwater present on site as a sensitive receptor. An appropriate way of addressing this in the ES would be via including the CEMP as a technical appendix to the ES.</p> <p>In relation to geodiversity, the Inspectorate agrees that effects Llanhilleth Quarry RIGS can be scoped out.</p> <p>The Scoping Report states that, if necessary, based on the findings of the peat depth survey, detailed information and plans for peat management will be included in a Peat Management Plan presented as a Technical Appendix to the Environmental Statement. This approach is welcomed by the Inspectorate.</p> <p>The Inspectorate recommends that a peat survey area is clearly identified on a plan and that peaty areas that cannot be avoided should be surveyed in accordance with the Scottish Government Guidance “Guidance on Developments on Peatland” (2017). A 10 m by 10m grid is considered acceptable. As peat depth probing is not provided in the SR, the Inspectorate recommends that peat should be measured deeper than 1.5 m, where present. Peat depth surveys should be conducted 25 m either side of proposed tracks. The ES should identify all survey points on a Figure to illustrate the extent of the peat survey.</p> <p>The Inspectorate recommends that peat depth should be investigated deeper than 1.5 m and that survey methodology should be justified in the ES, and notes that the Applicant should consider producing a revised methodology in relation to peat and consulting NRW and the relevant LPAs on the proposed approach.</p>	<p>information on the baseline coal mining status of land within the Site is included in Section Error! Reference source not found..</p> <p>Available desk-based information on coal mining is reported in the baseline in Section Error! Reference source not found..</p> <p>Potential effects on land contamination receptors have been included in the assessment in Section 11.10 and the Outline CEMP is included as a technical appendix to the ES.</p> <p>On the basis that the only geo-conservation site within the Site is the Llanhilleth Quarry RIGS, and based on the Proposed Development including use of an existing access through the designated area but no other development, geodiversity was scoped out of the assessment in the Draft ES, however following consultation with NRW (see Table 11.5) additional baseline information was obtained for the RIGS in the form of a slope stability assessment of the central access track (see Section 11.5, and consideration of effects on the RIGS during the construction phase are included in the assessment in the ES in Section 11.9.</p> <p>Appendix 11A includes a report detailing the findings of a Phase 1 Peat Survey (based on 100 x 100m grid spacing) for the Scoping Boundary. The use of this survey density for a Phase 1 survey is in accordance with the Scottish Government Guidance referenced by the Inspectorate. The 2021 Phase 1 Peat Survey of the Scoping Boundary found that very little peat was present within the Scoping Boundary. Where peat was identified, the Proposed Development has been designed to avoid it. An additional peat survey of a small area of potential peaty soils at the southern end of the central track through the former Llanhilleth Quarry was completed in June 2023 and is also included in Appendix 11A (Annex D). Further details of the baseline soil conditions are provided in Section 11.5 which provides information on the large areas of the Site which has been restored following historical mining activity.</p>

Consultee	Consideration	How addressed in this ES
		Further consultation on peat survey scope has not been completed due to the Site being found during the 2021 survey (and 2023 survey) to be largely devoid of peat.
Torfaen County Borough Council	<p>Torfaen County Borough Council as Local Planning Authority, is satisfied the information provided in the Scoping Report provides an acceptable basis for preparing an ES to support an application for this development subject to the comments from the Consultees as appended with their response.</p> <p>There are no comments specific to ground conditions.</p>	<p>Agreement is noted.</p>
Blaenau Gwent County Borough Council	<p>In Appendix B, in relation to ground conditions, it is noted that the proposal is not likely to have any direct impacts, however it is noted that consideration should be given to ground stability matters during construction of and operation of the wind farm, particularly in relation to ground instability associated with past mining activity and natural slope stability and movement.</p>	<p>Ground stability and other coal mining risks have been addressed in the CMRA produced for the Proposed Development, which is provided in Appendix 11A, Annex B. Available information on the baseline coal mining status of land within the Site is included in Section Error! Reference source not found. The findings will be used to inform any intrusive investigations needed to further assess the coal mining risk, and to inform the final design of the Proposed Development. Ground stability is also addressed in the slop stability assessment completed for the access track to Turbine 8 through the former Llanhilleth Quarry (See Annex D of Appendix 11A).</p> <p>A Phase 1 Geoenvironmental Desk Study has been produced for the Proposed Development, which is provided in Appendix 11A. This provides further information on the baseline status of the land in relation to ground stability and will include recommendations for any further investigation needed such as intrusive ground investigation.</p> <p>Compliance with good practice in structural design including compliance with the Eurocodes and relevant British Standards is an embedded measure in Table 11.7.</p>
Natural Resources Wales	<p>NRW have no specific comments on ground conditions however it is advised in relation to Hydrology and Hydrogeology that groundwater should be considered a receptor in its own right, and that</p>	<p>Groundwater is considered as a receptor of land contamination in the Phase 1 Geoenvironmental Desk Study produced for the Proposed Development, which is provided in Appendix 11A.</p>

Consultee	Consideration	How addressed in this ES
	consideration should be given to temporary / long-term changes to groundwater flows as part of the development.	Peat is considered as a ground conditions receptor in the assessment in Section 11.9 .
The Coal Authority	<p>The Coal Authority notes that the Site falls within a Development High Risk Area as defined by the Coal Authority, and that the Scoping Report acknowledges that the risk from coal mining legacy will be assessed and addressed in line with current best practice guidance (CIRIA C758D – Abandoned mine workings manual) and any formal planning application will be accompanied by the relevant geo-technical desk study.</p> <p>The Coal Authority requests that in the event that any mine entries are present where newbuild infrastructure is required, the layout affords due consideration of these mining features and avoids these areas where possible / practicable.</p>	<p>Coal mining risks have been addressed in the CMRA produced for the Proposed Development, which is provided in Appendix 11A, Annex B. Available information on the baseline coal mining status of land within the Site is included in Section Error! Reference source not found.. The findings will be used to inform any intrusive investigations needed to further assess the coal mining risk, and to inform the final design of the Proposed Development.</p> <p>A Phase 1 Geoenvironmental Desk Study has been produced for the Proposed Development, which is provided in Appendix 11A. This provides further information on the baseline status of the land in relation to ground stability and will include recommendations for any further investigation needed such as intrusive ground investigation.</p> <p>The final design will take account of coal mining features.</p> <p>See further Coal Authority correspondence and the Applicant's response in paragraphs 11.3.6 to 11.3.7.</p>

Statutory Pre-Application Consultation

- 11.3.4 A Draft ES was issued to Natural Resources Wales (NRW), alongside other Statutory Consultees on 28 November 2022. NRW provided a response on 1 February 2023. A summary of the response in relation to Ground Conditions and confirmation of how it has been addressed in the assessment is presented in **Table 11.5**.

Table 11.5 Summary of NRW response to the Draft ES for Ground Conditions

Consultee	Consideration	How addressed in this ES
NRW	NRW notes that the application site lies adjacent to Tirpentwys, a Regionally Important Geological Site (RIGS) crossing the Caerphilly/Torfaen border. NRW advises that the site is likely to be of Site of Special Scientific Interest (SSSI) quality for its geological features, and that it is under consideration to become a	<p>Additional baseline information was obtained for the RIGS in the form of a slope stability assessment of the central access track (see Section 11.5).</p> <p>The methodology in Section 11.8 has been updated to explain how effects on geological receptors are assessed. Consideration of effects on the RIGS</p>

Consultee	Consideration	How addressed in this ES
	<p>proposed SSSI and proposed Geological Conservation Review site.</p> <p>In relation to the proposed access road to turbine 8 Llanhilleth (Tirpentwys), which would run over/close to the key exposures. NRW has concerns that vehicle access in order to install turbine 8 could disturb the geological features for which the RIGS is designated (and SSSI proposed). NRW therefore recommend amendments and changes to the access road to adequately distance the road from the RIGS features, and the potential effects on the RIGS to be assessed in the ES.</p>	<p>during the construction phase are included in the assessment in the ES in Section 11.9.</p>
<p>NRW</p>	<p>NRW notes that there is potential for land contamination on the application site, due to previous uses ranging from farming to mining, and requests the following condition and informative be placed on any planning permission granted for the development:</p> <p><i>Condition 4 - Land contamination</i> <i>If, during development, contamination not previously identified is found to be present at the site then no further development (unless otherwise agreed in writing with the Local Planning Authority) shall be carried out until a remediation strategy detailing how this unsuspected contamination shall be dealt with has been submitted to and approved in writing by the Local Planning Authority. The remediation strategy shall be carried out as approved.</i></p> <p><i>Justification: To ensure the risks associated with previously unsuspected contamination at the site are dealt with through a remediation strategy, to minimise the risk to both future users of the land and neighbouring land, and to ensure that the development can be carried out safely without unacceptable risks.</i></p> <p><i>Informative/advice to applicant:</i> <i>The treatment and disposal of contaminated soils and groundwater is regulated by waste legislation and requires an environmental permit.</i> <i>Excavated materials that are recovered via a treatment operation can be re-used on-site under the CL:AIRE Definition of Waste: Development Industry Code of</i></p>	<p>NRW's comments are noted. The Outline CEMP includes measures to ensure that NRW's requirements are met in relation to land contamination.</p> <p>The embedded measures in Table 11.7 include a Phase 2 geo-environmental ground investigation to be completed at the pre-construction stage to characterise soil chemistry at target areas. 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. 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>

Consultee	Consideration	How addressed in this ES
	<p><i>Practice. This voluntary Code of Practice provides a framework for determining whether or not excavated material arising from site during remediation and/or land development works are waste. Developers should ensure that all contaminated materials are adequately characterised both chemically and physically, and that the permitting status of any proposed on site operations are clear. If in doubt, Natural Resources Wales should be contacted for advice at an early stage to avoid any delays.</i></p>	

Technical engagement

- 11.3.5 The Phase 1 geo-environmental desk study and CMRA recommend ground investigation to provide further information on the mining related ground hazards. The investigation will require drilling into Coal Measures strata and as such, the Coal Authority will be informed of the works in advance of the investigation, which will be completed preconstruction of the Proposed Development.
- 11.3.6 Following notification of the Coal Authority on the 6 December 2023 of the Proposed Development, including the Phase 1 geo-environmental desk study and CMRA, the Coal Authority provided recommendations in their letter of 29 December 2023 to PEDW as follows:
- *That “where mine entries are established to be present we would expect built development to avoid being located over, or within influencing distances of these features. We note that the application seeks a micro-siting allowance for the turbines and associated Infrastructure, of up to 50m for turbines and 100m for internal wind farm tracks and other infrastructure such as substations and compounds. We therefore assume that the positions of mine entries and their calculated zones of influence can be avoided by utilising the micro siting allowance”; and,*
 - *That “relevant conditions are imposed on any consent granted requiring the intrusive site investigations to be undertaken prior to commencement of the development. The findings of these investigations should be used to inform the layout of the development, to avoid turbines and infrastructure being located over or within influencing distance of mine entries or built development straddling surface mining highwalls”.*
- 11.3.7 To address the Coal Authority’s concerns and recommendations, further information was provided in the form of the Mynydd Llanhilleth: Coal Mine Risk Micro-siting Technical Note (included as **Appendix 11B, Annex C** to this ES). The report concludes that the proposed targeted investigations which will be undertaken during pre- construction will provide sufficient information to quantify the risk and inform appropriate mitigation measures to be used at affected locations to ensure the safety and competency of the turbines and infrastructure. It also states that construction of the wind farm in affected areas would not take place without the application of appropriate mitigation measures such as foundation design measures and/or micrositing.
- 11.3.8 PEDW provided comment and a request for further information on the earlier planning submission for the Proposed Development, on 1 February 2024. In relation to ground conditions the Inspector noted that:

- *“The Coal Authority’s records indicate coal mining features present at surface and shallow depth including: 72 mine entries, coal workings and reported surface hazards and warns mine gases may be present. The Coal Authority recommends site investigations to inform the layout of development to avoid development taking place over or within influencing distance of mine entries or development straddling surface mining highwalls. The ES (at Chapter 11) and the Phase 1 Geoenvironmental Desk Study (ES Appendix 11A) recommends intrusive ground investigations are carried out in relation to former mine workings and other constraints to inform the design of the proposed development.*
- *“The Inspector notes the Coal Authority’s assumption that these hazards can be avoided through micrositing of the proposed turbines and tracks. However, in light of the mining legacy and recommendations of the Coal Authority and ES that intrusive investigations are necessary to inform the design of the proposed development, the Inspector does not consider the information before him provides sufficient certainty that this would be the case.”*

11.3.9 The Inspector requested further information as follows:

- *“Either in the form of the results of intrusive ground investigations, or further technical submissions demonstrating the proposed development can take place as shown on the submitted plans or within the proposed micrositing allowance for each element of the proposed development.”*

11.3.10 Further information is provided with this ES in the form of the Mynydd Llanhilleth: Coal Mine Risk Micro-siting Technical Note (**Appendix 11B, Annex C**, see further details of the report in **Table 11.6**). Assurance of the availability of suitable mitigation measures to address likely ground stability hazards associated with the former mining on the Proposed Development Site is also provided in the Geotechnical Site Investigation Review (**Appendix 11B, Annex A**). This concludes that the proposed wind farm can be safely developed and constructed following an appropriate level of site investigation works and completion of any required engineering mitigation measures (which could include micro-siting of turbines, drilling and grouting of mine workings, excavation and treatment of mine adit entrances, ground improvement techniques, or deeper foundations).

11.3.11 Both the Torfaen and Blaenau Gwent LIRs set out broad agreement with the assessment undertaken to date and the further pre-commencement proposals.

11.4 Data gathering methodology

Study area

Wind Farm development and Grid Connection

11.4.1 The study area for Ground Conditions for contaminated land receptors includes the Proposed Development application boundary (‘Site’) and a 250m buffer area beyond the boundary. 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. 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 of soil for construction of buildings), that will occur within the Site. No external zone of influence for soil has been identified beyond the Site. The rationale for the study area is that the soils are geographically discrete and will not be substantially influenced by changes to their surroundings or vice versa.
- 11.4.3 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

- 11.4.4 A summary of the organisations that have supplied data, together with the nature of that data is outlined in **Table 11.6**.

Table 11.6 Data sources used to inform the Ground Conditions assessment

Organisation	Data source	Data provided
Department for Environment, Food & Rural Affairs (Defra)	Multi-Agency Geographic Information for the Countryside (MAGIC) interactive map. Available online at: https://magic.defra.gov.uk/MagicMap.aspx .	Topographical mapping
Natural Soil Resources Institute, Cranfield University.	LandIS Soilsclapes Map. Available online at: http://www.landis.org.uk/soilsclapes/# .	Regional soil mapping and information on soil types
British Geological Survey (BGS)	GeoIndex Onshore. Available online at: https://mapapps2.bgs.ac.uk/geoindex/home.htm	Geological information, including exploratory hole records.
British Geological Survey (BGS)	BGS sheet 1:50 000 Abergavenny Sheet 232 Solid and Drift 1990	Geological map for the study area and surrounding area
Natural Resources Wales	Welsh Peatlands Data Portal. ²⁵	The Peatlands of Wales map series provides an updated distribution of Welsh Peatlands based on current evidence sources up to 2022. 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

²⁵ Natural Resources Wales (2022). Welsh Peatlands Data Portal (Online). Available at: <https://datamap.gov.wales/maps/peatlands-of-wales-maps/>. (Accessed August 2024).

Organisation	Data source	Data provided
Welsh Government	DataMap Wales: Data and maps from the Welsh public sector. Available online at: https://datamap.gov.wales/ .	<p>the presence of peat in any given grid cell, with those cells scoring more than 2 on a scale of 1-10, captured in the 'Peatlands of Wales' peat distribution map.</p> <p>For this database and in accordance with the Welsh Government²² approach peat is defined as having a thickness of more than 40cm of organic material within the upper 80cm of a soil profile.</p> <p>Includes spatial data for various environmental and other datasets including nature and geodiversity conservation sites, historical landfill sites, agricultural land classification, and aggregates resource areas,</p>
Welsh Government and Natural Resources Wales	Lle Geo-Portal, Predictive Agricultural Land Classification Map, Version 2. ²⁶	<p>Predictive Agricultural Land Classification (ALC) map for Wales, based on the principles of the Agricultural Land Classification System of England & Wales, the Revised Guidelines & Criteria for Grading the Quality of Agricultural Land (Ministry of Agriculture, Forestry and Fisheries (MAFF) 1988)²⁷. Land is categorised into one of the following grades:</p> <ul style="list-style-type: none"> ● Grade 1: excellent quality agricultural land; ● Grade 2: good quality agricultural land; ● Grade 3a: good to moderate quality agricultural land; ● Grade 3b: moderate quality agricultural land; ● Grade 4: poor quality agricultural land; and ● Grade 5: very poor quality agricultural land. <p>Grades 1 to 3a are defined in Welsh planning policy as Best and Most Versatile (BMV) land.</p>

²⁶ Welsh Government (2022). Predictive Agricultural Land Classification (ALC) Map 2 (Online). Available at: https://datamap.gov.wales/maps/new?layer=inspire-wg:wg_predictive_alc2#/. (Accessed August 2024).

²⁷ Ministry of Agriculture, Fisheries and Food (1988) Revised Guidelines & Criteria for Grading the Quality of Agricultural Land. (Online) Available at: <http://publications.naturalengland.org.uk/publication/6257050620264448> (Accessed August 2024).

Organisation	Data source	Data provided
Coal Authority	Coal Authority Interactive Map. Available online at: https://mapapps2.bgs.ac.uk/coalauthority/home.html .	Coal mining information including recorded mine entries, shallow coal mining workings, coal outcrops, fissures and breaklines, and Development High Risk Areas.
Coal Authority	Consultants Coal Mining Report, Mynydd Llanhilleth, Blaenau Gwent, The Coal Authority, Reference 51002673982001, 7 September 2021.	<p>Site specific coal mining information identifying potential mining related risks.</p> <p>This report was based on the Scoping Boundary and therefore provides coverage of most of the Site. Additional Coal Authority information was obtained, as below, to provide full coverage of the Site.</p>
Coal Authority	Consultants Coal Mining Report, Mynydd Llanhilleth, Torfaen, The Coal Authority, Reference 51003317521001, 11 October 2022.	<p>Site specific coal mining information identifying potential mining related risks.</p> <p>This report covers the additional land to the east of the Scoping Boundary, including the Grid Connection, to provide full coverage of the Site.</p>
WSP (2024)	Coal Mining Risk Assessment (Ref. Doc Ref. 807095-WOOD-RP-OG-00003_P01, August 2024)	<p>Mining risk assessment to assist in defining the level of risk associated with historical mining activities within the Proposed Development application boundary 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 Appendix 11A.</p>
Wood (2021)	Technical Note: Mynydd Llanhilleth Phase 1 Peat Survey Factual Report (Ref. 807095-WOOD-RP-OG-0002_P01, October 2021).	<p>Phase 1 peat depth survey results for land within the Scoping Boundary.</p> <p>This report is included as an appendix to the Phase 1 Geo-environmental desk study, included in Appendix 11A.</p>

Organisation	Data source	Data provided
WSP (2024a)	Mynydd Llanhilleth Wind Farm, Phase 1 Geoenvironmental Desk Study (Ref. 807095-WOOD-RP-OG-0002_P02, August 2024).	<p>Desk study to assist in determining whether the Site is suitable for its proposed use, included in Appendix 11A. 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 May 2022) to identify potential evidence of contamination and verify desk study information as necessary. It includes the development of a Conceptual 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.</p>
WSP (2023)	Technical Note: Mynydd Llanhilleth – Geotechnical Walkover Survey at the former Llanhilleth Quarry (Tirpentwys)	<p>Appendix 11A Annex D details a walkover survey of the existing access track running through the centre of the area of the former Llanhilleth quarry, which is proposed for use as an access track to Turbine 8 during construction of the Proposed Development and during the operational phase. Quarried areas are located to both the east and west of the access track with steep slopes extending to the base of the quarry. The former quarry contains exposures of the Carboniferous Grovesend Formation bedrock and is designated as a Regionally Important Geological Site (RIGS) and NRW has confirmed that the RIGS is under consideration for designation as a geological Site of Special Scientific Interest (SSSI) and a</p>

Organisation	Data source	Data provided
		<p data-bbox="1029 306 1417 360">Geological Conservation Review Site.</p> <p data-bbox="1029 398 1422 696">The aim of the walkover was to determine the potential impact of using, and locally widening, the access track for windfarm construction traffic, in relation to ground stability. Based on the observations made during the site walkover, no obvious signs of existing slope instability were recorded.</p> <p data-bbox="1029 734 1430 1279">Additionally, given the distance to the exposed high walls of the quarried areas, the report concludes that the proposed windfarm activities are anticipated to have a negligible effect on the integrity of the rock outcrops, and, given the space available to allow for track widening at the corners, that it is unlikely that there will be any problems with the stability of the existing slope. However, given the uncertainty of the underlying ground conditions beneath the access track, it is recommended that further investigation and assessment is undertaken.</p> <p data-bbox="1029 1317 1430 1951">As part of the walkover, a localised peat survey was also undertaken to determine the presence and potential thickness of any peat deposits where the access road will need widening at the junction with Blaen-Y-Cwm Road, and where soil mapping indicates potential for peaty soils. Peat survey was undertaken over a 25m grid at the junction between the access track and Blaen-Y-Cwm Road to allow for the design of the widening of the junction for windfarm traffic. The ground in the survey area had been reworked and no peat was identified. If any peat had been present it is thought to have been removed as part of the forestry workings.</p>

Organisation	Data source	Data provided
Intégral Géotechnique (2024)	Mynydd Llanhilleth Windfarm – Geotechnical Site Investigation Review	<p>This report (included as Appendix 11B, Annex A) was produced to support the Environmental Statement for the Proposed Development and comprised a review of geotechnical constraints at the Proposed Development Site. The report includes a review of the CMRA (WSP, 2024) provided in Appendix 11A, Annex B to the ES, the Phase 1 Geoenvironmental Desk Study (WSP, 2024a) provided in Appendix 11A to the ES, and the Mynydd Llanhilleth Phase 1 Peat Survey Factual Report (Wood, 2021) which forms Appendix 11A, Annex D to the ES. The report states that based on a review of the available information, the anticipated ground conditions and identified geotechnical constraints are considered typical of the South Wales Coal Field. Intégral Géotechnique concludes that the proposed wind farm can be safely developed and constructed following an appropriate level of site investigation works and completion of any required engineering mitigation measures (which could include micro-siting of turbines, drilling and grouting of mine workings, excavation and treatment of mine adit entrances, ground improvement techniques, or deeper foundations).</p>
WSP (2024b)	Mynydd Llanhilleth: Tirpentwys Access Track – Preliminary Slope Stability Technical Note	<p>This technical note (included as Appendix 11B, Annex B) provides a summary of a preliminary slope stability assessment undertaken for the existing access track (forestry unpaved road) running through the centre of the area of the former Tirpentwys quarry under wind farm construction traffic for the Proposed Development. The report concludes that given the presence of strong intact bedrock</p>

Organisation	Data source	Data provided
WSP (2024c)	Mynydd Llanhilleth: Coal Mine Risk Micro-siting: Further Information Technical Note	<p>at a shallow depth, and with no signs of slope stability issues present during the 2023 walkover (WSP 2023), it is anticipated that the proposed wind farm traffic loads will not present any future slope stability concerns. The report recommends that the assessment is updated and refined following targeted ground investigation and detailed topographical survey. Targeted ground investigation will be undertaken as per this recommendation for the Final ES submission to confirm the ground conditions at the track and inform any detailed assessments of slope stability under traffic loads for the construction phase of the Proposed Development, if required.</p>
		<p>This technical note (included as Appendix 11B, Annex C) provides further information on the Applicant's approach to mitigating risks associated with former coal mining hazards at the Proposed Development Site, with reference to Coal Authority and PEDW correspondence (see paragraphs 11.3.5 to 11.3.10). The report concludes that the proposed targeted investigations to be undertaken during pre-construction will provide sufficient information to quantify the risk and inform appropriate mitigation measures to be used at affected locations to ensure the safety and competency of the turbines and infrastructure. It also states that construction of the wind farm in affected areas would not take place without the application of appropriate mitigation measures such as foundation design measures and/or micrositing.</p>

Survey work

Wind Farm development and Grid Connection

- 11.4.5 A Phase 1 peat depth survey was conducted by Wood during September 2021 within the Wind Farm development area of the Site where it is coincident with the Scoping Boundary

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 **Section 11.5**) is present on the Site. The findings are reported in the Peat Depth Survey Report (Wood, 2021) which is appended to the Phase 1 Geo-environmental desk study in **Appendix 11A**.

- 11.4.6 A site walkover of the Scoping Boundary was completed in May 2021 to inform the Phase 1 Geoenvironmental desk study. The walkover was completed by an experienced contaminated land consultant and was used to obtain photographs of key features of the Site, which were identified through desk based review of information on the Site's environmental setting and historical development. Observations from the site walkover are recorded in **Section 11.5** and are recorded in the Phase 1 Geo-environmental desk study produced to inform the ES (**Appendix 11A**).
- 11.4.7 Following submission of the Draft ES to NRW, receipt of feedback from NRW, and updates to the design information for the Proposed Development, additional peat survey and a slope stability assessment at the central access track through the former Llanhilleth Quarry (Tirpentwys) were completed (WSP, 2023) to update the baseline and inform the assessment in the ES. The survey findings are reported in **Section 11.5** and the report on the surveys forms an annex to the Phase 1 Geo-environmental desk study in **Appendix 11A**.

11.5 Overall baseline

Current baseline

Wind Farm development and Grid Connection

Topography

- 11.5.1 A detailed description of topography is presented in **Chapter 10: Water Environment**. The Proposed Development is located primarily on a broad ridge which runs roughly in a north-south direction. The majority of the Wind Farm Development Area sits at elevations between 350m AOD and 450m AOD across the ridge summit, and the proposed access track via Farm Road descends to an elevation of approximately 250m AOD at the junction to the B4246.

Soils (including agricultural land)

- 11.5.2 Information reviewed on the LandIS Soilsclapes map²⁸ indicates the likely soil types within the Proposed Development Site, including the Wind Farm Development Area and the Grid Connection, to comprise mainly freely draining acid loamy soils over rock, with a loamy texture and medium carbon content (type 13), and restored soils, mostly from quarry and opencast spoil, there are also localised areas with very acid loamy upland soils with a wet peaty surface, a peaty texture and high carbon content (type 16).
- 11.5.3 The restored soils are shown across the central part of the Wind Farm Development Area and most of its south-eastern area, also at the eastern tip of the Grid Connection and the north-eastern end of the access road (Farm Road) as it approaches the B4246. The peaty soils are shown in the area south of the disused quarry (known as 'The Canyon' – most of which is excluded from the Proposed Development boundary), and in the north of the Wind Farm Development Area where it joins Farm Road. The peaty soils are shown

²⁸ Cranfield University (2022). Soilsclapes (Online) Available at: <http://www.landis.org.uk/soilsclapes/#>, (Accessed March 2021).

continuing for around 700m along the south-western extent of Farm Road, however, some of these are likely to have been removed and replaced with alternative material during construction of the road.

- 11.5.4 The Peatland of Wales dataset shows the distribution of peat across Wales, with peat defined as having a thickness of more than 40cm of organic material within the upper 80cm of a soil profile. Within the Wind Farm development area one area of peat is shown on the Peatlands map, this is mainly outside the Wind Farm Development Area but intersects the access route at Farm Road at its south-western end. No peat is shown along the Grid Connection.
- 11.5.5 The 2021 Phase 1 Peat Survey of the Scoping Boundary found that very little peat was present. The peat survey comprised a Phase 1 peat depth survey undertaken on a 100m by 100m grid of points, with peat depth measurement taken at each point, and it covered the entire Scoping Boundary except for areas where utilities were identified and a 50m exclusion zone was applied. The survey indicated that the Site is generally not underlain by peat, as peat of $\geq 0.4\text{m}$ in thickness was only found at two survey locations in the east of the site. The 2021 Peat Survey report, including a plan showing the interpolated peat depth across the Scoping Boundary, is included as an Annex to the Phase 1 Geoenvironmental Desk Study in **Appendix 11A**. The majority of the Scoping Boundary was considered to have bedrock at or close to surface, with little or no cover by superficial deposits. Based on the limited peat identified, further peat delineation survey was not considered necessary.
- 11.5.6 An additional peat survey was completed in 2023 at the southern end of the central track through the former Llanhilleth Quarry (Tirpentwys) where track widening is likely to be needed where the existing track meets Blaen-y-Cwm Road, in an area where the LandIS Soils map²⁹ shows very acid loamy upland soils with a wet peaty surface, a peaty texture and high carbon content (type 16). No peat was encountered during the survey (included as Annex D to the Phase 1 Geoenvironmental Desk Study in **Appendix 11A**) and it was noted in the survey area that the ground had been significantly reworked, it is therefore possible that peat has been removed from this area historically.
- 11.5.7 As described in **paragraphs 11.5.2 and 11.5.3**, restored soils (made ground) are present across a large area of the Proposed Development site as a result of historical mining activity. This made ground is detailed further in **paragraph 11.5.10**.
- 11.5.8 The Predictive Agricultural Land Classification (ALC) Map 26 indicates that the agricultural land classification within the Site, which is also the relevant study area applied for soils and agricultural land, is mainly grade 5 (very poor quality agricultural land). Some Grade 4 is also present and some non-agricultural land. It can, therefore, be concluded that the Site, 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, and to provide a conservative assessment the land is assumed to be Grade 4.

Geology

- 11.5.9 The British Geological Survey (BGS) 1:50,000 scale geology mapping³⁰ shows superficial deposits as absent across most of the Proposed Development Site. The mapping generally indicates that bedrock is close to surface (<10m below ground level) or at surface. Exceptions are till deposits (diamicton) in the north of the Wind Farm

²⁹ Cranfield University (2022). Soils map (Online) Available at: <http://www.landis.org.uk/soilsmap/#>, (Accessed March 2021).

³⁰ British Geological Survey (2022). Geology Onshore (Online) Available at: <http://mapapps2.bgs.ac.uk/geology/home.html>, Accessed October 2022.

Development Area underlying turbine 2) and head deposits (clay, silt, sand and gravel) at the north-eastern extent of the access road along Farm Road.

- 11.5.10 Large areas of artificial ground are shown within the Proposed Development Site, these cover a slightly larger area than the restored soils shown on the Soilsmap and occupy the majority of Proposed Development Site, and included the eastern areas of the access road at Farm Road and eastern extent of the Grid Connection, as described in **paragraph 11.5.3**, and also the area of peaty soils described in **paragraph 11.5.3** south of The Canyon. The two types of artificial ground shown are described by the BGS as worked ground (undivided) – void, and made ground (undivided) – artificial deposit. Where present, and because of historical opencast coal workings within the Proposed development Site, made ground is likely to be variable in depth.
- 11.5.11 A central access track (forestry unpaved road) is present through the former Llanhilleth Quarry (Tirpentwys). This is used regularly by farm vehicles, log lorries and other site users, however, for it to be utilised in the Proposed Development as an access track to Turbine 8, it was confirmed following Draft ES submission that the track will require some upgrading (widening to allow abnormal loads to negotiate corners) using imported roadstone. The track is located on a spoil heap (made ground) associated with the former quarry. A site walkover by a geotechnical specialist was completed in June 2023 (included as **Annex D** to the Phase 1 Geo-environmental desk study in **Appendix 11A**) to check areas of the track where widening is proposed for potential slope stability issues. This survey confirmed that there is a wide corridor within which the track can be placed (>10m width) which would allow the track alignment for the Proposed Development to comfortably avoid the edge of the slope. No potential slope stability issues were identified in relation to the proposed track upgrading for the Proposed Development. At the request of NRW, a preliminary slope stability assessment was subsequently undertaken (WSP, 2024b) of the existing access track under wind farm construction traffic for the Proposed Development. This concludes that given the presence of strong intact bedrock at a shallow depth, and with no signs of slope stability issues present during the 2023 walkover (WSP 2023), that the proposed wind farm traffic loads will not present any future slope stability concerns. The report (**Appendix 11B, Annex B**) recommends that the assessment is updated and refined following targeted ground investigation and detailed topographical survey. A targeted ground investigation will be undertaken as per this recommendation for the Final ES submission to confirm the ground conditions at the track and inform any detailed assessments of slope stability under traffic loads for the construction phase of the Proposed Development, if required.
- 11.5.12 The British Geological Survey (BGS) GeoIndex Onshore map³⁰ indicates that bedrock geology on the Proposed Development Site mainly comprises the Hughes Member of the Pennant Sandstone Formation, which is described as “*green-grey, lithic arenites ..., with thin mudstone/siltstone and seatearth interbeds, and mainly thin coals.*”³¹ There is also an area of the Grovesend Formation (“*predominantly argillaceous, comprising mudstones and siltstones, with well developed coals; minor lithic ("Pennant") sandstones; and locally developed red mudstones*”³²) in the centre of the site oriented approximately east-west.
- 11.5.13 At the eastern extents of the access road along Farm Road and the Grid Connection Corridor, the bedrock geology changes from the Hughes Member to the Brithdir Member (sandstone), the Deri Formation (mudstone, siltstone, sandstone), the South Wales Upper Coal Measures Formation (mudstone, siltstone, sandstone) then the South Wales Middle Coal Measures Formation (mudstone, siltstone, sandstone).

³¹ British Geological Survey (2022). The BGS Lexicon of Named Rock Units – Result Details (Online). Available at: <https://webapps.bgs.ac.uk/lexicon/lexicon.cfm?pub=H>, (Accessed June 2023)

³² British Geological Survey (2022). The BGS Lexicon of Named Rock Units – Result Details (Online). Available at: <https://webapps.bgs.ac.uk/lexicon/lexicon.cfm?pub=GDB>, (Accessed June 2023)

- 11.5.14 As reported in the Phase 1 Geoenvironmental Desk Study, coal seam outcrops are shown around the margin of the topographic high which forms the plateau within the Proposed Development Site. Several mine entries are shown on the flanks of the plateau, comprising both shafts and adits, where they are associated with the Mynyddislwyn seam in the west and the Cefn Glas and Brithdir seams in the east.
- 11.5.15 The Phase 1 Geoenvironmental Desk Study records several faults crossing the site. There appear to be two fault sets, one running broadly north to south and the other running west to east, which is consistent with the regional pattern. The most significant is the Trevithin Fault which runs across the southeastern Wind Farm Development Area.
- 11.5.16 There are limited BGS borehole records available for the Proposed Development Site. Boreholes referenced as SO20SE58 and SO20SE 59³³ (Greenland 4 and 5 respectively) dating from 1976, completed for the National Coal Board, are located just south of the eastern end of the Grid Connection: these were drilled on the 'Greenland Tip' site and record spoil to 4.8m to 5.25m below ground level (bgl) overlying 0.70m to 0.75m of 'probably head and/or landslip' which is logged as a clay. This is underlain by bedrock comprising predominantly mudstone and sandstone. Several seatearth layers are noted, and a thin coal seam (c. 0.4m to 0.5m thick) is noted at depths of 12.25m bgl (Greenland 4) and 17.2mbgl (Greenland 5). A cavity/soft ground is recorded in Greenland 4 between 25.4m and 27m bgl. Correspondence included within the log record notes faulting of the strata and surface landslipping. This includes a fault identified as the Greenland Fault which is inferred to underlie the Grid Connection Corridor. The log notes numerous seams have been washed out in this area.
- 11.5.17 **Figure 11.1** shows the identified potential mining and geological hazards.
- 11.5.18 Further to the findings of the Phase 1 Geoenvironmental Desk Study (**Appendix 11A**), the CMRA (**Appendix 11A, Annex B**) and the Geotechnical Walkover Survey of the access track through the former Llanhilleth Quarry (Tirpentwys) (**Appendix 11A, Annex D**), additional ground stability assessments have been undertaken for the Proposed Development as detailed in **paragraphs** Error! Reference source not found. and **11.3.8, Table 11.6**. These are included in **Appendix 11B** to the ES and comprise: a review of geotechnical constraints at the Proposed Development Site (**Appendix 11B, Annex A**), a Preliminary Slope Stability assessment (**Appendix 11B, Annex B**, as described above in paragraph 11.5.11), and a Coal Mine Risk Micro-siting report (**Appendix 11B, Annex C**). All reports conclude that with appropriate mitigation measures the geohazards presented by the geological conditions, including the ground hazards posed by the former coal mining, can be mitigated to enable the Proposed Development to be safely constructed (see **Table 11.6** and the embedded measures in **Table 11.7**).

Geodiversity

- 11.5.19 Information on DataMap Wales shows there are currently no geological Sites of Special Scientific Interest (SSSIs) located within the Proposed Development Site and no Geological Conservation Review (GCR) sites.
- 11.5.20 There is a Regionally Important Geological Site (RIGS) adjacent to and partially within the Proposed Development Site, as shown on **Figure 11.1**. This comprises the northern portion of The Canyon, which is the former Llanhilleth Quarry (Tirpentwys), where the Carboniferous Grovesend Formation bedrock is visible at the quarry sides.

³³ BGS ID: 263974 : BGS Reference: SO20SE58, British National Grid (27700) : 326010,202290. Available at: http://scans.bgs.ac.uk/sobi_scans/boreholes/263974/images/10527438.html. (Accessed June 2023), and, BGS ID: 263975 : BGS Reference: SO20SE59, British National Grid (27700) : 326100,202310 Available at: http://scans.bgs.ac.uk/sobi_scans/boreholes/263975/images/10527455.html.

- 11.5.21 As described in **paragraph 11.5.11**, the Proposed Development includes use of an existing access track running roughly north to south centrally through the RIGS (potential SSSI and Geological Conservation Review site). The track is within the RIGS designated area, however this is the only part of the RIGS designated area included in the Proposed Development Site. BGS information (see **paragraph 11.5.9**) indicates that the track is likely to be located on a spoil heap. During the site walkover in June 2023 (see **Appendix 11A, Annex D**) photographs were obtained within the former quarry east of the central track. These show the rock exposures in the former quarry to the west and east of the track but not in the area of the track itself (see **Appendix 11A, Annex D**). Public access to the western half of the quarry has been discouraged using fencing at the western boundary of the former quarry, and this area was not surveyed in June 2023, however members of the public could be observed in the area during the walkover. The western former quarry area cannot be accessed on foot from the central track due to the steep slope down to it. During the walkover in June 2023 (**Appendix 11A, Annex D**), the track was noted to be on raised ground above the level of outcropping rock (which is visible east and west of the track) and to have no rock exposures. Based on the observations made during the walkover, there are no obvious signs of existing slope instability that could affect the track stability and subsequently affect the rock exposures.

Minerals

- 11.5.22 The Proposed Development Site is within an Aggregates Safeguarding Area, Mineral Buffer Zone and Preferred Area defined in the Blaenau Gwent Local Development Plan 2012. In relation to coal resources, Welsh Government planning policy is to move away from extraction of energy minerals.
- 11.5.23 The BGS GeoIndex minerals dataset shows the Proposed Development Site is in an area with mines and quarries, shallow coal, fireclay and brickclay resources, is underlain by sandstone with potential for high specification aggregate, and is in a primary, secondary and tertiary opencast coal resource area.
- 11.5.24 Information in the Torfaen LDP and on the Torfaen Council website indicates that there is a planning application for recovery of secondary aggregates from the former open-cast coal mining spoil heap at Tirpentwys, and construction of a new access road which would traverse the southern part of the Wind Farm Development Area from south to north to reach the existing access track through the centre of The Canyon which is part of the Wind Farm Development Area. As the wind farm development footprint will only occupy a small proportion of the Proposed Development Site and the wind turbines will not be located on the spoil heaps, effects on minerals were scoped out of the EIA. Use of (and improvement of) the existing central track through the former quarry for the Proposed Development, or construction and operation of the other elements of the Wind Farm development, will not sterilise the site or restrict future minerals extraction.
- 11.5.25 Given that the wind farm development footprint would only occupy a small proportion of the Proposed Development Site effects on minerals have been scoped out of the EIA, as agreed with PEDW.

Land contamination

- 11.5.26 The Phase 1 Geo-environmental desk study (Wood, 2022) has identified potential sources of land contamination on the Proposed Development Site to include localised residual mine waste from onsite surface workings, contaminants (such as fuels, oils and wastes) from opencast mining operations, made ground (opencast backfill), historical farm operations including use of fuels/oils, agricultural chemicals such as pesticides, dilapidated buildings with possible asbestos content which may release asbestos fibres to ground, and mine gas from former deep workings on the Site. Locations of potential

sources identified in the Phase 1 Geo-environmental desk study (Wood, 2022) are shown on **Figure 11.1**. No specific areas of agricultural chemical or fuel storage have been identified.

- 11.5.27 During the walkover in 2021, evidence of the former mining was evident as demolished buildings and small piles of rubble. Building demolition is a potential source of asbestos and other contaminants such as metals. Forestry operations were ongoing in the area around The Canyons, which bounds the Site. Several areas of suspected restored opencast were identified based on the topography observed, predominantly in the areas to the north and south of The Canyons. Evidence of former mining activity was noted in the valley to the north of the Site, along which the proposed Access Road at Farm Road runs. Some limited areas of forestry were observed at the western end of Cwm Du.
- 11.5.28 There are no buildings currently on the Site, however, there is a Welsh Water main running through the Site, this runs roughly south to north through the Site west of turbines 6 and 7 then heads northwest and runs to the south of turbine 3. Water supply pipes can be a potential receptor of contaminated land
- 11.5.29 Regarding contamination from agricultural activities, any contamination present, such as that arising from fuel/oil/chemical usage or leaks/spills, or ad hoc waste disposal is likely to be localised and of limited extent.
- 11.5.30 Former mine workings are a potential source of toxic and explosive gases and the Phase 1 Geo-environmental desk study (Wood, 2022) identifies a potential risk of ground gas being present. Whilst the turbines are not associated with significant enclosed spaces, the risk relates to the proposed built environment, particularly the substation building. No historical mine gas issues have been identified at the Site based on desk study evidence.
- 11.5.31 Potential sources of contamination are present in the surrounding area including former quarries, former mining activities and associated waste disposal activities. However, no current or historical activities with the potential to impact on land quality on the Proposed Development Site were identified in the Phase 1 Geo-environmental desk study (Wood, 2022).

Environmental setting: hydrogeology, hydrology, and sensitive land uses

- 11.5.32 A detailed description of hydrology is presented in **Chapter 10: Water Environment**. The Proposed Development Area sits on a watershed between the Afon Ebwy Fach/Afon Ebwy catchment to the west, and the Afon Lwyd catchment to the east, both of which are classified as main rivers by NRW.
- 11.5.33 The Afon Ebwy Fach is situated approximately 900m west of the Proposed Development Area and flows south joining the Afon Ebwy at Aberbeeg. At its nearest point, the Afon Ebwy passes within 1km of the southwest limit of the Proposed Development Area and continues flowing south. The Afon Lwyd is situated 2km east of the Proposed Development Area and flows south through Pontypool.
- 11.5.34 The Proposed Development Area is intersected by the headwaters of several tributaries of the Afon Ebwy Fach, Afon Ebwy and Afon Lwyd which are classified as ordinary watercourses.
- 11.5.35 A detailed description of hydrogeology is presented in **Chapter 10: Water Environment**. The localised Glacial Till and Head Deposits are classified as Secondary Undifferentiated aquifers. Bedrock is classified as a Secondary A Aquifer and is a designated Water Framework Directive (WFD) groundwater body. It achieved Good quantitative status and Poor chemical status in the 2016 WFD classification. There are no licensed groundwater abstractions on the Site identified in the Envirocheck report in **Appendix 11A**, the closest is within the Canyon, this is from a spring for general farming and domestic use at a farm.

The Proposed Development Site and the wider study area are not within a Source Protection Zone (SPZ). Groundwater beneath the Site is likely to be impacted by the historical coal mining activities.

- 11.5.36 There are no statutory designated ecological sites on the Proposed Development Site. Areas of local ancient and semi-natural woodland are located around the Site on the valley slopes and locally encroach into the Site at the top of Nant Ddu, Nant-y Caws and Cwm Cnyw. None of the proposed turbine locations intersect the areas of ancient woodland. There are no RAMSAR, SSSI, SAC, SPA, AONB, National Nature Reserve, Local Nature Reserve or National Park designations on the Site. The assessment of the likely significant effects of the Proposed Development on biodiversity is presented in **Chapter 8: Biodiversity**.

Future baseline

- 11.5.37 In the absence of the Proposed Development, the current agricultural land use (mainly sheep grazing) and localised forestry use are likely to continue on the Site.
- 11.5.38 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. Therefore, it is reasonable to conclude that in the absence of the Proposed Development there would not be a change in ground conditions over time within the study area.

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 11.7** outlines how these embedded measures will influence the Ground Conditions assessment.

Table 11.7 Summary of the embedded environmental measures

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
Construction			
Geology / geodiversity	Physical changes to rock exposures at RIGS (potential SSSI), or changes to quarry spoil heaps affecting access to the rock exposures, because of access track upgrade works at the central track through the former quarry	The area of the Proposed Development within the RIGS designated area is limited to a central access track constructed on material believed to include spoil associated with former quarrying activity. A slope stability assessment completed for the central track (Appendix 11A, Annex D) concluded that rock exposures	DNS condition

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
		<p>are not present at the track area and that the Proposed Development can be completed without compromising slope stability, or causing physical changes to rock exposures for which the RIGS is designated (potential SSSI), or changes to quarry spoil heaps affecting access to the rock exposures. This is based on the distance to the exposed high walls of the quarried areas from the track area. Given the space available to allow for track widening at the corners, it is also considered unlikely that there will be any problems with the stability of the existing slope.</p> <p>This assessment has also been confirmed by a Preliminary Slope Stability assessment (included as Appendix 11B, Annex B) for the existing access track (forestry unpaved road) running through the centre of the area of the former quarry under wind farm construction traffic for the Proposed Development. The report concludes that given the presence of strong intact bedrock at a shallow depth, and with no signs of slope stability issues present during the 2023 walkover (WSP 2023), it is anticipated that the proposed wind farm traffic loads will not present any future slope stability concerns. The report recommends that the assessment is updated and refined following targeted ground investigation and detailed topographical survey.</p> <p>Targeted ground investigation will be undertaken for the Final ES submission to confirm the ground conditions at the track and inform any detailed assessments of slope stability</p>	

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
Soil	<p>Compaction of soil by vehicles or during stockpiling during construction leading to damage to soil structure resulting in damage to/loss of soil functions</p>	<p>under traffic loads for the construction phase of the Proposed Development, if required.</p> <p>Any further investigations or assessments recommended following that investigation, will be completed during pre-construction.</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 compaction. This measure is integrated into the CEMP submitted alongside this ES.</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 the 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>	<p>CEMP and Materials Management Plan (MMP)</p>

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
Soil	Erosion of soil during construction, leading to loss of organic matter in runoff	<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. This measure is integrated into the CEMP.</p> <p>Measures to avoid soil compaction (which can result in soil erosion by increasing surface 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>	CEMP and MMP
Soil	Permanent loss of soil and associated soil functions due to construction of the wind farm	<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>	CEMP and MMP
Soil resources temporarily or permanently displaced, or to be	Degradation of soil functions and agricultural land quality due to cross-contamination of topsoil with contaminated	A Phase 1 geo-environmental desk study has been completed for all elements of the Proposed Development	CEMP, MMP and DNS condition

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
<p>translocated within the Proposed Development application boundary</p>	<p>soil/material excavated/disturbed during construction work</p>	<p>(Appendix 11A). This has identified potential contamination sources within agricultural areas.</p> <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 asbestos, 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. Deeper soil testing will be carried out as needed to inform the detailed (post consent) design of the Proposed Development in relation to former colliery tip areas or other areas of suspected made ground. 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. Monitoring for gas and groundwater is to be undertaken at the proposed turbine locations and associated with mine related features beneath access/internal roads to inform the design. The contaminated land risk assessment will be completed in accordance with the Environment Agency LCRM guidance. 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</p>	

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
		<p>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>	
<p>Contaminated land receptors: Site workers/site users including construction workers</p>	<p>Impacts on human health due to land contamination</p>	<p>A Phase 1 geo-environmental desk study has been completed for all elements of the Proposed Development (Appendix 11A).</p> <p>Phase 2 intrusive geoenvironmental ground investigation will be completed during the pre-construction phase, including soil sampling and chemical testing, to confirm the ground conditions.</p> <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</p>	<p>CEMP, MMP and DNS condition</p>

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
<p>Contaminated land receptors: soil, groundwater, surface water, humans (site users)</p>	<p>Groundwater 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 surface water quality.</p>	<p>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 all elements of the Proposed Development and the report is appended (Appendix 11A).</p> <p>If groundwater is present and needs 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 geoenvironmental ground investigation will be completed during the pre-construction phase, including soil sampling</p>	<p>CEMP and DNS condition</p>

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
<p>Contaminated land receptors: soil and groundwater, humans (site users), built environment (buildings, structures, services – water main running through the Site)</p>	<p>Leaks or spills or fuels or oils from construction vehicles or plant</p>	<p>and chemical testing, to confirm the ground conditions.</p> <p>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.</p>	<p>CEMP</p>
<p>Built environment (buildings, structures, services)</p>	<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 all elements of the Proposed Development and the report is appended to the ES (Appendix 11A).</p> <p>The Phase 1 Geoenvironmental Desk Study and the Coal Mining Risk Assessment identified coal mining hazards including known shallow abandoned mineworkings, possible unrecorded shallow mineworkings, backfilled opencast workings and associated highwalls, unstable ground and potential untreated mine entries (adits). The reports recommend a programme of Phase 2 intrusive investigation and testing to allow better quantification of the identified constraints. Further to the findings of the Phase 1 Geoenvironmental Desk Study</p>	<p>DNS condition</p>

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
		<p>and CMRA, a Coal Mine Risk Micro-siting technical note (Appendix 11B, Annex C) has been produced. This concludes that the proposed targeted investigations to be undertaken during pre-construction will provide sufficient information to quantify the risk and inform appropriate mitigation measures to be used at affected locations to ensure the safety and competency of the turbines and infrastructure.</p>	
		<p>Slope stability at the access track through the former Llanhilleth Quarry is considered in the geotechnical technical note included as Annex D to the Phase 1 Geoenvironmental Desk Study in Appendix 11A and is assessed in the Preliminary Slope Stability Technical Note (Appendix 11B, Annex B). The assessment concludes that the proposed wind farm traffic loads will not present any future slope stability concerns. The report recommends that the assessment is updated and refined following targeted ground investigation and detailed topographical survey. Targeted ground investigation will be undertaken at the access track through the former Llanhilleth Quarry as per this recommendation for the Final ES submission. This is to confirm the ground conditions at the track and inform any detailed assessments of slope stability under traffic loads for the construction phase of the Proposed Development, if required. As above, further targeted investigation of other areas of the Proposed Development Site, and any further investigations or assessments recommended</p>	

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
		<p>following that investigation, will be completed during pre-construction.</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> <p>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. Construction of the wind farm in areas affected by coal mining risks would not take place without the application of appropriate mitigation measures such as foundation design measures and/or micrositing.</p>	
<p>Built environment (buildings, structures, services)</p>	<p>Aggressive ground conditions with potential to cause damage to buildings/structures due to chemical attack.</p>	<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 ES (Appendix 11A).</p>	<p>DNS condition</p>

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
		<p>Phase 2 intrusive geo-environmental ground investigation will be completed during the pre-construction phase, including soil sampling and chemical testing, and groundwater monitoring / 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.</p>	
Operation			
Soils/agricultural land	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)
Contaminated land receptors: soil and groundwater, humans (site users)	Leaks or spills of fuels or oils from vehicles or plant during wind farm or grid connection 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)
Contaminated land receptors: humans (site users)	Impacts on site users' health due to encountering contaminants in soil	A Phase 1 geo-environmental desk study has been completed for all elements of the Proposed Development	DNS planning condition

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
		<p>and the report is appended to the ES (Appendix 11A).</p> <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 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 CEMP includes an unexpected contamination protocol.</p>	
<p>Contaminated land receptors: humans (site users), buildings</p>	<p>Accumulation of mine gas within enclosed spaces leading to potentially toxic and/or explosive atmospheres in enclosed spaces.</p>	<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 ES (Appendix 11A).</p> <p>A Phase 2 geo-environmental ground investigation will be completed at the pre-construction stage where the potential for gas accumulation</p>	<p>DNS planning condition</p>

Receptor	Potential changes and effects	Embedded measures	Compliance mechanism
Built environment (buildings, structures, services)	Aggressive or unstable ground conditions with potential to cause damage to buildings/structures due to ground movement or chemical attack.	<p>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 C665³⁴, which is likely to entail a minimum of six monitoring rounds over a minimum period of three months.</p> <p>The Phase 1 Geoenvironmental Desk Study and the Coal Mining Risk Assessment have identified coal mining hazards including known shallow abandoned mineworkings, possible unrecorded shallow mineworkings, backfilled opencast workings and associated highwalls, unstable ground and potential untreated mine entries (adits). Further specialist studies have been completed for the Proposed Development including the Mynydd Llanhilleth: Coal Mine Risk Micro-siting: Further Information Technical Note (included as Appendix 11B, Annex C to this ES), and the Geotechnical Site Investigation Review (Appendix 11B, Annex A). These reports recommend a programme of Phase 2 intrusive investigation and testing to allow better quantification of the identified constraints. This will be undertaken during pre-construction and appropriate mitigation measures applied.</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>	DNS planning condition

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

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 contaminated land. 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 0**.

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 ('the Proposed Development Site'), together with the Zones of Influence (Zols) that have formed the basis of the study area described in **Section 11.4**.

11.7.3 For contaminated land receptors the Zol has been defined as an area extending 250m from the boundary of the Proposed Development Site. Due to the location of the Proposed Development Site on top of the ridge, and the Grid Connection corridor on the slope at the west side of the ridge, there is limited potential for onsite migration of contamination and the nature of the surrounding land use means there are limited potential 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 22 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 22 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 11.8**.

Table 11.8 Ground Conditions receptors subject to potential effects

Receptor	Reason for consideration
Geology / geodiversity	
Former Llanhilleth Quarry (Tirpentwys) – exposures of Carboniferous Grovesend Formation bedrock	The Proposed Development boundary includes a central track through the former Llanhilleth Quarry (Tirpentwys) which is designated as a RIGS and NRW has confirmed is under consideration to become a proposed SSSI and proposed Geological Conservation Review site.
Soils	

Receptor	Reason for consideration
Soil resources	<p>Land within the Proposed Development Site is in agricultural use. There is no BMV agricultural land within the study area, however, grazing of sheep takes place.</p> <p>Peaty soils are present within the Proposed Development Site. 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.</p>
Soil resources: peat (having a thickness of more than 40cm of organic material within the upper 80cm of a soil profile)	Peat is present locally within the Proposed Development boundary. Peat has distinctive characteristics including high sensitivity to handling and its high organic content, healthy peatlands carry out an important carbon cycling / storage function. Peatlands areas protected through the planning system by the Welsh Government.
Land Contamination	
Humans – current and future site users (agricultural workers, maintenance workers/ operatives, public open space users)	Potential for human health impacts to these receptors has been identified in the Phase 1 geo-environmental desk study due to land contamination. Effects could occur either during construction or operation.
Humans – construction workers	
Controlled water: Groundwater – Secondary A aquifer (Coal Measures), Secondary (undifferentiated) aquifers (Glacial Till and Head)	Groundwater has been identified as a potential receptor in the Phase 1 geo-environmental desk study. Effects on the water environment due to land contamination could occur either during construction or operation.
Controlled water; Surface water – Surface water – Nant Ddu, Nant-y-cnyw, Nant-y-Caws, Nant Cyffin	Surface water has been identified as a potential receptor in the Phase 1 geo-environmental desk study. Effects on the water environment due to land contamination could occur either during construction or operation.
Current and future buildings and services – including the Welsh Water water main running through the central area of the Site	<p>Potential for impacts on the built environment (future wind farm development) due to land contamination have been identified in the Phase 1 geo-environmental desk study.</p> <p>Potential for impacts on the built environment (future wind farm development) due to land instability have been identified in the Phase 1 geo-environmental desk study and Coal Mining Risk Assessment.</p> <p>Potential for contamination caused by the Proposed Development to impact on water quality in an existing water main on the Site.</p>

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 11.9**.

Table 11.9 Ground Conditions receptors scoped in for further assessment

Receptor	Likely significant effects
Construction	
Geology / geodiversity	
Former Llanhilleth Quarry (Tirpentwys) – exposures of Carboniferous Grovesend Formation bedrock	Physical changes to rock exposures at RIGS (potential SSSI), or changes to quarry spoil heaps affecting access to the rock exposures, because of access track upgrade works at the central track through the former quarry during the construction.
Soil resources/agricultural land	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.
	Erosion of soil during construction, leading to loss of organic matter in runoff, causing degradation of soil function and agricultural land quality.
	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.
	Impacts on soil quality/agricultural land quality due to cross-contamination with contaminated soil/material excavated/disturbed during soil handling for construction of the Proposed Development.
Soil resources: peat (having a thickness of more than 40cm of organic material within the upper 80cm of a soil profile)	Peat is present locally within the Proposed Development boundary. Peat has distinctive characteristics including high sensitivity to handling and its high organic content, healthy peatlands carry out an important carbon cycling / storage function. Peatlands areas protected through the planning system by the Welsh Government.
Land contamination	
Humans – current and future site users (agricultural workers, maintenance workers/ operatives, public open space users)	Effects on human health due to accidental releases of contaminants (e.g. through spills or leaks) from construction vehicles / plant or from waste storage activities (e.g. due to runoff, leaching or dust migration).
Controlled water: Groundwater – Secondary A aquifer (Coal Measures), Secondary (undifferentiated) aquifers (Glacial Till and Head)	Effects on the water environment (groundwater) due to land contamination could occur either during construction due to spills or leaks of fuels / oils or run-off from inappropriately managed wastes.
Controlled water; Surface water – Surface water – Nant Ddu, Nant-y-cnyw, Nant-y-Caws, Nant Cyffin	Effects on the water environment (groundwater) due to land contamination could occur either during construction due to spills or leaks of fuels / oils or run-off from inappropriately managed wastes.
Current buildings and services (including water main on the Site)	Potential for contamination caused by the Proposed Development during construction due to spills or leaks of

Receptor	Likely significant effects
	fuels / oils to impact on water quality in an existing water main on the Site.
Operation	
Contaminated land receptors: future site users (agricultural workers, maintenance workers/ operatives, public open space users)	Exposure to land contamination via numerous pathways (e.g., inhalation, direct contact, ingestion) resulting in health effects to site users.
Contaminated land receptors: future site users (agricultural workers, maintenance workers/ operatives, public open space users), future buildings and services	Accumulation of mine gas within enclosed spaces leading to potentially toxic and/or explosive atmospheres in enclosed spaces.
Decommissioning	
The potential effects during decommissioning are similar to those during construction.	

11.7.8 The receptors/effects detailed in **Table 11.10** have been scoped out from being subject to further assessment because the potential effects are not considered likely to be significant.

Table 11.10 Summary of effects scoped out of the Ground Conditions assessment

Receptors/potential effects	Justification
Construction	
Minerals	Although the Wind Farm development site and the Grid Connection site are within an Aggregates Safeguarding Area, Mineral Buffer Zone and Preferred Area, there are no known proposals for mineral extraction on the Site and the Wind Farm development footprint would only occupy a small proportion of the Site. Additionally, in relation to coal resources, Welsh Government planning policy is to move away from the extraction of energy minerals.
Contaminated land receptors: Site users (agricultural workers, maintenance workers, operatives (e.g., solar farm workers), public open space users) – impacts on human health due to encountering land contamination	The embedded measures include a commitment that 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), and protection of the general public e.g., through site security measures to prevent access to construction areas and control of dusts. 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.

Receptors/potential effects	Justification
Contaminated land receptors: Construction workers – impacts on human health from known, suspected or unexpected land contamination	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.
Built environment (buildings, structures, services) - Aggressive ground conditions with potential to cause damage to buildings/structures due to chemical attack.	The embedded measures include a commitment to the basis of the structural design for the Proposed Development being completed in general accordance with design standards. Any peat is likely to be acidic and sulphate minerals may be present within the Coal Measures strata. This 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.
Built environment (buildings, structures, services) – Land instability with potential to result in subsidence	Potential for unstable ground conditions arising from former coal mining activity will be dealt with through the embedded measures. These include the geohazard and mining hazard assessments completed to date (Phase 1 Geoenvironmental Desk Study and Coal Mining Risk Assessment in Appendix 11A), and intrusive ground investigation, to be completed during the pre-construction phase. The ground investigation will inform the development of a remediation strategy if one is needed. Remediation verification will be undertaken if remediation is subsequently undertaken. With these embedded measures, the basis of the structural design for the Proposed Development will be completed in general accordance with design standards and land instability is not considered further in the assessment.
Operation	
Former Llanhilleth Quarry (Tirpentwys) – exposures of Carboniferous Grovesend Formation bedrock	Use of the central access track through the RIGS (potential SSSI) during the operational phase will be infrequent and will not impact on access to the rock exposures within the RIGS or have any potential to result in physical changes to rock exposures at the RIGS.
Soils/agricultural land	Maintenance activities requiring ground disturbance will be infrequent and limited in extent and are therefore likely to require minimal disturbance to soil.
Contaminated land receptors: soil and groundwater, humans (site users) - Leaks or spills of fuels or oils from vehicles or plant during wind farm or grid connection maintenance	The embedded measures include limitations on where and how refuelling/maintenance of plant and vehicles can take place during operation. Vehicle maintenance and refuelling of machinery will only be permitted 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.

Receptors/potential effects	Justification
<p>Built environment (buildings, structures, services) - Aggressive ground conditions with potential to cause damage to buildings/structures due to chemical attack.</p>	<p>The embedded measures include a commitment to the basis of the structural design for the Proposed Development being completed in general accordance with design standards. Any peat is likely to be acidic and sulphate minerals may be present within the Coal Measures strata. This will be assessed through ground investigation completed during the pre-construction to determine the requirements for in ground concrete structures. No significant effects are, therefore, likely relating to chemical attack on structures.</p>
<p>Built environment (buildings, structures, services) – Land instability with potential to result in subsidence</p>	<p>Potential for unstable ground conditions arising from former coal mining activity will be dealt with through the embedded measures. These include the geohazard and mining hazard assessments completed to date (Phase 1 Geoenvironmental Desk Study and Coal Mining Risk Assessment in Appendix 11A), and the additional studies included in Appendix 11B comprising a preliminary slope stability assessment for the existing access track through the former Llanhilleth Quarry (Tirpentwys) under wind farm construction traffic loads, a Geotechnical Site Investigation Review, and a Coal Mine Risk Micro-siting report, all of which conclude that the risks can be mitigated through design and the application of suitable mitigation measures, which will be informed by intrusive ground investigation, to be completed during the pre-construction phase. Ground investigation at the existing access track running through the centre of the former Tirpentwys quarry will be completed prior to submission of the Final ES. Ground investigations will inform the development of a remediation strategy if one is needed. Remediation verification will be undertaken if remediation is subsequently undertaken. With these embedded measures, the basis of the structural design for the Proposed Development will be completed in general accordance with design standards and land instability is not considered further in the assessment.</p>

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 11.8.2** 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.

11.9 Assessment of Ground Conditions effects

Overview

11.9.1 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**.

Wind Farm Development Area and Grid Connection

- 11.9.2 The permanent development features within the Wind Farm Development Area comprise the following:
- The (maximum of) seven 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 seven turbine foundations will therefore be 0.22ha;
 - 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 (12.5m²). The seven kiosks will, therefore, require a total area of 87.5m² (0.01ha);
 - 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 2,500m² in area, the maximum total area of the seven crane pads will therefore be 1.75ha;
 - The wind farm will require internal access tracks, of approximately 9.8km in length, of which 5.8km is existing track (i.e. 4.0km of new track is needed, and 2.2km of existing track will require upgrades. The Site Access point for the development, proposed from the B4246 through an unnamed road onto Farm Road, will involve the upgrading of the junction which connects the B4246 and Farm Road, whilst Farm Road itself will require improvements to ensure it is suitable for construction vehicles. These works will include widening, earthworks, and vegetation clearance. Some earthworks and widening will be needed to improve the existing track through The Canyon (central track through Tirpentwys). The access tracks will be approximately 5m wide and will have a 2m wide grassed verge on either side. The total track area (including existing tracks) will therefore be approximately 4.9ha and the verges will occupy an area of 3.9ha. 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 8.8ha as the maximum area of soil loss for the access tracks;
 - The Wind Farm development requires an internal substation 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 (0.13ha). The substation building will be a single storey building, approximately 14m x 10m (0.01ha), 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; and

- The substation welfare facilities will include a water supply system which is likely to be rainwater fed.
- 11.9.3 Based on the above details, the total area of permanent development where soil is likely to be permanently removed or sealed will be 10.92ha (this includes the verges in order to provide a worst-case assessment).
- 11.9.4 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 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 65m² (0.0065ha) during the construction works; and
 - Temporary ground disturbance will be required to install the underground cables running between the turbines and the substation, these will be placed in cable trenches approximately 0.45m wide and 0.75m deep. The length of cable is not known, therefore, a length of the new access track of 5.0km has been used as a likely total given the turbine layout, giving a total cable trench area of 0.23ha.
- 11.9.5 The maximum area of soil to be disturbed and/or temporarily displaced because of the Proposed Development Site would therefore be approximately 0.49 hectares.
- 11.9.6 The total area of land that will undergo temporary and / or permanent disturbance because of the Wind Farm Development is therefore estimated at 11.41ha.
- 11.9.7 As detailed in **Section 0**, available information on the soil on the Site indicates the absence of deep peat across most of the Wind Farm Development Area, however localised areas of peat $\geq 0.4\text{m}$ ($>40\text{cm}$) in thickness were confirmed during the Phase 1 Peat Survey (Wood, 2021). The design of the Wind Farm has been adapted to avoid these. Any further avoidance needed would be achieved through micro-siting. There is potential for extensive made ground within the Site, where the original soils will have been removed / replaced following historical mining activity. Some of the Site is likely to have the original soils still in situ and these may be relatively undisturbed. Based on desk study information these are likely to comprise a combination of very acid loamy upland soils with a wet peaty surface, a peaty texture and high carbon content, and freely draining acid loamy soils over rock, with a loamy texture and medium carbon content. These are soils which are likely to have medium to high sensitivity to handling.
- 11.9.8 As described in **Chapter 4**, the exact construction / installation method for the Grid Connection is to be confirmed. A corridor has been identified between the Wind Farm Development Area and a point which intersects with the existing NG overhead line network to the east of the Site near Rhiw Franc Farm, west of Pontnewynydd.
- 11.9.9 The Grid Connection is likely to be between approximately 1.5km to 2km in length. The underground cable will be laid into a trench, using an open cut method, with a depth of up to 1.5m. The exact width of the trench is dependent on the final specification of the cable; however, it will be in the region of 600mm to 1.5m. The installation of the cables will further require a clearance distance of 5m either side of the trench, creating a corridor approximately 11.5m wide. Upon completion of the installation of cables the ducts will be backfilled with sand before the remaining area is backfilled with the excavated material.

- 11.9.10 A tee-off structure will also be required at the point of connection, this will likely comprise a termination pole and disconnecter pole. Based on standard design parameters these poles will be 13m tall, upon which the line will be connected to the existing overhead line network.
- 11.9.11 Based on a worst case scenario, the maximum area of soil to be disturbed and/or temporarily displaced to install the Grid Connection cables would therefore be a cable corridor of 2.3ha where soil may need to be temporarily removed. The majority could be replaced following construction.
- 11.9.12 Overall, the Wind Farm Development and the Grid Connection combined will entail temporary disturbance of up to 2.79ha of soils and permanent development of 11.49ha.
- 11.9.13 The total area of land that will undergo temporary and / or permanent disturbance due to the Proposed Development, including the Wind Farm Development and the Grid Connection is therefore estimated at 14.28ha.

Assessment methodology: Geology and soils

- 11.9.14 The magnitude/consequence of the loss or damage to soil resources 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.
- 11.9.15 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 and statutory pre-application consultation response from Natural Resources Wales (see **Table 11.5**). The classifications in **Table 11.11** 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 Policy³⁵.

Table 11.11 Sensitivity classifications for soils (including agricultural land)

Value / Sensitivity	Description Example
Very high	<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 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)</p>

³⁵ Welsh Government (2024). The National Peatland Action Programme. (Online) Available at: <https://naturalresources.wales/evidence-and-data/maps/the-national-peatland-action-programme/?lang=en>, (Accessed August 2024).

Value / Sensitivity	Description Example
	<p><i>designated peatlands (any statutory designation including SSSI)</i></p> <p>Agricultural land: Grade 1 and 2 agricultural land³⁶ according to the Agricultural Land Classification (ALC) system³⁷</p>
High	<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 land³⁸ according to the ALC system</p>
Medium	<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>
Low	<p>Geology: Of local importance / interest with potential for replacement (e.g. non designated geological exposures, former quarry's / mining sites).</p> <p>Soils: soils (<i>other than peat</i>) supporting non-designated notable or priority habitats</p> <p>Agricultural land: Grade 4³⁹ and 5 agricultural land according to the ALC system</p>
Very Low	<p>Geology: No geological exposures, little / no local interest.</p> <p>Soils:</p>

³⁶ 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.

³⁷ 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 August 2024).

³⁸ 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.

³⁹ 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.

Value / Sensitivity	Description Example
	soils (<i>other than peat</i>) on previously developed land formerly in 'hard uses' with little potential to return to agriculture

11.9.16 The approach to assigning the consequence of any damage or loss will be based on the DMRB LA 109 guidance and IEMA guidance summarised in **Table 11.12**.

Table 11.12 Magnitude classifications soils (including agricultural land)

Magnitude	Description Example
Major	<p>Geology: loss of geological feature / designation and/or quality and integrity, severe damage to key characteristics, features or elements.</p> <p>Soils and agricultural land: physical removal or permanent sealing of >20 ha soil resource or agricultural land.</p>
Moderate	<p>Geology: partial loss of geological feature / designation, potentially adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.</p> <p>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.)</p>
Minor	<p>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.</p> <p>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.)</p>
Negligible	<p>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.</p> <p>Soils: no discernible loss / reduction of soil function(s) that restrict current or approved future use.</p>
No change	<p>Geology: no temporary or permanent loss / disturbance of characteristics features or elements.</p> <p>Soils: no loss / reduction of soil function(s) that restrict current or approved future use.</p>

11.9.17 The determination of significance combines the sensitivity and magnitude using the matrix presented in **Table 11.13**.

Table 11.13 Geology and soil effects significance evaluation matrix

		Magnitude of change				
		No change	Negligible	Minor	Moderate	Major
Sensitivity/importance/value	Very high	Neutral	Slight	Moderate or large	Large or very large	Very large
	High	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
	Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
	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 of Geology Effects: Construction phase

Introduction

11.9.18 Only the Wind Farm Development Area has any sensitive geological features present. No potential for significant effects has been identified for the Grid Connection. The assessment below therefore relates only to the Wind Farm Development Area.

Assessment of geology effects: Wind Farm Development Area and Grid Connection

11.9.19 As described in **Section 0**, the former Llanhilleth Quarry (Tirpentwys) is a designated RIGS due to exposures of Carboniferous Grovesend Formation bedrock which are visible because of the historical quarrying activity. This would qualify according to **Table 11.11** as a medium sensitivity receptor, however based on the consultation response detailed in **Table 11.5**, high sensitivity has been assigned to reflect that the area is likely to qualify as a Geological Conservation Review site and SSSI.

Physical changes to rock exposures at RIGS (potential SSSI), or changes to quarry spoil heaps affecting access to the rock exposures, because of access track upgrade works at the central track through the former quarry during the construction

11.9.20 The central access track through the former Llanhilleth Quarry (Tirpentwys) is used regularly by farm vehicles, log lorries and other site users with no stability issues recorded. It is proposed that the track is utilised in the Proposed Development as an access track to Turbine 8 and current design information indicates that the track will require some upgrading (widening to allow abnormal loads to negotiate corners, as detailed in **Appendix 12A: Abnormal Indivisible Load (AIL) Access Study** to **Chapter**

12 Traffic and Transport). No rock exposure are present at the track and it is likely to be located on a spoil heap (made ground) associated with the former quarry. A site walkover by a geotechnical specialist was completed (**Appendix 11A, Annex D**) to check areas of the track where widening is proposed for potential slope stability issues. No potential slope stability issues were identified based on the use of the track during construction or the widening of the track. However, to provide additional assurance, a preliminary slope stability assessment was undertaken for the existing access track (**Appendix 11B, Annex B**), this concludes that the proposed wind farm traffic loads will not present any future slope stability concerns. The report recommends that the assessment is updated and refined following targeted ground investigation and detailed topographical survey. Targeted ground investigation to confirm the nature of the ground conditions within the track is an embedded measure in **Table 11.7**, this will be completed prior to the Final ES submission and the findings reported in the Final ES.

- 11.9.21 None of the rock exposures for which the RIGS is designated are located within the footprint of the central track. The upgrades to the central track will not affect current pedestrian access to either the western or eastern areas of the former quarry where the rock exposure are present. The construction work to widen the access track is not expected to cause any change to the ground stability at the central access track due to there being sufficient width (>10m) at corners for the re-aligned track to comfortably avoid the edges.
- 11.9.22 Based on the High sensitivity of the geology receptor and no anticipated change to the designated features, this results in a **Neutral** effect which is not significant.

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

Introduction

- 11.9.23 Given the similar ground conditions on the Wind Farm Development Area and Grid Connection, and the likelihood that similar construction methods and standard best practice construction techniques will be used for the Grid Connection as will be used for the Wind Farm Development Area, the two areas have been assessed collectively below for the Proposed Development.

Assessment of soils effects: Wind Farm Development Area and Grid Connection

- 11.9.24 As described in **Section 0**, the agricultural classification for the Site, including the Wind Farm development site and the Grid Connection is assumed, for the purposes of the assessment, to be Grade 4, and based on the criteria in **Table 11.11** the agricultural land sensitivity is Low. Most of the Proposed Development Site is provisionally classed as Grade 5, with some Grade 4 and some non-agricultural land.
- 11.9.25 Based on the presence of peaty soils on the Wind Farm development site, combined with restored soils and freely draining acid loamy soils over rock, the soil sensitivity is assessed based on the criteria in Error! Reference source not found. 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

- 11.9.26 The maximum area of soil to be disturbed and/or temporarily displaced because of the proposed Wind Farm and Grid Connection would be approximately 2.79 hectares (based

on: Wind Farm – 0.49ha, Grid Connection – 2.3 ha). 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.

- 11.9.27 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.
- 11.9.28 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.
- 11.9.29 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

- 11.9.30 The maximum area of soil to be disturbed and/or temporarily displaced because of the proposed Wind Farm and Grid Connection would be approximately 2.79ha. Soil stripping and stockpiling will be needed for the permanent development elements which cover an area of approximately 10.92 hectares, giving a total area of 13.71 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.
- 11.9.31 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.
- 11.9.32 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 Wind Farm development site for construction of the permanent features of the Proposed Development: turbine foundations, crane pads, access tracks, kiosks and substation

- 11.9.33 The maximum area of potential permanent/long-term loss of soil/agricultural land due to the proposed Wind Farm and Grid Connection is 10.92 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.
- 11.9.34 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.

- 11.9.35 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. Measures in the design include location of the turbines off the areas likely to have peaty soils. This brings the overall effect down to **Slight negative**.

Degradation of soil functions and agricultural land quality due to cross-contamination of topsoil with contaminated soil/material excavated/disturbed during construction work

- 11.9.36 The maximum area of soil to be temporarily displaced because of the Wind Farm and Grid Connection would be approximately 2.79 hectares, and the maximum area of permanent/long-term loss of soil/agricultural land is 10.92 hectares, giving a total of 13.71 hectares of soil potentially subject to excavation, handling and storage for reinstatement/reuse or offsite disposal. The embedded environmental measures to avoid cross-contamination of soils include completion of a pre-construction targeted Phase 2 geo-environmental ground investigation to investigate and characterise potentially contaminated areas and identify any further measures needed to ensure the suitability of the soils for use in the Proposed Development.
- 11.9.37 The working methods will include compliance with an MMP. Materials will be segregated where possible to prevent cross-contamination of soils occurring. Such materials will only be reused if they are confirmed as suitable for use in line with the requirements of the MMP. The Outline CEMP includes a procedure for encountering unexpected/suspected contamination, and any temporary onsite storage of excavated materials suspected/confirmed to be contaminated will be on impermeable sheeting, covered over and with adequate leachate/runoff drainage to prevent migration of contaminants from the stockpile.
- 11.9.38 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.
- 11.9.39 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**, which is not significant in EIA terms.

Degradation of peat, due to damage caused by handling and storage during construction works (with loss of peat functions including carbon storage and peatland habitat biodiversity functions)

- 11.9.40 Peat within the Wind Farm development site is not subject to any statutory nature conservation designation and is not identified on The Peatlands of Wales map, however as localised peat of 0.4m thickness was recorded on the Site this is considered to be a high sensitivity receptor. Based on the available peat survey information (see 2021 and 2023 Peat Survey reports included as annexes to the Phase 1 Geoenvironmental Desk Study in **Appendix 11A**) it is anticipated that the Proposed Development can avoid peat through design e.g. through micrositing. Avoidance of peat is an embedded measure in **Table 11.7** in accordance with the peat hierarchy. The Proposed Development will therefore not result in significant effects on peat. Handling of peaty soils during construction will be in accordance with the embedded measures in **Table 11.7**, which include that the 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 Outline CEMP.

Permanent displacement of peat, due to construction of permanent development (e.g. wind turbines, access tracks, substation)

- 11.9.41 Based on the available peat survey information (see 2021 and 2023 Peat Survey reports included as annexes to the Phase 1 Geoenvironmental Desk Study in **Appendix 11A**) it is anticipated that the Proposed Development can avoid peat through design e.g. through micro-siting. Avoidance of peat is an embedded measure in **Table 11.7**. Excavation and permanent loss of peat will therefore be avoided by the Proposed Development, and significant effects on peat due to the loss of peat as waste, will be avoided.

11.10 Assessment of land contamination effects

Assessment methodology: Land Contamination

- 11.10.1 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

- 11.10.2 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 contaminated land 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.
- 11.10.3 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 integrity of the pathway.
- 11.10.4 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.
- 11.10.5 The likelihood classifications for the contaminant linkages being realised is presented in **Table 11.14**.

Table 11.14 Likelihood classifications for contaminant linkages

Classification	Definition	Examples
High Likelihood	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	<p>a) Elevated concentrations of toxic contaminants are present in soils in the top 0.5m in a residential garden.</p> <p>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.</p>
Likely	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.	<p>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.</p> <p>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.</p>
Low Likelihood	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.	<p>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.</p> <p>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.</p>
Unlikely	There is contaminant linkage, but circumstances are such that it is improbable that an event would occur even in the very long-term.	<p>a) Elevated concentrations of toxic contaminants are present below hardstanding.</p> <p>b) Light industrial unit <10 years old containing a double skinned UST with annual integrity testing results available.</p>

11.10.6 The magnitude of the potential consequence of a contaminant linkage gives an indication of the sensitivity of a given receptor to a particular source or contaminant of concern under consideration. It is based on full exposure *via* the linkage being examined. The classification of consequence is presented in **Table 11.15**.

Table 11.15 Classification of consequence

Classification	Human Health	Controlled Water	Ecology	Property / Structures/ Crops and animals	Examples
Severe	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).
Medium	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.	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. 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
Mild	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.
Minor	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.

11.10.7 The risk matrix to link the likelihood and consequence is shown in **Table 11.16**.

Table 11.16 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

11.10.8 The overall risk definitions are summarised in **Table 11.17**.

Table 11.17 Risk Definitions

Risk	Definition
Very High	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.
High	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.
Moderate	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.
Low	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.
Very Low	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

- 11.10.9 To use risk assessment as the basis for the evaluation of the significance of effects in relation to land contamination, it is necessary to evaluate the change in risk from baseline conditions to those during the construction, operation and decommissioning of 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.
- 11.10.10 **Table 11.18** uses the risk classification pre- and post-development as the basis for a significance evaluation matrix for the purposes of EIA.

Table 11.18 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)

		Risk Post-development (including embedded environmental measures)				
		Very Low	Low	Moderate / Low	Moderate	High
		Risks that remain at moderate, high, or very high post-development are unlikely to be considered acceptable and further environmental measures will be required to enable the development to proceed.				

Preliminary assessment of Land Contamination Effects

Land contamination and subsequent impacts on land contamination receptors (humans - current and future site users, agricultural workers, maintenance workers/ operatives, public open space users), controlled waters (groundwater and surface water), buildings and services (existing water main on the Site) due to spills or leaks of fuels / oils or run-off from inappropriately managed wastes

- 11.10.11 Vehicles, plant and machinery using liquid fuels and oils are already used within the Site on occasion due to its use for farming, however, as a result of the Proposed Development, use of these items would increase on the Site. With the implementation of the embedded measures in **Table 11.7**, specifically measures in the Outline CEMP to ensure vehicle maintenance and refuelling of machinery will be undertaken within designated areas where spillages can be easily contained, machinery will be routinely checked to ensure it is in good working condition, and 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. Based on a pre-existing risk level for the agricultural land use (in the Phase 1 Geoenvironmental Desk Study, **Appendix 11A**) of low for human health and buildings and services receptors and very low for controlled waters, and no change to these risks during the development, the effect is **negligible** (not significant).

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

- 11.10.12 The embedded measures (**Table 11.7**) 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.
- 11.10.13 The current risk level to site users from the identified potential sources of contamination on the Site, ranges from very low (based on a mild consequence, the limited potential sources present, and a likelihood of a contaminant linkage being realised of 'unlikely') to moderate/low risk (based on a severe consequence, for ground gas, and a likelihood of unlikely – based on there being limited enclosed spaces currently on the Site). With regard to contaminants present in soils there is no change in the risk level for the future site users. With regard to ground gas, there will be new enclosed spaces present in the Proposed Development, including the substation which will be occupied occasionally, and this increases the risk to site users from gas accumulation in enclosed spaces. Without the embedded measures, the risk level increases to moderate (based on a severe consequence and a low likelihood). However, with the embedded measures, the risk level can be reduced to moderate/low, as the likelihood of a contaminant linkage is reduced to unlikely. On this basis, the maximum risk level to site users is moderate/low, which is an increase from low (with no enclosed spaces present currently, the consequence is medium, and likelihood unlikely, giving a low risk), and the effects of the Project on human

health receptors during the operation phase are considered to be **minor negative**, which is **Not Significant** in EIA terms.

11.11 Assessment of cumulative (inter-project) effects

- 11.11.1 A cumulative effects assessment (CEA) has been undertaken for the Proposed Development 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 2.8 of Chapter 2**.
- 11.11.2 Effects on soil and agricultural land are limited in extent within the Proposed Development Site. Peat is a high sensitivity receptor, however the embedded measures in **Table 11.7** include avoidance of peat. There are no other 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. It is, therefore, unlikely that there will be any effects which could act cumulatively with effects from other developments to produce significant cumulative effects on soil or agricultural land receptors at a local or national level.
- 11.11.3 For land contamination receptors, a ZoI of 250m 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.
- 11.11.4 There is a development proposal for secondary aggregates extraction at Tirpentwys, (aka Llanhilleth Quarry), which is a Regionally Important Geological Site (RIGS) and potential Site of Special Scientific Interest (SSSI) due to its geological features. In the surrounding area, there are also three sites proposed for wind turbines / other renewable energy developments and development of a former industrial site ('The British - TCBC Masterplan') where drainage improvements are proposed. The former industrial site development is outside the ZoI for land contamination and is, therefore, not considered further in this section.
- 11.11.5 The Tirpentwys RIGS designation is partly within the Wind Farm Development Area, where an access track runs north to south between the western and eastern mineral extraction areas of Tirpentwys. However, the geological features the RIGS designation relates to (rock exposures) are outside the Wind Farm Development Area.
- 11.11.6 Available planning information for the proposed secondary aggregates extraction at Tirpentwys indicates that aggregates extraction would initially be limited to the eastern area of the Tirpentwys quarry, although the full extent of the planning boundary includes the central access track and some of the former quarry to its west side. No use of the central access track through Tirpentwys is identified as being required in the documentation reviewed, and the 'eastern cut area' of the quarry would be accessed via an existing track at the east side of the quarry. The available drawings show the RIGS rock exposures in the east side of the quarry and note that these are to be safeguarded. Based on the drawings, neither the extraction area, the RIGS safeguarding area, nor the proposed backfill area, appear to extend onto the Wind Farm Development Area. It is noted that the proposed backfill area for secondary aggregates extraction meets the eastern slope up to the central access track, which is on raised ground, well above the quarry floor level and above the level of outcropping rock in the eastern quarry area, but it is not shown to extend onto the track itself.
- 11.11.7 In relation to potential cumulative effects on geology and geodiversity, no potential slope stability issues have been based on the use of the track during construction, or widening of the track, for the Proposed Development. Targeted ground investigation prior to the

Final ES is an embedded measure confirm the nature of the ground conditions at the track and assess whether any mitigation is needed. None of the rock exposures for which the RIGS is designated are located within the footprint of the central track, and the construction work to widen the access track is not expected to cause any change to the ground stability at the track due to there being sufficient width (>10m) at corners for the re-aligned track to comfortably avoid the edges. The Proposed Development is therefore, assessed to have a neutral effect on the RIGS and consequently there is no potential for cumulative effects on the RIGS due to the Proposed Development in combination with the proposed secondary aggregates extraction.

- 11.11.8 The secondary aggregates extraction proposal may require the construction of new access roads / tracks or improvement of existing tracks within and outside the Wind Farm Development Area. Based on the available drawings, access routes are generally proposed to run along pre-existing tracks, which will limit the area of land take needed for quarry access. However, there is the potential for track improvements, such as track widening, or use of alternative routes, to result in temporary disturbance to, or permanent loss of, soils and agricultural land during the construction phase. Given that the likely use of existing tracks within the Wind Farm Development Area and outside it will limit the land take needed for access, it is not expected that the in-combination effects of the Proposed Development and the proposed secondary aggregates extraction would be significant in terms of the loss or damage to natural soil resources or agricultural land at the local or national level. Considering the other planned developments for renewable energy, these are likely to result in similar effects on soil and agricultural resources to those arising from the Proposed Development. There will be some cumulative impact locally and nationally caused by localised permanent development of previously undeveloped land (generally farmland for wind turbines, grid connection infrastructure etc, though the other development sites are also in areas affected by historical coal mining). However, with mitigation measures in place this is unlikely to result in a significant cumulative effect at a local or national scale, and in most instances the pre-existing agricultural land use can continue within or around the development footprint (including sheep grazing around solar panel arrays).
- 11.11.9 For land contamination receptors, a zone of influence (Zol) of 250m from the edge of the Proposed Development site is 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. In regard to the proposed secondary aggregates extraction, this proposed development is within the Zol, however, the potential for cumulative ground conditions effects relating to land contamination will be limited during the operational phase through the regulatory controls on extractive industries and waste management that would apply to the secondary aggregates extraction operations, such as The Environmental Permitting (England and Wales) Regulations 2016. The localised nature of the ground disturbance required for the construction of the Proposed Development and the embedded measures in Table 11.7, which address potential land contamination effects during construction of the Proposed Development associated with legacy contamination and pollution prevention during construction work, will limit the effects on land contamination receptors during the construction phase. Similar mitigation measures are likely to be needed for the construction phase of the secondary aggregates extraction development and, therefore, there should not be potential for significant in-combination effects to arise. It is therefore concluded that there are no potentially significant in-combination effects relating to ground conditions.

11.12 Significance conclusions

- 11.12.1 A summary of the results of the Ground Conditions assessment is provided in **Table 11.19** and **Table 11.20**.

Table 11.19 Preliminary summary of significance of effects: soils

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor ¹	Magnitude of change ²	Significance ³	Summary rationale
<u>Geology</u> Physical changes to rock exposures at RIGS (potential SSSI), or changes to quarry spoil heaps affecting access to the rock exposures, because of access track upgrade works at the central track through the former quarry during the construction	High	No change	Neutral (Not significant)	The assessment is based upon the construction work avoiding the designated features and slope stability assessment indicating that the use of the track during construction and operation, and the required track upgrade works, can be completed without effects on the stability of the track or on the rock exposures present west and east of the track. Embedded measures include targeted ground investigation to confirm the ground conditions at the track, for Final ES submission.
<u>Agricultural land</u> Compaction of soil by vehicles or during stockpiling during construction leading to damage to soil structure resulting in damage to/loss of soil functions	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.
<u>Soil</u> Compaction of soil by vehicles or during stockpiling during construction leading to damage to soil structure resulting in damage to/loss of soil functions	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.

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor ¹	Magnitude of change ²	Significance ³	Summary rationale
<u>Agricultural land</u> Erosion of soil during construction, leading to loss of organic matter in runoff	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.
<u>Soil</u> Erosion of soil during construction, leading to loss of organic matter in runoff	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.
<u>Agricultural land</u> Permanent loss of agricultural land, soil, and associated soil functions when soil is removed from the Wind Farm development site for construction of the permanent features of the Proposed Development: turbine foundations, crane pads, access tracks, kiosks and substation.	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.

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor ¹	Magnitude of change ²	Significance ³	Summary rationale
<p>Soil Permanent loss of agricultural land, soil, and associated soil functions when soil is removed from the Wind Farm development site for construction of the permanent features of the Proposed Development: turbine foundations, crane pads, access tracks, kiosks and substation.</p>	Low to Medium	Moderate	<p>Slight negative</p> <p>(Not significant)</p> <p>or</p> <p>Moderate negative</p> <p>(Potentially significant)</p>	<p>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.</p> <p>Measures in the detailed design, based on information from the peat survey (appended within Appendix 11A), supplemented by the pre-construction ground investigation, such as avoidance of areas with known peat or 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.</p>
<p>Agricultural land Degradation of agricultural land quality due to cross-contamination of topsoil with contaminated soil/material excavated/disturbed during construction work</p>	Low	Minor	<p>Neutral or Slight negative effect</p> <p>(Not significant)</p>	<p>The assessment is based upon the area of soil to be temporarily or permanently displaced, and the embedded environmental measures including completion of a pre-construction targeted Phase 2 geo-environmental ground investigation to investigate and characterise potentially contaminated areas and identify any further measures needed to ensure the suitability of the soils for use in the Proposed Development. The embedded environmental measures include the use of a MMP to ensure materials will only be reused if they are confirmed as suitable for use in line with the requirements of the MMP, and the Outline CEMP including a procedure for encountering unexpected/suspected contamination, and any temporary onsite storage of excavated materials suspected/confirmed to be contaminated will be on impermeable sheeting, covered over and with adequate leachate/runoff drainage to prevent migration of contaminants from the stockpile.</p>
<p>Soil Degradation of soil functions due to cross-contamination of topsoil with</p>	Low to Medium	Minor	<p>Neutral or Slight negative</p>	<p>The assessment is based upon the area of soil to be temporarily or permanently displaced, and the embedded environmental measures including completion of a pre-construction targeted</p>

Receptor and summary of predicted effects	Sensitivity/importance/value of receptor ¹	Magnitude of change ²	Significance ³	Summary rationale
contaminated soil/material excavated/disturbed during construction work			or Slight negative (Not significant)	Phase 2 geo-environmental ground investigation to investigate and characterise potentially contaminated areas and identify any further measures needed to ensure the suitability of the soils for use in the Proposed Development. The embedded environmental measures include the use of a MMP to ensure materials will only be reused if they are confirmed as suitable for use in line with the requirements of the MMP, and the Outline CEMP including a procedure for encountering unexpected/suspected contamination, and any temporary onsite storage of excavated materials suspected/confirmed to be contaminated will be on impermeable sheeting, covered over and with adequate leachate/runoff drainage to prevent migration of contaminants from the stockpile.
<u>Soil: Peat</u> Degradation of peat, due to damage caused by handling and storage during construction works (with loss of peat functions including carbon storage and peatland habitat biodiversity functions)	High	None	No effect	As peat is localised within the Proposed Development Site, the embedded measures include the avoidance of peat through design in accordance with the peat hierarchy.
<u>Soil: Peat</u> Permanent displacement peat, due to due to construction of permanent development (e.g. wind turbines, access tracks, substation)	High	None	No effect	As peat is localised within the Proposed Development Site, the embedded measures include the avoidance of peat through design in accordance with the peat hierarchy. This will be achieved through design informed by further peat survey.

1. The sensitivity/importance/value 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).
2. 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 (very low, low, medium, high, and very high).
3. The significance of the environmental effects is based on the combination of the sensitivity/importance/value of a receptor and the magnitude of change and is expressed as major (significant), moderate (potentially significant) or minor/negligible (not significant), subject to the evaluation methodology outlined in **Section 11.8**.

Table 11.20 Preliminary summary of significance of effects: land contamination

Potential effect	Baseline Assessment			Assessment with Proposed Development			Change in Risk (Significance)
	Likelihood	Consequence	Risk	Likelihood	Consequence	Risk	
Operational phase:							
<u>Human health and controlled waters</u> Land contamination and subsequent impacts on land contamination receptors (humans - current and future site users, agricultural workers, maintenance workers/ operatives, public open space users), controlled waters (groundwater and surface water), buildings and services (existing water main on the Site) due to spills or leaks of fuels / oils or run-off from inappropriately managed wastes	Medium	Unlikely	Low	Medium	Unlikely	Low	Negligible (Not significant) Embedded measures (Error! Reference source not found.) contained in the Outline CEMP include vehicle maintenance and refuelling of machinery being undertaken within designated areas where spillages can be easily contained, and machinery will be routinely checked to ensure it is in good working condition. 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.
<u>Human health</u> Exposure to land contamination via	Severe	Unlikely	Moderate/low	Severe	Unlikely	Moderate/low	Negligible (Not significant)

Potential effect	Baseline Assessment			Assessment with Proposed Development			Change in Risk (Significance)
	Likelihood	Consequence	Risk	Likelihood	Consequence	Risk	
<p>numerous pathways (e.g., inhalation, direct contact, ingestion) resulting in health effects for site users</p>							<p>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 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. Consideration of the risks to the built environment from ground gas (in particular, enclosed spaces where ground gas can accumulate) is an</p>

Potential effect	Baseline Assessment			Assessment with Proposed Development			Change in Risk (Significance)
	Likelihood	Consequence	Risk	Likelihood	Consequence	Risk	
							embedded measure through compliance with LCRM.

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 11.8**