



**Nant Mithil
Energy Park Limited**

Environmental Statement

Chapter 1: Introduction



Chapter 1

Introduction

Background

1.1 This Environmental Statement (ES) has been prepared by LUC on behalf of Nant Mithil Energy Park Ltd (hereafter referred to as the Applicant) to accompany a DNS application for consent to construct and operate a wind farm known as Nant Mithil Energy Park (hereafter referred to as the Proposed Development). The Site, the area delineated by the red line boundary, is located approximately nine kilometres (km) east of Llandrindod Wells, within the local planning authority area of Powys County Council (PCC) and within a wider upland area called Radnor Forest as shown on **Figures 1.1** and **1.2**.

1.2 The Proposed Development comprises the construction and operation of up to 30 wind turbines and associated infrastructure. At project scoping, solar and battery were included as part of the Proposed Development along with a new bridge over the River Wye and two blade transfer areas required for the transportation of Abnormal Indivisible Loads (AIL) to the Site. These elements have been removed from the proposals during the post-scoping design review stages for technical, environmental and commercial reasons.

1.3 The indicative output capacity at this stage is 198 megawatts (MW) and the operational lifespan is 40 years. In accordance with the Town and Country Planning Act 1990 (as amended) and the Developments of National Significance (Specified Criteria and Prescribed Secondary Consents) (Wales) Regulations 2016 (as amended), the Proposed Development is a 'Development of National Significance' (DNS) as the Proposed Development is an onshore wind farm with an installed generating capacity greater than 10 MW. As a DNS, consent will be required from the Welsh Ministers (via Planning and Environment Decisions Wales (PEDW)).

1.4 The application being submitted to PEDW, for determination by the Welsh Ministers, is accompanied by this ES which presents the findings of the Environmental Impact Assessment (EIA) undertaken in accordance with the Town and Country Planning (Environmental Impact

Assessment) (Wales) Regulations 2017 (as amended) (hereafter referred to as the EIA Regulations). The ES presents information on the identification and assessment of the likely significant environmental effects of the Proposed Development. Further details of the statutory requirements for EIA are set out in **Chapter 2: Approach to the EIA**.

1.5 This chapter is supported by the following figure provided in **Volume 2**:

- **Figure 1.1: Site Context**
- **Figure 1.2: Site Location**

1.6 This chapter is supported by the following appendices provided in **Volume 3**:

- **Appendix 1.1: Statement of Expertise**
- **Appendix 1.2: Glossary and Abbreviations**

The Proposed Development

1.7 The Proposed Development is described in detail in **Chapter 4: Project Description** of the ES. In summary, it will comprise:

- Up to 30 wind turbines each with a three-blade rotor;
- Two options for a new access junction off the highway;
- Crane hardstandings and adjacent laydown areas for each wind turbine location;
- Approximately 23.61 km of access tracks (of which approximately 21.81 km will be new track and 1.8 km will be upgraded existing track) including turning heads, passing places and associated ancillary engineering works;
- An electrical substation compound, consisting of a switching station, gantry, transformer area and control building;
- Onsite underground electrical cables connecting the wind turbines back to the energy park substation, laid in cable trenches alongside access tracks or near existing tracks on Site;
- Watercourse crossings and associated infrastructure;
- Site signage, vehicle parking and security fencing; and
- Biodiversity enhancement proposals.

1.8 In addition to the above components of the operational Proposed Development, construction of the Proposed Development will also require the following temporary components:

- Two temporary construction and storage compounds.
- The creation of up to three temporary borrow pits for the extraction of stone (subject to detailed site investigation). The northernmost temporary borrow pit will be used as a secondary temporary construction compound following extraction.
- The temporary diversion or temporary closure of Public Rights of Way (PRoW) that cross through the Site.
- A temporary security cabin at the site entrance.

1.9 The operational life of the Proposed Development is 40 years. Up to 23 months are required for construction (an indicative construction programme can be found in **Chapter 4**). It is anticipated that construction of the Proposed Development will take place in 2026-2029. Following the 40-year operational period, the Proposed Development will be decommissioned, or an application may be made to extend the operational life of the Proposed Development. Decommissioning will last approximately 12 months. This will involve the removal of the wind turbines, electrical equipment, control buildings and compounds.

The Applicant

1.10 Nant Mithil Energy Park is being developed by Nant Mithil Energy Park Limited, a subsidiary of Bute Energy Ltd ('Bute Energy'). Bute Energy is a developer of onshore wind and solar energy parks, using the latest technology to deliver low-cost renewable energy.

Rationale for the Nant Mithil Energy Park Project

1.11 The Site has been chosen due to its technical suitability for a wind farm development, with suitable high wind speeds, terrain and availability of access. The Site is partially located within a Pre-Assessed Area for wind energy (number 4), as outlined in Future Wales: The National Plan 2040 (2021)¹ which states that there is a presumption in favour of large-scale wind energy

¹ Welsh Government (2021) Future Wales: The National Plan 2040

developments in these areas, subject to the criteria listed in policy 18. See **Chapter 3: Site Selection and Design Strategy** for further information on the need for renewable energy and the iterative approach that has been taken to designing the Proposed Development within the EIA process.

Legislative Requirements for EIA

1.12 The Proposed Development falls under Schedule 2 of the EIA Regulations as an *“installation for the harnessing of wind power for energy production (wind farms)”*. Under the EIA Regulations, Schedule 2 developments are considered likely to have significant effects on the environment by virtue of factors such as its nature, size or location. In accordance with the EIA Regulations, the Proposed Development is therefore classified as an EIA development and an ES is required to be submitted alongside the application for consent to PEDW, for determination by the Welsh Ministers.

1.13 The EIA for the Proposed Development has been carried out in accordance with the relevant statutory framework as well as guidance and advice on good practice. These are set out in **Chapter 2**.

Planning Legislation and Policy Context

1.14 Since declaring a climate emergency in 2019, and responding to advice from the Climate Change Committee, Wales has legislated to reduce greenhouse gas (GHG) emissions to net zero by 2050. Furthermore, the UK Government has set a target for decarbonisation of electricity generation by 2035 and the Welsh Government (WG) is committed to examining potential pathways to net zero by 2035.

1.15 In September 2024, the Welsh Government announced a commitment to driving forward progress across four key areas. One of these is: *‘Green jobs and growth – creating green jobs that tackle the climate crisis and restore nature, while making families better off; accelerating planning decisions to grow the Welsh economy’*.

1.16 The National Development Framework (NDF) for Wales identifies that renewable energy is an abundant resource and Welsh Government is committed to harnessing its potential as ‘...a

key part of our commitment to decarbonisation and tackling the climate emergency'. The onshore wind sector has a vital role to play in the decarbonisation of power generation and the need requirement for onshore wind is in no doubt.

1.17 Primary legislation relevant to the delivery of the Proposed Development includes:

- **The Well-being of Future Generations (Wales) Act 2015** – Primary legislation that obligates all public bodies to put long-term sustainability at the forefront of its decision making and actions.
- **The Environment (Wales) Act 2016** – Obligates WG to reduce greenhouse gas emissions in Wales to 80% against 1990 levels by 2050. The Senedd has since agreed that Wales would become carbon neutral by 2050.
- **The Planning (Wales) Act 2015** – Made amendments to the Town and Country Planning Act 1990 to introduce Developments of National Significance (DNS). It established a faster and more streamlined route for obtaining planning permission for DNS to be determined, with applications being made directly to the Welsh Ministers. The **Wales Act 2017** further enabled Ministers to determine onshore energy generating projects up to 350MW. Secondary legislation is in place to prescribe the procedure for handling DNSs.

1.18 Key planning policies relevant to the Proposed Development include:

- **Future Wales: The National Plan 2040 (Feb 2021)** – Is the NDF for Wales and makes it expressly clear that it is the primary policy consideration for the assessment of Developments of National Significance. **Policy 17** strongly supports the development of renewable energy from all technologies at all scales to meet future energy needs and combat the climate emergency. **Policy 18** identifies a presumption in favour of large scale wind energy projects, subject assessment against to a number of criteria.
- **Planning Policy Wales (PPW) 12th Edition (Feb 2024)** – PPW sets out the land use planning policies of WG. To achieve set renewable energy targets, PPW requires the planning system to secure an appropriate mix of energy provision, which maximises benefits to our economy and communities whilst minimising potential environmental and social impacts.

- **Mid Wales Strategic Development Plan (SDP)** – At the time of writing, Mid-Wales does not have an adopted SDP and preparations are in their infancy. The SDP will provide a co-ordinated approach to energy across the region.
- **Powys Local Development Plan (April 2018)** – The LDP provides a supportive context to the development of large-scale renewable energy and recognises that proposals over 10MW will be determined by WG. Policy RE1 states that proposals for renewable energy development within or close to Strategic Search Areas (superseded by Pre-assessed Areas in the NDP) will be permitted subject to a number of criteria. The adopted LDP covers a plan period up to 2026. The Council is preparing its replacement LDP and consulted upon its preferred strategy in August-October 2024. It is due to consult upon its Deposit Plan in October 2025, ahead of submission for examination in 2026. Emerging Strategic Policy (SP) SP25 encourages renewable developments of all scales subject to a number of criteria.

1.19 Technical advice and guidance relevant to the Proposed Development include:

- Technical Advice Notes (TAN), circulars and policy clarification letters published by Welsh Government, which supplement PPW;
- Mid Wales Energy Strategy (Summer 2020) developed by the Growing Mid Wales Partnerships; and
- Powys LDP Supplementary Planning Guidance.

1.20 The planning policy context above is not exhaustive and where applicable, the following chapters will refer to specific policies, guidance and other material considerations relevant to the environmental topic being assessed. Full consideration of the planning policy context against which the proposed DNS application is to be determined is provided within the accompanying Planning Statement.

The Environmental Statement

Responsibilities

1.21 This ES has been compiled by LUC for the Applicant. Whilst LUC has overall responsibility for the ES, sub-consultants prepared specialist assessment chapters and provided input. The members of the project team and their respective roles are presented in **Table 1.1**.

Table 1.1: Responsibilities of the ES

Chapter Number	Topic	Team
1	Introduction	LUC
2	Approach to the EIA	LUC
3	Site Selection and Design Strategy	LUC
4	Project Description	LUC (with input from Bute Energy and Pell Frischmann)
5	Landscape and Visual Impact Assessment	LUC
6	Historic Environment	LUC
7	Ecology (non-avian)	ITP Energised
8	Ornithology	ITP Energised
9	Noise and Vibration	Hoare Lea
10	Access, Traffic and Transport	Pell Frischmann
11	Hydrology, Hydrogeology, and Geology (including Peat)	Aqua Terra Consultants Ltd & OWC Ltd
12	Aviation	WPAC

Chapter Number	Topic	Team
13	Shadow Flicker	LUC
14	Climate Change including Carbon Balance Assessment	LUC
15	Summary of Interrelated Cumulative Effects and Likely Significant Effects	LUC

1.22 Chapters 1-4 of the ES are introductory chapters and comprise the following:

- **Chapter 1: Introduction** (this chapter) which provides a brief introduction to the Proposed Development and the legislative requirements and an outline of the structure of the ES.
- **Chapter 2: Approach to the EIA** which provides more detail on the EIA process including Scoping and consultation.
- **Chapter 3: Site Selection and Design Strategy** which summarises the reason for site selection and provides details of the approach to the design strategy and layout modifications.
- **Chapter 4: Project Description** which provides a detailed description of the Proposed Development and explains the context of the Site.

1.23 Chapters 5-14 of the ES describe the likely significant environmental effects of the Proposed Development in relation to the topic areas included in **Table 1.1** above. **Chapter 15: Summary of Interrelated Cumulative Effects and Likely Significant Effects** provides a consolidated summary of all likely significant effects of the Proposed Development identified through the EIA process.

Structure

1.24 This ES presents the findings of the assessment of the likely environmental effects of the Proposed Development during construction and operation. The assessment forms part of the

wider process of EIA, which is undertaken to ensure that the likely significant effects, both positive and negative, of certain types of development are considered in full by the decision maker prior to the determination of an application for development consent or planning permission.

1.25 The ES has been prepared in accordance with the EIA Regulations 2017. The general methodology for the EIA is detailed in **Chapter 2**.

1.26 The ES is comprised of five volumes, in addition to a Non-Technical Summary. The structure of the ES is set out below:

- **Non-Technical Summary**
- **Volume 1: Main Text**
- **Volume 2: Figures**
- **Volume 3: Technical Appendices**
- **Volume 4: Visualisations**
- **Volume 5: Confidential Appendices** (only available to relevant statutory consultees)

Statement of Expertise

1.27 Regulation 17(4)(a) of the EIA Regulations requires the ES to be prepared by “*persons who in the opinion of the relevant planning authority or the Welsh Ministers, as appropriate, have sufficient expertise to ensure the completeness and quality of the statement*”.

1.28 The EIA process was overseen by a Director at LUC, with a BSc in Environmental Earth Science, an MSc in Environmental Assessment and Management and a Chartered Town Planner of the Royal Town Planning Institute (RTPI). The EIA expert has over 20 years’ professional experience, including in the management and co-ordination of EIAs for onshore wind farms in the UK, including Wales. LUC is also a Registrant of IEMA’s EIA Quality Mark Scheme. This scheme allows organisations that lead the co-ordination of statutory EIAs in the UK to make a commitment to excellence in EIA activities, and to have this commitment independently reviewed on a regular basis.

1.29 Appendix 1.1 provides details of the professional experience and qualifications for each of the lead topic authors.

Key Definitions

1.30 To ensure clarity in the ES, the following terms are used (see also **Appendix 1.2**):

- The Site: Shown as the area delineated by the 'red line' application boundary on figures within the ES.
- The Proposed Development: Shown as the components within the red line application boundary for which consent is being sought. Details of the components of the Proposed Development are provided in **Chapter 4** and shown in **Figure 4.1a-h** alongside an infrastructure layout plan for the Proposed Development.
- The Study Area: The area(s) included in desk or field studies for individual topic area assessments. The Study Area varies depending on the geographical extent of receptors considered and the nature of potential effects within each discipline, as informed by professional guidance and EIA best practice. The study areas are therefore explained within the approach and methods section of the relevant technical chapters (5-14) of this ES.
- The Applicant: Refers to Nant Mithil Energy Park Ltd.

Availability

1.31 An electronic version of the ES and supporting documents are available online from PEDW's Planning casework portal <https://planningcasework.service.gov.wales/> or the Applicant's website: www.nantmithilenergypark.wales. Hard copies of the ES can also be available to purchase at a cost of £3,000 (ES only without figures) and £7,000(whole application), reflecting printing and distribution costs. To request copies in any format, please email nant.mithil@bute.energy or write to the Nant Mithil Project Team, Bute Energy, Hodge House, Guildhall Place, Cardiff, CF10 1EB.



**Nant Mithil
Energy Park Limited**

Environmental Statement

Chapter 2: Approach to the EIA



Chapter 2

Approach to the EIA

Introduction

2.1 Environmental Impact Assessment (EIA) is the process of systematically evaluating and presenting all the likely significant environmental effects, both beneficial and adverse, of a Proposed Development, to assist the determining authority in making an informed decision on an application for consent to undertake a development. It enables the significance of effects to be clearly understood, incorporating consideration of mitigation (for adverse effects) and enhancement (for beneficial effects) measures. The results of the EIA process are presented within this Environmental Statement (ES) to accompany the planning application for the Proposed Development.

2.2 This chapter sets out the general approach undertaken for the assessments as part of the EIA. It sets out the broad methodology that has been used in the EIA and provides an overview of the key stages that have been followed, in line with the statutory EIA requirements and good practice guidance.

2.3 This chapter is supported by the following figures in **Volume 2** and appendices provided in **Volume 3**:

- **Figure 2.1: Existing Communities, Infrastructure and Utilities**
- **Figure 2.2: Cumulative Developments: wind farms**
- **Figure 2.3: Cumulative Developments: non-wind developments**
- **Appendix 2.1: Scoping Report**
- **Appendix 2.2: Scoping Direction**

- **Appendix 2.3: Scoping Response Table¹**
- **Appendix 2.4: Telecommunications Impact Assessment**
- **Appendix 2.5: Forestry Assessment**
- **Appendix 2.6: Cumulative Developments**

The EIA Process

2.4 As the Proposed Development will exceed the threshold for wind developments set out in Schedule 2 of the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 (as amended) (the EIA Regulations), and as it is a scheme that could potentially result in 'significant' environmental effects according to the EIA Regulations, the scheme is classified as an EIA development and an ES is required.

2.5 A significant environmental effect does not necessarily equate to the refusal of an application for planning permission. It will be one factor which will need to be balanced against a broad range of factors in the planning decision. This chapter sets out the broad methodology that has been used in the EIA for the Proposed Development. It provides an overview of the key stages that have been followed, in line with the statutory EIA requirements and good practice guidance.

2.6 As the Proposed Development will have a generating capacity greater than 10 megawatts (MW) it will be a 'Development of National Significance' (DNS), and an application for planning permission will be submitted to Planning and Environment Decision Wales (PEDW), for determination by the Welsh Ministers.

2.7 The ES has been prepared in accordance with the relevant statutory framework as well as advice and good practice, including:

- The EIA Regulations (2017)²

¹ Note this appendix contains those responses which covered general EIA issues. Topic specific responses for Scoping, non-statutory and statutory consultation stage are included in each topic chapter.

² Welsh Government (2017) The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017

- Developments of National Significance Guidance: Environmental Impact Assessment (2019)³
- Welsh Office Circular 11/99: Environmental Impact Assessment (1999)⁴
- The Planning Series: 10 – Environmental Impact Assessment (2017)⁵
- Institute of Environmental Management and Assessment (IEMA) (2004) Guidelines for Environmental Impact Assessment
- Institute of Environmental Management and Assessment (IEMA) (2017) Delivering Proportionate EIA⁶
- Planning Inspectorate: Nationally Significant Infrastructure Projects: Advice on Cumulative Effects Assessment (2024)⁷

2.8 This ES presents the written output of the EIA process. The information contained in this ES fulfils the requirements of the EIA Regulations and once submitted will enable the decision-making authority, in this case the Welsh Ministers, to make a decision on the application for planning permission.

2.9 Regulation 17(3) of the EIA Regulations states that the following information is required in the ES:

- A description of the Proposed Development comprising information on the site, design, size and other relevant features of the Proposed Development;
- A description of the likely significant effects of the Proposed Development on the environment;
- A description of any features of the Proposed Development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;

³ Welsh Government (2019) Developments of National Significance – Appendix 3: Environmental Impact Assessment

⁴ Welsh Office (1999) Circular 11/99: Environmental Impact Assessment

⁵ National Assembly for Wales (2017) The Planning Series: 10 – Environmental Impact Assessment

⁶ IEMA (2017) Delivering Proportionate EIA

⁷ Planning Inspectorate (2024) Nationally Significant Infrastructure Projects: Advice on Cumulative Effects Assessment.

- A description of the reasonable alternatives studied by the Applicant, which are relevant to the Proposed Development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the significant effects of the Proposed Development on the environment;
- A non-technical summary of the information referred to in sub-paragraphs (a) to (d); and,
- Any additional information specified in Schedule 4 relevant to the specific characteristics of the Proposed Development or type of development and to the environmental features likely to be significantly affected.

2.10 Regulation 17(4) of the EIA Regulations states that the ES must:

- Be prepared by persons who in the opinion of the relevant planning authority or the Welsh Ministers, as appropriate, have sufficient expertise to ensure the completeness and quality of the statement;
- Contain a statement by or on behalf of the Applicant describing the expertise of the person who prepared the ES;
- Where a Scoping opinion or direction has been issued in accordance with Regulation 14 or 15, be based on the most recent Scoping opinion or direction issued (so far as the Proposed Development remains materially the same as the Proposed Development which was the subject of that opinion or direction);
- Include the information reasonably required for reaching a reasoned conclusion on the significant effects of the Proposed Development on the environment, taking into account current knowledge and methods of assessment; and,
- Take into account other relevant environmental assessments required under Union legislation or any other provision of domestic legislation, with a view to avoiding duplication of assessment.

Good Practice Guidance

2.11 Welsh Government DNS Guidance outlines the stages of a DNS application in relation to EIA developments. The key steps to be followed in the EIA process are identified in IEMA guidance⁸:

Scoping

- Undertake a Scoping exercise to establish the likely significant effects.

Baseline Studies

- Examine, through baseline studies, the environmental character of the area likely to be affected by the Proposed Development.
- Identify relevant natural and man-made processes which may already be changing the character of the Site.

Predicting and Assessing Effects

- Consider the possible interactions between the Proposed Development and both existing and future Site conditions.
- Predict and assess the possible effects, both negative and positive, of the Proposed Development on the environment.

Mitigation

- Introduce design and operational modifications or other measures to avoid, reduce or offset adverse effects and enhance positive effects.

Integration

- EIA should be an iterative process, which aims to ensure early consideration of environmental issues at all stages of Proposed Development, and is founded on appropriate engagement with planning authorities and the Consultation Bodies. In addition to meeting the requirements of the EIA Regulations, the EIA process should add value to

⁸ IEMA (2004) Guidelines for Environmental Impact Assessment

the design process, improving environmental outcomes and creating a framework for community engagement.

Proportionality

- An ES should be fit for purpose and must be accessible to the consenting authority, consultees and the public. As such, it should focus on significant environmental effects to avoid being overly long in nature.

Efficiency

- Early identification of assessment and information requirements can ensure a coordinated EIA process and can minimise delays.

2.12 This ES provides a clear and concise assessment of the Proposed Development and its likely significant environmental effects, including primary, secondary, direct, indirect and cumulative effects, on the natural, built and human environments. The ES provides the Welsh Ministers, in consultation with statutory consultees and the wider community, with sufficient information to make an objective judgement as to the acceptability of the Proposed Development, within the context of national, regional and local planning and environmental policy.

EIA Methodology

2.13 Good practice in EIA is defined in several sources as set out above. The methods followed in this ES have drawn on these sources to generate a robust assessment. The ES preparation process adopted for the Proposed Development can be summarised as follows, and is described further below:

- Scoping and consultation with statutory consultees, non-statutory consultees and the local community to identify the key issues on which the EIA should focus;
- Establishing baseline environmental conditions through desktop research and site surveys;
- Determining how effects could be avoided or reduced through design evolution;
- Identifying the potential effects of the Proposed Development and any proposed mitigation;

- Assessing the significance of residual environmental effects on the identified receptors against recognised or defined criteria following mitigation;
- Describing how likely significant effects will be monitored (i.e. through conditions attached to a consent); and,
- Reporting the process, results and conclusions.

Scoping and Consultation

2.14 Consultation has formed an integral part of the ES preparation process, and the EIA team and the Applicant have contacted several interested parties over the course of the project to determine their views on the Proposed Development and to collect baseline information.

2.15 The purpose of the EIA Scoping process is to ensure that the EIA focusses on the identification of likely significant environmental effects; identifies those effects which are unlikely to need detailed study; and provide a means to reach agreement with statutory and non-statutory consultees on the most appropriate methods of impact assessment.

2.16 The Applicant submitted a request to PEDW for a Scoping Direction from Welsh Ministers on 6th September 2022 under Regulation 7 of the EIA Regulations. This request was accompanied by a Scoping Report prepared by LUC, which set out a summary of the Proposed Development; identified the issues proposed to be included in the ES; and proposed an approach to the assessment of effects for each proposed topic area. The Scoping Report (**Appendix 2.1**) was then issued by PEDW to a list of statutory and non-statutory consultees, which included the Welsh Government, Powys County Council (PCC), Natural Resources Wales, Cadw, Hafren Dyfrydwy, Mid and West Wales Fire and Rescue Service, and NATS. A Scoping Direction (**Appendix 2.2**) was received from Welsh Ministers on 13th January 2023.

2.17 The Scoping Direction included comments received from several consultees. A summary of the issues raised in response to the Scoping Report is provided in either **Appendix 2.3** or in **Chapters 5-14** where relevant to specific topics. **Appendix 2.3** also includes a brief response to each of the issues raised and indicates where these have been taken into consideration in the ES.

2.18 The aim of EIA should be to *“focus on [the] Proposed Development’s likely significant environmental effects, rather than any potential impacts”*.

2.19 In line with the above, where effects have been identified (whether at Scoping or during detailed assessment) as being not significant to warrant further assessment, these have been ‘scoped out’ and given only brief treatment in the relevant topic chapters. Effects scoped out of the EIA within topics that are scoped in are detailed in **Chapters 5-14**. Whole topics scoped out are detailed below.

Socio-Economics, Tourism and Land Use

2.20 It has been relatively common practice in the past for potential socio-economic effects of wind farm developments to be considered within the EIA process and reported on in the ES. This includes direct and indirect economic effects, provision of employment and associated income, use of hospitality services by workers during construction, changes to recreational activity and the potential for community or shared ownership. However, the outcome of these assessments is routinely that any such effects identified fall below the threshold of significance set out in the EIA Regulations. As proposed in the Scoping Report, socio-economic effects are therefore scoped out of the EIA. The DNS application is also supported by a standalone **Economic Benefits Statement** which does not form part of the ES.

2.21 Similarly, various studies and surveys have been undertaken on the relevance of wind farm impacts on tourism. The outcome of research and EIA assessments again routinely finds little evidence that wind farms have had or are having a negative effect on tourism across Wales and the UK as a whole. The latest research into this was undertaken by BiGGAR Economics in 2021, which analysed trends in tourism employment in the localities of 44 wind farms developed in Scotland in recent years, providing a substantial evidence base. The study found no relationship between tourism employment and wind farm development, at the level of the Scottish economy, across local authority areas nor in the locality of wind farm sites⁹. An earlier

⁹ BiGGAR Economics (2021) Wind Farms & Tourism Trends in Scotland: Evidence from 44 Wind Farms

study in 2014 by Regeneris Consulting Ltd on behalf of the Welsh Government had drawn similar conclusions¹⁰.

2.22 PEDW agreed with the scoping out of Socio-Economics and Tourism as reported in the Scoping Direction (**Appendix 2.2**).

2.23 In relation to potential effects on commoners and recreational users of the Site, effects on users of Public Rights of Way (PRoW) are considered in **Chapter 10: Access, Traffic and Transport**. Visual effects on users of open access land, walking and cycling routes are considered in **Chapter 5: Landscape and Visual Impact Assessment**. These are based on the details included in **Chapter 4: Project Description**. Interrelated effects on recreational users are considered in **Chapter 15: Summary of Interrelated Cumulative Effects and Likely Significant Effects**.

Major Accidents and Disasters

2.24 In accordance with the latest IEMA guidance¹¹, it has been important to adopt a proportionate approach for this assessment, given that many events which could be classified as ‘major accidents and disasters’, and which could cause significant effects on the environment, are not relevant to the Proposed Development or its location. The Proposed Development is not located in an area with a history of natural disasters such as extreme weather events, and its construction and operation will be managed within the requirements of several health and safety related control mechanisms, including the Construction (Design and Management) Regulations 2015 and the Health and Safety at Work etc. Act 1974. Relevant safety considerations incorporated into the final design of the Proposed Development are set out in **Chapter 4**.

2.25 At the time of scoping, solar and battery were also included as part of the Proposed Development. In the Scoping Direction (**Appendix 2.2**), PEDW responded ‘*As it is currently unknown whether there will be a solar element or battery storage included in the scheme, PEDW believes that it would be prudent to scope in a section on major accidents and disasters*

¹⁰ Regeneris Consulting Limited (2014) Study into the Potential Economic Impact of Wind Farms and associated Grid Infrastructure on the Welsh Tourism Sector

¹¹ IEMA (2020) Major Accidents and Disasters in EIA: A Primer

into the ES'. It also stated that *'should a solar array be included as part of this scheme, a Glint and Glare assessment is likely to be required'*. As solar and BESS no longer comprise part of the Proposed Development there are no parameters to assess relating to these technologies. Therefore glint and glare and major accidents and disasters relating to solar and BESS are scoped out of the assessment.

2.26 All other effects assessed in the EIA which could be deemed to potentially cause a major accident or disaster have been assessed elsewhere, and these have been assessed to be low likelihood but potentially high consequence events that can be suitably avoided or managed through mitigation. These relate to potential road traffic accidents occurring during the Proposed Development's construction, and land slide risk events and flood risk which have been assessed in **Chapter 10**, and **Chapter 11: Hydrology, Hydrogeology and Geology** respectively. Whilst there is the possibility of a road traffic accident occurring during construction, all traffic will be carefully managed through the Construction Traffic Management Plan (CTMP) and Abnormal Load Transport Management Plan (TMP), such that there is unlikely to be a major road traffic accident which causes major injury or fatality. The potential risk arising from Unexploded Ordnance (UXO) is addressed under 'Population and Human health' below.

2.27 The guidance is clear that major accidents and disasters can also be scoped out where proposed design measures or compliance with legislation and best practice will minimise the likelihood of a major accident or disaster occurring. Specific to the Proposed Development, this relates to a failure of the structural integrity of a turbine(s) or a mechanical fault. Modern turbines are fitted with sensors which detect if wind speeds are too high to operate safely, resulting in their shut down. This prevents excessive wear and damage to the gearbox and reduces the risk of turbines catching fire, the occurrence of blade failure or even a failure of the structural integrity of the turbine itself. Turbines and associated equipment will be procured and constructed to comply with both strict UK and internationally recognised health and safety standards and the high design standards specified by the manufacturer, and will be maintained on a regular basis in accordance with the high bar for operational maintenance set by Original

Equipment Manufacturers' (OEM) specification and SafetyOn's UK Wind Turbine Safety Rules¹².

2.28 The occurrence of wind turbines catching fire from suspected lightning strikes is also very rare, and there is no evidence that human life has been at risk from such events occurring in the past; assisted by turbine designs that include an embedded lightning protection system.

2.29 As advised in the guidance, it is also appropriate to scope out highly likely but low consequence events as they will not result in a significant environmental effect. These include heavy rainfall, as good practice infrastructure design will ensure that onsite flooding will be minimised. It is also appropriate to scope out low likelihood and low consequence events such as minor spills as these events are not considered to result in significant environmental effects and do not fall into the category of major accidents and disasters.

2.30 The Proposed Development's layout and design have also been informed by health and safety considerations. For example, by avoiding areas of steeper topography and applying a 100m buffer to a historic aircraft crash site within the Site.

Population and Human Health

2.31 In considering potential human health effects, it has been important to take into account the significance of primary effects identified throughout the ES to determine if there could be 'secondary effects' on human health. Where primary effects are not predicted to be significant i.e. operational and cumulative noise, then there is not considered to be a potential health effect. Where potential human health impacts have been identified, these are assessed in the relevant topic chapters.

2.32 Health effects that could be a result of construction and operational noise and construction traffic accidents are considered in the respective chapters (**Chapter 9: Noise and Vibration** and **Chapter 10**).

2.33 Health effects as a result of deterioration of water quantity and quality of public and private water supplies are considered further in **Chapter 11**. The Site is not a source zone for

¹² SafetyOn (in Partnership with Energy Institute) (2021) Wind Turbine Safety Rules – 4th Edition. Published by Energy Institute, London.

public water supply, is not in a Drinking Water Protection Area and private water supplies will be mitigated as detailed in **Chapter 11**.

2.34 The Construction (Design and Management) Regulations 2015 have formed an integral part of the design of the Proposed Development. Health and safety risks have been taken account of and their consideration reflected in the design. Surveys and investigations have been undertaken throughout the pre-consent phase to, as far as reasonably practicable, identify, manage and if possible, avoid any potential risks during construction.

2.35 The Site does carry a risk of Unexploded Ordnance (UXO). Any intrusive surveys carried out in the assessment and design stage have been preceded by an UXO survey undertaken by a suitably qualified surveyor. Prior to commencement of any pre-construction works being carried out onsite, a further UXO survey will be undertaken if there are any areas within the working footprint of the Proposed Development that have not been subject to an UXO survey to date.

2.36 All construction activities will be managed within the requirements of the Regulations and will also comply with the requirements of the Health and Safety at Work etc. Act 1974. To further reduce possible health and safety risks, a Health and Safety Plan for the construction of the project will also be drawn up. All staff and contractors working on the construction will be required to comply with the safety procedures and work instructions outlined in the Plan at all times.

2.37 To ensure that hazards are appropriately managed, risk assessments will be undertaken for all major construction activities, with measures put in place to manage any hazards identified.

2.38 With respect to turbine icing, the Welsh Government has previously stated in TAN8 policy¹³ that the build-up of ice on turbine blades is unlikely to present problems on the majority of sites in Wales. Even where icing occurs, the turbines' own sensors are likely to detect the imbalance and inhibit the operation of the machines. Nevertheless, the Applicant will implement measures to ensure the safety of workers and the general public in relation to ice throw and ice

¹³ It is noted that TAN8 is no longer in force.

fall, including notices throughout the Site alerting members of the public of the possible risk of ice throw and ice fall under certain conditions.

Utilities

2.39 In the Scoping Direction (see **Appendix 2.2**), PEDW agreed with the proposed approach to scope out utilities from the ES, given that any effects during construction could be readily mitigated via good practice measures that will be appropriate to any development and that can be readily secured by planning conditions.

2.40 As detailed in **Chapter 3: Site Selection and Design Strategy**, several constraints have been applied during the iterative design process, and this has guided the positioning of both turbines and other site infrastructure. Existing utilities onsite are shown on **Figure 2.1: Existing Communities, Infrastructure and Utilities**.

2.41 Regard to other utilities during construction of the Proposed Development will be controlled by the Construction Environmental Management Plan (CEMP) and managed under the relevant health and safety regulations as described above. Effects relating to utilities have therefore been scoped out through design.

Telecommunications

2.42 A technical study was undertaken by Pager Power to identify whether the Proposed Development will have a potential impact on any existing telecommunications infrastructure. This is provided in full at **Appendix 2.4**.

2.43 Telecommunications covers a broad range of communications infrastructure types, with point-to-point links communications infrastructure assessed as part of the EIA. The basis of the assessment was to identify any required mitigation solutions that should be implemented to conclude that no significant effects are predicted on telecommunications infrastructure. On this basis, the topic is scoped out of the ES.

2.44 Telecommunications infrastructure was identified through consultation with the relevant telecommunications stakeholders. The study area search radius was therefore informed by the safeguarding criteria applied by each stakeholder.

2.45 Following analysis by Pager Power as detailed in **Appendix 2.4**, it has been identified that there are turbines across the site that infringe upon exclusion zones for telecommunications links operated by Airwave, Vodafone and MBNL. Mitigation will be required post-consent to implement a solution. It is anticipated that an appropriate condition will be attached to the planning permission, which will require the Applicant to provide mitigation for the affected point-to-point telecommunications links which are present on the Site.

Forestry

2.46 As agreed by PEDW in the **Scoping Direction (Appendix 2.2)**, a forestry assessment has been carried out, detailing the area of permanent woodland loss and the requirements for compensatory planting as mitigation (**See Appendix 2.5**). Potential significant effects relating to forestry are assessed in the LVIA, ecology, ornithology, and hydrology, hydrogeology and geology ES Chapters. Information on compensatory planting is also provided in the Habitat Management Plan (**Appendix 7.10**) and the standalone **Green Infrastructure Statement**.

Public Consultation

2.47 Public consultation is a key component of the EIA process.

2.48 The first stage of consultation took place with the public, statutory consultees, and community consultees between Tuesday 20th September 2022 and Monday 31st October 2022. This was informal non-statutory consultation. Prior to the launch of the first phase of consultation, a series of key stakeholder meetings were held with local elected representatives to introduce the proposals. Two public exhibitions were held in September 2022 along with an online webinar. The consultation events were promoted in the local press, posters, on social media and a bilingual consultation brochure was distributed to key stakeholders and residents and businesses near to the Site. In addition, stakeholder meetings were held during the consultation period with politicians, local community groups and organisations.

2.49 Statutory Pre-Application Consultation (PAC) took place between 8th May and 24th June 2024, consulting on the DNS application. Three public exhibitions were held on 21st May (Dolau), 7th June (Penybont) and 8th June (New Radnor). This was undertaken in line with the Developments of National Significance (Procedure) (Wales) Order 2016.

2.50 This approach was taken to ensure there was extensive publicity of the scheme and a range of opportunities to view the Proposed Development, ask questions of the team and to give feedback. This was to ensure that anyone who has an interest in the Proposed Development had the opportunity to view and comment on them at this early stage. The breadth and depth of the consultation was important to make it widely accessible.

Baseline Characterisation

2.51 The purpose of the EIA is to predict how environmental conditions may change as a result of a development. This requires that the environmental conditions now and, in the future, assuming no development on the Site, are established. These conditions are referred to as the 'baseline' and are usually established through a combination of desk-based research, site survey, and empirical studies and projections. Together, these describe the current and future character of the Site and surroundings, and the value and vulnerability of key environmental resources and receptors.

2.52 Making predictions about how parameters such as land use, landscape, views and other environmental characteristics may change in the future relies on assumptions about future development and environmental trends. For this reason, where other development is not proposed in the vicinity of the Site, the baseline adopted for the EIA is normally taken as the current character and condition of the Site and surrounds, and the likely significant environmental effects of the Proposed Development are then assessed in the context of the current conditions alone.

2.53 It is accepted that the baseline conditions may gradually alter through time as a result of climate change, which has the potential to alter the landscape and species of flora and fauna within and around the Site, for example. However, these climate change effects are unlikely to materially alter the findings of the EIA. Further details are provided in **Chapter 14: Climate Change including Carbon Balance Assessment**.

2.54 Baseline conditions, and the means by which these have been established, are set out in **Chapters 5-14** of this ES.

2.55 As natural processes and/or human activities can also affect the baseline ('status quo'), it is important to establish the future baseline scenario in the absence of the Proposed

Development, also called the 'Do Nothing' scenario. The 'Do Nothing' scenario can be considered as the existing conditions, taking account of only clearly foreseeable changes over the lifespan of the Proposed Development. Effects have been assessed relative to this baseline in each of the topic chapters. If the Proposed Development does not proceed, it is likely that the current land use within the Site (open moorland and irregular grazing fields used predominantly for commercial agriculture and commercial forestry) will continue.

2.56 Establishing the future baseline scenario requires transparent decision making as to what natural process changes and/or changes as a result of human activity should be included or excluded from the future baseline scenario.

2.57 This scenario can be considered as the existing conditions, taking account of only clearly foreseeable changes over the lifespan of the Proposed Development. Effects have been assessed relative to this baseline. If the Proposed Development does not proceed it is reasonable to assume that the management of the Site will continue as at present.

2.58 Consideration of the future baseline scenario which acknowledges the absence of the Proposed Development is described in **Chapters 5-14** of this ES.

Consideration of Reasonable Alternatives

2.59 The ES is required to consider reasonable alternatives for the Proposed Development, as specified in Schedule 4, paragraph 2 of the EIA Regulations "*A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects*".

2.60 The ES provides a description of the site selection and design evolution of the Proposed Development and the alternative designs that this process suggested, along with consideration of these alternatives in **Chapter 3**.

Avoidance of Effects through Design

2.61 EIA is an iterative process that aims to ensure early consideration of environmental issues at all stages of project development. In this way, the findings from the EIA can be fed into

the design process, to avoid, reduce and if possible, remedy adverse environmental effects. This approach has been followed in the design of the Proposed Development. Where potentially adverse significant environmental effects were identified through environmental baseline surveys, or later in the detailed EIA, consideration was given as to how the design should be modified to 'design out' adverse significant environmental effects, or where this was not possible, to determine appropriate mitigation. This process is explained further in **Chapter 3** and the **Green Infrastructure Statement**, with reference to the step-wise approach detailed within Chapter 6 of PPW¹⁴, and in subsequent assessment in **Chapters 5-14**.

Identification of Likely Significant Effects

2.62 Part 5 of Schedule 4 of the EIA Regulations states *"The description of the likely significant effects on the factors specified in regulation 4(3) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development"*.

2.63 Each technical chapter contains a section that identifies the likely effects on the environment that may arise as a result of the construction, operation and/or decommissioning (where necessary) of the Proposed Development. The significance of environmental effects is typically assessed by considering both the character of the change (i.e. the size and duration of the effect) and the value/sensitivity of the environmental resource that experiences this effect (i.e. the receptor).

2.64 In accordance with the EIA Regulations, effects may be direct, indirect, secondary or cumulative. Within these categories, they may also be short, medium or long-term, permanent or temporary, beneficial or adverse. Direct (or primary) effects are changes to the baseline arising directly from activities that form part of the Proposed Development, for example, a localised increase in noise during construction. Indirect (or secondary) effects are those that arise as a result of a direct effect, for example deterioration of water quality in a watercourse due to a discharge could have secondary effects on aquatic biodiversity.

¹⁴ Welsh Government (2024) Planning Policy Wales – Edition 12

2.65 Effects and receptors have been described using quantitative criteria wherever possible using those listed below. Where different terminology has been used, this is stated clearly in the relevant chapter.

- The nature of the effect, described as adverse, neutral or beneficial.
- The magnitude of the effect, based on a scale of major, moderate, minor or none.
- The likelihood of the effect occurring, based on a scale of certain, likely or unlikely.
- The duration of the effect, based on a scale of long, medium and short term.
- The reversibility of the effect, being either reversible or irreversible.
- The value of the receptor, based on a scale of international, national, regional, local and negligible.
- The sensitivity of the receptor to the effect, based on a scale of high, medium and low and in some instances negligible.
- The occurrence of the effect during the phased implementation of the project.

2.66 Each of the technical chapters provides the specific criteria, including sources and justifications, for quantifying the significance of effects, and this is predominantly done by combining sensitivity of receptor and magnitude of effect. Where possible, this has been based upon quantitative and accepted criteria together with the use of value judgements and expert interpretations. This combination of sensitivity of receptor and magnitude of effect may take the form of a matrix table, if so, these are detailed in the technical chapters. The threshold at which effects are likely to be 'significant' is also defined in each of the technical chapters where relevant.

2.67 Unless stated otherwise in methodologies set out in the individual assessment chapters, effects of '**major**' or '**moderate**' significance are considered to be '**significant**' in the context of the EIA Regulations.

Interrelationships between Effects

2.68 Regulation 5(2) states that the EIA must *“identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development on the following factors—*

- a. population and human health;*
- b. biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC (1) and Directive 2009/147/EC;*
- c. land, soil, water, air and climate;*
- d. material assets, cultural heritage and the landscape;*
- e. the interaction between the factors referred to in sub-paragraphs (a) to (d).”*

2.69 Interrelationships may occur where two or more effects arise that have the potential to impact on the same receptor during construction or operation. An impact taken in isolation may not have a significant impact on a receptor, but where several effects are considered in an interrelated manner, the resultant impact could then be considered significant.

2.70 There is no single agreed standard on how the assessment of impact interrelationships should be undertaken, and so the assessment has been undertaken on a qualitative basis using the results of the individual assessments, informed by professional judgement.

2.71 In general terms impacts assessed individually as being of negligible magnitude are not considered to make a meaningful contribution to combined effects from impact interrelationships. For the avoidance of doubt, all impacts not explicitly assessed in the ES will be considered to be of negligible magnitude and will therefore not be assessed. Impacts will be considered where they have been identified and assessed in other chapters of the ES.

2.72 Receptors that are predicted to be the subject of more than one potential effect will be included in the combined effects assessments presented in each topic chapter. Receptors predicted to be the subject of only a single effect are excluded because there is considered to be no potential for an accumulation of effects to take place.

2.73 The interrelationship between potential effects between topic areas is addressed in **Chapters 5-14** and summarised in **Chapter 15**.

Cumulative Effects

2.74 As required by Regulation 5 of the EIA Regulations, the ES considers the possible effects that a proposal may have in combination with existing or consented developments. In accordance with the Planning Inspectorate's guidance for Nationally Significant Infrastructure Projects¹⁵, a staged process for assessing schemes has been adopted. This is the approach requested by PEDW in the Scoping Direction (**Appendix 2.2**) (albeit using the updated Advice published in September 2024). Likely cumulative effects have been defined as the likely effects that the Proposed Development may have in combination with other wind farms and relevant developments that are at application stage, consented, under construction or operational (i.e. the incremental effects resulting from the Proposed Development if all other wind and relevant developments are assumed to be constructed/operational).

2.75 The list of all developments identified for consideration in the cumulative effects assessment is presented in **Appendix 2.6: Cumulative Project List** (separated into two tables, one for wind development and one for all other non-wind development and noting planning status), and their respective locations are shown in **Figures 2.2 Cumulative Developments: wind farms** and **2.3 Cumulative Development: non-wind**. **Appendix 2.6** includes justification for which developments are scoped out. Subsequently, each topic-specific chapter (**Chapters 5-14**) then sets out, with justification, which developments are considered in the cumulative assessment for that topic.

2.76 Schemes at EIA Scoping stage (tier 3 projects) are not usually included due to the increased uncertainty that they will progress to an application, as well as the lack of sufficient environmental assessment information available for them which is otherwise required to enable a robust and meaningful cumulative assessment.

2.77 In addition to assessing the additional cumulative effects of the Proposed Development in combination with other schemes, **Chapter 5** and **Chapter 6: Cultural Heritage and Archaeology** assess the total cumulative effects of the Proposed Development assuming that all current and future developments are constructed/become operational.

¹⁵ [Planning Inspectorate \(2024\) Nationally Significant Infrastructure Projects: Advice on Cumulative Effects Assessment](#)

2.78 Appendix 2.6 was considered in each technical assessment of cumulative effects, presented in the relevant topic-specific **Chapters 5-14**. Within each technical chapter detail is provided as to which cumulative developments have been assessed, where relevant. **Appendix 2.6** also provides a table signposting which projects were assessed by each topic. The cut-off date for cumulative data collection was 1st October 2024. Changes to the cumulative baseline have not been included after this cut-off date to allow time for the assessments, visualisations and figures to be prepared. Should additional schemes enter into planning after this date, then it will be for the EIA for those schemes to consider the Proposed Development cumulatively.

Mitigation, Enhancement and Monitoring

2.79 Part (3)(d) of Regulation 17 of the EIA Regulations states that an ES should provide “a description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment”.

2.80 While mitigation has been embedded through the design process for a range of assessment topics (‘embedded mitigation’), specific additional mitigation measures (‘additional mitigation’) are also proposed to prevent, reduce and offset likely adverse effects which could not be avoided through design. These additional mitigation measures have been identified through the EIA process.

2.81 Each assessment chapter recognises:

- Embedded mitigation: Items that are embedded through the design of the Proposed Development to mitigate potential adverse effects, for example the application of a stand-off distance between a receptor and part of the Proposed Development.
- Applied mitigation: These are good practice and industry standard measures which are, by their nature, well understood, and for which there is a high degree of confidence as to their effectiveness. These are described in the chapters relating to particular topics and will be delivered during the construction process.
- Additional mitigation: Items that are further required to mitigate the likely adverse effects of the Proposed Development above and beyond the embedded and applied mitigation to be delivered during either the construction or operational phases.

- **Monitoring:** Any monitoring requirements to assess potential ongoing significant adverse effects on the environment as a result of the Proposed Development following the application of mitigation.

2.82 By making a distinction between embedded mitigation, applied mitigation and additional mitigation, and with embedded and applied mitigation forming an integral part of the Proposed Development (i.e. being in place for assessment purposes), the ES focuses on the likely significant effects of the Proposed Development. This approach prevents a series of unrealistic and unlikely effects from being reported in detail. It also provides clarity on the additional mitigation measures required to address likely significant as well as other adverse effects and outlines any ongoing monitoring requirements. In line with EIA good practice, including IEMA's guidance on 'Delivering Proportionate EIA' (2017), this approach will assist consultees and other stakeholders in focusing on the significant effects which might realistically arise and how they could be mitigated. This approach also recognises the need for a balanced approach to risk. This is considered fundamental to the preparation of a proportionate ES.

2.83 The embedded mitigation measures are set out in **Chapter 4**. Furthermore, the relevant embedded and applied mitigation measures are also described in detail in the specialist topic chapters. Applicable additional mitigation measures and monitoring requirements are also described in detail in the specialist topic chapters.

2.84 Schedule 4 of the EIA regulations states that the ES should include "*a description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements*". Where monitoring is proposed, this is identified and detailed in the individual topic **Chapters 5-14** and summarised in **Appendix 4.3: Schedule of Mitigation and Monitoring**. To provide a single reference source, all embedded and applied mitigation measures and those envisaged as additional mitigation and monitoring requirements are included on a topic-by-topic basis in the Schedule of Mitigation in **Appendix 4.3**. This schedule will be incorporated into the project CEMP. The implementation of all measures noted in **Appendix 4.3** will be secured either through conditions attached to the consent, subsequent planning permissions, or through other regulatory mechanisms and licences.

2.85 By assuming that embedded and applied mitigation is an integral part of the Proposed Development and will be effective, and then making a professional judgement on the likely effectiveness of the additional mitigation measures proposed, the remaining likely effects are then documented within this ES as ‘residual effects’. This is considered to be a robust, proportionate and realistic approach to assessment.

Data Gaps, Assumptions and Uncertainty in Assessment

2.86 The EIA process is designed to enable good decision-making based on the best possible information about the environmental effects of a Proposed Development. There will, however, always be an element of uncertainty as to the exact scale and nature of the effects. These may arise through shortcomings in available information or due to the limitations of the professional judgement process. Part 6 of Schedule 4 of the EIA Regulations requires that the ES provides *“details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved”*.

2.87 Whilst any assessment limitations are discussed in **Chapters 5-14**, it is considered that this ES contains adequate information to enable the Welsh Ministers and consultees to review and form a reasoned conclusion on the significant effects of the Proposed Development on the environment.

2.88 Each topic chapter also lists the relevant assumptions that have been made when completing the assessment. Again, it is not considered that these assumptions present limitations to understanding potential significant effects.

Competent Experts

2.89 Regulation 17(4)(a) of the Regulations requires the ES to be prepared by *“persons who in the opinion of the relevant planning authority or the Welsh Ministers, as appropriate, have sufficient expertise to ensure the completeness and quality of the statement”*.

2.90 As mentioned in **Chapter 1: Introduction**, a statement of competency, setting out the qualifications and experience of chapter authors, is provided in **Appendix 1.1: Statement of Expertise**.



**Nant Mithil
Energy Park Limited**

Environmental Statement

Chapter 3: Selection and Design Strategy



Chapter 3

Site Selection and Design Strategy

Introduction

3.1 This chapter provides details of the iterative approach that has been taken to designing the Proposed Development within the EIA process. It also outlines the site selection process undertaken by the Applicant in identifying the Site as a suitable location for an energy park. The chapter therefore considers the ‘reasonable alternatives’ which were considered by the Applicant in designing the Proposed Development, as required by the EIA Regulations.

3.2 Details of how and why the turbine layout and associated infrastructure have been modified during the iterative EIA process are provided to explain how the Proposed Development described in **Chapter 4: Project Description** was designed.

3.3 At the time of EIA Scoping, solar and battery were also included as part of the Proposed Development and the proposed route to the Site for the Abnormal Indivisible Loads (AIL) included the requirement for a new bridge over the River Wye and two blade transfer areas. Solar and battery were removed from the proposals during the post-scoping design review stages for technical and commercial reasons. Two further options for the AIL route have since been identified that no longer require a new bridge over the River Wye and therefore these works no longer form part of this DNS Application.

3.4 Modifications were also made to the layout to respond to comments received during the Pre-Application (PAC) process. These are reported on in **paragraph 3.50** of this chapter.

3.5 This chapter considers site selection and design evolution as required by the EIA Regulations. Further information site selection and design is provided in the **Design and Access Statement** and the **Green Infrastructure Statement**, which are provided in support of the DNS application for the Proposed Development.

Site Selection and Design Strategy

Site Selection

3.6 The Applicant's process and approach to selecting sites for renewable energy development involved early assessment of potential capacity for energy generation balanced with environmental and technical constraints, relevant policy and project deliverability in line with the urgency of reaching 2030 and 2035 renewable electricity and 2050 net zero targets for Wales. The Site Characteristics set out below demonstrate many of the characteristics that the Applicant considers when looking for potential locations for wind energy development.

3.7 Early selection of the Site for wind energy was primarily driven by the following criteria:

- A desk-based assessment to identify land suitable for development using Geographical Information System (GIS) by mapping technical and environmental constraints. These constraints included but were not limited to:
 - Nationally designated landscapes such as National Parks and National Landscapes/Areas of Outstanding Natural Beauty (AONBs)¹;
 - Cultural heritage designations such as World Heritage Sites, Scheduled Monuments, Listed Buildings, Conservation Areas and Registered Battlefields;
 - Application of the mitigation hierarchy, seeking firstly to avoid effects on ecological designations such as Site of Special Scientific Interest (SSSI), Special Protection Area (SPA), Special Area of Conservation (SAC), Historic Gardens, Ancient Woodland, Peatland² and Local Nature Reserves;
 - Terrain was reviewed to ensure that gradients supported the placement of a wind turbine and laydown areas;
 - Wind resource of the area was considered using publicly available wind data sources to assess wind speed and commercial viability;
 - Proximity to nearby residential properties; and

¹ AONBs in England and Wales were renamed as 'National Landscapes' in November 2023.

² DataMapWales – Peatlands of Wales

- Aviation constraints including licenced aerodromes and visibility to military and civilian RADARs.

- The GIS site search must identify an area of sufficient scale for an adequate number of turbines or capacity to accommodate a commercially viable scheme.
- Alignment with planning and renewable energy policy that forms part of the Development Plan. This included avoiding areas designated as unsuitable for large-scale wind energy development such as National Parks and National Landscapes/AONBs. Alignment with Policies 17 and 18 of Futures Wales (2021)³ and its evidence base⁴, which informed identification of the Pre-Assessed Areas (PAAs) for wind development⁵.
- Access to the Site from a port of delivery of turbine components to each of the turbine locations.
- Ground conditions for building of turbine foundations, access track and cable installation.
- Ability for extant land use to be maintained as much as possible alongside the simultaneous operation of wind turbines, such as upland grazing.

3.8 The Proposed Development will connect to the national electricity network. Nant Mithil Energy Park Ltd holds a grid connection agreement with Green GEN Cymru (GGC), an Independent Distribution Network Operator (IDNO), for capacity on their proposed Green GEN Towy Usk project. The connection point to GGC's network will be located at the Nant Mithil Energy Park site substation.

3.9 From this substation, GGC plans to install a 132 kilovolt (kV) wooden-pole overhead line to integrate with their wider proposed network. It is important to note that this grid connection infrastructure does not form part of the Proposed Development and will be addressed through a separate planning application.

³ [Welsh Government \(2021\) Future Wales: The National Plan 2040](#)

⁴ [Arup \(2019\) Assessment of on-shore wind and solar energy potential in Wales](#)

⁵ Note that the reference to PAA was only introduced into the final version of the NDF, however site identification was already underway prior to publication, when the areas were call 'priority areas' (for wind and solar).

Site Characteristics

3.10 Key characteristics of the Site that make it suitable for an energy park comprising wind turbines include the following:

- The Site has an excellent wind resource.
- The Site is available for wind energy development: the requisite land agreements are in place and there are no other conflicting land uses on the Site.
- Part of the Site is within a Pre-Assessed Area (PAA4) as defined in Future Wales and there are no planning policies which, in principle, preclude wind energy development at the Site.
- The Site has suitable ground conditions for turbine foundations, access tracks and other infrastructure.
- The Site is accessible for construction traffic and turbine deliveries from the trunk road network.

The Design Strategy

3.11 The design strategy for the Proposed Development has aimed to provide the best balance between minimising effects on the local and wider environment and optimising energy yield. It has sought to create a layout that relates sympathetically to the landform and scale of the Site and surrounding area, and that is well-composed from key views.

3.12 Energy yield is an important consideration for wind farm design in environmental terms, because the chief environmental benefit of the development – mitigation of climate change via low carbon, renewable energy generation – can only be maximised by optimising the energy generation potential of the Site while taking all other design considerations into account. Where a site is generally suitable for development, it is therefore important to avoid, to the extent commensurate with other constraints and effects, the ‘opportunity cost’ of failing to deliver the site’s fullest renewable energy generation potential.

3.13 PPW12 makes detailed reference to the step-wise approach as the means of demonstrating the steps which have been taken towards securing a net benefit for biodiversity. This includes addressing all the attributes identified under the diversity, extent, condition and connectivity and adaptability (DECCA) framework. Whilst PPW12 came into effect after the Site

had been selected and designed, the design process has followed the mitigation hierarchy approach and therefore it is considered that the approach to design of the Proposed Development has aligned with and adopted the steps in the step-wise approach.

3.14 The design parameters for the Proposed Development evolved through the design process, as environmental baseline information became available through desk and field-based surveys and feedback from consultation was received.

3.15 One key change implemented through the design process was the option to route AILs from Swansea port via a new bridge over the River Wye⁶, south of Builth Wells. This option was subsequently discounted as the River Wye is designated as both a SSSI and SAC as well as being subject to other environmental constraints. This approach accords with 'Step 1 Avoid' of the step-wise approach required by PPW12 since October 2023.

3.16 Further information on how the design of the Proposed Development has complied with the step-wise approach as advocated in PPW12 is provided in the **Green Infrastructure Statement** submitted with the DNS application.

3.17 While balancing the need to optimise the energy generation potential of the Site, the final design objectives included, but were not limited to, the following:

- To use the latest wind turbine technology, consisting of more efficient and larger turbines where these can be reasonably accommodated within the landscape, as supported by Policy 17 of the NDF⁷;
- Considering landform, scale and land use to locate turbines on the larger scale hill tops/ridges;
- Avoiding turbines appearing as overbearing on the steep sided slopes on the western and northern peripheries of the Site;
- Considering different turbine heights across the Site to respond to the varying topography and relative proximity to residential properties;

⁶ The installation of a temporary bailey bridge crossing the River Wye had previously been explored in association with the Llandinam Windfarm Repowering and Extension by Celt Power Ltd in 2013.

⁷ Welsh Government (2021) Future Wales: The National Plan 2040

- Minimising effects on nationally designated landscapes, most notably the Shropshire Hills National Landscape/AONB and Bannau Brycheiniog National Park, including cumulative effects;
- Minimising the effects of visible aviation lighting through the implementation of all available mitigation measures to reduce the number, frequency and intensity of visible lighting required;
- Avoiding breaching the 'residential visual amenity threshold' at nearby properties, beyond which these properties could be widely regarded to be unattractive places to live;
- Limiting noise at nearby properties to acceptable levels in accordance with established guidance;
- Avoiding any part of the Proposed Development being within the Radnor Forest SSSI, which lies partially within the eastern part of the Site boundary or within the Mithil Brook and Cwm Blithus SSSI, which lies partly within the western part for the Site boundary;
- Minimising interactions with ecologically sensitive habitats to the greatest feasible extent: in particular, peatland habitats, 'Annex 1' and 'Section 7' habitats and Groundwater Dependent Terrestrial Ecosystems (GWDTEs);
- Minimising interactions with peat resource present on the Site to the greatest feasible extent;
- Protecting the Site's hydrological regime, including peatland hydrology, and the interaction of this with the hydrological regime of the Site's surroundings, with particular focus on the site setting, within the catchments of the River Wye/Afon Gwy SAC;
- Taking account of the potential for effects on all bird species of conservation concern at and around the Site;
- Taking account of the potential for effects upon bats;
- Taking account of cultural heritage assets and their settings, including Scheduled Monuments, listed buildings and non-designated but locally important heritage assets such as Cefn y Crug and Cowlod cross dykes (PRN993; PRN6871);

- Minimising the requirement for significant earthworks by considering topography and slope stability;
- Limiting infrastructure on common land to access tracks and its associated drainage and cable trenches, and minimising land take overall as far as possible across the Site;
- Minimising effects on the access and recreation opportunities provided by the Public Rights of Way (PRoW) network within the Site;
- Exploring opportunities within the Site to provide greater access and recreational opportunities; and,
- Securing net benefits for biodiversity.

Project Design Evolution

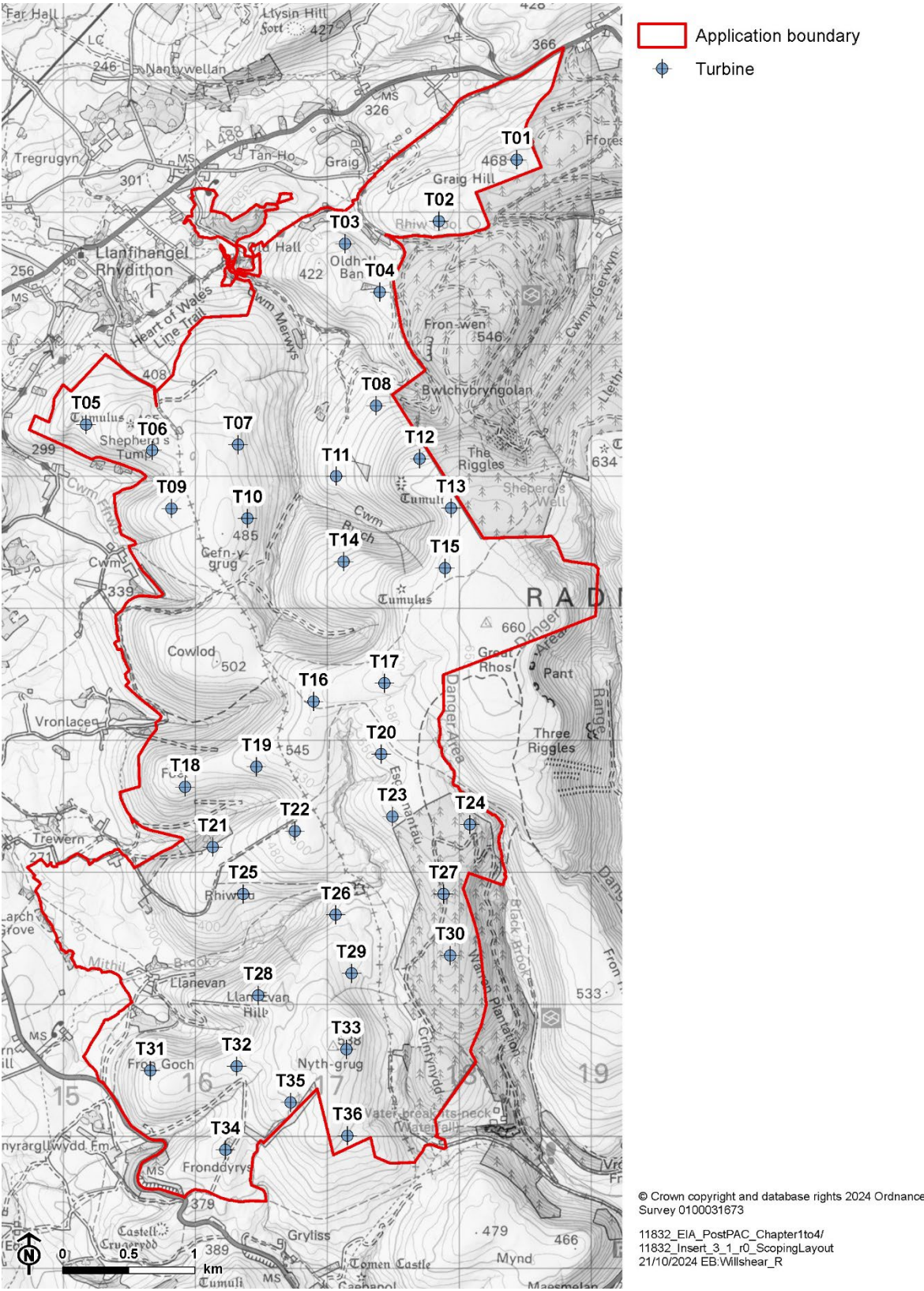
3.18 The design strategy and objectives outlined above have been considered as the design of the Proposed Development has evolved. The design process involved multiple workshops with technical team members to address potential constraints and opportunities associated with one or more of the turbines or elements of the associated infrastructure. Feedback from the relevant technical stakeholders as appropriate to the design process, and comments received through consultation were given due regard during the evolution of the project design.

3.19 Eleven layout iterations were identified and appraised before the turbine layout was finalised. These are described in 'key groups' below.

Layout V1: Scoping

3.20 This 36-turbine layout presented a 'maximum development' scenario, allowing identification of the full potential variety and extent of likely significant environmental effects of the Proposed Development for the purposes of EIA Scoping. It was largely based on consideration of the desktop constraints referred to above and standard turbine separations for wind yield purposes and the overall Site boundary. This layout is presented in **Insert 3.1**.

Insert 3.1: Scoping Layout



Layouts V2-4 (turbines only)

3.21 These layout iterations intended to refine the scoping layout using a combination of desk-based data, ongoing field surveys as they were collected and final field survey datasets when completed. They took account of constraints including the following:

■ Landscape and Visual

- The location of turbines along the western periphery of the Site, at the plateau edge of the Radnor Forest Complex (Radnor Forest Landscape Character Area (LCA 43)), with the design objective of containing turbines within the interior of this large-scale landscape, and avoid the perception of turbines ‘spilling down the slopes’ towards the neighbouring more settled, smaller scale landscapes to the north and west of the Site.
- Consideration of turbines located relative to the transitional zone between the Radnor Forest LCA 43 and Llanbister-Penybont Uplands LCA 40 at the northern extents of the Site.

■ Residential Visual Amenity

- Proximity to residential properties located within 2km of the Site and seeking to avoid turbines appearing overly prominent or giving rise to potentially ‘overbearing’ effects on residential visual amenity, resulted in turbines being moved or removed or turbine blade tip heights being reduced within areas of the Site to the north, west and south-west.

■ Ornithology

- A 500m no-disturbance buffer was applied due to the presence of breeding Schedule 1 species located within the Site.
- Consideration was given to areas of higher red kite activity.
- Consideration of proximity to nightjar breeding habitat.

■ Site Topography

- Where possible, increasing distance of turbines from the steeper slopes within the Site, including the slope edge along the western Site boundary, to minimise the need for cut

and fill (resulting in landscape change) and complex engineering solutions for turbine foundations.

- Consideration of where turbines may be harder to access due to site topography.

■ Cultural Heritage

- Avoidance of Scheduled Monuments plus a 50m buffer.
- Increasing separation distance of a turbine from Esgairnantau bank and ditch (Clwyd Powys Archaeological Trust HER Entry Ref. PRN6862) in the Esgairnantau forestry.

■ Peat, Hydrology and Ecology

- Consideration of the Phase 1a peat survey data and avoidance of the areas of peat as far as possible.
- A 50m separation distance between turbines and water courses/water bodies as a watercourse pollution prevention measure and to reduce bat collision risk.
- A 100m separation distance between turbines and GWDTE.
- Consideration of proximity to ponds identified as having potential for Great Crested Newts.
- A 250m separation distance between turbines and Private Water Supplies.
- Minimising interactions with ecologically sensitive habitats to the greatest feasible extent: in particular, peatland, 'Annex 1' and 'Section 7' habitats, in accordance with 'Step 2 Minimise' of the step-wise approach.
- Minimising removal of forestry within the Esgairnantau commercial plantation in the south-east of the Site.

■ Energy Yield

- Maintaining a 5x by 3x (prevailing vs. cross-wind) rotor diameter separation distance between turbines as far as possible to optimise energy yield output and mitigate wake effects on downwind turbines.

Summary of Changes Made Through Layouts V2-4

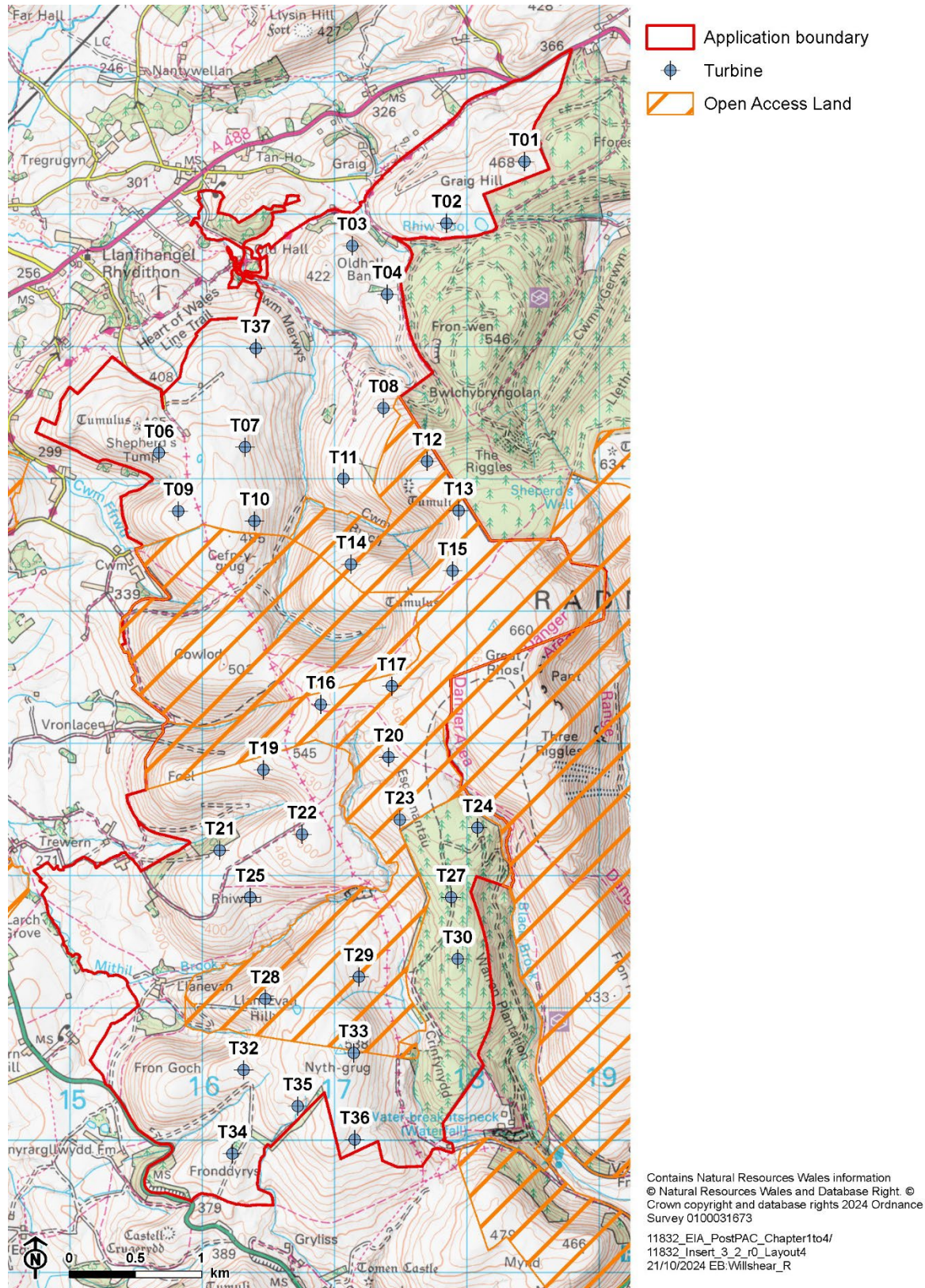
3.22 Consideration of the constraints set out above resulted in a reduction of the number of turbines from 36 to 33⁸. This layout was the subject of a whole team design workshop and was assessed from a noise perspective. The key drivers for the removal of three turbines and the reduction in tip height for some turbines were:

- T26 was removed as it was located within the no-disturbance buffer of a protected bird species nest.
- Along the western edge of the Site, turbines T5, T9, T18, T21, T25, T31 and T34 were reviewed to reduce potential effects on residential amenity at the closest residential properties to the north and west. This resulted in:
 - The removal of three turbines: T5, T18 and T31;
 - Turbines moved further east into the interior of the Site, where spacing from other turbines allowed; and
 - A reduction in turbine blade tip height of turbines T1, T2, T3, T6 and T32 to 205m to blade tip (from 220m to blade tip) to reduce effects on residential amenity for the closest residential properties located to the north and west of the Site.
- Additional land adjoining the north of the Site became available where a 'T37' was introduced.

3.23 The resulting layout is shown in **Insert 3.2**.

⁸ T26, T5, T18 and T31 removed, T37 introduced.

Insert 3.2: Result of Layouts V2-4 Design Iterations



Layouts V5-6 (turbines only)

3.24 This stage of the design took place following Phase 1a peat survey, hydrological walkover, landscape and visual amenity site visits (including detailed residential visual amenity surveys), cultural heritage site visits and protected species surveys. Some consideration of infrastructure and constructability had commenced at this stage however this section still focusses on the turbine only layout. The key additional design objectives applied to these layout iterations were:

■ Peat

- The design sought to avoid all development on 0.3-0.5m peat depth where possible whilst considering other constraints and design objectives ('Steps 1 and 2 Avoid and Minimise' of the step-wise approach).

■ Residential Visual Amenity

- Following the LVIA site visit, tip heights for turbines across the Site were reviewed again considering the potential for significant adverse residential visual amenity effects and judgements relating to the potential for turbines to be overbearing from the closest residential properties.

■ Ornithology

- Initial collision risk modelling was undertaken at this stage, with results informing the relative turbine dimensions (height to tip, hub heights and blade lengths) being considered in relation to potential effects on residential visual amenity. Where possible to reduce the impacts on collision risk for red kite the lower sweep of the turbines was set at 50m in areas of higher red kite activity.

■ Cultural Heritage

- Following the cultural heritage site visit, it was identified that some turbines were located within or adjacent to the lines of sight between the three Scheduled Monuments (round barrows: Shepherd's Tump (Cadw SM Ref. RD253), Cwm Bwch (Cadw SM Ref. RD255) and Great Rhos (Cadw SM Ref. RD254)) in the north of the Site.

■ Hydrology and Ecology

- Avoid all development on wetland habitats i.e. those included in UKHab Level 2 Code 'f', where feasible. This corresponds to all types of bog, fen, marsh, swamp and rush pasture. Efforts were made to avoid these habitats where they were situated on or near identified peat resource.
- Avoid turbine bases within 250m of GWDTEs where feasible.
- Avoid placement of any infrastructure within 100m of GWDTEs where feasible.
- Achieving a 50m separation between turbine blade tips and bat foraging habitat, identified as woodland, forestry and watercourses. The wooded areas included the Esgairnantau forestry and forestry on the eastern site boundary and patches of woodland within the Site.

■ Land Availability

- A parcel of land in the north-west of the Site was no longer available for the siting of either a wind turbine or any infrastructure and was subsequently removed from the red line boundary.

■ Energy Yield

- To achieve separation distances between turbines that would allow optimal performance for each of them as far as possible. In some instances standard separation distances (as detailed above) for some turbine models would not be achievable bearing in mind the environmental influences on the turbine layout. Layout iterations were therefore assessed for performance by the Applicant's technical advisors.

3.25 Constraints applied to earlier layouts V2-4 in relation to landscape and visual effects, residential visual amenity, ornithology, topography, cultural heritage, peat, hydrology and ecology and energy yield (turbine separation) continued to be considered.

Summary of Changes Made Through Layouts V5-6

3.26 Whilst consideration of these constraints did not result in any further turbines being removed at this stage, several modifications to the layout were made in response to them, to further reduce environmental impacts. This layout was further assessed from a noise perspective. Modifications to the turbine layout to respond to constraints at this stage included:

- Tip heights of turbines T1, T2, T3 and T37 were reduced to 180m to blade tip height to reduce potential impacts on residential amenity at the closest residential properties to the north;
- Turbines T6, T7, T11 and T14 located on or adjacent to the lines of sight between the three Scheduled Monuments were moved out of these lines of sight; and
- Turbines identified as being closer than 50m from bat foraging habitat were moved out of this zone.

3.27 At this stage it was decided to undertake further peat survey in the Esgairnantau forestry area, 'Phase 1b' peat survey, to further minimise impact on peat ('Step 2 Minimise' of the step-wise approach).

Layouts V7-8 (full infrastructure)

3.28 The design work undertaken for layouts V2-6 had focussed on turbine locations with commentary from the lead designer on infrastructure requirements and constraints. Once the design process for the turbine locations had reached this stage, it was considered appropriate to add the design of the infrastructure layout, taking account of the known constraints, for whole team review.

3.29 The design of the access track layout was based on the primary design objectives of efficiency, minimising the amount of new track required, and health and safety, including avoiding slopes too steep for access and creating clear definitions between turbine working areas and access tracks. A further objective was to use existing access tracks as far as possible to minimise the need for new excavation (noting some tracks are also public rights of way).

3.30 Constraints applied to layouts V2-6 continued to be considered. Supplementary data relating to a Phase 1b peat survey and a land stability site walkover were added to the constraints. The key additional design objectives applied to these layout V7 and 8 iterations were:

- Peat, Hydrology and Ecology
 - Consideration of the results of the combined extended Phase 1a and Phase 1b peat surveys.

- Avoiding any turbine bases or other site infrastructure being located within the Radnor Forest SSSI in the east of the Site.
- Achieving a 200m buffer from watercourse where signs of otter were identified.

■ Ornithology

- Further collision risk modelling for red kite was undertaken at this stage. The results informed an emerging consideration of mitigation of higher collision risk by considering painting one of the three turbine blades.

■ Site Topography

- Infrastructure layouts considered the existing terrain within the Site, with access tracks and crane hardstandings needing to avoid slopes that were too steep to allow turbine components to be delivered to turbine locations and erection cranes being able to install the turbines, or an excess of earthworks or interaction with environmental constraints being required in order to achieve viable gradients. Where possible, all hardstandings were designed to run parallel to the existing contours to provide a balanced cut and fill at each location.
- A review of potential substation sites was carried out, initially considering both the topographical and engineering requirements of a 150m x 150m platform, and then considered against all onsite constraints and in relation to potential landscape and visual and other effects (constraints were generally as noted above and below in relation to other development components).

■ Energy Yield

- As well as spacing and turbine performance considerations above, additional consideration was given to turbines in parts of the Site with particular wind flow characteristics relating to the Site terrain (steep ridges and valleys).

■ Noise

- This layout was further tested from a noise perspective and subject to a team design workshop.

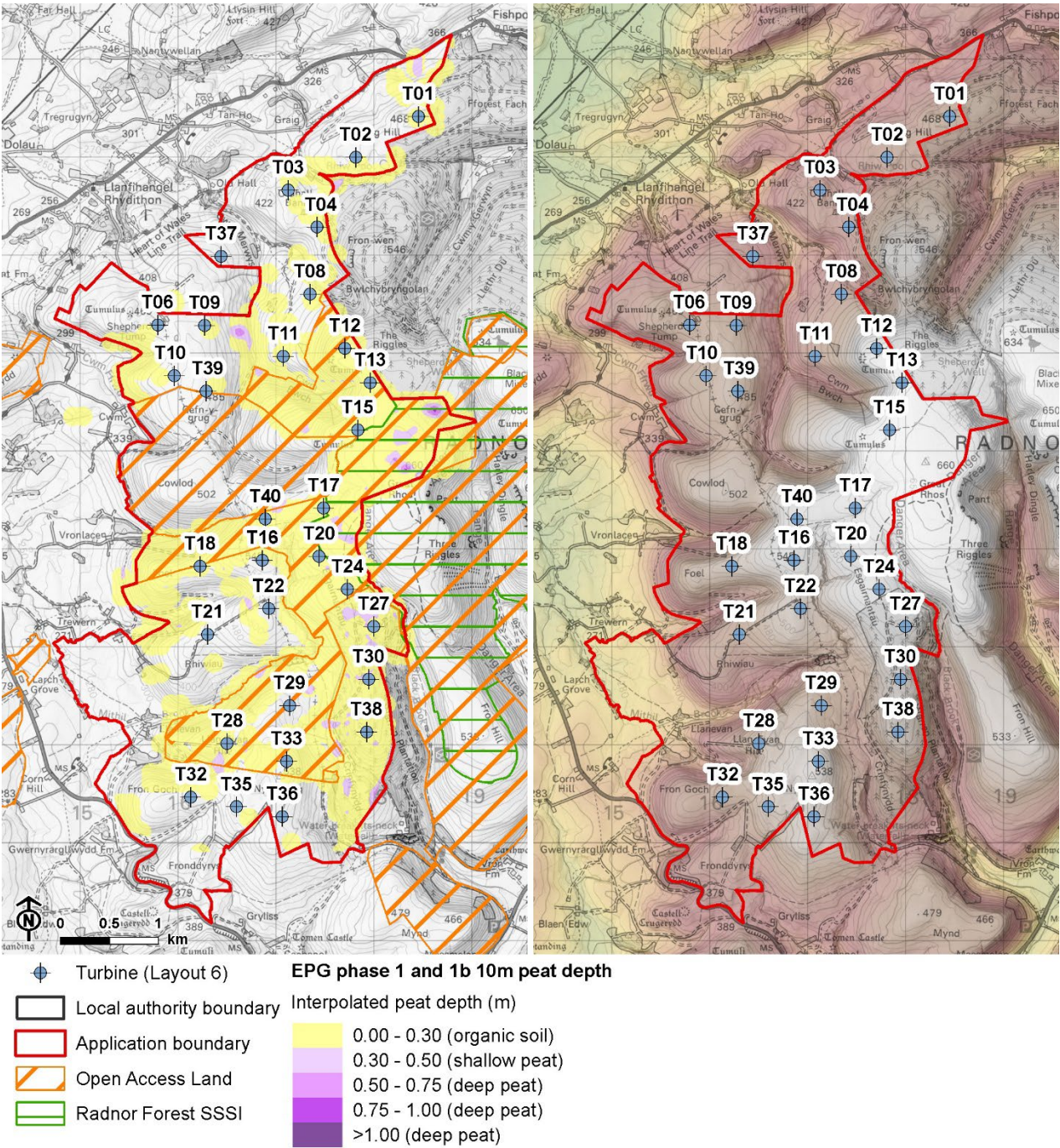
3.31 Consideration of these constraints resulted in a reduction of the number of turbines from 33 to 31.

- T14 was removed due the steepness of the gradient to reach the turbine and also due to the potential for associated track and associated cut to affect the immediate setting of the Great Rhos Round Barrow Scheduled Monument.
- T34 was removed due to noise, residential visual amenity (even accounting for reduced tip height) and ornithological collision risk.

3.32 The review of potential substation sites concluded that the south-west corner of the Site performed best when considering all environmental constraints, including: access from the A44, sufficient land for the platform whilst minimising earthworks requirements, lower elevation reducing visibility in wider views, sufficient distance from proposed turbines, proximity to the proposed Towy Usk connection, located outside the limited areas of peat onsite and on lower sensitivity habitats.

3.33 The resulting layout is shown in **Insert 3.3** and was used as a basis for a focussed slope stability site walkover, an overall engineering walkover and the Phase 2 peat survey.

Insert 3.3: Result of Layouts V7-8 Design Iterations



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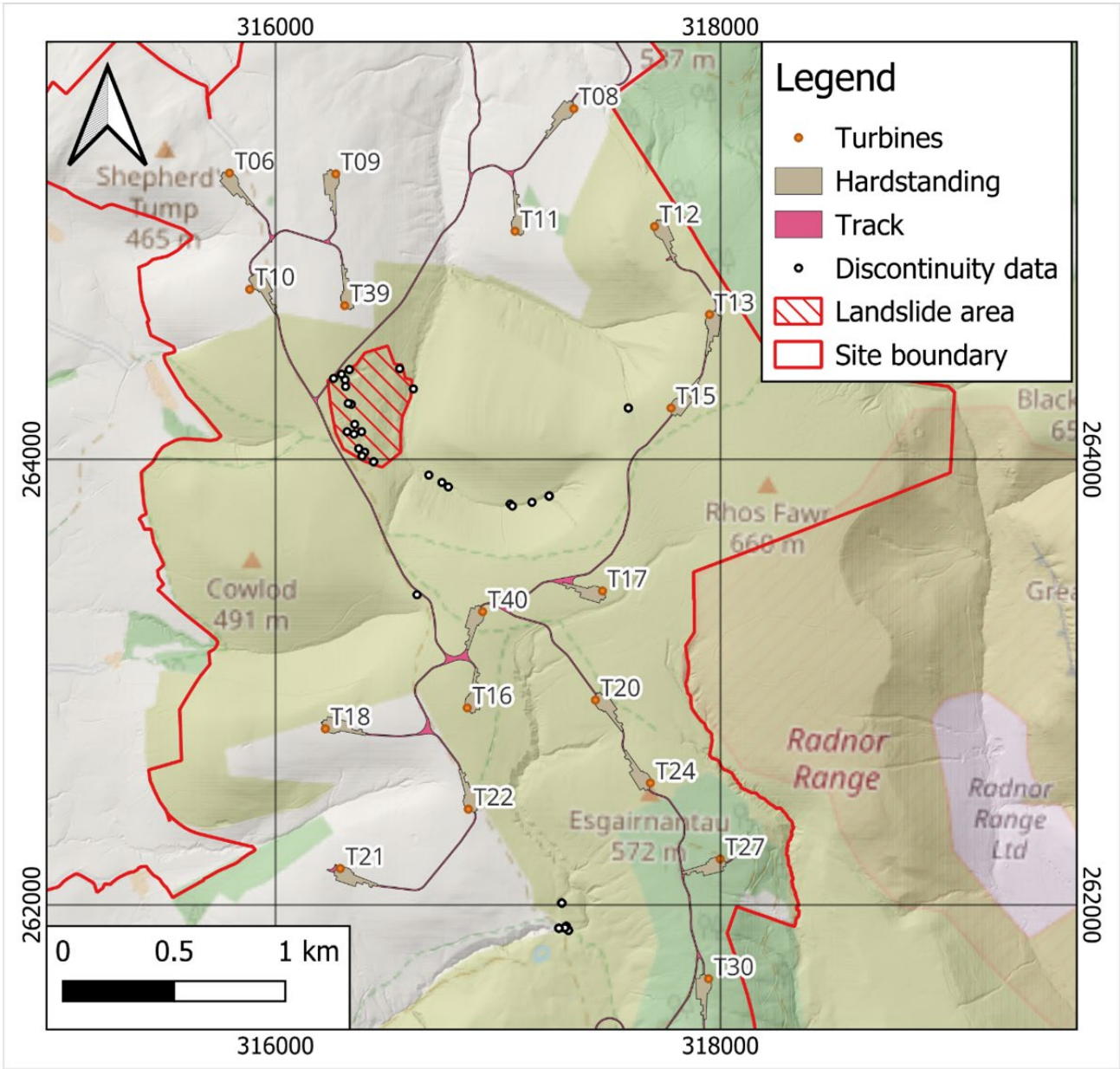
Layouts V9-10 (full infrastructure)

3.34 This stage of the design took place following a focussed slope stability site walkover, an engineering walkover and the Phase 2 peat survey. Some engineering considerations relating to the access track layout, which had been raised from the Layout V7-8 stage, were considered in more detail at this stage. This was carried out at three key locations:

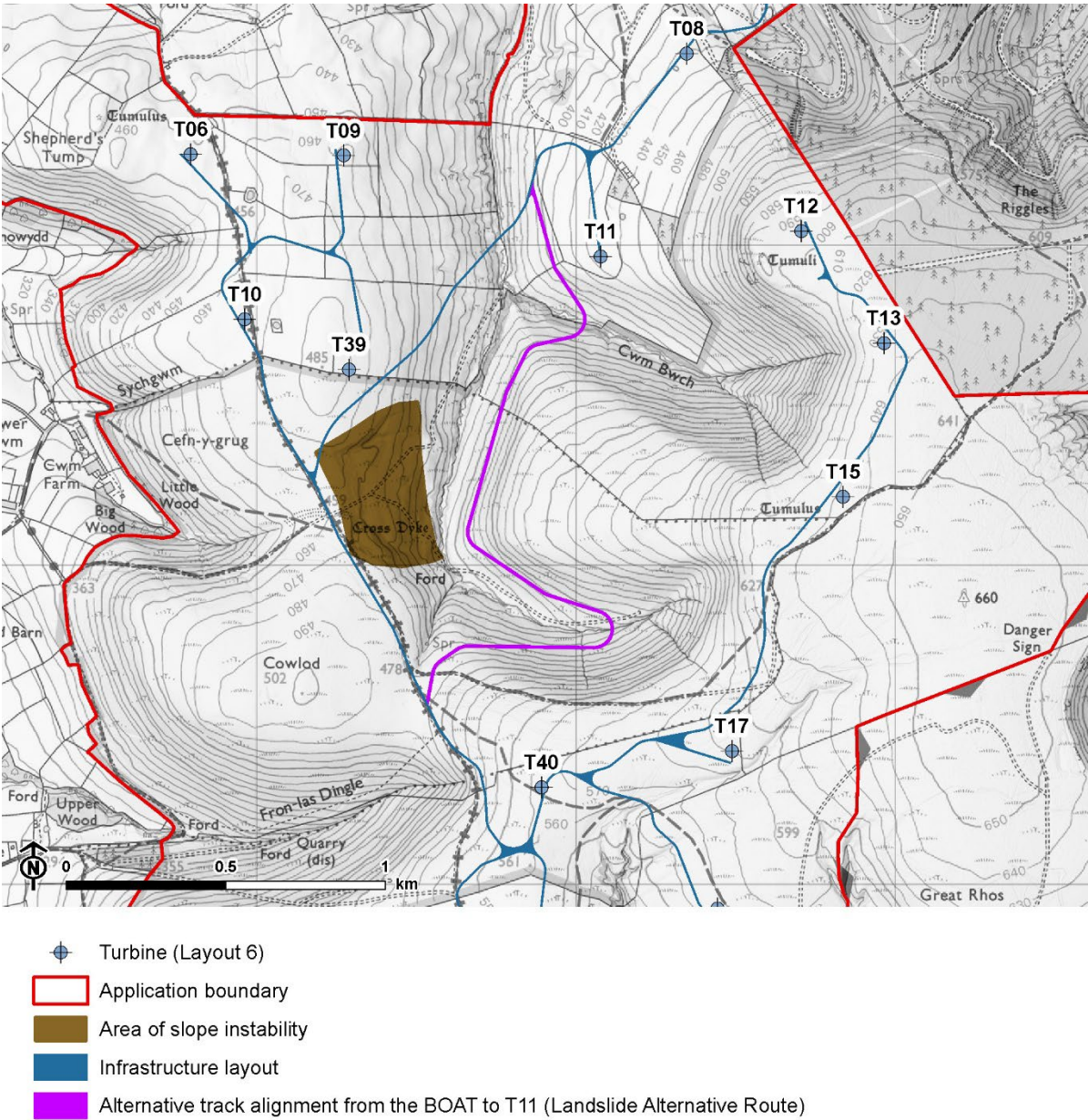
Around an area of slope instability between where the track spurs from the BOAT to T11:

3.35 Slope stability had been raised earlier in the design process as an area of previous landslide had been identified during an early site walkover, located near to the BOAT on the southern slope of the Maes Brook valley, opposite the southern arm of Cwm Bwch. **Insert 3.4** below shows the track layout near the landslide area. Turbine movements and their resulting infrastructure movements had relocated some track and a turbine closer to this area of historic landslide, therefore this required further investigation. At the same time, alternative track route options were also considered, crossing from the south of the Common Land and passing east of the watercourse as shown on **Insert 3.5**.

Insert 3.4: Track layout near the landslide area



Insert 3.5: Alternative track route options considered



3.36 The alternative track route options were discounted as they would have led to additional land take within the Common Land, required more earthworks, encroached on watercourse buffers and required two additional watercourse crossings.

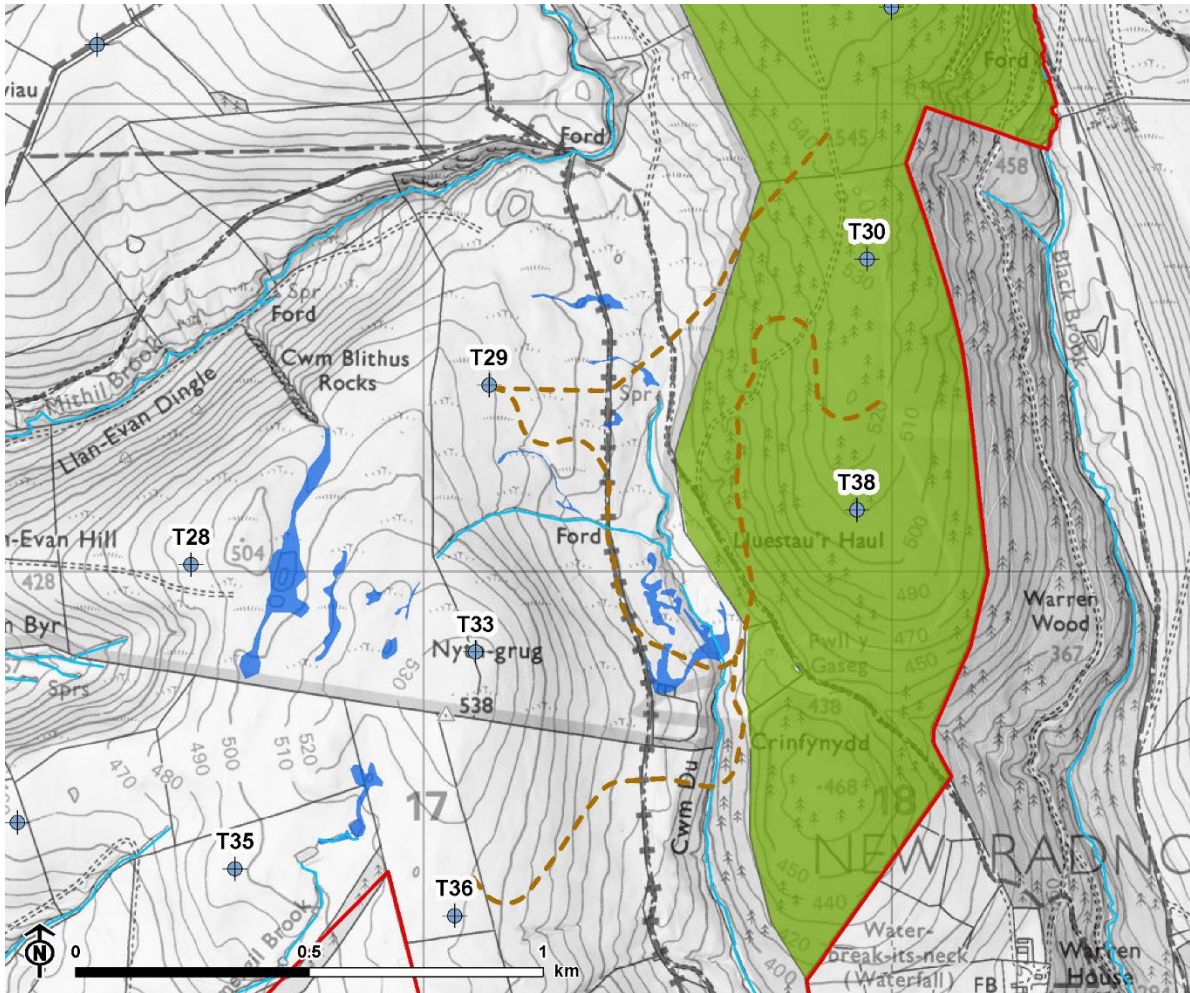
3.37 These reviews resulted in the track being moved westwards further up the slope to increase the distance between the track and the area of instability.

From T29/36 east towards T30/38:

3.38 At this part of the Site, specific constraints are the steep slopes going down to the watercourse Cwm Du (some greater than 30%), presence of peat, 100m badger sett buffers, the 500m no-disturbance ornithology buffer, presence of GWDTE and the Esgairnantau Forestry.

3.39 Four different routes were considered. These routes and constraints are shown on **Insert 3.6**. The final chosen route avoids peat and the need for a watercourse crossing and remains outside the nest buffer. However, due to the extent of GWDTE in this part of the Site, it was not possible to entirely avoid GWDTE. In addition, a small part of the track does fall within the 100m badger sett buffer. Additional mitigation measures relating to both GWDTE and badger are set out in the relevant chapters.

Insert 3.6: Route options considered from T29/36 east towards T30/38



- Application boundary
- ⊕ Turbine (Layout 6)
- Esgairnantau forestry
- Groundwater dependent terrestrial ecosystem
- Access track routes from T29/T36 east towards T30/T38 considered
- Watercourse

The site entrance in the south-western part of the Site:

3.40 Initially, the Site was proposed to be accessed from the south, off the A44 at the location marked A in **Insert 3.7** below. As the site design progressed and the substation location was confirmed, it was determined that location B would lead to reduced effects, including avoiding the Regionally Important Geodiversity Sites (RIGS), better visibility for traffic accessing and egressing from the A44, reduced earthworks and avoiding potential delivery impacts, including reducing potential for tree felling, on an offsite red kite nest and a listed milestone in the highway verge. However, location B does require the main site access track to cross a PRow and an underground electricity supply to a telecommunications mast.

3.41 Following a review of the route to the Site for the turbine component abnormal loads, a further option whereby the Site is accessed from the north was identified and the two site access options were named Site Access North and Site Access South. Location B as described above became Site Access South.

3.42 Two different options for Site Access North were reviewed, as shown as North-A and North-B on **Insert 3.8**). Constraints identified relating to North-A and North-B were a watercourse, peat (organic soil), topography and relative earthworks requirements, red kite nesting sites, a GCN pond buffer, a Private Water Supply, a post-medieval quarry and mature trees.

3.43 Option North-B was taken forward to the final design as Site Access North, to avoid an additional watercourse crossing being required and reduce earthworks requirements ('Steps 1 Avoid and 2 Minimise'). Option North-B also avoided peat and a post-medieval quarry. The removal of one mature tree is likely to be required, however the North-A option would have required the removal of several mature trees. Mitigation measures are set out in **Chapter 7: Ecology (non-avian)**.

3.44 At this stage, the abnormal loads for the Proposed Development could come from either the north or the south of the Site, therefore provision is made for two options for the site access junction off the A44 on the south-western edge of the Site. Whilst consent is being sought for both options, only one will be constructed.

3.45 In conclusion, Option North-B will be constructed if the abnormal loads come from the north and Site Access South will be constructed if the abnormal loads come from the south.

Insert 3.7: Site entrance options considered – Part 1

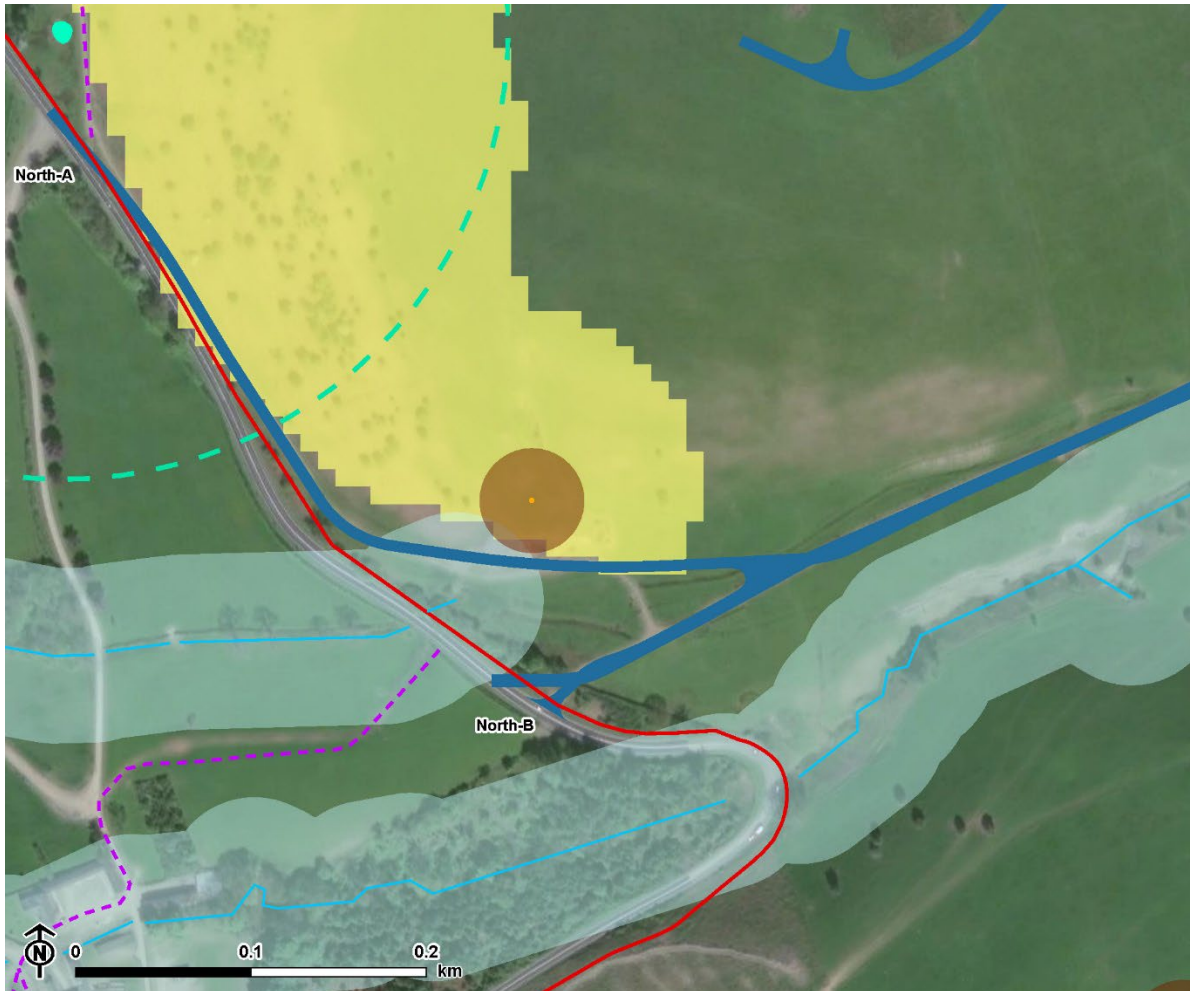


- Application boundary
- Turbine (Layout 6)
- Access Track
- Regionally Important Geodiversity Site
- Non-designated historic asset point
- Non-designated historic asset point - 30m buffer
- Grade 2 listed building
- Telecommunications mast
- Underground power supply to the telecommunications mast
- Surface water
- Public Rights of Way (Powys County Council)

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Insert 3.8: Site entrance options considered – Part 2



- Application boundary
- Turbine (Layout 6)
- Access Track
- Non-designated historic asset point - 30m buffer
- Non-designated historic asset point
- GCN pond
- GCN pond 250m buffer
- Surface water
- Surface water 50m buffer
- Public Rights of Way (Powys County Council)

EPG phase 1 and 1b 10m peat depth

- Interpolated peat depth (m)
- 0.00 - 0.30 (organic soil)

3.46 Constraints applied to layouts V2-8 continued to be considered. Supplementary data relating to the surveys carried out at this stage were added to the constraints. The key additional and final design objectives applied to these layout V9 and 10 iterations were:

■ Site Topography

- Site walkovers were carried out by both the engineering and the geology teams.
- A review onsite of area of previous landslide identified in a previous site visit and through review of aerial mapping. As a result, other parts of the Site with similar aspect and geology were also reviewed.

■ Peat

- Phase 2 peat probing was carried out.

■ Ornithology

- A review of the onsite route for cabling connecting the turbines to the onsite substation considered the buffer around the protected nest locations.

■ Ecology

- Bat buffers were further reviewed against the provisional Esgairnantau forestry felling proposals.

■ Noise

- Further review was undertaken relating to predicted noise levels at The Pods at The Warren to the south-east of the Site and to the properties closest to T2 and T3. The assessed height of the camping pod receptor was also amended to reflect that they do not have first floors.

■ Other Infrastructure

- The remaining temporary and permanent infrastructure required for the Proposed Development was incorporated into the layout. A review was carried out of the most suitable locations for the permanent anemometer mast and temporary construction compounds and borrow pits.

3.47 Consideration of these constraints resulted in some final modifications to the turbine and infrastructure layout including:

- Moving T13 east to increase the distance from the turbine base and the escarpment edge, to reduce the level of complex engineering solutions required for the foundations.
- As stated above, moving the track going to T11 westwards further up the slope to increase the distance between the track and the area of instability.
- T30, in the Esgairnantau forestry, was moved south, to enable the associated hardstanding to be moved out of an area of shallow peat.
- Whilst the 500m no-disturbance buffers for the protected nest locations was achieved for all turbines and infrastructure, it was concluded that, in the interest of reducing the total length of cable run where possible, a cable duct could be installed underground outside of the breeding season such that cables could be pulled through at the required stage of the construction programme.
- T24 was moved north to avoid the need to fell further Esgairnantau forestry to accommodate the bat buffer for a turbine not located within this forestry.
- T36 was moved north-west to increase the distance between this turbine and the Pods at the Warren. Any movement further west of this turbine was precluded by the oversail buffer to the Site boundary. This move also responded positively to a recommendation regarding ground stability to move this turbine north-west.
- T2 was moved south-east to further reduce noise levels at the property Graig.
- A permanent anemometer mast and associated permanent hardstand and temporary crane pad was added to the site layout to the west of T32. The technical wind speed and direction measurement requirements determined this was the only viable location within the site.
- In consideration of the construction methodology, both a temporary construction compound near the Site entrance and a satellite temporary construction compound further north within the Site were required. The location of both was determined through consideration of all constraints.

- Three borrow pit locations were identified following a desktop review of the potential for stone to be excavated, along with other environmental constraints. To reduce the overall temporary land take, it was determined that the satellite temporary construction compound could make use of a borrow pit location once the required stone had been extracted.

Environmental Effects and Interactions Following Design Modifications

GWDTEs and Water Course Buffers

3.48 It became clear over the course of these layout iterations that it would not be feasible to entirely avoid all provisional GWDTE 'buffers' (as described above) in areas surrounding T28, T29, T33, T35, T36 and their associated infrastructure and for the track to T27. The approach taken from this stage of the design process onwards was therefore to:

- Minimise interaction with the provisional buffers to the greatest extent feasible, considering the hydrological dynamics (e.g. flow paths) noted via the hydrological field survey; and
- Avoid any encroachment into the provisional GWDTE buffers where this would result in compromise to the GWDTE following mitigation.

3.49 Assessment has been presented of effects on GWDTEs in **Chapter 11: Hydrology, Hydrogeology and Geology** of the ES and associated appendices, considering detailed GWDTE characteristics and mitigation options.

Amendments to the layout following PAC

3.50 The following amendments were made to the layout following PAC:

- T27, its associated hardstanding and track was removed resulting in;
 - A reduced overall land-take of the Proposed Development because the red line boundary has been reduced as a result.
 - A reduction in visual impact and residential visual amenity impacts, where T27 was prominent in views.
 - Reduced impacts relating to the four watercourse crossings, of which two would have crossed GWDTE and well as habitat loss and noise effects.

- T25 was moved south-east within the 50m micro-siting allowance: as a result of Cadw's PAC response, moving T25 south-east retains the line of sight between the Shepherd's Tump round barrow and those at Cwm Bwch, thereby reducing the level of change to this key element of the setting of Shepherd's Tump round barrow.
- T28 and T29 were moved south within the micro-siting allowance to increase separation distances from residential properties to the north of these two turbines.
- The permanent met mast was removed as it was no longer required. This has resulted in a reduced overall land-take of the Proposed Development.
- The 50m cabling corridor between T20 and T26 was removed as a further review of the cabling strategy identified that this was no longer required. This has resulted in a reduced overall land-take of the Proposed Development.
- The 50m cabling corridor between T6 and T13 was moved east, so that the western edge of the cabling corridor runs alongside the BOAT and avoids an area of deeper peat to the west of the BOAT. This movement was informed via discussions with the Welsh Government's Land Quality Advice Service (LQAS).
- The substation was reconfigured from a 150m x 150m layout to a 75m x 130m layout (75m x 250m during construction) to optimise the configuration of the electrical equipment within the substation, resulting in a reduction in footprint of the substation by 3,750m² and associated earthworks.
- A temporary security cabin is to be placed at the Site entrance during the construction period.

3.51 Wind turbines were not re-numbered at this stage, so whilst the final layout has turbine numbering up to 31, the Proposed Development comprises a total of 30 wind turbines.

Design Conclusions

3.52 The final design for the Proposed Development is shown in **Figures 4.1a-h**.

3.53 The inherent nature of wind turbines as tall, modern structures means that the form of the Proposed Development as a whole is important, and a clear design strategy is necessary. The

overall aim of the design strategy was to create an energy park with a cohesive design that is sympathetic in form and scale to the surrounding landscape context, whilst achieving an appropriate balance between maximising renewable energy yield and minimising other environmental and technical effects.

3.54 The design of the Proposed Development has evolved over multiple iterations to achieve the best feasible balance of maximising renewable and low carbon energy generation benefits and other environmental effects.

3.55 It is considered that the final design presents the optimum design scenario in this respect. **Chapter 4: Project Description** sets out in detail the Proposed Development. Assessment of environmental effects is presented in the technical assessments in **Chapters 5-14** of this ES. The overall planning balance is provided in the **Planning Statement** submitted with the DNS application.



**Nant Mithil
Energy Park Limited**

Environmental Statement

Chapter 4: Project Description



Chapter 4

Project Description

Introduction

4.1 This chapter describes the components of the Proposed Development for which planning permission is being sought and which have been assessed through the Environmental Impact Assessment (EIA) process. It includes details about the construction, operation and decommissioning of the Proposed Development, and outlines measures proposed to mitigate effects on the environment during these stages.

4.2 This chapter is supported by the following figures which are included in **Volume 2**:

- **Figure 4.1a: Infrastructure Layout**
- **Figure 4.1b-h: Detailed Infrastructure Layout**
- **Figure 4.2: Indicative Wind Turbine Elevation**
- **Figure 4.3: Indicative Wind Turbine Foundation**
- **Figure 4.4: Indicative Crane Hardstanding and Laydown Areas Arrangement**
- **Figure 4.5: Indicative Cable Trench Details**
- **Figure 4.6a: Indicative Substation Layout**
- **Figure 4.6b: Indicative Substation Elevations**
- **Figure 4.7: Indicative Temporary Construction Compound Layout**
- **Figure 4.8: General Borrow Pit Arrangement**
- **Figure 4.9a: Site Access Arrangement (Northern Option)**
- **Figure 4.9b: Site Access Arrangement (Southern Option)**
- **Figure 4.10: Indicative Access Track Arrangement**
- **Figure 4.11: Indicative Watercourse Crossing**

- **Figure 4.12: Open Access Land and Pre-Assessed Area for Wind Energy**

- **Figure 4.13: Public Rights of Way and Infrastructure Layout**

4.3 This chapter is also supported by the following appendices which are included in **Volume 3**:

- **Appendix 4.1: Outline Borrow Pit Restoration Plan**

- **Appendix 4.2: Outline Construction Environmental Management Plan (CEMP)**

- **Appendix 4.3: Schedule of Mitigation and Monitoring**

- **Appendix 4.4: Outline Decommissioning Plan**

- **Appendix 7.10: Outline Habitat Management Plan and Net Benefits for Biodiversity Assessment**

- **Appendix 11.4: Outline Soil Management Plan**

- **Appendix 11.6: Preliminary Slope Stability Assessment**

- **Appendix 5.8: Aviation Lighting Impact Assessment**

- **Appendix 12.1: Aviation Lighting and Mitigation Report**

The Site and Surrounding Area

4.4 The Proposed Development is located within the local planning authority of Powys County Council (PCC), approximately 9 km east of Llandrindod Wells.

4.5 The Site covers an area of approximately 1773 hectares (ha) and consists of a mix of lowland pasture with hedgerows and open hill grazing used for commercial agriculture and commercial coniferous plantation. Several farmsteads and residential properties are located within the low areas to the north, west and south of the Site.

4.6 Part of the south-western Site boundary is formed by the A44 which runs in a north-west to south-east alignment. The A488 runs in a south-west to north-east direction to the north of the Site and forms a short stretch of the north-eastern Site boundary. These main roads provide access to numerous settlements/communities and residential properties, which are typically located in the lower-lying valleys surrounding the Site.

4.7 The Site is partially located within Pre-Assessed Area 4 for Wind Energy as defined in Future Wales: the National Plan, shown on **Figure 4.12**. The Site is part of a wider upland area known as Radnor Forest, forming a plateau up to 660 m Above Ordnance Datum (AOD) in height, which is the highest and most extensive range within the Radnorshire Hills. A large part of the Radnor Forest is a broad upland plateau, which has steep sides, and several distinct summits and ridges making up the wider complex of hills. The Site includes Great Rhos, which is the highest summit at 660 m AOD. It also includes several minor summits and ridges on the mountain's western flank and extends to the base of the mountain at approximately 250 m AOD near the settlement of Llandegley on the A44. These open hills are steep-sided, although parts of Radnor Forest Hills complex are now covered by coniferous plantation forestry.

4.8 There are several classes of open access land within, and adjacent to, the Site. These are shown on **Figure 4.12**. 'Cowlod Common', an area of Common Land, lies within the central western part of the Site. There is further Common Land adjacent to the Site's eastern and western boundaries. An area of 'Open Access' land covers the open hilltop at Great Rhos and the adjoining ridges running south of Cowlod Common and runs into the southern part of the Site, adjacent to Esgairnantau Forest. Immediately adjacent to the north-eastern and south-eastern Site boundary are areas of 'public dedicated forest'. The Site primarily comprises grade 4 and 5 agricultural land with the Esgairnantau forest classified as 'non-agricultural'. The majority of grade 3b land is situated in the western portion of the Site, where no infrastructure is proposed. There is a small area of grade 3b land within the central northern section of the Site. There is no Best and Most Versatile (BMV) land on the Site.

4.9 There are several Public Rights of Way (PRoW) that cross the Site, as shown on **Figure 2.1**. Many of these PRoWs connect the Site to the surrounding area, including to the numerous walking and trail routes around Radnor Forest, to the east of the Site. The PRoWs include the Heart of Wales Trail, a long-distance path which runs along the northern boundary of the Site and a network of footpaths, bridleways, byways and Byway Open to All Traffic (BOAT) that provide recreational opportunities across the Site.

Overview of the Development

4.10 As outlined in **Chapter 1: Introduction**, the main components of the operational Proposed Development are as follows:

- Up to 30 wind turbines each with a three-blade rotor;
- Two options for a new access junction off the highway;
- Crane hardstandings and adjacent laydown areas for each wind turbine location;
- Approximately 23.61 km of access tracks (of which approximately 21.81 km will be new track and 1.8 km will be upgraded existing track) including turning heads, passing places and associated ancillary engineering works;
- An electrical substation compound, consisting of a switching station, gantry, transformer area and control building;
- Onsite underground electrical cables connecting the wind turbines back to the energy park substation, laid in cable trenches alongside the access tracks or near existing tracks on Site;
- Watercourse crossings and associated infrastructure;
- Site signage, vehicle parking and security fencing; and,
- Biodiversity enhancement proposals.

4.11 In addition to the above components of the operational Proposed Development, construction of the Proposed Development will also require the following temporary components:

- Three temporary construction and storage compounds.
- The creation of up to three temporary borrow pits for the extraction of stone (subject to detailed site investigation). The northernmost temporary borrow pit will be used as a secondary temporary construction compound following extraction.
- The temporary diversion or temporary closure of a number of Public Rights of Way (PRoW) that cross through the Site.

- A temporary security cabin at the Site entrance.

4.12 The detailed layout of the Proposed Development, including the temporary construction compounds and borrow pits, is shown in **Figures 4.1a-h**. Each component of the Proposed Development is described in further detail later in this chapter with supporting figures.

4.13 The wind turbines will have a maximum blade tip height of 220 m (for three wind turbines), 205 m (for 24 wind turbines) and 180 m (for three wind turbines). Tip heights for each wind turbine by number are shown in **Table 4.1** below.

4.14 Following statutory Pre-Application Consultation (PAC), T27 was removed. However turbines were not re-numbered, therefore there is no T27 in the application as submitted (hence it is omitted from **Table 4.1**). Further detail is provided in **Chapter 3: Site Selection and Design Strategy**.

4.15 The indicative output capacity of the Proposed Development at this stage is 198 MW. However, this capacity may vary subject to the final wind turbine model chosen¹.

4.16 **Table 4.1** provides the coordinates and tip heights for the proposed wind turbines.

Table 4.1 Proposed wind turbine locations and tip heights

Wind Turbine Number	Easting	Northing	Tip Height (m)
1	316131	260465	205
2	316596	260366	205
3	317056	260242	205
4	317108	260686	205
5	316502	261016	205

¹ The wind turbine to be used will be subject to a tendering process if the application receives consent. This means that output capacity could change from that currently envisaged based on current market options, however the wind turbine selected would need to fall within the parameters for which consent is granted and as assessed in this ES.

Wind Turbine Number	Easting	Northing	Tip Height (m)
6	317124	261358	205
7	317925	261133	205
8	317947	261649	205
9	317999	262207	205
10	317682	262578	205
11	317438	262920	205
12	316291	262164	205
13	316867	262430	205
14	316224	262791	205
15	316862	262885	205
16	316931	263317	205
17	317470	263410	205
18	317778	264231	205
19	317990	264586	205
20	317704	265046	205
21	315891	264810	205
22	316311	264691	205
23	315793	265286	205

Wind Turbine Number	Easting	Northing	Tip Height (m)
24	316271	265282	205
25	317051	264983	220
26	317341	265575	220
28	317424	266259	220
29	317116	266614	180
30	317890	266951	180
31	318443	267407	180

The Proposed Development Components

Wind Turbines

4.17 Planning permission is being sought for the installation and operation of 30, three bladed horizontal axis wind turbines. Wind turbines will have maximum tip heights of 220 m/205 m/180 m, rotor diameter of 163 m/155 m/155 m, and hub heights of 145.5 m/130.5 m/113.5 m (relative to tip height). It should be noted that the final chosen wind turbine may be different depending on the technology available at the time of construction, however 220 m/205 m/180 m will be the maximum proposed tip height of the wind turbines (as set out in **Table 4.1**).

4.18 Maximum parameters for each component for each proposed wind turbine tip height are set out in **Table 4.2**. These are the maximum parameters that have been assessed and reported within this ES.

Table 4.2 Maximum wind turbine component parameters

Wind Turbine Numbers	Tip Height (m)	Rotor Diameter (m)	Blade Length (m)	Hub Height (m)
T25 / T26 / T28	220	163	79.7	145.5
T1 to T24	205	155	76	130.5
T29 / T30 / T31	180	155	76	113.5

4.19 The wind turbine will consist of a tapered tubular steel tower, composite (typically fiberglass infusion and carbon pultruded-moulded) blades, and a nodular cast iron rotor hub. Dimensions of the indicative wind turbines are illustrated in **Figure 4.2**.

4.20 The 220 m and 205 m to tip wind turbines (wind turbines number 1 to 24 and wind turbine numbers 25, 26 and 28 respectively) require a 50 m clearance above ground level for the blade tip for mitigation for red kite. See **Chapter 8: Ornithology**.

Aviation Warning Lighting

4.21 As the Proposed Development's wind turbines will exceed 150 m height to blade tip, they will need to be lit in accordance with the requirements of the Civil Aviation Authority's (CAA) Air Navigation Order (ANO), in addition to meeting the lighting requirements of the Ministry of Defence (MOD). It is proposed that wind turbines T1, T3, T5, T7, T9, T12, T14, T17, T19, T22, T23, T26, T29 and T31 on the perimeter of the Site are provided with 2000/200 candela (cd) lights at hub height, in line with ANO lighting proposals accepted by the CAA. Additional infra-red (IR) lighting is also proposed on all wind turbines to satisfy the MOD requirements.

4.22 Based on meteorological data obtained for the last 30 years at the closest meteorological station (Cardiff Airport), it is expected that the lights will operate at 200 cd for approximately 88% of the time when not obscured by cloud cover. It should also be noted that the luminous intensity of lights mounted on the wind turbine nacelle reduces at vertical angles below the horizontal plane. This results in a reduction in light emitted by the light source below a 0° vertical angle. That is to say, the light will appear less bright to an observer looking up at the

nacelle from below, than it will to an observer at the same elevation as the nacelle. Full details of the proposed lighting scheme and its rationale is provided in **Appendix 12.1**, alongside an assessment of its impacts in **Appendix 5.8**.

Wind Turbine Foundations and Crane Hardstandings and Laydown Area

4.23 The wind turbines will be installed on foundations comprising both stone and steel-reinforced concrete. These typically measure 25 m in diameter in plan with a concrete depth of 3.5 m and overlay of depth approximately 0.5 m (see **Figure 4.3**). Each wind turbine will require approximately 1,720 cubic metres (m³) of concrete. The detailed design, sizing and specification for each foundation will depend on the final wind turbine type and the specific ground conditions encountered at each wind turbine location.

4.24 Adjacent to each wind turbine, an area of permanent hardstanding approximately 1,045 m² in area (50 m x 20 m + 15 m x 3 m) will be constructed for use as a crane hardstanding and laydown area. These hardstandings will be used during the erection process as a platform for the cranes to lift the wind turbine components into position. During operation, the hardstanding provides safe access for maintenance or repairs which may also require the use of a crane.

4.25 The exact geometry and position of the crane hardstanding and laydown areas will depend on the wind turbine supplier's standard procedures and the specific crane selected for erection. These areas will be levelled using cut and fill operations and surfaced in crushed stone to provide a durable surface. An indicative crane hardstanding and laydown area arrangement is shown in **Figure 4.4**.

Grid Connection, Transformers and Cables

4.26 A transformer will be required for each wind turbine. It is assumed that the wind turbine type selected will have the electrical transformers located within the wind turbines. The wind turbine transformers will increase the electrical voltage to 33 kilovolts (kV).

4.27 All 33kV wind farm cable arrays will be connected to the control building within the onsite substation via underground high voltage (HV) 33 kV cables. These will be laid in trenches that

generally run alongside the access tracks with an earth and fibre optic cable. Indicative cable trench details are provided in **Figure 4.5**.

4.28 There is one location where cabling will potentially depart from the proposed internal access tracks – between T6 and T13 (see **Figure 4.1c**). The decision to route the section of cable between T6 and T13 broadly adjacent to the BOAT allows for a more direct connection between these two wind turbines, reducing the amount of resources used (i.e. length of cabling) and improving the long-term operational performance of the energy park.

4.29 The Proposed Development will connect to the national electricity network. Nant Mithil Energy Park Ltd holds a grid connection agreement with Green GEN Cymru (GGC), an Independent Distribution Network Operator (IDNO), for capacity on their proposed Green GEN Towy-Usk project. The connection point to GGC's network will be located at the Nant Mithil Energy Park site substation.

4.30 From this substation, GGC plans to install a 132kV wooden-pole overhead line to integrate with their wider proposed network. It is important to note that this grid connection infrastructure does not form part of the Proposed Development and will be addressed through a separate planning application. However, a high-level assessment of the grid connection is provided in **Appendix 4.5: High-level Grid Connection Appraisal**.

4.31 A Supervisory Control and Data Acquisition (SCADA) system will be installed to gather information from individual wind turbines and provide the ability to control them from a central location. A fibre optic communications cable will run alongside the power cables to link the wind turbines to the SCADA system.

Substation, Switching Station and Control Building

4.32 The operational substation compound will measure up to 75 m x 130 m and will be surrounded by an earthed palisade fence, painted in a colour that assimilates into the winter colours found in the landscape on the Site (using the Natural Colour System), as agreed with PCC. It will contain a Control and Operations Building and electrical equipment, including switchgear, Reactive Compensation units, transformers, communications equipment, protection equipment, vehicular access and parking. The Control and Operations building will also contain toilets, office, welfare and a storeroom. A temporary compound of 120 m x 75 m will also adjoin

the operational substation during construction as shown in **Figure 4.6a**. An indicative plan and typical elevation of the compound and building proposed is shown in **Figures 4.6a and b**.

4.33 Rainwater will be collected from the roof of the building, with excess discharged locally via a Sustainable Drainage System (SuDS) (subject to approval from the SuDS Approving Body (SAB)). Waste will be held in a closed system and removed by a licensed contractor at regular intervals. The control building will be finished in materials to be agreed with the PCC as the Local Planning Authority. The location of the substation compound in relation to the Site is shown in **Figures 4.1a and 4.1b**.

Temporary Construction Compounds and Security Cabin

4.34 Three temporary construction compounds are proposed to accommodate facilities including site offices and meeting rooms, staff welfare, storage for construction vehicles, plant, equipment, infrastructure components and other materials. The main construction compound measures 100 m x 100 m and its location in relation to the Site is shown in **Figures 4.1a and 4.1b**. The satellite construction compound could measure up to 100 m x 100 m and its location in relation to the Site is shown in **Figures 4.1a and 4.1e**. This satellite construction compound will be on the location of borrow pit 3 (the most northerly borrow pit), once the stone has been removed from this location. A compound of 120 m x 75 m will also adjoin the operational substation during construction as shown in **Figure 4.6a**.

4.35 An indicative plan of the construction compounds is shown in **Figure 4.7**. The compound sites and borrow pits will be restored once construction is complete and the wind turbines are operational. The restoration will be based on the principles outlined in **Appendix 4.1** and **Appendix 4.2**.

4.36 A temporary security cabin is proposed at whichever Site entrance is implemented, to monitor, control and record the access and egress of vehicles and personnel onto and off the Site during construction of the Proposed Development, shown in **Figure 4.1a**.

Borrow Pits, Stone, Concrete, Sand and Steel Volumes

4.37 To reduce the volume of stone brought onto the Site from another location for construction of the Proposed Development, and any other associated environmental effects,

suitable stone will be sourced from borrow pits, if feasible, to provide the material necessary for new or upgraded tracks and hardstanding construction. The general arrangement of a borrow pit is shown in greater detail in **Figure 4.8**.

4.38 At this stage, prior to ground investigations, three borrow pit search areas have been identified, as shown in **Figure 4.1a** and **Figures 4.1b-g** (named, from south to north, borrow pit 1, 2 and 3). These have been selected on the basis of desktop assessments, and influenced by the likely availability of stone, proximity to access tracks and by onsite environmental characteristics, including topography, soil/peat depth/stability, surface hydrology and potential visibility from surrounding areas, and which will allow restoration measures to be put in place as appropriate. The final size of the borrow pits will be confirmed following detailed ground investigation, but it is not expected that these areas will be utilised fully.

4.39 The three borrow pit search areas allow for flexibility in the event that some areas are rendered unsuitable, or the quality of stone is inadequate for construction purposes.

4.40 For the purpose of the assessment in **Chapter 10: Access, Traffic and Transport**, it is assumed that 50% of all aggregate required for construction will be imported to the Site as a worst-case.

4.41 Stone, fill, concrete, sand and steel volume requirements include:

- 31,575 m³ of aggregate for capping for access tracks;
- 13,275 m³ of aggregate for capping for the substation and construction compounds;
- 84,557 m³ of 6N structural fill for the wind turbine bases;
- 56,705 m³ of concrete;
- 8,525 m³ of sand for cable trenches; and
- 7,758 tonnes (t) of steel.

4.42 As a worst-case in terms of vehicle movements, the assessment of effects on access, traffic and transport assumes that all the concrete required for the Proposed Development will be imported to Site. The volume of concrete required for the construction of the wind turbine foundations is estimated to be 1,720 m³ per wind turbine (or an estimated total of 51,600m³ for

the 30 wind turbines), with an additional 300m³ being required for the substation control building.

4.43 Onsite batching of concrete may be required. Whilst this has not been applied to the assessment in **Chapter 10**, as it would not represent the worst-case, other topics have considered this activity in their assessments as a worst-case scenario where relevant. Should batching take place, this will be undertaken in the borrow pit search areas meaning no additional land take will be required.

4.44 Once construction is complete, if implemented, the borrow pits will be restored and redressed with topsoil in sympathy with the adjacent landforms. The general approach to the restoration of borrow pits is outlined in **Appendix 4.1**. Borrow pits will be restored within one year of operation of the energy park.

Access from the Public Road Network

4.45 At this stage, the abnormal loads for the Proposed Development could come from either the north or the south of the Site, therefore provision is made for two options for the site access junction off the A44 on the south-western edge of the Site. Whilst consent is being sought for both options, only one will be constructed (it is anticipated that this will be controlled by a suitably worded planning condition). These two options are shown on **Figures 4.9a and b**.

4.46 The new site access junction will provide the sole access to the Site for abnormal loads associated with the wind turbine equipment, as well as access for construction materials and ongoing operational traffic. The route from Port of Entry to the Site for the abnormal loads does not form part of this DNS application.

4.47 In order that the assessments of both construction and operational impacts fully consider these two options, the following approach has been taken:

- For assessment requiring consideration of land take, the Northern option has been used for land take calculations as this will require the greater amount of land;
- For permanent track length, the Northern option has been utilised, as it is longer;

- For the technical chapter assessments, both have been considered with regards their potential adverse impact on receptors, with the conclusion on overall impacts noting that only one will be constructed; and,
- For LVIA, a photomontage has been prepared which shows the southern option, as this is considered to be more visible from the highway and will include a view of the substation, although the LVIA assessment also considers impact of the northern access.

4.48 Details of the proposed vehicle movements during construction and operation of the Proposed Development are provided in **Chapter 10**.

4.49 A Construction Traffic Management Plan (CTMP), a framework of which is available within **Chapter 10**, secured via a suitably worded planning condition, will be implemented to reduce disturbance on the local road network. The CTMP will also contain details of temporary measures, such as signage, to be put in place on the approach to the Site to ensure the safe access and egress of construction vehicles from and onto the road network.

Onsite Access Tracks

4.50 In total, approximately 23.61 km of track will be required for the Proposed Development. Approximately 21.81 km of new track will be constructed and 1.8 km of existing track will be upgraded for the Proposed Development, as shown in **Figures 4.1a-h**. The nominal running width will be approximately 5.5 m and existing tracks will be upgraded to this width (approximately a 2.5 m increase in width). Track widths may be wider in some sections to accommodate bends in the track alignment and to include passing bays. An indicative access track arrangement is shown in **Figure 4.10**.

4.51 Up to 14 turning heads will be installed at appropriate locations to accommodate empty abnormal load turning and there are up to 130 passing places located throughout the Site for safe vehicular access and egress (no passing places will be within the Common Land). Adjacent to the track will be an assumed 3 m verge for cabling on one side alongside a 3 m verge to accommodate appropriate drainage on the other, which is subject to approval from the SuDS Approving Body (SAB). If both the cabling and drainage are located on the same side of the access track then a 10 m verge on one side will be required. Clean water cut-off drains are proposed at the upslope edge of the site access tracks. Intermittent cross drainage will allow

runoff to flow from upslope to the downslope locations, maintaining the existing hydrological regime. Across areas of longitudinal fall, drainage channels will be stopped off intermittently to maintain the existing hydrological regime and limit stream power within each channel.

4.52 Site tracks are required throughout the operational phase of the Proposed Development to permit access for maintenance and repair operations. They will also allow access during the decommissioning stage.

4.53 Generally, the sloping verges of access tracks will be reinstated through re-seeding with locally occurring species, top-soil reuse and/or turf replacement to blend in with the surroundings. Measures such as grass-reinforcement may be applied where the track widens on steeper bends and in passing places if suitable material is generated during the construction of the track. The adjacent grassland will be allowed to extend across the edges and middle, reducing the extent of the visibility of tracks in the landscape. The engineered appearance of any embankments will be smoothed out to ensure any landforms blend in with topography.

4.54 2.62 km of new access track is required within the area of Common Land. Adjacent to the track will be an assumed 10 m verge for cabling and drainage on one side of the track. The drainage verge will be subject to approval from the SuDS Approving Body (SAB).

4.55 Any hedgerows that are lost as a result of the Proposed Development will be replaced (see Appendix 7.10 Outline Habitat Management Plan).

Watercourse Crossings

4.56 To access the wind turbines and associated infrastructure, there are 8 watercourse crossings proposed where the access tracks and/or cable cross a stream, a dry gulley that could represent a flow path during times of heavy rainfall, or a narrow crossing of a groundwater dependent terrestrial ecosystem (GWDTE). Watercourse crossings will be designed to maintain, and not reduce, the existing capacity of the channels. Further information on watercourse crossings is provided in **Appendix 11.2: Outline Surface Water Drainage Strategy**. Indicative watercourse crossing plans are provided in **Figure 4.11**. Small crossings (<2 m wide) will generally be pipe culverts with a concrete surround, whilst larger crossings (>2 m wide) will be bottomless culverts with concrete stays on a natural bed material.

4.57 Detailed design and sizing of watercourse crossings will be undertaken in line with relevant good practice following consent, to be agreed with and approved by PCC and Natural Resources Wales (NRW) prior to construction.

Micrositing

4.58 It is proposed that the wind turbines and other infrastructure will be subject to a standard 50 m micrositing allowance, which will be applied should adverse ground conditions be encountered during pre-construction ground investigations, or where more optimal ground conditions are available. Any movement of infrastructure will be dependent on other onsite constraints (including topography and slope stability) and subject to advice from an Environmental and Ecological Clerks of Works (ECoW) and Archaeological Clerk of Works (ACoW). Tailored restrictions to the standard micrositing allowance are proposed to ensure that the final position of the wind turbines and associated infrastructure are not varied to such a degree as to cause a notable change in the predicted environmental effects outlined in the ES. These restrictions are detailed in **Table 4.2**.

Table 4.3 Micrositing restrictions

Infrastructure Component	Justification for Micrositing Restriction
T1	Any movement east needs to consider the presence of a pond and maintain suitable buffers.
T2	Any movement east needs to consider the presence of a pond and maintain suitable buffers.
T3	Any movement west needs to consider the presence of a pond and maintain suitable buffers.
T4	Any movement west for this wind turbine, as well as its associated hardstanding, needs to avoid direct effects to Nyth-grug cairn (PRN6832).

Infrastructure Component	Justification for Micrositing Restriction
T5	Any movement east needs to consider the presence of a pond and ground water dependent terrestrial ecosystem (GWDTE) and maintain suitable buffers. In addition, any movement east or south-west needs to consider the presence of peat.
T6	Any movement north needs to consider the potential presence of nesting birds and maintain a suitable buffer, subject to pre-construction survey. Any movement south needs to consider the presence of GWDTE and maintain suitable buffers.
T7	Any movement north-west needs to consider the presence of peat deposits.
T8	Any movement north-west or south-east needs to consider the presence of peat deposits. Any movement west needs to consider the potential presence of nesting birds and maintain a suitable buffer, subject to pre-construction survey.
T9	Any movement east needs to consider protected species buffers, subject to pre-construction survey and any movement north, south or west needs to consider the presence of peat deposits. Any movement west needs to consider the potential presence of nesting birds and maintain a suitable buffer, subject to pre-construction survey.
T10	Any movement east, south, south-east or south-west needs to maintain a required bat buffer around forestry, subject to pre-construction habitat survey.
T11	No movement south-west in order to maintain the required watercourse buffer and no movement north-east to maintain the required separation distance from the Site of Special Scientific Interest (SSSI).

Infrastructure Component	Justification for Micrositing Restriction
T12	Any movement north or west needs to maintain a required bat buffer around forestry, subject to pre-construction habitat survey. In addition, any movement north or west needs to consider the presence of a pond and maintain suitable buffers. Any movement further than 9 m north-west is prevented due to the presence of an Airwave telecommunications link.
T13	Any movement south needs to consider the potential presence of nesting birds and maintain a suitable buffer, subject to pre-construction survey.
T14	None required.
T15	None required.
T16	Any movement north-east needs to consider the presence of peat deposits.
T17	No movement east or south to maintain the required separation distance from the Site of SSSI. In addition, the presence of an ephemeral drainage channel prevents any movement south.
T18	No movement of wind turbine and associated access track south between NGR317587 263960 and NGR317779 264203 to avoid encroachment into the setting of Great Rhos round barrow (Scheduled monument RD254). Any movement further north than 32 m is prevented due to the presence of a BT telecommunications link. Any movement north-west needs to consider the presence of a watercourse and maintain a suitable buffer.
T19	Any movement to the east, north-east, or north needs to maintain a required bat buffer around forestry, subject to pre-construction habitat survey. Any movement west or north-west needs to consider the existing watercourse and maintain a suitable buffer and any movement east needs to consider nightjar habitat.

Infrastructure Component	Justification for Micrositing Restriction
T20	Movement in any direction of this wind turbine, including its hardstanding, needs to avoid further encroachment into the setting of Cwm Bwch round barrow pair (scheduled monument RD255). Any movement to the east, north-east or north needs to maintain a required bat buffer around forestry, subject to pre-construction habitat survey and any movement east needs to consider nightjar habitat. Any movement more than 30 m north-east is prevented by a MBNL telecommunications link.
T21	Movement in any direction of T21-T24 must consider the need to retain sightlines between the designated historic assets: Shepherd's Tump Round Barrow (RD253) and the Cwm Bwch round barrow pair (scheduled monument RD255). In addition, any movement east or south-east needs to also consider the presence of a pond and maintain suitable buffers.
T22	Movement in any direction of T21-T24 must consider the need to retain sightlines between the designated historic assets: Shepherd's Tump Round Barrow (RD253) and the Cwm Bwch round barrow pair (scheduled monument RD255). In addition, any movement west needs to also consider the presence of a pond and maintain suitable buffers.
T23	Movement in any direction of T21-T24 must consider the need to retain sightlines between the designated historic assets: Shepherd's Tump Round Barrow (RD253) and the Cwm Bwch round barrow pair (scheduled monument RD255). In addition, any movement east needs to also consider the presence of a pond and maintain suitable buffers.
T24	Movement in any direction of T21-T24 must consider the need to retain sightlines between the designated historic assets: Shepherd's Tump Round Barrow (RD253), Great Rhos Barrow (RD253) and the Cwm Bwch round

Infrastructure Component	Justification for Micrositing Restriction
	barrow pair (RD255). In addition, any movement north-west must consider the location of a Private Water Supply and retain the appropriate buffer.
T25	Micrositing to the north east is limited to minimise the impacts of this turbine on the line of sight between SAMs in response to Cadw consultation comments. Any movement north or east needs to maintain a required bat buffer around forestry, subject to pre-construction habitat survey. In addition, any movement east needs to also consider the presence of a pond and maintain suitable buffers.
T26	Any movement north or east needs to maintain a required bat buffer around forestry, subject to pre-construction habitat survey and also consider buffers for protected species, also to be informed by pre-construction survey. In addition, any movement east needs to consider nightjar habitat.
T28	Following PAC, T28 was relocated southwards within its micrositing allowance as such micrositing to the north is now restricted. Any movement north or east needs to maintain a required bat buffer around forestry, subject to pre-construction habitat survey, and any movement east needs to consider nightjar habitat. Any movement of this wind turbine, its hardstanding and the access track to the south-west needs to avoid direct physical effects to a non-designated historic asset located at NGR317360 266240.
T29	This wind turbine was moved south within the micrositing allowance following PAC, therefore no further movement south can be made. Any movement west needs to consider the presence of a pond and maintain suitable buffers.

Infrastructure Component	Justification for Micrositing Restriction
T30	Any movement south needs to maintain a required bat buffer around forestry, subject to pre-construction habitat survey and also needs to consider nightjar habitat. In addition, any movement north needs to consider the presence of a pond and maintain suitable buffers.
T31	Any movement south or east needs to maintain a required bat buffer around forestry, subject to pre-construction habitat survey and also needs to consider nightjar habitat. In addition, any movement east needs to consider the presence of a pond and maintain a suitable buffer.
Substation	The substation was realigned following PAC. Notwithstanding this, any movement west must consider the location of a Private Water Supply (PWS).
Temporary Construction Compound	Temporary Compound 1: Any movement north needs to consider the presence of a pond and maintain suitable buffers and any movement north-east must consider the presence of GWDTE.
Borrow Pits	Borrow Pit 1: Any movement north-west must consider the watercourse and associated buffer. Borrow Pit 2: None required. Borrow Pit 3 (also temporary construction compound 2): Any movement north-east needs to consider the location of T26.
Access Tracks	Micrositing allowance is removed for sections of the access tracks to avoid additional direct physical effects to non-designated historic assets, as follows: ■ To the north-west of T16 and south of T21 between NGR316562 263503 and NGR316525 263575;

Infrastructure Component	Justification for Micrositing Restriction
	■ To the south of T21 between NGR316226 264156 and NGR316213 264187; and ■ To the north of T08 between NGR317888 261833 and NGR317861 262019. Micrositing allowance is reduced to 10 m for sections of the access tracks to avoid additional direct physical effects to non-designated historic assets, as follows: ■ To the south of the substation between NGR316173 259725 and NGR316206 259784; ■ To the east of T06 between NGR317423 261369 and NGR317512 261490; and ■ For the access track to and hardstanding of T28 to avoid direct physical effects to a non-designated historic asset located at NGR317360 266240. Micrositing restrictions are placed on sections of the access tracks for hydrology, geology and peat considerations, as follows: ■ South-east of T22 – no movement south-east due to potential slope stability considerations and landslide. ■ From T5 to T6 – any movement west or east must consider GWDTEs. ■ East of T6 – any movement south where crossing watercourse must consider proximity to the spring and PWS. ■ T15/T16 towards T21 – any movement west around NGR 36712 263333 must consider steep slopes and any movement east must consider the spring. ■ East of T30 – any movement east must consider proximity to the water feature.

Infrastructure Component	Justification for Micrositing Restriction
	Micrositing restrictions are placed on sections of the access tracks for SSSI considerations, as follows: ■ Moving the track east between T17 and T18 to avoid direct impact on the SSSI.
Cabling	Along the section of the 50m cable corridor route between T06 and where the cable corridor route meets the BOAT, the final location of the cable must avoid localised peat deposits in the vicinity of these two locations: NGR 317387261584 and NGR 317366261522.

4.59 Beyond the identified micrositing allowance and restrictions, any relocation of components will require written approval from PCC as the Local Planning Authority in consultation with statutory consultees, via a formal non-material amendment or variation to the application.

Construction and Reinstatement Details

4.60 The construction phase of the Proposed Development will consist of the following principal activities. Where relevant, reinstatement activities related to these construction elements are also described in this section:

- The working of borrow pits (as required);
- The upgrading/creation of the site access point and bellmouth, site access tracks, including passing places, turning heads, junctions, water crossings and drainage;
- Construction of temporary compounds;
- Construction of the onsite substation;

- Construction of wind turbine foundations at each wind turbine location; Excavation of trenches for drainage and the laying of electrical cable adjacent to the access tracks connecting the wind turbines to the onsite substation;
- Excavation of trenches and laying of electrical cable in one additional location not adjacent to the access tracks, between T06 and T13, if required;
- Construction of crane hardstandings and laydown/storage adjacent to each wind turbine;
- Delivery and erection of wind turbines (including installation of aviation warning lights);
- Testing and commissioning of site equipment including wind turbines;
- Installation of any signage or other items delivered through the Strategic Recreation Framework; and,
- Site restoration and implementation of the Habitat Management Plan.

General Approach to Reinstatement

4.61 Following construction, the Site will be reinstated by the contractor. The anticipated type and extent of reinstatement is outlined below:

- Where a re-turfing method is appropriate, such as along track verges, the surface layer of soil and vegetation will be stripped and stored separately from the lower soil layers and replaced as intact as possible once construction is complete;
- Local reinstatement will be carried out to retain the structure and composition of the original plant communities, as well as forming a stable area over reformed ground, thus reducing erosion by rain, run-off and wind; and,
- Bare soil areas will be allowed to revegetate naturally in combination with reseedling using a low-density seed mix which mirrors local vegetation to help bind the soil more quickly.

Working of Borrow Pits

4.62 Excavation of material from borrow pits will be carried out using standard quarrying techniques, which may include blasting and mechanical excavation. All blasting work will be undertaken by a specialist contractor who will assume responsibility for blast design and

implementation. The extent of any blasting requirement, however, cannot be determined until intrusive site investigations are completed.

4.63 As stated above, the satellite construction compound will be on the location of the third borrow pit, once the stone has been removed from this location.

4.64 Once construction is complete, borrow pits implemented during construction will be made safe before operation of the Proposed Development. The general approach to this is outlined in **Appendix 4.1**.

Construction and Upgrading of Site Access Point and Tracks

4.65 As the track and infrastructure design has minimal overlap with peat (see **Chapter 11: Hydrology, Hydrogeology and Geology**), a cut track design is proposed for new tracks and will be achieved by excavating through to a suitable formation. During construction, vegetation, topsoil and subsoil will be placed to the sides of the tracks. On overburden soil, suitably graded capping material up to 400 mm will be applied to form tracks and additional material will be applied where deemed necessary by the contractor. On rock, suitably graded running layer of a minimum thickness of 150 mm will be applied. The total track depth will depend on the strength of the base formation and upon the gradient of the slope being traversed. Where existing tracks require upgrading this will be undertaken by localised widening (assumes up to 2.5 m).

4.66 Drainage verges will be constructed alongside the access tracks subject to approval from the SAB. Surplus soil will be placed and dressed alongside the track to blend in with the surrounding landscape and topsoil will then be placed on the track shoulders and seeded to promote revegetation. Final track drainage design will be determined prior to the commencement of construction of the relevant track section.

Construction of Temporary Construction Compounds

4.67 The construction compounds will be formed by stripping organic and soft surface material and laying geotextile and crushed rock to create a firm regular surface. CCTV will be installed within the construction compounds as required and the perimeter secured by a temporary 2 m high security fence.

4.68 The temporary construction compounds will be restored once construction is complete and the wind turbines are operational.

Construction of Onsite Substation

4.69 The substation site will be prepared through vegetation clearance and initial civil works to level and prepare the development platform. This will include a temporary construction compound area in addition to the substation component areas of:

- Control and Operation Building;
- Air Insulated Switchgear (AIS) area;
- STATCOM areas;
- auxiliary transformers;
- main 33/132 kV transformer bays;
- emergency diesel generator area; and
- associated substation car parking and hard standing areas.

4.70 The ground floor of the Control and Operations Building will consist of a ground bearing slab and will incorporate ducts and trenches for the entry and exit of electrical cables. The Control and Operations Building will house operational and welfare facilities to allow safe control of the substation and energy park site either remotely or in person and will be a single storey structure, the finish of which will be subject to agreement with PCC under a planning condition.

4.71 The outdoor AIS and transformer areas will be excavated to approximately 1,000 mm to allow concrete cable ducts and foundations for AIS equipment (busbars, circuit breakers and similar) to be installed. Depending on site access and local material availability, these can be pre-cast and brought to site or poured in-situ. Concrete plinths for the transformers and STATCOMs will be constructed in accordance with their ground-bearing requirements with bunds up to 500 mm from ground level added to capture any potential oil spill in operation. Below the transformer bund areas, oil dump tanks are installed to ensure a catastrophic failure (where a transformer loses all of its oil) is fully captured and no harm to the environment occurs.

4.72 Auxiliary transformers and a back-up diesel generator are installed on bunded concrete plinths in separate areas. The diesel generator ensures continuity of supply to the substation control systems in the event of grid failure.

4.73 A 2.5 m high earthed palisade security fence will be installed around the perimeter of the substation compound and CCTV will be installed on the control building and other locations within the compound as required to provide full coverage of the assets.

4.74 There will be two Abnormal Indivisible Loads (AILs) associated with the substation for the two 140MVA Grid Transformers.

Construction of Wind Turbine Foundations and Crane Hardstandings

4.75 Construction of wind turbine foundations, hardstandings and laydown/storage areas will require the excavation of surface organic and soft surface material through to underlying rock. This excavated material may be used to partially backfill the excavation and provide material for landscaping and surfacing reinstatement. It will be stored near to the excavation until required. The underlying rock will be levelled to provide a workable platform for the assembly of reinforcing bars and formwork used to contain the poured concrete.

4.76 During construction, dewatering may be required to keep the construction area dry (for example, if rainwater gets into construction areas). Suitable filtration systems will be employed to ensure that silt laden water does not contaminate surface watercourses and that extracted water is returned to the surrounding area with a limited effect on local hydrology. The area around the wind turbines will then be back filled with selected excavated material.

4.77 Wind turbine foundations will be capped with soil material, which may form a raised mound above the existing ground level. These will be re-turfed with the removed material, but where vegetation is sparse or unlikely to regenerate, reseedling with an appropriate local seed mix may be undertaken as outlined above under the heading 'General Approach to Reinstatement'. The condition of turfs will be monitored regularly during the first few months following reinstatement. If necessary, water will be imported to the Site to ensure the re-establishment of this vegetation.

4.78 Hardstanding areas at each wind turbine location will be retained for use during operation and decommissioning, however the edges will as far as possible be blended to the adjacent contours and natural vegetation allowed to re-establish.

Installation of Cabling

4.79 The cabling connecting each wind turbine to the control building will be laid in an arrangement as shown in **Figure 4.5**. Detailed construction and trenching specifications will depend on ground conditions encountered at the time, but typically cables will be laid in a trench anticipated to be 1.4 m deep and 1.4 m wide with the final width determined by the number of circuits in the trench. To minimise ground disturbance, cables will be routed along the side of the access tracks where practicable. Cables will be laid within a sand or granular bedding to prevent damage to the cables from sharp stones. Trenches will be backfilled with excavated material and the surface redressed. If sand bedding is used, clay bunds will be placed at intervals within the bedding to prevent unnatural flows of ground water.

4.80 Where cabling potentially departs from the access tracks between T6 and T13, there will be multiple circuits to capture generation from the northern part of the Site. Cabling vehicles will use the existing BOAT and lay the cables in a verge to the east of the BOAT. Where the cabling is laid further from the BOAT, a temporary trackway may be installed, depending on ground conditions.

4.81 There is a minor watercourse, Mithil Brook, that will need to be crossed by the cable along this route. The cable crossing of the watercourse will be designed and implemented to minimise disturbance to the watercourse, considering hydrology and ecology factors. Methods considered would include Directional Drilling or excavation and backfill during a no-flow (ephemeral situation) period.

4.82 During construction, topsoil will be removed, stored separately to prevent compaction and contamination, and reinstated after installation in accordance with best practice soil handling techniques and the general approach to reinstatement set out earlier in this chapter.

Erection of Wind Turbines

4.83 The erection process for all wind turbines will last approximately 10 months. The duration will depend on weather conditions, as generally wind turbines are erected in wind speeds not exceeding 8 to 10 m/s for health and safety reasons. Cranes will be used for the off-loading of wind turbine components from the AIL vehicles and will assist in assembly. The wind turbine erection contractor will specify the type of cranes used during the erection process.

Construction Lighting

4.84 Depending on the time of the year and the stage of the construction programme, temporary lighting may be required at the temporary construction compound during working hours (described below). Lighting will be limited at all times to the minimum required for health and safety purposes.

Construction and Operational Employment

4.85 The number of construction staff present onsite will vary according to the construction phase and activities being undertaken. Staffing levels will generally decrease as construction progresses through to the commissioning phase. The maximum number of staff present at any one-time during construction of the Proposed Development will be approximately 100. The precise numbers will depend on the ongoing activities at any time. The peak workforce numbers will be during civil works which are estimated to last up to a 4 months period (months 7 to 10 in the Indicative Construction Programme set out below).

4.86 In addition to direct employment opportunities, the construction site will bring benefits to local businesses such as in the supply of materials or services for construction and in accommodation for workers and catering. See the **Economic Benefits Statement** submitted with the DNS Application.

Construction Programme

Table 4.4 Indicative construction programme

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Site mobilisation/setup and access																							
Forestry clearance																							
Borrow pit operations (onsite)																							
Access tracks (onsite)																							
Crane hardstandings																							
Wind turbine foundations																							
Project control building																							
Substation and cabling																							
Wind turbine erection activities																							
Reinstatement																							

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Demobilisation																							

Working Hours

4.87 In general, working hours for construction will be from 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturday. No work is proposed on Sundays and public holidays unless otherwise agreed with PCC.

4.88 Exceptions to the proposed working hours will be made for foundation pours and wind turbine erection. Concrete pouring for an individual wind turbine must take place continuously and so activity will only cease when the pour has been completed. Wind turbine erection can only occur during periods of low wind speeds and so to minimise the construction programmes, lifting operation may need to be scheduled outwith the above hours. In addition, it may be necessary to complete a particular lifting operation to ensure the structure is left safe.

4.89 Working hours will be subject to a suitably worded planning condition.

Good Practice Construction Measures

4.90 Good practice measures will be employed as standard techniques during the construction and operation of the Proposed Development. Such measures are considered to be an integral part of the construction and operation of the Proposed Development. This is considered a realistic scenario given the current regulatory context and accepted good practice across the wind energy industry. As such, good practice measures to minimise the effects of the Proposed Development have been taken into consideration in the EIA assessments (as applied mitigation) prior to any required additional mitigation where relevant.

4.91 Good practice measures will include (but are not limited to) measures associated with:

- Pollution incidents;
- Erosion and sedimentation;
- Modification of surface water drainage patterns;
- Modification of ground water levels;
- Compaction of soils; and
- Peat stability.

4.92 Many of these measures are detailed in **Appendix 4.2** for the construction phase, with the input of topic specialists. See **Appendix 4.3** for a complete list of the embedded, applied and additional mitigation for the Proposed Development.

Soil Management

4.93 The Proposed Development has been designed, through embedded mitigation, to avoid (in the first instance) and minimise disturbance to peatland. One area of peat to a maximum recorded depth of 39 cm is overlapped by the micrositing corridor for cabling to the east of T6, but this will be avoided during the micrositing process and micrositing restrictions have been noted in **Table 4.2** above. Some areas of shallow peaty soils (<30 cm) overlap with elements of the Proposed Development, notably around wind turbines 17, 18, 19 and 20 on the Great Rhos Plateau.

4.94 Applied and additional mitigation during construction to minimise impacts on peatland on the Great Rhos Plateau and the Radnor Forest SSSI include groundwater monitoring, which will be used to design and implement a detailed drainage scheme. Methodology, assessment and proposed mitigation for the potential impacts on peat and soils is set out in **Chapter 11**

4.95 The Proposed Development requires that soil will be stripped. These soils will then be managed according to the following different scenarios:

- Immediate restoration upon excavation (i.e. simultaneous stripping and restoration on proximal development parcels).
- Temporary stockpiling for a short period (weeks) and then restoration (e.g. where earthworks cut/fill is required).
- Temporary stockpiling for a longer period (months) prior to restoration (e.g. on the footprint of temporary hardstand areas). This includes the borrow pits, which will be restored at the end of the construction period and re-soiled – see **Appendix 4.1**.
- Long term storage pending use in the decommissioning phase in due course. These soils shall be those associated with the stripping of permanent hardstanding and tracks. The longer term storage of soils for future use in decommissioning shall be undertaken within the re-soiled earthworks batters surrounding the wind turbine locations.

4.96 The Outline Soil Management Plan (OSMP), presented at **Appendix 11.4** provides the measures that will be implemented to minimise the effect that the Proposed Development has on soils in all of these scenarios. Soil management and storage will be carried out in accordance with Defra (2009) 'Construction Code of Practice for the Sustainable Use of Soils on Construction Sites'.

4.97 The OSMP, which will be incorporated into the detailed CEMP, will ensure that soil is appropriately managed and re-used onsite. Prior to construction and on completion of ground investigations and microsites, the OSMP will be refined and agreed with PCC and NRW where necessary, as part of the agreement of the detailed CEMP under the terms of a suitably worded planning condition.

Environmental Management

4.98 Prior to the construction of the Proposed Development, the Applicant will develop a detailed CEMP, an outline of the content of which is provided in **Appendix 4.2**. The CEMP will establish the project management structure and clearly identify the roles and responsibilities in the management and reporting on the construction phase environmental aspects. The CEMP will be used to ensure that all relevant mitigation identified within the ES to protect the environment is implemented through agreed procedures and working methods. Adherence to the CEMP, as well as referenced legislation and guidance documents, will be a contractual requirement for the appointed Principal Contractor and their sub-contractors.

4.99 The purpose of the CEMP will be to:

- Provide a mechanism for ensuring that construction methods avoid, minimise and control potentially adverse significant environmental effects as identified in the EIA report;
- Ensure that good construction practices are adopted and maintained throughout the construction of the Proposed Development;
- Provide a framework for the mitigation of unexpected effects during construction;
- Provide assurance to third parties that agreed environmental performance criteria are met;
- Establish procedures for ensuring compliance with environmental legislation and statutory consents; and,

- Detail the process for monitoring and auditioning environmental performance.

4.100 The CEMP will be updated when necessary to account for changes or updates to legislation and good practice methods throughout the construction phase. The CEMP will also be amended to incorporate information obtained during detailed ground investigations which will be undertaken post consent and prior to start of construction. Compliance with the CEMP (including procedures, record keeping, monitoring and auditing) will be overseen by a suitably qualified and experienced ECoW and ACoW.

4.101 The CEMP will contain the following documents, which the Principal Contractor and their sub-contractors will be required to adhere to throughout the construction process:

- Pollution Prevention Plan (PPP);
- Construction Method Statements (CMS);
- Soil Management Plan (following the principles set out in the Outline SMP at **Appendix 11.4**);
- Site Waste Management Plan (SWMP);
- A Construction Traffic Management Plan (CTMP) (see **Appendix 10.2**);
- Path Management Plan (PaMP) (following the principles set out in **Chapter 10**);
- Borrow Pit Restoration Plan (following the principles set out in the Outline BPRP at **Appendix 4.1**); and
- Site Restoration Plan.

4.102 The CEMP will also contain the following information:

- The name, qualifications and CV of the nominated person(s) with the responsibility for all environmental matters, for approval;
- A completed register of contacts confirming the contact detail for all key personnel for managing environmental issues, including the Applicant's representatives, the ECoW, ACoW, Principal Contractor contacts and appropriate regulator contacts;
- The construction programme (schedule);

- A site-specific action plan, providing a register of environmental risks and outlining the requirement for accompanying site-specific mitigation, monitoring, and reporting procedures; and
- Audit and inspection procedures.

4.103 The CEMP and associated plans will be submitted to PCC, and others as appropriate, prior to the commencement of works for approval in line with a suitably worded planning condition(s). A copy of the CEMP will be kept in the construction site office for the duration of the works.

4.104 The Principal Contractor will be responsible for the continual development of the CEMP to take account of monitoring and audit results during the construction phase and changing environmental conditions and regulations.

4.105 Performance against the CEMP will be monitored by the Applicant's Construction Project Manager the ECoW and ACoW throughout the construction period. They will ensure that the works carried out are in accordance with the relevant best practice guidance documents.

4.106 The services of the other specialist advisers (such as archaeologists, hydrologists etc.) will be retained as appropriate, to be called on as required to advise on specific environmental issues.

4.107 Regular meetings will be held throughout the construction period to discuss environmental management, providing updates on the performance of the environmental mitigation measures, and identifying any actions for performance improvement. The meetings will be attended by the ECoW, the Applicant's Construction Project Manager, the Principal Contractor, Site Manager and any other relevant personnel or regulatory agency representative as required.

Habitat Management Plan and Net Benefits for Biodiversity Assessment

4.108 The Outline Habitat Management Plan ('HMP') and Net Benefit for Biodiversity (NBB) Assessment can be found in **Appendix 7.10** and provide a high-level approach to implement

positive land management for the benefit of nature conservation, both to mitigate and/or compensate for the effects of the Proposed Development and to deliver wider enhancement to the nature conservation value of the Site and its surroundings.

4.109 The approach to Net Benefit for Biodiversity (NBB) is based on a qualitative measurement. This approach is discussed in **Appendix 7.1 Outline Habitat Management Plan and Net Benefit for Biodiversity Assessment**.

4.110 The main aim of the HMP is to identify positive land management measures that will be implemented for the benefit of nature conservation to deliver NBB for the Proposed Development. Measures to protect existing habitats during construction are presented in the Outline CEMP (**Appendix 4.2**) which will be finalised prior to construction, and in the SMP (**Appendix 11.4**). All measures fall within the Site.

4.111 The Outline HMP sets out:

- An overview of habitats of conservation concern and protected species within the Site;
- Objectives for the creation and management of habitats of conservation concern;
- Spatial opportunities for habitat creation and management; and,
- Outline prescriptions to achieve habitat creation and management and monitoring.

4.112 A detailed HMP will be secured via a suitably worded planning condition.

4.113 During the preparation of the detailed HMP, a detailed programme of monitoring will be developed. Monitoring is likely to be resource-intensive in the initial years, while the success of implementation will require review. However, monitoring at intervals to be agreed is likely to be undertaken throughout the operational lifetime of the Energy Park.

4.114 The monitoring programme will ensure that appropriate mechanisms are in place to remediate any failed measures, or implement essential management, throughout the operational lifetime of the Energy Park.

Waste Management

4.115 Waste will be generated and require management during construction.

4.116 Measures to reduce potential environmental effects associated with the storage and transportation of waste will include:

- The careful location of stockpiles and other storage areas;
- The use of good practice in the design of storage areas and the use of suitable containers;
- The use of sheeting, screening, and damping where appropriate and practicable;
- The control and treatment of runoff from soil and soil stockpiles;
- Minimising storage periods; and,
- Minimising haulage distances.

4.117 All materials will be identified, classified, quantified and, where practicable, appropriately segregated. Any materials that cannot be reused will be disposed of according to relevant waste management legislation which will serve to address several possible environmental effects. This includes:

- The Duty of Care imposed by Section 34 of the Environmental Protection Act 1990; and
- The Waste Management Licensing Regulations 1994 (as amended), particularly provisions relating to registered exemptions from waste management licensing.

4.118 All materials removed from site will be handled in accordance with relevant waste and environmental regulations. Waste will be transferred using a registered waste carrier to a licensed waste disposal site or recycling centre.

Health and Safety

4.119 All construction activities will be managed within the requirements of the Construction (Design and Management) Regulations 2015 (CDM Regulations) and will not conflict with the Health and Safety at Work etc. Act 1974. The design of the Proposed Development has taken full account of these regulations. As part of the CDM Regulations requirements, and to further reduce possible health and safety risks, a Construction Phase Health and Safety Plan for the project will also be drawn up prior to construction commencing. All staff and contractors working on the construction will be required to comply with the safety procedures and work instructions outlined in the plan at all times.

4.120 Risk assessments will be undertaken for all major construction activities, with measures put in place to manage any hazards identified.

4.121 Should they be required, fire service vehicles will use the site entrance that will be used for construction traffic during construction of the Proposed Development and used by maintenance vehicles during operation of the Proposed Development. During construction there will be water bowzers on Site to service the welfare units and where required a mobile water tanker is used to dampen down dust on access tracks and construction areas. It is anticipated that the fire service will use their own provisions and what can be utilised from watercourses.

Public Rights of Way

4.122 As stated above, there is a network of PRoWs that cross the Site, comprising footpaths, bridleways and a BOAT that provide access and recreational opportunities across the Site.

4.123 PRoWs have been taken into account during the design of the Proposed Development. As set out in **Chapter 3**, there are many constraints that need to be considered in designing an Energy Park and therefore it has not been possible to avoid all interactions with PRoWs. Some temporary and permanent infrastructure will cross PRoWs and there will be some oversail of wind turbine blades. **Figure 4.13** shows the PRoW network on the Site alongside the infrastructure layout for the Proposed Development.

4.124 It is recognised that it may be necessary or preferable to divert PRoWs for both the construction and operational phases of the Proposed Development. Diversion routes will be determined following detailed site investigation and any minor modifications made to the layout within the micro-siting allowance. Diversion routes will be secured via separate consents, after the permission for the Proposed Development is secured. The Applicant is currently in discussion with PCC's PRoW Officer regarding the suitable wording of a planning condition that will maintain the safety of PRoW users and will introduce opportunity for recreational enhancements. The Applicant will continue to engage closely with PCC and other stakeholders to ensure the suitability of any diversions.

4.125 During construction, consideration will be given to pedestrians, equestrians, cyclists and 4x4 drivers due to potential interactions between construction traffic and users of the PRow network.

4.126 Access will be managed and may be restricted on a temporary basis while construction works are ongoing. The timings of this will be determined by the appointed Principal Contractor with responsibility for health and safety during construction under the Construction (Design and Management) Regulations 2015. Details of the restrictions and the mechanisms under which they will be secured will be provided in the detailed Construction Traffic Management Plan (CTMP) which will be secured by a suitably worded planning condition.

4.127 Advance notice of any temporary closures or diversions of PRowS will be publicised as required, applied for and subject to a Temporary Traffic Regulation Order (TTRO) made by the local planning authority.

4.128 Within areas of Common and Replacement Land, the construction works will only require temporary rolling fencing along the access tracks and BOAT when they are being constructed and upgraded, respectively, for animal welfare and the public's health and safety. Save for where these measures are required, access will remain available on the remainder of the Common and Replacement Land throughout the construction phase. During the operational phase of the development, access will be available across the Common Land.

4.129 These measures will be formulated into a PaMP (**Chapter 10**) which will be an appendix to the CTMP. Mitigation measures for PRow users during construction will include:

- The Principal Contractor will ensure that speed limits are always adhered to by their drivers and associated subcontractors. This is particularly important close to the PRow network and at crossing points. Advisory speed limit signage will also be installed on approaches to areas where PRow users may interact with construction traffic.
- Signage will be installed on the Site exit that makes drivers aware of local speed limits and reminding drivers of the potential presence of pedestrians, equestrians and cyclists in the area. This will also be emphasised in weekly toolbox talks.
- Users of the PRowS will be separated from construction traffic through the use of temporary barriers (where permitted and appropriate) and this will ensure that safe access to the Site

for recreational purposes will be maintained. Crossing points will be provided where required, with path users having right of way. Appropriate temporary road signage, compliant with Traffic Signs Manual Chapter 8, will be provided to assist at these crossings for the benefit of all users.

4.130 Potential impacts on PRow users are assessed in **Chapter 5: Landscape and Visual Impact Assessment** and **Chapter 10**. Impact Interactions are discussed in **Chapter 15: Summary of Interrelated Cumulative Effects and Likely Significant Effects**.

4.131 A **Strategic Recreation Framework**, which is submitted alongside the DNS application, sets out how access can be improved on the Site during operation of the Proposed Development.

Operational Details

4.132 The Proposed Development has been designed to have an operational lifespan of up to 40 years.

4.133 The Site will likely be staffed on a full-time basis by between 2-4 operatives most days of the week. Consequently, it is predicted that the amount of traffic associated with the operation of the Proposed Development will be minimal. Traffic generated will comprise routine service and maintenance team visits, together with the occasional need for more extensive maintenance or repair. Wind turbine operations will be overseen by suitable qualified contractors.

4.134 Once operational, staff will be employed to operate the Proposed Development and undertake routine maintenance work during its lifetime. Routine maintenance and servicing will take place throughout the year. This will include tasks such as adjustment of blades, inspection of blade tip brakes, inspection of welds in the wind turbine towers, electrical inspections and maintenance and track and drainage maintenance. In the event of any unexpected events onsite, appropriate repair works will be carried out.

4.135 Site visits relating to work required for ongoing management and monitoring of the HMP will also be required. These will be determined as the HMP is developed and agreed (post consent).

4.136 The majority of visits to the Site will likely be making use of a small four-wheel drive vehicle, although there may be an occasional need for an HGV or crane to access the Site for heavier maintenance and repairs. Ongoing track maintenance will generally be undertaken in the summer months when tracks are dry.

Decommissioning

4.137 Following the 40-year operational life of the Proposed Development, the development will be decommissioned and site restored (in accordance with details agreed by planning condition) unless a future planning application is submitted and permission secured for the retention or replacement of the wind turbines and associated infrastructure.

4.138 Decommissioning will last approximately twelve months.

4.139 Decommissioning will involve:

- Dismantling and removal of wind turbines, electrical equipment; and
- Restoration of the wind turbine hardstandings and substation.

4.140 Wind turbine components will be dismantled and removed in a similar but reverse fashion to their delivery and erection. Cranes will be used to split the wind turbines into sections which will then be transported from the Site by HGVs. These components will be cut up offsite in controlled environments ready for reuse, recycling or appropriate disposal in accordance with the relevant waste management regulations at the time.

4.141 The plinth and the top surface of the wind turbine base will be broken out, and all cabling will be cut out at the same depth with the remaining concrete. Once the broken-out concrete has been removed, the area will be reinstated with a final layer backfilled with soil/peat to an agreed method statement, as outlined in the restoration section above.

4.142 The medium voltage, earth and SCADA cables will be left in place to avoid unnecessary ground disturbance.

4.143 Tracks will be left for use by the landowners or covered in topsoil. No stone will be removed from the Site during decommissioning. This approach is considered to be less

environmentally damaging than seeking to remove all track foundations, underground cables and tracks entirely.

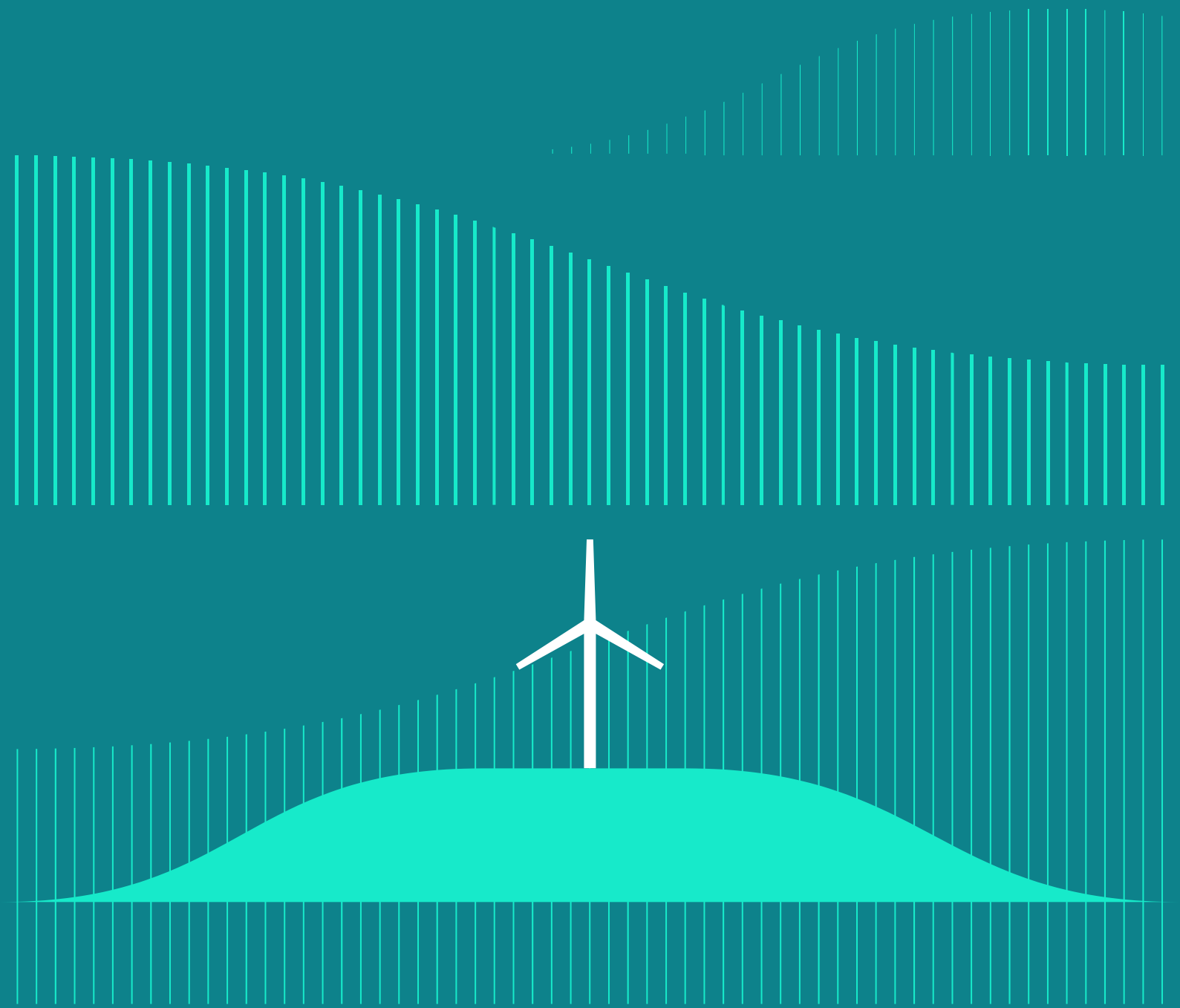
4.144 Prior to the decommissioning works taking place, it is anticipated that a decommissioning strategy will be prepared by the Applicant for agreement with the Local Planning Authority under the terms of a suitably worded planning condition. See **Appendix 4.4** for further details.



Nant Mithil
Energy Park Limited

Environmental Statement

Chapter 5: Landscape and Visual Amenity



Chapter 5

Landscape and Visual Amenity

Introduction

5.1 This chapter considers the potential effects of the proposed Nant Mithil Energy Park (herein referred to as the ‘Proposed Development’) on landscape and visual resources of the Site and surrounding Study Area associated with the construction and operation of the Proposed Development. The specific objectives of the chapter are to describe:

- The planning context relating to landscape and visual matters;
- The assessment methodology and significance criteria used in completing the impact assessment;
- Consultation undertaken;
- The landscape and visual baseline, with reference to the accompanying appendices;
- The mitigation measures that have been designed into the Proposed Development to minimise adverse effects; and
- The residual effects; including direct, indirect and cumulative effects.

5.2 Landscape and visual assessments are separate, although related, processes and accordingly this chapter considers the potential effects of the Proposed Development on:

- The landscape as a resource in its own right (caused by changes to the constituent elements of the landscape, its specific aesthetic or perceptual qualities, and the character of the landscape); and
- Views and visual amenity as experienced by people (caused by changes in the appearance of the landscape).

5.3 The Landscape and Visual Impact Assessment (LVIA) has been undertaken by Chartered Members of the Landscape Institute (CMLI) at LUC, who have also been involved in the early

stages of the Proposed Development through the provision of turbine layout design advice (see **Appendix 1.1: Statement of Expertise**).

5.4 This chapter is supported by the map figures (**Figure 5.1** to **Figure 5.25**) in Environmental Statement (ES) **Volume 2: Figures**, and visualisations (**Figure 5.26** to **Figure 5.57**) in ES **Volume 4: Visualisations for LVIA and Cultural Heritage**.

5.5 The chapter is also supported by the following appendices included in ES Volume 3: Appendices:

- **Appendix 5.1: LVIA Methodology**
- **Appendix 5.2: Zone of Theoretical Visibility (ZTV) Mapping and Visualisation Methodology**
- **Appendix 5.3: Identification of Landscape Units and LANDMAP Aspect Areas**
- **Appendix 5.4: Landscape Assessment Tables**
- **Appendix 5.5: Visual Assessment Tables**
- **Appendix 5.6: Assessment of Designated Landscapes**
- **Appendix 5.7: Residential Visual Amenity Assessment**
- **Appendix 5.8: Aviation Lighting Impact Assessment**

Scope of the Assessment

Study Area

5.6 Natural Resources Wales (NRW) LANDMAP Guidance Note 46 (GN46): Guidance for Wales, Using LANDMAP in Landscape and Visual Impact Assessments (2021)¹ suggests that a 'search area' is considered during the early stages of a project to help identify the extent of study area needed for the detailed LVIA. The guidance states that the study area is where a full, detailed LVIA is completed, and is where significant landscape or visual effects on sensitive

¹ Natural Resources Wales (2021, updated 2024) Using LANDMAP in Landscape and Visual Impact Assessments GN46v

receptors are likely to arise. For tall vertical structures such as wind turbines, a large study area is often likely to be appropriate.

5.7 For structures such as a wind turbine with a maximum blade tip height in the range of 176 m to 225 m, the guidance recommends an initial 'search area' of between 26 km and 33 kilometres (km) to identify sensitive landscape and visual receptors, and other developments to be included in the cumulative assessment. A 33 km radius extent was considered during the initial Scoping stage of the Proposed Development, however, as advocated by the Guidance and GLVIA3 the assessment will focus on receptors likely to experience potentially significant effects and that these will likely be contained within a smaller radius than 33 km.

5.8 For structures of up to 225 m, the guidance recommends a detailed Study Area of between 26 km and 28 km, and so the upper radius distance of this range (from the outmost turbines of the Proposed Development in all directions) has been used for the detailed LVIA. The location of the Proposed Development and the extent of the Study Area and the initial search area are shown on **Figure 5.1**.

5.9 Zone of Theoretical Visibility (ZTV) maps have been generated, illustrating areas from where the Proposed Development may be visible within the Study Area (refer to **Figure 5.4a** (28 km radius) and **Figure 5.4b** (15 km radius) for the turbine hub height (113.5 m, 130.5 m and 145.5 m) ZTVs and, **Figure 5.5a** (28 km radius) and **Figure 5.5b** (15 km radius) for the turbine blade tip height (180 m, 205 m and 220 m) ZTV. ZTVs illustrating the comparative extents of hub height and blade tip height visibility are presented on **Figure 5.6a** (28 km radius) and **Figure 5.6b** (15 km radius). The ZTVs are based on bare earth topography and therefore do not take account of potential screening by vegetation or buildings (more detail on the method for ZTV production is contained in **Appendix 5.2**. The ZTVs have been used as a tool for understanding where visual effects may arise. Receptors which are outside the ZTV will not be affected by the Proposed Development and have not been considered in the assessment.

5.10 The assessment of effects on residential visual amenity has considered a 2 km radius Study Area from the outermost turbines, as detailed in **Appendix 5.7**.

5.11 Landscape and visual receptors have been considered within the following radii from the outermost turbines of the Proposed Development:

■ Landscape Receptors:

- Landscape units (based on published landscape character assessments for Powys, Shropshire and Herefordshire) within 15 km, and those within the Bannau Brycheiniog National Park (BBNP) up to 28 km; and
- Nationally designated landscapes within a 28 km radius, the BBNP² and the Shropshire Hills National Landscape/Area of Outstanding Natural Beauty (AONB)³.

■ Visual Receptors:

- Local communities within a 15 km radius;
- Local residents within a 2 km radius, in the form of a residential visual amenity assessment presented in **Appendix 5.7**;
- Road and rail users within a 15 km radius;
- Users of open access land, walking routes and cycle routes within a 15 km radius;
- Visitors to attractions, promoted viewpoints and popular hill summits within 20 km; and
- Visitors to attractions, promoted viewpoints and popular hill summits within the BBNP up to 28 km.

Effects Assessed in Full

5.12 The following effects have been scoped into this assessment:

- Direct effects during construction/decommissioning on the landscape resource relating to the construction of the Proposed Development on the Site;
- Direct effects during operation on the landscape features and character of the Site;
- Indirect effects during construction and operation on visual amenity, including:
 - Visual effects on local communities⁴;

² The Brecon Beacons National Park (BBNP) was renamed Bannau Brycheiniog in April 2023. The term Brecon Beacons is still used when referring to existing documents prepared before this name change or when quoting directly from an extant document.

³ AONBs in England and Wales were renamed as 'National Landscapes' in November 2023.

⁴ Individual residential properties are being dealt with separately through a Residential Visual Amenity Assessment (RVAA) which is presented in **Appendix 5.7**.

- Visual effects on road and rail users;
- Visual effects on users of Open Access Land, Public Rights of Way (PRoW), cycle routes, promoted walking routes; and
- Visual effects on visitors to attractions, promoted viewpoints and popular hill summits.
- Indirect effects during operation on the landscape character of the wider Study Area (15 km radius);
- Indirect effects on designated landscapes, including:
 - Special qualities of the Shropshire Hills National Landscape/AONB; and
 - Special qualities of the BBNP.
- Cumulative effects during operation on landscape character, visual amenity and designated landscapes;
- Direct and indirect effects of visible medium-intensity (2000 candela (cd.)⁵/200 cd.) aviation lighting on the landscape and visual amenity (including on the Shropshire Hills National Landscape/AONB, Bannau Brycheiniog National Park (BBNP) and International Dark Sky Reserve (IDSR) and reference to cumulative effects where relevant); and
- Indirect effects on residential visual amenity (includes reference to cumulative effects where relevant).

Effects Scoped Out

5.13 Where it is judged that significant effects are unlikely to occur, the assessment of likely effects on some receptors may be ‘scoped out’. This was agreed at the Environmental Impact Assessment (EIA) Scoping stage as detailed in **Table 5.1** below.

5.14 On the basis of the desk based and field survey work undertaken, the professional judgement of the LVIA team, experience from other relevant projects, policy guidance or standards, and feedback received from consultees, the following topic areas and potential effects have been scoped out of detailed assessment:

⁵ The measurement of luminous intensity (i.e. light emitted in a particular direction by a light source) [Note: a candle emits light with a luminous intensity of roughly one cd.].

- Indirect effects during construction on landscape receptors (landscape units) outside of the Site;
- Indirect effects during construction on visual receptors beyond 5 km from the nearest proposed turbine;
- Indirect effects during construction on residential receptors within 2 km from the nearest proposed turbine;
- Effects on nationally or locally designated landscapes beyond 28 km from the nearest proposed turbine, from where it is judged that significant effects are unlikely to occur;
- Effects on landscape character beyond the reporting units (15 km radius of the proposed turbines) and not included within the boundary of the BBNP;
- Effects on visual receptors beyond 28 km;
- Effects on landscape and visual receptors that have no theoretical visibility of the Proposed Development (as indicated by ZTVs) and will therefore not be subject to significant effects;
- Effects of decommissioning of the Proposed Development at the end of its operational life;
- Cumulative effects arising in combination with other wind energy developments beyond 28 km from the nearest turbine of the Proposed Development;
- Cumulative effects in relation to other single turbine wind energy developments of less than 50 metres (m) to maximum blade tip height ;
- Cumulative effects in relation to single turbines of any height beyond 10 km of the proposed turbines; and
- Cumulative landscape and visual effects during construction and decommissioning.

5.15 Above-ground heritage assets and Registered Historic Landscapes have been considered in so far as they contribute to landscape character and the nature and quality of views from publicly accessible locations, but effects on them as receptors in their own right, including effects on their setting, are addressed in **Chapter 6: Historic Environment**.

Assessment Methodology

Legislation and Guidance

Legislation

5.16 The National Parks and Access to the Countryside Act 1949 and the Countryside and Rights of Way (CROW) Act 2000 – protect nationally important landscapes such as the BBNP and Shropshire Hills National Landscape/AONB.

Policy

5.17 The European Landscape Convention (ELC)^{16F} although not legislation, is a Convention of the Council of Europe and treaty between states that seeks to influence governments. It sets out the importance of protecting, managing and planning Europe's landscapes for their future prosperity, regardless of formal designations. The UK Government became a signatory to the ELC in 2006. Wales' LANDMAP Information System was developed as a response to the ELC, creating an integrated resource for landscape character, qualities and influences to be assessed across Wales.

5.18 The assessment is carried out in accordance with the principles contained within the following policy:

- Future Wales: The National Plan 2040 (Welsh Government 2021)⁶;
- Planning Policy Wales (PPW) Edition 12 (Welsh Government, 2024)⁷;
- Powys County Council (PCC) Local Development Plan (LDP) (2011-2026)⁸;
- Brecon Beacons National Park LDP (2013)⁹;
- Shropshire County Council (SCC) Draft Shropshire Local Plan (2016-2038); and
- Herefordshire Council (HC) Local Plan 2021-2041.

⁶ [Welsh Government \(2021\) Future Wales: The National Plan 2040](#)

⁷ [Welsh Government \(2024\) Planning Policy Wales \(PPW\) \(Edition 12\)](#)

⁸ A replacement LDP (2022-2037) is currently being prepared, with the new plans expected to be adopted in 2026.

⁹ [Brecon Beacons National Park Authority \(2013\) Brecon Beacons National Park Local Development Plan](#)

Guidance

5.19 This assessment has been carried out in accordance with the principles contained within the Landscape Institute and the Institute of Environmental Management and Assessment (2013): Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3)¹⁰ and The Landscape Institute (2024) Notes and Clarifications on aspects of the 3rd Edition Guidelines on Landscape and Visual Impact Assessment (GLVIA3), Technical Guidance Note 2024-01¹¹.

5.20 The assessment has also been informed by guidance contained within the following documents:

- Design Commission for Wales (2023) Designing for Renewable Energy in Wales¹²;
- Design Commission for Wales (2014) Designing Wind Farms in Wales¹³;
- The Planning Inspectorate (2024) Nationally Significant Infrastructure Projects: Advice on Cumulative Effects Assessment¹⁴;
- Landscape Institute (2019) Residential Visual Amenity Assessment (RVAA) Technical Guidance Note 2/19¹⁵;
- Landscape Institute (2019) Visual Representation of Development Proposals Technical Guidance Note 06/19¹⁶;
- Natural Resources Wales (undated) Using LANDMAP in Landscape and Visual Impact Assessments GN46¹;
- Scottish Natural Heritage (SNH)¹⁷ (2017) Siting and Designing Windfarms in the Landscape. Version 3a¹⁸;

¹⁰ Landscape Institute and the Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Impact Assessment (3rd Edition)

¹¹ The Landscape Institute (2024) Technical Guidance Note (TGN) 2024-01: Notes and Clarifications on aspects of the 3rd Edition Guidelines on Landscape and Visual Impact Assessment (GLVIA3)

¹² Design Commission for Wales (2023) Designing for Renewable Energy in Wales

¹³ Design Commission for Wales (2014) Designing Wind Farms in Wales

¹⁴ Planning Inspectorate (2024) Nationally Significant Infrastructure Projects: Advice on Cumulative Effects Assessment

¹⁵ Landscape Institute (2019) Technical Guidance Note 2/19: Residential Visual Amenity Assessment (RVAA)

¹⁶ Landscape Institute (2019) Technical Guidance Note 06/19: Visual Representation of Development Proposals

¹⁷ Now NatureScot.

¹⁸ NatureScot (2017) Siting and designing wind farms in the landscape (Version 3a)

- Scottish Natural Heritage (2017) Visual Representation of Wind Farms Guidance. Version 2.2¹⁹;
- NatureScot (February 2024, and updated November 2024) Pre-application guidance for onshore wind farms²⁰;
- Scottish Government and NatureScot (2024) Guidance on Aviation Lighting Impact Assessment²¹; and
- NatureScot (2021) Assessing the cumulative landscape and visual impact of onshore wind energy developments²².

Methodological Overview

5.21 Full details of the assessment methodology, including the assessment of cumulative effects, are presented in **Appendix 5.1**. The key steps in the methodology for assessing both landscape and visual effects were as follows:

- An overall Study Area of 28 km radius was defined from the outmost turbines of the Proposed Development in all directions;
- The area in which the Proposed Development may be visible was established through ZTV mapping and field work;
- The landscape of the Study Area was analysed, and landscape receptors identified, in particular the landscape units (identified via the publish landscape character assessments and with further reference to LANDMAP analysis – see **Appendix 5.3** and designated landscapes;
- The visual baseline was recorded in terms of the different groups of people who may experience views of the Proposed Development (visual receptors), the places where they will be affected, and the nature of views and visual amenity;

¹⁹ [NatureScot \(2017\) Visual representation of wind farms: Guidance \(Version 2.2\)](#)

²⁰ [NatureScot \(2024\) Pre-application guidance for onshore wind farms](#)

²¹ [Scottish Government and NatureScot \(2024\) Guidance on Aviation Lighting Impact Assessment](#)

²² [NatureScot \(2021\) Guidance – Assessing the cumulative landscape and visual impact of onshore wind energy developments](#)

- Viewpoints representing visual receptors and key views were selected and agreed with relevant stakeholders (see **Table 5.1**);
- The layout and design of the Proposed Development was developed to reach the final turbine layout and ancillary infrastructure design; and
- The significance of landscape and visual effects was judged with reference to the sensitivity of the receptor (taking account of both the susceptibility and value) and magnitude of change (taking account of the scale of effect, duration and reversibility).

5.22 This was developed in consultation with PCC. The methodologies for creating the ZTV mapping, undertaking photography and preparing the visualisations, including illustration of effects arising from visible aviation lighting, are presented in **Appendix 5.2**.

Assessing the Significance of Effects

5.23 An assessment of landscape and visual effects requires consideration of the nature of the receptor (sensitivity of receptor) and the nature of the effect on the receptor (magnitude of change).

5.24 GLVIA3 states that the nature of receptors, commonly referred to as their sensitivity, should be judged by their susceptibility to the type of change proposed, and the value attached to the receptor. For the purposes of this assessment susceptibility and value are defined as high, medium or low. Sensitivity is expressed as **low**, **medium** or **high** (or the intermediate levels of **low-medium** or **medium-high**).

5.25 The nature of the effect on each landscape and visual receptor, commonly referred to as its magnitude of change, has been assessed in terms of size and scale of effect, duration and reversibility. The assessment of size/scale is described as being large, medium, small or barely perceptible. Duration is determined in relation to the length of phases of the Proposed Development (short-term, medium-term or long-term). Reversibility has been reported as reversible, partially reversible or irreversible. The magnitude of landscape change is expressed as **barely perceptible**, **low**, **medium** or **high** (or the intermediate levels of **low-medium** or **medium-high**).

5.26 In GLVIA3 geographical extent is also considered as forming part of the magnitude of landscape or visual change (when combined with the size/scale of effect, duration and reversibility). However, the process of combining all three considerations in one judgement with equal weighting can distort the aim of identifying significant effects of a Proposed Development. For example, a high magnitude of change, based on size or scale, may be reduced to a lower overall level of magnitude if it was to occur across a localised geographical area. This may result in a potentially significant effect being overlooked if the effect is diluted down due to the limited geographical extent. Therefore, for this assessment the geographical extent of effects is reported alongside the effect. The key objective is to communicate the location of different predicted effects. The magnitude of landscape or visual change is based primarily on size/scale (with a consideration of duration and reversibility). The geographical extent of the landscape or visual effect is then described independently.

5.27 Judgements on sensitivity (of the landscape or visual receptor), and magnitude of landscape change (the landscape or visual change) are combined to assess the significance of each effect guided by the principles set out in **Diagram A.1** contained in **Appendix 5.1**. It should be noted that the relationship between sensitivity and magnitude is not always linear, and therefore a rigid matrix-type approach is not used. Instead, the determination of overall level of effect requires the application of professional judgement of the component variables which need to be considered. All judgements are clearly explained. Sensitivity and magnitude are typically weighted evenly so that a medium sensitivity and medium magnitude will result in a moderate overall effect, while a high sensitivity combined with a high magnitude will result in a major effect and a low sensitivity combined with a low magnitude will result in a minor effect. However, there are many possible combinations and in some cases a weighting to either sensitivity or magnitude may be required to come to an overall level of effect e.g. a medium-high sensitivity combined with a medium magnitude could result in either a moderate or a major effect. In these finely balanced cases magnitude tends to influence the overall level of landscape or visual effect slightly more than sensitivity.

5.28 Levels of effect have been identified as **Negligible**, **Minor**, **Moderate** or **Major** (or the intermediate levels of **Minor-Moderate** and **Moderate-Major**) where landscape or visual effects of 'moderate' and above are considered **Significant** in the context of the EIA Regulations.

Consultation

5.29 In undertaking the assessment, consideration has been given to the Scoping responses and other consultation which has been undertaken as detailed in **Table 5.1**.

5.30 A Scoping Report for the Proposed Development was prepared and submitted to PEDW on 6 September 2022²³ (provided in **Appendix 2.1: Scoping Report**). In response a DNS: EIA Scoping Direction was received on 13 January 2023²⁴ (provided in **Appendix 2.2: Scoping Direction**), in which comments in relation to landscape and visual issues were summarised by PEDW.

5.31 The statutory consultation on the Proposed Development began on 8 May 2024 and closed on 24 June 2024. The consultation responses received by statutory consultees during this period are summarised in **Table 5.1** alongside a summary of the Scoping Direction comments, where they relate to landscape and visual matters. An explanation of how comments received via Scoping and the statutory consultation have been responded to in the LVIA is also included.

²³ LUC on behalf of Nant Mithil Energy Park Limited (2022) Nant Mithil Energy Park EIA Scoping Report

²⁴ Planning and Environment Decisions Wales (PEDW) (2023) DNS: EIA Scoping Direction – CAS-01907-D7Q6Z1: Nant Mithil Energy Park

Table 5.1 Consultation responses

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Planning and Environment Decisions Wales (PEDW) 13/01/2023	DNS: EIA Scoping Direction comments	Landscape and Visual Amenity – ID.8 Study Area PEDW notes that the LVIA will be carried out to a Study Area of 33 km from the site boundary, based on NRW guidance. Any deviation from this methodology should be supported by a robust rationale. Furthermore, as the proposal includes other elements, such as Solar and battery storage, each of these will have a different impact on within the Study Area, and thus different site area buffers may be required.	NRW Guidance contained in GN461 details that an initial 33 km ‘search area’ should be used to provide an evidenced basis for the inclusion or exclusion of particular landscape and visual receptors for assessment, when considering LVIA for structures of between 176 m and 225 m. The subsequent study area is where a full, detailed LVIA is completed. Significant landscape or visual effects on sensitive receptors are most likely to occur in this area, and it is this maximum 28 km radius which has been used for this assessment. The 28 km radius Study Area used for the assessment of landscape and visual effects is shown on Figure 5.1. Solar and battery storage no longer form part of the Proposed Development such that any impacts associated with this infrastructure have not been assessed.
		Landscape and Visual Amenity – ID.9 (and reiterated at ID.40) Viewpoints It is noted in NRW’s comments contained at Appendix 1 4.4 that the exact location of viewpoint 15, and night-time viewpoint 2 are to be discussed formally. PEDW would also encourage the Applicant to seek guidance and confirmation from PCC regarding the location of these viewpoints, to ensure that the LPA is satisfied with the viewpoints chosen. Furthermore, the visual receptors can also be taken from consultation with PCC’s Rights of Way Officer.	Viewpoint 28/N3: Hay Bluff, Bannau Brycheiniog National Park²⁵ is located at the summit of this popular hill within the BBNP, and illustrates maximum visibility of the turbines, and visible aviation lighting of the Proposed Development above the distant horizon north of the BBNP. Visual effects (both day-time and night-time effects) from Viewpoint 28/N3: Hay Bluff are illustrated by the accompanying day-time and night-time visualisations (illustrated in Figure 5.53) presented in ES Volume 4: Visualisations for LVIA and Cultural Heritage. Reference was taken from the PCC Public Right of Way, Common Land and Access Land Team response (detailed further below in this table)

²⁵ Viewpoints renumbered in final LVIA based on increasing distance from outermost turbines.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			during the identification of assessment viewpoints and PRow routes for consideration in the assessment. Enplan, on behalf of PCC agreed the final list of viewpoints and format of the accompanying visualisations (as detailed in Table 5.7) to be included in the LVIA (16/02/2024 by email, see below).
		Landscape and Visual Amenity – ID.10 Zone of Theoretical Visibility (ZTV) The Applicant should ensure that consultation with PCC informs the Zone of theoretical Visibility.	ZTVs generated to turbine blade tip height (180 m, 205 m and 220 m) and turbine hub height (113.5 m, 130.5 m and 145.5 m) have informed the LVIA consultation undertaken with PCC.
		Landscape and Visual Amenity – ID.11 Aircraft Detection Lighting System PEDW has no comment to make on this aspect, however advises the Applicant to consult directly with NATS and the Civil Aviation Authority.	Aircraft Lighting Detection Systems are considered in ES Chapter 12: Aviation and the accompanying Appendix 12.1: Aviation Lighting and Mitigation Report. Impacts arising from visible lighting are considered in Appendix 5.8.
		Landscape and Visual Amenity – ID.12 Elements scoped out of Cumulative LVIA The approach to cumulative LVIA should accord with the advice in the Planning Inspectorate’s NSIP Advice Note 17. The Applicant’s proposal to scope out single turbines of any size beyond 10 km and turbines less than 50 m unless they are in groups of 10 or more should be supported by a robust rationale if they fail to accord with NSIP Advice Note 17 or the advice in GLVIA (3rd).	ES Chapter 2: Approach to the EIA details the developments included in the assessment of cumulative effects. The approach has been informed by the Planning Inspectorate (2024) Nationally Significant Infrastructure Projects: Advice on Cumulative Effects Assessment²⁶, and agreed with PCC.
		Landscape and Visual Amenity – ID.13	ES Chapter 2 details the developments included in the assessment of cumulative effects. The approach has been informed by Planning

²⁶ [Planning Inspectorate \(2024\) Nationally Significant Infrastructure Projects: Advice on Cumulative Effects Assessment](#)

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Scoping out solar farms outside of 5 km As stated above, the approach to cumulative assessment should accord with NSIP Advice Note 17. The Applicant should liaise with PCC about what other schemes should be considered.	Inspectorate (2024) Nationally Significant Infrastructure Projects: Advice on Cumulative Effects Assessment and agreed with PCC. No solar farms have been identified within 5 km of the Proposed Development or the wider study area for inclusion in the cumulative assessment. Table 5.10 details the other wind energy developments considered in the cumulative assessment contained in the LVIA and illustrated in the accompanying wireline visualisations from each representative viewpoint (where relevant/visible) (contained in ES Volume 4: Visualisations for LVIA and Cultural Heritage).
		Landscape and Visual Amenity – ID.14 Photomontages The Applicant is advised to consult with PCC to ensure that the number and location of viewpoints is considered sufficient.	Photomontage visualisations are provided from 22 of the 28 representative viewpoint locations, to illustrate day-time visual effects (Viewpoints 1 to 28). Effects arising from visible aviation lighting are illustrated by three photomontage visualisations (Viewpoints N1 to N3). Additional wireline only visualisations are included from six viewpoints and three additional assessment points (AP1 to APS) requested by Enplan on behalf of PCC. Visualisations are presented in ES Volume 4: Visualisations for LVIA and Cultural Heritage .
		Landscape and Visual Amenity – ID.15 Residential Visual Amenity PEDW welcomes that a Residential Visual Amenity will be included. The Applicant should liaise with PCC over the approach to the RVA.	Effects on residential visual amenity are considered within Appendix 5.7 . The 2 km radius Study Area (from the nearest turbine) and residential properties therein to be included in the assessment was agreed with PCC.
		Landscape and Visual Amenity – ID.16 Aviation Lighting Assessment	Impacts arising from visible lighting are considered in Appendix 5.8 , and representative viewpoints to illustrate visible aviation lighting effects were agreed with PCC and scoping comments received from NRW informed the

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		The Applicant is advised to consult directly with PCC, NRW and potentially BBNPA with regards to the methodology, and viewpoint areas proposed for the Aviation Lighting Assessment.	location of the night-time representative viewpoint from the summit of Hay Bluff (VP28/N3) in the BBNP. BBNP not consulted directly following comments received from NRW on the proposed representative viewpoint location which is considered to adequately illustrate potential effects from the National Park.
		Other considerations – ID.50 Potential visible effects of visible turbine lighting The Applicant is advised to liaise with the UK Civil Aviation Authority and the LPA regarding visible turbine lighting assessments.	A reduced aviation lighting scheme has been agreed with the Civil Aviation Authority (CAA) ²⁷ and is detailed in ES Chapter 12 and the accompanying Appendix 12.1 . Impacts arising from visible lighting are considered in Appendix 5.8 , and representative viewpoints to illustrate visible aviation lighting effects were agreed with PCC and NRW.
		Other considerations – ID.59 Glint and Glare Should a solar array be included as part of this scheme, a Glint and Glare assessment is likely to be required, and this should be included as a separate appendix of the ES. Guidance should be sought from the LPA regarding whether one is needed, and if so, what the parameters of this study should be. There may also be a need to include a Residential Impact Assessment (which could be incorporated into the LVIA depending on the findings of the Glint and Glare Assessment).	No solar array forms part of the final Proposed Development therefore no glint and glare study has been undertaken and is not considered within Appendix 5.7 .
Powys County Council (PCC)	Formal Scoping Consultation	No comments received in relation to landscape and visual amenity, LVIA related questions Q4.1 > Q4.9 contained in EIA Scoping Report.	Subsequent consultation undertaken with PCC via Enplan in respect to landscape and visual amenity (detailed below).

²⁷ CAA Approval of Proposed Obstacle Lighting Scheme for Nant Mithil Wind Farm – Letter dated 17 January 2024.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
13/01/2023		DNS: EIA Scoping Direction comment, Access, Traffic and Transport – ID.40 PCC Public Right of Way, Common Land and Access Land Team 1. There are 25 public rights of way within the proposed red line development area; 4 footpaths, 15 bridleways and 6 sections of BOAT. Those which are directly affected by the information supplied in the EIA Scoping Request are listed below, once further information on track layouts and borrow pits is submitted it is likely this will increase. 2. The development also takes in a significant area of designated open access land, where the public has a right of access on foot for recreation. 4. The developer must avoid siting turbines on any of the public rights of way. In addition, micro-siting of turbines that may result in public rights of way being located within the topple zone of turbines should be avoided. If turbines are located on the public rights of way, or the public rights of way are within topple zones, then a permanent legal diversion will be required, as a secondary consent, before any construction affecting the line of the public right of way can commence. 5. New access tracks constructed for the wind farm can adversely affect the public rights of way due to changes of level and surfacing, new drainage ditches, culverts and fencing. These details must be agreed with the Countryside Access and Recreation team in advance, at all locations where an access track will cross or coincide with the line of a public right of way. 7. Temporary closures of public rights of way may be required during construction. Details of the phasing and timing of these closures and any	ES Chapter 10: Access, Traffic and Transport provides a detailed response to the issues raised by the PCC Public Right of Way, Common Land and Access Land Team. Effects arising during construction and operation, for visual receptors (people) accessing the Site for recreation via the network of PRow routes (footpaths, bridleways and Byways open to all traffic (BOAT²⁸)) and Open Access Land (including RCL35, known as Cowlod common) are considered in the LVIA (detailed in Table A.54 in Appendix 5.5). Additional assessment point 2 (AP2, Figure 5.55) and cross reference to Cultural Heritage viewpoint 3 (CH03, Figure 6.7) were agreed with Enplan on behalf of PCC to represent views experienced by recreational users of the BOAT and other PRowS which cross the Site. Implications for short-term (during construction) and long-term (during operation) access across the Site via the existing network of PRow routes and potential diversions is considered further in ES Chapter 10. Whilst the design of the Proposed Development has sought to avoid wherever possible and minimise potential direct impacts on the existing network of PRowS across the Site, it has not been possible to avoid all impacts. The outline Strategic Recreation Framework which accompanies the DNS application details the potential mitigation and enhancement measures relating to recreation that the Applicant is committed to delivering alongside the Proposed Development.

²⁸ Byway open to all traffic (BOAT) – a right for all traffic, including vehicles, but used by the public mainly for the purpose for which footpaths and bridleways are so used.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		alternative routes must be agreed with the Countryside Access and Recreation team before work commences. 9. The proposals will impact on outdoor recreation opportunities within the site, which is within 5 km of Llanfihangel Rhydithon, New Radnor and Penybont villages. The importance of public rights of way and other outdoor recreation opportunities for our residents and visitors are highlighted in the Council's Rights of Way Improvement Plan 2018-28, which can be found at https://en.powys.gov.uk/article/2439/Rights-of-Way-Improvement-Plan.	
Powys County Council (PCC) 20/10/2023-16/02/2024	Post-scoping consultation with Enplan on behalf of PCC	16/11/2023 – Post Consultation meeting with Enplan to discuss the approach to the LVIA (via Microsoft Teams) Discussion of EIA Scoping Report Questions during meeting: Q4.1 – Enplan accepted the proposed approach to use Powys LCA landscape character areas as the landscape units for the assessment of landscape effects, and requested that the assessment consider all landscape units (e.g. landscape character areas defined within the Powys LCA) within a 15 km radius of the Proposed Development. Q4.2 – Enplan accepted the proposed approach to consider effects on the Shropshire Hills National Landscape/AONB and BBNP nationally designated landscapes in the LVIA. Q4.3 – The 28 km radius Study Area for the identification and assessment for potential visual effects was accepted by Enplan. Q4.4 – No initial comments provided by Enplan on proposed viewpoints (subsequent comment provided, as detailed below).	The Powys LCA landscape character areas have been used as the landscape units for the assessment of landscape effects (as detailed in Appendix 5.3). Landscape units within a 15 km radius have been considered in the assessment (as detailed in Appendix 5.4). Effects on the Shropshire Hills National Landscape/AONB and BBNP nationally designated landscapes are considered in Appendix 5.6. A 28 km radius Study Area has been adopted for the LVIA, as shown on Figure 5.1. A 2 km radius Study Area has been adopted for the RVAA as detailed in Appendix 5.7.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Q4.5 – Further clarification of approach to cumulative assessment requested by Enplan. Q4.6 – The 2 km radius Study Area for the inclusion of residential properties within the Residential Visual Amenity Assessment (RVAA) was accepted by Enplan. Q4.7 – No detailed comments provided on the receptors to be scoped in and out of assessment not provided (subsequent comment provided, as detailed below). Q4.8 – No initial comments provided by Enplan on proposed night-time viewpoints (subsequent comment provided, as detailed below). Q4.9 – No additional relevant parties identified by Enplan to be included in the post-scoping LVIA consultation.	
		10/01/2024 – Enplan confirmed receipt of materials and acceptance of the 15 representative LVIA viewpoints proposed in EIA Scoping Report, with additional viewpoints requested. Details of additional viewpoints not provided at this time.	Original 15 representative viewpoints proposed in EIA Scoping Report included in LVIA (as detailed in Table 5.7) and accompanied by photomontage visualisations presented in ES Volume 4: Visualisations for LVIA and Cultural Heritage .
		24/01/2024 – PCC requested consideration of 19 additional viewpoint locations (named²⁹ NM-A > NM-S) for inclusion in the LVIA, with location details shared via email for review. <i>“Broadly these additional viewpoints should be considered because they fall into one or more of the following groups:</i> ■ <i>Representative views from relatively nearby settlements not currently covered</i>	Additional viewpoint locations reviewed in the context of the original 15 EIA Scoping Report viewpoints, the additional viewpoints identified by the assessment team, and the ZTV for the final Proposed Development. Wireline visualisations shared with PCC (25/01/2024) from each of the requested additional viewpoint locations in advance of meeting to discuss requests on 26/01/2024.

²⁹ Viewpoints named and NM for Nant Mithil, with subsequent alphabetical label.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		■ <i>Close range viewpoints from publicly accessible locations</i> ■ <i>From Offa's Dyke National Trail, the users of which may be visually affected at specific viewpoints and sequentially</i> ■ <i>From Open Access Land/PRoW/Highways at high points in the landscape, not currently covered in respect of the angle of view particularly</i> ■ <i>Relevant viewpoints shared with Aberedw and/or Byn Gilwern from where the individual visual and combined visual effects would be usefully considered</i> ■ <i>In one case, a potential viewpoint from a popular tourist destination (NM-N), which needs a review."</i> List of additional viewpoints requested: ■ NM-A – Bwlch-Ilwyn Bank ■ NM-B – Llandegley Rocks ■ NM-C – Castle Bank ■ NM-D – Evenjobb, B4357 ■ NM-E – Hergest Ridge, Offa's Dyke ■ NM-F – Offa's Dyke, Ditchyeld Bridge ■ NM-G – Offa's Dyke, Castle Ring Pen Offa ■ NM-H – Offa's Dyke, Gilfach Hill ■ NM-I – Garth, near Builth Wells ■ NM-J – Cefnlllys Castle ■ NM-K – A44 south of Llandegley	

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		■ NM-L – Heart of Wales Line Trail near The Pales ■ NM-M – BOAT at edge of north-western Site boundary ■ NM-N – Water-break-its-neck waterfall and walks ■ NM-O – Hundred House ■ NM-P – Llanfihangel Hill ■ NM-Q – Mynd, edge of Open Access Land ■ NM-R – Carneddau ■ NM-S – Caergynan Bank, Open Access Land	
		25/01/2024 – Enplan provided confirmation of the type of visualisation being requested to accompany each of the 19no. additional viewpoint locations – all locations (NMa to NMs) to be accompanied by wireline visualisations, whilst Llandegley Rocks (NM-B) and Heart of Wales Line Trail near the Pales (NM-L), Mynd, edge of Open Access Land (NM-Q) and Caergynan Bank, Open Access Land (NM-S) to be accompanied by photomontage visualisation.	Final viewpoint and assessment point visualisations presented in ES Volume 4: Visualisations for LVIA and Cultural Heritage.
		26/01/2024 – Enplan provided further comment on the additional viewpoints requested and the potential receptors, views and effects they have been identified to represent (related to previous discussions regarding EIA Scoping Report question Q4.7). Enplan highlighted potential inclusion/exclusion of particular additional viewpoints in the future LVIA's for the Aberedw Energy Park and Bryn Gilwern Energy Park.	List of additional viewpoints was reviewed with reference to original 15 LVIA viewpoints and the final design freeze layout. Final list of viewpoints for agreement with Enplan/PCC devised and wireline visualisations prepared. The following viewpoints have been excluded from final list of LVIA viewpoints: ■ NM-F – Offa's Dyke, Ditchyeld Bridge ■ NM-H – Offa's Dyke, Gilfach Hill

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			■ NM-I – Garth, near Builth Wells ■ NM-J – Cefnlllys Castle ■ NM-R – Carneddau (NM-I, NM-J and NM-R to be considered further for LVIAs for the Aberedw and Bryn Gilwern Energy Parks).
		05/02/2024 – PCC confirmed that the intended approach for the cumulative landscape and visual assessment is accepted (in response to previous discussions regarding EIA Scoping Report question Q4.5).	The Applicant's approach to the cumulative assessment undertaken across the EIA is detailed in ES Chapter 2 .
		16/02/2024 – Confirmation of final list of viewpoints (VP1-VP28), night-time assessment viewpoints (N1-N3) and assessment points (AP1-AP3) and accompanying visualisations for inclusion in LVIA accepted by Enplan (in response to previous discussions regarding EIA Scoping Report questions Q4.4 and Q4.8).	The final list of representative assessment viewpoints and accompanying visualisations included in the LVIA are detailed in Table 5.7 .
Natural Resources Wales (NRW) 24/11/2022	Formal Scoping Consultation (contained in formal scoping consultation dated 13/01/2023)	We have reviewed Chapter 4 Landscape and Visual Amenity of the submitted EIA Scoping Report and offer the following comments in response to the questions asked in 'Appendix A: List of Scoping Questions for Consultees'. Q2.2 Do the consultees agree the approach to consideration of various standard good practice measures as 'pre-mitigation' is appropriate? Yes – we agree this is appropriate.	Noted.
		Q4.1: Is the proposed approach and scope for the assessment of effects on landscape character and LANDMAP aspect areas considered to be appropriate?	LANDMAP GN46 has informed the approach to the assessment of landscape and visual effects. However, post receipt of the Scoping Opinion, Powys County Council (PCC) published the new Local Landscape Character Assessment (LCA) for the Powys Local Development Plan Area

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Yes. We note that NRW's LANDMAP guidance note 46 is to be applied. (NB: please can NRW provide the information required to enable us to complete the stage 2 filtering process for Geological Landscape aspect areas i.e. data needs to provide a match between Site IDs in the GIS data and the online survey records) To be addressed by NRW.	Landscape Character Assessment Report ³⁰ , which is underpinned by baseline landscape character information contained in LANDMAP. The character areas within this character assessment, along with those defined in the Brecon Beacons Landscape Character Assessment ³¹ covering the Bannau Brycheiniog National Park Authority (BBNP) have been used to inform the landscape units for the assessment of landscape effects, as detailed in Appendix 5.3 .
		Q4.2: Is the proposed approach and scope for the assessment of effects of designated landscapes considered to be appropriate? Yes. We note that the effects on Brecon Beacons National Park (BBNP)'s special qualities are scoped in.	Effects on the BBNP are assessed in Appendix 5.6 .
		Q4.3: Is the proposed approach and scope for the assessment of visual effects appropriate? Yes. We note that the effects on popular hilltops up to 28 km away within BBNP are to be assessed.	Visual effects are assessed within the 28 km radius Study Area, as shown on Figure 5.1 . Visual effects (both day-time and night-time effects) from the BBNP are represented by Viewpoint 28: Hay Bluff, with accompanying visualisations (Figure 5.53) presented in ES Volume 4: Visualisations for LVIA and Cultural Heritage .
		Q4.4: Do consultees consider that the proposed viewpoints are appropriate to inform the visual assessment, and that the suggested presentation of visualisations is appropriate? Yes- exact location of VP15 to be agreed with NRW to ensure maximum intervisibility. We note that VP15 is from the path to Hay Bluff. This needs to be at an elevation from which all the turbine hubs would be visible on the	Viewpoint 28/N3: Hay Bluff ³² is located at the summit of this popular hill within the BBNP, and illustrates maximum visibility of the turbines, and visible aviation lighting of the Proposed Development above the furthest horizon.

³⁰ LUC on behalf of Powys County Council (2022) Local Landscape Character Assessment for the Powys Local Development Plan Area – Landscape Character Assessment Report

³¹ Fiona Fyfe Associates on behalf of Brecon Beacons National Park Authority (2012) Brecon Beacons National Park Landscape Character Assessment

³² Viewpoint renumbered in final LVIA based on distance from nearest turbine of Proposed Development.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		furthest horizon. We note that the proposed wirelines and photomontages will be in accordance with Landscape Institute (LI) guidance.	The accompanying photomontage and wireline visualisations have been produced in accordance with the latest LI ³³ and NatureScot ³⁴ visualisation guidance as detailed in Appendix 5.2 and are presented in ES Volume 4: Visualisations for LVIA and Cultural Heritage .
		Q4.7: Do consultees consider the effects to be scoped in and out appropriate? Yes.	Noted. The final scope of landscape and visual effects assessed in the LVIA has been informed by the final turbine hub height (113.5 m, 130.5 m, 145.5 m) and blade tip height (180 m, 205 m, 220 m) ZTVs as shown on Figure 5.4a-b and Figure 5.5a-b respectively.
		Q4.8: Is the approach to aviation lighting assessment and night-time photography appropriate and proportionate, and are the suggested night-time viewpoints appropriate? Yes – the exact location of N2 viewpoint to be agreed with NRW to ensure maximum intervisibility. We note that N2 viewpoint is from Gospel Pass/Hay Bluff car park.	Viewpoint 28/N3: Hay Bluff ³⁵ is located at the summit of this popular hill within the BBNP, and illustrates maximum visibility of the turbines, and visible aviation lighting of the Proposed Development above the furthest horizon. The accompanying photomontage day-time and night-time are presented in ES Volume 4: Visualisations for LVIA and Cultural Heritage .
		Q4.9: Are there any other relevant parties who should be included within the post-scoping consultation process for the LVIA? Not known.	Noted.
Bannau Brycheiniog National Park Authority (BBNPA) ³⁶ 13/01/2023	Formal Scoping Consultation	No response to Scoping Request received.	Letter sent to BBNP Authority on 26 th April 2024 setting out how landscape and visual effects related to the BBNP have been considered in the LVIA.

³³ [Landscape Institute \(LI\) \(2019\) Technical Guidance Note 06/19: Visual Representation of Development Proposals](#)

³⁴ [NatureScot \(2017\) Visual representation of wind farms: Guidance \(Version 2.2\)](#)

³⁵ Viewpoints renumbered in final LVIA based on increasing distance from outermost turbines.

³⁶ The Brecon Beacons National Park was renamed Bannau Brycheiniog in April 2023.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Shropshire Hills National Landscape/ Area of Outstanding Natural Beauty (AONB) Partnership 13/01/2023	Formal Scoping Consultation	No response to Scoping Request received.	Letter sent to Shropshire Hills National Landscape /AONB Partnership on 26 th April 2024 setting out how landscape and visual effects related to the Shropshire Hills National Landscape/AONB have been considered in the LVIA.
Shropshire Council (SC) 13/01/2023	Formal Scoping Consultation	No response to Scoping Request received.	Letter sent to Shropshire Council on 26 th April 2024 setting out how landscape and visual effects within the extents of Shropshire (e.g. within the Shropshire Hills National Landscape/AONB) have been considered in the LVIA.
Herefordshire Council (HC) 13/01/2023	Formal Scoping Consultation	No response to Scoping Request received.	Letter sent to Herefordshire Council on 26 th April 2024 setting out how landscape and visual effects arising within the extents of Herefordshire have been considered in the LVIA.
Natural Resources Wales (NRW)03/05/2024	DNS: Pre-application Consultation comments (contained in formal consultation response dated 24/06/2024)	We advise we cannot yet agree with the judgements relating to landscape impacts set out in the LVIA and request a hard copy of the ZTVs (Figures 5.4a and 5.5a) and visualisations for VP 28/ N3 to be printed at the intended paper size for our use on site, when consulted on the application submission.	Hard copies of the visualisations from VP28 / N3 and ZTV figures (Figures 5.4a and 5.5a) requested were sent to NRW on the 28 th September 2024.
Natural Resources Wales (NRW) 03/05/2024	DNS: LVIA Discretionary Advice Service (DAS) Request – Landscape	Photomontage from VP 28 In our previous advice we noted the turbines appeared to have been rendered faintly in the photomontage from VP 28. Particularly the turbines	Alternative day-time and dusk/night-time baseline photography from VP28 / N3: Hay Bluff was captured by LUC in July 2024. The alternative baseline photography has been used in the preparation of the photomontage visualisations (Figure 5.53) that are presented in Volume 4: Visualisations for LVIA and Cultural Heritage of the ES submission.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
	Comments dated 22 nd August 2024	located around the most elevated parts of Radnor Forest, which are rendered so faintly that they are barely visible in the photomontage. Having visited the site with a hard copy of the visualisations, we consider the issue highlighted in our previous advice is likely due to: - The baseline photograph having been taken in conditions of poor / sub-optimal visibility. - In an attempt to match these conditions the turbines have been rendered too faintly. Whilst we do not know the precise weather (sp.) or visibility conditions at the time of the photography, the baseline image lacks clarity. For example, during our visit, visibility was forecast to be very good, but cloud and passing low cloud/ rain showers were visible to the north. Despite this, the ridgeline of the Radnor Forest landform, and those around the site, were seen in sharp contrast against the sky, and we could clearly make out the communications mast on the summit of Black Mixen, which lies close to the site. Therefore in conditions similar to those at the time of our visit, the turbines would be clearly visible and would stand out, and would be significantly more noticeable than the version presented in the photomontage from VP 28. We therefore recommend you either revisit the preparation of the photomontage and increase the contrast of the turbines against the backdrop, or retake the baseline photograph in good visibility and re-render the turbines accordingly.	

Desk Based Research and Data Sources

5.32 The following information and data sources have informed the assessment:

- National Landscape Character Areas (NLCAs) for Wales;
- LANDMAP (accessed via the NRW website);
- Powys County Council (2022) Local Landscape Character Assessment for the Powys Local Development Plan Area Landscape Character Assessment Report³⁷;
- Bannau Brycheiniog National Park (2012) Landscape Character Supplementary Planning Guidance;
- Brecon Beacons National Park Authority (2012) Brecon Beacons Landscape Character Assessment³⁸;
- Bannau Brycheiniog National Park Authority (2023) Y Bannau: The Future – The Management Plan For Bannau Brycheiniog National Park 2023-2038;
- The Registered Landscapes of Outstanding and Special Interest in Wales (accessed via the Lle Geo Portal);
- Dark Skies and Light Pollution in Wales (accessed via the NRW website³⁹);
- England's Light Pollution and Dark Skies Mapping (accessed via the Campaign to Protect Rural England website⁴⁰);
- National Character Areas (NCAs) for England;
- Shropshire County Council (2006) The Shropshire Landscape Typology⁴¹;

³⁷ LUC on behalf of Powys County Council (2022) Local Landscape Character Assessment for the Powys Local Development Plan Area – Landscape Character Assessment Report

³⁸ Fiona Fyfe Associates on behalf of Brecon Beacons National Park Authority (2012) Brecon Beacons National Park Landscape Character Assessment

³⁹ Natural Resources Wales (NRW) (2021) Dark Skies and Light Pollution in Wales Map

⁴⁰ Campaign to Protect Rural England (CPRE) (2016) England's Light Pollution and Dark Skies Map

⁴¹ Shropshire County Council (2006) The Shropshire Landscape Assessment

- Shropshire Hills AONB Partnership (2019) Shropshire Hills AONB Management Plan 2019-24⁴²;
- Herefordshire Council (2023) Herefordshire County Landscape Character Assessment⁴³;
- Ordnance Survey (OS) Maps at 1:25,000 scale (OS Explorer) and 1:50,000 (OS Landranger);
- OS Terrain® 5 mid-resolution height data (digital terrain model (DTM) (5 m grid spacing, 2.5 metres RMSE);
- OS Terrain® 50 lower-resolution height data (DTM) (50m grid spacing, 4 metres RMSE);
- OS 1:25,000 raster data;
- OS 1:50,000 raster data;
- OS 1:250,000 raster data;
- OS Address® Plus Data;
- Data from other wind farm applications for the cumulative assessment; and
- PEDW, PCC and Renewable UK (RUK) (websites) to inform the cumulative assessment.

Field Survey

5.33 Field survey work was carried out between July 2022 and July 2024, with records being made through photographs and field notes. The survey work included visits to the Site itself, as well as to all the identified viewpoints and designated landscapes within the Study Area. Travel around the Study Area using public roads and Public Rights of Way (PRoWs) was also carried out to consider the potential effects on landscape character and on views.

5.34 All residential properties and their curtilages within 2 km were viewed from publicly accessible locations to inform the Residential Visual Amenity Assessment (RVAA), contained in **Appendix 5.7**.

⁴² Shropshire Hills Area of Outstanding Natural Beauty (AONB) Partnership (2019) Shropshire Hills AONB Management Plan 2019-24

⁴³ LUC for Herefordshire Council (2023) Herefordshire County Landscape Character Assessment

Assessment Limitations

5.35 Some limitations of the LVIA and cumulative assessment include:

- Zones of theoretical visibility (ZTV) are based on a 'bare ground' scenario which produces a 'worst case' situation (buildings and vegetation will provide some screening); and
- The Residential Visual Amenity Assessment has been undertaken from publicly accessible viewpoints. Some properties have been grouped in order to achieve a proportionate assessment (see **Appendix 5.7**).

5.36 Despite the limitations noted above, it is considered that there is sufficient information and detail to identify and report on likely significant landscape and visual effects, including effects on residential visual amenity.

Existing Conditions

Landscape Baseline

Landscape of the Site

5.37 The Site is located in Mid-Wales approximately 9 km to the east of Llandrindod Wells and situated within the local planning authority of PCC. The location of the Site and shown in **Figure 5.1**. The Site is partially located within a Pre-Assessed Area (4) for Wind Energy as defined in Future Wales: The National Plan (**Figure 4.13**), formerly part of Priority Area (6) within the draft Welsh National Development Framework (NDF). The Site is part of a wider upland area known as Radnor Forest, forming a plateau up to 660 m Above Ordnance Datum (AOD) in height, which is the highest and most extensive range within the Radnorshire Hills. A large part of the Radnor Forest is a broad upland plateau, which has steep sides, and several distinct summits and ridges making up the wider complex of hills. The Site comprises a series of open, smoothly rounded ridges within Radnor Forest, and includes Great Rhos, which is the highest summit at 660 m AOD. The plateau comprises several minor summits and lower rounded ridges on its western flanks, with slopes descending to approximately 250 m AOD near the settlement of Llandegley and the A44 to the west (as illustrated on **Figure 5.2**). These open hills are steep-sided, although parts of Radnor Forest Hills complex are now covered by coniferous forest.

5.38 The Site comprises a mix of large-scale fields of pasture, open hill grazing and coniferous plantation. The landscape has a sense of relative remoteness from settlement, and although it has some valued semi-natural habitats, its perceptual character is influenced by commercial forestry and agriculture. The Site is relatively devoid of existing man-made features, and the landscape has a sense of relative remoteness from settlement, and experiences dark night skies as indicated by the Natural Resources Wales (NRW) map of Dark Skies and Light Pollution in Wales (shown on **Figure 5.13a**).

5.39 There are no public highways onsite (with the exception of the BOAT – see **paragraph 5.42** below); however, the south-western Site boundary is adjacent to the A44 which runs in a north-west to south-east alignment past the Site from where the Site will be accessed (via one of the two site access options detailed on **Figure 4.1b**). The A488 runs in a south-west to north-east direction to the north of the Site. These main roads provide access to numerous settlements/communities and residential properties, which are typically located in the lower-lying valleys surrounding the Site (**Figure 5.15b**). Key settlements/communities along the A44 and A488 in the vicinity of the Site include: Llanfihangel Rhydithon and Dolau, situated off the A488 approximately 1.3 km and 2.3 km to the north of the Site respectively; Llanfihangel-Nant-Melan, located along the A44 approximately 2.3 km to the south of the Site; Llandegley, located along the A44 approximately 2 km to the west of the Site; Bleddfa located on the A488 approximately 2.4 km to the north-east of the Site; New Radnor, located just off the A44 approximately 3.3 km to the east, south-east of the Site; and Penybont and Crossgates, located along the A44 approximately 4.6 km and 6.9 km west of the Site respectively (shown on **Figure 5.14b**).

5.40 The Site contains areas of Open Access Land ('open country' covering the open hilltop at Great Rhos and adjoining ridges and an area of 'common land' (Cowlod Common) in the centre of the Site (shown on **Figure 4.13**)). These provide public access, as well as some public rights of way which cross the Site. There is an area of 'public dedicated forest' managed by NRW to the north-east of the Site at Fishpools and a further area to the east, south-east of the Site at Warren Wood. The 'Water Break-Its Neck' waterfall is situated in the Radnor Forest, approximately 0.5 km south-east of the Site. This waterfall is a popular visitor attraction, situated near the car park for Nash Wood and Warren Wood.

5.41 Numerous PRowS provide access into the interior upland plateau of the Site from the surrounding valleys, including a BOAT which crosses the Site from south-west of Llanfihangel, south-eastwards across the plateau to the valley of Black Brook and the A44 between New Radnor and Llanfihangel-Nant-Melan. Several tracks provide access to farmsteads around the periphery of the Site and into the upland interior of the Site.

5.42 ES Chapter 7: Ecology (non-avian) details the habitats found across the Site. Aerial photography as shown on **Figure 5.3** indicates that land use consists of a mix of lowland pasture with hedgerows, open hill grazing and coniferous plantation. In low-lying areas in the west of the Site, and just outside of it, there are several farmsteads and residential properties. The residential properties are primarily located along the western boundary of the Site, with small clusters also visible to the south and north-east.

5.43 There are three Scheduled Monuments (barrows) in the north/centre of the Site. In addition, there is one known World War II crash site, between the two easterly barrow monuments with another crash site situated outside the Site boundary to the east. Grade II listed buildings are located at Llanevan relating to the farm and its barn and cow shed. Offsite are Crug Eryr (a mound and bailey castle) and Llandegley Rocks (a hillfort) Scheduled Monuments, which are 0.2 km south and approximately 2 km west respectively from the Site, and Cae Banal Castle Mound Scheduled Monument approximately 1 km south of the Site (as shown on **Figure 6.2** and detailed in ES **Chapter 6**).

5.44 The nearest operational wind farm is the Garreg Lwyd Hill Wind Farm, which is just over 12 km to the north and comprises 17 turbines 126.5 m to blade tip height. A small scale single turbine is operational at Cefncynfal approximately 4.9km north, north-west of the Site with a blade tip height of 77 m. Hendy Wind Farm⁴⁴ comprising seven turbines 110 m to blade tip height, located approximately 3 km west of the Site has been constructed but is understood not to be currently operational, therefore is considered to be 'in construction' for the purposes of this assessment.

5.45 In summary, the key landscape elements, features and characteristics of the Site are:

⁴⁴ Construction is understood to be complete and the wind farm awaits a connection to the electricity network (as of 19 December 2023), therefore the development is considered as part of the existing baseline situation.

- Large-scale upland moorland with heath, grassland, and semi-improved pasture at its margins;
- Small streams within incised valleys, and ponds/pools on the plateau generally north, west and south from the plateau through the Site;
- Occasional small blocks and linear belts of woodland and conifer plantation, with large areas of conifer plantation in the south-east and adjoining the Site;
- Open Access Land crossed by a BOAT and numerous PRoW; and
- Sense of remoteness, with dark night skies.

Landscape of the Study Area

5.46 As described above and shown in **Figure 5.1**, the overall Study Area extends to a 28 km radius from the outermost turbines of the Proposed Development which includes local authority areas in the West Midlands of England, in addition to PCC.

5.47 The Study Area includes the following other local authority areas:

- Within 10 km of the Proposed Development:
 - Herefordshire Council (HC).
- Between 10 km and 28 km of the Proposed Development:
 - Shropshire Council (SC); and
 - Bannau Brycheiniog National Park (BBNP).

5.48 The Shropshire Hills National Landscape/AONB is situated approximately 10 km north-east of the Site at its nearest point with the BBNP situated approximately 18 km to the south of the Site. The Middle Wye Valley Registered Historic Landscape (RHL) is located approximately 16 km south of the Site and the Elan Valley RHL 16 km to the west of the Site. There are no Nationally Designated Landscapes, Registered Historic Landscapes, or Local Landscape Designations which cover the extents of the Site.

5.49 The northern peripheral extents of the BBNP are located within the Study Area, comprising the Black Mountains escarpment, including the summits of Hay Bluff (677 m AOD) at approximately 24.6 km, Twmpa (690 m AOD) at approximately 25.7 km, and Rhos Dirion

(713 m AOD) at approximately 28 km, and from the ridgelines that extend from it northwards towards the Wye Valley, including Wenallt (408 m AOD) and Rhos Fawr (c.355 m AOD), at approximately 22.5 km and 26 km respectively. The Study Area includes the Radnorshire Hills (within which the Site is located), the Vales of Irton and Ithon, the Upper Wye Valley, the Teme Valley, and the BBNP. It also encompasses part of the West Midlands of England including the Clun and North West Herefordshire Hills, and the northern extent of the Black Mountains. The Study Area also includes a small part of the Shropshire Hills National Landscape (an AONB).

5.50 Typical of this part of Wales, the Study Area is characterised by upland moorland hills dissected by steep sided valleys. The Site is located on the largest area of exposed upland plateau within the Radnorshire Hills, often referred to as the Radnor Forest upland complex. Several river valleys incising the rolling uplands surround it, including the Lugg Valley and Teme Valley to the north-east. The large area of the Aberedw Uplands extend to the south, south-west of the Radnor Forest, with the well-known Wye Valley beyond, located approximately 15 km south-west and west of the Site. Together with the Irthon and Ithon tributary rivers, the river valleys incise large areas of upland as they flow through a narrow lowland vale between the Radnorshire Hills (central and northern parts of the Study Area), the eastern extents of the Cambrian Mountains (west of the Study Area) and the Epynt plateau (to the south-west beyond the Study Area).

5.51 Blocks of coniferous forestry are located throughout the Study Area including within the Site and across much of the eastern extents of the Radnor Forest upland complex, although typically at higher elevation uplands and upper valley slopes. Uplands are generally characterised by areas of open moorland with rough grazing, including on upper valley sides, whilst a more complex farmed landscape of woodland and pasture exists on lower valley sides and valley floors.

5.52 Settlement is typically confined to the lower valleys with compact linear villages, together with a small number of larger nucleated, valley towns at river crossing points, including the spa towns of Builth Wells and Llandrindod Wells; their location influenced by the A470 and A483 which cross through the Study Area. Where these roads cross at Builth Wells and Llanellwedd, is the location of the Royal Welsh Showground which becomes very busy throughout July. The

Heart of Wales railway runs through the Study Area to the north of the Site, linking between the English Midlands and south-west Wales.

5.53 There are good opportunities for recreation throughout the Study Area as many of the upland areas allow for open access, and promoted routes cross the area including the Elan Valley Way, Heart of Wales Line Trail, Glyndŵr's Way (a National Trail), Offa's Dyke Path (a National Trail) and National Cycle Network (NCN) Route 825 – Radnor Ring Route. At greater distance from the Site the Wye Valley Walk, Cambrian Way and Severn Way cross the Study Area.

Landscape Character – National Level Landscape Character Assessments

National Landscape Character Areas (NLCA) – Wales

5.54 At the national level, NRW has published a series of National Landscape Character Areas (NLCA), forming a broad landscape characterisation of the entirety of Wales. These are mapped on **Figure 5.7**. The Site is located wholly within the Radnorshire Hills (NLCA 20).

5.55 The Radnorshire Hills NLCA is described as *“This is an area of gentle, smooth, upland hills, rising gradually from the border in the east, to the Wye Valley in the west”*⁴⁵. The NLCA profile goes on to state *“Radnorshire’s topography is breathtaking and varied, with smooth, rolling, open moors, dissected by steep sided valleys with hedgerow-enclosed pastures by small rivers and streams, and ancient woodlands. Unfenced moorland roads reinforce the sense of openness and being away from the confines and pressures of other, more urbanised landscapes. The varying topography straddles the upland-lowland divide in many places, giving rise to marginal agriculture”*.

5.56 The area displays significant influence of both Welsh and English cultural and social heritage, many of which now offer opportunities for related recreation *“Radnorshire, the old county name that included this area, historically had the lowest population of any of the Welsh counties. Offa’s Dyke runs through part of the area and there are a mix of English and Welsh influences to the east in this Marches landscape. It is a very rural, and in the main it is a quiet area, away from the focus of tourism, despite promotion as ‘Kilvert Country’”*.

⁴⁵ Natural Resources Wales (2014) National Landscape Character – NLCA 20: Radnorshire Hills

5.57 The key characteristics of NLCA 20 are:

- ***“Smooth rounded moorland hills and glacially modified valleys – Bedrock geology is that of Silurian rock, including sandstones, shales and mudstones.***
- ***An undulating upland landscape – with sinuous skylines and distant views from moor to moor.***
- ***Extensive sheep and cattle rearing.***
- ***Minor river valleys – such as the Ithon and Marteg, dissect the area. A lateral network of minor tributaries drains the hillsides.***
- ***Enclosed Pasture in valleys and lower hillsides – with seasonally wet, deep peat soils and loams.***
- ***Heather dominated moorland – occurs in the most elevated parts of the area, some recognised for red grouse.***
- ***A network of geometric fields of small to large scale – defined by mixed native hedgerows interspersed with broadleaf woodland. few extensive blocks of coniferous forestry.***
- ***Shelter belts – in exposed upland and hillside locations in a few locations, at times incongruous in location and geometric shape, often coniferous.***
- ***Offa’s Dyke – illustrates the historic, strategic importance of this Marches landscape. Other historic elements included remnants of Medieval and post Medieval settlement, including motte and bailey castles, earthworks and moated sites.***
- ***Very little settlement, which is confined to the lower valleys – the pattern is defined by compact linear villages, together with a small number of larger nucleated, valley towns at river crossing points. A comparatively low population in this former county.”***

5.58 The landscape of the NLCA is varied, consisting of “...steeply rounded, high hills and ridges, some with open moorland, others of enclosed pasture or forestry. These are interspersed with lower hills and valleys. The area is very rural and largely undisturbed by industries, heavy traffic, tourism or commuters, and herein lies its timeless beauty and tranquillity. Apart from the two main roads that run through, from east to west (A 44) and from

south to north (A 483), the area is quiet and little frequented other than by the local rural population. The only small towns, Presteigne and Knighton, are on the periphery along the English border”.

5.59 Existing large scale wind farm development is found within the NLCA to the north of The Site, in the form of Llandinam Wind Farm (102 turbines at 45.5 m to blade tip height, and one of the first in Wales) and Garreg Lwyd Hill Wind Farm (17 turbines at 126.5 m to blade tip height), and the NLCA acknowledges that *“These wind turbines, along with radio masts, are visible landmarks seen at a distance from all sides”*. In addition, the under construction Hendy Wind Farm (7 turbines at 110 m to blade tip height) is located directly west of the Site within the NLCA.

5.60 The Site and surrounding area of the Radnor Forest upland complex and neighbouring valleys displays many of these key characteristics of the wider NLCA, with an upland plateau, with smooth rounded moorland hills, and minor river valleys. Improved pastures are found at the peripheries of the Site extending up towards the plateau from the surrounding lower valley slopes to the north, west and south of the Site. Sheep grazed semi-improved grassland and grassy moorland is common across the Site, with post and wire fences, and often geometric shelterbelts of coniferous woodland, and blocks of broadleaf woodland found to the northern, western and southern extents of the Site, off the elevated plateau. Areas of large scale coniferous plantation are found to the south-east of the Site and extend beyond the Site boundary to the north-east and east of the Site. There is no settlement found within the Site, although several scattered farmsteads are found in close proximity to the Site boundary. Settlement is found to the north along the slopes of the Aran River valley, to the west and south-west, along the A44 and south-east in the Radnor valley towards the Welsh border with Herefordshire and England.

5.61 Other NLCAs in Wales within a 15 km radius from the outermost turbines of the Proposed Development include:

- NLCA 27: The Spas and Wells of Central Wales – approximately 1 km to the west and extending south-westwards from the Site towards the towns of Llandrindod Wells and Builth Wells;
- NLCA 26: Upper Wye Valley – approximately 14 km to the west; and

- NLCA 29: Upper Wye Valley – approximately 13 km to the south-west.

National Character Areas (NCA) – England

5.62 In England, at a national level, Natural England has published a series of National Character Areas (NCA), forming a broad landscape characterisation of England. NCAs within a 15 km radius from the outermost turbines of the Proposed Development include:

- NCA 58: Clun and North West Herefordshire Hills, approximately 8.5 km to the south-east at its closest point.

5.63 The relevant NCAs are mapped on **Figure 5.7**.

The Mid-Wales Landscape

5.64 The landscape of Mid-Wales is made of a diverse range of landscapes of variable scales and character. NRW⁴⁶ describes the area as *“A very large rural area with regional scale remote uplands and mountains, coastline, reservoirs and borderlands contributing to its identity. The area encompasses part of the Brecon Beacons, the highest mountain range in Southern Britain, and a substantial part of the Brecon Beacons National Park. The Cambrian Mountains form an upland spine that divides mid Wales and continues northwards to the Berwyns. The rivers Severn, Wye, Usk and Teifi flow through the area, punctuated by historic towns, villages and castles. Tranquil, undulating rural farmland dominates the hills and deep, often wooded, valleys that descend to the rugged Ceredigion coastline and coastal resort towns. Moors, forests and deep reservoir valleys are associated with the extensive wilder uplands”*.

5.65 It describes the area of Mid-Wales defined by NLCA 20 within which the Site is located as *“The Radnorshire Hills comprises areas of open moorland, forestry and upland grazing with dramatic long ranging views over smooth rolling hills and sheltered valleys of traditional farmland. A very rural area with qualities of timelessness and tranquillity, occasionally interrupted by windfarms”*.

⁴⁶ [Natural Resources Wales \(2018\) The Mid-Wales Landscape](#)

Landscape Character – Local or Regional Level Landscape Character Assessments

5.66 At the local level, the landscape of the Site and 28 km radius Study Area is defined in the following published landscape character assessments:

- Powys County Council (2022) Local Landscape Character Assessment for the Powys Local Development Plan Area – Landscape Character Assessment Report;
- Herefordshire Council (2023) Herefordshire County Landscape Character Assessment;
- Shropshire County Council (2006) The Shropshire Landscape Typology; and
- Brecon Beacons National Park Authority (2012) Brecon Beacons Landscape Character Assessment.

Powys Landscape Character Assessment

5.67 The Powys wide local landscape character assessment was finalised in 2022, and published in 2023, and was not available at the time of the preparation of the EIA Scoping Request⁴⁷ for the Proposed Development. The landscape character assessment updated the previous 2008 assessment and defined 61 unique LCAs across the county. The character assessment describes how the earlier assessment and LANDMAP has underpinned the definition of the landscape character areas *“The original LCA (2008) drew heavily on baseline aspect area data gathered from LANDMAP, and the boundaries of the identified landscape character areas were principally derived from Visual and Sensory LANDMAP aspect areas boundaries. The current landscape character assessment adopted the boundaries of the original LCA (2008) in the first instance, although these were checked and refined as appropriate using current LANDMAP data and other datasets, which was then verified by field work”*. (paragraph 2.12).

5.68 The landscape of the whole Site is defined by Landscape Character Area (LCA) 43 Radnor Forest⁴⁸, as shown on **Figures 5.9a-c**. The LCA *“comprises a distinctive and dramatic elevated landform situated in the east of the Powys Local Development Plan (LDP) area, located to the immediate north and west of New Radnor. The LCA steeply rises up from the surrounding lower*

⁴⁷ LUC on behalf of Nant Mithil Energy Park Limited (2022) Nant Mithil Energy Park EIA Scoping Report

⁴⁸ Powys County Council (2022) Landscape Character Assessment Profiles – LCA 43: Radnor Forest

lying areas of Llanbister- Penybont Uplands LCA to the west, Lugg Valley LCA to the north-east, Presteigne & Beggar's Bush Hillsides LCA to the east, New Radnor Valley LCA to the south-east and Aberedw Uplands LCA to the south”.

5.69 The key characteristics of LCA 43 are:

■ Topography, geology and drainage:

- **“High upland plateau landscape rising dramatically from the surrounding landscape to an elevation of 660 m AOD at its highest point at Great Rhos. The conical hill of The Whimble (599 m AOD) is visually distinctive from the surrounding landscape to the east.”**
- **“Valley slopes are cut by steep, glaciated valleys now occupied by watercourses. The regular series of valleys incising the slopes create distinctive, finger-like rounded profiles. The deep, steep-sided glacial valley Harley Dingle is a particularly notable landform cutting into the south-eastern slopes of the LCA.”**
- **“Watercourses flowing from this elevated landscape include the spring fed tributaries to the River Lugg, and the Summerhill Brook.”**
- **“The underlying geology comprises siltstones and sandstones of late Silurian age. Mithil Brook and Cwm Blithus is a Geological Conservation Review (GCR) site.”**

■ Vegetation cover:

- **“Prominent expanses of coniferous plantation, which are characteristically uniform and straight sided. The largest plantations are situated on the north-east facing slopes, with smaller plantations within Davy Morgan's Dingle on the south-facing slopes.”**
- **“A small number of broadleaved woodland blocks are located in the north of the LCA, some of which are of ancient semi-natural origin.”**

■ Agricultural land use and field patterns:

- **“The majority of this area is occupied by extensive tracts of unimproved acid grassland upland commons, with large straight-sided fields defined by post and wire fences, or coniferous shelterbelts.”**

- “Land use in the valley surrounding Bleddfa comprises **smaller scale improved pasture fields** bound by hedgerows with frequent hedgerow trees.”

■ Semi-natural habitats:

- “Where not covered by conifer plantation, the area is a good example of **expansive upland moorland, with extensive areas of blanket bog, dry heathland and bracken habitats**, particularly in the south.”
- “The Radnor Forest SSSI is an expansive area covering 827 ha in the mid-south of the LCA, designated for its important assemblages of **well-developed submontane heath communities over thin blanket peat**.”

■ Archaeology and cultural heritage:

- “The majority of field patterns reflect the pattern of **19th century enclosure of upland commons**, with regular straight-edged boundaries.”
- “Early prehistoric settlement indicated by **a series of round barrow hilltop burial monuments as well as prehistoric enclosures**, designated as Scheduled Monuments. There is an undesignated hill fort of likely Iron Age origin at Llysin Hill.”
- “Medieval and later activity represented by **scattered remains of former house sites, isolated relict field systems and by occasional pillow mounds**. Small stone quarries for building stone, probably of postmedieval date.”
- “The area was a **medieval royal hunting ground**, hence its name ‘Radnor Forest’. Bleddfa means “place of the wolf” with folklore stipulating the last of the Welsh wolves were killed here.”

■ Settlement and road pattern:

- “**Largely unsettled, with small hamlets at Bleddfa and Fishpools** on the A488 and a small number of isolated farmsteads tucked into valleys, mainly in the north of the LCA.”
- “Crossed by the A488 in the north and the A44 in the south, the latter of which cuts through the narrow Summergill Brook Valley and has **the feel of a gateway through the upland mass**. Elsewhere the road network is limited.”

- ***“Crossed by numerous Public Rights of Way (PRoW) with two NRW promoted recreational routes at Fishpools and Warren Wood. Extensive upland areas in the south are open access land.”***

■ Views and perceptual qualities:

- ***“Distinctive landform is a prominent feature within the local landscape and forms a backdrop to views.”***
- ***“Panoramic views over the surrounding landscape from elevated parts of this LCA including distant views to the Brecon Beacons National Park to the south-west and Snowdonia National Park to the north-west.”***
- ***“Moorland summits have a strong sense of remoteness, high levels of tranquillity and dark night skies.”***

5.70 Other LCAs and Landscape Character Types (LCTs) within a 15 km radius from the outermost turbines of the Proposed Development, are as follows:

■ Local Landscape Character Assessment for the Powys Local Development Plan Area

- LCA 31: Bwlch-y-sarnau Uplands⁴⁹;
- LCA 32: Teme Hillsides⁵⁰;
- LCA 33: Ithon Valley Hillsides⁵¹;
- LCA 35: Beacon Hill⁵²;
- LCA 36: Teme Valley⁵³;
- LCA 37: Drysgol Uplands⁵⁴;
- LCA 38: River Dulas Hills & Valleys⁵⁵;

⁴⁹ Powys County Council (2022) Landscape Character Assessment Profiles – LCA 31: Bwlch-y-sarnau Uplands

⁵⁰ Powys County Council (2022) Landscape Character Assessment Profiles – LCA 32: Teme Hillsides

⁵¹ Powys County Council (2022) Landscape Character Assessment Profiles – LCA 33: Ithon Valley Hillsides

⁵² Powys County Council (2022) Landscape Character Assessment Profiles – LCA 35: Beacon Hill

⁵³ Powys County Council (2022) Landscape Character Assessment Profiles – LCA 36: Teme Valley

⁵⁴ Powys County Council (2022) Landscape Character Assessment Profiles – LCA 37: Drysgol Uplands

⁵⁵ Powys County Council (2022) Landscape Character Assessment Profiles – LCA 38: River Dulas Hills & Valleys

- LCA 39: Ithon Valley⁵⁶;
- LCA 40: Llanbister-Penybont Uplands⁵⁷;
- LCA 42: Lugg Valley⁵⁸;
- LCA 44: Wye Valley (Rhayader to Builth Wells)⁵⁹;
- LCA 45: Presteigne & Beggars Bush Hillsides⁶⁰;
- LCA 49: New Radnor Valley⁶¹;
- LCA 50: Aberedw Uplands⁶²;
- LCA 51: Painscastle Uplands⁶³;
- LCA 54: Aberedw Valley⁶⁴;
- LCA 55: Wye Valley (Builth Wells to Hay-on-Wye)⁶⁵; and
- LCA 56: Northern Mynydd Epynt⁶⁶.

Shropshire Landscape Character Assessment

5.71 The Shropshire Landscape Typology defines the landscapes of the whole county of Shropshire, including areas within the Shropshire Hills National Landscape/AONB⁶⁷. It identifies 27 unique LCTs across the county, and each type represents a different combination of the physical (natural) and cultural (human) aspects that define landscape character.

⁵⁶ Powys County Council (2022) Landscape Character Assessment Profiles – LCA 39: Ithon Valley

⁵⁷ Powys County Council (2022) Landscape Character Assessment Profiles – LCA 40: Llanbister – Penybont Uplands

⁵⁸ Powys County Council (2022) Landscape Character Assessment Profiles – LCA 42: Lugg Valley

⁵⁹ Powys County Council (2022) Landscape Character Assessment Profiles – LCA 44: Wye Valley (Rhayader to Builth Wells)

⁶⁰ Powys County Council (2022) Landscape Character Assessment Profiles – LCA 45: Presteigne & Beggar Bush Hillsides

⁶¹ Powys County Council (2022) Landscape Character Assessment Profiles – LCA 49: New Radnor Valley

⁶² Powys County Council (2022) Landscape Character Assessment Profiles – LCA 50: Aberedw Uplands

⁶³ Powys County Council (2022) Landscape Character Assessment Profiles – LCA 51: Painscastle Uplands

⁶⁴ Powys County Council (2022) Landscape Character Assessment Profiles – LCA 54: Aberedw Valley

⁶⁵ Powys County Council (2022) Landscape Character Assessment Profiles – LCA 55: Wye Valley (Builth Wells to Hay-on-Wye)

⁶⁶ Powys County Council (2022) Landscape Character Assessment Profiles – LCA 56: Northern Mynydd Epynt

⁶⁷ AONBs in England and Wales were renamed as 'National Landscapes' in November 2023.

5.72 The LCTs⁶⁸ in Shropshire and a 15 km radius from the outermost turbines of the Proposed Development are as follows:

- CV/02: High enclosed plateau LCT;
- CV/04: High enclosed plateau LCT;
- CV/10: Riverside Meadows LCT;
- CV/14: Estate farmlands LCT;
- CV/18: Estate farmlands LCT;
- CV/25: High enclosed Plateau LCT;
- CV/26: Wooded Hills and farmland LCT; and
- CV/28: High enclosed Plateau LCT.

Herefordshire Landscape Character Assessment

5.73 The Herefordshire County Landscape Character Assessment was commissioned in 2022. The landscape character assessment covers the whole county of Herefordshire including areas within the Wye Valley National Landscape/AONB and Malvern Hills National Landscape/AONB. The assessment updates earlier assessments undertaken in 2009 and 2004 respectively. The landscape character assessment is intended to both inform work on policy development and development management, guiding development that is sympathetic to local character and the qualities of the landscape.

5.74 The LCAs⁶⁹ within Herefordshire and a 15 km radius from the outermost turbines of the Proposed Development are as follows:

- LCA 1b: Lugg, Arrow and Frome – River Floodplains LCT;
- LCA 4a: North West Herefordshire – Enclosed River Valley Farmland LCT;
- LCA 5a: Wye Valley – Undulating Wooded Farmland and Estates LCT;

⁶⁸ Shropshire County Council (2006) The Shropshire Landscape Typology

⁶⁹ LUC for Herefordshire County Council (2023) Herefordshire Landscape Character Assessment – Landscape Character Type Profiles

- LCA 5b: Arrow and Lugg Valley – Undulating Wooded Farmland and Estates LCT;
- LCA 9a: North West Herefordshire Hills – Limestone Uplands LCT; and
- LCA 10b: Briley to Lyonshall LCA - Border Sandstone Hills and Farmland LCT.

Brecon Beacons Landscape Character Assessment

5.75 The Brecon Beacons Landscape Character Assessment was commissioned by the Bannau Brycheiniog National Park Authority (BBNPA) in 2012. The landscape character assessment identifies *“five broad landscape types within the National Park: Uplands, Upland Valleys, Settled Valleys, Lowlands and Mountains and Valleys. Within these landscape types, fifteen Landscape Character Areas were identified. Each one has its own character, identity and ‘sense of place’ derived from the particular combinations of natural and cultural elements within it”*.

5.76 Each LCA is described in terms of its *“location and context; historical development; distinctive characteristics; LANDMAP components; settlements; key views; special qualities; sensitivities; contribution to ecosystem services and Green Infrastructure and forces for landscape change. Each Landscape Character Area profile ends with a management strategy and recommended management guidelines to protect and strengthen its landscape character”*.

5.77 LCAs within the BBNP and within the 28 km radius from the outermost turbines of the Proposed Development are as follows:

- LCA 13: The Black Mountains⁷⁰; and
- LCA 14: Wye Valley Foothills⁷¹.

⁷⁰ Fiona Fyfe Associates on behalf of Brecon Beacons National Park Authority (2012) Brecon Beacons National Park Landscape Character Assessment – Landscape Character Area 13: The Black Mountains

⁷¹ Fiona Fyfe Associates on behalf of Brecon Beacons National Park Authority (2012) Brecon Beacons National Park Landscape Character Assessment – Landscape Character Area 14: Wye Valley Foothills

LANDMAP

5.78 LANDMAP⁷² is a Geographical Information System (GIS) where landscape characteristics, qualities, sensitivities and influences are recorded and evaluated in a nationally consistent dataset. LANDMAP separates the information into five ‘aspect layers’, including:

- **Visual and Sensory:** Which evaluates landscape characteristics and qualities that we perceive through our senses, primarily visual. This includes information on individual physical attributes of landform and land cover, and the relationship between them.
- **Historic Landscape:** Which identifies the landscape characteristics and qualities which depend on key historic land uses, patterns and features.
- **Geological Landscape:** Which identifies the landscape qualities determined by bedrock and surface processes, such as hydrology, which control erosion and deposition.
- **Landscape Habitats:** Which identifies habitat features and characteristics, as well as their spatial relationship with the wider landscape.
- **Cultural Landscape:** Which describes the link between people and landscape, including the way in which human activity shapes the landscape and the meaning of places to people.

5.79 These aspect layers are then divided into ‘aspect areas’, which form the reporting units for LANDMAP. Each aspect area is given an overall evaluation score defined as ‘outstanding’ (important at an international or national level), ‘high’ (important at a regional or county level), ‘moderate’ (important at a local level), or ‘low’ (little or no importance).

5.80 The aspect areas that are located wholly or partially within the Site with their overall evaluation scores, are presented below in **Table 5.2** and mapped on **Figures 5.11a-e**.

⁷² [Natural Resources Wales \(2023\) LANDMAP – the Welsh landscape baseline](#)

Table 5.2 LANDMAP aspect areas within the Site and their evaluation

Aspect Area	Aspect ID	Area Name	Location in the Site	Overall Evaluation	Justification
Visual and Sensory (VSAA) (see Figure 5.11a)	RDNRVS108	Upland moor, Radnor Forest	Covers the majority of the south and central part of the Site.	High	<i>“good example of wild, open, spacious, natural, diverse, tranquil upland moorland which is generally well managed, plus attractive views.”</i>
	RDNRVS119	Improved upland, Radnor Forest	Covers the northern part of the Site including Shepherd’s Tump, Oldhall Bank and Graig Hill.	Moderate	<i>“intrinsically higher landscape value has been degraded by insensitive intensive farming with conversion of rough grassland/moorland areas to improved grassland fields by drainage.”</i>
	RDNRVS133	Rolling hills, central south-east	Covers a small area in the south-west of the Site.	Moderate	<i>“attractive traditional pastoral landscape with strong field pattern, often with well laid hedges typifies Radnor – and results in overall moderate values as it is not unusual or particularly distinctive.”</i>

Aspect Area	Aspect ID	Area Name	Location in the Site	Overall Evaluation	Justification
Historic Landscape (HLAA) (see Figure 511b)	RDNRHL673	Llandegley	Covers a small area in the south-west of the Site.	Moderate	<i>“Medium sized area of mixed medieval (including some residual strip fields) and later fieldscapes surrounding the single small medieval settlement at Llandegley.”</i>
	RDNRHL828	Radnor Forest	Covers the majority of the Site, apart from a small area of farmland to the south-west (covered by HLAA RDNRHL673).	High	<i>“Straggling upland ridge at the heart of Radnorshire and marking the highest point in the county at 660 m. Mostly enclosed with large (presumably 19th century) fields and with scattered remains of medieval and later farming but also prehistoric funerary monuments and finds. A valuable historic landscape but with widely spread but important content.”</i>

Aspect Area	Aspect ID	Area Name	Location in the Site	Overall Evaluation	Justification
Geological Landscape (GLAA) (see Figure 5.11c)	RDNRGL187	Penybont-Hundred House	Covers a small area in the south-west of the Site.	Moderate	<i>“Outcrop of widespread geology; exposures of at least regional importance not currently recorded.”</i>
	RDNRGL807	Radnor Forest	Covers the majority of the Site, apart from a small area of farmland to the south-west (covered by GLAA RDNRGL187).	Outstanding	<i>“Upland area with sites of national importance (candidate SSSIs) for Silurian (Ludlow) stratigraphy and significant glacial features.”</i>
Landscape Habitat (LHAA) (see Figure 5.11d)	RDNRLH010	No name in data (Level 3 = improved grassland)	Covers a small area in the south-west of the Site, including the northern valley side of the Mithil Brook, and	Low	No justification given.

Aspect Area	Aspect ID	Area Name	Location in the Site	Overall Evaluation	Justification
			lower-lying farmland to the west.		
	RDNRLH022	No name in data (Level 3 = bracken)	Covers a small area on the southern, south-west facing slope of Shepherd's Tump, in the north-west of the Site.	Moderate	<i>"the site is a dominated by bracken, other habitats include improved grassland, broadleaved woodland. Therefore the overall evaluation habitat and species is Moderate."</i>
	RDNRLH024	No name in data (Level 3 = mosaic)	Covers much of the south and central parts of the Site, including Fron Goch, Crinfynydd, Foel, Cowlod, and Great Rhos.	High	No justification given.

Aspect Area	Aspect ID	Area Name	Location in the Site	Overall Evaluation	Justification
	RDNRLH053	No name in data (Level 3 = improved grassland)	Covers the northernmost part of the Site, including Shepherd's Tump, Oldhall Bank, and Graig Hill.	Low	No justification given.
	RDNRLH060	No name in data (Level 3 = improved grassland)	Covers a small area in the south of the Site including Fronddyrys and the western slope of Cwm Du.	Moderate	<i>"The area is located across Improved upland hills with a few small pockets of diversity including; Llynheilyn pool, Belibedw mawn pool, Llanboidy wood and Cwm-y-bont. The landscape habitat is characterised by the dominance of Improved grassland interspersed by; Semi-natural Broadleaved Woodland, Planted Coniferous Woodland, Marshy Grassland and Bracken. The area supports a LNR</i>

Aspect Area	Aspect ID	Area Name	Location in the Site	Overall Evaluation	Justification
					<i>designation. The area is classified as being of Moderate value for overall habitat and species evaluation.”</i>
Cultural Landscape (CLAA) (see Figure 5.11e)	RDNRCLS04 8	Improved upland, Radnor Forest	Covers the northern part of the Site including Shepherd’s Tump, Oldhall Bank, and Graig Hill.	Moderate	No justification given.
	RDNRCLS01 7	Upland moor, Radnor Forest	Covers most of the Site, apart from a small area in the west and a small area in the north (covered by RDNRCLS048).	High	No justification given.

Scope of the Landscape Assessment

Identifying Landscape Units for Assessment

5.81 For the purpose of this LVIA, the 'landscape units' for assessment have been based on the LCAs and LCTs set out in the PCC Local Landscape Character Assessment, the Shropshire Landscape Typology, and the Herefordshire County Landscape Character Assessment. These overarching reporting units, described as LCAs or LCTs, and those in Wales are each made up of the multiple smaller LANDMAP units, which are variable according to which of the five aspects they fall within. As noted in LANDMAP GN46 *"assessors carrying out LVIA need to judge the appropriate scale of reporting for the development, which may not always be the reporting scale of LANDMAP"*.

5.82 The LCA and LCT units are considered appropriate to the size and scale of the Proposed Development and 28 km radius Study Area. LANDMAP information from the survey records is also used to further inform the LVIA. Detailed assessments have been undertaken for the landscape units within 15 km of the nearest proposed turbine as agreed with PCC (as these are the most likely to experience potentially significant effects), following the Scoping exercise detailed in **Appendix 5.3**.

5.83 Direct landscape effects will be limited to LCAs in which the Proposed Development is located. Effects on other LCAs within the wider Study Area will be indirect, experienced through views of the Proposed Development from within the LCA. Beyond 15km, indirect effects on landscape character are considered unlikely to be significant, therefore LCAs beyond 15 km are scoped out of the assessment.

5.84 The theoretical visibility of the Proposed Development (based on turbine hub height and blade tip height ZTVs shown on **Figures 5.4a-b** and **Figures 5.5a-b**, and **Figure 5.9** respectively) has been used as a preliminary means of identifying which LCAs within 15 km require assessment, and which LCAs can be scoped out of further consideration because they are unlikely to experience significant effects arising from the introduction of the Proposed Development. Given the ZTVs have been prepared on the basis of a 'bare ground' digital terrain model (DTM) that does not take into account the influence of screening by woodland, vegetation and buildings or other features, the theoretical visibility over-emphasises the extent of visibility

of the Proposed Development and therefore represents a ‘maximum potential visibility’ scenario. LCAs with limited actual visibility within 15 km of the Site, as informed by observations made during fieldwork regarding the nature of views and screening by woodland and other features, were scoped out and not considered further within the assessment.

5.85 Information from the relevant LANDMAP aspect layers has been incorporated into the descriptions and evaluations of the landscape units. The assessment of landscape units is presented in **Appendix 5.4**.

Designated Landscapes

5.86 The designation of landscapes indicates a recognised value placed by society on a landscape. An absence of designation does not mean an absence of landscape value; however, designations are a useful starting point for understanding landscape value.

Nationally Designated Landscapes

5.87 Since the passage of the National Parks and Access to the Countryside Act 1949, nationally important landscapes in England and Wales have been designated as National Parks or Areas of Outstanding Natural Beauty (AONB)⁷³.

5.88 In Wales, these cover approximately 25% of the country, whilst in England they comprise approximately 24.4%⁷⁴.

5.89 National Parks were established under the 1949 National Parks and Access to the Countryside Act (revised 1995 Environment Act), to “*conserve and enhance their natural beauty, wildlife and cultural heritage as well as to provide opportunities for public understanding and enjoyment*”.

5.90 AONBs in England and Wales were also introduced under the 1949 National Parks and Access to the Countryside Act (revised in the 2000 CRow Act). These areas are designated with the sole obligation to conserve and enhance their natural beauty. AONBs are managed by partnerships between local authorities.

⁷³ AONBs in England and Wales were renamed as ‘National Landscapes’ in November 2023.

⁷⁴ Glover, J. on behalf of the Department for Environment, Food and Rural Affairs (2018, updated 2019) Landscapes review: National Parks and AONBs

5.91 These designations have enabled the UK to retain its exceptional landscapes, whilst managing development within them and allowing their continued enjoyment by the public.

5.92 The Site itself is not located within any nationally designated landscapes, however the Shropshire Hills National Landscape/AONB is located approximately 10.1 km to the north-east of the Site (as shown on **Figure 5.12a**), with visibility of turbines predicted at distances of 10 km and greater as shown on **Figure 5.12b**.

5.93 The Bannau Brycheiniog National Park (BBNP) is located approximately 18 km to the south of the Site (as shown on **Figure 5.12a**), with visibility of turbines predicted at distances of 19.5 km and greater as shown on **Figure 5.12b**.

Shropshire Hills National Landscape/AONB

5.94 The special qualities of the Shropshire Hills National Landscape/AONB are outlined in the Shropshire Hills AONB Management Plan 2019-2024⁷⁵. Those of greatest relevance to this assessment are detailed below:

- *“Diversity and contrast (landscape character): With a variety of geology unequalled in any area of comparable size in Britain, the Shropshire Hills have no single dominant feature or landform. The area’s landscape character is one of variety and of transition – between the lowland plains of the English Midlands and the uplands of Wales, and between north and south of Britain. This is reflected in both ecology and human activity.”*
- *“Hills: The rocky Stiperstones, the dissected plateau of the Long Mynd, the craggy volcanic Stretton Hills and Wrekin, the harsh quarried landscape of the Clee Hills, the wooded scarp of Wenlock Edge, and the rolling enclosed hills of the Clun Forest all have their own distinctive character. The hills define the identity of the area and are the backbone of our landscape. They contain commons, heath, moorland and rough grasslands, and are home to a variety of upland birds including curlew, red grouse and merlin.”*
- *“Rivers and river valleys: The Rivers Clun, Teme and Onny, along with many smaller rivers and streams, are relatively clean and natural in form, and of high quality. Many are lined*

⁷⁵ Shropshire Hills Area of Outstanding Natural Beauty (AONB) Partnership (2019) Shropshire Hills AONB Management Plan 2019-24

with alder, and home to important species like the dipper, white-clawed crayfish and otter. The critically endangered freshwater pearl mussel is found in the River Clun just outside the AONB. Valleys vary from the steep-sided batches and dingles of the Long Mynd and Stiperstones, to larger expanses with some flood meadows, and the broad dales such as Corve Dale and Ape Dale which divide up the area. The AONB makes up the majority of the headwaters of the Teme catchment, and a short stretch of the River Severn within the AONB divides the Wrekin from Wenlock Edge. There are few large water bodies but many ponds, marshes and flushes.”

- *“Heritage: Many ancient features survive in a landscape which has seen less change than many parts of the country. Defences such as Offa’s Dyke, Iron Age hillforts such as at Caer Caradoc and Bury Ditches and medieval castles and fortified houses such as Clun and Stokesay, tell of centuries of turbulent Marches history. The Shropshire Hills has the greatest concentration of medieval castle earthworks anywhere in Britain. Much of the field and settlement pattern is very ancient with tiny lanes, villages and scattered hamlets and farms. There are also estates, parkland, planted settlements and abandoned medieval villages, along with areas of later, more regular Parliamentary enclosure. Stone and timber-framed buildings in a variety of styles reflect the diversity of local materials available, and there is a rich variety of churches and churchyards. The Clee Hills and Stiperstones in particular have seen periods of thriving industry such as lead mining and stone quarrying, often with haphazard ‘squatter’ settlement.”*
- *“Scenic and environmental quality: Panoramic views extend from, across and into the AONB, which abounds in both wide open spaces and intimate corners. There are contrasts from relatively wild hills and valleys to softer, settled landscapes, as well as between varying seasonal colours of heather, grass, bracken and broadleaved trees. The high quality of the built environment of towns, villages and rural settlement complements and blends with the countryside. Clean air and water are accompanied by other valuable ecological functions including food and fibre growing, and water runoff control.”*
- *“Tranquillity: ‘Off the beaten track and remote in the context of this part of England, the Shropshire Hills are a haven of tranquillity – peace and quiet, dark skies and unspoilt views.*

Relatively low levels of noise and development are coupled with modest visitor numbers to create an unspoilt quality that is greatly valued.”

- *“Culture and Opportunities for Enjoyment: ‘The Shropshire Hills span a wide spectrum of cultural settings. These range from the urban fringes of Telford and Ironbridge, through the rural setting of market towns just outside the AONB such as Ludlow, Craven Arms and Much Wenlock, to some of the most sparsely populated areas in England along the Welsh border. Church Stretton has a unique location in the heart of the hills and a strong Edwardian character. The Shropshire Hills have been a cultural inspiration for writers such as A E Housman, Mary Webb and Malcolm Saville. Opportunities for enjoyment and wellbeing are open to both locals and visitors for walks and outdoor activities respecting the area’s qualities. The AONB has some of the best rights of way networks in Shropshire, along with most of its open access land, plus a wide variety of sites, features and promoted routes.”*

Bannau Brycheiniog National Park (BBNP)

5.95 The special qualities of the BBNP are highlighted within the Y Bannau: The Future – The Management Plan for the BBNP 2023-2028⁷⁶. Those of greatest relevance to this assessment are detailed below:

- *“Sweeping grandeur & outstanding natural beauty: The National Park’s sweeping grandeur and outstanding natural beauty observed across a variety of harmoniously connected landscapes, including marvellous gorges and waterfalls, classic karst geology with limestone pavement, caves and sink holes, contrasting glacial landforms such as cliffs and broad valleys carved from old red sandstone and prominent hilltops with extensive views in all directions. A landscape that provides a sense of time depth and timelessness.”*
- *“Enjoyable & accessible: Enjoyable and accessible countryside with extensive, widespread and varied opportunities to pursue walking, cycling, fishing, water-based activities and other forms of sustainable recreation or relaxation.”*

⁷⁶ Bannau Brycheiniog National Park Authority (2023) Y Bannau: The Future – The Management Plan For Bannau Brycheiniog National Park 2023-2038

- *“Sounds, sights, smells & tastes: A feeling of vitality and wellbeing that comes from enjoying the National Park’s fresh air, clean water, rural setting, open land and locally produced foods.”*
- *“Peace, tranquillity & darkness: A National Park offering, dark, night time skies, peace and tranquillity with opportunities for quiet enjoyment, inspiration, relaxation and spiritual renewal.”*

5.96 The preservation of these special qualities features heavily within the Bannau Brycheiniog LDP⁷⁷.

5.97 The entirety of the National Park is also recognised as an IDSR. The level of dark skies within the National Park and across the Study Area is illustrated on **Figure 5.13a** informed by the 2021 light pollution mapping undertaken by NRW⁷⁸.

5.98 The Bannau Brycheiniog LCA provides an overview of the landscape character of the National Park, which has been divided into 15 character areas. Those that fall within the 28 km radius Study Area are set out below and detailed on **Figure 5.a** to **Figure 5.8c**:

- **LCA 13: The Black Mountains** – *“This LCA is largely defined by its topography: a series of broad ridges running north-south and separated by narrow, steep-sided valleys. It contains some of the highest land in the National Park – the summit of Waun Fach is over 800 m above sea level. The higher moorlands are empty and remote, contrasting with the more pastoral and settled valleys between them. This is a rich archaeological landscape, with a concentration of surviving prehistoric features on the higher land, as well as the Medieval Llanthony Priory in the Vale of Ewyas. The valleys contain a network of ancient farms, fields, woodland and winding lanes.”*
- **LCA 14: Wye Valley Foothills** – *“A series of ridges run down from the Black Mountains towards the Wye Valley, creating a series of narrow, enclosed valleys which gradually broaden out. These valleys form the basis of a strongly agricultural landscape, visually dominated by the northern scarp of the Black Mountains, with farms nestling at the heads of valleys. It is a well-wooded landscape with ancient woodlands on valley sides and alongside*

⁷⁷ Bannau Brycheiniog National Park Authority (2013) Brecon Beacons National Park Local Development Plan

⁷⁸ Natural Resources Wales (2021) New map casts light on Wales’ dark skies

streams, as well as some conifer plantations. The tops of the ridges support heath habitats, and many contain prehistoric monuments. Along the northern edge of the LCA are a series of nucleated settlements (Hay-on-Wye being the largest). Llangors Lake is an important archaeological and recreation site.”

5.99 The assessment of effects on the Shropshire Hills National Landscape/AONB and BBNP are detailed in **Appendix 5.6**, drawing on the assessment of landscape and visual effects presented in this chapter and the accompanying **Appendix 5.4** and **Appendix 5.5**.

Locally Designated Landscapes

5.100 Different parts of the UK currently have different policy approaches to local landscape designations. Local landscape designation is supported by national policy in Wales, however, within the PCC area locally designated landscapes are not defined. As stated in the Powys Local LCA³⁷ “As part of their current adopted LDP, Powys Local Planning Authority opted not to identify areas of landscape importance within their administrative boundaries (usually referred to as Special Landscape Areas, or SLAs). Instead they adopted the approach that all landscapes have valued attributes, and these key sensitivities/qualities are drawn out in the Landscape Character Assessment” (paragraph 1.12).

5.101 Across England locally designated landscapes have been inconsistently defined due to past changes of emphasis in national planning guidance. Many local authorities in England currently use Local Landscape Designations (LLDs) to protect locally important landscapes with locally appreciated scenic value. Regionally their names and approaches differ, but overall, they work towards protecting areas of value in relation to the local authority area. LLDs are variously termed ‘Areas of Great Landscape Value’, ‘Special Landscape Areas’, or ‘Areas of Special Landscape Importance’ among others.

5.102 No locally designated landscapes are defined within the Shropshire Council or Herefordshire Council areas within the areas of the Study Area in England. As such, no locally designated landscapes are found across the whole Study Area which require further consideration or assessment in the LVIA.

Historic Landscape Designations

5.103 The Register of Landscapes of Historic Interest in Wales recognises a number of historic landscapes of national significance across Wales.

5.104 Registered Landscapes of Historic Interest are shown on **Figure 5.12a** and **Figure 5.12b**. The nearest Registered Historic Landscapes (RHLs) are the Middle Wye Valley⁷⁹ located approximately 16km to the south of the Site, and the Elan Valley⁸⁰, located approximately 21 km to the west of the Site, from the outermost turbines of the Proposed Development. The Middle Wye Valley is considered to be of Outstanding Historic Importance, and the Elan Valley is of Special Historic Importance. These have been considered when determining 'value' in both the landscape and visual assessments, and are considered in greater detail within ES **Chapter 6**.

Visual Baseline Conditions

Analysis of Theoretical Visibility of the Proposed Development

5.105 The ZTVs in **Figures 5.4a-a** and **Figures 5.5a-b** show the theoretical visibility of the Proposed Development to maximum turbine hub height (covering the range of individual turbine heights of 113.5 m, 27.5 m, 142.5 m) and maximum turbine blade tip height (covering the range of individual turbine heights of 180 m, 205 m, 220 m) respectively, and comparatively on **Figures 5.6a-b**. The ZTVs are based on a bare ground model and do not take into account the effects of screening provided by buildings and/ or vegetation. Visibility of the Proposed Development has been verified in the field.

5.106 The ZTVs indicate theoretical visibility of the proposed turbines from areas of high ground in the Radnorshire Hills, Cambrian Mountains, the Epynt Plateau, and Black Mountains, the Clun and North West Herefordshire Hills. Theoretical visibility of turbines is also indicated from the Wye Vale, the Vales of Irfon and Ithon and the Herefordshire Lowlands, as well as from the BBNP, predominantly from the north-facing slopes above the Wye Valley, and the scarp and hill summits at the northern periphery of the Black Mountains. There is also more distant theoretical

⁷⁹ Cadw (2002) Full Reports of Registered Historic Landscape – Middle Wye Valley (HLW (P) 3)

⁸⁰ Cadw (2001) Full Reports of Registered Historic Landscape – Elan Valley (HLW (P) 4)

visibility of turbines predicted from the low lying Spas and Wells of Central Wales to the west of the site and Herefordshire Lowlands to the south-east.

5.107 There are a number of existing operational or under construction wind energy developments within the study area, which are listed in **Table 5.10**. All of these developments are included as part of the baseline for the primary assessment, since they are already present within the landscape and views. Theoretical visibility of these existing developments from across the Study Area is illustrated on **Figure 5.19** which shows a combined ZTV of all operational wind energy developments with the Proposed Development (to maximum turbine blade tip height).

Key Visual Receptors

5.108 Visual receptors are the people who will be affected by changes in views and may include people living in the area, people who work there, people passing through on road, rail or other forms of transport, people visiting promoted landscapes or attractions, and people engaged in recreation of different types.

5.109 Visual receptors considered within this assessment include:

- People within settlements/local communities⁸¹ surrounding the Site;
- People travelling on roads and railways through the Study Area;
- People using promoted walking routes, PRow's and cycle routes, and accessing Open Access Land, in and around the Site and wider Study Area for recreational purposes;
- People visiting particular attractions, promoted viewpoints (such as those depicted with a blue viewpoint symbol on the 1:50,000 OS map base) or popular hill summits;
- People visiting and using the Shropshire Hills National Landscape/AONB for recreational purposes, both during the day-time and at night-time; and
- People visiting and using the BBNP for recreational purposes, both during the day-time and at night-time.

⁸¹ Individual residential properties and groups of properties within 2 km of the outermost turbines of the Proposed Development are considered within the Residential Visual Amenity Assessment (RVAA), which is presented in **Appendix 5.7**.

Settlements/Communities

5.110 The pattern of settlement within the Study Area is typically concentrated in the valleys and close to or along main communication routes (e.g. roads or railway lines). There are very few large towns within this part of Mid-Wales, with the Victorian Spa towns of Builth Wells and Llandrindod Wells representing the largest conurbations within 15 km of the Site. To the east, north-east of the Site the market town of Knighton sits on the border between Powys and Shropshire on the route of the A4113 in the Teme Valley, whilst to the south-east the Herefordshire market town of Kington lies close to the border with Mid-Wales on the route of the main communication route between Wales and the English West Midlands, the A44.

5.111 Based on an analysis of theoretical visibility indicated by **Figures 5.4a-b** and **Figures 5.5a-b**, and **Figure 5.14a** and **Figure 5.14b** as well as other considerations, **Table 5.3** below provides information on which local communities have been taken forwards for detailed assessment. The ZTV does not take account of any screening or filtering of views by built form or vegetation, which will substantially reduce visibility from the majority of the local communities. In order to focus on potentially significant effects, those from which there is no theoretical visibility are not considered further in this assessment. Furthermore, those beyond 15 km from the outermost turbines of the Proposed Development have not been considered further as significant effects are not predicted to arise for local communities at these distances.

Table 5.3 Settlements/Communities (within 15 km of the outermost turbines of the Proposed Development) taken forwards to assessment

Settlement/ Local Community	Approx. Distance ⁸²	Location of the Settlement/ Local Community and Existing Views	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Receptors are Carried Forward for Detailed Assessment
Fishpools	1.1 km	Hamlet north of the Site above a tributary valley of the River Lugg. Settlement is oriented east-west along the A488 development mainly extends along the north side.	Very limited theoretical visibility of maximum blade tip heights arising from views of a small number of turbines, with actual visibility reduced further by forestry on the valley side so is not considered further. Residential properties located within 2 km of the proposed turbines and in this small hamlet are considered in the Residential Visual Amenity Assessment (RVAA) presented in Appendix 5.7 .
Llanfihangel Rhydithon	1.3 km	Small settlement situated off the A488 to the north of The Site, and extending north and south of the road. Settlement comprises an original core	Extensive visibility indicated by the ZTV from the majority of the extents of the settlement.

⁸² Measured from the outermost turbine of the Proposed Development to the nearest part of the settlement/community.

Settlement/ Local Community	Approx. Distance ⁸²	Location of the Settlement/ Local Community and Existing Views	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Receptors are Carried Forward for Detailed Assessment
		centred on crossroads on the A488, with more recent development extending the settlement northwards from the road.	Considered in the assessment.
Dolau	2.3 km	Small settlement situated north-west of the Site in the valley of the River Aran. Built development extends along both sides of a minor road running south-east towards the A488.	Extensive visibility indicated by the ZTV from the majority of the extents of the settlement. Considered in the assessment.
Llandegley	2.3 km	Small settlement situated on the A44 west of the Site in the valley of the Mithil Brook. Settlement comprises an original core centred on the church by the A44, with more recent development extending westwards.	Extensive visibility indicated by the ZTV from the majority of the extents of the settlement. Considered in the assessment.
Llanfihangel- Nant-Melan	2.3 km	Hamlet situated on the A44 south of the Site, in the valley of the Summergil Brook.	Close to the Site, and some visibility of turbines indicated

Settlement/ Local Community	Approx. Distance ⁸²	Location of the Settlement/ Local Community and Existing Views	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Receptors are Carried Forward for Detailed Assessment
		Settlement is oriented east-west and development extends along both sides of the road.	by the ZTV from the majority of the extents of the settlement. Considered in the assessment. Residential properties located within 2 km of the proposed turbines and in this small hamlet are considered in the RVAA presented in Appendix 5.7 .
Bleddfa	2.4 km	Small settlement situated on the A488 north of the Site in a tributary valley of the River Lugg. Most development extends to the north of the A488.	Close to the Site, and some visibility of turbines indicated by the ZTV from the majority of the extents of the settlement. Considered in the assessment.
New Radnor	3.3 km	Village situated on the B4372 south-east of the Site in the valley of the Summertil Brook. Most development extends south-east towards the A44	Close to the Site, and some visibility of turbines indicated by the ZTV from some parts of the settlement. Considered in the assessment.

Settlement/ Local Community	Approx. Distance ⁸²	Location of the Settlement/ Local Community and Existing Views	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Receptors are Carried Forward for Detailed Assessment
		which runs to the south of the settlement.	
Penybont	4.6 km	Village situated west of the Site in the Ithon Valley. Settlement comprises an original core along the A44, with more recent development extending along a minor road running south.	Extensive visibility indicated by the ZTV from the majority of the extents of the settlement. Considered in the assessment.
Llanddewi Ystradenni	6.3 km	Small settlement situated off the A483 north-west of the Site in the Ithon Valley. Settlement comprises an original core centred on the church at the southern end, with more recent development extending the settlement northwards.	Very limited or no visibility of turbines indicated by ZTV, with intervening buildings and woodland expected to limit visibility further, and effects are unlikely to be significant. Not considered further.
Kinnerton	6.4 km	Small settlement located east of the Site on a tributary of the Hindwell Brook. The B4372 runs along the north of the village, with built development	Very limited or no visibility of turbines indicated by ZTV, with intervening buildings and conifer woodland expected to limit visibility further, and

Settlement/ Local Community	Approx. Distance ⁸²	Location of the Settlement/ Local Community and Existing Views	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Receptors are Carried Forward for Detailed Assessment
		extending south-east along minor roads.	effects are unlikely to be significant. Not considered further.
Crossgates	6.9 km	Village situated west of the Site in the Ithon Valley. Settlement is located at the crossroads of the A44 running east-west and the A483 running north-south, with most development to the west of the A483.	Extensive visibility indicated by the ZTV from the majority of the extents of the settlement. Considered in the assessment.
Old Radnor	7.4 km	Small settlement situated south-east of the Site on a hillside above the valley of the Summergeil Brook. Settlement extends along a minor road near the A44, with the most extensive views being to the north-west.	Extensive visibility indicated by the ZTV from the majority of the extents of the settlement. Considered in the assessment.
Hundred House	7.7 km	Small settlement situated south-west of the Site in the Edw Valley. Settlement lies	Extensive visibility indicated by the ZTV from the majority of the extents of the settlement.

Settlement/ Local Community	Approx. Distance ⁸²	Location of the Settlement/ Local Community and Existing Views	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Receptors are Carried Forward for Detailed Assessment
		along the A481 and a minor road branching north.	Considered in the assessment.
Evenjobb	8.2 km	Village situated east of the Site on a tributary of the Hindwell Brook. Built development predominantly lies east of the B4372.	Extensive visibility indicated by the ZTV from the majority of the extents of the settlement. Considered in the assessment.
Gladestry	8.2 km	Small settlement situated north-west of the Site in the valley of the Gladestry Brook. Built development extends along bends in the B4594 and minor roads leading off it.	Very limited or no visibility of turbines indicated by ZTV, with intervening buildings and woodland expected to limit visibility further. Not considered further.
Llandrindod Wells	9.7 km	Small town located west of the Site on the route of the A483 in the Ithon Valley, with built development extending predominantly east of the River Ithon.	Very limited or no visibility of turbines indicated by ZTV, with intervening buildings and woodland to the east of the settlement expected to limit visibility further, and effects are unlikely to be significant. Not considered further.

Settlement/ Local Community	Approx. Distance ⁸²	Location of the Settlement/ Local Community and Existing Views	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Receptors are Carried Forward for Detailed Assessment
Knucklas	10 km	Village situated off the B4355 north-east of the site in the Teme Valley. Built development extends predominantly east-west along minor roads west of the B4355. A viaduct on the Heart of Wales Train Line is a prominent feature in the west of the settlement.	Very limited or no visibility of turbines indicated by ZTV. Not considered further.
Huntington	10 km	Small settlement situated in the Arrow Valley south-east of the Site. Settlement predominantly comprises a few large farms and other residences on a network of minor roads a few kilometres east of the B4594.	Very limited or no visibility of turbines indicated by ZTV, with intervening buildings and woodland expected to limit visibility further. Not considered further.
Knighton	10.5 km	Small town situated north-east of the Site in the Teme Valley. Built development extends south of the River Teme along a network of streets centred	Very limited or no visibility of turbines indicated by ZTV, and effects are unlikely to be significant.

Settlement/ Local Community	Approx. Distance ⁸²	Location of the Settlement/ Local Community and Existing Views	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Receptors are Carried Forward for Detailed Assessment
		around the A488, A4113 and B4355.	Not considered further.
Abbeycwmhir	11.5 km	Small settlement situated north-west of the Site in the valley of the Clywedog Brook. Settlement is largely oriented east-west along a minor road and development extends along both sides of the road.	Very limited or no visibility of turbines indicated by ZTV, with intervening buildings and woodland expected to limit visibility further. Not considered further.
Llanyre	11.6 km	Village situated west of the Site, on a minor road off the A4081 in the Ithon Valley. Built development extends mainly along a minor road running south to the A4081.	Extensive visibility indicated by the ZTV from the majority of the extents of the settlement. Considered in the assessment.
Nantmel	12 km	Small settlement situated west of the Site in the Dulas Valley. Built development extends predominantly along two minor roads just north of the A44.	Very limited or no visibility of turbines indicated by ZTV, with intervening buildings and woodland expected to limit visibility further. Not considered further.

Settlement/ Local Community	Approx. Distance ⁸²	Location of the Settlement/ Local Community and Existing Views	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Receptors are Carried Forward for Detailed Assessment
Norton	12 km	Village situated north-east of the Site in the Lugg Valley. Built development extends predominantly on the west side of the B4355 as it runs southwards through the village.	Very limited or no visibility of turbines indicated by ZTV, with intervening buildings and woodland expected to limit visibility further, and effects are unlikely to be significant. Not considered further.
Kington	12.5 km	Small town situated south-east of the Site off the A44 in the Arrow Valley, within Herefordshire.	Some visibility indicated by the ZTV from parts of the settlement. Considered in the assessment.
Llanbadarn Fynydd	13 km	Small settlement situated around the A483 north-west of the Site in the Ithon Valley. Built development extends along the A483 and minor roads on either side of the River Ithon.	Very limited or no visibility of turbines indicated by ZTV, with intervening buildings and woodland expected to limit visibility further. Not considered further.
Presteigne	13.5 km	Small town situated in the Lugg Valley east of the Site. Built development extends	Very limited or no visibility of turbines indicated by ZTV, with intervening buildings and

Settlement/ Local Community	Approx. Distance ⁸²	Location of the Settlement/ Local Community and Existing Views	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Receptors are Carried Forward for Detailed Assessment
		south of the River Lugg along a network of streets centred around the B4355 and B4362.	woodland expected to limit visibility further. Not considered further.
Builth Wells (including Llanelwedd)	14.2 km	Small town on the A470 situated south-west of the Site in the Wye Valley. Built development extends predominantly south of the River Wye.	Very limited or no visibility of turbines indicated by ZTV, with intervening buildings expected to limit visibility further, and effects are unlikely to be significant. Not considered further.
Newbridge on Wye	14.5 km	Small town on the A470 situated south-west of the Site in the Wye Valley. Built development extends predominantly east of the River Wye.	Limited theoretical visibility at considerable from Site, with intervening woodland and buildings to east of settlement likely to further reduce visibility and the potential for significant effects to arise. Not considered further.

Roads and Railway Lines

5.112 Visibility of a Proposed Development from a transport route is rarely uniform along its entire length. This is because views of the surrounding landscape change as one travels along

a route depending on the surrounding landform, the presence of built form, structures, tree cover and vegetation situated along a route. Within the Study Area, the roads and railway lines tend to follow the low-lying floors of the valleys which encircle the Site, connecting settlements and act as key communication corridors.

5.113 Based on an analysis of theoretical visibility and potential views, **Table 5.4** provides information on which transport routes have been carried forward for detailed assessment. Where there is limited theoretical visibility, or where actual visibility from a road or railway line is likely to be limited due to localised screening, these are not considered further in this LVIA, as the likelihood for significant effects is limited. Furthermore, those beyond 15 km from the outermost turbines of the Proposed Development have not been considered further as significant effects will not occur at this distance. The roads and railway routes carried forwards for assessment, and informed by the theoretical visibility of the Proposed Development from indicated by the ZTV, are illustrated on **Figure 5.15a** and **Figure 5.15b**.

Table 5.4 Roads and railway routes (within 15 km of the outermost turbines of the Proposed Development)

Road and Railway Routes	Distance ⁸³	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Carried Forward for Detailed Assessment
A44, between Monkland and Llangurig	0.6 km	Extensive visibility indicated by the ZTV from substantial sections of the route, and route runs very close to the Site. Considered in the assessment.
A488, between Bishop's Castle and Penybont	0.6 km	Extensive visibility indicated by the ZTV from substantial sections of the route, and route runs very close to the Site. Considered in the assessment.

⁸³ Measured from the outermost turbine of the Proposed Development to the nearest section of the transport route.

Road and Railway Routes	Distance ⁸³	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Carried Forward for Detailed Assessment
A481, between Llanelwedd and Fforest Inn	1.8 km	Extensive visibility indicated by the ZTV from substantial sections of the route, and route runs close to the Site. Considered in the assessment.
B4372, between Beggar's Bush and New Radnor	2.9 km	Extensive visibility indicated by the ZTV from substantial sections of the route, and route runs close to the Site. Considered in the assessment.
B4356, between Presteigne and Llanbister	4.5 km	Very limited or no visibility of turbines indicated by ZTV on most sections of the route, with distance and intervening screening expected to limit visibility further. Not considered further.
B4357, between Walton and Rhos-y-meirch	7.6 km	Extensive visibility indicated by the ZTV from substantial sections of the route. Considered in the assessment.
A483, between Llanwrtyd Wells and Abermule	6.8 km	Extensive visibility indicated by the ZTV from sections of the route. Considered in the assessment.
A470, between Builth Wells and Newbridge-on-Wye	14.5 km	Very limited or no visibility of turbines indicated by ZTV on most sections of the route, with distance and intervening screening expected to limit visibility further. Not considered further.

Road and Railway Routes	Distance ⁸³	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Carried Forward for Detailed Assessment
Heart of Wales Railway Line ⁸⁴	2.6 km	Extensive visibility indicated by the ZTV from substantial sections of the route, and route runs close to the Site. Considered in the assessment.

Long Distance Trails and Cycle Routes

5.114 Visibility of a Proposed Development from a recreational route is rarely uniform along its entire length as views of the surrounding landscape change as one moves along a route, depending on the surrounding landform, the presence of built form, structures, tree cover and vegetation. The NCN routes within the Study Area tend to follow the valleys nearby the Site. Walking routes on the other hand tend to be more varied and often pass over elevated upland areas, including close to the Site, along ridges and onto hill summits. It is from these walking routes that longer distance views can often be afforded. **Table 5.5** below provides information on the promoted long distance trails and cycle routes within the Study Area which have been carried forward for detailed assessment, are illustrated on **Figure 15.6b**.

Table 5.5 Long distance trails and cycle routes (within 15 km of the outermost turbines of the Proposed Development)

Long Distance Trails and Cycle Routes	Distance ⁸⁵	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Carried Forward for Detailed Assessment
Elan Valley Way ⁸⁶	<200 m	Extensive visibility indicated by the ZTV from substantial sections of the route, and route runs very close to the Site.

⁸⁴ [The Heart of Wales Line website](#)

⁸⁵ Measured from the outermost turbine of the Proposed Development to the nearest section of the recreational route.

⁸⁶ [LDWA \(undated\) Elan Valley Way](#)

Long Distance Trails and Cycle Routes	Distance ⁸⁵	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Carried Forward for Detailed Assessment
		Considered in the assessment.
The Heart of Wales Line Trail ⁸⁷	<300 m	Extensive visibility indicated by the ZTV from substantial sections of the route, and route runs very close to the Site. Considered in the assessment.
Glyndŵr's Way ⁸⁸	4.8 km	Extensive visibility indicated by the ZTV from substantial sections of the route. Considered in the assessment.
Offa's Dyke Path ⁸⁹	8.8 km	Extensive visibility indicated by the ZTV from substantial sections of the route. Considered in the assessment.
The Herefordshire Trail ⁹⁰	12.5 km	Very limited or no visibility of turbines indicated by ZTV on most sections of the route, with distance and intervening screening expected to limit visibility further. Not considered further.
Wye Valley Walk ⁹¹	14.5 km	Some visibility of turbines indicated by ZTV, but owing to distance and intervening screening, effects are unlikely to be significant. Not considered further.

⁸⁷ The Heart of Wales Line (undated) The Heart of Wales Line Trail

⁸⁸ National Trails (undated) Glyndwr's Way

⁸⁹ National trails (undated) Offa's Dyke Path

⁹⁰ LDWA (undated) Herefordshire Trail

⁹¹ Wye Valley Walk (undated) The Wye Valley Walk

Long Distance Trails and Cycle Routes	Distance ⁸⁵	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Carried Forward for Detailed Assessment
NCN Route 825 – Radnor Ring Route ⁹²	4.3 km	Extensive visibility indicated by the ZTV from substantial sections of the route. Considered in the assessment.
NCN Route 8 – Cardiff to Holyhead (Also known as Lôn Las Cymru) ⁹³	14.5 km	Some visibility of turbines indicated by ZTV, but owing to distance and intervening screening, effects are unlikely to be significant. Not considered further.

Open Access Land and PRowS

5.115 The Countryside and Rights of Way Act 2000 (CRoW Act) normally gives a public right of access to land mapped as Open Country (mountain, moor, heath and downland) or registered Common Land in England and Wales. These areas are known as Open Access Land. In Wales they also include areas of dedicated land where owners, such as NRW (e.g. Public Dedicated Forest), allow free access. In total these areas of Open Access Land cover almost one fifth of the country, and allow people the right of access on foot. Whilst many areas of Open Access Land are accessed via PRowS, open access allows people the opportunity to walk freely, explore wild, open landscapes and find their own way, as such it can be anticipated that visual receptors (people) could access any of these areas where they exist.

5.116 There are several classes of open access land within, and adjacent to, the Site (see **Figure 4.13: Open Access Land and Pre-Assessed Area for Wind Energy**). The north-eastern and south-eastern extents of the Site lie adjacent to areas of Public Dedicated Forest; there is an area of Open Country covering the open hilltop at Great Rhos (660 m AOD) and the adjoining ridges, extending west to Foel and as far south as Nyth-grug (538 m AOD). There are

⁹² [Sustrans \(undated\) Route 825](#)

⁹³ [Sustrans \(undated\) Route 8](#)

areas of Common Land within the Site including Cowlod Common, and adjacent to the Site's eastern and western boundaries. These provide public access, as well as some PRow which cross the Site.

5.117 Visibility of the Proposed Development from across areas of Open Access Land or PRow is predicted to arise as indicated by **Figure 5.16a** and **Figure 5.16b**. Visibility is rarely uniform as views of the surrounding landscape change as receptors move through these areas (whether following a PRow or roaming freely), depending on the surrounding landform, the presence of built form, structures, tree cover and vegetation. **Table 5.6** below provides information on the area of Open Access Land and PRow within the Study Area which have been carried forward for detailed assessment, and are illustrated on **Figure 5.16b**.

Table 5.6 Open access land and PRow (within 15 km of the outermost turbines of the Proposed Development)

Open Access Land and PRow	Distance ⁹⁴	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Carried Forward for Detailed Assessment
Open Access Land and PRow located within the Site		
Open Access Land, BOAT and other PRow within the Site	Within Site	Direct impacts on the areas of Open Access Land within the Site, and extensive visibility of turbines and ancillary infrastructure. Considered in the assessment.
Open Access Land and PRow within 15 km		
Open Access Land – Radnor Forest	300 m	Area of Open Access Land lies adjacent to the site, with extensive visibility indicated by the ZTV. Considered in the assessment.

⁹⁴ Measured from the outermost turbine of the Proposed Development and area of Open Access Land or section of PRow.

Open Access Land and PRoWs	Distance ⁹⁴	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Carried Forward for Detailed Assessment
Public Dedicated Forest – Fishpools ⁹⁵	<200 m	Area of Dedicated Forest lies adjacent to the site, with extensive visibility indicated by the ZTV. Considered in the assessment.
Public Dedicated Forest – Warren Wood ⁹⁶	<200 m	Represented by VP1: Water-break-its-neck (Waterfall) in area of Open Access Land, and representing effects on views experienced by users of path network represented by viewpoint (as detailed in Table 5.7 above). Not considered further.
Open Access Land – Coed-swydd	1.1 km	Area of Open Access Land lies close to the Site, with extensive visibility indicated by the ZTV. Considered in the assessment.
Open Access Land – Rhos-swydd	2.4 km	The Heart of Wales Line Trail (long distance walk) passes through area of Open Access Land, effects on views experienced by users of path considered (as detailed in Table 5.5 above). Not considered further.
Open Access Land – Llandegley Rhos	2.4 km	Represented by VP12: Llandegley Rocks and VP13: Bwlch-Ilwyn Bank located in areas of Open Access Land, effects on views experienced by users of Open Access Land represented by viewpoints (as detailed in Table 5.7 above).
Open Access Land – extending across	3.1 km	Represented by VP15: Llanfihangel Hill located in area of Open Access Land, effects on views experienced by

⁹⁵ [Natural Resources Wales \(2024\) Fishpools, near Knighton](#)

⁹⁶ [Natural Resources Wales \(2024\) Warren Wood, near New Radnor](#)

Open Access Land and PRowS	Distance ⁹⁴	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Carried Forward for Detailed Assessment
Llanfihangel Hill, Gwauncestre Hill and Little Hill		users of Open Access Land represented by viewpoint (as detailed in Table 5.7 above).
Open Access Land – extending across Llanfihangel Hill, Gwauncestre Hill and Little Hill	3.1 km	Represented by VP15: Llanfihangel Hill located in area of Open Access Land, effects on views experienced by users of Open Access Land represented by viewpoint (as detailed in Table 5.7 above).
Open Access Land – Caergynan Bank	4.0 km	Represented by VP16: Caergynan Bank, Open Access Land, effects on views experienced by users of Open Access Land represented by viewpoint (as detailed in Table 5.7 above).
Open Access Land – Llan Fawr south of Pilleth	5.8 km	Elan Valley Way passes through area of Open Access Land, effects on views experienced by users of path considered (as detailed in Table 5.5 above).
Open Access Land – Beacon Hill	6.0 km	The Heart of Wales Line Trail (long distance walk) and Glyndŵr's Way pass through area of Open Access Land, effects on views experienced by users of path considered (as detailed in Table 5.5 above) and represented by VP17: Glyndŵr's Way near Lanlluest (as detailed in Table 5.7 above).
Open Access Land – Glaschwmm Hill and Llandeilo Hill	6.8 km	Extensive visibility indicated by the ZTV from north-facing sections of the Open Access Land. Considered in the assessment.

Open Access Land and PRowS	Distance ⁹⁴	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Carried Forward for Detailed Assessment
between Aberedw and Gladestry		
Open Access Land – Cwm-brith Bank and Cefnlllys	7.0 km	Extensive visibility indicated by the ZTV. Areas of Open Access Land are close to the town of Llandrindod Wells and may therefore be popular with residents and visitors. Considered in the assessment.
Open Access Land – extending across the Gilwern Hills and Carneddau	7.0 km	Represented by VP21: Castle Bank located in Open Access Land, effects on views experienced by users of Open Access Land represented by viewpoint (as detailed in Table 5.7 above).
Open Access Land – Old Radnor	7.4 km	Represented by VP19: Old Radnor located at periphery of area of Open Access Land, effects on views experienced by users of Open Access Land represented by viewpoint (as detailed in Table 5.7 above).
Open Access Land – Hergest Ridge	8.0 km	Offa's Dyke Path passes through area of Open Access Land, effects on views experienced by users of path considered (as detailed in Table 5.5 above) and represented by VP22: Hergest Ridge near Offa's Dyke Path (as detailed in Table 5.7 above).
Open Access Land – Aberedw Hill	8.1 km	Extensive visibility indicated by the ZTV. Considered in the assessment.

Open Access Land and PRoWs	Distance ⁹⁴	Theoretical Visibility of the Proposed Development (ZTV coverage) and Other Considerations to Determine if Carried Forward for Detailed Assessment
Open Access Land – Moelfre, Tylcau Hill and Warren Hill	9.2 km	Extensive visibility indicated by the ZTV from north-facing sections of the Open Access Land. Considered in the assessment.
Open Access Land – Yr Allt, Moel Dod and Castle Bank	9.5 km	Glyndŵr's Way passes through this area of Open Access Land, effects on views experienced by users of path considered (as detailed in Table 5.5 above). Not considered further.

Selection of Representative Viewpoints to Inform the Assessment of Visual Receptors

5.118 Representative viewpoints have been used to inform the assessment of visual effects. The viewpoint list is not an exhaustive list of locations where the Proposed Development will be visible, but aims to provide a representation including views from settlements, points of interest and sequential views along routes. The viewpoints have been agreed with the relevant statutory consultees (see **Table 5.1** above for detail) and are all publicly accessible. Viewpoints include:

- Locations which represent the experience of different types of visual receptors (people);
- Locations at different distances and angles to provide a range of viewing angles and distances (i.e. short, medium and long distance views);
- Locations which illustrate the key interactions between other cumulative wind farm schemes, either in combined or successive views;
- Locations which represent a range of viewing experiences, for example static views and views along sequential routes;
- Specific viewpoints which have been identified as promoted views or provide important views of the landscape; and
- Illustrative viewpoints which have been chosen to demonstrate a particular visual effect (which could include restricted visibility in particular locations).

5.119 The representative viewpoints (VP1 to VP28) have been identified and selected to represent views experienced by different types of visual receptor (people) from a range of different locations, including settlements, roads and other transport routes, promoted recreational routes such as long distance footpaths and cycle routes, promoted viewpoints and popular hill summits and visitor attractions, where it can be anticipated groups of people may congregate and experience potential views of the Proposed Development.

5.120 The theoretical turbine hub and blade tip visibility of the Proposed Development within the Study Area from these viewpoints is illustrated on **Figures 5.4a-b** and **Figures 5.5a-b** respectively, and comparatively on **Figures 5.6a-b**. Actual visibility (e.g. taking account of landscape features which may screen or filter views) was verified during field work and the capturing of baseline photography.

5.121 Promoted viewpoints and hill summits in the Shropshire Hills National Landscape/AONB between 11.5 km and 21.8 km (VP24, VP25 and VP27), and within the BBNP at up to 28 km (VP28, at 24.6 km) from the Proposed Development are represented in the final list of representative viewpoints, given the highest sensitivity attained to the receptors visiting these locations within these nationally designated landscapes.

5.122 Three dusk/night-time representative viewpoints (N1 to N3) have also been identified and agreed with statutory consultees to represent the effects of visible aviation lighting during hours of darkness, as detailed in **Appendix 5.8**. The viewpoints have been chosen to represent the most sensitive dusk/night-time views experienced from areas of designated and promoted dark skies (e.g. the IDSR in the BBNP, N3), the closest residents and communities to the Site (e.g. A44 south of Llandegley, N1) and where visual receptors (people) are known to frequent during hours of darkness (e.g. The Space Guard Centre Observatory, Knighton, N2).

5.123 In addition to the day-time and dusk/night-time viewpoints, three assessment points (AP1 to AP3) have been identified following consultation with PCC to illustrate views from particular settlements (detailed in **Table 5.3** below), routes (detailed in **Table 5.4** below), Long Distance Trails and Cycle Routes (detailed in **Table 5.5** below) and areas of Open Access Land or PRoWs across the Study Area (detailed in **Table 5.6** below). These assessment points are accompanied by wireline visualisations and support the assessments of the relevant settlements and routes which they represent.

Table 5.7 Representative viewpoints and assessment points

VP/AP No.	Location	Grid Reference		Approx. Distance to Nearest Proposed Turbine	Nearest Proposed Turbine	Accompanying Visualisation Type ⁹⁷	Receptor/Reason for Selection
		Easting	Northing				
Day-time Representative Viewpoints							
VP1	Water-break-its-neck (Waterfall) and nearby walks	318167	260045	1.11 km	T7	Wireline	Located in Open Access Land to the south-east of the Site, at the popular Water-break-its-neck (Waterfall) accessed by recreational receptors via the promoted woodland walks.
VP2	Heart of Wales Line Trail near	317982	268438	1.13 km	T31	Wireline and day-time photomontage	Located on this promoted long distance trail which broadly follows the route of the Heart of Wales Line rural railway between Swansea and Shrewsbury. The viewpoint is situated in open pasture to the north of the A488 and the Site.

⁹⁷ Presented in ES **Volume 4: Visualisations for LVIA and Cultural Heritage**.

VP/AP No.	Location	Grid Reference		Approx. Distance to Nearest Proposed Turbine	Nearest Proposed Turbine	Accompanying Visualisation Type ⁹⁷	Receptor/Reason for Selection
		Easting	Northing				
	Coco's Farm Campsite ⁹⁸						Represents views experienced by recreational users of the footpath and users of the nearby Coco's Wild Camp campsite, as well as views experienced by nearby residents and road users on the minor road network.
VP3	A44 east of Castell Crugerydd	316268	259223	1.19 km	T2	Wireline and day-time photomontage	Located close to the most southerly of the proposed Site entrances from the A44 (shown on Figure 4.1a). Represents views experienced by receptors travelling along the A44, and illustrates views of the proposed onsite substation from this road.

⁹⁸ [Coco's Wild Camp website](#)

VP/AP No.	Location	Grid Reference		Approx. Distance to Nearest Proposed Turbine	Nearest Proposed Turbine	Accompanying Visualisation Type ⁹⁷	Receptor/Reason for Selection
		Easting	Northing				
VP4	A488 Llanfihangel Rhydithon	316033	267353	1.29 km	T29	Wireline and day-time photomontage	Located adjacent to the A488 and within the small settlement/community of Llanfihangel Rhydithon to the north of the Site. Represents views experienced by road users travelling on the A488 and residents within the community.
VP5	Black Mixen	319647	264402	1.67 km	T19	Wireline and day-time photomontage	Representative of recreational visitors to a popular summit in the open access land at Radnor Forest.
VP6	A44 outside the Fforest Inn, Llanfihangel-nant-Melan	317066	258489	1.75 km	T3	Wireline and day-time photomontage	Representative of receptors travelling on the A44 and A481 to the south of the Site, visitors to the Fforest Inn, a historic Drovers Inn and nearby residents, and those within the small

VP/AP No.	Location	Grid Reference		Approx. Distance to Nearest Proposed Turbine	Nearest Proposed Turbine	Accompanying Visualisation Type ⁹⁷	Receptor/Reason for Selection
		Easting	Northing				
							community of Llanfihangel-nant-Melan to the south-east.
VP7	Dolau	314295	266966	2.25 km	T23	Wireline and day-time photomontage	The viewpoint represents views experienced by the local community of Dolau, as well as travellers on this local road in close proximity to the Site. The viewpoint is also located close to the Heart of Wales railway to the north.
VP8	Llandegley (A44, outside the church)	313945	262912	2.29 km	T14	Wireline and day-time photomontage	Represents views experienced by travellers on the A44, as well as the local community of Llandegley.

VP/AP No.	Location	Grid Reference		Approx. Distance to Nearest Proposed Turbine	Nearest Proposed Turbine	Accompanying Visualisation Type ⁹⁷	Receptor/Reason for Selection
		Easting	Northing				
VP9	Heart of Wales Line Trail near The Pales	313652	264060	2.36 km	T21	Wireline and day-time photomontage	Located on the promoted long distance trail where it follows the minor local road network and passes the Pales Quaker Meeting House. Represents views experienced by recreational users of the footpath as well as views experienced by nearby residents and road users on the minor road network.
VP10	A488 at Bleddfa	320664	268330	2.41 km	T31	Wireline and day-time photomontage	Represents views experienced by the local community in Bleddfa and road users of the A488. This viewpoint is located at a natural stopping point near the village green within the small settlement.

VP/AP No.	Location	Grid Reference		Approx. Distance to Nearest Proposed Turbine	Nearest Proposed Turbine	Accompanying Visualisation Type ⁹⁷	Receptor/Reason for Selection
		Easting	Northing				
VP11	A481 near Rhewey Farm	314949	257591	3.11 km	T1	Wireline and day-time photomontage	Represents views experienced by travellers on the A481, as well as representing typical views from the hills to the south of the Site.
VP12	Llandegley Rocks	313145	261805	3.16 km	T12	Wireline and day-time photomontage	Located at the summit of Llandegley Rocks (436 m AOD) and within Open Access Land to the west of the Site. The viewpoint offers panoramic views over the wider landscape and towards to the Radnor Forest complex. Representing views experienced by recreational receptors (walkers) who access the hill summit via the network of PRoW routes into the Open Access Land.

VP/AP No.	Location	Grid Reference		Approx. Distance to Nearest Proposed Turbine	Nearest Proposed Turbine	Accompanying Visualisation Type ⁹⁷	Receptor/Reason for Selection
		Easting	Northing				
VP13	Bwlch-Ilwyn Bank	311807	259834	4.37 km	T1	Wireline	Located on the PRoW crossing Bwlch-Ilwyn Bank Open Access Land to the west of the Site, and north-west of the under-construction Hendy Wind Farm. Representing views experienced by recreational receptors (walkers).
VP14	A44 bridge approaching Penybont	311325	264168	4.61 km	T23	Wireline and day-time photomontage	Viewpoint represents views experienced by travellers on the A44, as well as the local community of Penybont. Also representative of views experienced from the A488/ Open Access Land north-east of Penybont.
VP15	Llanfihangel Hill	318562	255422	5.05 km	T3	Wireline	Viewpoint located within Open Access Land to the south of the Site, on an elevated track

VP/AP No.	Location	Grid Reference		Approx. Distance to Nearest Proposed Turbine	Nearest Proposed Turbine	Accompanying Visualisation Type ⁹⁷	Receptor/Reason for Selection
		Easting	Northing				
							passing around the northern flanks of Llanfihangel Hill (509 m AOD). Representing views experienced by recreational users (mainly walkers and cyclists), but also those participating in game sports in this upland location.
VP16	Caergynan Bank, Open Access Land	313641	271305	5.81 km	T29	Wireline and day-time photomontage	Located at Caergynan Bank near Maelienydd (350 m AOD), and within Open Access Land to the north-west of the Site. Representing views experienced by recreational receptors (walkers) and receptors travelling through the Open Access Land via the minor road network.

VP/AP No.	Location	Grid Reference		Approx. Distance to Nearest Proposed Turbine	Nearest Proposed Turbine	Accompanying Visualisation Type ⁹⁷	Receptor/Reason for Selection
		Easting	Northing				
VP17	Glyndŵr's Way near Lanlluest	319076	274112	6.73 km	T31	Wireline and day-time photomontage	Located on the Glyndŵr's Way National Trail views experienced by recreational users of the long-distance footpath, as it crosses upland areas north of the Site.
VP18	Crossgates	308838	265056	6.96 km	T23	Wireline and day-time photomontage	Represent views experienced by the local community of Crossgates, as well as receptors travelling on the A483 and A44.
VP19	Old Radnor	325024	259147	7.37 km	T7	Wireline and day-time photomontage	Represents views of this local community located to the south-east of the Site close to the border with Herefordshire, England.
VP20	Evenjobb, B4357	326239	262596	8.25 km	T9	Wireline	Viewpoint located within the small settlement/community of Evenjobb on the

VP/AP No.	Location	Grid Reference		Approx. Distance to Nearest Proposed Turbine	Nearest Proposed Turbine	Accompanying Visualisation Type ⁹⁷	Receptor/Reason for Selection
		Easting	Northing				
							B4357 to the east of the Site. Representing views of residents within the community, and road users travelling north and south on the B4357.
VP21	Castle Bank	308753	256178	8.53 km	T1	Wireline	Representative of recreational users of open land and providing a view of the Site from the south-west.
VP22	Hergest Ridge near Offa's Dyke Path	325433	256266	8.95 km	T7	Wireline and day-time photomontage	Located near the Whet Stone and high point of Hergest Ridge (426 m AOD) within Herefordshire. The viewpoint is situated in Open Access Land and near to the route of the Offa's Dyke Path National Trail. Representing views experienced by recreational users

VP/AP No.	Location	Grid Reference		Approx. Distance to Nearest Proposed Turbine	Nearest Proposed Turbine	Accompanying Visualisation Type ⁹⁷	Receptor/Reason for Selection
		Easting	Northing				
							(walkers), and similar long-distance views from neighbouring areas of the Herefordshire Hills.
VP23	Offa's Dyke Path, Castle Ring Pen Offa	327057	263622	9.12 km	T19	Wireline	Located on the Offa's Dyke Path National Trail at the small hill summit of Pen Offa (372 m AOD). Representing recreational walkers on this long distance trail which broadly follows the border between England-Wales.
VP24	Ridge north of Knighton	328158	273644	11.54 km	T31	Wireline and day-time photomontage	Representative of walkers on the Offa's Dyke Path National Trail, from the nearest point of the Shropshire Hills National Landscape/AONB.

VP/AP No.	Location	Grid Reference		Approx. Distance to Nearest Proposed Turbine	Nearest Proposed Turbine	Accompanying Visualisation Type ⁹⁷	Receptor/Reason for Selection
		Easting	Northing				
VP25	Offa's Dyke Path, south of Newcastle	324938	279640	13.85 km	T31	Wireline and day-time photomontage	Represents views experienced by recreational users of the nearby National Trail which passes through upland parts of the National Landscape/AONB.
VP26	A44 between Lyonshall and Kington	332158	256173	15.07 km	T7	Wireline and day-time photomontage	Situated adjacent to the route of the A44 between the settlements of Lyonshall and Kington in Herefordshire. Represents the views experienced by receptors travelling west into Powys and from England.
VP27	Bury Ditches Iron Age hill fort	332757	283809	21.77 km	T31	Wireline and day-time photomontage	Representative of visitors to this Iron Age hill fort, who are likely to have an interest in the view. It is also located within the Shropshire

VP/AP No.	Location	Grid Reference		Approx. Distance to Nearest Proposed Turbine	Nearest Proposed Turbine	Accompanying Visualisation Type ⁹⁷	Receptor/Reason for Selection
		Easting	Northing				
							Hills AONB (between Clun and Bishop's Castle).
VP28 (and N3 below)	Hay Bluff, BBNP	324524	236701	24.72 km	T3	Wireline and day-time photomontage	Representative of long-distance views experienced by recreational walkers from the upland landscapes of the BBNP.
Day-time Assessment Points							
AP1 (and N1 below)	A44 south of Llandegley	314202	262091	2.09 km	T12	Wireline	Located at a large lay-by situated west of the A44 to the south of the small settlement/community of Llandegley. Representing views experienced by road users travelling along the A44, and similar views

VP/AP No.	Location	Grid Reference		Approx. Distance to Nearest Proposed Turbine	Nearest Proposed Turbine	Accompanying Visualisation Type ⁹⁷	Receptor/Reason for Selection
		Easting	Northing				
							experienced from nearby scattered residential dwellings.
AP2	BOAT south of Water-break-its-neck (Waterfall) in Open Access Land	318161	259957	1.14 km	T3	Wireline	Located on the BOAT which crosses the Site and within Open Access Land to the south-east of the Site, near to the popular Water-break-its-neck (Waterfall) and nearby NRW promoted recreational woodland walks. Representing recreational users (mainly walkers and cyclists, but all other users of the BOAT).
AP3	Hundred House	311266	254440	7.74 km	T1	Wireline	Representative of receptors travelling on the A481 to the west, south-west of the Site, and

VP/AP No.	Location	Grid Reference		Approx. Distance to Nearest Proposed Turbine	Nearest Proposed Turbine	Accompanying Visualisation Type ⁹⁷	Receptor/Reason for Selection
		Easting	Northing				
							residents within the small settlement and community of Hundred House.
Night-time Representative Viewpoints – assessed in Appendix 5.8: Aviation Lighting Impact Assessment							
N1 (and AP1 above)	A44 south of Llandegley	314202	262091	2.09 km	T12 (nearest lit turbine T12)	Wireline and night-time photomontages (illustrating 2000 cd. and 200 cd. visible aviation lighting)	Night-time assessment viewpoint located on the A44 south of the small settlement/community of Llandegley and representative of other near lower-lying settlements to the west and north of the Site, and represents locations which are more likely to be frequented during the hours of darkness by visual receptors, including residents.

VP/AP No.	Location	Grid Reference		Approx. Distance to Nearest Proposed Turbine	Nearest Proposed Turbine	Accompanying Visualisation Type ⁹⁷	Receptor/Reason for Selection
		Easting	Northing				
N2	The Space Guard Centre Observatory, Knighton ⁹⁹	330646	270200	12.52 km	T31 (nearest lit turbine T31)	Wireline and night-time photomontages (illustrating 2000 cd. and 200 cd. visible aviation lighting)	Night-time assessment viewpoint at a working observatory reliant on dark skies. Not typically publicly accessible by day or night, but represents views experienced by visitors to this private observatory positioned in an elevated location (approximately 417 m Above Ordnance Datum (AOD)) to the east of the Site. The viewpoint location is taken from outside the observatory and does not seek to replicate views experienced from where the telescopes are positioned inside the observatory.

⁹⁹ [The Spaceguard Centre website](#)

VP/AP No.	Location	Grid Reference		Approx. Distance to Nearest Proposed Turbine	Nearest Proposed Turbine	Accompanying Visualisation Type ⁹⁷	Receptor/Reason for Selection
		Easting	Northing				
N3 (and VP28 above)	Hay Bluff, BBNP	324434	236635	24.72 km	T3 (nearest lit turbine T3)	Wireline and night-time photomontages (illustrating 2000 cd. and 200 cd. visible aviation lighting)	Night-time assessment located on the hill summit of Hay Bluff within the BBNP and IDSR. This viewpoint is representative of recreational walkers in the BBNP and IDSR, but is less likely to be accessed or the views appreciated by receptors during hours of darkness due to its remote upland location.

Relationship Between Visual Receptors and Representative Viewpoints

5.124 The list of visual receptors that have been assessed in this LVIA are set out in **Table 5.8** below, with reference to the representative viewpoint(s) or proxy assessment. The detailed assessment of visual receptors is set out in **Appendix 5.5**.

Table 5.8 Relationship between visual receptors and representative viewpoints

Visual Receptor Group	Representative Viewpoint(s) Assessment Point or Proxy Assessment (e.g. Long Distance Trails which pass through areas of Open Access Land)	Assessment Table(s) Ref. (Appendix 5.5) ¹⁰⁰
Local Communities		
Llanfihangel Rhydithon	VP4: A488 Llanfihangel Rhydithon (Figure 5.29)	Table A.29 (Table A.4)
Dolau	VP7: Dolau (Figure 5.32)	Table A.30 (Table A.7)
Llandegley	VP8: Llandegley (A44, outside the church) (Figure 5.33) AP1/N1: A44 south of Llandegley (Figure 5.54)	Table A.31 (Table A.8)
Llanfihangel-Nant-Melan	VP6: A44 outside the Fforest Inn, Llanfihangel-Nant-Melan (Figure 5.31)	Table A.32 (Table A.6)
Bleddfa	VP10: A488 at Bleddfa (Figure 5.35)	Table A.33 (Table A.10)

¹⁰⁰ Proxy representative assessment table in brackets.

Visual Receptor Group	Representative Viewpoint(s) Assessment Point or Proxy Assessment (e.g. Long Distance Trails which pass through areas of Open Access Land)	Assessment Table(s) Ref. (Appendix 5.5) ¹⁰⁰
New Radnor	No specific viewpoint or accompanying visualisation (due to lack of opportunities for clear views from the settlement).	Table A.34
Penybont	VP14: A44 bridge approaching Penybont (Figure 5.39)	Table A.35 (Table A.14)
Crossgates	VP18: Crossgates (Figure 5.43)	Table A.36 (Table A.18)
Old Radnor	VP19: Old Radnor (Figure 5.44)	Table A.37 (Table A.19)
Hundred House	AP3: Hundred House (Figure 5.56)	Table A.38
Evenjobb	VP20: Evenjobb, B4357 (Figure 5.45)	Table A.39 (Table A.20)
Llanyre	No specific viewpoint proposed (due to lack of opportunities for clear views from the settlement).	Table A.40
Kington	No specific viewpoint proposed (due to lack of opportunities for clear views from the settlement). VP26: A44 between Lyonshall and Kington (Figure 5.51), located approximately 2 km east of the settlement.	Table A.41 (Table A.26)
Road and Railway Users		

Visual Receptor Group	Representative Viewpoint(s) Assessment Point or Proxy Assessment (e.g. Long Distance Trails which pass through areas of Open Access Land)	Assessment Table(s) Ref. (Appendix 5.5) ¹⁰⁰
A44, between Monkland and Llangurig	VP3: A44 east of Castell Crugerydd (Figure 5.28) VP6: A44 outside the Fforest Inn, Llanfihangel-nant-Melan (Figure 5.31) VP8: Llandegley (A44, outside the church) (Figure 5.33) VP14: A44 bridge approaching Penybont (Figure 5.39) VP26: A44 between Lyonshall and Kington (Figure 5.51) AP1/N1: A44 south of Llandegley (Figure 5.54)	Table A.42 (Table A.6 Table A.8 Table A.14 Table A.26)
A481, between Llanelwedd and Fforest Inn	VP6: A44 outside the Fforest Inn, Llanfihangel-nant-Melan (Figure 5.31) VP11: A481 near Rhewey (Figure 5.36) AP3: Hundred House (Figure 5.56)	Table A.43 (Table A.6 Table A.11)
A488, between Bishop's Castle and Penybont	VP4: A488 Llanfihangel Rhydithon (Figure 5.29) VP10: A488 at Bleddfa (Figure 5.35) VP2: Heart of Wales Line Trail near Coco's Farm Campsite (Figure 5.27) (0.3 km off route) VP7: Dolau (Figure 5.32) (0.6 km off route)	Table A.44 (Table A.4 Table A.10 Table A.2 Table A.7)

Visual Receptor Group	Representative Viewpoint(s) Assessment Point or Proxy Assessment (e.g. Long Distance Trails which pass through areas of Open Access Land)	Assessment Table(s) Ref. (Appendix 5.5) ¹⁰⁰
B4372, between Beggar's Bush and New Radnor	VP23: Offa's Dyke Path, Castle Ring Pen Offa (Figure 5.48) (1.0 km from B4372)	Table A.45 (Table A.23)
B4357, between Walton and Rhos-y-meirch	VP20: Evenjobb, B4357 (Figure 5.45) VP23 (0.8 km off route): Offa's Dyke Path, Castle Ring Pen Offa (Figure 5.48)	Table A.46 (Table A.20 Table A.23)
A483, between Llanwrtyd Wells and Abermule	VP18: Crossgates (Figure 5.43)	Table A.47 (Table A.4)
Heart of Wales Railway Line	VP24: Ridge north of Knighton (Figure 5.49) (0.6 km from route) VP7: Dolau (Figure 5.32) (0.3 km from route) VP18: Crossgates (Figure 5.43) (0.3 km from route)	Table A.48 (Table A.24 Table A.7 Table A.18)
Long Distance Trails and Cycle Routes Users		
The Heart of Wales Line Trail (long distance walk)	VP2: Heart of Wales Line Trail near Coco's Farm Campsite (Figure 5.27) VP9: Heart of Wales Line Trail near The Pales (Figure 5.34) VP14: A44 bridge approaching Penybont (Figure 5.39)	Table A.49 (Table A.2 Table A.9 Table A.14 Table A.17)

Visual Receptor Group	Representative Viewpoint(s) Assessment Point or Proxy Assessment (e.g. Long Distance Trails which pass through areas of Open Access Land)	Assessment Table(s) Ref. (Appendix 5.5) ¹⁰⁰
	VP17: Glyndŵr's Way near Lanlluest (Figure 5.42) (0.7 km from route)	
Offa's Dyke Path	VP22: Hergest Ridge near Offa's Dyke Path (Figure 5.47) VP23: Offa's Dyke, Castle Ring Pen Offa (Figure 5.48) VP24: Ridge north of Knighton (Figure 5.49) VP25: Offa's Dyke Path, south of Newcastle (Figure 5.50)	Table A.50 (Table A.22 Table A.23 Table A.24 Table A.25)
Glyndŵr's Way	VP17: Glyndŵr's Way near Lanlluest (Figure 5.42)	Table A.51 (Table A.17)
Elan Valley Way	VP7: Dolau (Figure 5.32) VP10: A488 at Bleddfa (Figure 5.35) VP18: Crossgates (Figure 5.43)	Table A.52 (Table A.7 Table A.10 Table A.18)
NCN Route 825 – Radnor Ring Route	VP13: Bwlch-Ilwyn Bank (Figure 5.38) (0.4 km from route) Assessment Point 3: Hundred House (Figure 5.56)	Table A.53 (Table A.13)
Open Access Land and PRow Users		

Visual Receptor Group	Representative Viewpoint(s) Assessment Point or Proxy Assessment (e.g. Long Distance Trails which pass through areas of Open Access Land)	Assessment Table(s) Ref. (Appendix 5.5) ¹⁰⁰
Open Access Land, BOAT and other PRoWs within the Site	AP2: BOAT south of Water-break-its-neck (Waterfall) in Open Access Land (Figure 5.55) CH03: Shepherd's Tump Round Barrow (Cadw SM Ref. RD253) (Figure 6.7)	Table A.54
Open Access Land – Radnor Forest	VP5: Black Mixen (Figure 5.30)	Table A.55 (Table A.5)
Public Dedicated Forest – Fishpools	No specific viewpoint or accompanying visualisation (due to lack of opportunities for clear views from predominantly woodland paths).	Table A.56
Public Dedicated Forest – Warren Wood	VP1: Water-break-its-neck (Waterfall) (Figure 5.26)	(Table A.1)
Open Access Land – Coed-swydd	VP9: Heart of Wales Line Trail near The Pales (Figure 5.34)	Table A.57
Open Access Land –Rhos-swydd	The Heart of Wales Line Trail (long distance walk) passes through area of Open Access Land.	(Table A.49)
Open Access Land – Llandegley Rhos	VP12: Llandegley Rocks (Figure 5.37) VP13: Bwlch-Ilwyn Bank (Figure 5.38)	(Table A.12 Table A.13)
Open Access Land – Cwm-brith Bank and Cefnlllys	No specific viewpoint or accompanying visualisation.	Table A.58

Visual Receptor Group	Representative Viewpoint(s) Assessment Point or Proxy Assessment (e.g. Long Distance Trails which pass through areas of Open Access Land)	Assessment Table(s) Ref. (Appendix 5.5) ¹⁰⁰
Open Access Land – Old Radnor	VP19: Old Radnor (Figure 5.44)	(Table A.19)
Open Access Land – Hergest Ridge	Offa's Dyke Path passes through area of Open Access Land. VP22: Hergest Ridge near Offa's Dyke Path (Figure 5.47)	(Table A.51 Table A.22)
Open Access Land – extending across the Gilwern Hills and Carneddau	VP21: Castle Bank (Figure 5.46) located in area of Open Access Land	(Table A.21)
Open Access Land – extending across Llanfihangel Hill, Gwaunceste Hill and Little Hill	VP15: Llanfihangel Hill (Figure 5.40) located in area of Open Access Land	(Figure 5.15)
Open Access Land – Aberedw Hill	No specific viewpoint or accompanying visualisation.	Table A.59
Open Access Land – Glascwm Hill and Llandeilo Hill between Aberedw and Gladestry	No specific viewpoint or accompanying visualisation.	Table A.60

Visual Receptor Group	Representative Viewpoint(s) Assessment Point or Proxy Assessment (e.g. Long Distance Trails which pass through areas of Open Access Land)	Assessment Table(s) Ref. (Appendix 5.5) ¹⁰⁰
Open Access Land – Llan Fawr south of Pilleth	Elan Valley Way passes through area of Open Access Land.	(Table A.52)
Open Access Land – Caergynan Bank	VP16: Caergynan Bank, Open Access Land	(Table A.16)
Open Access Land – Beacon Hill	The Heart of Wales Line Trail and Glyndŵr's Way pass through area of Open Access Land. VP17: Glyndŵr's Way near Lanlluest (Figure 5.42)	(Table A.49 Table A.51 Table A.17)
Open Access Land – Moelfre, Tylcau Hill and Warren Hill	No specific viewpoint or accompanying visualisation.	Table A.61
Open Access Land – Yr Allt, Moel Dod and Castle Bank	Glyndŵr's Way passes through area of Open Access Land.	(Table A.51)

Residential Receptors

5.125 Informed by OS AddressBase® Plus residential property data, 149 residential properties were identified within 2 km of the wind turbines, as shown in **Figure A5.7.1**. The closest properties are located < 650m from the nearest turbine (Property Group 18, comprising P101: Lower Cwm Farm at 640 m and P102: Cwm Farm at 624 m). The average distance of the properties located within 2 km of the proposed turbines is 1.45 km. .

5.126 Residential receptors within 2 km comprise scattered properties to the north, west and south the Site and properties within and close to the small settlements of Fishpools,

Llanfihangel Rhydithon, Dolau, Llandegley, Llanfihangel-Nant-Melan, roadside clusters and farmsteads, as well as isolated properties on the lower slopes of the Radnor Forest Hills. The outlook from properties varies, owing to their individual orientation, adjacent landform and intervening features (such as topography, vegetation, and other built structures).

5.127 Individual residential properties within 2 km of the turbines are considered within the RVAA, which is presented in **Appendix 5.7**.

Other Wind Farm Development

Existing Wind Farm Development

5.128 The operational wind energy developments located within the 28 km radius Study Area are listed in **Table 5.10** below and shown on **Figure 5.18**.

5.129 For wider context and to demonstrate regional patterns of wind energy development, **Figure 5.17** illustrates wind energy developments within a 60 km radius of the Site and illustrates the general pattern of existing and emerging wind energy development across Powys and the wider Mid-Wales area.

5.130 Existing operational or under construction wind energy developments (and therefore considered as part of the existing baseline for the primary assessment in the LVIA) in closest proximity to the Site include the under construction Hendy Wind Farm located approximately 3 km west of the Proposed Development to the south of Llandegley Rocks (436 m AOD) and west of Blaen Edw Bank (332 m AOD) and within the Pre-Assessed Area (4) for Wind Energy as defined in Future Wales: The National Plan (**Figure 4.13**).

5.131 Within the wider 28 km radius Study Area, the operational Garreg Lwyd Hill Wind Farm (17 turbines at 126.5 m to blade tip height) is located approximately 12 km to the north of the Site, and just outside the Pre-Assessed Area (4) for Wind Energy, situated in an area of upland within the Radnorshire Hills between the Teme Valley to the east and the Ithon Valley to the west. The operational Llandinam Wind Farm (102 turbines at 45.5 m to blade tip height) is located to the north-west of the Pre-Assessed Area (4) for Wind Energy and occupying a large upland plateau to the east, south-east of the Severn Valley. The operational Bryn Titli Hill Wind

Farm (22 turbines at 53.5 m to blade tip height) is situated to the north-west of the Study Area, and is located on an upland plateau east, north-east of the River Wye Valley.

5.132 The cumulative ZTV shown on **Figure 5.19** illustrates the combined visibility (to maximum turbine blade tip height) of all operational developments within the 28 km Study Area, and the theoretical additional visibility introduced by the turbines of the Proposed Development.

Identification of Developments to be Included in the Cumulative Assessment

5.133 In line with NRW's LANDMAP Guidance Note 46¹, the scope of the assessment of cumulative landscape and visual effects included an initial search for wind energy schemes within 33 km from the Site which is the upper range of the search area recommended for structures between 176 m and 225 m in vertical height. Due to the assessment focussing on developments which may give rise to significant cumulative effects, a more focused Study Area of 28 km was applied.

5.134 Single turbines of ≥ 50 m within 10 km from the Site were also considered if they were deemed to have potential interactions which will give rise to significant cumulative effects. The criteria for the inclusion of wind energy developments within the cumulative assessment is set out in **Table 5.9** below and ensures the study focusses on those interactions which may potentially give rise to significant cumulative effects.

Table 5.9 Criteria for wind energy developments to be considered within the cumulative assessment

Maximum Turbine Blade Tip Height (m)	Turbine No.	0-10 km from the Site	>10 km to 28 km from the Site
<50 m	Single turbine	No	No
	More than one turbine	Yes	Yes
>50 m	Single turbine	Yes	No
	More than one turbine	Yes	Yes

5.135 All operational, consented and in planning wind energy developments within these distances are shown below in **Table 5.10** and shown on **Figure 5.18**. These all fall under Tier 1 criteria set out in the Planning Inspectorate (2024) Nationally Significant Infrastructure Projects: Advice on Cumulative Effects Assessment. Tier 2 wind energy developments that have reached statutory consultation stage and notified PEDW of their intent to submit within one year (Banc Du Energy Park¹⁰¹, Rhiwlas Energy Park¹⁰², Aberedw Energy Park¹⁰³, Bryn Gilwern Energy Park¹⁰⁴ and Green GEN Towy Usk overhead transmission line¹⁰⁵) have not been considered in the cumulative assessment. This approach and the list of schemes to be considered in the cumulative assessment has been agreed with PCC and PEDW as detailed in ES **Chapter 2**.

5.136 This information is correct as of 1 October 2024 (the cumulative assessment cut-off date, which was the date for the decision to include/exclude cumulative schemes), and was fixed prior to progression of the cumulative assessment and finalising the ES for statutory consultation.

Table 5.10 Wind energy developments considered within the cumulative assessment

Wind Farm	No. of Turbines	Status	Distance from Proposed Development ¹⁰⁶	Maximum Blade Tip Height (m)
Operational				
Hendy	7	Under Construction ¹⁰⁷	2.6 km	110 m maximum blade tip height (69 m hub height/82 m rotor diameter (RD))

¹⁰¹ Reference: DNS CAS-01927-F0T2T1 – Banc Du Energy Park

¹⁰² Reference: DNS CAS-01928-W3M9S8 – Rhiwlas Energy Park

¹⁰³ Reference: DNS CAS-03009-N5D9K8 – Aberedw Energy Park

¹⁰⁴ Reference: DNS CAS-03010-F0X0Q1 – Bryn Gilwern Energy Park

¹⁰⁵ Reference: DNS CAS-02379-G1Z1J0 – Green GEN Towy-Usk Project

¹⁰⁶ Distance between the closest turbine of the Proposed Development and nearest turbine of the other wind energy development.

¹⁰⁷ Construction is understood to be complete and the wind farm awaits a connection to the electricity network (as of 29 November 2024), therefore the development is considered as part of the existing baseline situation.

Wind Farm	No. of Turbines	Status	Distance from Proposed Development ¹⁰⁶	Maximum Blade Tip Height (m)
Cefncynfal	1	Operational	4.9 km	77m maximum blade tip height (50 m hub height/54 m rotor diameter (RD))
Garreg Lwyd Hill	17	Operational	12.2 km	126.5 m maximum blade tip height (80 m hub height/93 m rotor diameter (RD))
Llandinam	102	Operational	20.1 km	45.5 m maximum blade tip height (31 m hub height/29 m rotor diameter (RD))
Bryn Titli	22	Operational	23.8 km	53.5 m maximum blade tip height (35 m hub height/37 m rotor diameter (RD))
Bryn Blaen	6	Operational	29.9 km	100 m maximum blade tip height (59 m hub height/82 m rotor diameter (RD))
Consented – Tier 1 (Considered along with above developments in Cumulative Scenario A)				
Llandinam Repowering	34	Consented	20.5 km	121.2 m maximum blade tip height (80 m hub height/ 82.4 m rotor diameter (RD))
Application – Tier 1 (Considered along with above developments in Cumulative Scenario B)				
Bryngydfa	12	Application Submitted	11.5 km	126.5 m maximum blade tip height (80 m hub height/93 m rotor diameter (RD))

Wind Farm	No. of Turbines	Status	Distance from Proposed Development ¹⁰⁶	Maximum Blade Tip Height (m)
Garn Fach ¹⁰⁸	17	Application Submitted	17.2 km	149.9 m maximum blade tip height (83.5 m hub height/ 133 m rotor diameter (RD))

Future Baseline in the Absence of the Proposed Development

5.137 In the absence of the Proposed Development, it is likely that land within the Site will continue under the same land use, albeit influenced by a number of ongoing forces for change such as variations in land management, drier summers and wetter winters as a result of climate change, and felling and replanting of forestry. The elevated nature of the Site, its good wind resource and being partially within a pre-assessed area for wind energy as defined in Future Wales⁶, means that it is possible a wind farm would be developed in this location.

Implications of Climate Change

5.138 Climate change will have a highly influential role in the future of the landscape, including the Site and surrounding Study Area. Whilst there is no certainty in the exact changes which will occur, projections for the UK include:

- Increased temperatures generally;
- Increased incidence of hot spells particularly in summer, and decrease in summer rainfall leading to a decrease in soil moisture;
- Increase in incidence of heavy rainfall events throughout the year, but particularly in winter;

¹⁰⁸ The Garn Fach Wind Farm was consented by Welsh Ministers on 22 October 2024, but after the 1 October 2024 cut-off date adopted for the Environmental Statement (as detailed in ES Appendix 2.6)

- Increase in near surface wind speeds, with winter months experiencing more significant effects of wind; and
- Increased frequency and magnitude of storms throughout the UK.

5.139 The alterations in climate and conditions means the composition of vegetation and habitats is likely to alter, causing variations in landscape character. Some of these changes are likely to include:

- Increased growth of grasses and expansion of bracken within upland heathland could change the vegetation structure towards something more representative of a lowland heathland environment, therefore altering the upland character of the Site;
- Changes in vegetation composition will also apply to areas of acid grassland and purple moor grass found across the Site, again altering landscape character¹⁰⁹; and
- Areas of marshy grassland, blanket bog and wet heath will see increasing dry spells which will likely shrink their extents, altering the character of these areas. Conversely, during storm events, increased erosion and gullying may diminish parts of these habitats^{110 111}.

5.140 Furthermore, increased temperatures and dry spells could see the risk of wildfires increase on the Site.

5.141 As climate change progresses, the demand for renewables as the UK tries to meet its net zero targets may mean additional applications for wind energy developments are made across the Study Area. This could also include proposals to re-power existing wind farms which will see taller and more efficient wind turbines introduced into the landscape. One example of this is the likely replacement of the operational Llandinam Wind Farm with the larger consented Llandinam Repowering as detailed in **Table 5.10** above.

¹⁰⁹ Natural England (2020) Climate Change Adaptation Manual: Upland acid grassland

¹¹⁰ Natural England (2020) Climate Change Adaptation Manual: Blanket bog

¹¹¹ Natural England (2020) Climate Change Adaptation Manual: Upland flushes, fens and swamps

Design Considerations (Embedded Mitigation)

5.142 The turbine layout of the Proposed Development was developed as part of the iterative assessment and design process. An overview of the design evolution is provided in ES **Chapter 3: Site Selection and Design Strategy**.

5.143 The design strategy for the Proposed Development has aimed to provide the best balance between energy yield and minimising effects on the local and wider environment. It has sought to create a layout that relates sympathetically to the landform and scale of the Site and surrounding area, and that is well-composed from key views.

5.144 The design strategy from a landscape and visual perspective, and with reference to specific design objectives has been to:

- Minimise effects on nationally designated landscapes, most notably the Shropshire Hills National Landscape/AONB and the BBNP, including cumulative effects;
- Minimise adverse effects on views from nearby settlements;
- Minimise the effects of visible aviation lighting through the implementation of all available mitigation measures to reduce the number, frequency and intensity of visible lighting required;
- Ensure no individual turbine or turbines appear too dominant or overwhelming in views from residential properties, such that it could result in unacceptable living conditions and breach the Residential Visual Amenity Threshold at nearby properties, beyond which these properties could be widely regarded to be unattractive places to live;
- Locate turbines in the large-scale unenclosed areas within the interior of the upland plateau as far as possible where landscape scale is larger, and avoiding the smaller scale valleys;
- Consider landform, scale and land use to locate turbines on the larger scale hill tops/ridges within the interior of the Site;
- Set turbines back from the steeper edges of the interior plateau and ridges within the Site (i.e. the break of the slope), and avoid turbines appearing as overbearing on the steep sided slopes on the south-eastern, western and northern peripheries of the Site;

- Consider different turbine heights across the Site to respond to the varying topography and relative proximity to residential properties; and
- Achieve as consistent a height and spacing of turbines as feasible (in light of other constraints), to achieve a well-balanced composition overall.

5.145 The appearance and proximity of the Proposed Development in views from the Shropshire Hills National Landscape/AONB and BBNP, formed a key consideration in the design development, and particularly visibility of turbine nacelles, some of which will require visible aviation lighting as detailed in the **Appendix 12.1** and **Appendix 5.8**.

5.146 The access tracks have been designed to utilise existing track where possible, minimising the necessity for new excavation. They have also been kept away from highly visible slopes where possible. The tracks will be finished with locally sourced (where practicable) cap-stone/wearing course of graded crushed rock (the adjacent grassland will be allowed to extend across the edges and middle, reducing the extent of the visibility of tracks in the landscape). The engineered appearance of any embankments will be smoothed out to ensure any landforms blend in with topography (using sinuous forms rather than straight lines) – and will be reinstated through measures such as re-seeding with locally occurring species, top-soil reuse and/or turf replacement to blend with the surroundings. Measures such as grass-reinforcement may be applied where the track widens on steeper bends and in passing places.

5.147 The onsite substation is located within the south-western extents of the Site close to the main Site entrance from the A44 (see **Figure 4.1a** and **Figure 4.1b**), where it will connect to the proposed Green GEN Towy Usk 132 kV overhead line¹¹². It is situated on flatter ground that is free of onsite constraints and alongside the proposed wind farm access track south of T1. The substation will comprise of a compound (measuring 750 m x 130 m), secured with 2.5 m high earthed palisade fence, painted in a colour that assimilates into the winter colours found in the landscape on the Site (using the Natural Colour System), as agreed with PCC. A control and operations building will be located within the substation compound and its colour will also be suitably chosen to blend with the moorland surroundings and agreed with PCC. Hardstanding

¹¹² This project will be subject to a separate DNS/NSIP application – Reference: DNS CAS-02379-G1Z1J0. Information available at: [Green Gen Towy Usk \(undated\) Delivering a Positive Energy Future for Wales](#)

and parking areas within the substation compound will be finished with cap-stone/wearing course of graded crushed rock (to match the onsite tracks).

5.148 Three borrow pit search areas are located within the Site; borrow pit search area one close to T1 and T2 and the onsite substation in the south-western extents of the Site, borrow pit search area two towards the centre of the Site between T14 and T15 and, borrow pit search area three in the north of the Site, between T25 and T26. Their siting has sought to minimise loss of existing landscape features (i.e. trees and woodland, hedgerow field boundaries or other sensitive vegetation which is not easily reinstated), and visibility from the wider landscape (although some visibility during construction will be inevitable) whilst ensuring that they are in suitable locations for resourcing onsite stone in a sequential way as the wind farm access tracks are constructed from south to north (as advised by the civil engineer). Sensitive restoration of the borrow pits as set out in the Outline Borrow Pit Restoration Plan (**Appendix 4.1**) will minimise long-term visibility of these temporary interventions (once appropriate vegetation has established).

Micrositing

5.149 The micrositing of turbines has been restricted in certain directions, influenced by a range of technical and environmental onsite constraints. The details of specific micrositing constraints are detailed in ES **Chapter 4: Project Description**.

5.150 Taking these restrictions into account, any micrositing that may occur in the remaining areas (i.e. the impact of moving turbines any direction within a 50 m radius) has been considered for each landscape and visual receptor and it is judged that this will not change the results reported in the LVIA, or the accompanying RVAA contained in **Appendix 5.7** and Aviation Lighting Impact Assessment contained in **Appendix 5.8**.

Good Practice Measures (Applied Mitigation)

During Construction

5.151 In order to minimise impacts arising from construction, the construction of turbines and associated infrastructure will follow an agreed Construction Environmental Management Plan

(CEMP) (see **Appendix 4.2** for an outline plan) and Outline Soil Management Plan (SMP) (see **Appendix 11.4** for an outline plan) which will include arrangements for implementation of various aspects of the works such as turf and soil removal, storage and replacement, and stream crossings. The CEMP and SMP will also set out restoration of landscape earthworks, soils and surface vegetation once the construction phase is complete.

Assessment of Construction Effects

5.152 The assessment of effects is based on the project description as outlined in ES **Chapter 4** and shown on **Figure 4.1** to **Figure 4.10**.

5.153 To cover the worst-case/maximum effect scenario, landscape and visual effects arising from the introduction of the type and scale of wind farm development proposed are assumed to be adverse during construction, unless stated otherwise (in accordance with the LVIA methodology set out in **Appendix 5.1**).

Sources of Effects During Construction

5.154 During the proposed 23 month construction phase, there will be potential short-term (lasting 0-5 years e.g. resulting from construction activities or presence of temporary structures) landscape and visual effects arising from the presence of partially constructed infrastructure and the undertaking of construction activities on the Site (as described in ES **Chapter 4**). Effects occurring during the construction phase are considered to be reversible unless otherwise stated.

5.155 The changes arising during the construction of the Proposed Development will be primarily associated with the following construction activities:

- Clearance of vegetation (dry and wet heath, unimproved and semi-improved acid grassland, improved and semi-improved grassland, marshy grassland, bracken, species poor hedgerow, and a small amount of semi-natural broadleaf woodland. More extensive areas of coniferous plantation (51.37 ha at Esgairnantau, see ES **Chapter 7: Ecology (non-avian)** for further information) in the location of the temporary construction compounds, borrow pits, onsite substation, turbines, , crane hard standings, and onsite access tracks;

- Presence of temporary fencing on areas not within common land (which will be maintained in a neat and tidy condition) in discrete areas such as turbine bases, substation, compounds and sections of road, to protect the public and prevent unauthorised access;
- Presence of two temporary construction compounds located in the south (construction compound 1, sited between T2 and T5) and north (construction compound 2, sited between T25 and T26) of the Site, including associated activity and storage of materials;
- Quarrying of stone from three onsite borrow pits (borrow pit one in the south of Site, sited between T1 and T2, borrow pit two in the centre of Site, between T14 and T15, and borrow pit 3 sited between T25 and T26 in the north of Site – and to be utilised as construction compound 2) and transporting it to construct the new onsite access tracks and areas of hardstanding;
- Formation of new site entrance located on the A44 in the south-west of the Site, selected from one of two access options detailed on **Figure 4.1b** (Site access North, shown on **Figure 4.10a** and Site Access South, shown on **Figure 4.10b**);
- Works to construct new onsite access tracks between the 30 turbines – including vehicle movements along these routes;
- The erection by tall cranes of 30 turbines with a maximum blade tip height of 180 m (three turbines), 205 m (24 turbines) and 220 m (three turbines) (and partially built towers whilst turbines are being erected), and associated crane pads;
- Construction of the onsite substation;
- Temporary floodlighting; and
- Movement and activity of construction vehicles and machinery (including cranes) on the Site.

Landscape Effects During Construction

Effects on Landscape Elements/Features During Construction

5.156 The area or length of landscape elements/features that will be directly lost, indirectly affected, gained or enhanced within the Site as a result of the construction works is set out in **Table 5.10** below. For further information, please refer to ES **Chapter 7: Ecology (non-avian)** .

Effects on Landscape Units During Construction

5.157 A detailed assessment of construction effects on the landscape character of the Site and host LCA is provided in **Appendix 5.4** and the remainder of this section provides a summary of that assessment.

Landscape Units Directly Affected During Construction

5.158 The greatest effects during the construction phase will be in areas directly affected by construction activities detailed above. This will affect the host LCA 43: Radnor Forest. landscape unit which covers the entirety of the Site (as shown on **Figure 5.9**).

LCA 43: Radnor Forest

5.159 LCA 43: Radnor Forest landscape unit comprises a large-scale, elevated upland plateau reaching a high point of 660 m AOD at Great Rhos. Incised by a regular series of deep, steep-sided glacial valleys that have created distinctive finger-like profiles along the edge of the plateau. Land cover comprises extensive tracts of unimproved acid grassland, with large straight-sided fields defined by post and wire fences, or coniferous shelterbelts. Large, angular blocks of coniferous plantation with characteristically straight edges cover a substantial area to the east. Elsewhere, extensive areas of blanket bog, dry heathland and bracken habitats provide contrast and diversity. Radnor Forest SSSI comprises large areas of well-developed submontane heath communities. It is judged to have a medium-high susceptibility to change and a medium value, resulting in a medium-high sensitivity (see **Table A.1** in **Appendix 5.4** for details).

5.160 There will be a large scale of effect on the areas directly affected by construction of the 30 turbines with associated crane pads and tracks between the turbines, , the construction of the

temporary construction compounds between the eastern and western groups of turbines and close to the centre of the landscape unit, and the excavations associated with one of the borrow pits in the north-eastern corner of the landscape unit, resulting in a change from an undeveloped area of exposed upland plateau to a construction site. The construction works are expected to last approximately 23 months, so will be short-term. Re-establishment of vegetation will take approximately three to five years, depending on the vegetation and soils and will likely persist into the operation phase. The level of reversibility will be varied, from fully reversible changes associated with construction plant and activity that will cease at the end of the construction period, to partially reversible changes (e.g. the borrow pits will be restored but not to the exact original condition, as detailed in the Outline Borrow Pit Restoration Plan, **Appendix 4.1**), to non-reversible changes (such as loss of vegetation to make way for crane pads and along the route of new/widened tracks including the access track and tracks between turbines). The scale of landscape change at construction is judged to be **large**, resulting in an overall **Major** (significant) landscape effect for the directly affected areas and within 2 km. The scale of effect will reduce with distance from the Proposed Development resulting in a **medium** change to the landscape unit beyond 2 km, resulting in an overall **Moderate** (significant) effect for the landscape unit as a whole.

Landscape Units Indirectly Affected During Construction

5.161 Indirect landscape effects arising during the construction phase for other landscape units beyond the Site are unlikely to exceed the level of effect associated with operational landscape effects, and are therefore not assessed independently.

Visual Effects During Construction

5.162 A detailed assessment of visual effects arising during the construction phase of the Proposed Development is provided in **Appendix 5.5** and this section provides a summary of that assessment.

5.163 Visual effects during the construction phase will affect the same visual receptors (people) as assessed in the operational phase. Visual effects resulting from construction will change throughout the construction phase. Whilst the construction period will last for 23 months, not all construction activities will be evident during this time onsite or from the surrounding landscape.

For example, initial earthworks, construction of access tracks, turbine foundations and other hard-standings, and the installation of ground level ancillary components of the Proposed Development will be largely indiscernible in views from the wider landscape. During periods of darkness, construction lights and movement of vehicles within the Site will be visible against the large-scale and unlit upland landscape, particularly during the winter months of the construction phase when the number of hours of daylight are reduced. As individual wind turbines are gradually constructed, and the 30 turbines of the Proposed Development start to appear in the landscape, the level of visual effects experienced will generally increase. As such, visual effects during the construction phase are unlikely to exceed the level of effect associated with operational visual effects.

5.164 During the construction phase the most visible aspects will be the cranes and part constructed turbines. However, other aspects such as the quarrying and excavations associated with the formation and extraction of materials from borrow pits, construction of onsite access tracks between turbines and the main Site entrance and access track from the A44, construction traffic along the tracks construction of the substation, construction of the temporary compounds and general movement around the Site will be visible from local areas around the Site. The visual effects associated with these activities will change throughout the construction phase and will be temporary in nature as turbines and other ancillary infrastructure is gradually constructed and construction disturbance is reinstated, but in general the construction of the wind farm and activity on the Site will significantly affect views experienced by visual receptors (people) within or in closest proximity to the Site.

5.165 Visual effects resulting from construction will change as wind turbines are gradually constructed in sections. However, for receptors beyond 5 km from where onsite construction activities are only likely to be evident in clear conditions, the visual effects during the construction phase are unlikely to exceed the level of effect associated with operational visual effects and are not assessed independently. It is acknowledged that at the latter stages of the construction phase, when the majority of the turbines are constructed on Site, the same or a very similar levels of effect that are predicted to arise during the long-term operation of the Proposed Development will be experienced, and persist into the operational phase. As such, it can typically be assumed that any significant visual effects identified in the operational phase for

receptors beyond 5 km will only start to arise as the construction phase nears completion and the majority of permanent onsite components, predominantly in this case the wind turbines, are present.

5.166 The assessment therefore focuses on indirect visual effects arising during construction for those visual receptors located within a 5 km radius of the Proposed Development, and in general terms the construction of the wind farm and activity on the Site will **significantly** affect views experienced by the receptors listed below.

Views from Representative Viewpoints Indirectly Affected During Construction

5.167 Significant visual effects are identified from several representative viewpoints during the construction phase of the Proposed Development – VP2, VP3, VP4, VP5, VP6, VP8, VP9, VP11, VP12, VP13, representing views experienced by communities, road users, and recreational users of long-distance walking trails, cycle routes, PRoWs and areas of Open Access Land within 5 km of the Site.

Local Communities Indirectly Affected During Construction

5.168 Significant visual effects will arise for receptors within the closest communities to the Site, as turbines and other ancillary infrastructure is constructed within the interior of the Radnor Forest Upland plateau. Many of the ground level excavations and construction activities will be largely imperceptible from these communities, including from the nearest settlements (within 5 km) of Llanfihangel Rhydithon, Dolau, Llandegley, Llanfihangel-Nant-Melan, Bleddfa, New Radnor and Penybont until the construction of turbines commences and these vertical features start to appear above the enclosing skylines in views from the settlements.

5.169 From extents of the settlement of Llanfihangel Rhydithon (illustrated by VP4: A488 Llanfihangel Rhydithon, **Figure 5.29**, however, wider available views from settlement considered in **Table A.30** in **Appendix 5.5**), particularly those to the north-west of the A488, cranes erecting turbines and part-built turbines will be seen in relatively close proximity (within 1.3 km). Receptors in this local community have a medium-high sensitivity, and will experience a medium-high magnitude of change, resulting in a **Moderate-Major** (significant) visual effect during construction, experienced from the majority of the extents of the settlement.

5.170 Similar effects will be experienced from the settlement of Dolau (no significant views identified from VP7: Dolau, **Figure 5.32**, however, wider available views from settlement considered in **Table A.30** in **Appendix 5.5**), further south-west along the A488. Receptors in this local community have a medium-high sensitivity, and will experience a medium-high magnitude of change, resulting in a **Moderate-Major** (significant) visual effect, experienced from a large extent of this small settlement.

5.171 To the west of the Site, the community of Llandegley located on the A44 (illustrated by VP8: Llandegley (A44, outside the church), **Figure 5.33**) will experience views of construction activities at approximately 2.3 km, with some views of ground level excavations and construction of access tracks and onsite ancillary infrastructure possible above the smooth skyline formed by the western edge of the Radnor Hills (views from wider settlement considered in **Table A.30** in **Appendix 5.5**). Receptors in this local community have a medium-high sensitivity, and will experience a medium-high magnitude of change, resulting in a **Moderate-Major** (significant) visual effect as cranes constructing, turbines, partially constructed turbines (at different stages as construction moves northwards across the Site, and experienced from much of this small settlement.

5.172 From the settlement of Penybont within 4.9 km of the nearest turbines of the Proposed Development (see **Table A.35** in **Appendix 5.5**), construction activities onsite will be seen at greater distance, however given the clear views of the skyline from parts of the settlement, construction activities at ground level will be evident on the upland plateau. These will be followed by views of cranes and partially constructed turbines in the central and northern areas of the Site closest to the settlement. Receptors in this local community have a medium-high sensitivity, and will experience a medium magnitude of change, resulting in a **Moderate** (significant) visual effect. During periods of darkness, construction lights within the Site may be occasionally visible, however they will not be particularly notable given the presence of street lights along the A44 through the village, and other lights within the settlement. At the eastern end of the village, rising intervening landform and a small patch of forestry to the east provide additional screening of construction effects.

Road Users Indirectly Affected During Construction

5.173 Road users travelling on the A44 will experience significant visual effects as they pass in close proximity to the Site. This will include passing the north and south accesses (only one access will be required) near VP3: A44 east of Castell Crugerydd (see **Figure 5.28**) where the new Site access entrance, main access track into the energy park, onsite substation and borrow pit one will be seen. Other onsite construction activities will be clearly evident from this short section of the road at the south-western extent of the Site, with temporary lighting of the secure Site access entrance and construction compound evident beyond the substation site. Views from the road towards cranes and partially built turbines within approximately 1.1 km of the road at their closest point will introduce large vertical features which will be a defining feature of views for a section of the road between Llandegley and Llanfihangel-nant-Melan (as detailed in **Table A.42** in **Appendix 5.5** and illustrated by VP3, AP1 – **Figure 5.54**, VP6 – **Figure 5.31** and VP8, **Figure 5.33**). Road users of this road are judged to be of low-medium sensitivity, and will experience a medium – high magnitude of change within 3 km of the Site, resulting in a **Moderate** (significant) effect, limited to receptors travelling on this section of the road between Llandegley and Llanfihangel-nant-Melan. Beyond this distance effects will reduce to **Minor** (not significant).

5.174 Views from the A481 are detailed in **Table A.43** in **Appendix 5.5**, and illustrated by VP11: A481 near Rhewey (**Figure 5.36**) and VP6: A44 outside the Fforest Inn, Llanfihangel-nant-Melan (**Figure 5.31**). The road passes within 5 km of the south-western extents of the Site between Hundred House and Fforest Inn, near Llanfihangel-nant-Melan. Road users are considered to be of low-medium sensitivity, and are predicted to experience a medium-high magnitude of change resulting in a **Moderate** (significant) experienced from a relatively short section of this route within 5 km.

5.175 The Heart of Wales Train Line passes to the north of the Site close to the settlement of Dolau. Views of construction activity within the Site will be most evident along the route travelling north-east of Crossgates and as the railway approaches Dolau, with travellers experiencing middle distance and oblique views of partially built turbines and cranes over the skyline to the east. Intervening landform along the western edges of the Radnor Forest upland complex will screen ground activities, although construction lights and vehicular movements will

be visible and noticeable above the descending slopes of Oldhall Bank during periods of darkness (particularly during winter months). As detailed in **Table A.48** in **Appendix 5.5** users of this promoted scenic railway journey are considered to be of medium-high sensitivity and will be judged to experience a medium magnitude of change during construction, resulting in a **Moderate** (significant) effect. Similar views will be experienced along a short section of the route between the section of track south of Crossgates and approaching Dolau, where views are more open and elevated.

Users of Long Distance Walking Routes and Cycle Routes Indirectly Affected During Construction

5.176 Recreational users walking on the Heart of Wales Line Trail will experience views of construction activities in the northern extents of the Site at close proximity to T29, T30 and T31 (at less than <500 m), as illustrated by VP2: Heart of Wales Line Trail near Coco's Farm Campsite (**Figure 5.27**) and wider views of the majority of the Proposed Development from VP9: Heart of Wales Line Trail near The Pales (**Figure 5.34**). Ground level construction activities will occasionally appear in views from along the length of the trail within 5 km of the Site, with groundworks, felling, clearing of grassland and heath as well construction of foundations and hardstandings intermittently visible. Vertical elements such as partially built turbines and crane movements will be visible along the skyline for long sections of the trail, from Llywncaedu, past Llanfihangel Rhydithon and Penybont. During periods of darkness, particularly winter months, construction lighting and vehicular movements will be noticeable against the upland slopes. As set out in **Table A.51** in **Appendix 5.5**, users of the trail are judged to be of high sensitivity, and will experience a high magnitude of visual change during the construction phase between Penybont and Coed-swydd within approximately 3 km of the Proposed Development, and resulting in a **Major** (significant) visual effect. Beyond this distance the magnitude of change will reduce to low-medium where the influence of screening from sections of the route contains outwards views towards the Proposed Development and resulting in **Minor-Moderate** (not significant) visual effects. Similar visual effects will be experienced from sections of the Elan Valley Way where it shares the same route past the northern extents of the Site, with **Major** (significant) effects predicted to arise for users on the stretch of trail passing between through the Site and up the slopes towards Oldhall Bank and Graig Hill (as detailed in

Table A.52 in Appendix 5.5). To the east the route passes through extensive forestry with limited opportunity for outward views. Where the two routes deviate and the Elan Valley Way heads north towards Dolau significant effects will extend to approximately 3 km from the Site, whilst the magnitude of change will reduce to low-medium and the visual effect to **Minor-Moderate** (not significant), beyond approximately 5 km from where the influence of intervening landform and vegetation will reduce visibility of construction activities.

5.177 Recreational users of the Glyndŵr's Way National Trail will experience views of construction activities at greater distance, with views from elevated sections of the trail along Cwnch Bank to the north-east of the Site, with direct but more distant views extending towards the Radnor Forest upland complex, from approximately 5 km. Intervening topography along the northern edge of the Site will limit visibility of ground construction activities, while vertical elements including partially built turbines and cranes will be visible over the skyline. During periods of darkness, particularly longer winter months, construction lights and vehicular movements within the Site will be noticeable. As set out in **Table A.51 in Appendix 5.5**, users of the trail are judged to be of high sensitivity, and will experience a medium magnitude of visual change during the construction phase resulting in a **Moderate** (significant) visual effect from a short segment of the route at Cwnch Bank and heading south-west from across Bailey Hill (within approximately 7 km). Beyond this distance users will experience a low magnitude of visual change during the construction phase resulting in a **Minor** (not significant) effect.

5.178 From NCN Route 825, the Radnor Ring Route users will experience views closest to the Site between Sunny Bank and Bwlchau, when heading north along the route towards construction activity within the Site. Views towards cranes and partially built turbines on the skyline in views east, perpendicular to the direction of travel. Ground activities within the Site will be largely screened by intervening landform and vegetation, but some activities will be evident on the western periphery of the Radnor Hills. The magnitude of visual change during construction is judged to be medium from a short section of the route between Sunny Bank and Bwlchau, and along the western slopes of Mynydd yr Heol within 5 km, resulting in a **Moderate** (significant) visual effect. Reducing to low and **Minor** (not significant) beyond 5 km (see **Table A.53 in Appendix 5.5**).

Users of Open Access Land and PRowS Indirectly Affected During Construction

5.179 Several areas of Open Access Land exist within and directly adjacent to the Site, with access between and across them via a network of PRowS as described in **Table A.54** in **Appendix 5.5**. Within the Site, PRowS crossing the Open Access Land (as shown on **Figure 4.13**) include a BOAT crossing south, south-east from Cefn-y-Grug in the north. It runs to the east of Cowlod and exits the Open Access Land at Foel, before re-entering it at the Mithil Brook and continuing south along the slopes of Nyth Grug. Other routes in the area include a bridleway running across the north-western side of the Great Rhos plateau, and another bridleway across the south-western slopes of Great Rhos. Views of construction activity within the Site will be close-range from the upland summits and tracks across the Open Access Land within the Site (as illustrated by AP2: BOAT south of Water-break-its-neck (Waterfall) in Open Access Land, **Figure 5.55**, and the nearby CH03: Shepherd's Tump Round Barrow (Cadw SM Ref. RD253), **Figure 6.7**). Ground construction works, including construction of hardstandings and foundations, clearance of grassland and heather, felling, and regrading across the Site will be visible, particularly from atop the summits including Cowlod, Nyth-grug and the western slopes of Great Rhos. Vertical elements within the Site, including partially built turbines and cranes, will be visible and noticeable within the upland landscape, and will appear large in close-range views over the skyline to the north and south. Users of the PRow network and areas of Open Access Land in the Site are judged to be medium-high. Users will experience a high magnitude of visual change during construction of the Proposed Development, resulting in **Major** (significant) visual effects, as they move through what will be a temporary construction site whilst the Proposed Development is constructed.

5.180 From neighbouring areas of Open Access Land within the Radnor Forest upland complex users will experience similar visual effects. The adjacent Open Access Land extending over open moorland and rough grazing in the east of the Radnor Forest is accessed by PRow routes (as shown on **Figure 5.16b**) which include a bridleway passing between Whimble and the Ystol Bach Brook in the east, and another bridleway running north-west from Harley Dingle to cross the spur between Great Rhos and Fron Hill to the upper valley of the Black Brook. Representative views experience from this area are illustrated by VP5: Black Mixen (**Figure 5.30**). Ground construction works, including construction of hardstandings and foundations,

clearance of grassland and heather, felling, and regrading across the Site will be visible, particularly from the summits of Black Mixen, Great Creigau and Great Rhos. Along the southern descending slopes visibility of ground activities will be increasingly screened by intervening landform and areas of intervening forestry. **Table A.55** in **Appendix 5.5** outlines that users of this Open Access Land are judged to be of medium-high sensitivity, and will experience a medium-high magnitude of change, resulting in **Moderate-Major** (significant) visual effects.

5.181 An area of Public Dedicated Forest at Fishpools is located directly to the east of the Site. PRoW cross the area and include numerous bridleways through the forest and a short section of footpath near Shepherd's Well in the south-west. There is a waymarked Fishpools walking trail through Fforest Fach in the north of the area, and the Heart of Wales Line Trail also crosses the area briefly from east to west near Fforest Fach. A **Moderate** (significant) visual effect will arise during construction for views experience from limited areas of this area of Open Access Land east, north-east of the Site experienced from the elevated summits of Fforest Fach and Fron-wen, from where the absence of woodland allows for open outward views and from the promoted trails near Fishpools (as detailed in **Table A.56** in **Appendix 5.5**).

5.182 From the small area of Open Access Land at Coed-swydd (**Table A.57** in **Appendix 5.5**) users will experience a medium-high magnitude of change, resulting in **Moderate-Major** (significant) visual effects, arising from views of construction activities within the Site. These will be most evident from the PRoW along the eastern facing slopes of Coed-swydd, with views extending towards the interior of the Radnor Forest and to the descending western slopes of Cowlod, Foel and Rhiwiau (similar to the views represented by VP9: Heart of Wales Line Trail near The Pales (**Figure 5.34**)).

5.183 VP12: Llandegley Rocks (**Table A.12** in **Appendix 5.5**, and **Figure 5.37**) and VP13: Bwlch-Ilwyn Bank (**Table A.13** in **Appendix 5.5**, and **Figure 5.38**) represent views from the areas of Open Access Land west of the Site at Llandegley Rhos. Users are judged to be medium-high sensitivity, and will experience middle to long distance views of construction activity, comprising clearance of heath, grassland and forestry in order to construct access tracks and turbine foundations. Cranes and partially built turbines will be visible across the upland landscape, although intermittent blocks of forestry will provide some filtering of views of ground level construction activities. Overall, the magnitude of change will be medium-high

(VP12) and medium (VP13), where the existing presence of Hendy Wind Farm in close proximity to the Open Access Land at Bwlch-llwyn Bank forms a key prominent feature in the foreground of views towards the Site. A **Moderate-Major** (significant) and **Moderate** (significant) effect is predicted to arise from the respective areas of the Open Access Land.

5.184 Further south of the Site, at the north-eastern extents of the Aberedw Uplands, a **Moderate** (significant) effect will arise for views experienced by users of this elevated area of the Open Access Land extending towards Llanfihangel Hill, Gwaunceste Hill and Little Hill, as illustrated by nearby VP15: Llanfihangel Hill (**Table A.15** in **Appendix 5.5**, **Figure 5.40**).

Residual Construction Effects

5.185 The assessment of effects above assumes all construction related best practice mitigation measures are implemented in accordance with the Construction Environmental Management Plan (CEMP) (see **Appendix 4.2** for an outline plan) and Soil Management Plan (see **Appendix 11.4** for an outline plan), therefore the residual effects arising from construction will remain as identified in the section above.

Assessment of Operational Effects

5.186 The assessment of operational effects is based on the project description as outlined in **ES Chapter 4** and shown on **Figure 4.1a** and **Figure 4.1b-h**.

5.187 As for construction effects, to cover the maximum effect (worst-case) scenario, landscape and visual effects arising from the introduction of the type and scale of wind farm development proposed are assumed to be adverse during operation, unless stated otherwise (in accordance with the LVIA methodology set out in **Appendix 5.1**).

Sources of Effects During Operation

5.188 The main effects of the Proposed Development on landscape and visual amenity once it has been built and is operational will be as a result of:

- The presence of 30 new operational turbines (including rotating blades) up to 180 m, 205 m and 220 m to maximum blade tip height, present for 40 years;

- The presence of visible medium-intensity (2000 cd./200 cd.) aviation lighting on the nacelles of 14 of the 30 proposed turbines (T1, T3, T5, T7, T9, T12, T14, T17, T19, T22, T23, T26, T29 and T31);
- Presence of a new onsite operational substation south of T1 and comprising a compound (measuring 75 m x 130 m), secured with an earthed 2.5 m high palisade fencing painted in a colour that assimilates into the winter colours found in the landscape on the Site (using the Natural Colour System), as agreed with PCC, and including a control and operations building, electrical equipment, and parking area;
- Presence of new and upgraded tracks, typically 5.5 m in width and finished with locally sourced (where possible) cap-stone/wearing course of graded crushed rock (the adjacent grassland will be allowed to extend across the edges and middle, reducing the extent of the visibility of tracks in the landscape);
- Presence of new site entrance located on the A44 in the south-west of the Site, selected from one of two access options (Site access North and Site Access South) as detailed on **Figure 4.1b**);
- Habitat restoration and management areas and restored borrow pits as set out in the outline Habitat Management Plan (**Appendix 7.10**) and Outline Borrow Pit Restoration Plan (**Appendix 4.1**); and
- The occasional movement of maintenance vehicles onsite.

Landscape Effects During Operation

Effects on Landscape Units During Operation

5.189 Appendix 5.4 contains detailed assessments for the landscape units (LCAs and LCTs) that have been considered in the LVIA. A summary, setting out those which are deemed likely to experience significant effects as a result of introduction the Proposed Development, is provided below. The Proposed Development is expected to remain operational for 40 years, so will be long-term, and will be reversible as the turbines and substation will be dismantled and removed from the Site once the operational period has ceased and the crane pads, other hard standing and onsite access tracks will be broken down below ground level.

Landscape Units Directly Affected During Operation

5.190 The greatest level of effect during the operational phase will arise in areas directly affected by the presence of the Proposed Development. This will affect the host LCA 43: Radnor Forest landscape unit which covers the entirety of the Site (as shown on **Figure 5.9**).

LCA 43: Radnor Forest

5.191 LCA 43: Radnor Forest landscape unit comprises a large-scale, elevated upland plateau reaching a high point of 660 m AOD at Great Rhos. Incised by a regular series of deep, steep-sided glacial valleys that have created distinctive finger-like profiles along the edge of the plateau. Land cover comprises extensive tracts of unimproved acid grassland, with large straight-sided fields defined by post and wire fences, or coniferous shelterbelts. Large, angular blocks of coniferous plantation with characteristically straight edges cover a substantial area to the east. Elsewhere, extensive areas of blanket bog, dry heathland and bracken habitats provide contrast and diversity. Radnor Forest SSSI comprises large areas of well-developed submontane heath communities. The distinctive landform is a prominent feature that forms a backdrop to views and is noted as a key characteristic of the landscape unit. The *“far-reaching and scenic views including distant views to the Brecon Beacons National Park to the south-west and to Snowdonia National Park to the north-west”*¹¹³ are noted as a key landscape quality of this LCA. Strong sense of tranquillity and remoteness across much of the upland plateau. Noise and movement of traffic on the A488 and A44 locally disrupt the sense of tranquillity in the valleys. The Powys LCA notes the *“strong sense of remoteness, high levels of tranquillity and dark skies experienced at moorland summits”* as a key landscape sensitivity of this LCA. It is judged to have a medium-high susceptibility to change and a medium value, resulting in a medium-high sensitivity (see **Table A.1** in **Appendix 5.4** for details).

5.192 Direct operational effects will arise as a result of the turbines, , substation, and access tracks being introduced within this landscape unit. One road access point will be implemented along the A44, either to the north or south of Fronddyrys. The Proposed Development will increase the presence of modern man-made influence within the landscape and add built features to the skyline, affecting the sense of remoteness and tranquillity. However, the exposed

¹¹³ Powys County Council (2022) Landscape Character Assessment Profiles – LCA 43: Radnor Forest

upland landform, presence of blanket bog, dry heathland and bracken habitats, evidence of prehistoric and medieval settlement, the PRow and extensive areas of Open Access Land, and the far-reaching and scenic views (including distant views to BBNP to the south-west and to Eryri/Snowdonia National Park to the north-west) will remain. Nevertheless, the Proposed Development will result in a large change in the character of the area directly affected by the Proposed Development, changing this area to a wind farm landscape. The scale of effect will reduce with distance from the Proposed Development, with the geographical extent of the largest scale of effect arising across the area of the landscape unit directly affected by the Proposed Development, including the summits of Oldhall Bank, Great Rhos, Nyth-grug, Fron Goch, Foel, Cowlod, Cefn-y-grug and Shepherds Tump, (within the Site) as well as the summits of Black Mixen, The Whimble, and Mynd. (all within 2 km of the Proposed Development). The large scale effect arising over a long-term duration is judged to result in a high magnitude of change for the area of the LCA occupied by the Site and up to 2 km from the Proposed Development resulting in a **Major** (significant) effect, and a **Moderate** (significant) effect for the landscape unit as a whole.

Landscape Units Indirectly Affected During Operation

5.193 The presence of the operational components of the Proposed Development will also affect the perceptual (visual and sensory) character of some areas of the landscape around the Site. A medium scale of effect to landscape character (due to changes in perceptual/visual and sensory character) is predicted to occur up to approximately 6-7 km from the proposed turbines (limited to those areas where turbines are predicted to be theoretically visible). The landscape units located within this distance are shown on **Figure 5.9** and those which will experience a medium, or medium-high magnitude of change are set out below.

LCA 50: Aberedw Uplands

5.194 Comprising two geographically distinct areas separated by the Aberedw Valley, the closest part of the landscape unit is located immediately to the south of the Site, approximately 0.9 km from the nearest proposed turbine. A large-scale landscape of elevated hills, plateaus and ridges, incised by upland brooks which create a gently undulating landform. Hill summits frequently exceed 400 m AOD in elevation. Landcover primarily comprises unenclosed upland

commons of upland heathland and extensive areas of upland moorland. Woodland cover is sparse, limited to occasional conifer shelterbelts. There are expansive views from the upland landscape over the surrounding lower-lying areas and to other upland landscapes including distant views to summits within BBNP. Has a strong visual relationship with the Aberedw Valley which it overlooks. An exposed, wild and rugged landscape with a strong sense of remoteness, particularly experienced from the upland summits. Traffic on the A44 locally influences the sense of remoteness and tranquillity. The LCA is judged to have a medium susceptibility to change and a medium-high value, resulting in a medium-high sensitivity (see **Table A.2** in **Appendix 5.4** for details).

5.195 During the operational phase there will be indirect effects as a result of views of up to 30 turbines, , substation, and access tracks being introduced in a landscape unit less than 1 km away, and the Proposed Development will introduce a new feature on the skyline. The proximity of the Proposed Development to the northern part of the landscape unit (less than 1 km at its closest point) will result in a medium scale of effect to the character of the landscape unit in views from north facing slopes and hill summits (within 5 km) including from The Van, Bryn-y-maen, Gwaunceste Hill, and Llanfihangel Hill. The medium scale of effect will occur on north-facing hill-slopes and summits within 5 km of the Proposed Development, reducing for north-facing slopes beyond 5 km. Beyond 5 km there will be a small change to the character of views from hill summits and north-facing slopes. The medium scale effect arising over a long-term duration is judged to result in a medium magnitude of change for north-facing slopes and hill summits within 5 km of the Proposed Development resulting in a **Moderate** (significant) effect, and an overall **Minor** (not significant) effect for the wider extents of the landscape unit beyond 5 km. The Proposed Development will have no effect on the south-facing hill slopes and undulating land around Glasnant and Perthycolly.

LCA 40: Llanbister-Penybont Uplands

5.196 This landscape unit wraps around the west and north-western edge of the Site and incorporates a small area within the Site, although no direct effects will arise within this area as a result of the Proposed Development.

5.197 A complex landform of low rolling hills (rising to a maximum elevation of 445 m AOD at Carneddau), incised by shallow stream valleys. Landcover is dominated by traditional small to

medium scale pasture fields enclosed by strong hedgerow boundaries, interspersed with pockets of nationally-designated grassland habitats and small broadleaved woodlands. There are distinctive areas of open common land on the low hills. Some far-reaching views are available from the hill summits, with a greater sense of visual enclosure in the valleys. The landscape unit has a strong visual relationship with upland areas to the east which overlook the landscape and form a backdrop in views (noted as a key landscape quality in the Powys LCA).

5.198 This is an attractive, tranquil, rural and traditional pastoral landscape with a sense of timelessness resulting from the general absence of modern development, although the under construction Hendy Wind Farm (7 turbines at 110 m blade tip height) is located within this landscape unit. It is judged to have a high susceptibility to change and a medium-high value, resulting in a medium-high sensitivity (see **Table A.3** in **Appendix 5.4** for details).

5.199 During operation, indirect effects will arise as a result of views of up to 30 turbines, , substation, and access tracks being introduced within an adjacent landscape unit, and the Proposed Development will add new features to the skyline in views to the east and south. The proximity of the Proposed Development to the eastern part of the landscape unit (less than 1 km from the nearest turbine in places) will result in a large scale change to the character in areas up to 5 km from the turbines (including the rolling pastoral landscape between Llandegley and Hundred House) and a medium scale change to the rolling farmland to the north of the Site, including south-facing slopes and elevated, open common land at Caergynan Bank. The large scale effect arising over a long-term duration is judged to result in a medium-high magnitude of change to central, and eastern extents of the landscape unit within 5 km of the Site, including the rolling pastoral land between Llandegley and Hundred House, resulting in a **Moderate-Major** (significant) effect. Beyond 5 km, effects will reduce and a **Minor-Moderate** (not significant) effect will arise for the wider extents of the landscape unit.

LCA 39: Ithon Valley

5.200 Located to the north-west of the Site, approximately 2 km from the nearest proposed turbine. Comprises the valley of the River Ithon and a small section of its tributary, the River Aran. The valley is relatively narrow in the north, widening in the south to form a broad undulating valley floor. Predominantly pastoral land use with small and irregular fields in the north, becoming larger and more uniform in the south. Pasture is interspersed with pockets of

grassland and meadow habitats (some of which are nationally designated), with broadleaved woodland on the lower valley slopes. The steep valley slopes create a strong sense of visual enclosure throughout the north and south-west of the LCA. Where topography allows, there are views to the adjacent hills and uplands within neighbouring LCAs. A rural and scenic character in the valleys, generally tranquil away from main roads. Experiences dark skies across much of the landscape unit. Several PRoW cross the valley, including parts of the Glyndŵr's Way and the Heart of Wales Line Trail Long Distance footpath. The LCA is judged to have a medium susceptibility to change and a medium, resulting in a medium-high sensitivity (see **Table A.4** in **Appendix 5.4** for details).

5.201 During operation indirect effects will arise from the introduction of the proposed turbines, , access tracks and substation into views in the adjacent landscape unit, and the Proposed Development will add a new feature to the skyline in views to the east and south. The proximity of the Proposed Development to the eastern part of the landscape unit (approximately 2 km in places) will result in a medium scale of effect to the landscape character in areas up to 6km from the turbines, including the low-lying farmland around Penybont, Cwmbrith, and Dolau. The turbines will increase the presence of modern human development seen from these areas, affecting the attractive views out to enclosing hills and uplands that are noted as a characteristic of the landscape unit. However, the valley landform, small-scale pastoral land use, historic nucleated settlements, and the sense of rurality will continue to give the area its distinctive character. Views from the north-western reaches of the Ithon Valley (beyond 5 km), will be partially or fully screened by intervening vegetation and topography, particularly where the steeper valley sides provide visual enclosure, therefore resulting in a small scale of effect for these areas. The medium scale of effect over a long-term is judged to result in an overall medium-high magnitude of landscape change for areas up to 6 km from the turbines (including the low-lying farmland around Penybont, Cwmbrith, and Dolau) resulting in a **Moderate-Major** (significant) effect, and a low magnitude of landscape change for the north-western reaches of the Ithon Valley (beyond 6 km) resulting in a **Minor** (not significant) effect.

LCA 38: River Dulas Hills & Valleys

5.202 This landscape unit is located to the west of the Site, approximately 4.5 km from the nearest proposed turbine. A medium-scale landscape of gently undulating minor hills and

valleys forming a transitional landscape sloping down from the uplands to the north to the lowland valleys to the south. The hills form distinctive landform features. Land use dominated by improved pasture with regular, straight-sided, medium scale fields in the north and irregular fields in the south, with intact mature hedgerows. Fields are interspersed with semi-natural habitats including hay meadows, valley mires, deciduous ancient woodlands and rhos pastures which add diversity and texture. A relatively settled landscape with scattered historic villages, hamlets and isolated farmsteads, linked by minor lanes. Major road corridors including the A44, A470 and A483 introduce some modern built development. Has a strong visual relationship with surrounding uplands to the north which form a backdrop to many views from the landscape unit (noted as a key landscape quality in the Powys LCA). From elevated areas there are expansive views across the landscape unit. Strongly rural character with scenic views across the traditional rolling pastoral landscape. Generally tranquil, although traffic noise and visual disturbance on major road corridors locally reduces tranquillity. A traditionally managed pastoral landscape which is in overall good condition, with intact hedgerows. A network of PRow cross the landscape including small parts of the Glyndŵr's Way, the Wye Valley Walk, and the Heart of Wales Line Trail long-distance footpaths. The LCA is judged to have a medium susceptibility to change and a medium-high value, resulting in a medium-high sensitivity (see **Table A.9** in **Appendix 5.4** for details).

5.203 During operation, there will be indirect effects as a result of the introduction of the turbines and ancillary infrastructure into views from the LCA. The nearest turbine of the Proposed Development will be approximately 5 km from the LCA, and new features across the skyline in views east, south-east towards the upland areas core of the Radnor Forest LCA. The Proposed Development will increase the presence of modern human development on the skyline affecting the expansive views across and out of the landscape unit, most notably from low-lying areas within 6 km, as well as from south-east facing hill slopes and summits, including Gwastedyn Hill and Cefyn Cenarth. However, the small-scale rolling pastoral fields interspersed with woodland and semi-natural habitats, diverse heritage assets, and strong visual relationship with surrounding uplands to the north will continue to give the landscape unit its distinctive character. Nevertheless, the Proposed Development will result in a medium scale of effect to the character of a small geographical extent of the landscape unit, occurring between approximately 4.5 km and 6 km of the Site, and including the small-scale farmland surrounding Penybont and the

rolling farmland to the north of Llandrindod Wells, with effects gradually diminishing with distance. The medium scale effect arising over a long-term duration is judged to result in a medium magnitude of change for north-facing slopes and hill summits within 6 km of the Proposed Development resulting in a **Moderate** (significant) effect, and a **Minor** (not significant) effect for the wider extents of the landscape unit beyond 6 km. No landscape effects will arise for the valleys of the LCA north of Abbeycwmhir.

LCA 32: Teme Hillsides

5.204 The LCA is located to the north-east of the Site, approximately 4.6 km from the nearest proposed turbine. A complex landscape of steeply sloping hills and ridges which frequently exceed 400 m AOD. Enclosed stream valleys dissect the landscape, enhancing the undulating landform. Land cover comprises a mosaic of large-scale, regular fields of improved pasture on higher ground, with small-scale irregular pasture fields interspersed with pockets of unimproved grassland, broadleaved woodland (including ancient woodland) and conifer plantation in the valleys. Settlement comprises nucleated hamlets and isolated farmsteads nestled within the valleys, with little modern development. A network of rural lanes crosses the landscape unit. The LCA has a strong visual relationship with the Teme Valley, as well as intervisibility with the Shropshire Hills National Landscape/AONB to the north-east, and the Herefordshire Hills to the east. Views to the north and west are enclosed by surrounding upland landforms. Skylines are undeveloped. A rural landscape with a sense of tranquillity resulting from the absence of major settlement and limited modern development. The A488 main road introduces limited and localised disruption. This is an enclosed landscape with a sense of isolation in places, particularly within the valleys. The LCA is crossed by a number of PROWs including sections of the Heart of Wales long distance trail, the Glyndŵr's Way and Offa's Dyke Path, as well as part of NCN Route 825. The LCA is judged to have a high susceptibility to change and a medium, resulting in a medium-high sensitivity (see **Table A.10** in **Appendix 5.4** for details).

5.205 During operation there will be indirect effects arising from views of turbines and access tracks introduced within a landscape unit approximately 4.6 km to the south-west, and adding a new feature in views from this LCA. The Proposed Development will be seen in open views from south-west facing hill slopes and elevated summits within relative proximity, particularly from the west of the landscape unit including sections of Glyndŵr's Way near Lanlluest and sections of

the Offa's Dyke Path on Hawthorn Hill/Hengwm Hill and Garth Hill. The Proposed Development will form a noticeable manmade feature in middle distance views from hill summits and south-west facing hill slopes, limited in part by occasional conifer plantations on upper slopes. However, the fundamental characteristics of the area (undulating hills with steep slopes and ridges, narrow, enclosed stream valleys, prehistoric and medieval assets, and the enclosed, isolated valleys) will continue to give the landscape its distinctive character. The medium scale effect arising over a long-term duration is judged to result in a medium magnitude of change across south-facing slopes of the LCA, including Llanlluest, Wernygeufon Hill, and Llan-wen Hill, as well as south-west facing slopes of the Lugg Valley, resulting in a **Moderate** (significant) effect within 6 km, and a **Minor** (not significant) effect for the wider extents of the landscape unit beyond 6 km. There will be no change to north-east facing hillslopes and enclosed valleys where topography limits views towards the Site.

5.206 Significant landscape effects are contained to landscape units within Powys, and no significant landscape effects are predicted to extend to landscapes of Herefordshire or Shropshire including within the Shropshire Hills National Landscape/AONB, or within the landscapes of the BBNP. At greater distances from the Site, the Proposed Development will exert increasingly less effect upon landscape character (including visual and sensory characteristics) of surrounding landscape units. In areas beyond 5-7 km from the turbines of the Proposed Development, it is anticipated that only a small change to landscape character will occur, as although turbines will be perceptible, the Proposed Development will be perceived within the wider landscape and the fundamental characteristics of the landscape are more likely to remain unaltered and no effects on landscape character at this distance will be significant.

Visual Effects During Operation

5.207 Appendix 5.5 contains detailed assessments for the visual receptors that have been considered in the LVIA. A summary, setting out those which are deemed likely to experience significant effects as a result of the Proposed Development, is provided in this section.

5.208 The Proposed Development is expected to remain operational for 40 years, so will be long-term¹¹⁴, and will be largely reversible as the turbines will be dismantled and removed from

¹¹⁴ Long-term is considered to be over 10 years (see **Appendix 5.1: LVIA Methodology**).

the Site once the operational period has ceased and the crane pads and other above ground infrastructure (including tracks) will be broken down below ground level. As such the majority of visual effects will be reversible at the end of the operational period and once decommissioning and restoration measures have been implemented.

Views from Representative Viewpoints Indirectly Affected During Operation

5.209 Significant visual effects are identified from several representative viewpoints during the operational phase of the Proposed Development:

- VP2: Heart of Wales Line Trail near Coco's Farm Campsite – **Major** (significant);
- VP3: A44 east of Castell Crugerydd – **Moderate-Major** (significant);
- VP4: A488 Llanfihangel Rhydithon – **Moderate-Major** (significant);
- VP5: Black Mixen – **Major** (significant);
- VP6: A44 outside the Fforest Inn, Llanfihangel-nant-Melan – **Moderate-Major** (significant);
- VP8: Llandegley (A44, outside the church) – **Moderate** (significant);
- VP9: Heart of Wales Line Trail near The Pales – **Moderate-Major** (significant);
- VP11: A481 near Rhewey – **Moderate-Major** (significant);
- VP12: Llandegley Rocks – **Moderate-Major** (significant);
- VP13: Bwlch-llwyn Bank – **Moderate** (significant);
- VP14: A44 bridge approaching Penybont – **Moderate** (significant);
- VP15: Llanfihangel Hill – **Moderate** (significant);
- VP16: Caergynan Bank, Open Access Land – **Moderate** (significant);
- VP17: Glyndŵr's Way near Lanlluest – **Moderate** (significant);
- VP18: Crossgates – **Moderate** (significant);
- VP19: Old Radnor – **Moderate** (significant);
- VP21: Castle Bank – **Moderate** (significant); and
- VP22: Hergest Ridge near Offa's Dyke Path – **Moderate** (significant).

5.210 The viewpoints represent views experienced by communities, road users, and recreational users of long-distance walking trails, cycle routes, PRowWs and areas of Open Access Land within the Study Area. The relevant viewpoints and accompanying visualisations are referred to in the summary section which follows below.

Local Communities Affected During Operation

5.211 The local communities considered in this assessment are shown on **Figure 5.14b**. Local communities have a medium-high sensitivity (as judged in the detailed assessments in **Appendix 5.5**).

5.212 Within the immediate valleys that surround the Site, parts of the local communities that occupy the valley slopes will experience medium to large changes as described below.

5.213 Where the Proposed Development will be in relatively close proximity in a direct line of vision, or affect a substantial part of the view, or provide contrast with the existing view, the scale of visual effect is judged to be medium-large. Where this occurs the magnitude of visual change (which takes into consideration the scale of effect and duration) is judged to be medium-high due to a medium-large scale of effect over a long-term time period.

5.214 Views from the community of Llanfihangel Rhydithon on the A44 to the north of the Site will experience a medium-high magnitude of change, resulting in **Moderate-Major** (significant) visual effects (as outlined in **Table A.30** in **Appendix 5.5**). The settlement is split into two main areas located alongside the A488. Within each area, similar visual effects will arise for the majority of receptors, with some intervening screening of parts of the Proposed Development afforded by buildings and neighbouring trees in some locations. Visual effects arising for residents and visitors to the north-eastern section of the settlement will be similar to those described for VP4: Llanfihangel Rhydithon (**Figure 5.29**), which lies within the settlement, however, from north-west of the A44 more open views are experienced from this area of the settlement. The Proposed Development will introduce up to 15 turbines into easterly and south-easterly views, appearing above the treeline and on the skyline beyond the settlement at distances of approximately 1.3 km and beyond. The Proposed Development will often occupy approximately a relatively large horizontal field of view.

5.215 From the nearby settlement of Dolau, south-west along the A44 and to the north of the Site, similar views will be experienced to those from Llanfihangel Rhydithon. Whilst VP7: Dolau (**Figure 5.32**) lies within the settlement, the degree of screening illustrated from the viewpoint is not replicated from other parts of the settlement where open views to the south, south-east are afforded towards the Site. The Proposed Development will introduce 16 turbines into view, 14 of which will have both blades and hubs visible above the skyline at a distance of approximately 2.3 km and greater from the settlement. Generally turbines will appear to be contained in the upland plateau which forms the interior of the Site, however turbines north of Oldhall Bank begin to descend along lesser summits, and appear to extend the visual effect towards the Nantwylyan Valley closer to the settlement. A medium-high magnitude of change will arise, resulting in **Moderate-Major** (significant) visual effects (as outlined in **Table A.31** in **Appendix 5.5**).

5.216 From the small settlement of Llandegley approximately 2.3 km west of the Site, the effects for many residents and visitors are likely to be similar to those identified for VP 8: Llandegley (A44, outside the church) (**Figure 5.33**), which lies within the settlement. However, views eastwards from some locations in the village are more open, with the Radnor Forest hills being particularly prominent. The Proposed Development will introduce up to 28 turbines into views from the settlement location, stretching along the western edge of the Radnor Forest and occupying a large horizontal field of view (as detailed in **Table A.31** in **Appendix 5.5**). Overall, a medium-high magnitude of visual change will arise, resulting in a **Moderate-Major** (significant) visual effect for receptors within this local community (as outlined in **Table A.31** in **Appendix 5.5**).

5.217 From areas where the Proposed Development will result in a clearly perceptible change in views but may be slightly further away, oblique to the view or partially screened, the scale of visual effect is judged to be medium. This applies to the following receptor groups (refer to **Appendix 5.5** for detailed assessments):

- The settlement of Penybont, located west of the Site on the A44 at approximately 4.6 km from the Proposed Development. A medium magnitude of visual change will arise, resulting in a **Moderate** (significant) visual effect for receptors in the settlement where open

outwardly views can be afforded towards the Radnor Forest Hills (as detailed in **Table A.35** in **Appendix 5.5**, and illustrated by VP14: A44 bridge approaching Penybont, **Figure 5.39**).

- Similar views will arise from the settlement of Crossgates at approximately 6.9 km. A medium magnitude of visual change will arise, resulting in a **Moderate** (significant) visual effect for receptors in the settlement where open outwardly views can be afforded (as detailed in **Table A.36** in **Appendix 5.5**, and illustrated by VP18: Crossgates, **Figure 5.43**).
- From the small settlement of Old Radnor is located approximately 7.5 km to the south-east of the Site, a medium magnitude of visual change will arise for views from the settlement experienced by the local community, where the southern and eastern turbines of the Proposed Development will appear in views above the skyline from the north-west facing parts of the settlement, including its elevated core with historic church and public house. A **Moderate** (significant) visual effect will arise (as detailed in **Table A.37** in **Appendix 5.5**, and illustrated by VP19: Old Radnor, **Figure 5.44**).

5.218 Other local communities will be affected by small or imperceptible changes in views, and these will not lead to significant visual effects.

Road Users Affected During Operation

5.219 The roads considered in this assessment are shown on **Figure 5.15b**. Road users are judged to have a low-medium sensitivity (as detailed in the assessments set out in **Appendix 5.5**).

5.220 For motorists travelling along the roads that pass within 5 km of the Site, the scale of visual effect is judged to be medium to large as the Proposed Development will be seen in close proximity and will introduce large scale vertical features in views, which with the exception of sections of the A44 where the under construction Hendy Wind Farm is seen within 3 km, often unaffected by visibility of wind turbines as receptors move through the landscape. As a result, the magnitude of visual change (which takes into consideration the scale of effect and duration) is judged to be medium-high due to the medium to large scale of effect over a long-term period of time, however, this change will be variable as sequential views are experienced intermittently by users of these roads as they travel past the Site where views often become screened by

intervening landform and vegetation, and whilst views in alternative directions may be afforded. This will affect:

- Users travelling on the A44 within close proximity to the south-western and western extents of the Site will experience significant effects as they pass in close proximity to the Site. This will include passing the north and south accesses (only one access will be required) near VP3: A44 east of Castell Crugerydd (see **Figure 5.28**). Receptors will see the new Site access entrance, main access track into the wind farm and onsite substation in the foreground of views, particularly when travelling northwards, and the southern turbines will be seen extending across the view at distances of 1.1 km and greater. The Proposed Development will introduce additional large vertical features which will be a defining feature of views for a section of the road between Llandegley and Llanfihangel-nant-Melan (as detailed in **Table A.42** in **Appendix 5.5** and illustrated by VP3, AP1 – **Figure 5.54**, VP6 – **Figure 5.31** and VP8, **Figure 5.33**), whilst the turbines of the under construction Hendy Wind Farm will also be seen from sections of the route between VP3 and VP8. As detailed in **Table A.42** in **Appendix 5.5** road users of this road will experience a medium-high magnitude of change within 3 km of the Site, resulting in a **Moderate** (significant) effect. Beyond this distance effects will reduce to **Minor** (not significant).
- The views which will arise during the operational phase from the A481 are detailed in **Table A.43** in **Appendix 5.5** (illustrated by VP11: A481 near Rhewey, **Figure 5.36** and VP6: A44 outside the Fforest Inn, Llanfihangel-nant-Melan, **Figure 5.31**). The road passes within 5 km of the south-western extents of the Site between Hundred House and Fforest Inn, near Llanfihangel-nant-Melan. A medium-high magnitude of change resulting in a **Moderate** (significant) experienced from a relatively short section of this route within 5 km, where turbines will become a defining feature of the view for receptors travelling east, north-east as the road ascends and contours around the northern flanks of the Aberedw Uplands (VP11) towards Fforest Inn.
- The Heart of Wales Train Line passes to the north of the Site close to the settlement of Dolau. Travellers on this promoted scenic railway journey (as detailed in **Table A.48** in **Appendix 5.5**) will experience a medium magnitude of change during operation with the northern turbines of the Proposed Development appearing in views to the south, south-east

across the northern skyline of the Radnor Hills as the railway follows the broad route of the River Aran. This will result in a **Moderate** (significant) effect. These views will be experienced along a short section of the route between the section of track south of Crossgates and approaching Dolau, where views are more open and elevated, whilst views from other sections of the route will be contained by intervening landform and vegetation.

Users of Long Distance Walking Routes and Cycle Routes Indirectly Affected During Operation

5.221 The long distance walking routes and cycle routes considered in this assessment are shown on **Figure 5.16b**. Users of promoted long distance walking routes are judged to have a high sensitivity, whilst users of cycle routes are judged to have a medium sensitivity (as set out in the detailed assessments in **Appendix 5.5**).

5.222 Recreational users walking on the Heart of Wales Line Trail will experience views from close proximity to T29, T30 and T31 (at less than <500 m) from sections of the trail near Llanfihangel Rhydithon and Llywncaedu, where views will be perpendicular to the direction of travel but closer range, and turbines will appear large in scale, appearing over the summit of Shepherd's Tump and Oldhall Bank (as illustrated by VP2: Heart of Wales Line Trail near Coco's Farm Campsite, **Figure 5.27**). The Proposed Development will introduce up to 30 turbines into views from the short section of route in proximity to Penybont and Coed-swydd, appearing in mostly direct views to the east. From this section of the route, turbines will appear as medium to large scale features along the skyline, seen relatively well-spaced beyond the summits of the Radnor Forest upland complex (as represented by VP9: Heart of Wales Line Trail near The Pales, **Figure 5.34**). Users of the trail are judged to be of high sensitivity, and will experience a high magnitude of visual change during the operational phase between Penybont and Coed-swydd within approximately 3 km of the Proposed Development, resulting in **Major** (significant) visual effects. Beyond this distance the magnitude of change will reduce to low-medium where the influence of screening from sections of the route contains outwards views towards the Proposed Development and resulting in **Minor-Moderate** (not significant) visual effects as detailed in **Table A.51** in **Appendix 5.5**.

5.223 Similar visual effects will be experienced from sections of the Elan Valley Way where it shares the same route past the northern extents of the Site, with **Major** (significant) effects

predicted to arise for users on the stretch of trail passing through the Site and up the slopes towards Oldhall Bank and Graig Hill (as detailed in **Table A.52** in **Appendix 5.5**). Where the Elan Valley Way heads north towards Dolau, significant effects will extend to approximately 5 km from the Site. Beyond approximately 5 km distance whilst the magnitude of change will reduce to low-medium and the visual effect to **Minor-Moderate** (not significant), the influence of intervening landform and vegetation will reduce visibility of turbines to partially screened and filtered views from some sections of the trail, and from where wider views are available across the surrounding landscape.

5.224 Significant visual effects will arise from sections of the Offa's Dyke Path National Trail (as detailed in **Table A.50** in **Appendix 5.5**), located within 10 km of the Proposed Development. This includes the section represented by VP22: Hergest Ridge near Offa's Dyke Path (**Figure 5.47**) from where walkers will experience longer distance and slightly oblique views of the proposed turbines, which will appear as smaller scale features on the skyline to the west, north-west. In views from further south-east along Hergest Ridge, turbines will appear silhouetted above the forms of Mynydd, Black Mixen and Great Rhos. Users will experience a medium magnitude of change at distances within 9 km where open views of the Proposed Development are afforded from the path, resulting in a **Moderate** (significant) visual effect. Beyond this distance users will experience a low magnitude of visual change during the operational phase resulting in a **Minor** (not significant) effect. No significant visual effects are predicted from viewpoint locations (VP24: Ridge north of Knighton (**Figure 5.51**) and VP25: Offa's Dyke Path, south of Newcastle (**Figure 5.52**) on this National Trail where it passes over high ground within the Shropshire Hills National Landscape/AONB.

5.225 Significant visual effects are also predicted to arise from sections of Glyndŵr's Way National Trail (as outlined in **Table A.51** in **Appendix 5.5**), where the Proposed Development will introduce up to 30 turbines into middle to longer distance views looking south along the route from near Cwnch Bank. From this elevated section of the route the turbines will appear as small to medium scale features seen over the Radnor Forest hills skyline and starting to descend the slopes of Graig Hill, with turbines further south partially screened by landforms of Great Rhos and Foel. The scale of effect will be medium from this short section of the route near Cwnch Bank and Lanlluest represented by VP17: Glyndŵr's Way near Lanlluest (**Figure**

5.42) and will lead to a medium magnitude of change at a distance of approximately 6.7 km, resulting in a **Moderate** (significant) visual effect. Beyond this distance users will experience a low magnitude of visual change during the operational phase resulting in a **Minor** (not significant) effect.

5.226 As detailed in **Table A.53** in **Appendix 5.5**, from NCN Route 825, the Radnor Ring Route users will experience views closest to the Site between Sunny Bank and Bwlchau, when heading north along the route towards the Site. The Proposed Development will introduce views of up to 30 turbines in oblique easterly views as the route passes at its closest point across the western slopes of Hendy and Mynydd Yr Heol, seen on the skyline to the east above intervening landform and vegetation. Views towards the Site will be perpendicular to the direction of travel and will appear fleeting, as intermittent landform and vegetation will provide screening. The magnitude of visual change during operation will be medium from a short section of the route between Sunny Bank and Bwlchau, and along the western slopes of Mynydd yr Heol within 5 km, resulting in a **Moderate** (significant) visual effect. Reducing to low and Minor (not significant) beyond 5 km.

Users of Open Access Land and PRowS Indirectly Affected During Operation

5.227 The areas of open access land and PRowS considered in this assessment are shown on **Figure 5.16b**.

5.228 Open Access Land within the Site (as shown on **Figure 4.13**) is accessed and crossed by several PRowS, including a BOAT which crosses south, south-east from Cefn-y-Grug in the north (as described in **Table A.54** in **Appendix 5.5**). Users will experience large scale changes as turbines, , onsite access tracks and other ancillary infrastructure will be introduced in close proximity (as illustrated by AP2: BOAT south of Water-break-its-neck (Waterfall) in Open Access Land, **Figure 5.55**, and the nearby CH03: Shepherd's Tump Round Barrow (Cadw SM Ref. RD253), **Figure 6.7**). There will also be open views of the substation from Open Access Land and PRowS in the southern extents of the Site. Turbines will be prominent features in views where they will often surround receptors at close proximity; however, there will remain open views between the turbines and from the peripheries of the wind farm layout at the edges of the Radnor Forest upland complex so that the long-distance views to surrounding landscapes can continue to be appreciated. Users of the PRow network and areas of Open Access Land in

the Site are judged to be medium-high. Users will experience a high magnitude of visual change during operation of the Proposed Development, resulting in **Major** (significant) visual effects, as they move through what will become a wind farm landscape.

5.229 There will also be large scale changes to views for visual receptors located outside the Site but typically within 3 km, where open and elevated views are afforded and where turbines are in a direct line of sight or affect a substantial part of the available views, or provide a substantial contrast or juxtaposition with the existing view. These include the neighbouring areas of Open Access Land within the Radnor Forest upland complex, comprising open moorland and rough grazing and accessed by several PRow routes (as shown on **Figure 5.16b**) which include a bridleway passing between Whimble and the Ystol Bach Brook in the east, and another bridleway running north-west from Harley Dingle to cross the spur between Great Rhos and Fron Hill to the upper valley of the Black Brook. Representative views experience from this area are illustrated by VP5: Black Mixen (**Figure 5.30**). Users will experience a medium-high magnitude of change, resulting in **Moderate-Major** (significant) visual effects, with turbines forming a key feature in views west across the upland plateau, although those on lower ground will often appear partially screened by the rolling intervening landform.

5.230 From the area of Public Dedicated Forest at Fishpools, a **Moderate** (significant) visual effect will arise during operation for views experience from limited areas of this Open Access Land east, north-east of the Site. Effects will be experienced from the promoted trails near Fishpools within Fforest Fach (directly east, north-east of T31), the elevated summits of Fforest fach and Fron-wen, where the absence of woodland allows for open outward views (as detailed in **Table A.56** in **Appendix 5.5**).

5.231 From the Open Access Land at Coed-swydd (**Table A.57** in **Appendix 5.5**) receptors will experience a medium-high magnitude of change, resulting in **Moderate-Major** (significant) visual effects, arising from views of turbines and the north-western periphery of the access track network within the Site which will be most evident from the PRow along the eastern facing slopes of Coed-swydd, with views extending towards the interior of the Radnor Forest and to the descending western slopes of Cowlod, Foel and Rhiwiau (similar to the views represented by VP9: Heart of Wales Line Trail near The Pales (**Figure 5.34**)).

5.232 Views from VP12: Llandegley Rocks (**Table A.12** in **Appendix 5.5** and **Figure 5.37**) and VP13: Bwlch-Ilwyn Bank (**Table A.13** in **Appendix 5.5** and **Figure 5.38**) represent views from the areas of Open Access Land west of the Site at Llandegley Rhos. The magnitude of change will be medium-high (VP12) and medium (VP13), where the existing presence of Hendy Wind Farm in close proximity to the Open Access Land at Bwlch-Ilwyn Bank forms a key prominent feature in the foreground of views towards the Site. A **Moderate-Major** (significant) and **Moderate** (significant) effect is predicted to arise from these respective areas of the Open Access Land located within 5 km of the Site.

5.233 VP15: Llanfihangel Hill (**Table A.15** in **Appendix 5.5** and **Figure 5.40**) represents views from Llanfihangel Hill, Gwaunceste Hill and Little Hill Open Access Land at the north-eastern extents of the Aberedw Uplands. **Moderate** (significant) effects on views experienced by users of this elevated area of the Open Access Land will arise, whilst similar **Moderate** (significant) effects will arise from the adjacent area covering Glascwm Hill and Llandeilo Hill between Aberedw and Gladestry (see **Table A.60** in **Appendix 5.5**) from where the Proposed Development will introduce up to 30 turbines into north-easterly views, occupying a narrow proportion of the horizontal field of view across the western extents of the Radnor Forest upland complex.

5.234 From the Gilwern Hills Open Access Land to the west, represented by VP21: Castle Bank (**Table A.21** in **Appendix 5.5** and **Figure 5.46**), a medium magnitude of change will occur for recreational receptors within this area of Open Access Land, resulting in a **Moderate** (significant) effect. Similar effects will arise from the Open Access Land at Cwm-brith Bank and Cefnlllys (**Table A.58** in **Appendix 5.5**), where the Proposed Development will introduce up to 30 turbines into easterly views from approximately 7 km, occupying a medium proportion of the horizontal field of view. The turbines will appear on the western skyline of the Radnor Forest upland complex. Receptors will experience a medium magnitude of visual change, giving rise to a **Moderate** (significant) visual effect.

5.235 To the north, north-west of the Site VP16 (**Table A.16** in **Appendix 5.5** and **Figure 5.41**) represents views experienced by recreational receptors within the Caergynan Bank, Open Access Land. Turbines will appear along the skyline of the Radnor Forest upland complex, with those furthest north partially or almost entirely back clothed by the rounded and forested forms

of Fron wen and Great Rhos. At a distance of approximately 6 km, with similar views likely to be obtained from across much of the elevated areas of the Open Access Land, recreational receptors will experience a medium magnitude of visual change resulting in a **Moderate** (significant) visual effect.

Implications for the Special Landscape Qualities and Features of Designated Landscapes

5.236 Appendix 5.6 contains detailed assessments for the designated landscapes that have been considered in the LVIA. A summary is provided in this section.

Bannau Brycheiniog National Park

5.237 Visibility of the proposed turbines from BBNP will be limited to upland locations to the north-north-east towards the Site (as shown on **Figure 5.12b**). The Proposed Development will be seen as a distant man-made feature at distances of between 19 km and 28 km within the Study Area and in clear atmospheric conditions, which will form a small component of the often panoramic views available and experienced from elevated locations within the National Park (as illustrated in the day-time visualisations for Viewpoint 28 (N3): Hay Bluff, BBNP, **Figure 5.53**). Although perceptible in some of the views experienced from the landscapes at the northern periphery of the BBNP, in the context of other man-made elements including the turbines of more distant wind farms of Bryn Titli, Llandinam and Garreg Lwyd Hill (which are evident in clear conditions), the Proposed Development will not detract from the diverse landscape, sweeping uplands, green valleys, dramatic waterfalls, ancient woodland, caves, forests, reservoirs or spectacular and distinctive upland landforms for which the park is designated. The special qualities of the BBNP considered in the assessment; namely, its *‘Sweeping grandeur & outstanding natural beauty’* (including its *‘prominent hilltops with extensive views in all directions’*), its *‘Enjoyable and accessible open countryside’*, its *‘Sounds, sights, smells & tastes’* and its *‘Peace, tranquillity & darkness’* will not be significantly adversely affected by the introduction of the Proposed Development into either day-time or night-time views experienced from upland locations within the National Park at distances exceeding 18 km. The BBNP will remain an iconic landscape with exceptionally high scenic quality and a strong sense of place resulting from its elevation, dramatic and distinctive topography, and panoramic views.

5.238 Taking into account the observations above, overall, it is concluded that the Proposed Development will not prejudice the values or integrity of this designated landscape by adversely impacting on the special qualities for which it is designated.

Shropshire Hills National Landscape/AONB

5.239 Although there will be views of the turbines of the Proposed Development from the Shropshire Hills National Landscape/AONB, their presence will not fundamentally and significantly alter the key characteristics of the landscape, or the special qualities of the Clun Forest and Valley Area of the National Landscape/AONB. The introduction of the proposed turbines is unlikely to significantly alter the enjoyment associated with visiting and walking in the upland reaches of the National Landscape/AONB. No significant visual effects are predicted to arise from the designated landscape as represented by the views illustrated from Viewpoint 24: Ridge north of Knighton (**Figure 5.49**), Viewpoint 25: Offa's Dyke Path, south of Newcastle (**Figure 5.50**), and Viewpoint 27: Bury Ditches Iron Age hill fort (**Figure 5.52**).

5.240 While the Proposed Development will be visible from south, south-west facing elevated slopes and hills within the Clun Forest and Valley area of the National Landscape/AONB at distances of approximately 10.5 km and beyond, these views will often be experienced in the context of the presence of other man-made elements including operational wind farms (Garreg Lwyd Hill and Llandinam Wind Farms) located at a closer or similar to distance to the National Landscape/AONB, whilst views of turbines will be partially screened by intervening landform or coniferous woodland and the full extents of the turbine layout (i.e. all 30 turbines) will not be evident from the extents of the designated landscape.

5.241 The special qualities of the Shropshire Hills National Landscape/AONB considered in this assessment; namely, its 'Diversity and contrast (landscape character)', 'Hills', 'Scenic and environmental quality', 'Tranquillity' and 'Culture and Opportunities for Enjoyment' will not be significantly adversely affected by the introduction of the Proposed Development into either day-time or night-time views experienced from upland locations within the National Landscape/AONB at distances exceeding 10.5 km.

5.242 Considering the observations above, it is considered that the Proposed Development will not prejudice the values or integrity of this designated landscape by adversely impacting on the special qualities for which it is designated.

Assessment of Decommissioning Effects

Sources of Effects During Decommissioning

5.243 The changes arising during the decommissioning of the Proposed Development will be primarily associated with:

- Presence of a temporary decommissioning compound, temporary laydown areas and temporary lighting;
- Presence and movement of decommissioning traffic around the Site and surrounding area;
- Removal of the substation at ground level;
- Removal of the turbines with the use of cranes;
- Removal of the crane pads and other hard standing, broken down below ground level; and
- Making cabling safe and leaving in situ.

Landscape and Visual Effects During Decommissioning

5.244 It is anticipated that the impacts that result from the decommissioning of the Proposed Development will be no greater than those during the construction phase, because it is essentially a reduced and quicker reversal of the construction process. Inherent in the decommissioning phase is the temporary nature of operations. As there is so much uncertainty as to what the baseline will be at the time of decommissioning, it is difficult to be specific about the post-operational impacts. However, it is likely that the removal of turbines will not result in any significant impacts on landscape features, the character of the site or the character of the surrounding landscape.

Assessment of Cumulative Effects

Introduction

5.245 The aim of the cumulative assessment has been to “*describe, visually represent and assess the ways in which a proposed windfarm will have additional impacts when considered with other consented or proposed windfarms*” (NatureScot, 2021¹¹⁵).

5.246 In accordance with NatureScot guidance and Planning Inspectorate advice note¹¹⁶, the assessment has considered the following scenarios:

- **Scenario A** – The most certain future baseline scenario which includes wind energy, and other development types, which have been granted planning consent but are not yet constructed (consented) alongside the existing operational and under construction schemes that are already present in the baseline of the primary assessment of the LVIA.
- **Scenario B** – A less certain baseline scenario which includes wind energy, and other development types, that are the subject of a valid submitted application which are currently awaiting determination by the relevant consenting authority, including those at appeal (proposed), alongside those schemes considered in Scenario A.

5.247 The other wind energy developments within 28 km of the Proposed Development and considered in the above cumulative assessment scenarios are detailed in **Table 5.10** above, and shown on **Figure 5.18**.

General Observations on Visibility of Cumulative Developments

5.248 Combined cumulative ZTVs (CZTVs) (**Figure 5.19** to **Figure 5.25**) for the Proposed Development with other wind energy developments have been prepared to show where ZTVs overlap and where cumulative effects may occur. The ZTVs consider different groupings of wind energy development as follows:

¹¹⁵ NatureScot (2021) Guidance – Assessing the cumulative landscape and visual impact of onshore wind energy developments

¹¹⁶ Planning Inspectorate (2024) Nationally Significant Infrastructure Projects: Advice on Cumulative Effects Assessment

- Operational and under construction wind energy developments within 28 km (refer to **Figure 5.19**), including:
 - Garreg Lwyd Hill – operational;
 - Llandinam – operational;
 - Bryn Titli – operational;
 - Bryn Blaen – operational; and
 - Hendy – under construction.
- Operational and under construction, and consented wind energy developments within 28 km (illustrating combined visibility of Scenario A schemes, refer to **Figure 5.20**), including the operational and under construction wind farms above, and:
 - Llandinam Repowering – consented (and which will replace the operational Llandinam).
- Operational, consented and proposed wind energy developments within 28 km (illustrating combined visibility of Scenario B schemes, refer to **Figure 5.21**), including the operational and under construction, and consented wind farms above, and:
 - Garn Fach – proposed; and
 - Bryngydfa – proposed.

5.249 Paired ZTVs have also been prepared to illustrate where the Proposed Development may be seen in conjunction with other individual existing or proposed wind energy developments:

- Paired ZTV illustrating visibility of under construction Hendy Wind Farm and Proposed Development (refer to **Figure 5.22**);
- Paired ZTV illustrating visibility of operational Garreg Lwyd Hill Wind Farm and Proposed Development (refer to **Figure 5.23**);
- Paired ZTV illustrating visibility of proposed Bryngydfa Wind Farm and Proposed Development (refer to **Figure 5.24**); and
- Paired ZTV illustrating visibility of proposed Garn Fach Wind Farm and Proposed Development (refer to **Figure 5.25**).

Summary of Cumulative Landscape and Visual Effects – Additional

5.250 The detailed cumulative assessment by receptor has assessed **additional** cumulative effects, i.e. the effect of adding the Proposed Development to a theoretical projected baseline of other built or unbuilt wind farms in Scenario A and Scenario B. It has considered whether the effects identified against the projected baselines in Scenario A or Scenario B are different from the effects recorded in the LVIA against the existing baseline for each receptor. The results are summarised below.

Scenario A

5.251 There is one consented (but unbuilt) wind energy development within the Study Area at Llandinam Repowering (34 turbines at 121.2 m blade tip height), located approximately 20.3 km to the north-west of the Proposed Development (as illustrated by **Figure 5.20**). The larger turbines will replace the existing operational turbines of Llandinam Wind Farm, appearing more perceptible in views whilst occupying a similar horizontal extent to the existing scheme, and comprising two discrete clusters of turbines separated by a perceptible gap. However, there will be limited interaction between the Proposed Development and the consented Llandinam scheme given the intervening distance between the developments. It is considered that the addition of the Proposed Development to a baseline containing turbines at the Repowered Llandinam Wind Farm will not result in any different effects compared to adding the Proposed Development to the current baseline. The total effects arising from the two developments will be no greater than the sum of their individual effects. Overall, the detailed cumulative assessments contained in **Appendix 5.4** and **Appendix 5.5** indicate that schemes under Scenario A will not interact with the Proposed Development to the extent that there will be any additional cumulative effects on landscape character or visual amenity.

5.252 Effects arising from the Proposed Development in cumulative Scenario A will be no different from the effects arising from the Proposed Development when considered in against the existing baseline, and as already recorded in the primary assessment. There will be **no additional cumulative effects over and above those set out in the primary assessment of the LVIA for Scenario A.**

Scenario B

5.253 There are two proposed (undetermined) wind energy developments located within the Study Area as shown on **Figure 5.21**. The development at Bryngydfa (12 turbines at 126.5 m blade tip height) is located 11 km to the north, north-west of the Proposed Development and is the closest proposed wind energy development to the Site. The Bryngydfa turbines will appear to marginally consolidate the existing wind farm at Garreg Lwyd Hill (17 turbines at 126.5 m to blade tip height). The proposed Garn Fach Wind Farm (17 turbines at 149.9 m blade tip height) is located approximately 16 km to the north-west of the Proposed Development and will consolidate the two clusters of turbines which are formed by the consented Llandinam Repowering scheme, creating a perception of one large wind farm cluster, with turbines of comparable scale evident across a reasonably large extent of the horizon in distant views of over 15 km to the north-west.

5.254 Overall, the detailed cumulative assessments contained in **Appendix 5.4** and **Appendix 5.5** indicate that schemes under Scenario B will not interact with the Proposed Development to the extent that there will be any additional cumulative effects on landscape character or visual amenity.

5.255 Effects arising from the Proposed Development in cumulative Scenario B will be no different from the effects arising from the Proposed Development when considered against the existing baseline, and as already recorded in the primary assessment. There will be **no additional cumulative effects over and above those set out in the primary assessment of the LVIA for Scenario B**.

Summary of Cumulative Landscape and Visual Effects – Combined

5.256 The assessment of combined cumulative effects considers the effect on landscape and visual receptors if all potential future developments (consented and proposed), including the Proposed Development, are implemented when compared to the existing baseline (operational and under construction). However, it should be noted that GLVIA3 (paragraph 7.13) recognises the uncertainties inherent in providing a judgement of combined cumulative effect whereby *“...assessing combined effects involving a range of different proposals at different stages in the*

planning process can be very complex. Furthermore, the assessor will not have assessed the other schemes and cannot therefore make a fully informed judgment”.

Scenario A

5.257 In terms of the combined (or sometimes referred to as total) cumulative effects of cumulative schemes in Scenario A, the Proposed Development will introduce additional wind energy development into the Radnorshire Hills, and the first development within the Radnor Forest upland complex. This will generally increase the presence of wind energy development across this central eastern are of Powys, defined by the Radnorshire Hills NLCA 20, which includes the Pre-Assessed Area for Wind Energy (Area 4) which covers part of the Site.

5.258 Although the Proposed Development will introduce turbines into a landscape unit that is not currently directly affected by wind energy development (LCA 43: Radnor Forest), this area is already indirectly affected by views of the existing wind energy developments at Garreg Lwyd Hill and Bryn Titli (located within the 28 km Study Area), as well as the under construction Hendy Wind Farm (located within 4 km of the Site), as illustrated in **Figure 5.20** and Viewpoint 5: Black Mixen, **Figure 5.30**. Compared to the existing baseline, the Proposed Development alongside consented developments taken together will result in an increase in the number and size of turbines across the Study Area with the Proposed Development contributing 30 turbines at 180 m, 205 m and 220 m to blade tip height, and the Llandinam Repowering scheme increasing from 102 turbines at 45.5 m to blade tip height to 34 turbines at up to 121.2 m blade tip height.

5.259 This is likely to result in a **significant change when considered against the existing baseline** (i.e. combined cumulative effect) as there will be a greater influence of wind energy development upon the landscape of the Study Area, and increased prominence of individual wind farms due to the increase in the scale of turbines (rotor diameter and maximum blade tip height) proposed for the consented Llandinam Repowering and the Proposed Development. However, the Proposed Development's part in these combined landscape and visual effects will be no greater than reported in the primary assessment of the LVIA. The combined effects arising from all of the developments will be no greater than the sum of their individual effects as set out in the LVIA for each individual scheme.

Scenario B

5.260 In addition to the developments set out in Scenario A above, other proposed (yet undetermined) developments will also contribute towards the increase in the size of turbines across the Study Area, as illustrated in **Figure 5.21**. Bryngydfa will introduce a further 12 turbines at 126.5 m blade tip height and Garn Fach will add 17 turbines at 149.9 m blade tip height.

5.261 These developments along with those in Scenario A and the Proposed Development will result in a **significant change when considered against the existing baseline (i.e. combined cumulative effect)** as there will be further influence of wind energy development upon the landscape of the Study Area, and increased prominence of individual wind farms due to the general increase in the scale of turbines (rotor diameter and maximum blade tip height) of the proposed Garn Fach and Bryngydfa Wind Farms, and the Proposed Development. However, the Proposed Development's part in these combined landscape and visual effects will be no greater than reported in the primary assessment of the LVIA.

Summary of Cumulative Implications for the Special/Primary Landscape Qualities and Features of Designated Landscapes

5.262 Appendix 5.6 contains detailed assessments for the designated landscapes that have been considered in the LVIA including a consideration of the cumulative implications upon them. A summary is provided in this section.

Bannau Brycheiniog National Park (BBNP)

Scenario A

5.263 There are currently no consented wind farms located within, or in proximity to the BBNP, however, distant views of wind farms in panoramic views to the north will be afforded from extents of the BBNP similar to those from where visibility of the Proposed Development will arise (as illustrated in **Figure 5.20**). The consented development of the Repowered Llandinam Wind Farm (34 turbines at 121.2 m blade tip height) will be evident in long distance views to the north from the BBNP, and whilst the larger turbines will replace the existing operational turbines of Llandinam Wind Farm and be more perceptible in these long distance views, they will slightly

narrow the horizontal extent of the view occupied by turbines, with the two discrete clusters of consented turbines appearing separated by a perceptible gap (as shown on the wireline for Viewpoint 28, **Figure 5.53**). However, there will be limited interaction between the Proposed Development and the consented Llandinam scheme given the intervening distance between the developments.

5.264 The Proposed Development's contribution to the change in views from the BBNP under Scenario A will be the same as reported in the primary assessment of the LVIA, i.e. it will be seen as a distant man-made feature at distances exceeding 18 km, and will form a small component of the panoramic views experienced from elevated locations on the northern periphery of the National Park.

Scenario B

5.265 There are currently no proposed wind farms located within, or in proximity to the BBNP, however distant views of wind farms across the wider study area (28 km) will be afforded from extents of the National Park similar to those from where visibility of the Proposed Development will arise (as illustrated by **Figure 5.21**).

5.266 The proposed Garn Fach Wind Farm will consolidate the two clusters of turbines which are formed by the consented development at the repowered Llandinam Wind Farm, creating a perception of one large wind farm cluster, with turbines of comparable scale evident across a relatively large extent of the horizon in distant views to the north-west. Turbines of the proposed Bryngydfa Wind Farm will be barely perceptible in the distance to the north, north-west from the BBNP and will be seen alongside the operational Garreg Lwyd Wind Farm and the consented Llandinam Repowering Wind Farm. The introduction of the Proposed Development into a baseline containing this scheme will not result in new or different significant effects to those described in the primary assessment. The Proposed Development will appear distinctly separate from the consented and proposed wind farms described above, and will be perceptible closer to the BBNP in views to the north.

5.267 The Proposed Development's contribution to the change in views from the BBNP under Scenario B will be the same as reported in the primary assessment of the LVIA, i.e. it will be seen as a distant man-made feature at distances exceeding 18 km, and will form a small

component of the panoramic views experienced from elevated locations on the northern periphery of the National Park.

5.268 The addition of the Proposed Development to a landscape containing the above consented and proposed wind energy developments considered under Scenario A and Scenario B will contribute to a noticeable but small change to views from the BBNP. The special qualities of the National Park will not be significantly adversely affected by the introduction of the Proposed Development into either day-time or night-time views experienced from upland locations within the National Park under either Scenario A or Scenario B. It is concluded that the addition of the Proposed Development will not prejudice the values or integrity of this nationally designated landscape by adversely impacting on the special qualities for which it was designated.

Shropshire Hills National Landscape/AONB

Scenario A

5.269 There are currently no consented wind energy developments located within the Shropshire Hills National Landscape/AONB. The consented Repowered Llandinam Wind Farm (34 turbines at 121.2 m blade tip height) will be located approximately 11.7 km west of the Shropshire Hills National Landscape/AONB and will replace the operational Llandinam Wind Farm with a smaller number of larger turbines, occupying a similarly large horizontal extent when seen in views to the west, north-west from the National Landscape/AONB (as illustrated by **Figure 5.20**).

5.270 The Proposed Development will be seen as a distinctly separate cluster of turbines in views to the south-west to the repowered Llandinam Wind Farm and at a similar distance. The operational Garreg Lwyd Hill Wind Farm (17 turbines at 126.5 m blade tip height) will continue to have the greatest influence on views from the Shropshire Hills National Landscape/AONB, located 3 km from the boundary, appearing in the foreground of views towards both Llandinam (in views to the west, north-west) and the Proposed Development (in views to the south, south-west), illustrated in Viewpoints 24: Ridge North of Knighton – **Figure 5.49**, 25: Offa's Dyke Path, south of Newcastle – **Figure 5.50** and 27: Bury Ditches Iron Age hill fort – **Figure 5.52**. The existing operational wind farms at Bryn Titli (23.5 km to the west, north-west) and Bryn Blaen

(25 km to the west, north-west) will also be seen in long distance views from the National Landscape/AONB, however will likely only be perceptible in clear atmospheric conditions and other developments will have a greater influence on views from the National Landscape.

5.271 The Proposed Development's contribution to the change in views from the Shropshire Hills National Landscape/AONB under Scenario A will be the same as reported in the primary assessment of the LVIA, i.e. it will be seen as an additional wind energy development seen from the upland plateau, hill summits and west facing slopes at the south-western extents of the National Landscape/AONB at distances of between 11.5 km and 28 km.

5.272 The Proposed Development's contribution to the change in views from the Shropshire Hills National Landscape/AONB under Scenario A will be the same as reported in the primary assessment of the LVIA, i.e. it will be seen as an additional wind energy development from the upland plateau, hill summits and west facing slopes at the south-western extents of the National Landscape/AONB at distances of between 11.5 km and 28 km.

Scenario B

5.273 There are currently no proposed wind energy developments located within the Shropshire Hills National Landscape/AONB, however the proposed Bryngydfa (12 turbines at 126.5 m blade tip height) and Garn Fach (17 turbines at 149.9 m blade tip height) Wind Farms will be visible from extents of the designated landscape similar to those from where visibility of the Proposed Development will arise (as illustrated by **Figure 5.21**), but at much closer proximity. Bryngydfa (approximately 2.5 km away at the nearest point) will extend the existing Garreg Lwyd Hill Wind Farm, whilst Garn Fach Wind Farm (approximately 9.5 km away) will consolidate and extend the cluster formed by the existing or repowered Llandinam Wind Farm (assuming the consent to repower is implemented).

5.274 The Proposed Development will appear distinctly separate from these two clusters of turbines, appearing at a similar distance from turbines of the Garn Fach Wind Farm in views to the south-west from elevated areas of the AONB.

5.275 The Proposed Development's contribution to the change in views from the Shropshire Hills National Landscape/AONB under Scenario B will be the same as reported in the primary assessment of the LVIA, i.e. it will be seen as an additional wind energy development seen from

the upland plateau, hill summits and west facing slopes at the south-western extents of the National Landscape/AONB at distances of between 11.5 km and 28 km.

5.276 The addition of the Proposed Development to a landscape containing the above consented and proposed wind energy developments considered under Scenario A and Scenario B will contribute to a noticeable but reasonably small change to views from a small area of the Shropshire Hills National Landscape/AONB. The special qualities of the National Landscape/AONB will not be significantly adversely affected by the introduction of the Proposed Development into either day-time or night-time views experienced from upland locations within the nationally designated landscape under either Scenario A or Scenario B. It is concluded that the addition of the Proposed Development will not prejudice the values or integrity of this nationally designated landscape by adversely impacting on the special qualities for which it was designated.

Residential Visual Amenity Assessment

5.277 A Residential Visual Amenity Assessment (RVAA) is contained in **Appendix 5.7**. The RVAA describes the change in view likely to be experienced by residents at the closest properties to the Proposed Development. It has been undertaken in accordance with the principles contained within the Landscape Institute's GLVIA3 and Residential Visual Amenity Assessment (RVAA) Technical Guidance Note 2/19 (LI TGN 2/19)¹⁵. The approach has also been informed by numerous decisions made following public inquiries into wind energy proposals in the UK.

5.278 Residential visual amenity was a key consideration in the design of the Proposed Development. The nearest properties were visited early in the design process to ensure that a full understanding of views from each property and its curtilage was gained to input to the design, in an iterative design/assessment process. Due to the elevated position of the Proposed Development, many of the closest properties are situated in the lower lying farmed landscape below the upland landscape of the Radnor Forest within which the wind farm is located. Some properties closest to the Proposed Development are located on the foot slopes and slopes which surround the site and therefore their primary outlook is often directed over the surrounding landscape and away from the site. Conversely, more distant properties are situated

on opposite valley slopes or within the lower reaches of the shallow valleys to the north and west of the Site, often with views afforded towards the Site and the proposed turbines.

5.279 The RVAA sets out the methodology that has been applied including how properties within 2 km of the proposed turbines have been identified for consideration in the assessment. A total of 149 properties were identified via OS AddressBase® Plus Data and verified during fieldwork for consideration in the assessment. Where similar views of the Proposed Development are likely to be experienced, properties have been grouped within the assessment. LI TGN 2/19 considers residential receptors to be of high visual sensitivity in the context of RVAA and so this sensitivity has been applied to all properties.

5.280 Eight residential properties considered within the assessment are understood to be financially involved in the Proposed Development. Where relevant this is indicated in the specific property or property group assessment (as detailed in **Appendix 5.7**), but has not influenced the assessment of effects on residential visual amenity.

5.281 The properties and property groups assessed as likely to experience a **high** magnitude of change are summarised below:

Individual Properties

- P19: Brynywellan – The most northerly turbines (T30 and T31) will be seen in open views from the property and its curtilage;
- P20: The Mountain – The most northerly turbines (T30 and T31) will be seen from the primary outlook and curtilage of this elevated property becoming a key/defining element of the view;
- P56: Tynyberth – A wide angle of view will be occupied by turbines from the elevated position of the property which affords views south-east towards the Radnor Hills;
- P59: Upper Mill within Property Group 10 – Views of turbines from the south-east facing outlook of property and curtilage at close proximity;
- P60: Old Hall – Due to the horizontal extent and the proximity to turbines in views from the from the property and its curtilage;

- P61: Treforgan – Due to the horizontal extent and the proximity to turbines in views from the primary outlook from the property and its curtilage, with an absence of available views in alternative directions;
- P64: Tynyvelin – Views from the primary outlook and curtilage of the property will be affected by the introduction of turbines across a relatively wider horizontal extent of the available views;
- P66: Penybryn – Wide angle of view occupied by turbines and the elevated position of the property to afford views south-east towards the Radnor Hills;
- P84: Ty Maes within Property Group 14, at the southern edge of the settlement of Dolau – Primary outlook and views from curtilage will be affected by the introduction of up to 13 turbines of the Proposed Development;
- P99: Climaenowydd – Visibility of up to nine turbine hubs will be possible, breaking the smooth skyline formed by the rounded hills of Shepherd’s Tump, Cowlod, Foel and Rhiwiau where turbines will occupy a relatively large horizontal field of view, experienced from the primary outlook and curtilage of the property;
- P100: Coedswydd – Turbines will occupy a relatively small horizontal extent of views to the east and south-east, and appear as large vertical features in views into the interior plateau of the Radnor Hills. However, expansive views of turbines will be afforded from the private access to and from the property at closer proximity;
- P104: Wern Fach – From the gardens and primary outlook of the property to the south, south-east, turbines will occupy a relatively wide horizontal angle of view, extending southwards along the elevated skyline formed by Cefn-y-grug, Cowlod and Foel from T19 across to T12 positioned on Rhiwiau;
- P105: Rhonllwyn – Theoretical visibility of up to 27 turbines occupying a large horizontal extent of the available views towards the Radnor Hills from the curtilage of the property.
- P108: Bailea Cottage – Up to 17 turbines will theoretically be visible from the property, appearing in views at close proximity from the primary outlook, with an absence of available views in alternative directions;

- P111: Great Trewern – To the east of the properties T11 and T14 to T17 will appear above the incised valley of Fron-las Dingle, seen in steeply pitched close views from the property curtilages' (T14 is approximately 1 km from Vronlace);
- P114: New Trewern – Turbine hubs and blades of T14 to T17 will be evident above the rounded landform of Foel to the north-east, with turbines T9 to T13 extending southwards across the head of the valley of Carrog Dingle, breaking the skyline in steeply pitched views from the curtilage and in slightly oblique views from the south-east elevation of the property;
- P116: Lower Trewern – The nearest turbine (T12, at approximately 1,656 m) and other turbines will be evident at distances approaching and exceeding 2 km from the property and its curtilage, and appearing across a wide horizontal extent of the open available views from the eastern elevation and curtilage of the property;
- P117: The Bank – The Proposed Development will be seen in open views to the east where a wide angle of view will be occupied by turbines clearly discernible on the skyline from the property as well as its curtilage and private access track;
- P118: Larch View, P119: Rocks View and P120: Rhos Degla within Property Group 22 – A large number of turbines will be seen occupying views east to the skyline of the Radnor Hills from the primary outlook and curtilage of each property;
- P124: Llanevan – Turbines will be seen at distances of less than 900 m and occupy a relatively wide horizontal angle of view from the rear of the property, its immediate curtilage and private enclosed gardens, and when approaching the property along the private access track from the south, south-west
- P125: Corn Hill – The Proposed Development will be seen in open views east where a wide angle of view will be occupied by turbines clearly discernible on the skyline from the east primary outlook of property and gardens (property currently uninhabited);
- P126: Pye Corner – The Proposed Development will occupy views east from the property and its curtilage, and the public lane when travelling east from the property, however, the primary outlook from the property and gardens to the south, south-west, and west will be unaffected; and

- P127: Blaen Edw – The full extent of turbines (up to 24) will occupy a relatively large horizontal extent from the north-east elevation, garden and curtilage of the property, and will also be seen from the access track when travelling north towards the A44.

Property Groups

- Property Group 5, comprising P17: Lower Fishpools Lodge 1 and P18: Lower Fishpools Lodge 2 – The most northerly turbines (T29, T30 and T31) of the Proposed Development will be seen in proximity from the properties and their curtilages’;
- Property Group 8, comprising nine properties within the eastern extents of the settlement of Llanfihangel Rhydithon – Views from this property group east of the A488 will be affected by turbines occupying a wide angle of view and often from the primary outlook of properties;
- Property Group 9, comprising 13 properties within the western extents of the settlement of Llanfihangel Rhydithon – Views of up to 19 turbines are predicted from the property group. The blades of T28 to T31 will be evident in views to the east, south-east breaking the wooded skyline above the settlement;
- Property Group 18, comprising P101: Lower Cwm Farm and P102: Cwm Farm – Steeply pitched views from the primary outlook and curtilage of each property, with turbines occupying a relatively small horizontal field of view will be affected by the introduction of turbines, however, a greater proportion of the turbines will be evident when approaching the properties via the private access track;
- Property Group 19, comprising P106: Wern and P107: Llwynbyrfach – From the gardens and primary outlook of each property to the east and south-east respectively, turbines will occupy a relatively wide horizontal angle of view, extending southwards along the elevated skyline formed by Cefn-y-grug, Cowlod and Foel from T19 across to T12 positioned on Rhiwiau;
- Property Group 20, comprising P109: Vronlace and P110: Penllanlas – Turbines will occupy views to the east of the properties, appearing in the primary outlook of Vronlace at a distance of approximately 1.4 km, however visibility of the closest turbines will only be afforded in steeply pitched views to the skyline above Foel and Fron-las Dingle;

- Property Group 21, comprising P112: Little Trewern and P113: Upper Trewern – Turbines will occupy a relatively wide horizontal angle of view from the properties, including those experienced from the primary outlook and enclosed gardens of Upper Trewern at a distance of approximately 862 m, with open views of turbines experienced from the shared access track; and
- Property Group 28, comprising five properties – Up to 13 turbines will be visible above the skyline in views across and along the valley to the south of the Site, and turbines will occupy a relatively large proportion of the available views from the primary outlook of each property and its associated curtilage.

5.282 All properties/property groups with a high magnitude of change were assessed in terms of potential effect on ‘living conditions’ by judging whether the Proposed Development will breach the Residential Visual Amenity Threshold, in accordance with LI TGN 2/19, i.e. the turbines will be so overwhelming, unpleasantly encroaching or inescapably dominant from any property so as to render the property an unpleasant place to live.

5.283 Every endeavour has been taken through the design of the Proposed Development to ensure the Residential Visual Amenity Threshold is not breached from any property located within 2 km of the proposed turbines. The detailed assessment of effects on residential visual amenity has not identified any breach of the Residential Visual Amenity Threshold, with detailed reasoning provided in the assessment presented in **Appendix 5.7**.

Aviation Lighting Impact Assessment

5.284 An Aviation Lighting Impact Assessment is contained in **Appendix 5.8**. The assessment sets out the background to the requirements for visible aviation lighting, followed by an assessment of landscape and visual effects arising for representative receptors within the Study Area.

5.285 The Applicant commissioned a specialist aviation consultant (Wind Power Aviation Consultants (WPAC) Ltd) to design, in consultation with the Civil Aviation Authority (CAA) a

reduced lighting scheme, which has been secured for the Proposed Development¹¹⁷. The reduced lighting scheme design is detailed in **Appendix 12.1** and **Appendix 5.8**, and comprises:

- Two medium-intensity ‘steady’ red (2000 cd.) lights on the nacelles of 14 of the 30 turbines of the Proposed Development (turbines T1, T3, T5, T7, T9, T12, T14, T17, T19, T22, T23, T26, T29 and T31) (the secondary light on each turbine is fitted for use in the event of failure of the primary light, and will not be lit concurrently);
- Infra-red lights to Ministry of Defence (MoD) specification installed on the nacelles of perimeter and central turbines (all 30 turbines) (which are not visible to the human eye); and
- Intermediate level 32 cd. lights (low-intensity) red lights are not required to be fitted on the turbines towers as part of the lighting scheme.

5.286 It is also proposed that visibility sensors are installed on appropriate perimeter turbines to measure prevailing atmospheric conditions and visibility range. Where atmospheric conditions limit visibility to distances of less than 5 km in any direction (e.g. presence of low cloud cover, rain, mist, haze or fog) the lights will be illuminated at the necessary intensity of 2000 cd. (where the lights will emit a minimum average luminous intensity of 2000 cd. 0° (degrees). When horizontal meteorological visibility exceeds 5 km or greater from all sensors on the turbines, automatic dimming of the lights will occur, and they will operate in a lower reduced intensity mode of 200 cd. (the equivalent of not less than 10% of the minimum peak intensity capable illumination), and as detailed in **Appendix 12.1** it is anticipated that the proposed turbine lights at the Proposed Development will be illuminated in this reduced intensity mode for 88% of the time. As outlined in the latest good practice guidance (Scottish Government and NatureScot, 2024)¹¹⁸, illumination of the lights in this reduced intensity situation, where automatic dimming is proposed, is considered to represent a reasonable and fair worst case scenario. Whilst this guidance advocates that where automatic dimming mitigation is adopted photomontage visualisations showing lights illuminated only to the 200 cd. scenario (e.g. not less than 10% of the minimum peak intensity) need be presented, visualisations of the lights illuminated at their

¹¹⁷ CAA Approval of Proposed Obstacle Lighting Scheme for Nant Mithil Wind Farm – Letter dated 17 January 2024.

¹¹⁸ Scottish Government and NatureScot (2024) Guidance on Aviation Lighting Impact Assessment

2000 cd. maximum intensity are also presented for completeness, and to illustrate the comparable difference offered by the automatic dimming mitigation.

5.287 The luminous intensity of a 2000 cd. light mounted on the turbine nacelle can also be substantially reduced at vertical angles below the horizontal plane. This mitigation is often referred to as vertical directional intensity mitigation and results in a reduction in the luminous intensity (brightness) of the light emitted by the light source from the 0° vertical angle, and substantially beyond the relatively narrow (3°) vertical beam spread, projecting horizontally from the nacelle light, between -1° to +2°. That is to say, the light will appear less bright to an observer looking up at the nacelle from below, than it will to an observer at the same elevation as the nacelle. The luminous intensity emitted at angles below -1° may also vary dependent on the specific obstacle lighting manufacturer's specification. Therefore, although the light emitted from a 2000 cd. or 200 cd. light source may be constant, the apparent brightness and size of the light as perceived by visual receptors (people) will vary dependent on distance, angle of view, and atmospheric conditions.

5.288 Whilst the Applicant is also committed to the implementation of vertical directional intensity mitigation, comprising the use of aviation lights that are designed to operate close to the minimum required intensities (as discussed in detail in **Appendix 5.8**), this mitigation is not relied upon in the assessment of effects arising from aviation lighting.

5.289 This mitigation, embedded in the design of many modern aviation lights, has the potential to substantially reduce the light intensity emitted in the direction of a particular viewpoint or the receptors it represents, and thus the illuminance experienced from particularly locations. However, at this stage an appropriately cautious approach has been taken to reflect the likely variations in assumed reductions in luminous intensity (brightness) which may arise in relation to aviation lights produced by different manufacturers.

5.290 As part of the assessment in **Appendix 5.8**, three representative night-time assessment viewpoints have been assessed in detail:

- Night-time Assessment Viewpoint N1 (AP1): A44 South of Llandegley – Located on the A44 south of the small settlement/community of Llandegley and representative of other near lower-lying settlements to the west and north of the Site, and represents locations which are

more likely to be frequented during the hours of darkness by visual receptors, including residents.

- Night-time Assessment Viewpoint N2: The Space Guard Centre Observatory, Knighton – Located at a working observatory reliant on dark skies. Not typically publicly accessible by day or night, but represents views experienced by visitors to this private observatory positioned in an elevated location (approximately 417 m Above Ordnance Datum (AOD)) to the east of the Site. The viewpoint location is taken from outside the observatory and does not seek to replicate views experienced from where the telescopes are positioned inside the observatory.
- Night-time Assessment Viewpoint N3 (VP28): Hay Bluff, BBNP – Located on the hill summit of Hay Bluff within the BBNP and IDSR. This viewpoint is representative of recreational walkers in the BBNP and IDSR, but is less likely to be accessed or the views appreciated by receptors during hours of darkness due to its remote upland location.

5.291 In terms of visual effects, a **Moderate** (significant) visual effect is predicted to arise for Viewpoint N1: (AP1): A44 South of Llandegley when the lights are operating in the maximum intensity scenario (2000 cd.), as the introduction of the turbine lights into a largely dark baseline environment above the elevated western hills of the Radnor Forest upland complex will result in a clearly perceptible change in the view from the viewpoint and similar views experienced from nearby residential receptors within this rural landscape. The lights will appear incongruous and of greater brightness to other existing lights which may be evident around the small settlements of Llandegley and individual dwellings and farmsteads within the vicinity of the viewpoint. However, the provision for the medium-intensity nacelle lights to be controlled by visibility sensors in order to reduce the intensity of the lights to approximately 10% of the minimum peak intensity in times of clear meteorological conditions (where visibility exceeds 5 km in all directions), will substantially reduce the perceptibility of the proposed lights and the visual effect will reduce to **Minor-Moderate** (not significant) in this reduced intensity scenario (200 cd.).

5.292 A **Minor-Moderate** (not significant) effect is predicted to arise from Viewpoint N2: The Space Guard Centre Observatory, Knighton when the lights are operating in the maximum intensity scenario. Whilst existing lighting associated with settlements and communication routes are evident in the surrounding valleys, views across the upland plateaus and hills to the

west and north of the viewpoint are largely unaffected by artificial lighting. The lights will be seen to the west, south-west of the observatory which occupies an elevated position with open views to the eastern flanks and high summits of the Radnor Forest upland complex, with some lights screened by intervening landform and coniferous woodland. When operating in the reduced intensity scenario the visual effect will reduce to **Minor** (not significant).

5.293 Given the focus of the observatory is on the night skies high above the horizon, rather than views at elevations closer to the horizontal plane (0°) and closer to where the aviation lights will be introduced, it is not anticipated that the introduction of the visible aviation lights will have any detrimental effect on the effective operation of telescopes and other equipment contained within the observatory.

5.294 No significant visual effects are predicted to occur from Viewpoint N3 (VP28): Hay Bluff, BBNP, where the lights will be seen at distances exceeding 24 km, resulting in a **Minor** (not significant) visual effect in the maximum intensity scenario, reducing to **Negligible** (not significant) in the reduced intensity scenario.

5.295 The assessment also provides an overall analysis of the visibility of the proposed aviation lighting. In summary, the turbine lights will appear the brightest during the maximum intensity scenario when the lights will be illuminated at their minimum peak intensity of 2000 cd. However, this scenario is predicted to occur relatively infrequently based on historical meteorological information, and the lights are predicted to operate in the reduced intensity scenario the vast majority of the time (88%).

5.296 The lights will be perceived at their brightest at locations closest to the light source. Table 8a of the Aviation Lighting and Mitigation Report (**Appendix 12.1**) details the predicted illuminance from each viewpoint, for example, where seen from Viewpoint 03: A44 east of Castell Crugerydd at 1.25 km from the nearest lit turbine (T1) the illuminance will be 1280 μlx in the maximum intensity scenario and 128 μlx in the reduced intensity scenario (e.g. not less than 10% of their maximum luminous intensity). Conversely, from more distant locations such as Viewpoint 28: Hay Bluff, BBNP and the IDSR at 24.7 km from the nearest lit turbine (T3) the illuminance will be 3 μlx in the maximum intensity scenario and 0.3 μlx in the reduced intensity scenario (e.g. not less than 10% of their maximum luminous intensity). This is approximately equivalent (slightly dimmer) than a car brake light seen at a distance of 5 km (4 μlx) in the

maximum intensity scenario, or fainter than a typical bright star in the sky (e.g. Orion – 0.5 to 2 μlx) in the reduced intensity scenario.

5.297 Regarding the effects on landscape character, no significant effects are anticipated. The proposed aviation lighting will introduce additional artificial lighting into the night-time landscape of the Radnor Forest LCA 43, within which darkness is a baseline characteristic of the upland plateau as described in the 2022 Powys LCA¹¹⁹ *“Moorland summits have a strong sense of remoteness, high levels of tranquillity and dark night skies”*. The introduction of the 14 visible aviation lights is predicted to give rise to a **Minor-Moderate** (not significant) effect on the landscape of LCA 43 at night in the maximum intensity scenario, reducing to **Minor** (not significant) in the reduced intensity scenario.

5.298 Overall, in summary, no significant effects on landscape character are predicted at night. Effects of lighting will primarily affect views rather than perceived underlying characteristics of the landscape (i.e. landscape character).

5.299 The assessment concludes that the visible aviation lighting will not affect the special qualities of the Shropshire Hills National Landscape/AONB as detailed in the Shropshire Hills Management Plan¹²⁰ namely the *“Tranquillity. ‘Off the beaten track and remote in the context of this part of England, the Shropshire Hills are a haven of tranquillity – peace and quiet, dark skies and unspoilt views’*. Areas where the visible aviation lights will be observed from the National Landscape/AONB are generally less likely to be frequented during the hours of darkness, given their relative remoteness.

5.300 The assessment also concludes that the Proposed Development at dusk/night will not affect the special qualities of the BBNP, including the special quality detailed in Y Bannau: The Future - The Management Plan For Bannau Brycheiniog National Park 2023-2028¹²¹ which includes reference to dark skies *“Peace, tranquillity and darkness: A National Park offering dark night time skies, peace and tranquillity with opportunities for quiet enjoyment, inspiration,*

¹¹⁹ LUC on behalf of Powys County Council (2022) Local Landscape Character Assessment for the Powys Local Development Plan Area – Landscape Character Assessment Report

¹²⁰ Shropshire Hills Area of Outstanding Natural beauty (AONB) Partnership (2019) Shropshire Hills AONB Management Plan 2019-24

¹²¹ Bannau Brycheiniog National Park Authority (2023) Y Bannau: The Future – The Management Plan For Bannau Brycheiniog National Park 2023-2038

relaxation and spiritual renewal” (Page 47). Areas where the visible aviation lights will be observed from the National Park are generally less likely to be frequented during the hours of darkness, given their relative remoteness and sometimes challenging terrain.

Further Survey Requirements and Monitoring

5.301 It is not anticipated that further survey/monitoring will be required.

Summary of Effects

5.302 The tables below summarise the predicted effects of the Proposed Development on landscape and visual amenity, including effects on designated landscapes, residential visual amenity and effects arising from visible aviation lighting.

Summary of Residual Landscape Effects

5.303 Landscape effects are summarised in **Table 5.11** below. It is anticipated that the impacts that result from the decommissioning of the Proposed Development will be no greater than those identified during the construction phase.

Table 5.11 Summary of residual landscape effects

Landscape Receptor (Landscape Units within 15 km based on LCA/LCTs in Powys, Shropshire, Herefordshire, and within 28 km in the BBNP)	Sensitivity	Magnitude of Change (during construction) ¹²²	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
Powys LCA						
LCA 43: Radnor Forest	Medium-High	High, within 2 km Medium, for wider LCA	Major (significant) within 2 km of Site, Moderate (significant) for the LCA as a whole	High, within 2 km Medium, for wider LCA	Major (significant) within 2 km of Site Moderate (significant) for the LCA as a whole	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
	Medium-High (at night)	n/a	n/a	Low-Medium, at 2000 cd. Low, at 2000 cd. (at night)	Minor-Moderate (not significant), at 2000 cd. Minor (not significant), at 200 cd. (at night)	Scenario A: n/a Scenario B: n/a
LCA 50: Aberedw Uplands	Medium-High	n/a	n/a	Medium, within 5 km Low, for wider LCA	Moderate (significant), within 5 km of Site Minor (not significant) for the LCA as a whole	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.

¹²² Landscape effects arising during construction only considered for the host LCA within which the Proposed Development is located, as detailed in **Appendix 5.1: LVIA Methodology**.

Landscape Receptor (Landscape Units within 15 km based on LCA/LCTs in Powys, Shropshire, Herefordshire, and within 28 km in the BBNP)	Sensitivity	Magnitude of Change (during construction) ¹²²	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
LCA 40: Llanbister– Penybont Uplands	Medium-High	n/a	n/a	Medium-High, within 5 km Low-Medium, for wider LCA	Moderate-Major (significant), within 5 km of Site Minor-Moderate (not significant) for the LCA as a whole	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
LCA 39: Ithon Valley	Medium-High	n/a	n/a	Medium-High, within 6 km Low, for wider LCA	Moderate-Major (significant), within 6 km of Site Minor (not significant) for the LCA as a whole	Scenario A: n/a Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
LCA 42: Lugg Valley	Medium	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: n/a Scenario B: n/a
LCA 49: New Radnor Valley	Medium	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: n/a Scenario B: n/a
LCA 45: Presteigne & Beggar	Medium	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment.

Landscape Receptor (Landscape Units within 15 km based on LCA/LCTs in Powys, Shropshire, Herefordshire, and within 28 km in the BBNP)	Sensitivity	Magnitude of Change (during construction) ¹²²	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
						Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
LCA 51: Painscastle Uplands	Medium-High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: n/a Scenario B: n/a
LCA 38: River Dulas Hills & Valleys	Medium-High	n/a	n/a	Medium, within 6 km of Site Low, for wider LCA	Moderate (significant), within 6 km of Site Minor (not significant) for the LCA as a whole	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
LCA 32: Teme Hillsides	Medium-High	n/a	n/a	Medium, within 6 km of Site Low, for wider LCA	Moderate (significant), within 6 km of Site Minor (not significant) for the LCA as a whole	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
LCA 35: Beacon Hill	Medium-High	n/a	n/a	Low	Minor-Moderate (not significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: Minor (not significant)

Landscape Receptor (Landscape Units within 15 km based on LCA/LCTs in Powys, Shropshire, Herefordshire, and within 28 km in the BBNP)	Sensitivity	Magnitude of Change (during construction) ¹²²	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
LCA 44: Wye Valley (Rhayader to Builth Wells)	Medium	n/a	n/a	Low	Minor (not significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment. <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
LCA 31: Bwlch-y-sarnau Uplands	Medium	n/a	n/a	Low	Minor (not significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment. <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
LCA 33: Ithon Valley Hillsides	Medium	n/a	n/a	Low	Minor (not significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment. <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
LCA37: Drysgol Uplands	Medium	n/a	n/a	Low	Minor (not significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment.

Landscape Receptor (Landscape Units within 15 km based on LCA/LCTs in Powys, Shropshire, Herefordshire, and within 28 km in the BBNP)	Sensitivity	Magnitude of Change (during construction) ¹²²	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
						Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Shropshire LCA						
CV/26: Wooded hills and farmland	High	n/a	n/a	Low-Medium, upper south-west facing hillslopes Low, for low lying areas	Minor-Moderate (not significant), for upper south-west facing hillslopes Negligible (not significant) for low lying areas	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
CV/04, CV/25, CV/28: High enclosed plateau	High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Herefordshire LCA						
LCA4a: North West Herefordshire – Enclosed River Valley Farmland LCT	Low-Medium	n/a	n/a	Low	Minor (not significant)	Scenario A: n/a Scenario B: n/a

Landscape Receptor (Landscape Units within 15 km based on LCA/LCTs in Powys, Shropshire, Herefordshire, and within 28 km in the BBNP)	Sensitivity	Magnitude of Change (during construction) ¹²²	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
LCA 9a: North West Herefordshire Hills – Limestone Uplands LCT	Medium-High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
LCA 10b: Briley to Lyonshall – Border Sandstone Hills and Farmland LCT	Medium-High	n/a	n/a	Low	Minor (not significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
BBNP LCA						
LCA 14: Wye Valley Foothills	High	n/a	n/a	Low	Minor (not significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment. <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
LCA 13: The Black Mountains	High	n/a	n/a	Low	Minor-moderate (not significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment. <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.

Summary of Residual Visual Effects

5.304 Visual effects are summarised in **Table 5.12** below. It is anticipated that the impacts that result from the decommissioning of the Proposed Development will be no greater than those identified during the construction phase of the project.

Table 5.12 Summary of residual visual effects

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ¹²³	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
Day-time Representative Viewpoints						
VP1: Water-break-its-neck (Waterfall)	Medium-High	Low-Medium	Minor-Moderate (not significant)	Low-Medium	Minor-Moderate (not significant)	Scenario A: n/a Scenario B: n/a
VP2: Heart of Wales Line Trail near Coco's Farm Campsite	Medium-High	High	Major (significant)	High	Major (significant)	Scenario A: n/a Scenario B: n/a
VP3: A44 east of Castell Crugerydd	Medium	High	Moderate-Major (significant)	High	Moderate-Major (significant)	Scenario A: n/a Scenario B: n/a
VP4: A488 Llanfihangel Rhydithon	Medium-High	Medium	Moderate (significant)	Medium	Moderate (significant)	Scenario A: n/a Scenario B: n/a
VP5: Black Mixen	High	High	Major (significant)	High	Major (significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
VP6: A44 outside the Fforest Inn, Llanfihangel- nant-Melan	Medium-High	Medium-High	Moderate-Major (significant)	Medium-High	Moderate-Major (significant)	Scenario A: n/a Scenario B: n/a
VP7: Dolau	Medium-High	Low	Minor (not significant)	Low	Minor (not significant)	Scenario A: n/a

¹²³ Visual effects arising during construction only considered for receptors within 5 km radius of the Proposed Development as detailed in **Appendix 5.1: LVIA Methodology**.

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ¹²³	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
						Scenario B: n/a
VP8: Llandegley (A44, outside the church)	Medium-High	Medium	Moderate (significant)	Medium	Moderate (significant)	Scenario A: n/a Scenario B: n/a
VP9: Heart of Wales Line Trail near The Pales	Medium-High	Medium-High	Moderate-Major (significant)	Medium-High	Moderate-Major (significant)	Scenario A: n/a Scenario B: n/a
VP10: A488 at Bleddfa	Medium-High	Barely Perceptible	Negligible (not significant)	Barely Perceptible	Negligible (not significant)	Scenario A: n/a Scenario B: n/a
VP11: A481 near Rhewey	Medium	Medium-High	Moderate-Major (significant)	Medium-High	Moderate-Major (significant)	Scenario A: n/a Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
VP12: Llandegley Rocks	Medium-High	High	Moderate-Major (significant)	High	Moderate-Major (significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
VP13: Bwlch-Ilwyn Bank	Medium-High	Medium	Moderate (significant)	Medium	Moderate (significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ¹²³	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
VP14: A44 bridge approaching Penybont	Medium-High	Medium	Moderate (significant)	Medium	Moderate (significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
VP15: Llanfihangel Hill	Medium-High	n/a	n/a	Medium	Moderate (significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment. <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
VP16: Caergynan Bank, Open Access Land	Medium-High	n/a	n/a	Medium	Moderate (significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment. <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
VP17: Glyndŵr's Way near Lanlluest	Medium-High	n/a	n/a	Medium	Moderate (significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
VP18: Crossgates	Medium-High	n/a	n/a	Medium	Moderate (significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
VP19: Old Radnor	Medium-High	n/a	n/a	Medium	Moderate (significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ¹²³	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
VP20: Evenjobb, B4357	Medium-High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
VP21: Castle Bank	Medium-High	n/a	n/a	Medium	Moderate (significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
VP22: Hergest Ridge near Offa's Dyke Path	High	n/a	n/a	Medium	Moderate (significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
VP23: Offa's Dyke, Castle Ring Pen Offa	High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment. <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
VP24: Ridge north of Knighton	High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment. <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
VP25: Offa's Dyke Path, south of Newcastle	High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ¹²³	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
VP26: A44 between Lyonshall and Kington	Medium	n/a	n/a	Low	Minor (not significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
VP27: Bury Ditches Iron Age hill fort	High	n/a	n/a	Low	Minor-Moderate (not significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment. <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
VP28: Hay Bluff, Bannau Brycheiniog National Park	High	n/a	n/a	Low	Minor-Moderate (not significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment. <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
Dusk/night-time Visual Effects						
N1 (AP1): A44 south of Llandegley	Medium-High	n/a	n/a	Medium, at 2000 cd. Low-Medium, at 200 cd.	Moderate (significant), at 2000 cd. Minor-Moderate (not significant), at 200 cd.	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
N2: The Space Guard Centre Observatory, Knighton	High	n/a	n/a	Low-Medium , at 2000 cd. Low, at 200 cd.	Minor-Moderate (not significant), at 2000 cd. Minor (not significant), at 200 cd.	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ¹²³	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
N3 (VP28): Hay Bluff, Bannau Brycheiniog National Park	High	n/a	n/a	Low, at 2000 cd. Barely Perceptible, at 200 cd.	Minor (not significant), at 2000 cd. Negligible (not significant), at 200 cd.	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
Settlements/Communities						
Llanfihangel Rhydithon	Medium-High	Medium-High	Moderate-Major (significant)	Medium-High	Moderate-Major (significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
Dolau	Medium-High	Medium-High	Moderate-Major (significant)	Medium-High	Moderate-Major (significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
Llandegley	Medium-High	Medium-High	Moderate-Major (significant)	Medium-High	Moderate-Major (significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
Llanfihangel-Nant-Melan	Medium-High	Low	Minor (not significant)	Low	Minor (not significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
Bleddfa	Medium-High	Barely Perceptible	Negligible (not significant)	Barely Perceptible	Negligible (not significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
New Radnor	Medium-High	Low	Minor (not significant)	Low	Minor (not significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
Penybont	Medium-High	Medium	Moderate (significant)	Medium	Moderate (significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
Crossgates	Medium-High	n/a	n/a	Medium	Moderate (significant)	<u>Scenario A:</u> n/a

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ¹²³	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
						Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Old Radnor	Medium-High	n/a	n/a	Medium	Moderate (significant)	Scenario A: n/a Scenario B: n/a
Hundred House	Medium-High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: n/a Scenario B: n/a
Evenjobb	Medium-High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: n/a Scenario B: n/a
Llanyre	Medium-High	n/a	n/a	Low	Minor (not significant)	Scenario A: n/a Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Kington	Medium-High	n/a	n/a	Low	Minor (not significant)	Scenario A: n/a Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Road and Railway Routes						
A44	Low-Medium	Medium-High, within 3 km Low-Medium, beyond 3 km	Moderate (significant), within 3 km Minor (not significant), beyond 3 km	Medium-High, within 3 km Low-Medium, beyond 3 km	Moderate (significant), within 3 km Minor (not significant), beyond 3 km	Scenario A: No additional cumulative effects over and above those set out in the primary assessment.

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ¹²³	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
						Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
A481	Low-Medium	Medium-High, within 3 km Low, beyond 3 km	Moderate (significant), within 5 km Minor (not significant), beyond 5 km	Medium-High, within 3 km Low, beyond 3 km	Moderate (significant), within 5 km Minor (not significant), beyond 5 km	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
A488	Low-Medium	Low-Medium, within 5 km Barely Perceptible, beyond 5 km	Minor-Moderate (not significant), within 5 km Negligible (not significant), beyond 5 km	Low-Medium, within 5 km Barely Perceptible, beyond 5 km	Minor-Moderate (not significant), within 5 km Negligible (not significant), beyond 5 km	Scenario A: n/a Scenario B: n/a
B4372	Low-Medium	Low	Minor (not significant)	Low	Minor (not significant)	Scenario A: n/a Scenario B: n/a
B4357	Low-Medium	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: n/a Scenario B: n/a
A483	Low-Medium	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ¹²³	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
Heart of Wales Railway Line	Medium-High	Medium, within 4 km Low, beyond 4 km	Moderate (significant), within 4 km Minor (not significant), beyond 4 km	Medium, within 4 km Low, beyond 4 km	Moderate (significant), within 4 km Minor (not significant), beyond 4 km	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Long Distance Trails and Cycle Routes						
The Heart of Wales Line Trail	High	High, within 3 km Low-Medium, beyond 3 km	Major (significant), within 3 km Minor-Moderate (not significant), beyond 3 km	High, within 3 km Low-Medium, beyond 3 km	Major (significant), within 3 km Minor-Moderate (not significant), beyond 3 km	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Offa's Dyke Path National Trail	High	n/a	n/a	Low-medium, within 10 km Low, beyond 10 km	Moderate (significant), within 10 km Minor (not significant), beyond 10 km	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Glyndŵr's Way National Trail	High	Medium, within 7 km Low, beyond 7 km	Moderate (significant), within 7 km Minor (not significant), beyond 7 km	Medium, within 7 km Low, beyond 7 km	Moderate (significant), within 7 km Minor (not significant), beyond 7 km	Scenario A: No additional cumulative effects over and above those set out in the primary assessment.

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ¹²³	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
						Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Elan Valley Way	High	High, within 3 km Low-Medium, beyond 3 km	Major (significant), within 3 km Minor-Moderate (not significant), beyond 3 km	High, within 3 km Low-Medium, beyond 3 km	Major (significant), within 3 km Minor-Moderate (not significant), beyond 3 km	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
NCN Route 825 – Radnor Ring Route	High-Medium	Medium, within 5 km Low, beyond 5 km	Moderate (significant), within 5 km Minor (not significant), beyond 5 km	Medium, within 5 km Low, beyond 5 km	Moderate (significant), within 5 km Minor (not significant), beyond 5 km	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Open Access Land and PRowS						
Open Access Land, BOAT and other PRowS within the Site	Medium-High	High	Major (significant)	High	Major (significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ¹²³	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
Open Access Land – Radnor Forest	Medium-High	Medium-High	Moderate-Major (significant)	Medium-High	Moderate-Major (significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Public Dedicated Forest – Fishpools	Medium-High	Medium	Moderate (significant)	Medium	Moderate (significant)	Scenario A: n/a Scenario B: n/a
Open Access Land – Coed-swydd	Medium-High	Medium-High	Moderate-Major (significant)	Medium-High	Moderate-Major (significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Open Access Land – Cwm-brith Bank and Cefnlllys	Medium-High	n/a	n/a	Medium	Moderate (significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Open Access Land – Aberedw Hill	Medium-High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment.

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ¹²³	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
						Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Open Access Land – Glascwm Hill to Llandeilo Hill between Aberedw and Glascwm	Medium-High	n/a	n/a	Medium	Moderate (significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Open Access Land – Moelfre, Tylcau Hill and Warren Hill	Medium-High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.



**Nant Mithil
Energy Park Limited**

Environmental Statement

Chapter 6: Historic Environment



Chapter 6

Historic Environment

Introduction

6.1 This chapter considers the potential significant effects of the Proposed Development on the historic environment. The historic environment is defined in Planning Policy Wales (PPW) Edition 12 (2024)¹ as comprising all surviving physical elements of past human activity, the individual elements of which constitute historic assets². These historic assets can include historic buildings, places, landscapes, as well as archaeological remains that provide physical evidence of past human activity and hold of sufficient value (i.e. heritage significance) to this and future generations to merit consideration in the planning system. This assessment therefore focuses on if, and how, the Proposed Development will change the heritage significance of historic assets within and around it.

6.2 Relevant historic assets are also discussed in the Landscape and Visual Impact Assessment (LVIA) presented in **Chapter 5: Landscape and Visual Amenity** of this ES. The LVIA focuses on a development's visibility from a location, such as a historic asset, and the effect that visibility has on visitors to that location; in other words on visual amenity. In contrast, the historic environment assessment focuses on effects to the heritage significance of historic assets. Each assessment therefore considers different types of receptors (people vs. heritage significance) and effects and can come to differing conclusions on levels of effect relating to the same receptor.

6.3 The historic environment assessment was undertaken by LUC. The chapter has been authored by David Bull and Tom Marshall (see **Appendix 1.1: Statement of Expertise**).

6.4 This chapter is supported by the following figures in **Volume 2**:

¹ [Welsh Government \(2024\) Planning Policy Wales \(Edition 12\)](#)

² Historic assets are synonymous with 'heritage assets', 'cultural historic assets', 'sites' or 'monuments'.

- **Figure 6.1: Location of Historic Assets within the Site**
- **Figure 6.2: Location of Historic Assets within the Core Study Area**
- **Figure 6.3: Location of Designated Historic Assets within the Wider Study Area**
- **Figure 6.4: Location of Visualisations to Inform the Assessment of Setting Change**
- **Figure 6.5: Proposed Changes to the Common Land Boundary**

6.5 This chapter is supported by the following visualisations in **Volume 4**:

- **Figure 6.6: Cwm Bwch Round Barrow Pair (Cadw Ref. RD255) – view from (photomontage)**
- **Figure 6.7: Great Rhos Round Barrow (Cadw Ref. RD254) – view from (photomontage)**
- **Figure 6.8: Shepherd’s Tump Round Barrow (Cadw Ref. RD253) – view from (photomontage)**
- **Figure 6.9: Bronze Age Round Barrows on Whinyard Rocks (Cadw Ref. RD190) – representative view from (wireline)**
- **Figure 6.10: Black Mixen, round barrow to NW of (Cadw Ref. RD256) – view from (wireline)**
- **Figure 5.30: Black Mixen round barrow (Cadw Ref. RD257) – representative view from (photomontage)**
- **Figure 5.37: Llandegley Rocks Hillfort (Cadw Ref. RD264) – in-combination view (photomontage)**
- **Figure 6.11: Llandegley Rocks Hillfort (Cadw Ref. RD264) – view from (wireline)**
- **Figure 6.12: Crug Eryr Mound and Bailey Castle (Cadw Ref. RD003) – view from mound (wireline)**
- **Figure 6.13: Cae-Banal Castle Mound (Cadw Ref. RD108) – view from mound (wireline)**
- **Figure 6.14: Nyth-grug Cairn (CPATRef. PRN6832) – view from (wireline)**

6.6 This chapter is supported by **Appendix 6.1: Historic Environment Assessment** in **Volume 3** which is referred to throughout.

6.7 The cultural heritage viewpoint visualisation locations prepared to support this chapter and accompanying **Appendix 6.1** are shown on **Figure 6.4**.

6.8 The following terminology is referred to throughout this chapter:

- **Designated historic asset:** Designation highlights a building, site, monument or area's special interest and value to this and future generations and gives it protection under law or policy. Such historic assets meet the relevant designation criteria provided in Annexes A-C of PPW: Technical Advice Note 24: The Historic Environment³ or, in the case of World Heritage Sites, are of outstanding universal value and meet one of the published criteria; their value (importance) has therefore been established through the designation process. Designated historic assets relevant to this assessment comprise:
 - **Scheduled monument:** A monument included on the schedule of monuments compiled under the Historic Environment (Wales) Act 2023. It is a criminal offence to undertake works affecting a scheduled monument without written consent from Cadw on behalf of Welsh Ministers.
 - **Listed building:** A building of special architectural or historic interest included in the statutory list compiled under the Historic Environment (Wales) Act 2023. Any building or structure or any part of a building, (or any building or structure falling within the curtilage of a listed building and dating prior to 1948) may be listed. Listed status protects a building against unauthorised demolition, alteration or extension. It ensures that its special interest is taken into account when proposals are put forward which affect its character or appearance.
 - **Conservation area:** An area of special architectural or historic interest designated by local planning authorities under powers delegated by the 2023 Act, the character or appearance of which it is desirable to preserve or enhance.

³ Welsh Government (2017) Planning Policy Wales – Technical Advice Note 24: The Historic Environment – Annex A, B and C

- **Registered Historic Park and Garden (RHPG):** A designed landscape included in the Cadw Register of Landscapes Parks and Gardens of Special Historic Interest in Wales. Entry on the register recognises its national importance and is a material consideration in planning policy.
- **Non-designated historic asset:** These are buildings, monuments, sites, places, areas or landscapes identified as having a degree of significance meriting consideration in planning decisions because of their historic interest but which do not meet the criteria for designation.
- **Heritage significance:** The sum of the value(s) of receptors (historic assets) is referred to in historic environment policy as their 'significance'. To avoid confusion with the EIA concept of the 'Significance of Effect' upon receptors, the significance of historic assets will be termed their 'heritage significance'.
- **Setting:** Monuments, buildings, gardens and settlements were almost always placed and orientated deliberately, normally with reference to the surrounding topography, resources, landscape and other structures. PPW⁴ and Cadw's setting guidance⁵ define setting as the surroundings in which a historic asset is understood, appreciated and experienced – embracing present and past relationships to the surrounding landscape. The extent of setting is not fixed and may change as the historic asset and its surroundings evolve.
- **Zone of Theoretical Visibility (ZTV):** This is a computer-generated tool to identify the theoretical extent of visibility of a development. The elevation(s) of a development is tested against a bare earth 3D terrain model which does not feature buildings, vegetation or other boundaries which may influence the visibility of a development. In open terrain where there are few intervening features, a ZTV provides a reasonable representation of visibility. However, visibility from lowland rural areas is often affected by tree and hedgerow cover; whilst in developed areas, visibility is usually determined by intervening buildings. A ZTV therefore presents a maximum-case visibility scenario.

⁴ [Welsh Government \(2024\) Planning Policy Wales \(Edition 12\)](#)

⁵ [Welsh Government \(2017\) Setting of Historic Assets in Wales](#)

- **Sensitivity** is a measure of how likely the heritage significance of a historic asset is to be affected by a specific proposed change. This can relate to physical change (e.g. change/removal of historic fabric) or setting change (e.g. the introduction of a novel type of development or land use within the setting of a historic asset that affects the contribution setting makes to the heritage significance of an asset).
- **Susceptibility** is distinct from ‘sensitivity’ in that susceptibility is about inherent risk from setting change – i.e. historic assets where setting makes a high level of contribution to significance, independent of a specific threat.

Scope of the Assessment

Effects Assessed in Full

6.9 This assessment concentrates on the effects of construction and operation of the Proposed Development upon those historic assets identified during the review of desk-based information and field surveys (the extents of the study areas are set out below).

6.10 The following effects have been identified and agreed from Scoping stage onwards for consideration in this assessment:

- Direct effects resulting from physical change to historic assets within the Site. Historic assets beyond the Site are not at risk of direct physical change as a result of the Proposed Development.
- Direct effects to designated and non-designated historic assets that are identified as being sensitive to setting change. These effects are considered in relation to the Site and the different study areas as set out below.
- Cumulative operational effects as a result of setting change.

Effects Scoped Out

6.11 On the basis of the desk-based and field survey undertaken, the professional judgement of the EIA team, experience from other relevant projects and policy guidance or standards, and feedback received from consultees, the following topic areas have been ‘scoped out’ of detailed assessment, as agreed in the Scoping Direction:

- Direct physical effects to historic assets outside the Site (historic assets beyond the Site are not at risk of physical change as a result of the Proposed Development);
- Direct effects due to setting change to non-designated historic assets beyond the Core Study Area (given the distance over which significant effect arising from setting such effects are unlikely, given the scale and nature of the Proposed Development);
- Cumulative effects to the heritage significance of historic assets during construction due to setting change (this is because such effects are temporary);
- Indirect physical effects on historic assets as a consequence of vibration, dewatering or changes in hydrology (since such effects are unlikely, and will not be significant, given the scale and nature of the Proposed Development)⁶; and,
- Cumulative physical effects (these are considered highly unlikely given the nature/location of the Proposed Development).

Assessment Methodology

Legislation and Guidance

Legislation and Policy

6.12 The assessment is carried out in accordance with the principles contained within the following legislation:

- Historic Environment (Wales) Act 2023; and
- Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017.

6.13 Relevant planning policy is covered in Appendix 6.1.

⁶ Further information on vibration and hydrology is provided in **Chapter 9: Noise and Vibration** and **Chapter 11: Hydrology, Hydrogeology and Geology (including Peat)**.

Guidance

6.14 This assessment is carried out in accordance with the principles contained within the following documents:

- Code of Conduct: professional ethics in archaeology (Chartered Institute for Archaeologists (CIfA), 2022);⁷
- Standard and guidance for historic environment desk-based assessment (CIfA, 2020);⁸
- Conservation Principles for the sustainable management of the historic environment in Wales (Cadw, 2011) (hereafter ‘conservation principles’);⁹
- Setting of Historic Assets in Wales (Cadw, 2017) (hereafter ‘setting guidance’);¹⁰
- Military Aircraft Crash Sites: Archaeological guidance on their significance and future management (English Heritage, 2002);¹¹
- Heritage Impact Assessment in Wales (Cadw, 2017);¹² and,
- Principles of Cultural Heritage Impact Assessment (PCHIA) in the UK (CIfA, Institute of Historic Building Conservation and Institute of Environmental Management and Assessment, 2021).¹³

Consultation

6.15 In undertaking the assessment, consideration has been given to the Scoping Responses and other consultation which has been undertaken as detailed in **Table 6.1**.

⁷ [Chartered Institute for Archaeologists \(2014, updated 2019, 2020, 2021 & 2022\) Code of conduct: professional ethics in archaeology](#)

⁸ [Chartered Institute for Archaeologists \(2014, updated 2017 & 2020\) Standard and guidance for historic environment desk-based assessment](#)

⁹ [Welsh Assembly Government \(2011\) Conservation Principles for the sustainable management of the historic environment in Wales](#)

¹⁰ [Welsh Government \(2017\) Setting of Historic Assets in Wales](#)

¹¹ [English Heritage \(2002\) Military Aircraft Crash Sites: Archaeological guidance on their Significance and Future Management](#)

¹² [Welsh Government \(2017\) Heritage Impact Assessment in Wales](#)

¹³ [Chartered Institute for Archaeologists, Institute of Historic Building Conservation and Institute of Environmental Management and Assessment \(2021\) Principles of Cultural Heritage Impact Assessment \(PCHIA\) in the UK](#)

Table 6.1 Consultation responses

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Cadw (Scoping Report September 2023)	EIA Scoping Direction (13 January 2023)	Cadw identified that the document 'The Setting of Historic Assets in Wales' should [be] used to inform the assessment of direct effects due to setting change.	Cadw's setting guidance has informed the assessment of direct effects due to setting change.
		Cadw agreed that the study areas suggested were appropriate.	Noted.
		Cadw requested that the Powys County Council (PCC) Built Heritage Conservation Officer and the Clwyd Powys Archaeological Trust (CPAT) ¹⁴ are consulted in relation to impacts to listed buildings and conservation areas, and non-designated historic assets respectively.	No effects have been identified for listed buildings or conservation areas. CPAT has been consulted on impacts relating to non-designated historic assets.

¹⁴ Since submission of the ES at PAC, the Clwyd Powys Archaeological Trust has changed to Heneb: Clwyd Powys Archaeology (HCPA). The role of HCPA in the planning system remains the same as CPAT.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Cadw identified that PCC's Local Development Plan supplementary guidance for archaeology and historic environment should be considered within the assessment.	The assessment has considered this supplementary guidance.
		Cadw agreed that the approach to cumulative effects was appropriate.	Noted.
		Cadw identified that a walkover survey of the whole application site should be undertaken and where possible supported by a LiDAR survey, and that they agreed with CPAT's consultation response (scoping) in relation to archaeological evaluation.	LiDAR data gathered for the Site has been reviewed and 14 previously unrecorded historic assets identified and included in the historic environment baseline. Given the extent of previous surveys within the Site undertaken by CPAT and others, a full walkover survey was considered disproportionate. Please refer to Appendix 6.1 for further information.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Cadw agreed with the effects scoped out of the assessment.	Noted.
CPAT	EIA Scoping Direction (13 January 2023)	CPAT agreed with the study areas for non-designated historic assets.	Noted.
		CPAT identified that PCC's Local Development Plan supplementary guidance for archaeology and historic environment should be considered within the assessment.	The assessment has considered this supplementary guidance.
		CPAT agreed that the approach to the cumulative assessment for non-designated historic assets was appropriate.	Noted.
		CPAT requested the need for a complete systematic transect walkover survey of the red line boundary.	LiDAR data obtained for the Site, has been reviewed and 14 previously unrecorded historic assets identified and included in the historic

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			environment baseline. Given the extent of previous surveys within the Site by CPAT and others, a full walkover survey as considered disproportionate. Please refer to Appendix 6.1 for further information.
		CPAT identified that LiDAR data should be gathered at a resolution of 0.25m and that this should be reviewed to inform the baseline and assessment of effects.	LiDAR data at a resolution of 0.25m has been obtained for the Site, reviewed and 14 previously unrecorded historic assets identified and included in the historic environment baseline. Please refer to Appendix 6.1 for further information.
		CPAT identified the potential need for archaeological evaluation in the form of geophysical survey and archaeological trial trenching.	The potential for previously unrecorded buried archaeological remains within the Site has been considered in relation to the pattern and significance of known historic assets (drawn from relevant HER data, the results of previous

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			archaeological surveys undertaken by CPAT and others, a review of historic mapping and available digital aerial imagery, LiDAR data review and the results of the walkover survey for this assessment), as well as the land use history and geology within the Site, to understand the archaeological potential (refer to Appendix 6.1). The potential for previously unrecorded buried archaeological remains within the Site has been assessed to be negligible to low, and as such the need for archaeological evaluation in the form of geophysical survey and archaeological trial trenching is considered disproportionate. Applied mitigation designed to respond to previously unrecorded buried archaeological remains being identified during construction has

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			been proposed. Please refer to Appendix 6.1 and this chapter.
		Requested that the paleoenvironmental potential of the Site is considered.	The paleoenvironmental potential of the Site has been considered. Please refer to Chapter 11 and Appendix 6.1 .
Cadw	Meeting to discuss proposed infrastructure layout (10 November 2023)	Discussion included the putative links between the placement of barrows in the landscape and watercourses, and lines of sight between prehistoric funerary monuments, the proximity of turbines to Cwm Bwch Round Barrow pair (Cadw SM Ref. RD255) and concern around the wider landscape view and the potential impact that turbines will have on the landscape as a whole.	The design iteration process has sought to retain lines of sight between assets, where there is intervisibility between assets and where this contributes to their heritage significance. Please refer to Chapter 3 and Appendix 6.1 .

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Offsetting and compensatory enhancement measures were discussed.	Opportunities for enhancement measures are identified in Appendix 6.1 .
	Site visit with Cadw, LUC and the Applicant (26 January 2024), including visits to the three prehistoric funerary monuments at Cwm Bwch, Shepherd's Tump, Great Rhos (Cadw Refs. RD255; RD253; RD254) and Crug Eryr Mound and Bailey Castle (Cadw Ref. RD003).	Cadw and LUC discussed the setting of each of the scheduled monuments within the Site and Crug Eryr Mound and Bailey Castle, and its contribution to the heritage significance of these assets. Potential direct effects due to setting change were also discussed.	The results of discussions with Cadw have been used to inform the assessment of direct effects due to setting change. Please refer to this chapter and Appendix 6.1 .
		Offsetting and compensatory enhancement measures were discussed.	Opportunities for offsetting and enhancement measures are identified in Appendix 6.1 .
Cadw	Pre-application Consultation (PAC; 24 June 2024)	Cadw expressed concerns that the photomontages accompanying Chapter 6 of the ES did not identify the location of the designated	The location of designated historic assets (Cadw Refs. RD253, RD254 and RD255) have been added to the wirelines which accompany

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		historic assets identified in the assessment. They note that this makes the full impact of the turbines on the views between assets (direct effects due to setting change) difficult to fully understand.	photomontages (Figure 6.6 to 6.8 of the ES). As is common practice, LUC do not show the location of the historic assets on photomontages, as this has the potential to give a misleading impression of the level of visibility of assets.
		Cadw notes that Chapter 6 of the ES indicates that the significant adverse impact of the proposed development on scheduled monuments RD003, RD253, RD254 and RD255 can be partly mitigated by a landscape survey before construction works commence and a watching brief during the construction works in order to record any archaeological information that is exposed: However, it is clear that these mitigation measures are insufficient to reduce	Landscape survey has been identified as part of the mitigation for the removal of Earthwork Enclosure (LUC_08) (please refer to Table 6.5) five further non-designated historic assets. Landscape survey has not been suggested for Cadw Refs. RD003, RD253, RD254 and RD255 in either Chapter 6 or Appendix 6.1 .

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		the scale of the adverse impact to a level that will not be significant.	
		Cadw disagreed with the assessment of a Moderate significance of effect due to setting change for the Shepherd's Tump round barrow (Cadw Ref. RD253), stating that the ES Figure 6.7 showed that the line of sight between these assets will be obscured or considerably affected by T25. Cadw concluded that the presence of T25 in this view i.e. disrupting the sight line between the assets, significantly increases the impact of the Proposed Development on the setting of the Shepherd's Tump round barrow to a level that in Cadw's opinion will be Major adverse significant effect.	T25 has been relocated approximately 50m to the south-east. ES Figure 6.8 demonstrates that T25's new location retains the line of sight between the Shepherd's Tump and Cwm Bwch barrows. Following this design change, the assessment of Moderate significance of effect due to setting change for Shepherd's Tump Round Barrow (Cadw Ref. RD253) is appropriate.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Cadw identifies that Appendix 6.1 of the ES includes offsetting and enhancement measures but does not offer details of the measures set out.	Paragraphs 6.26 and 6.27 of Appendix 6.1 sets out the approach to offsetting and enhancement presented in Welsh Government (2017) Setting of Historic Assets in Wales (Section 5, pp 10). This clearly states that offsetting and enhancement is not mitigation and cannot reduce the level of effect or residual significance of effect but can be used to enable the decision-making authority to weigh the benefits of the development. Paragraph 6.28 of Appendix 6.1 identifies the Applicant's approach to offsetting and enhancement measures. The Applicant considers that the level of detail is appropriate for the decision-making authority i.e. Welsh

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			Ministers to determine the value of any proposal for offsetting and enhancements. Paragraph 6.31 of Appendix 6.1 identifies that the development of a formal Historic Environment Enhancement Plan (HEEP) will be undertaken once the Proposed Development has been consented. The commitment to producing a full HEEP, including the identification of a mechanism for delivering to the satisfaction of relevant parties such as Cadw, will be secured as a condition of that consent.
HCPA (formally CPAT)	PAC (17 July 2024)	HCPA are content with the study areas applied and the assessment approach and methodology set out.	Noted

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		HCPA agrees that given the sparse nature of the known archaeology, moorland location and the lack of clearly defined settlement areas, they agree that the potential for unrecorded sub-surface archaeology being revealed within the construction footprint is low .	Noted
		HCPA noted that it would be useful to see figures for previously unrecorded historic assets identified from LiDAR data so that they can confirm your interpretations in Appendix C of Appendix 6.1 and the ES.	The locations of previously unrecorded historic assets identified from LiDAR data are shown on Figure 6.1 . LiDAR image of historic assets subject to direct physical effects have been included in Table C.1 of Appendix C of Appendix 6.1 including Earthwork Enclosure (LUC_08).
		HCPA notes that Cowlod and Cefn y Crug short dykes (HCPA Refs. PRN 993; PRN 6871) are	CPAT have previously undertaken a project exploring the origins of short dykes in mid and

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		assessed to be of medium importance in the ES, HCPA consider that they may be of high importance as a rare site type dating to the early medieval period.	north-east Wales. This project was carried out with support from Cadw. Cowlod and Cefn y Crug short dykes (HCPA Refs. PRN993; PRN6871) were subject to assessment and intrusive archaeological investigation as part of this project reassessing this asset type. In the project's concluding report for Cadw, CPAT made scheduling recommendations i.e. identified short dykes that meet the criteria for designation. Cowlod and Cefn y Crug short dykes were not recommended for scheduling. In accordance with the approach and methodology (with which HCPA are content), these non-designated historic assets have been assessed to be of medium importance, as they have not

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			been found to demonstrate the equivalent importance of a designated historic asset.
		HCPA identify that Figure 6.13 of the ES only looks south and does not show the more significant impact views to the west and east. It would be useful for the decision maker to be able to see these wireframe views and they should be added.	Figure 6.13 of the ES (Figure 6.14 of the ES) provides a 360-degree view from Nyth-grug Cairn (HCPA Ref. PRN6832), and therefore shows the likely change to setting to the east and west.
		HCPA noted that the ES states that the level of effect resulting from the construction of the access track to Cowlod Dyke and Cefn y Crug Dyke has been assessed to be minor and therefore not significant in EIA terms. HCPA consider the level of effect to be at least Moderate .	In accordance with the assessment approach and methodology identified in Chapter 2 of Appendix 6.1 , a level of impact/magnitude of change assessed to be small (a slight loss or alteration of a historic asset's significance) to a historic asset of medium importance, equates to

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		The precise nature of any works to the access through these historic assets needs to be highlighted and the impact adjusted as necessary.	a minor level of effect which is not significant in EIA terms. The detailed construction methodology for the access tracks is not available at this time as the detailed design will be undertaken post consent. The revised mitigation (see below) is appropriate to enable a full record of any surviving physical remains of the Cowlod Dyke and Cefn y Crug Dyke within the construction footprint.
		Table 6.1 of Appendix 6.1 of the ES summarises the impacts and mitigation. HCPA could not see any mention of the potential disturbance to Cwm Du Mound (HCPA Ref. PRN6838). This seems to be on the edge of the T06 to T13 50m underground cable corridor	Du Mound and Cwm Du Stone (HCPA Refs. PRN6838; PRN6833) are located outside the T06 to T13 50m underground cable corridor and therefore no potential direct physical effects to these assets have been identified.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		along with nearby Cwm Du Stone (HCPA Ref. PRN6833).	
		The close proximity of T04 to the east and its associated hardstanding and access track will clearly result in a major change to the setting of the Nyth-grug Cairn (HCPA Ref. PRN6832). T04 will oversail the monument considerably and be dominant in the eastern view. While a Moderate level of effect is suggested here, we consider the impact may be Major adverse.	HCPA did not comment on the description of the contribution made to the heritage significance of Nyth-grug Cairn (HCPA Ref. PRN6832) by its setting, the assessment of the medium importance for the cairn, or the assessment of a medium level of impact/magnitude of change. In accordance with the assessment approach and methodology identified in Chapter 2 of Appendix 6.1, a magnitude of change assessed to be medium (a medium loss or alteration of a historic asset's heritage significance either through physical and/or setting change) to a historic asset of medium importance, equates to

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			a Moderate level of effect which is significant in EIA terms.
		HCPA identified that the level of impact/magnitude of change for Nyth-grug Cairn (HCPA Ref. PRN6832) could be reduced by the removal of T04 from the Proposed Development (a design change and therefore embedded mitigation). This would remove the most visually overbearing feature, improving the view distraction and sensory experience impacts at the site.	It is in the opinion of the Applicant that T4 should be retained due to the contribution it makes to the overall renewable electricity generation of the Proposed Development. Both beneficial and adverse effects will be considered in the planning balance.
		Given the increased potential for previously unrecorded buried archaeology associated Fronddyrys Neolithic Site (HCPA Ref. PRN2474), HCPA recommend that strip/map/excavate methodology should be used	The additional mitigation for the Fronddyrys Neolithic Site (HCPA Ref. PRN2474), Cwm Du Mound (HCPA Ref. PRN6838), Earthwork Enclosure (LUC_08), Cowlod Dyke (HCPA Ref. PRN6871) and Cefn y Crug Dyke (HCPA Ref.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		here during groundbreaking for the substation to ascertain whether related evidence of Neolithic activity is present. In addition, HCPA recommended archaeological area excavation for: • Earthwork Enclosure (LUC_08); • Cowlod Dyke (HCPA Ref. PRN6871); and • Cefn y Crug Dyke (HCPA Ref. PRN993).	PRN993) has been revised in accordance with HCPA's recommendations.
		HCPA stated their appreciation of the sentiment and intention of the Applicant's approach to offsetting and enhancement outlined in the ES. They note it is likely that these measures would focus on the better preserved and more visible and accessible historic assets in the	Noted.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		development area including the prehistoric and funerary monuments and possibly the Cefn y Crug Dyke and maybe a well preserved former medieval/post medieval farmstead.	

Study Area

6.16 Physical effects to the heritage significance of historic assets are assessed within the Site only (redline boundary). Setting effects are assessed for historic assets within the Site, and using two study areas, which have been defined in response to the bare earth modelling of the Proposed Development's ZTV and an understanding of the distance over which significant effect arising from setting change are considered likely. The two study areas are the:

- **Core Study Area:** Consisting of the land beyond the Site to a distance of 5km. All historic assets located within the Core Study Area have been considered for the potential for effects arising from setting change.
- **Wider Study Area:** Consisting of land between 5km (Core Study Area) and 10km. Designated historic assets lying within this area have been considered for the potential for effects due to setting change.

6.17 Consideration has also been given to the potential for setting change to designated historic assets within the ZTV beyond 10km.¹⁵

Desk Based Research and Data Sources

6.18 The following desk-based data sources have informed the assessment:

- Cadw spatial data for designated historic assets comprising:
 - Scheduled monuments;
 - Listed buildings;
 - Conservation areas; and,
 - RHPGs.¹⁶
- Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW) National Monuments Record of Wales (NMRW), which is held online as Coflein;

¹⁵ No historic assets beyond 10km were identified that may experience setting change as a result of the operation of the Proposed Development.

¹⁶ No World Heritage Sites or Registered Historic Landscapes have been identified within the baseline.

- HCPA Historic Environment Records (HER) data (Received September 2024);
- Available historic mapping, including relevant Tithe maps and Ordnance Survey (OS) mapping (principally First and Second Edition 25-inch and 6-inch to the mile mapping where available for the Site);¹⁷
- Publicly available aerial photography (oblique and vertical);¹⁸
- LiDAR data gathered for the Proposed Development;¹⁹
- Available reports from recent archaeological work undertaken in the area ('grey literature');
- Relevant archive material available online;
- Visualisations and 3-D turbines modelled and viewed in relevant software;
- A zone of theoretical visibility (ZTV); and,
- Findings of other relevant topics identified in ES **Chapter 5: Landscape and Visual Amenity**, **Chapter 9: Noise and Vibration** and **Chapter 11: Hydrology, Hydrogeology and Geology (including Peat)** for the Proposed Development.

6.19 In addition to the sources identified above, the research framework for the archaeology of Wales²⁰ was used to inform the assessment of the heritage significance and importance of those historic assets identified in the baseline.

Field Survey

6.20 A walkover survey of the Site was undertaken in November and December 2023 to inform the assessment. Weather conditions were good, with excellent visibility. It allowed for the verification of known historic assets,²¹ confirming their interpretation, location, and likely sensitivity to change, and informed the assessment of potential effects on those assets.

6.21 Site visits were also undertaken in November and December 2023 and January 2024 to selected historic assets in the Core and Wider Study Areas. The selection of historic assets

¹⁷ No previously unrecorded historic assets were identified from review of the historic map sources.

¹⁸ No previously unrecorded historic assets were identified from review of publicly available aerial photographs.

¹⁹ See **Appendix 6.1** for details.

²⁰ IFA Wales/Cymru on behalf of the archaeological community of Wales (2008) A Research Framework for the Archaeology of Wales

²¹ This included ground truthing of historic assets identified from the review of the LiDAR data.

beyond the Site was informed by the ZTV and professional judgement in relation to the likely sensitivity to setting change of historic assets with theoretical visibility or the potential for in-combination views that contribute to their heritage significance.

6.22 Selected photographs from the walkover survey and site visits are included in **Appendix 6.1**.

Assessment Approach

6.23 The historic assets forming the baseline were subject to a high-level analysis to identify those that are sensitive to the Proposed Development and required detailed assessment. Those historic assets identified as being likely to experience effects have been subject to a full assessment undertaken in line with the six steps set out in PCHIA:

- 1.** Understanding historic assets:
 - a.** Describe the historic asset;
 - b.** Ascribe heritage significance; and,
 - c.** Attribute importance.
- 2.** Evaluating the consequences of change:
 - a.** Understand change;
 - b.** Assess impact; and,
 - c.** Weight the effect.

Description

6.24 All historic assets are described factually and in a manner proportionate to their importance and susceptibility to change. The description includes sufficient detail to understand the potential effect of the Proposed Development on their heritage significance and, consequently, only information that is relevant to understanding how heritage significance might be affected by the Proposed Development has been included. Further information on historic assets identified in this chapter is presented in **Appendix 6.1**.

Ascribing Heritage Significance

6.25 This assessment seeks to identify the heritage significance of the historic assets within the historic environment baseline to assess the likely impact of the Proposed Development on the historic environment and the recommendations for any appropriate mitigation required to avoid, prevent, reduce or, if possible offset effects.

6.26 The heritage significance that makes historic assets important can be articulated in various ways. Annex A, B and C of TAN 24: Historic Environment²² set out how Wales' historic sites and places are assessed to determine whether their heritage significance is of national importance. One approach to assessing heritage significance in any circumstance (designated or non-designated) is to adjust these criteria to reflect the relative importance of the historic asset, from national to local. However, as each historic asset type (monument, historic building etc.) is assessed against different designation criteria this approach is not consistent, which can make it difficult for the reader to follow.

6.27 A more consistent and easily understandable approach draws upon the heritage values referenced by Cadw's conservation principles and comprise:

- **Evidential value:** Every historic asset has a unique story to tell. The surviving historic fabric, physical remains including buried archaeological remains, helps us to understand when and how each historic asset was made, how it was used and how it has changed over time.
- **Historical value:** Historic assets may illuminate particular aspects of the past. They can help us to understand how people lived and worked, and the beliefs and values they cherished. They may be associated with notable people or events. Through evocation and association, historic assets can connect past people, aspects of life and events with the present.
- **Aesthetic value:** We may value historic assets for their visual qualities, whether they result from conscious design and craftsmanship, or from the fortuitous effect of change over time.

²² Welsh Government (2017) Planning Policy Wales – Technical Advice Note 24: The Historic Environment – Annex A, B and C

Tastes alter and so do historic assets: earlier records and careful analysis of what survives may help in appreciating aesthetic value.

- **Communal value:** Historic assets may be cherished by the people and communities who relate to them, and they may play an important part in collective experience or memory. Historic assets can have economic as well as social value with the capacity to provide a valuable source of income or employment.

The Contribution of Setting to Heritage Significance

6.28 Heritage values are a way of transparently and consistently articulating the heritage significance of any historic asset, including any contribution made by setting to that heritage significance. In line with PPW, the contribution that setting makes to a historic asset's heritage significance has been considered.

6.29 All historic assets have a setting, but the contribution that this makes to their heritage significance varies in line with the location, form, function and preservation of the asset and its surroundings. Setting can be integral to the heritage significance of a historic asset (contributing to one or more of its heritage values or their appreciation), therefore a change in an important element of an asset's setting can equate to a direct impact to its heritage significance. Equally, where setting does not contribute to a historic asset's heritage significance, no effect can result from setting change.

Ascribing Importance (Value)

6.30 Historic assets may derive their heritage significance from one or more of the above heritage values, but a lack of interest in one or more of these values does not indicate a lower level of importance, just that their interest lies elsewhere. The above heritage values help in understanding heritage significance of a historic asset, but do not determine the level of that significance (i.e. 'importance').

6.31 The heritage values expressed in Cadw's conservation principles can help explain a historic asset's heritage significance, but they do not explain how important (e.g. high, medium, low) the significance of the asset is. Establishing the importance of a historic asset is a key stage of the assessment process as it influences the way in which decisions are made during

the development of a proposal as well as the weight to be given it by the decision-maker. Importance is determined using professional judgement alongside an understanding of local, regional, and national historic environment research objectives and, where appropriate, the use of the designation criteria for historic assets²³. The criteria used to inform the assessment of importance of historic assets are identified in **Table 6.2**.

Table 6.2 Historic asset importance criteria

Importance	Description
High	Historic assets of national significance. Comprising designated historic assets and non-designated historic assets of demonstrable equivalent importance.
Medium	Historic assets of regional importance. Identified with reference to regional priorities from the Research Framework for the Archaeology of Wales.
Low	Historic assets of local importance.

Evaluating the Consequences of Change

6.32 A historic asset's sensitivity to change does not automatically equate to its importance. It varies depending on the nature of a historic asset's heritage significance, the contribution that setting makes to that heritage significance, and the character of the proposed development and the way in which it interacts with that heritage significance.

6.33 Unless otherwise stated, all historic assets within the Site have been assumed to be of high sensitivity to direct physical change as their heritage significance is derived primarily from their evidential and historical value which will be diminished or lost if physically changed.

6.34 Sensitivity to setting change is variable and has been established based on an understanding of the contribution made by setting to a historic asset's heritage significance and the likely interaction of the Proposed Development with that contribution. Sensitivity to setting change has been articulated by describing the way a historic asset's setting contributes (or not)

²³ Designation criteria are included in Welsh Government (2017) Planning Policy Wales – Technical Advice Note 24: The Historic Environment – Annex A, B and C.

to its heritage significance (or understanding that significance), with reference to Cadw's setting guidance, and how that contribution may be changed by the Proposed Development.

6.35 In terms of the operation of the Proposed Development, the risk to the heritage significance of historic assets is one of setting change. Visibility is typically a key factor in setting change and the most far-reaching experiential quality. Therefore, historic assets sensitive to setting change have been identified via the creation of study areas informed by review of a bare earth ZTV and an understanding of the distance over which significant visual effects are considered likely. Historic assets within the Site and Core and Wider Study Areas that were identified as having theoretical visibility of the Proposed Development have been subject to a desk-based appraisal of their heritage significance (including the contribution made by setting) and their potential interaction with the Proposed Development (see **Appendix 6.1**). Designated historic assets lying outside the ZTV were also subject to review to determine the risk of setting change from potential in-combination views.²⁴ Historic assets deriving heritage significance from elements of their setting that could be changed by the Proposed Development have been assessed in detail.

6.36 All historic assets identified as being sensitive to the Proposed Development have been assessed in **Appendix 6.1**.

6.37 This chapter presents the findings of the assessment of likely significant effects of the construction and operation of the Proposed Development on those historic assets considered to have the potential to experience significant effects for the purposes of EIA.

Understanding Change

6.38 In line with the PCHIA guidance²⁵ the way in which the Proposed Development may change the heritage significance of a historic asset, and whether that change is temporary or permanent, has been clearly articulated with explicit reference to the heritage value(s) affected.

²⁴ i.e. views of the relevant historic asset and the Proposed Development in-combination.

²⁵ Chartered Institute for Archaeologists, Institute of Historic Building Conservation and Institute of Environmental Management and Assessment (2021) Principles of Cultural Heritage Impact Assessment (PCHIA) in the UK

Assessing Impact (Magnitude of Change)

6.39 Assessment of the impact to a historic asset's heritage significance as a result of the Proposed Development has been undertaken using professional judgement and an understanding of how the heritage values of that asset that contribute to its heritage significance will be affected. It is not a measure of the reach or extent of the proposal or the importance of the historic asset. As per the PCHIA guidance a simple scale is used for assessing an impact and, for transparency, the criteria for this are set out below in **Table 6.3**.

Table 6.3 Level of impact/magnitude of change criteria

Magnitude of Change	Description
Large	Substantial, near total, or total loss of a historic asset's heritage significance either through physical and/or setting change. Substantial level of change to how that significance is understood, appreciated, or experienced.
Medium	Medium loss or alteration of a historic asset's heritage significance either through physical and/or setting change. Medium level of change to how that significance is understood, appreciated, or experienced.
Small	Slight loss or alteration of a historic asset's heritage significance either through physical and/or setting change. Small changes to how that significance is understood, appreciated, or experienced.
None	No change to the heritage significance of the historic asset, or how that significance is understood, appreciated, or experienced.

Level of Effect (Significance of Effect)²⁶

6.40 The level of the effect has been determined using professional judgement to reflect the importance of the historic asset using the scaled criteria in **Table 6.4** below. The justification for the significance of effect has been reported clearly. This approach accords with the guidelines for assessment set out in the PCHIA guidance (termed ‘weighting the effect’).

6.41 A clear statement has been made as to whether an effect is a significant effect in terms of the EIA Regulations based on professional judgement of the available evidence and guided by the description of significance of effect identified in **Table 6.4**. **Major** and **moderate** effects are considered significant in the context of the EIA Regulations.

Table 6.4 Significance of effect criteria

Significance of Effect	Description
Major	A large magnitude of change (e.g. total or near total loss) to the heritage significance of a historic asset of medium or high importance.
Moderate	A medium magnitude of change (e.g. substantial loss or alteration) to the heritage significance of a historic asset of medium or high importance; or a large magnitude of change (total or near total loss) to a historic asset of low importance.
Minor	A small magnitude of change (slight loss or alteration) to the heritage significance of a historic asset of medium or high importance; a medium or small (slight to substantial loss or alteration) to the heritage significance of a historic asset of low importance; or any change to a historic asset of very low importance.
Negligible	No change to the heritage significance of a historic asset.

²⁶ In EIA terms the level of effect is typically referred to as the significance of effect. This terminology has deliberately been avoided to prevent confusion with the discussion of heritage significance. Similarly, the PCHIA term of ‘weighting the effect’ has been avoided to remove any sense of conflation with weighing of effects in the planning balance – a matter solely for the decision-maker.

Cumulative Effects

6.42 Impacts of a cumulative nature can relate to the physical fabric or setting of historic assets. This can be a result of impact interactions between different impacts of a development or in-combination with impacts of other schemes. Alternatively, they may be additive impacts from incremental changes caused by a development together with other operational schemes or those already in the planning system.

6.43 This assessment considers the potential effects to the heritage significance of historic assets against a baseline that includes existing or consented wind farms, in line with the schemes agreed for inclusion in the cumulative assessment. A full list of operational and consented developments considered in the cumulative effects assessment is provided in **Appendix 2.6** and locations are shown on **Figure 2.2 Cumulative Developments: wind farms** and **Figure 2.3 Cumulative Developments: non-wind developments**.

6.44 Further information on cumulative effects is provided in **Appendix 6.1**.

Assessment Limitations

6.45 The assessment has utilised a range of sources on the area's historic environment. Much of this is necessarily secondary information compiled from a variety of sources (e.g. HER data and grey literature reports). It has been assumed that this information is reasonably accurate unless otherwise stated.

6.46 The potential for previously unrecorded buried archaeological remains has been considered in relation to the pattern and significance of known historic assets (drawn from relevant HER data, the results of previous archaeological surveys, a review of historic mapping and available digital aerial imagery, LiDAR data review and the results of the walkover survey), as well as the land use history and geology within the Site, to understand the archaeological potential.

6.47 The results of the Phase 1 and 2 peat surveys reported in **Chapter 11** provide a detailed understanding of the presence of peat within the Site. These results are sufficient to identify the paleoenvironmental potential for the Site and the likelihood of significant effects resulting in the construction of the Proposed Development on the paleoenvironmental record.

6.48 Whilst some information gaps are inevitable, given the buried nature of archaeological remains, it is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and assessment of likely significant environmental effects on the historic environment. A precautionary approach has been applied, based on the available information and the professional experience and judgment of the project team, to ensure that all likely significant effects have been assessed and reported. For the avoidance of doubt, when any historic asset is identified as being of 'uncertain' importance, a precautionary approach will be applied, and the effect reported as potentially significant. However, this has not been necessary in this assessment.

Existing Conditions

6.49 A summary of the existing conditions is presented below. Further information on the archaeological and historical context for the assessment and individual historic assets forming the baseline is presented in **Appendix 6.1**.

The Site

Designated Historic Assets

6.50 Six designated historic assets of **high** importance are located within the Site, comprising three scheduled monuments and three listed buildings.

6.51 The three contemporary Bronze Age (2300 BC to 800 BC) round barrows form a distinct group of funerary monuments and are part of a wider dispersed ritual landscape utilising the elevated summits within the landscape. The Great Rhos Round Barrow (Cadw Ref. RD254) and Shepherd's Tump Round Barrow (Cadw Ref. RD253) are located approximately 850m to the south and c. 2.1km to the west of the Cwm Bwch Round Barrow Pair (Cadw Ref. RD255) respectively (refer to **Figure 6.1**).

6.52 **Cwm Bwch Round Barrow Pair (Cadw Ref. RD255)** comprises two grass and heather covered barrows approximately 20m apart. Located at 610m AOD, on the plateau of a ridge protruding west from the summit of Rhos Fawr. Thirty meters to the west of the barrows, the land falls sharply away forming the horseshoe shaped Cwm Bwch. The prominent elevated position of the Cwm Bwch barrows on the edge of the ridge enables wide open views projecting

west over and into Cwm Bwch and Cwm Merwys and across to the Aran Valley beyond. To the south, the eye is drawn north-east around the top of the horseshoe forming Cwm Bwch, and along the line of the northern ridge of Great Rhos. This ridge and Cowlod (502m AOD) restricts views further south.

6.53 Directly south on the northern ridge of Great Rhos at approximately the same elevation and silhouetted against the sky, **Great Rhos Round Barrow (Cadw Ref. RD254)** is clearly visible from the Cwm Bwch barrows (refer to **Figure 6.6**). This view is reciprocated from Great Rhos barrow (see **Figure 6.7**). This visual interaction appears to be intended and influenced the positioning of these three barrows on the landforms they occupy. This visual and spatial relationship to one another, and the landforms on which they have been deliberately positioned, makes a positive contribution to how these historic assets are understood and appreciated as funerary monuments forming part of a distinct group.

6.54 Some 150m below and c.2.1km to the west of the barrows at Cwm Bwch, is **Shepherd's Tump Round Barrow (Cadw Ref. RD253)**. This barrow sits in a distinctly different landscape unit to those above it at Cwm Bwch and Great Rhos. The bright greens of the rolling enclosed improved farmland, are a striking contrast to the darker hues of high ridges of the open moorland. While views from the Cwm Bwch barrows to the west include the Shepherd's Tump barrow, the visual relationship is less apparent to that of the Great Rhos barrow, with both distance, the intervening deep valleys and the wider vistas over the Aran Valley and the high ground beyond diminishing the prominence of the Shepherd's Tump barrow in this view (refer to **Figure 6.8**).

6.55 The natural approach to the barrows at Cwm Bwch is strongly influenced by topography of the landform. Rising from the Aran Valley and following the alignment of the hill road south-east, the approach traverses between Shepherd's Tump hill to the west and the deep valley of Cwm Merwys to the east, before circling north-east at Cowlod hill, to follow the ridge passing Great Rhos barrow, before turning north around the top of the Cwm Bwch horseshoe. This routeway links the four barrows and may have been important to the communities who built and interacted with the barrows as part of the social and spiritual lives.

6.56 **Great Rhos Round Barrow (Cadw Ref. RD254)** has been crossed east to west by a post and wire fence delineating the enclosed moorland to the north and common to the south.

This barrow has been positioned on the ridgeline, set back from the southern edge of the horseshoe forming Cwm Bwch. This location enables clear and distinct reciprocating views over the intervening cwm between it and the Cwm Bwch barrows to the north. This position also skylines the barrow in views from Cwm Bwch barrows (see **Figure 6.7**).

6.57 From the Great Rhos barrow, the eye is drawn around the top of the horseshoe and follows the ridge down to rest on the Cwm Bwch barrows (refer to **Figure 6.7**). While not sky lined, the pair of barrows remain a distinct feature, partly due to the landform of the ridge which appears to project out into the landscape, which is further emphasised by the steep south-west facing slope of Cwm Bwch (refer **Figure 6.8**).

6.58 As previously observed, the Shepherd's Tump barrow is in a different landscape unit to those on the ridge. Approximately 2.4km to the north-west below Great Rhos barrow, the Shepherd's Tump barrow is a noticeable feature in the landscape, but its location below and beyond Cwm Bwch barrows suggests views of it are secondary to those of the pair of barrows on the opposing ridgeline (refer to **Figure 6.8**). Views to the west from Great Rhos barrow are dominated by those of the Aran Valley beyond the foothills on which the Shepherd's Tump barrow is located (refer to **Figure 6.8**).

6.59 Shepherd's Tump Round Barrow (Cadw Ref. RD253) comprises a grass covered circular mound located within an area of enclosed improved farmland, characterised by large straight sided fields defined by post and wire fences. This distinct field pattern contrasts with the open moorland that rises sharply beyond Cwm Merwys to the east and the softer fieldscape of smaller fields broken up by hedgerows boarding the eastern edge of the Aran Valley to the west. These changing characteristics emphasise the varying topography from valley floor which rises to form the gently rounded 'foothills' before the sudden dramatic rise of the high ground and open moorland beyond. It is on a highpoint within the foothills between the Aran Valley and the high ground to the east that the Shepherd's Tump barrow has been sited.

6.60 At 460m AOD the rounded hill on which the Shepherd's Tump barrow sits, provides open views to the west over the Aran Valley. To the east the dominant feature is the ridge of high ground which rises some 150m above Shepherd's Tump. The landform prevents views into Cwm Merwys, however the curving horseshoe bowl of Cwm Bwch is central and pronounced in

this view. The perception of the shape and depth of this natural amphitheatre reacts to changes in the light, and the shadows forming within it.

6.61 The combination of the scale of their upstanding remains and position, set back from the ridge on a largely flat plateau with rising ground and commercial forest beyond, results in the Cwm Bwch barrows being only just discernible on the skyline in views from the Shepherd's Tump barrow. By contrast the Great Rhos barrow's position on the ridge provides the sky as its backdrop, and therefore is much more noticeable in views towards it from the Shepherd's Tump barrow. However, none of the three barrows (Cwm Bwch barrows and Great Rhos barrow) are of a scale that elevates them above the supremacy of the ridge and Cwm Bwch in views to the east (refer to **Figure 6.8**).

6.62 The Shepherd's Tump barrow is a clear and distinctive feature in views from the Aran Valley where topography, vegetation and modern infrastructure allow intervisibility with Shepherd's Tump hill. It was noted on the skyline from Little Hill when approaching Dolau from the west and from the A44 at Penybont, and when traveling north along the A488. These views are focused on the Shepherd's Tump barrow and not the barrows on the ridge behind, which are indistinguishable from the open moorland on which they are positioned.

6.63 Intervisibility with the Shepherd's Tump barrow from the Aran Valley and opposing high ground to the west, appears to have been key to the positioning of the barrow in the landscape.

6.64 The significance of these Bronze Age funerary monuments (Cadw Refs. RD255; RD254; RD253) is largely derived from the evidential (scientific) value and historical (illustrative) value of their physical remains, including any buried archaeological remains, which have the potential to enhance the knowledge of funerary and ritual practices during the Bronze Age. In addition, any paleoenvironmental information that may be preserved in soils beneath these barrows has the potential to inform the understanding of climate, local conditions and land cover when the barrows were constructed.

6.65 The arrangement and distribution of barrows within a landscape can provide valuable information about settlement patterns and ritual beliefs. Their positioning was strategic and features in the landscape likely held wider spiritual significance to the surrounding communities, both at the time of construction and in periods succeeding it. The survival of these barrows to the present day, their intervisibility, how topography and landform was exploited to enhance

their dominance in the landscape and the natural routeways through the landscape which links them and the ability to appreciate and understand these key elements of their setting contributes to their heritage significance.

6.66 Llanevan Farmhouse (Cadw Ref. 9259) dates from the 16th Century, with later 19th century additions and alterations. To the north of the farmhouse is a 17th Century three-bay timber framed barn (Cadw Ref. 9257), which has further lofted bays at either end. To the west of the farmhouse, is a 19th century cowhouse made of rubble stone with a corrugated iron roof (Cadw Ref. 9259).

6.67 These buildings form a discrete group around a central farmyard. To the south is a collection of large modern agricultural buildings. Located at the base of the open hill to the east and the tree-lined course of Mithil Brook runs west/east to the north of Llanevan farmstead. To the west enclosure fields formed of largely straight sided fields defined by hedges supplemented by modern post and wire fencing run as far as the A44.

6.68 The farmyard setting of these listed buildings, surrounded by associated fields, access to grazing on the open hill to the east, and the functional relationship with each, other contribute to the understanding and appreciation of them as part of a post-medieval farmstead, and how they are experienced as such. Their heritage significance is largely derived from their physical remains (evidential and historical value), which contribute to their architectural and historical interest as post-medieval buildings.

Non-designated Historic Assets

6.69 Sixty-four non-designated historic assets are located within the Site. Of these, 14 historic assets (LUC_01 to LUC_14) have been identified from LiDAR data. Non-designated historic assets within the Site are characterised by possible prehistoric funerary monuments, medieval cross dykes, and evidence of medieval or post-medieval settlement and agricultural activity.

6.70 The Neolithic occupation site at Fronddyrys (HCPA Ref. PRN2474) was identified due to the recovery of flint tools. Despite intensive agricultural disturbance there is some potential for further buried archaeological remains associated with Neolithic occupation to be present. Given the potential for any surviving physical remains that may still be present (evidential value) from this period to contribute to the knowledge and understanding of Neolithic settlement and activity

in mid-Wales, but in consideration of the probability of poor survival due to previous ground disturbance, this asset has been assessed to be of **low** importance.

6.71 The Cowlod Mound (HCPA Ref. 6873) is a distinct circular mound to the west of the summit of Cowlod. Its location on the end of a ridge with views to the west will fit the pattern of Bronze Age barrows elsewhere along the west facing ridge of Radnor Forest. Given its low profiles and dense heather covering, this mound is significantly less visually dominant in the landscape than putatively contemporary designated historic assets within the Site.

6.72 Nyth-grug cairn (HCPA Ref. PRN6832) is a summit cairn or barrow bisected by a fence, with a triangulation at the centre of the cairn. At 538m AOD views from the cairn are extensive, with the focus to the west, down and over the Aran Valley. To the east, long views are restricted by Fron Hill. Despite its low profile the mound is a prominent feature in the landscape, although this may be in part due to the triangulation point as much as the mound itself.

6.73 Cowlod Mound and Nyth-grug cairn have the potential to be Bronze Age in origin and their physical remains (evidential and historical value) to contribute to the knowledge and understanding of prehistoric funerary and ritual monuments in mid-Wales and have been assessed to be of **medium** importance.

6.74 The Rhos platforms and enclosure (HCPA Ref. PRN35890; PRN6861) were described in 1992 by CPAT, however no features associated with these assets could be identified when the location was re-visited by CPAT in 1996. These enigmatic features have been interpreted as a Bronze Age enclosed settlement. If present, their physical remains (evidential and historical value) have the potential to inform our knowledge of prehistoric settlement in mid-Wales and as such have been assessed to be of **medium** importance.

6.75 The putative alignment of the Roman road between Mortimer's Cross and Castell Collen (HCPA Ref. PRN14801) follows the northern boundary of the Site. The possible alignment of the Roman road and particularly where it may survive as visible and buried archaeological remains (evidential and historical value) has the potential to provide valuable insights into the construction of Roman roads and the Roman road network at a regional level and as such, this asset has been assessed to be of **medium** importance.

6.76 Esgairnantau Bank and Ditch (HCPA Ref. PRN6862) comprises an earthwork roughly parallel to the top of a ridge to the north-west of Black Brook overlooking Davy Morgans Dingle. Tentatively dated to the early medieval period, no precise date has been established.

6.77 Cefn y Crug Dyke (HCPA Ref. PRN993) crosses the ridge between Cwm Merwys and Cefn-y-grug approximately east/west to the north of Cowlod hill. The arcing c. 220m bank has a ditch to the south. The broad bank is no more the 0.5m high with little variation and the ditch is no more than 0.4m deep. There is a slight kink in the bank where the dyke is cut through by the mountain track/hill road.

6.78 The Cowlod Dyke (HCPA Refs. PRN6871) is located towards the base of a steep west facing slope, of the Radnor Forest towards a saddle, to the south-east of Cowlod hill. Aligned south/north, the southern end of the bank starts on a steep south-west facing slope overlooking Fron-las dingle and runs north where it appears to terminate before the north facing slope of Cwm Merwys.

6.79 Both Cefn y Crug and Cowlod dykes (HCPA Refs. PRN993; PRN6871) interact with the mountain road/hill road aligned approximately north-east/south-west. The continued use of this natural routeway, including in the modern era by wheeled vehicles, has truncated both earthworks.

6.80 The physical remains of Esgairnantau Bank and Ditch, Cefn y Crug Dyke and Cowlod Dyke have the potential to inform the knowledge and understanding the date and function of these linear land divisions (evidential and historical value). Their settings, on ridges and spatial relationship to one another and other possibly contemporary linear assets in landscape, contribute to how they are appreciated and understood as territorial boundaries and land divisions, and provide valuable insights into land management practices and social organisation at a regional level during the medieval period. As such, these assets have been assessed to be of **medium** importance.

6.81 Medieval and post-medieval agricultural activity within the Site is evidenced by the earthwork remains of individual or groups of building platforms, enclosures (LUC_08; LUC_10) and field banks/boundaries (HCPA Ref. PRN399302; LUC_10), trackways (HCPA Ref. PRN1001826; LUC_09) and areas of ridge and furrow cultivation (LUC_01 to LUC_07). These historic assets are associated with small-scale and often seasonal agricultural activity and

occupation. Later post-medieval buildings also survive as turf covered wall-footings, including a well-defined three roomed structure terraced into the slopes of the Cwm Merwys (HCPA Ref. PRN6863). The long hut at Cwm Byr (HCPA Ref. PRN33936) is an example of a post-medieval long house.

6.82 Abandoned and poorly preserved remains of medieval and post-medieval agricultural buildings are a common and widespread type of historic asset found across rural Wales, particularly in marginal and upland areas. Their heritage significance is predominantly derived from their physical remains, including any buried archaeological remains, which have the potential to contribute to an understanding of their date, form and function, as well as farming practices and the rural economy prevalent at the time. In consideration of their contribution to the understanding of rural settlement patterns, farming practices and the rural economy at a local level, these historic assets have been assessed to be of **low** importance.

6.83 Cwm Bwch was the location for a tragedy which occurred in 1945 when a Miles Martinet I aircraft flew into the side of the hill (HCPA Ref. PRN132136). Previously recorded remains of the aircraft were removed from the hillside sometime before 1992. The heritage significance of these crash site is derived from any surviving physical remains (evidential value), and as a place of remembrance for local communities and the families of those who lost their lives (communal value). While larger sections of the wreckage have now been removed from the location of the crash site, there is the potential for further physical remains of the Miles Martinet I aircraft to be present. In consideration of this, and its communal value, this historic asset has been assessed to be of **low** importance.

6.84 The remaining non-designated assets include a possible pillow mound, boundary marker stones, small post-medieval and later quarries, ponds, triangulation points, a sheepfold, ford and footbridges. As common and well-understood historic assets of local interest and have been assessed to be of **low** importance.

6.85 The locations of designated and non-designated historic assets within the Site are shown on **Figure 6.1**.

Previously Unrecorded Historic Assets Including Buried Archaeological Remains

6.86 Previous field surveys covering much of the Site have been undertaken by CPAT and others. LiDAR data gathered for the Proposed Development has been reviewed. In addition, the construction footprint of the Proposed Development has been the subject of a walkover survey to inform the historic environment baseline, and to identify any potential direct physical effects to historic assets resulting from construction. The potential for further previously unrecorded historic assets which manifest as visible aboveground physical remains within the Site has been assessed to be **negligible**.

6.87 While areas of dense or recently felled rotational commercial forest within the Site have not been subject to a walkover survey, physical disturbance from ground preparations for afforestation and activity associated with felling, such as the operation and movement of forestry plant and machinery, are likely to have removed or significantly truncated any previously unrecorded historic assets that may be present.

6.88 There is the potential for previously unrecorded buried archaeological remains to be present within the footprint of the Proposed Development. Given the pattern of distribution of known historic assets within the Site, and their form and function, as well as the receiving environment i.e. largely open moorland, the potential for the presence of previously unrecorded buried archaeological remains within areas of the Site has been assessed to be **negligible to low**.

6.89 While it is acknowledged that there is potential for buried archaeological remains – such as secondary burials or evidence of ritual activity – associated with the Bronze Age funerary monuments within the Site to extend beyond their scheduled areas (where designated) and their visible physical remains, this potential diminishes with distance.

Paleoenvironmental Potential

6.90 There are areas of peat with depths great than 30cm within the Site (please refer to **Chapter 11** for details), with the deepest peat deposits found within the commercial forest on Esgairnantau, and on the Great Rhos plateau. It can take over 1,000 years for a metre of peat to form, with the varying depths having the potential to preserve any archaeological remains which predate, or coincide with, the peat formation. As peat is formed in anaerobic conditions,

which prevent the micro-biological activity needed for the chemical breakdown of organic materials there is potential for organic archaeological remains, and **low** potential for paleoenvironmental evidence within areas where peat has been identified.

Core Study Area

6.91 The location of historic assets identified within the Core Study Area are shown on **Figure 6.2**.

6.92 One hundred and eighty-two designated historic assets have been identified within the Core Study Area. These comprise:

- 32 scheduled monuments:
 - 11 prehistoric funerary and ritual monuments including eight round barrows, Cwm-Maerdy Standing Stone, Bryn y Maen Alignment and Fedw Stone Circle (Cadw Refs. RD113; RD069; RD027);
 - Llannerch cup-marked rock probably dating from the Neolithic and the Bronze Age (Cadw Ref. RD234);
 - Four late prehistoric defended enclosures, including the hillforts at Llandegley Rocks, the example south-west of Castell Cwm Aran and Graig Camp (Cadw Refs. RD264; RD094; RD112);
 - Glog Camp and Nant Brook Enclosure (Cadw Refs. RD098; RD147) – the remains of earthwork/stone-built enclosures, the date or precise nature of which is unknown, but are likely to be later prehistoric or medieval in origin;
 - Penybont Common Roman road and early turnpike road (Cadw Ref. RD258) – the route and surviving earthworks of the Roman road between Castell Collen and Leintwardine as it crosses Penybont Common and the later turnpike road;
 - Five medieval earthwork castles at Crug Eryr, Radnor, Bleddfa, Castell Cwm Aran and Cae-Banal (Cadw Refs. RD003; RD033; RD061; RD095; RD108);
 - New Radnor medieval town and associated defences (Cadw Refs. RD050; RD152; RD154);

- Medieval moated sites at Mynachdy and Twiscob (Cadw Refs. RD097; RD146);
- Penybont Common and Cwm-Twrch medieval settlements (Cadw Refs. RD157; RD165); and,
- The ruins of a medieval chapel, known as Ednol Chapel (Cadw Refs. RD273).

■ 151 listed buildings:

- Church of St. Mary Magdalene Grade I listed church (Cadw Ref. 9122);
- Four Grade II* listed buildings including the monument to Sir George Cornwall Lewis in New Radnor a Victorian politician and former owner of Harpton Court (see below), and Downton House located in open farmland north of the A44, 1.5km east of New Radnor (Cadw Refs. 9205; 9237); and,
- 146 Grade II listed buildings characterised by farmhouses, traditional farm buildings, chapels and churches, milestones, bridges and houses, cottages, mills and commercial buildings within settlements.

■ New Radnor Conservation Area; and,

■ Harpton Court RHPG (Grade II; Cadw Ref. (PGW(Po)59(POW)).

6.93 Information as to why designated heritage assets within the Core Study Area have been screened in or out of the assessment of effects is presented in **Appendix 6.1**.

6.94 Data held by the HCPA HERs have identified 2,301 non-designated historic assets within the Core Study Area. These are characterised by:

- Prehistoric funerary and ritual monuments, including the sites of or poorly preserved remains of Bronze Age cairns and standing stones, field systems, burnt mounds and later prehistoric defended enclosures identified as buried archaeological remains from cropmarks;
- Roman roads identified by archaeological field survey and excavation, or the projected alignment of Roman roads;

- Early medieval and medieval building platforms, field systems, the sites of townships and holy wells, ridge and furrow cultivation and cottages and houses thought to contain elements dating from the medieval period; and,
- Post-medieval farmhouses, traditional farm buildings, cottages, sheepfolds, field clearance cairns, field boundaries, lime kilns, mills, mill ponds, weirs, an aqueduct, sawmills, churches and chapels, a cockpit, wells, railway lines and former railway lines.

6.95 Those historic assets that have not been designated have been assessed to be of **low** to **medium** importance.

Wider Study Area

6.96 The following designated historic assets of **high** importance are located within the Wider Study Area:

- 101 scheduled monuments comprising:
 - 38 Neolithic/Bronze Age ritual and funerary monuments including stone circles, a standing stone, ring cairns, round cairns and round barrows;
 - Five prehistoric enclosure settlements (Cadw Refs. RD247; RD062; RD031; RD265; RD030);
 - Seven later prehistoric hillforts (Cadw Refs. RD149; RD011; RD013; RD123; RD093; RD130; RD237);
 - Two burnt mounds or cooking mounds at Llwynceubren (Cadw Ref. RD141);
 - Two Roman forts, two practice camps and a marching camp (Cadw Refs. RD136; RD001; RD1126; RD134; RD138) and a section of Roman road near Llandrindod Wells (Cadw SM Ref. RD259);
 - Nine sections of Offa's Dyke (Cadw Refs. RD021; RD017; RD018; RD019; RD025; RD022; RD023; RD020; RD024) and a short ditch (Cadw Ref. RD089);
 - 33 medieval historic assets including castles, motte and bailey castles, moated sites, house platforms, abandoned settlements and field systems; and,
 - Cwmblaenerw Enclosed Long Hut (Cadw Ref. RD169).

- 248 listed buildings (four Grade I; 22 Grade II*; 222 Grade II) comprising:
 - 194 domestic buildings, including farmhouses and associated traditional farm buildings and agricultural ranges, individual isolated cottages and minor country houses, as well as groups of houses, terrace houses and villas located within settlements;
 - 16 commercial, civil or industrial buildings located within settlements, including banks/former banks, post offices, hotels and public houses, shops and mills;
 - 24 churches, chapels and memorials;
 - Six bridges, milestones and buildings associated with railways; and,
 - Eight telephone boxes.
- Knighton and Llandrindod Wells conservation areas; and
- Llandrindod Wells Public Parks (Grade II*) and Evancoyd (Grade II) RHPG (Cadw Refs. PGW(Po)20(POW); PGW(Po)51(POW)).

6.97 The location these designated historic assets are shown on **Figure 6.3**.

6.98 Information as to why designated heritage assets within the Wider Study Area have been screened in or out of the assessment of effects is presented in **Appendix 6.1**.

Designated Heritage Assets Screened In for Detailed Assessment

6.99 Where designated heritage assets of **high** importance within the Core and Wider Study Areas have been identified as having theoretical visibility with the Proposed Development, the presence of which during operation has the potential to change their setting and the contribution their setting makes to their heritage significance, they have been included for further assessment. These are set out below.

6.100 The **Whimble, Whinyard Rocks and Red Hill Bronze Age barrows (Cadw Refs. RD191; RD190; RD189)** comprise six Bronze Age barrows located on the ridgeline of Bach Hill and on top of the summit of Whimble hill. They form a putative cemetery group which loosely create a linear row that extends across the northern boundary of the Walton Basin.

6.101 As a places of burial and ritual during the Bronze Age, it is likely that these barrows had a prominent place within a social group's territory and may have acted as a focal point for

communal activity in the landscape, as well as serving as a physical and symbolic marker of its builders' place in space and time.

6.102 The setting of these six barrows, including their deliberate siting on prominent locations within the landscape on the northern edge of the Walton Basin (Whimble hill, Whinyard Rocks and Bache Hill), which provide intervisibility with the Walton Basin to the south and east, informs the appreciation and understanding of these aspects of their heritage significance. Their visual and spatial relationship to one another as a distinct group forming a 'linear' cemetery, as well as with other contemporary assets in the landscape, such as the Black Mixen Barrows (Cadw SM Ref. RD256), further contributes to their heritage significance.

6.103 The **Black Mixen Round Barrows (Cadw Ref. RD257; RD256)** are two Bronze Age funerary monuments located some c.1km apart on Black Mixen hill. Immediately to the north of the southern barrow is a fenced compound containing a telecommunications mast and associated infrastructure (see **Figure 5.30**). The northern barrow (Cadw Ref. RD256) is located on the open moorland, a short distance beyond which is surrounding commercial forest enclosing the open moorland on which the barrow sits to the west, north and east.

6.104 The siting of the southern barrow (Cadw Ref. RD257) enables views over and into the Harley Dingle Valley to the south-west (now occupied by a rifle range), and to the south towards the round barrow cemetery on Bache Hill and Whimble hill (see above). The Black Mixen barrows relationship with one another, and the possibility that they form part of a wider dispersed barrow cemetery contributes to their heritage significance.

6.105 The contemporary barrows to the west (within the Site; Cadw Refs. RD254; RD255), are in a different landscape unit and do not have intervisibility with those at Black Mixen. Given their landscape separation and lack of intervisibility, the Black Mixen barrows do not share any further relationship with the barrows which are located within the Site, beyond their obvious spatial relationship within the Forest of Radnor massif.

6.106 The heritage significance of these eight heritage assets is largely derived from the evidential (scientific) and historical (illustrative) value of their physical remains, including any buried archaeological remains that have the potential to contribute to the understanding of prehistoric burial practices and as good representative examples of their type and form. There is also the potential for environmental evidence preserved in the soils beneath the barrows that

may inform the understanding of climate, local conditions and land cover when the barrow was constructed. When considered as a barrow cemetery their importance is further enhanced through their group value.

6.107 Llandegley Rocks Hillfort (Cadw Ref. RD264) is an Iron Age (800 BC to 74 AD) hillfort situated on an imposing ridge. The hillfort's large striking earthwork defences once supplemented with a wooden palisade were intended to make a powerful statement of status and display, and that impression is still experienced today. While the purpose of hillforts is widely contested, they are often characterised as being defensive structures. Although this assertion is true in most cases, many hillforts are also associated with continuous settlement. This social complexity is evidenced at Llandegley Rocks, as the hillfort is accompanied to the south-west by a contemporary enclosure settlement (HCPA Ref. PRN169150), containing hut platforms (HCPA Ref. PRN169656 and PRN169653).

6.108 The positioning of the hillfort was clearly strategic, the promontory location allows for commanding views to the north, east and south. Views to the north-west are restricted by higher ground on which the contemporary enclosure settlement is located, suggesting a functional relationship between these assets. Views to the south-west contain the recently constructed Hendy Wind Farm. The hillfort retains its dominance over the landscape between the lowlands below and the hills of Radnor Forest to the east. Also, to the south-south-west there is possible intervisibility with another hillfort (Cadw Ref. RD112; see below). These key elements of the hillfort's setting contribute to how it is appreciated, understood and experienced, as an impressive, strategically located defended enclosure forming part of a late prehistoric landscape.

6.109 Graig Camp (Cadw Ref. RD112) comprises the remains of a late prehistoric/Roman period hillfort. There is no evidence of structures within the hillfort, and modern ploughing within the enclosure may have truncated or removed any buried archaeological remains present.

6.110 The hillfort occupies a knoll of a ridge which stretches away to the north-east, the highest point being crowned by the north-western defences. Natural ridges of rock lie just outside the south-eastern defences. The hillfort's prominent location enables views across the surrounding lowland landscape, including south-east towards the Edw Valley. Its location and relationship with other contemporary assets in the landscape has the potential to provide important insights

into the nature of the Iron Age landscape and the understanding of social organisation, land division and land use at the time. Potential intervisibility, with Llandegley Rocks Hillfort may have been a factor in the choice of location.

6.111 The heritage significance of these assets is largely derived from the evidential (scientific) and historical (illustrative) value of their physical remains, including any buried archaeological remains, which have the potential to enhance the knowledge of later prehistoric defences and activity within the hillforts. The hillforts form an important element within the wider later prehistoric landscape. Their spatial relationship with other contemporary assets and how the hillforts position in the landscape enables an understanding and appreciation of their deliberate siting to take advantage of their defensive position, dominance in the landscape and to enable views down into valley below, contributes to these historic asset's heritage significance.

6.112 Crug Eyr Mound and Bailey Castle (Cadw Ref. RD003) is an earthwork castle dating from the medieval period (1066 AD-1540 AD). While its primary purpose was as a stronghold, it may also have had a role as a high-status residence. The castle is first mentioned in 1188 AD as the seat of Maelgwyn, son of Cadwallon ap Madog of Powys. Unusually, the castle is thought to have remained in Welsh hands throughout most of its active life.

6.113 As is characteristic of castles of this type and form in Wales, Crug Eyr is situated in a defensive position with strategic views over the surrounding landscape. The castle's position on the top of a knoll, which falls away steeply to the north-west, south-west and north-east, complements and adds to the castle's defences. The knoll, which stands over 100m above the Edw Valley below, provides commanding views to the west over and across the Edw Valley.

6.114 These elements of castle's setting are key to appreciating and understanding the deliberate siting of the castle to take advantage of the locations naturally defensive position in the landscape and long views west, enabling a level of control over those occupying and moving through the Edw Valley below, and contribute most to its heritage significance.

6.115 To the north-east across the ridge which connects the knoll to the higher ground beyond the A44, the views are restricted by Fronddyrys. The noise and movement of vehicles using the A44 also forms part of the setting of this asset. These elements of the castle's setting contribute less to its heritage significance.

6.116 Earthworks identified as a medieval hollow way (HCPA Ref. PRN35076), and a group of building platforms at Gwernarglwydd to the west (HCPA Refs. PRN50349; PRN4451) may be contemporary with the castle. The hollow way may have had a functional relationship with the castle providing access to the castle from the Edw Valley. The functional and spatial relationship between these assets is an important element of the castle's setting and contribute to how it is appreciated and understood as part of a wider medieval landscape.

6.117 There may also have been a functional relationship with Cae-Banal Castle Mound (Cadw Ref. RD108; see below), it may have guarded the approach to Crug Eryr along the valley to the south-east, protecting its eastern flank. While there is no intervisibility between the two assets, their proximity implies a functional relationship. The spatial relationship between these and other contemporary military and administrative centres in the landscape is an important element of Crug Eryr's setting, which contributes to the appreciation and understanding of them as part of a system of military and administrative control and the politics of the time.

6.118 The heritage significance of Crug Eryr Mound and Bailey Castle is primarily derived from the evidential (scientific) and historical (illustrative) value of its physical remains. This includes any surviving buried archaeological remains associated with the features within the motte and bailey castle, which may provide important information about the activities that took place within it and the chronological construction of the defences. In addition, this castle is of communal value being one of the few documented motte and bailey castles to be held by the Welsh during its functional life.

6.119 Cae-Banal Castle Mound (Cadw Ref. RD108) is a simple medieval earthwork motte surrounded by a ditch, except to the east where the natural slope is the steepest and has been incorporated into the motte's outer defences.

6.120 The motte is located on a steep south-east facing spur that overlooks the valley formed by Summergil Brook. The location of the motte takes advantage of the natural landform, including the shallow ravine to east, to enhance its defences, and provides open views across the valley it was designed to control access and movement through.

6.121 The size of the motte and the lack of an accompanying bailey suggests that Cae-Banal acted as an outlier to the larger castle at of Crug Eryr, controlling access along the valley formed by Summergil Brook and protecting its eastern flank. While there is no intervisibility

between the two assets, their proximity implies a functional relationship. The spatial relationship between these and other contemporary military and administrative centres in the landscape is an important element of Crug Eryr's setting, which contributes to the appreciation and understanding of them as part of a system of military and administrative control and the politics of the time.

6.122 The heritage significance of Cae-Banal castle is primarily derived from the evidential (scientific) and historical (illustrative) value of its physical remains. This includes any surviving buried archaeological remains associated with the features identified within and surrounding the motte, which may provide important information about the activities that took place there and the chronological construction of the defences.

Future Baseline in the Absence of the Proposed Development

6.123 In the 'do nothing' scenario, there will be little physical change to the heritage significance of the historic assets within the Site as current land use (livestock grazing) entails processes which cause little or minimum ground disturbance to areas which have not already been disturbed. As such, only natural decay (weathering and erosion) is considered likely to affect any assets in the 'do nothing' scenario. It should, however, be noted that patterns of rural land use may change as a consequence of the UK leaving the European Union and as Welsh Government objectives drive an increase in woodland expansion.

6.124 Effects related to change in setting in a 'do nothing' scenario are impossible to quantify as it primarily rests on whether new proposals for development are brought forward elsewhere within the surroundings of the Site.

Implications of Climate Change

6.125 Chapter 14: Climate Change provides details of the climate change projections in north Wales for the 2060s, when the operational period of the Proposed Development is likely to end. In summary, the projections highlight that in the 2060s, summer and winter temperatures are

likely to be greater than the current baseline, with winter rainfall increasing and summer rainfall decreasing.

6.126 Increase in rainfall will change groundwater and soil conditions, potentially affecting the preservation of buried archaeological remains and eroding/flooding above ground historic assets.

Design Considerations (Embedded Mitigation)

6.127 The design of the Proposed Development has sought to avoid or minimise (as far as reasonably possible) effects to historic assets. Each iteration of the design has been reviewed to ensure that direct physical effects to known historic assets are avoided where possible. Where direct physical effects occur, it is only to assets of low and medium importance. Similarly, how turbines will appear within the setting of historic assets has been a key consideration in design refinements, including the location of turbines. Care has been taken to reduce the prominence of turbines in key lines of sight to and between historic assets. The design of the Proposed Development has also sought to avoid interacting with areas of peat and changes to the hydrology of the Site that could affect the Site's paleoenvironmental potential.

6.128 Further detailed information on the evolution of the design of the Proposed Development is presented in **Appendix 6.1** and **Chapter 3**.

Micrositing

6.129 During construction, micrositing may take place to allow adjustment within a defined radius of the proposed turbine locations, and a similar tolerance either side of the access track locations. The micrositing allowance for turbines and associated infrastructure is 50m, as set out in **Chapter 4**. Following a review of these areas and after the implementation of restrictions to micrositing, direct physical effects to historic assets due to micrositing have been avoided.

6.130 Further detailed information on changes to micrositing allowance to avoid direct physical effects to historic assets is presented in **Appendix 6.1**.

6.131 The micrositing allowance for turbines T21 to T25 have also been restricted to retain key lines of sight to and between historic assets.

6.132 It is considered that changes to the location of the remaining turbines within the micro-siting allowance will not increase the levels of effect resulting from setting change identified in **Appendix 6.1**.

Good Practice Measures (Applied Mitigation)

6.133 Good practice measures to prevent, reduce, and/or where possible offset potential physical effects to historic assets, including previously unrecorded buried archaeological remains, are proposed. Measures which will be adopted include:

- The temporary fencing off or marking out of historic assets in proximity to the construction footprint to prevent accidental damage during construction.
- Implementation of a working protocol should previously unrecorded buried archaeological remains (e.g. archaeological deposits and features) be discovered.
- The use of a Construction Environmental Management Plan (CEMP), supplemented by toolbox talks as appropriate, to highlight the historic environment sensitivities of areas of the Site to those working on the Proposed Development. An outline CEMP is provided at **Appendix 4.2**.
- Appointment of an Archaeological Clerk of Works (ACoW) to supervise targeted ground-breaking operations and provide onsite advice on avoidance of effects (e.g. providing onsite identification and recording of previously unrecorded historic assets and liaising with the local authority archaeological adviser (HCPA) as necessary).

6.134 HCPA will be consulted to provide guidance on appropriate conditions to be applied to any consent.

Construction Effects (Direct Physical Effects)

6.135 No direct physical effects during the construction phase of the Proposed Development to designated historic assets have been identified.

6.136 Direct physical effects resulting from the construction of the Proposed Development have been identified for six non-designated historic assets recorded within the Site.

6.137 The construction of the permanent and temporary hardstanding and access track for T24 will result in the removal Earthwork Enclosure (LUC_08). The total removal of this non-designated historic asset assessed to be of **low** importance is likely to result in a level of impact judged to be **large** resulting in a **moderate** level of effect, which is a significant effect in EIA terms.

6.138 Information on non-significant direct physical effects to the remaining five non-designated historic assets is presented in **Appendix 6.1**.

Operational Effects (Direct Effects Due to Setting Change)

6.139 Significant direct effects due to setting change as a result of the operation of the Proposed Development have been identified for four designated heritage assets of **high** importance and one non-designated historic asset assessed to be of **medium** importance. These are considered below.

6.140 Information on non-significant effects to eight designated historic assets and the two non-designated historic assets due to setting change is presented in **Appendix 6.1**.

6.141 All direct effects due to setting change will last for the life of the Proposed Development and will be reversible upon decommissioning.

Designated Historic Assets

Cwm Bwch Round Barrow Pair (Cadw Ref. RD255)

6.142 The nearest turbines from the historic asset will be T20 approximately 130m north-east, T25 c.500m to the west and T19 and T18 approximately 550m and 750m south-east and south respectively.

6.143 Turbine T20 will be set back behind the asset, between it and the rotational commercial forest to the east. Given the distance from the asset (c.130m) and height, T20 will be the dominant feature in the setting of this asset to the east. T26-T31 will be located below the historic asset to north and north-west. T30 and T31 will be partly screened by Fron-wen and to some extent intervening commercial forest. The hubs of T26-T31 will be below the skyline when seen from the Cwm Bwch barrows.

6.144 To the west of the asset, T25 will be located below the steep south-west slope of Cwm Bwch. The hub and blades of T25 will be directly to the west of the barrow. T21-T24 will be set back in a different landscape unit to the barrows on the west facing slope of Cwm Merwys and below Shepherd's Tump hill. T21-T24 and their associated infrastructure, and T25 will be the most visually prominent elements of the Proposed Development when looking west over and into Cwm Bwch and Cwm Merwys, towards Shepherd's Tump hill and the Aran Valley beyond (refer to **Figure 6.6**).

6.145 Running along the ridge to the south, T17 and T18 are set back from the ridge, but will be dominant features in the setting of the asset to the south. The remaining turbines to the south of the Site appear to retreat along the ridge and will be less dominant and will appear to be in a different landscape unit.

6.146 A borrow pit is located between T25 and T26 on the north-west facing slope between c.430m AOD and c.460m AOD, approximately 500m to the north-west of the barrows. The borrow pit is not predicted to have intervisibility with the barrows.

6.147 While turbines to the west (T21-T25) will be a marked change to the setting from the Cwm Bwch Barrows and dominant features in the setting of the asset, the landform which forms part of the asset's setting – Cwm Bwch horseshoe, Cwm Merwys, Shepherd's Tump hill and the Aran Valley beyond – will remain recognisable. The contribution these landscape features make to the understanding and appreciation of this asset's positioning in the landscape will remain perceptible.

6.148 The Shepherd's Tump barrow (Cadw Ref. RD253) to the west is in a distinctly different landscape unit to those above it at Cwm Bwch and Great Rhos (Cadw Refs. RD255; RD254). The distance between the Cwm Bwch Barrows and the Shepherd's Tump barrow (approximately 2.1km) in-combination with the lack of prominence of the asset's visible remains makes it difficult to identify the Shepherd's Tump barrow in views from the Cwm Bwch ridge. During operation of the Proposed Development, lines of sight between the Cwm Bwch barrows and Shepherd's Tump barrow will be retained. Turbines will still be close to the line of sight and the presence of intervening turbines (T21-T25) and movement of the blades and associated infrastructure will be a notable distraction from the way this relationship is experienced. The presence of these turbines will further diminish the relationship between Cwm Bwch Barrows

and the Shepherd's Tump barrow, which is limited by the distance between the Cwm Bwch Barrows and the Shepherd's Tump barrow (approximately 2.1km) in-combination with the lack of prominence of the asset's visible remains.

6.149 The presence of T18 on the ridge to the east of the Great Rhos barrow (Cadw Ref. RD254) will be a distraction but will not prevent intervisibility between the Cwm Bwch and Great Rhos barrows. The remaining turbines to the south, set back beyond the ridge on which Great Rhos barrow sits will similarly distract, but not prevent the appreciation and understanding of this relationship. The distinct landscape form – the top of the Cwm Bwch horseshoe and the opposing ridge – will remain well-defined, recognisable and easily readable in the landscape.

6.150 The natural approach to the barrows at Cwm Bwch from the Aran Valley, traversing between Shepherd's Tump hill to the west and Cwm Merwys to the east, circling north-east at Cowlod and follow the ridge past Great Rhos barrow, before turning north around the top of the Cwm Bwch horseshoe, will remain perceptible despite the presence of the Proposed Development in the landscape.

6.151 The visual and spatial relationship with the other barrows (Great Rhos and Shepherd's Tump), and the landform on which the Cwm Bwch barrows have been deliberately positioned, makes a positive contribution to how this historic asset is understood and appreciated as a funerary monument forming part of a distinct group, and this asset's heritage significance. While the presence of the Proposed Development in the landscape will be a notable change to how the Cwm Bwch barrows are experienced, the intended visual relationship between the barrows at Cwm Bwch, Shepherd's Tump and Great Rhos, and the ability to understand and appreciate the influence of the landforms they occupy in their positioning in the landscape will be retained.

6.152 The evidential (scientific) and historical (illustrative) value derived from the physical remains of the barrows including their upstanding remains and environmental information held within soils beneath the asset, which contributes most to its heritage significance, will not be affected.

6.153 The presence of the Proposed Development in the landscape during operation, will be a notable change to setting of the Cwm Bwch barrows, and will be a negative influence on how they are experienced in the landscape, but will not affect this historic asset's heritage significance. This change to the way the Cwm Bwch barrows' setting contributes to the way it is

experienced will lead to a level of impact judged to be **medium** resulting in a **moderate** level of effect, which is a significant effect in EIA terms.

Great Rhos Round Barrow (Cadw Ref. RD254)

6.154 The nearest turbine to the Great Rhos barrow is T18, approximately 220m to the north-east. T19 will be located c.600m to the north-east, and beyond that T20 is approximately 900m to the north. To the south-west are T17 and T16, c.700m and c.1km respectively.

6.155 Turbine T18 will be set back slightly above and behind this asset. Given the distance from the asset (c.220m) and height, T18 will be the dominant feature in the setting of this asset to the north-east. T19 and T20 will appear less dominant as they recede along the ridge to the north. To the west of the asset two groups of turbines, T21-T25 to the north-west and T14-T16 to the south-west, will frame views to the west. There will be no intervisibility with the borrow pit to the north.

6.156 T19, T20, T25 and T26, will be dominant features in the setting of this asset, and present in views towards the Cwm Bwch barrows (Cadw Refs. RD255). The remaining turbines to the north will be set back and below and will appear to recede into the background. The distinct landscape form – the top of the Cwm Bwch horseshoe and the opposing ridge and plateau – on which the Cwm Bwch barrows are positioned will remain well-defined, recognisable, and easily readable in the landscape.

6.157 T21-T24 and their associated infrastructure, will be the most prominent elements of the Proposed Development when looking north-west over Cwm Bwch and Cwm Merwys towards Shepard's Tump hill and the Aran Valley beyond (refer to **Figure 6.7**).

6.158 The Shepherd's Tump barrow (Cadw Ref. RD253) to the north-west is in a distinctly different landscape unit to that at Great Rhos and Cwm Bwch barrows. The distance between the Great Rhos Barrow and the Shepherd's Tump barrow (approximately 2.4km) in-combination with the lack of prominence of the asset's visible remains makes it difficult to identify the Shepherd's Tump barrow in views from the Great Rhos ridge. During operation of the Proposed Development, lines of sight between Great Rhos barrow and Shepherd's Tump barrow will be retained. Turbines will still be close to the line of sight and the presence of intervening turbines (T21-T24) and movement of the blades and associated infrastructure will be a notable

distraction from the way this element of relationship is experienced. The presence of these turbines will further diminish the relationship between Great Rhos barrow and the Shepherd's Tump barrow, which is limited by the distance between the Great Rhos barrow and the Shepherd's Tump barrow (approximately 2.4km) in-combination with the lack of prominence of the asset's visible remains.

6.159 Running along the ridge to the south, T17, T16 and T14 are set back slightly from the ridge but will be dominant features in the asset's setting to the south-west. The remaining turbines beyond appear to retreat along the ridge and will not be dominant and appear to be in a different landscape unit.

6.160 The natural approach to the Great Rhos barrow from the Aran Valley, traversing between Shepherd's Tump hill to the west and Cwm Merwys to the east, circling north-east at Cowlod and follow the ridge to Great Rhos barrow, before turning north beyond it around the top of the Cwm Bwch horseshoe to reach the Cwm Bwch barrow, will remain perceptible despite the presence of the Proposed Development in the landscape.

6.161 The visual and spatial relationship with the other barrows (Cwm Bwch and Shepherd's Tump), and the landform on which the Great Rhos barrow has been deliberately positioned, makes a positive contribution to how this historic asset is understood and appreciated as a funerary monument forming part of a distinct group, and this asset's heritage significance. While the presence of the Proposed Development in the landscape will be a notable change to how the Great Rhos barrow is experienced, the intended visual relationship between the barrows at Cwm Bwch, Shepherd's Tump and Great Rhos, and the ability to understand and appreciate the influence of the landforms they occupy and their positioning in the landscape will be retained.

6.162 The evidential (scientific) and historical (illustrative) value derived from the physical remains of the barrow including its upstanding remains and environmental information held within soils beneath the asset, which contributes most to its heritage significance, will not be affected.

6.163 The presence of the Proposed Development in the landscape during operation, will be a notable change to setting of the Great Rhos barrow, and will be a negative influence on how it is experienced in the landscape, but will not affect this historic asset's heritage significance. This change to the way the Great Rhos barrow's setting contributes to the way it is experienced will

lead to a level of impact judged to be **medium** resulting in a **moderate** level of effect, which is a significant effect in EIA terms.

Shepherd's Tump Round Barrow (Cadw Ref. RD253)

6.164 The nearest turbines to the Shepherd's Tump barrow are T21-T24. Of these T23 is approximately 300m to the south-east, T21 and T22 are c.700m and c.1km to the south-east respectively and T24 is c.700m to the east.

6.165 The four turbines (T28-T31) will appear to recede in a rough line to the north-east, the closest being T28 at approximately 2.1km. Turbines T25 and T26 will be set back below the barrow to the east, on the west facing slope of Cwm Merwys. Turbines T20, T19, T18 and T17, appear to be set back from the edge of the ridge of high ground beyond Cwm Merwys and Cwm Bwch on Great Rhos. The remaining turbines running along the ridge beyond Cowlod hill to the south-east are skylined but appear set back from the edge of the high ground and forming the backdrop to the west and south facing slopes remaining the dominant feature.

6.166 A borrow pit is located between T25 and T26 on the north-west facing slope between c.430m AOD and c.460m AOD, approximately 1.6km to the east of the barrow. The borrow pit will create an obvious manmade feature cut into the slope below the ridge. While it is acknowledged that the appearance of the borrow pit will soften with time, this feature will break up the natural landform and be a noticeable change in the landscape and the setting of the barrow.

6.167 Given their proximity to the asset (c.300m-1km) and height, T21-T24 will be the dominant feature in the setting of the asset to the east and south-east (refer to **Figure 6.8**). T23 will disrupt views from the asset of the horseshoe form of Cwm Bwch.

6.168 While turbines T21-T24 and to a lesser extent turbine T25 will disrupt views south-east from the Shepard's Tump barrow towards the Cwm Bwch and Great Rhos barrows (Cadw Refs. RD255; RD254), lines of sight between these barrows will be maintained. Turbines will still be close to the line of sight and the presence of intervening turbines (T21-T25) and movement of the blades and associated infrastructure will be a notable distraction from the way this element of relationship is experienced. Given their low profile and position set back slightly from the edge of the ridge on a plateau, their distance (c.2.1km) and to an extent the colour palette of the

covering and surrounding vegetation, the barrows at Cwm Bwch are only just discernible in this view. In contrast, the Great Rhos barrow's location on the ridge silhouettes it against the skyline, making it a clearly recognisable landscape feature in views from the Shepard's Tump barrow.

6.169 During operation of the Proposed Development, the presence of intervening turbines and associated infrastructure to the south-east of the Cwm Bwch and Great Rhos barrows will be a distraction. The presence of these four turbines and T25, will diminish the relationship between the Cwm Bwch barrows and be a distraction in views between the asset and the Great Rhos barrow.

6.170 The uninterrupted views from the Shephard's Tump barrow to the west over the Aran Valley will be unaffected by the presence of the Proposed Development in the setting of the asset. Where there is intervisibility with the barrow from within the landscape below looking east, the asset's prominence will be diminished by the presence of turbines in the landscape setback but behind it. However, the distinctive form of the barrow and Shepard's Tump hill, will remain recognisable in these views, and the contribution this makes to the appreciation and understanding of the chosen location – i.e. to enable it to be visible from the west when looking east – will remain.

6.171 The natural approach to the Shepherd's Tump barrow from the Aran Valley, and the relationship of this routeway to enable access to the Great Rhos barrow and Cwm Bwch barrows, will remain perceptible despite the presence of the Proposed Development in the landscape.

6.172 The visual and spatial relationship between with the other barrows (Cwm Bwch and Great Rhos), and the landform on which the Shepard's Tump barrow has been deliberately positioned, makes a positive contribution to how this historic asset is understood and appreciated as a funerary monument forming part of a distinct group, and this asset's heritage significance. While the presence of the Proposed Development in the landscape will be a notable change to how the Shepard's Tump barrow is experienced, the intended visual relationship between the barrows at Cwm Bwch, Shepherd's Tump and Great Rhos, and the ability to understand and appreciate the influence of the landforms they occupy on their positioning in the landscape will be retained.

6.173 The evidential (scientific) and historical (illustrative) value derived from the physical remains of the barrow including its upstanding remains and environmental information held within soils beneath the asset, which contributes most to its heritage significance, will not be affected.

6.174 The presence of the Proposed Development in the landscape during operation, will be a notable change to setting of the Shepard's Tump barrow, and will be a negative influence on how it is experienced in the landscape, but will not affect this historic asset's heritage significance. This change to the way the Shepard's Tump barrow's setting contributes to the way it is experienced will lead to a level of impact judged to be **medium** resulting in a **moderate** level of effect, which is a significant effect in EIA terms.

Crug Eyr Mound and Bailey Castle (Cadw Ref. RD003)

6.175 The ZTV for the Proposed Development has identified that there will be potential intervisibility with 21 turbines from Crug Eyr castle (refer to **Figure 6.12**). The nearest elements of the Proposed Development will be the substation and access tracks which are located on the escarpment and the ridgeline of Fronddyrys and situated c.800m north-east of the asset. Also located on at Fronddyrys, will be a borrow pit approximately 1.1km to the north-east. The nearest turbines are both located north-east of the asset, with T01 being located 1.22km away, and T03 located 1.33km.

6.176 Whilst the Proposed Development will be in a different landscape unit, with the turbines set back behind and slightly below the highest point of the Fronddyrys and Fron Goch ridgelines, the presence of the Proposed Development, in particular the substation, borrow pit (which will soften with time) and access tracks, will be a notable change in the setting of the castle to the north-east.

6.177 The presence of the Proposed Development to the north-east, will not affect the understanding and appreciation of the castle's deliberate positioning on the top of a knoll, whose form complements and adds to the castle's defences, or the castle's dominance over the Edw Valley below, evidenced by the commanding views to the west.

6.178 The spatial and functional relationship with putatively contemporary historic assets, such as the hollow way (HCPA Ref. PRN35076), and a group of building platforms at Gwernarglwydd

(HCPA Refs. PRN50349; PRN4451), or Cae-Banal Castle Mound (Cadw Ref. RD108; see below), which contribute to the heritage significance of this asset, will not be affected by the operation of the Proposed Development, or its presence in the setting of the asset to the north-east.

6.179 While the presence of the Proposed Development during operation will not affect the understanding and appreciation of the deliberate siting of the castle or relationship with other contemporary historic assets in the landscape, turbines, access tracks, the substation and borrow pit to the north-east, will be a notable change to the castle's setting, and how it is experienced in the landscape. In addition, the heritage significance of this historic asset is principally derived from its evidential (scientific) and historical (illustrative) value, which will not be affected by the presence of the Proposed Development in its setting.

6.180 While the introduction of the Proposed Development in the landscape will not affect this historic asset's key setting relationships, it will change how these are experienced. This change to the way Crug Eryr Mound and Bailey Castle's setting contributes to the way it is experienced will lead to a level of impact judged to be **medium** resulting in a **moderate** level of effect, which is a significant effect in EIA terms.

Non-designated Historic Assets

Nyth-grug Cairn (HCPA Ref. PRN6832)

6.181 This non-designated historic asset has been assessed to be of **medium** importance (see Chapter 4 of **Appendix 6.1**).

6.182 The ZTV for the Proposed Development identifies that this asset will have intervisibility with all 30 turbines (see **Figure 6.14**). The nearest turbine (T04) along with its permanent hardstanding will be c.50m to the south-east of the asset. Turbines T01-T03 and T05 will be between c.500m and c.700m from the asset. It is not anticipated that the substation or borrow pit to the south-west will be visible from the cairn.

6.183 Turbine T04 will be a major change to the setting of the cairn. While T01-T03 will be slightly below the cairn to the west, these turbines will be clearly visible and a notable distraction

in views from the cairn to the west which extend over the Aran Valley to the higher ground beyond.

6.184 While the Proposed Development will be a notable change, the moorland edge setting of the cairn and the ability to appreciate and understand the choice of location i.e. the summit of Nyth-grug and wide vistas over the surrounding landscape, as well as the topographical features and form of that landscape will not be affected. While the presence of the Proposed Development in the landscape will change to how the Nyth-grug Cairn is experienced, the ability to understand and appreciate the influence of the landform this asset occupies on its positioning in the landscape will be retained.

6.185 The presence of the Proposed Development in the landscape during operation, will be a notable change to the setting of this summit cairn. The proximity of turbines T03 and T04 and their associated access tracks will be a marked change to the setting of the asset. Given the close proximity of T04, this turbine's blades will over-sail the asset, affect the way the asset is experienced.

6.186 The evidential (scientific) and historical (illustrative) value derived from the physical remains of the barrow including its upstanding remains and environmental information held within soils beneath the asset, which contributes most to its heritage significance will not be affected.

6.187 The presence of the Proposed Development in the landscape during operation, will be a notable change to setting of Nyth-grug Cairn, and will be a negative influence on how it is experienced in the landscape, but will not affect this historic asset's heritage significance. This change to the way the summit cairn's setting contributes to the way it is experienced in the landscape will lead to a level of impact judged to be **medium** resulting in a **moderate** level of effect, which is a significant effect in EIA terms.

Beneficial Effects

6.188 The realignment of the current boundary and the removal of the post and wire fence, which bisects Great Rhos Round Barrow (Cadw Ref. RD254), will be a notable positive change to the setting of the asset, and will be a positive effect on how it is experienced. This change will

lead to a level of impact judged to be small resulting in a **minor** level of beneficial effect in EIA terms. Further information is provided in **Appendix 6.1**.

6.189

Proposed Additional Mitigation

Direct Physical Effects

6.190 The following specific additional mitigation for significant direct physical effects to Earthwork Enclosure (LUC_08) is proposed:

- A Level 3 landscape survey record²⁷ including preparation of a report on the results of the landscape survey and preparation and submission of an ordered archive. A Level 3 record provides an enhanced and integrated, multidisciplinary record. It will comprise an account of the historic asset and its setting accompanied by a full range of measured and annotated drawings as well as photographs and reconstruction/phased diagrams and an accurate measured survey plan alongside three-dimensional data.
- Archaeological area excavation including preparation of a report on the results of the archaeological recording and preparation and submission of an ordered archive.

6.191 The Level 3 landscape survey record and archaeological area excavation will be undertaken in line with a Written Scheme of Investigation agreed with HCPA.

6.192 Additional mitigation for non-significant direct physical effects is identified in **Table 6.1** of **Appendix 6.1**.

Direct Effects Due to Setting Change

6.193 For developments of this sort, it is difficult to fully mitigate impacts to historic assets resulting from setting change during the operation beyond those changes to the design and layout identified as the Proposed Development evolves (embedded mitigation). Therefore, no specific additional mitigation to reduce the potential effects to historic assets due to setting

²⁷ Historic England (2017) *Understanding the Archaeology of Landscapes: A Guide to Good Recording Practice* (Second Edition) (page 33-34)

change resulting from the presence of the Proposed Development in the landscape have been identified.

Offsetting and Enhancement Measures

6.194 Cadw's setting guidance identifies that offsetting through compensatory proposals, such as improved access and interpretation, will not reduce the impact of a development within the setting of the historic asset and should not be considered as mitigation.²⁸ Cadw does advise that offsetting can be suggested as part of a proposed development, to enable the decision-making authority to weigh the benefits of the development, including opportunities for compensatory proposals, against the impact of the development on historic assets and their setting.

6.195 In relation to setting, Cadw defines enhancement measures, as measures to enhance the setting of a historic asset, such as the removal of trees to open up an intended view.²⁹ For this assessment, enhancement measures are taken to include all compensatory proposals to offset effects to the historic environment resulting from the Proposed Development.

6.196 The approach to enhancement measures is identified in **Appendix 6.1** which is intended as a starting point for further discussion with relevant consultees and interested parties to develop a site specific offering. The Applicant has no fixed vision as to how best the various measures suggested could or should be implemented. Instead, this is intended to offer a series of ideas that can be developed in partnership with key consultees including Cadw, HCPA, land managers, commoners and the local community.

²⁸ [Welsh Government \(2017\) Setting of Historic Assets in Wales \(Section 5 on page 10\)](#)

²⁹ [Welsh Government \(2017\) Setting of Historic Assets in Wales \(Section 6 on page 10\)](#)

Residual Effects

Residual Construction Effects (Direct Physical)

6.197 Following the implementation of the additional mitigation identified above and in **Table 6.5** (below), none of the direct physical effects due to the construction of the Proposed Development are predicted to be significant.

Residual Operational Effects (Due to Setting Change)

6.198 As no additional mitigation is proposed to address significant setting effects, the significance of effects remain as reported above.

Assessment of Cumulative Effects

6.199 No cumulative effects to historic assets have been identified resulting from the operation of the Proposed Development. Further information on cumulative effects is presented in **Appendix 6.1**.

Combined Effects

6.200 No interrelationships between effects have been identified.

Further Survey Requirements and Monitoring

6.201 No further survey requirements or monitoring have been identified for the historic environment at this stage. Monitoring may be required for offsetting and enhancement measures. The form of monitoring will be agreed by relevant parties as part of the development of offsetting and enhancement measures.

Summary of Effects

6.202 **Table 6.5** below summarises the predicted significant effects of the Proposed Development on the historic environment.

Table 6.5 Summary of effects

Predicted Effect	Importance	Magnitude	Significance	Mitigation	Significance of Residual Effect
Construction					
Removal of Earthwork Enclosure (LUC_08)	Low	Medium	Moderate	A Level 3 landscape survey record and archaeological area excavation recording, including preparation of a report on the results of the landscape survey and preparation and submission of an ordered archive.	Minor
Operation					
Cwm Bwch Round Barrow Pair (Cadw Ref. RD255)	High	Medium	Moderate	None proposed.	Moderate
Great Rhos Round Barrow (Cadw Ref. RD254)	High	Medium	Moderate	None proposed.	Moderate
Shepherd's Tump Round Barrow (Cadw Ref. RD253)	High	Medium	Moderate	None proposed.	Moderate

Predicted Effect	Importance	Magnitude	Significance	Mitigation	Significance of Residual Effect
Crug Eyr Mound and Bailey Castle (Cadw Ref. RD003)	High	Medium	Moderate	None proposed.	Moderate
Nyth-grug Cairn (HCPA Ref. PRN6832)	Medium	Medium	Moderate	None proposed.	Moderate



**Nant Mithil
Energy Park Limited**

Environmental Statement

Chapter 7: Ecology (non-avian)



Chapter 7

Ecology

Introduction

7.1 This chapter considers the potential effects of the Proposed Development on Ecology. It details the ecological baseline conditions and identifies Important Ecological Features (IEFs). An Ecological Impact Assessment (EclA) is then carried out for IEFs which may be vulnerable to effects from the Proposed Development.

7.2 The Ecology chapter should be read with reference to the scheme description in **Chapter 4: Project Description**, as well as other chapters as referenced throughout. This chapter relates entirely to non-avian ecology. See **Chapter 8: Ornithology** for avian baseline details and assessment. Relevant assessment regarding groundwater-dependent terrestrial ecosystems (GWDTE) is included within **Chapter 11: Geology, Hydrology and Hydrogeology**.

7.3 The Ecology (non-avian) assessment was undertaken by ITP Energised. The chapter has been authored by Donna Black BSc (Hons) MSc ACIEEM, Jenny Diack BSc (Hons) MCIEEM, Alison Hood BSc (Hons) MSc MCIEEM and Richard King BSc (Hons) MSc MCIEEM (see **Appendix 1.1: Statement of Expertise**).

7.4 This chapter is supported by the following figures in **Volume 2**. The figures marked 'Confidential' are provided in Volume 5: Confidential Appendices (which are only available to relevant consultees):

- **Figure 7.1a: Nature Conservation Designations: Statutory Designations**
- **Figure 7.1b: Nature Conservation Designations: Non-Statutory Designations**
- **Figure 7.2a: North UK Habitat Classification Survey Results**
- **Figure 7.2b: South UK Habitat Classification Survey Results**
- **Figure 7.3a: North National Vegetation Classification (NVC) Survey Results**

- **Figure 7.3b: South National Vegetation Classification Survey Results**
- **Figure 7.4: Potential Groundwater Dependent Terrestrial Ecosystems (GWDTE)**
- **Figure 7.5: Protected Mammal Survey Results (Confidential)**

7.5 This chapter is informed by and should be read in conjunction with the following appendices, provided in **Volume 3**. The appendices marked 'Confidential' are provided in **Volume 5: Confidential Appendices** (which are only available to relevant consultees):

- **Appendix 7.1: Nant Mithil Ecological Desk Study**
- **Appendix 7.2: Nant Mithil Habitat Survey Report (Environment Systems, 2021)**
- **Appendix 7.3: Nant Mithil Phase 1 Habitat Survey and NVC Report 2022 (ITPEnergised, 2022)**
- **Appendix 7.4: Nant Mithil Habitat Survey Report 2024 (Environment Systems, 2024)**
- **Appendix 7.5: Nant Mithil Bat Risk Assessment**
- **Appendix 7.6: Nant Mithil Protected Species Report (Confidential)**
- **Appendix 7.7: Nant Mithil Otter Survey Report**
- **Appendix 7.8: Nant Mithil Great Crested Newt Report (GCN) (Confidential)**
- **Appendix 7.9: Nant Mithil Aquatic Habitat Assessment Report**
- **Appendix 7.10: Outline Habitat Management Plan and Net Benefit for Biodiversity Assessment**
- **Appendix 7.11: Nant Mithil Shadow Habitat Regulations Assessment (HRA)**
- **Appendix 7.12: Nant Mithil Fish Survey Report 2024**
- **Appendix 7.13: Nant Mithil Bryophyte Survey Report 2024**
- **Appendix 7.14: Nant Mithil NVC Survey Report 2024**

Scope of the Assessment

Effects Assessed in Full

7.6 The following effects were identified at the Scoping stage for consideration in this assessment:

Construction

7.7 The following potential effects are assessed in the chapter:

- Damage/modification and loss of habitat IEFs;
- Habitat fragmentation and disturbance/displacement of bats, badger, fish and GCN species IEFs;
- Pollution events and sedimentation of aquatic habitat, including the River Wye SAC and SSSI; and,
- Death/injury and or disturbance to IEFs, such as bats, including destruction/removal of habitat.

Operation

7.8 The following potential effects are assessed in the chapter:

- Injury or death to bat species due to turbine collision and/or barotrauma;
- Disturbance/displacement of faunal species once turbines are in operation;
- General site maintenance activities including vehicle collisions with faunal species; and,
- Pollution events and sedimentation that may be caused by Site maintenance.

Decommissioning

7.9 Decommissioning is considered to result in similar potential significant effects to construction, although the magnitude of the impact is likely to be lower. This is based on the access tracks and hardstandings likely remaining in situ so there will be no impacts associated with their removal (such as sedimentation, further disruption to habitats etc). Decommissioning is therefore scoped out of the assessment.

Cumulative Effects

7.10 Cumulative effects as a result of the Proposed Development will be considered as follows:

- Cumulative effects during construction on Ecology; and,
- Cumulative effects during operation on Ecology.

Effects Scoped Out

7.11 Based on the desk based and field survey work undertaken, the professional judgement of the EIA team, experience from other relevant projects and policy guidance or standards, and feedback received from consultees, the following topic areas have been ‘scoped out’ of detailed assessment, as proposed in the Scoping Report:

- Due to the majority of designated sites (that lie in proximity to the Site) being designated for habitats and floral species, it is considered unlikely there will be any negative effects as a result of construction, operation or decommissioning activities due to lack of functional connectivity. Therefore with the exception of Radnor Forest SSSI, which overlaps the Site’s boundary, and the River Wye SAC and SSSI, which lies within 1.6km and is hydrologically connected, designated Sites will be scoped out of the assessment – NRW confirmed agreement with this in their Scoping Response of 24/11/2022.
- In line with common practice for wind farm assessments, due to the size of the Site and small footprint of the Proposed Development a targeted survey for reptiles was not considered pragmatic. However any incidental observations of reptiles were recorded during other surveys and mitigation for reptiles will be included within the CEMP where suitable habitat is present. Therefore, reptiles are scoped out of the assessment.
- Suitable habitats for hazel dormouse are outwith the Proposed Development areas, therefore significant impacts would be unlikely, and dormouse is scoped out of the assessment – NRW confirmed agreement with this for the main Site within their DAS response of 12 September 2023 and for the Site entrance within email correspondence of the 05/10/2023.

Assessment Methodology

Legislation, Policy and Guidance

Legislation

7.12 The assessment is carried out in accordance with the following legislation:

- The Environment (Wales) Act 2016¹;
- The Conservation of Habitats and Species Regulations 2017²;
- The Hedgerow Regulations 1997³;
- The Invasive Alien Species (Enforcement and Permitting) Order 2019⁴;
- The Wellbeing of Future Generations (Wales) Act 2015⁵;
- The Protection of Badgers Act 1992⁶; and,
- The Wildlife and Countryside Act 1981 (as amended)⁷.

Policy

7.13 The assessment is carried out in accordance with the following policies:

- Future Wales: The National Plan 2040 (Welsh Government, 2021a)⁸;
- Planning Policy Wales 12 (PPW) (Welsh Government, 2024b)⁹; and,
- Powys Local Development Plan (2011-2026)¹⁰.

¹ [Welsh Government \(2016\) Environment \(Wales\) Act 2026](#)

² [UK Government \(2017\) The Conservation of Habitats and Species Regulations 2017](#)

³ [UK Government \(1997\) The Hedgerows Regulations 1997](#)

⁴ [UK Government \(2019\) The Invasive Alien Species \(Enforcement and Permitting\) Order 2019](#)

⁵ [Welsh Government \(2015\) Well-being of Future Generations \(Wales\) Act 2015](#)

⁶ [UK Government \(1992\) Protection of Badgers Act 1992](#)

⁷ [UK Government \(1981\) Wildlife and Countryside Act 1981](#)

⁸ [Welsh Government \(2019, updated 2021a\) Future Wales: the national plan 2040](#)

⁹ [Welsh Government \(2024\) Planning Policy Wales \(Edition 12\)](#)

¹⁰ [Powys County Council \(2011\) Powys Local Development Plan 2011-2026 \(Adopted April 2018\)](#)

Guidance

7.14 This assessment is carried out in accordance with the principles contained within the following documents:

- Guidance document on the strict protection of animal species of Community interest under the Habitats Directive (European Commission, 2021)¹¹; and,
- Technical Advice Note (TAN) 5: Nature Conservation and Planning (2009)¹².

7.15 Further key guidance documents relating to the assessment of effects of windfarm developments on terrestrial (non-avian) ecological receptors that have been referenced in this assessment include the following:

- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (Chartered Institute of Ecology and Environmental Management (CIEEM), 2018)¹³;
- Species and Habitats of Principal Importance in Wales, as listed in Section 7 of the Environment (Wales) Act 2016¹⁴;
- State of Natural Resources Report for Wales 2020 (NRW, 2020)¹⁵;
- Mid Wales Area Statement (NRW)¹⁶;
- Powys Nature Recovery Action Plan (2022-2032) (Powys Nature Partnership)¹⁷;
- Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation (NatureScot *et al.*, 2021)¹⁸; and,

¹¹ European Commission (2021) Guidance document on the strict protection of animal species of Community interest under the Habitats Directive

¹² Welsh Government (2009) Technical Advice Note (TAN) 5: Nature Conservation and Planning

¹³ Chartered Institute of Ecology and Environmental Management (CIEEM) (2018, updated 2022) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (Version 1.2)

¹⁴ Wales Biodiversity Partnership (2016) Section 7 – Biodiversity lists and duty to take steps to maintain and enhance biodiversity

¹⁵ Natural Resources Wales (2020) State of Natural Resources Report (SoNaRR) for Wales 2020

¹⁶ Natural Resources Wales (undated) Mid Wales Area Statement

¹⁷ Powys Nature Partnership (2022) Powys Nature Recovery Action Plan 2022-2032

¹⁸ NatureScot, Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, The University of Exeter and The Bat Conservation Trust (BCT) (2021) Bats and Onshore Wind Turbines – Survey, Assessment & Mitigation (Version: August 2021)

- Great Crested Newt Mitigation Guidelines (English Nature, 2001)¹⁹.

7.16 Where appropriate, more detail relating to specific legislation, guidance or policy is provided in the corresponding appendix for each specialist input supporting this chapter (**Appendices 7.1 to 7.14**).

Consultation

7.17 In undertaking the assessment, consideration has been given to the Scoping Responses and other consultation which has been undertaken as detailed in **Table 7.1**.

¹⁹ English Nature (2001) Great Crested Newt Mitigation Guidelines

Table 7.1 Consultation responses

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Powys County Council (PCC) Ecologist	Formal Scoping Consultation	The Powys Nature Recovery Action Plan (PNRAP) is the updated version of the Powys Local Biodiversity Action Plan. Consideration of species and habitats identified within the PNRAP would ensure locally important species and habitats can be appropriately accounted for and for net biodiversity loss of these species and habitats to be avoided and opportunities for enhancement can be maximised.	The PNRAP has been referred to throughout the survey effort and assessments to ensure that all locally important species and habitats have been considered and are appropriately accounted for and for net biodiversity loss of these species and habitats to be avoided and opportunities for enhancement maximised.
Natural Resources Wales (NRW) 24/11/2022	Formal Scoping Consultation	In general, the EIA for this development should include sufficient information to enable the local planning authorities to determine the extent of any environmental impacts arising from the proposed scheme on legally protected species, including those which may also comprise notified features of designated sites affected by the proposals.	Legally protected species including those which comprise notified features of designated sites affected by the Proposed Development have been taken into account and impacts assessed accordingly – see paragraphs 7.78-7.174 and 7.183-7.328.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Evaluation of the impacts of the scheme should include – direct and indirect; cumulative; short, medium and long term; permanent and temporary; positive and negative; construction, operation and decommissioning/post operational phases and impacts on long-term site security of the nature conservation resource.	All such impacts have been considered within the evaluation – see paragraphs 7.183-7.328.
		The EIA must include a description of all the existing natural resources and wildlife interests within and in the vicinity of the proposed development together with a detailed assessment of the likely impacts and significance of those impacts.	All existing natural resources and wildlife interests are described and impacts assessed in paragraphs 7.78-7.174 and 7.183-7.328.
		In general, any habitat surveys should accord with the NCC Phase 1 Survey guidelines (NCC (1990) Handbook for Phase 1 Habitat Survey (NCC, Peterborough)). We advise that Phase 1 surveys are undertaken and completed during	Phase 1 and the more detailed UK Hab and Phase 2 (NVC) surveys have been undertaken and are detailed within Appendices 7.2, 7.3 and 7.4.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		the summer to ensure the best chance of identifying the habitats present.	
		Protected Species: We advise that the site and where necessary land adjacent to the site is subject to assessment to determine the likelihood of protected species being present and affected by the proposals. Targeted species surveys should be undertaken for all species scoped in which: ■ i. Are undertaken by qualified, experienced, and where necessary, licensed ecologist(s); and ■ ii. Comply with current best practice guidelines. In the event that the surveys deviate from published guidance, or there are good reasons for deviation, full justification for this should be included within the EIA.	All surveys/assessments required to assess the likelihood of habitats and protected species being present which may be impacted by the proposals, have included the Site and where necessary land adjacent to the Site (where access was permitted, land was accessible, and health and safety allowed – see paragraph 7.43-7.62 for limitations). All surveys were undertaken following best practice guidance, which includes specific survey buffers for certain species, which were taken into account – see paragraph 7.18 – Study Area.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Bats: Surveys for bats should follow the guidance in Bats and Onshore Wind Turbines, Survey, Assessment and Mitigation (NatureScot). NRW will require an assessment of likely risk of the proposals on Bats using the Ecobat tool in the above guidance, with the above output clearly indicating if there are turbines and months/seasons posing a particular risk to bats such that mitigation measures may be required. The Preliminary roost assessments referred to above should follow the guidance in Bat Conservation Trust (BCT's) 'Bat Surveys for Professional Ecologists Good Practice Guidelines (3rd Ed)'. Where safe to do so, we recommend that trees with potential to support roosting bats are subject to climbed endoscope inspections.	Bat surveys of the Site and up to a 250m buffer (where access was permitted, land was accessible, and health and safety allowed) have been undertaken between 2020 and 2023. This included a Preliminary Roost Assessment of buildings, trees and structures within the Study Area and bat activity surveys using static recorders during the 2020 and 2022 bat activity seasons. Surveys were carried out in line with the recommended guidance. Based on the results of the surveys a Bat Risk Assessment has been completed to identify turbine locations where mitigation may be required to reduce the risk to bats. The Bat Risk Assessment has been updated in November 2024 following confirmation of Ecobat being back online following a period of technical difficulties since June 2022 . Ecobat has now been used to re-analyse all survey

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			data to provide a measure of bat activity/site risk and the results of both years surveys have been considered within the Bat Risk Assessment (Appendix 7.5).
		GCN: We note that Great crested newts have been confirmed as present within the site boundary through positive eDNA. We further note ‘assessments for GCN are done within 500m of breeding ponds and that the proposed development will avoid areas within 500m of a breeding pond, where practical’. If the proposed development is within 500m of a pond used by GCN, these should be followed up with the suite of traditional surveys to determine the population concerned as per the guidance set out in “Great Crested Newt Mitigation Guidelines” by English Nature dated 2001.	Where ponds have been identified within 500m of the Proposed Development as supporting GCN, through presence/absence surveys, then full population assessments have been conducted of these ponds to confirm the population size class . Where ponds have previously been identified as unsuitable for GCN, as a precaution due to fluctuations in water levels and age of some of the initial HSI data, an updated assessment has been conducted in 2024 of ponds within 250m of the Proposed Development to ensure pond and GCN

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			data is up to date to inform mitigation and licencing requirements across the Site.
		Dormouse: We are aware of dormouse records within the locality and from the submission it appears there may be habitat which would support this species. We therefore advise that we do not agree with the Applicant's proposal to scope dormouse out and advise they are scoped into the EIA.	Further consultation with NRW in 2023 ²⁰ resulted in NRW removing this request and agreeing that further dormouse surveys of the main site would no longer be required. Further direct communications ²¹ with the local NRW officer also confirmed that surveys at the entrance to the Site where hedge removal is proposed would not be required. However, a working method statement will be produced which mitigates any potential impacts on dormouse during construction. This will

²⁰ NRW DAS response dated 12 September 2023.

²¹ Personal Comms with Cinzia Sertorio (NRW) dated 5 October 2023.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			follow best practice guidance ²² and will be included in the CEMP.
		Otter and water vole: We welcome that specific surveys for otters and water voles will be carried out for all land within the developable area and up to 250m from its boundary. We advise in relation to otters that the assessment ensures that habitats are assessed for its potential natal use.	Noted. Appendices 7.6 and 7.7 detail these surveys.
		Impact Assessment: Should protected species be confirmed, information must be provided identifying species-specific impacts in the short, medium and long term together with any mitigation and compensation measures proposed to avoid, reduce or offset the impacts identified. We advise comprehensive descriptions of the habitats affected are	Where protected species have been confirmed information is provided on impacts in the short, medium and long term as well as mitigation and compensation measures as detailed in paragraphs 7.183-7.328. Maintenance of favourable conservation status has been considered in paragraphs 7.183-7.328.

²² Bright, Morris and Mitchell-Jones (2006) The Dormouse Conservation Handbook (Second Edition)

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		included to support robust conclusions about their significance for the species. We advise that EIA considers significance (both alone and in combination) and where applicable conservation status. The EIA must demonstrate that there will be no detriment to maintenance of favourable conservation status (FCS) of the species during construction, operation, maintenance and where relevant decommissioning phases of the scheme. Where proposals implicate protected species which are also notified features of designated sites (e.g. SAC, SSSI), we advise that the EIA considers the impacts on those species from both perspectives. We advise that the EIA sets out how the long term site security of any mitigation or compensatory measures will be assured, including management and monitoring information and long term financial and management responsibility.	Noted. Where significant impacts on protected species are identified a Species Protection Plan (SPP) will be implemented.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Where the potential for significant impacts on protected species is identified we advocate that a conservation plan is prepared for the relevant species and included as an Annex to the EIA.	
		European protected species: Where a European Protected Species (EPS) is identified and the development proposal will contravene the legal protection they are afforded, a licence should be sought from NRW. The EIA must include consideration of the requirements for a licence and set out how the works will satisfy the three requirements as set out in the Conservation of Habitats and Species Regulations 2017 (as amended).	Noted – Licences from NRW will be required for badger and GCN, as outlined in paragraphs 7.254 and 7.255 respectively. The licencing requirements will be incorporated into subsequent SPPs. An outline of how works will satisfy the three requirements as set out in the Conservation of Habitats and Species Regulations 2017 (as amended) for GCN is included in paragraph 7.258.
		Local Biodiversity Interests: We recommend that the Applicant consults the Local Authority Ecologist on the scope of the work to ensure that regional and local biodiversity issues are adequately considered, particularly those habitats	The PCC Ecologist has been consulted on the scope of the work as well as the Outline Habitat Management Plan (OHMP). The local biological

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		and species listed in the relevant Local Biodiversity Action Plan and that are considered important for the conservation of biological diversity in Wales. NRW would expect the Applicant to contact other relevant people/organisations for biological information/records relevant to the site and its surrounds. These include the relevant local records centre and any local ecological interest groups (e.g. bat, mammal groups).	records centre has also been consulted as part of the desk study.
		Securing biodiversity enhancement: We also advise that, in accordance with the Environment (Wales) Act 2016 and Planning Policy Wales, the application demonstrates how it can deliver biodiversity enhancements and thus contribute to promoting ecological resilience.	The OHMP and NBB assessment in Appendix 7.10 demonstrates how the application can deliver biodiversity enhancements and thus contribute to promoting ecological resilience.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Natural Resources Wales (NRW) 24/06/2024	Statutory Pre-Application Consultation (PAC)	All mitigation identified in the sHRA will need to be detailed in a submitted Construction Environmental Management Plan (CEMP).	Noted. It is confirmed that this mitigation is detailed in the Outline CEMP (Appendix 4.2) and a condition is proposed, requiring a detailed CEMP to be submitted and approved prior to commencement of the development.
		The sHRA (Section 7) has satisfactorily screened the potential for in combination effects of the proposed development with seven other developments within the River Wye SAC catchment. However, we note that Section 4.28 of the ES refers to the connection of the proposed substation to Green GEN 132 kV Towy Usk project. We advise that this project is relevant when considering the combined potential environmental impact of the development and should be included in Section 4.1.3 and Section 7 of the sHRA (Appendix 7.11).	The Green GEN Cymru 132kV Towy Usk Project has been taken into consideration, however as it is only at scoping stage it has not been included in the cumulative assessment. The approach to cumulative assessment is set out in Chapter 2: Approach to the EIA .

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Nutrient sensitive catchment. With regards to Phosphorous, the Shadow HRA has identified that there is a potential Likely Significant Effect (LSE) as a result of changes to the watercourses soil chemistry, however there is no specific reference to the impact of phosphorous from the proposed development on water quality within the catchment. We will advise the Competent Authority to screen potential impacts from phosphorous in their HRA.	Reference has been made in the sHRA (Appendix 7.11) to the impact of phosphorous from the Proposed Development on water quality within the catchment (Appendix 7.11 and Table 7.2, Section 5.1.4).
		Table 7.9 Evaluation of ecological features. Fish species are mentioned in this table despite the Aquatic Habitat Assessment Report (Appendix 7.9) suggesting that salmonids, a Section 7 species Environment (Wales) Act 2016 and minor species are present. We advise that further consideration should be given to the inclusion of salmonids in this table.	Salmonids, white-clawed crayfish, bullheads and river/brook lamprey have now been included in this table.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Less than local level of importance is given to running water despite rivers and streams being included in the Section 7 list of habitats Environment (Wales) Act 2016. We do not agree with the evaluation that <i>'the streams on site do not align with the Section 7 habitat 'Rivers' and the Freshwater and wetlands priority in the Powys Nature Recovery Action Plan (PNRAP)'</i> . We advise further consideration is given to this matter.	Table 7.9 has been amended, and further consideration has been given to running water with acknowledgment that they do align with the Section 7 habitat 'Rivers'. They have been reassessed as being of local level importance.
		Table 7.11 Important ecological features scoped in or out of the assessment – The River Wye SAC is scoped into the assessment for both the construction and operational phase of the development. Whilst we note reference has been made to the presence of salmonids and white-clawed crayfish as qualifying features, there has been no mention of bullhead, an Annex II species that is one of the primary reasons for the selection of this site.	Table 7.11 has been updated with the inclusion of bullhead and river/brook lamprey. Rivers, streams and fish have been added to the table.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		The table does not include rivers and streams within the list of habitats nor fish within the list of species. It is not clear why these have been omitted or whether all watercourses and fish species are considered as Important Ecological Features (IEFs) within the River Wye SAC catchment.	
		Section 7.186 – Assessment of Construction Effects – We advise that fragmentation (of fish habitat) due to the construction of watercourse crossings should be included in this section.	Consideration of fragmentation (of fish habitat) has been included.
		Section 7.193 – Assessment of Effects River Wye SAC – Impact. This section should include consideration of impacts on bullhead as well as habitat fragmentation impacts	Consideration of impacts on bullhead and habitat fragmentation impacts has been added.
		Section 7.194 – Assessment of Effects River Wye SAC – Magnitude. This section identifies the presence of twelve watercourses within the Site with the potential to support	Noted. All watercourses within the Site were fully assessed at the time, however all watercourses within the Site will be considered to have potential

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		white-clawed crayfish and five providing suitable habitat for juvenile salmonids. In our opinion additional watercourses have the potential to support salmonids. The report states that, '<i>Direct construction impacts on salmon and white-clawed crayfish are temporary and therefore not considered to be significant, due to the very limited temporal and physical extent that the watercourse will be physically impacted and the likelihood that these species would move away from disturbances.</i>' We advise that salmonids may hide under stones rather than move away from disturbances and so may be crushed by plant or machinery. Habitat fragmentation should also be considered here due to crossings impacting on fish migration.	to support salmonids and mitigation applied as necessary. The comment that salmonids may hide under stones rather than move away from disturbance has been taken into consideration and this has been reassessed. Habitat fragmentation has been considered in Section 7.222
		Section 7.265 – Assessment of Operational Effects. The list of elements with potential to impact on IEFs should include	Habitat fragmentation has been added to the list of elements with potential to impact on IEFs and

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		habitat fragmentation due to crossing works, impacting on fish migration.	considered within the assessment in Section 7.222.
		Aquatic Habitat Assessment Report. In addition to those water courses identified as providing suitable habitat for salmonids, the following watercourses are also likely to support salmonids as well as minor species. In the absence of survey data indicating that these species are not present, it should be assumed that they are ■ Mithil brook Tributary 1 – Fron Las Dingle ■ Mithil brook Tributary 2 – Carrog Dingle We note section 4.2.1 states that '<i>Areas highlighted for salmonids and white-clawed crayfish should be treated as sensitive habitat sites and considered for further surveys before commencing any work</i>'. We agree and advise that the information will be required to inform the HRA.	This is noted and these watercourses have been taken into consideration in this chapter in Section 7.223. Further fish and white-clawed crayfish surveys have been undertaken and included as Appendix 7.12. The sHRA and this chapter have been updated to take account of the results.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Outline Habitat Management Plan and net benefit for biodiversity assessment (Appendix 7.10). We welcome the inclusion of Riparian restoration and planting in section 3.2 of the OHMP. The plan should also include maintenance of the buffer strip fencing as well as the planted trees. We also advise that watercourse crossings should be designed so as to facilitate fish passage (where they are or are likely to be present) and the passage of sediment. The retention of a natural bed, through the use of bridges or bottomless/arched culverts is considered to be the very best way to achieve this.	Details on fence maintenance and maintenance of planted trees has been included in the OHMP (Appendix 7.10). Details of watercourse crossings have been included in the OHMP (Appendix 7.10).
		Shadow Habitat Regulations Assessment (sHRA) Section 4.1 refers to the potential need for a habitat compensation plan if species are found to be present within the affected areas. We therefore advise further surveys are carried out prior to the submission of the planning application and the	Further surveys have been undertaken and the relevant documents amended (Appendix 7.11: sHRA and Appendix 7.12: Fish and white-clawed crayfish report).

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		relevant documents amended/produced based on survey results.	
		Radnor Forest SSSI – We do not consider there is currently sufficient information to demonstrate how the proposed development will avoid damaging the special interest features of the SSSI. Section 7.20 Field survey lists the surveys carried out to date to inform the Environmental Impact Assessment (EIA). We have some reservations regarding the results of the Phase 1 and NVC surveys undertaken as they do not correspond well with recent monitoring and surveillance we have undertaken along the western edge of Radnor Forest SSSI and observations made for adjacent areas within the application site	As discussed with NRW ²³ , further NVC surveys have been undertaken in the areas of concern adjacent to the western boundary of Radnor Forest SSSI. The results of these are detailed in Appendix 7.14 and discussed further within Section 7.227.

23 NRW, 2024. Email correspondence from NRW confirming the need for further NVC surveys of areas adjacent to Radnor Forest SSSI (16/09/2024)

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		For this reason we do not concur with the conclusion in section 7.43 of the ES that <i>“it is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and assessment of likely significant environmental effects on Ecology”</i> This may not be correct given the apparent discrepancy between NVC survey and our recent monitoring data for areas within the Radnor Forest SSSI.	
		Section 7.67 refers to the current conservation status of Radnor Forest SSSI as being favourable owing to the grazing and little signs of fires in the recent past. The confidence in this conclusion is limited, as quantitative monitoring was last undertaken in 2016 and did not include all of the SSSI management units.	This point is noted and the description of the conservation status has been amended.
		Section 7.74 lists the dominant habitats within the development boundaries. The presence of blanket bog	M19 (non-mire) community was recorded during the update NVC survey adjacent to the SSSI. This

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		vegetation (on shallow peat) is not mentioned here but is considered important in relation to assessment of potential impacts within and adjacent to the Radnor Forest SSSI.	community while not considered to be blanket bog, has been included in this section and impacts considered in Section?
		Table 7.6 lists all NVC communities found at the Site, we advise that the list needs reviewing based on our own survey results and observations.	Updated NVC surveys have been undertaken in 2024 and thus the list in Table 7.6 has been reviewed and all NVC communities recorded as present are included in Table 7.6.
		Section 7.76 refers to GWDTE. The blanket bog areas noted above have not been mapped by the EIA vegetation survey (Chapter 7 – volume 2 – Fig 7.4). These may also be ground water dependent as they appear to be hydrologically linked to the larger peatland area within the SSSI at Great Rhos.	M19 (non-mire) community has been recorded and is now mapped in Figure 7.3.a. M19 is not considered to be ground water dependent.
		Table 7.9 evaluates all ecological features present on the Site. With respect to habitat H12 Calluna vulgaris – Vaccinium myrtillus heath, we advise the level of importance	The level of importance of H12 within Table 7.9 has been amended to National/Local and has been considered further.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		should be graded as National/Local as the areas of this habitat on Esgairnantau form an integral part of the SSSI feature of special interest. We also advise that M19 <i>Calluna vulgaris</i> – <i>Eriophorum vaginatum</i> and M20 <i>Eriophorum vaginatum</i> blanket mire should be listed amongst the features as they are present within the application site at Great Rhos extending towards the top of head of Cwm Bwch and forming a natural extension to the blanket mire within Radnor Forest SSSI. Consequently, they should also be allocated a level of National Importance.	Further surveys have been undertaken in this area of concern and the results are detailed in Appendix 7.14 and discussed further in this chapter.
		Section 7.179 describes the design considerations and the factors to be considered throughout the development. With regards to ‘Avoiding areas of peat soils’ we advise that areas of shallow peat are important and characteristic of the Radnor Forest area. They may also be re-growing as a	Further NVC surveys and soil gauge surveys have been undertaken adjacent to the SSSI and the results are considered within Section 7.227

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		result of increased precipitation caused by climate change. Therefore, development should avoid disturbing areas of peat greater than 10 cm and cutting through drainage links between such areas.	
		We advise that blanket bog is included within Table 7.11 – Important ecological features scoped in or out of the assessment. It should be scoped in for construction and scoped out for operation.	The M19 (non-mire) community has been scoped in for construction and out for operation.
		Section 7.187 states that ‘where possible, design iteration has ensured avoidance of the highest quality and most sensitive areas of habitat’. However as explained above, we do not consider the most potentially important area of habitat (blanket bog) has been identified in the survey. The latest design iteration includes three turbine locations (T18, T19 and T20), a section of track and underground cabling that are likely to have a significant impact on that habitat	Further NVC surveys of the area of concern have been undertaken and the results are detailed in Appendix 7.14 and discussed further in Section 7.227 and 7.238

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		which may be considered to be integral to the adjacent peatland habitat on Great Rhos. Consequently, the development may have significant impact on the adjacent SSSI. Without the submission of detailed hydrological and NVC surveys of the areas of concern, we cannot advise the planning authority on whether the first step of the step-wise approach (avoidance of damage) to development has been followed.	
		Section 6.4.7 of PPW clearly states that 'Planning Authorities should also refer to up to date ecological survey information (where appropriate) and consider local ecological information submitted by recognised environmental organisations'.	Consideration of NRW's ecological information provided has been included in this chapter.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Table 7.12 – Direct and indirect habitat losses. We advise this table needs to include the area of M19/M20 blanket bog between the top of Cwm Bwch and Great Rhos. This needs re-mapping as it is currently shown (Figure 7.3a and 7.3b) as NVC types H12, H18 and M15/M25. Areas figures need calculating for this habitat, the total area is relatively small and likely to be heavily impacted by development in relation to turbines T18, T19 and T20.	Further NVC surveys have been undertaken in the area of concern and maps updated including habitat loss calculations.
		Section 7.199 Assessment of effects- Impact states that ‘indirect impact to habitats are assessed to within 10m of the footprint of a development and therefore there is no anticipated loss of blanket bog as a result of the Proposed Development.’ We cannot agree with this conclusion because we consider blanket bog vegetation to be present within the application site that will be significantly impacted by the location of turbines T18 – T20 and associated works.	Further NVC surveys of the area of concern have been undertaken and the impact on the area of M19 (non-mire) community has been assessed.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Section 7.201 Assessment of effects – Magnitude is considered to be negligible and not significant in the context of the EIA regulations. We consider the magnitude to be ‘moderate to high’, given potential impact of the current turbine layout within blanket bog area at the top of Cwm Bwch and the linkage of these areas to peatland habitat in the adjacent SSSI.	Further NVC surveys of the area of concern indicate the presence of an M19 (non-mire) community, this has been taken into account and considered further.
		Section 7.202 Assessment of effects – Significance of effects concludes that given the consideration of sensitivity and magnitude, the effect significance is considered to be negligible and not significant in the context of the EIA regulations. As per previous section we consider impact significance should be major/moderate.	Further NVC surveys of the area of concern indicate that an M19 (non-mire) community is present. This has been taken into account and considered further.
		Section 7.322 Combined effects – Habitats refers to the need for further habitat surveys are needed to cover areas previously surveyed outside the optimal survey period. We	Further NVC surveys covering the land at the top of Cwm Bwch and adjacent to Great Rhos (SSSI) have been undertaken as requested. The details of

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		advise that further surveys should include a more detailed NVC survey covering the land at the top of Cwm Bwch and adjacent to Great Rhos (SSSI).	this are covered in Appendix 7.14 and are discussed further in this chapter
		Table 7.18 Summary of effects. We advise the information pertinent to Radnor Forest SSSI is reviewed in line with our previous comments. We consider magnitude should be moderate/high, significance major/moderate and Significance of Residual Effect significant. The mitigation column should consider any possible removal/relocation of the turbine locations T18, T19 and T20 in order to give a residual effect of 'not significant' in the short term. Although potential operational impacts on upland birds need to be considered as well in the context of this SSSI.	The results of the additional NVC survey in the area of concern has been taken into consideration along with NRW's ecological information and as such that which is pertinent to Radnor Forest SSSI has been reviewed in line with NRW's previous comments and the effects have been amended accordingly.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Appendix 7.10 – Outline HMP Section 2 Priority Features for Management Action. Section 2.2 Habitats, describes the current status and management recommendations for several habitat types, but does not mention peatland. We advise it also needs to consider sustainable management of blanket bog/peatland in the context of maintaining/enhancing the extent and condition of that habitat within the Radnor Forest SSSI and adjacent areas. Peatland restoration is key Welsh Government target in relation to carbon storage/capture.	Peatland restoration measures have been fully considered and included in the SSSI within the Site boundary, as described in the OHMP (Appendix 7.10).
		Section 2.2.3.2 Management Recommendations for heathland and acid grassland, states that overall grazing will be reduced and targeted conservation grazing implemented. We consider that reduced grazing for areas currently mapped as heathland will also benefit blanket bog but areas	Conservation grazing has been extended in areas adjacent to the SSSI.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		of M20 blanket bog that may have been mapped as M25 marshy grassland should not be subjected to increased grazing pressure.	
		Section 3.5 Conservation grazing. We would support conservation grazing in these areas to improve habitat quality. On key heathland and blanket bog areas reduced or no grazing between November to March would be preferable as we consider livestock preferentially graze on heather during the winter period.	This has been addressed within the OHMP (Appendix 7.10).
		Section 3.5.3.2 Monitoring and Timing – Heath. We have developed site specific performance indicators for monitoring dry heath and blanket bog vegetation within the Radnor Forest SSSI and these can be provided to contractors undertaking monitoring within the application site. Monitoring needs to record heather condition/grazing	Noted. The use of JNCC guidance has been included in this section.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		damage, as per Joint Nature Conservation Committee (JNCC) guidance.	
		Section 4 - Net Benefit for Biodiversity (NBB). Section 4.2.1 NBB Results. We advise Table 1 and 2 in this section include blanket bog vegetation, which occurs within the SSSI at Great Rhos and likely extends onto adjacent areas of the application site. A large proportion of the 'heathland loss' identified here is likely to be peatland habitat and so extension of heathland habitat elsewhere through conservation grazing cannot compensate for this. We continue to advise the proposed design layout should aim to avoid these habitats	An updated NVC was undertaken of the area adjacent to the SSSI boundary at Great Rhos and an M19 (non-mire) community was described here. This has been included in the table and assessed appropriately.
		Drawing 1: Habitat management Plan Options. We advise entire management parcels adjacent to Radnor Forest	Conservation grazing has been added to management parcels adjacent to Radnor Forest as

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		should be subject to conservation grazing, as should the Cowlod common.	well as within the SSSI itself (Appendix 7.10: OHMP).
		Invasive non-native species. Appendix 7.10 – OHMP. We note Section 3.31 of the outline CEMP (Appendix 4.2) specifies that measures to prevent the spread of INNS will be detailed in an Invasive Species Management Plan. We consider biosecurity to be a material consideration owing to the location/nature of the proposal. We would therefore advise the Planning Authority any subsequent consent includes the imposition of a condition requiring the submission and implementation of a Biosecurity Risk Assessment to the satisfaction of the LPA.	A biosecurity risk assessment will be implemented which is noted in the OHMP (Appendix 7.10)
		European Protected Species - bats We have reviewed the design, location considerations and good practice measures for bats and we concur with the	Noted. No further action is required.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		proposed applied mitigation including the use and application of an Ecological Compliance Audit (ECA) scheme. We also concur with the assessment of construction and operational effects on EPS.	
		Table 7.7 External data on protected or otherwise notable species The Legal Protection Column of this table makes reference to the 'Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)'. We advise that this should read 'Conservation of Habitats and Species Regulations 2017 (as amended)'.	Table 7.7 has been updated.
		Table 7.9 Evaluation of ecological features With regards to EPS, we note reference is made to the level of importance but there is no reference to the Current	Table 7.9 has been updated to include details of CCS for each EPS.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Conservation Status (CCS) for each local population of EPS. This should be included in the report.	
		Table 7.1 Consultation Responses We note the ecologist's response comments in relation to our request to utilise the Ecobat tool to assess the likely risk on bats. The response column states that 'Ecobat has been offline due to technical difficulties since June 2022 and was not available to analyse the 2022 survey data.' We advise that the Ecobat tool is available again and can be used for further supplementary/corroboratory analysis to inform this ES. We therefore would welcome and advise that all extant data is uploaded into the programme and the results included in future version of ecological reports.	Ecobat has been utilised for the 2022 bat data and the chapter and bat risk assessment (Appendix 7.5) has been updated accordingly.
		Section 7.291 to Section 7.308 – Proposed Mitigation (Additional Mitigation) and Compensation - Bats	Noted. Text on Regulations 52 and 53 added to Section 7.295.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		We understand that mitigation measures are to be detailed within a Bat Mitigation and Monitoring Strategy, to be secured by planning condition, whereby specific mitigation measures at each turbine location will be detailed. We welcome the proposed approach to the use of Smart curtailment (Section 7.297). We advise that the design specifications of all turbines includes capability for Smart curtailment and that all turbines are subject to the strategy given the longevity of the proposal. We advise that the text in section 7.306 includes reference to: ■ (a) Regulation 52 of the Conservation of Habitats and Species Regulations 2017 (as amended) in respect of the monitoring of incidental capture/killing of EPS (e.g. bats)	

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		■ (b) Regulation 53 of the Conservation of Habitats and Species Regulations 2017 (as amended) in respect of the prevention of incidental capture/killing of EPS (e.g. bats)	
		Section 7.307, outlines details of the curtailment strategy and post construction monitoring strategy. With regards to curtailment, we strongly advise against defining an actual number of 'acceptable or permissible bat casualties'. Instead, we advocate an overall approach of active management / continued informed monitoring to prevent casualties. This in our view is the most appropriate and consistent way forward in respect of considering this issue. In respect of conservation status of local bat populations, and as informed by on site habitat functionality, we consider that appropriate scheme design, should normally	Noted, wording revised to remove reference to bat fatality thresholds.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		incorporate off site habitat creation and enhancement proposals. Based on the information provided we would advise the Planning Authority to secure the implementation of appropriate curtailment and monitoring via planning conditions.	
		European Protected Species – Otter Since presence of this species is a material consideration for the determination of the proposal, we would advise the Planning Authority to secure the carrying out of phased pre-commencement otter surveys via condition to ensure the potential presence of otter is confirmed prior to construction and where necessary remedial measures are implemented for their protection.	Noted. To be secured through a planning condition, phased pre-commencement Otter surveys will be undertaken to ensure the potential presence of otter is confirmed prior to construction and where necessary remedial measures implemented for their protection.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		European Protected Species – Great crested newt We acknowledge the methodology of GCN surveys and their limitations. The suitability of the waterbodies within the development footprint was assessed by using the Habitat Suitability Index (HSI) assessments. All suitable ponds were then surveyed in accordance with the industry standard guidelines (English Nature, 2001). Several of the surveyed ponds were found to host small to medium populations of GCN. The overall conclusion is that the site supports a medium population of GCN and therefore any works on site will need to be carried out under a single licence for the overall site. We support the need for a Species Protection Plan (SPP) to be submitted in support of any licence application and we would advise the Planning Authority to secure its submission and implementation via condition.	Noted. To be secured through a planning condition, a detailed SPP for GCN will be produced to prescribe the required mitigation and compensation measures for this species. Works can only proceed under a NRW derogation licence in accordance with the SPP.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		We consider the submitted proposals demonstrate that they are not likely to be detrimental to the maintenance of the favourable conservation status of GCN, provided any subsequent consent is subject to the provisions of a planning condition and planning obligation as noted below.	
		Section 4 Discussions and Recommendations This section states ‘As a precaution due to the large frequency of waterbodies dry during previous surveys, natural fluctuations of these water levels and the time between HSI assessments and the proposed works, in addition to confirmation of design freeze since initial surveys, it is recommended that the following waterbodies have an updated HSI assessment and/or eDNA surveys for great-crested newt, if said waterbodies hold water. This information would be used to inform future mitigation and licencing requirements.’	The update HSI assessments were conducted in the 2024 season, and this informed the requirement for further presence/absence surveys and population assessments of ponds which were considered to now be potentially suitable for/confirmed as supporting great crested newt in the 2024 season. These surveys have confirmed status of great crested newt in ponds which were previously considered unsuitable, and this includes ponds which may be used as resting/loafing sites. These surveys were completed following industry

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		We advise that just HSI assessment will not appropriately consider water bodies that are more likely to function as resting places rather than breeding places.	standard guidelines and further details are included in Technical Appendix 7.8 and within Section 7.187.
		Section 7.166. We note the intention during 2024, to carry out further assessments of 23 ponds previously considered to have a poor suitability for GCN, due to low water levels. We welcome this precautionary approach. The results of the 2024 surveys should be included in the ES and used to inform any mitigation requirements. We concur with the details included in Table 7.11 Important Ecological Features scoped in or out of the assessment, to scope in GCN for both the construction and operational phase of the development.	These update assessments have been completed in the 2024 season and the results of this have informed an update of the impact assessment and mitigation and compensation requirements, as discussed in this chapter.
		Section 7.232 (Impacts – Significance of Effects)	This is noted and proposals for the provision of a long-term GCN conservation area will be

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		This section states 'Approximately 2.5ha of terrestrial habitat will be impacted within 500m of the pond, with three turbine hard standings and associated access tracks in the vicinity. There is a risk of killing and injuring newts during construction'. We advise the loss of terrestrial habitat is materially used to inform proposals concerning the provision of a dedicated long-term GCN conservation area.	incorporated into the mitigation/compensation and detailed within the SPP, which will be secured through a planning condition and implemented under an NRW derogation licence. The measures will include for compensation of terrestrial habitat that will be lost to the development.
		Section 7.235 (Impacts – Magnitude) This section refers to the current conservation status of GCN in its natural range as being unfavourable. We refer you to our science report 259 which reviews the CCS of GCN in Wales.	Noted. The document has been reviewed and supports the conclusion of an unfavourable population at a national and county level.
		Section 7.325 (Further Survey Requirements and monitoring – GCN)	Noted. The post construction monitoring will be done in accordance with the methodology of the Wales GCN Monitoring Scheme, which will be

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		This section states that post construction monitoring of GCN populations and habitats will be incorporated through the GCN Species Protection Plan (SPP). We advise the post construction monitoring is done in accordance with the methodology of and results reported through the Wales GCN Monitoring Scheme. The presence of GCN on site indicates that an NRW derogation licence will be needed to carry out works affecting this species. We would therefore advise the Planning Authority to include advisory information with regards to licence requirements.	detailed within the SPP, and will form a condition of the NRW derogation licence. Results reported through the scheme and through NRW licencing returns, as required.
		Great crested newt – Appendix 7.10 OHMP Section 2.3.2.1 GCN Current Status We advise this section refers to the CCS of the species as being unfavourable as stated in section 7.325 above. We	Noted. This section has been updated to reference the current conservation status of the species as being unfavourable. The Species Protection Plan (SPP) for great crested newt will incorporate

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		also advise that population targets are set for this site (we suggest a monitoring Key Performance Indicator (KPI) of 60 newts within 6 ponds or more ponds).	appropriate population targets for the site as recommended.
		Section 3.3.3 Monitoring and Timing Reference is made to the ‘Specific monitoring timings and methodology will fall under the Species Protection Plan (SPP) for great crested newt to be produced and adhered following the proposed development’. We advise that Monitoring methodology must accord with and results reported through the Wales GCN Monitoring Scheme.	Noted. The monitoring methodology which is to be detailed within the SPP for great crested newt will be in accordance with the Wales GCN Monitoring Scheme and results will be reported through the scheme.
		UK Protected Species – Water Vole Water voles surveys were carried out following best practice guidance searching for potential evidence of their presence within riparian zones and up to 20m away from the water’s edge.	Noted. This has been included in the Outline CEMP (Appendix 4.2).

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		No evidence of this species was identified during the survey although suitable habitat is available within the site (Section 7.164). The presence of water vole on site is therefore considered unlikely and no further surveys or mitigation are required. Good practice mitigation has been recommended in the Protected Species Survey Report Appendix 7.6 . We advise these are included in the CEMP.	
		Bryophytes and Lichens We consider the area to be extremely under-recorded for bryophytes and lichens and there could well be notable species present, especially in any mires or flushes. The uplands of Powys are the Welsh hotspot for the S7 species <i>Jamesoniella undulifolia</i> and <i>Barbilophozia kunzeana</i> and there is every reason to expect one or both to be present within the site's large footprint. There is already a record of a large population of <i>Hamatocaulis vernicosus</i> (S7 species) at	A bryophyte and lichen survey of all flushes and mires has been undertaken. None of these species were recorded within the Site as detailed in Appendix 7.13 and discussed further in Section 7.199.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		SO159607, to the west of Turbines 5 (as mapped on the infrastructure layout plan Figure 4.1a), in a flush complex that has not been included within the GWDTE map found in Chapter 7 Volume 2 - Figure 7.4. All three of these bryophytes are hydrology-dependent and could be affected by the construction (especially the extensive track network) if flush hydrology is impacted upon. There will be numerous other flushes across the proposed development area, many of which could hold S7 bryophytes. If these are likely to be affected by any of the works they should be surveyed in detail.	
		Referencing errors Section 7.183 states that 'some potential effects on IEFs (features of Local or higher value) can be scoped out of the	Noted and amended.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		assessment, as described in Table 7.10 below' This should read table 7.11. Section 7.190 states that 'All habitat loss calculations are presented in Table 7.11' This should read table 7.12. Section 7.328 refer to Table 7.17 for a summary of predicted effects of the proposed development on ecology. This should read Table 7.18.	

Study Area

7.18 The extent of field survey was based on relevant industry standard guidance, as indicated below:

- The Phase 1 habitat survey followed Joint Nature Conservation Committee (JNCC, 2010²⁴) Guidance, covering, as a minimum, the Proposed Development area plus a 100m buffer (access permitting) – this document has been updated by the UK Habitat Classification (UKHab) Survey (**Appendix 7.4**).
- The UKHab Survey followed UKHab Ltd (2023)²⁵ guidance, covering, as a minimum, the Proposed Development area plus a 100m buffer (access permitting).
- The NVC survey followed standard guidance (Rodwell, 2006)²⁶, covering the Proposed Development area, plus a 100m buffer (access permitting) but extended to 250m for wetland habitats (access permitting).
- Bat activity surveys covering the turbine area followed the NatureScot *et al.* (2021) guidance. The guidance describes that, where developments have more than ten turbines, detectors should be placed within the developable area at ten of the turbine locations (if known) plus a third of the additional turbine locations, with the latter distributed according to a system of stratified sampling based on the availability of different habitats and topographical features on the Site and based on professional judgment.
- Bat roost survey methods followed Collins (2016²⁷ and 2023²⁸) and NatureScot *et al.* (2021) guidance. The Preliminary Roost Assessment Study Area covered buildings, structures and trees within the Site and up to a 250m buffer (where accessible). Further survey of potential roost features was not required as all lay outside 300m of potential turbine locations, and 50m of all infrastructure.

²⁴ JNCC (2010) Handbook for Phase 1 habitat survey – a technique for environmental audit

²⁵ UKHab Ltd (2023) UK Habitat Classification (Version 2.0)

²⁶ Rodwell, J. S. (2006) NVC Users' Handbook. ISBN 978 1 86107 574 1.

²⁷ Collins, J. (ed) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition). The Bat Conservation Trust, London.

²⁸ Collins, J. (ed) (2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th Edition). The Bat Conservation Trust, London.

- Badger survey followed the methods described by Roper (2010)²⁹. It covered suitable habitat within the Site and up to a 100m buffer.
- Otter survey followed best practice guidance (Chanin, 2003)³⁰, with a survey buffer area of watercourse habitat up to a minimum of 250m upstream and downstream of the Site. A search was undertaken of the riparian zone and up to 20m away from the water's edge (where suitable habitat was found to be present).
- Water vole survey followed best practice guidance (Dean, et al., 2016)³¹, with a survey area of up to 100m from Site upstream and downstream of the Site along the watercourse. A search for potential water vole evidence was undertaken in the riparian zone and up to 20m away from the water's edge (where suitable habitat was found to be present).
- Great crested newt (GCN) surveys followed best practice guidance (Oldham, *et al.*, 2000³² and English Nature, 2001³³) with a survey area encompassing the development boundary (the Site) and a 250m buffer, henceforth referred to as the 'study area'.
- Aquatic habitat assessment survey methodology was adapted from that described in Hendry and Cragg-Hine (1997)³⁴ such that it incorporates habitat types for all groups of fish and covered all watercourses within the Site.
- The fish and white-clawed crayfish surveys followed best practice guidance (Environment Agency, 2019)³⁵ (Peay, 2003)³⁶ with a survey area encompassing the Site boundary, as well as areas outside the Site boundary where necessary due to watercourses being dry within the Site boundary. Bryophyte survey was limited to bryophytes (mosses, liverworts and hornworts) within the Site boundary with a focus on assessing the possible presence of *Barbilophozia kunzeana*, *Biantheridion undulifolia* and *Hamatocaulis vernicosus*.

²⁹ Roper, T. J. (2010) New Naturalist Library: Volume 114: Badger. Collins New Naturalist.

³⁰ Chanin, P. (2003) Monitoring the Otter *Lutra lutra* – Conserving Natura 2000 Rivers Monitoring Series No. 10

³¹ Dean, M., Strachan, R., Gow, D., and Andrews, R. (2016) The Water Vole Mitigation Handbook

³² Oldham, R. S., Keeble, J., Swan, M. J. and Jeffcote, M. (2000) Evaluating the suitability of habitat for the great crested newt (*Triturus cristatus*)

³³ English Nature (2001) Great Crested Newt Mitigation Guidelines

³⁴ Hendry and Cragg-Hine (1997)

³⁵ Environment Agency (2019). Electric fishing operations; equipment and working practices. EA Operational instruction 993_08.

³⁶ Peay, S. (2003). Monitoring the White-clawed crayfish *Austropotamobius pallipes*. Conserving Natura 2000 Rivers.

- NVC surveys 2024 followed best practice guidance (Rodwell, 2006). The assessment was limited to NVC vegetation communities within the three survey areas identified by NRW³⁷ within the Site boundary.

Desk Based Research and Data Sources

7.19 An ecological desk study is in **Appendix 7.1**. The desk study has been updated in January 2025. It has utilised a range of data sources, including the following:

- National Biodiversity Network (NBN) Atlas (NBN Atlas, 2025);
- MAGIC: Nature on the Map (MAGIC, 2025);
- Natural Resources Wales Designated Sites Search (Natural Resources Wales, 2025a);
- Natural Resources Wales Ancient Woodland Inventory (Natural Resources Wales, 2025b); and,
- Biodiversity Information Service (BIS) for Powys and Brecon Beacons National Park (BIS, 2025).

Field Survey

7.20 The following field surveys were carried out to inform the assessment:

- Phase 1 habitat survey: This was undertaken in October 2020 of the potential wind farm area and a survey of additional areas undertaken in October 2022. Mapping of habitats was carried out in the field on to (printed) aerial photographs of the Survey Area with reference to 1:25,000 scale Ordnance Survey maps. This was done by identifying habitat boundaries in the field and corresponding boundaries between areas of differing colour or pattern on the aerial photographs. See **Appendices 7.2 and 7.3** for details on the surveys and qualifications of surveyors.
- UK Hab survey: This was undertaken in August 2023 and updated the above Phase 1 habitat survey of the areas previously covered in October 2020. Those covered in October 2022 have been incorporated into the 2023 report and Phase 1 habitats converted to UK

³⁷ NRW, 2024. Email correspondence 16/09/2024

Hab classification. See **Appendix 7.4** for details on the surveys and qualifications of surveyors.

- NVC: This was undertaken to provide more detailed information on the grassland, heath, mire and woodland communities and their alignment with NVC communities as described in Rodwell *et al.* (1991-2000)³⁸. Refer to **Appendix 7.4** for details on the surveys and qualifications of surveyors.
- Bat activity surveys: Bat activity surveys of the turbine area were carried out in the spring, summer and autumn periods of 2020 and were repeated in 2022. All survey work was carried out in line with the standard methods described within the NatureScot *et al.* (2021) guidance on assessing bats and onshore windfarm developments. In addition, a bat roost survey comprising a Preliminary Roost Assessment (PRA) of buildings, structures and trees within the Site and up to a 250m buffer was completed between 2020 and 2023 to identify any potential roost features that may be impacted by the Proposed Development. The PRA surveys were carried out in line with the bat survey guidance relevant at the time of the surveys (Collins, 2016 and 2023). See **Appendix 7.5, Annex A, B and C** for details on the bat surveys and qualifications of surveyors.
- Protected mammal surveys: A combined survey investigating for signs of badger, otter and water vole was conducted over September – November 2022. Any incidental evidence of other protected species was also recorded. Methods followed best practice as outlined in paragraph 7.20 above. See **Appendix 7.6** for details on the protected mammal surveys and qualifications of surveyors.
- Otter survey: A second otter survey was undertaken in August 2023. Methods followed best practice as outlined in paragraph 7.20. It involved searching for otter evidence, such as spraints, footprints, runs, couches, slides and holts, along watercourses within 200 m. See **Appendix 7.7** for details of the otter surveys and qualifications of surveyors.
- GCN surveys: Ponds on Site and within the study area (up to 500m from the Site boundary) were assessed for GCN. A range of surveys were conducted between 2021 and 2024 to

³⁸ Rodwell, J. S. (Ed), *et al.* (1991-2000) British Plant Communities (5 volumes)

assess pond suitability, presence /absence and population size of GCN, as required.

Surveys consisted of:

- Great crested newt Habitat Suitability Index (HSI) (Oldham, et al., 2000) assessment;
- Environmental DNA (eDNA) survey;
- Presence/Absence survey; and,
- Population Size Class Assessment (PSCA) survey.

7.21 See **Appendix 7.8** for details of the GCN surveys and qualifications of the surveyors.

- Aquatic Habitat Assessment survey was undertaken in December 2023. Methods followed an adaptation of Hendry and Cragg-Hine (1997). See **Appendix 7.9** for details of the Aquatic Habitat Assessment surveys and qualifications of the surveyors.
- Fish and white-clawed crayfish surveys were undertaken in August 2024 by two experienced aquatic ecologists. Baseline fish, white-clawed crayfish and environmental deoxyribonucleic acid (eDNA) surveys (for white-clawed crayfish and fish metabarcoding) were undertaken across four watercourses that will be impacted by the Proposed Development. See **Appendix 7.12** for details of the assessment surveys and qualifications of surveyors.
- A bryophyte Survey was undertaken in October 2024. All potential habitat within the Site for *Barbilophozia kunzeana*, *Biantheridion undulifolia* and *Hamatocaulis vernicosus* was visited and searched in detail, which comprised all springs, flushes and mires. Recording of common bryophyte species was also undertaken. Small samples of critical species were collected for determination by microscopy. See **Appendix 7.13** for details of the bryophyte assessment survey and qualifications of surveyors.
- An updated NVC survey of the areas that required further survey was undertaken in October 2024. All of the habitat within the three land parcels (identified by NRW) were accessed and the vegetation communities present were classified and mapped. Sample quadrats were recorded to help describe the vegetation. See **Appendix 7.14** for details of the NVC assessment survey and qualifications of surveyors.

Assessing Significance

7.22 The approach to the EclA follows the Chartered Institute of Ecology and Environmental Management guidelines (CIEEM, 2018), which prescribe an industry-standard method to define, predict and assess potential ecological effects to a given Proposed Development. Starting with establishing the baseline through a mix of desk study and field survey, IEFs are identified and those requiring assessment established through a reasoned process of valuation and consideration of factors, such as statutory requirements, policy objectives for biodiversity, conservation status of the IEF (habitat or species), habitat connectivity and spatial separation from the Proposed Development. From this stage, these features are assessed for impacts with the assumption of this being in the presence of construction industry-standard mitigations to ameliorate impacts as far as practicably possible. Additional mitigation strategies can then be determined to minimise any residual impacts that would otherwise be experienced by the IEF and any opportunities for biodiversity gains identified.

7.23 In summary, the impact assessment process (CIEEM, 2018) involves:

- Identifying and characterising impacts and their effects;
- Incorporating measures to avoid and mitigate negative effects;
- Assessing the significance of any residual effects after mitigation;
- Identifying the appropriate compensation methods to offset significant residual effects; and,
- Identifying opportunities for ecological enhancement/net benefit for biodiversity/biodiversity net gain.

Identifying Important Ecological Features

7.24 **Table 7.2** below lists the criteria used to determine the value (importance) of ecological features in a geographical context.

Table 7.2 Geographical evaluation criteria (note: excludes ornithological designations)

Importance	Criteria	Examples
International	Nature conservation resource, i.e. designated nature conservation area, habitat or populations of species, of international importance. For any Special Area of Conservation (SAC) this may also include offsite features on which the qualifying population(s) or habitat(s) are considered, from the best available evidence, to depend.	International nature conservation areas: ■ Any SAC or candidate SAC (cSAC). Significant numbers of a designated population outside the designated area. A site supporting more than 1% of the EU population of a species.
National (i.e. Wales)	Nature conservation resource, i.e. designated nature conservation area, habitat or populations of species, of national importance. N.B. For designations, such as a Site of Special Scientific Interest (SSSI) or a National Nature Reserve (NNR), this may also include offsite features on which the qualifying population(s) or habitat(s) are considered, from the best available evidence, to depend.	National nature conservation areas: ■ Any SSSI or NNR designated for biological feature(s). A site supporting more than 1% of the UK population of a species. Nationally important population/assemblage of an EPS or species listed on Schedule 5 of the WCA.
Council area (i.e. PCC)	Nature conservation resource, i.e. nature conservation designation, habitat or species, of importance on a regional scale.	Statutory and non-statutory nature conservation designations: ■ Any Local Nature Reserve (LNR);

Importance	Criteria	Examples
		■ Any Site of Interest for Nature Conservation (SINC); ■ Any Local Wildlife Site (LWS); ■ Any Country Park; and, ■ Ancient Woodland listed on the Ancient Woodland Inventory (Natural Resources Wales, 2022b²³). A Council-scale important population/area of a species or habitat of principal importance through its listing on Section 7 of the Environment (Wales) Act 2016. A regional-scale important population/area of a species or habitat listed on the local Biodiversity Action Plan (BAP)/Action for Nature Plan. A regional-scale important population/assemblage of an EPS or species listed on Schedule 5 of the WCA.
Local (i.e. within 2km of the Site)	Nature conservation resource, e.g. a habitat or species of importance in the context of the local district.	A breeding population of a species of principal importance through its listing on Section 7 of the Environment (Wales) Act 2016. A breeding population of a species or a viable area of a habitat that is listed

Importance	Criteria	Examples
		on the Local BAP/Action for Nature Plan because of its rarity in the locality. An area supporting 0.05%-0.5% of the UK population of a species.
Less than local	Unremarkable, common and widespread habitats and species of little/no intrinsic nature conservation importance.	Common, widespread, agricultural and/or exotic species (such as escapees).

7.25 Where a feature qualifies under two or more criteria, the higher value is applied to the feature.

7.26 Within this chapter, any ecological feature of local or higher value is considered an IEF.

Ecological Zone of Influence

7.27 The Ecological Zone of Influence (EZoI) is defined as the area within which there may be IEFs subject to effects from the Proposed Development. Such effects could be direct (e.g. habitat loss resulting from land take or removal of a building occupied by bats) or indirect (e.g. noise or visual disturbance causing a species to move out of the EZoI). Generally, the EZoI is up to 10km for statutory designations listed for bat interests, up to 2km for other designated sites designated for mobile species and for habitats and species the distances listed in **Table 7.2**. The EZoI was determined through:

- Review of the existing baseline conditions based on desk study results, field surveys and information supplied by the consultees;
- Identification of sensitivities of ecological features, where known;
- The outline design of the Proposed Development and approach to construction; and,

- Through liaison with other technical specialists involved in the assessment (e.g. hydrologists and noise specialists).

Characterising Ecological Impacts and Effects

7.28 In accordance with the CIEEM guidelines, the following definitions are used for the terms ‘impact’ and ‘effect’:

- Impact – Actions resulting in changes to an ecological feature. For example, the construction activities of a development removing a hedgerow.
- Effect – Outcome to an ecological feature from an impact. For example, the effects on a species population from the loss of a hedgerow.

7.29 In accordance with the CIEEM guidelines, when determining impacts on IEFs, reference is made to the following:

- Beneficial or adverse – i.e. whether the impact has a beneficial or adverse effect in terms of nature conservation objectives and policy.
- Magnitude – i.e. the size of an impact, in quantitative terms where possible.
- Extent – i.e. the area over which an impact occurs.
- Duration – i.e. the time for which an impact is expected to last.
- Timing and frequency – i.e. whether impacts occur during critical life stages or seasons.
- Reversibility – i.e. a permanent impact is one that is irreversible within a reasonable timescale or for which there is no reasonable chance of action being taken to reverse it. A temporary impact is one from which a spontaneous recovery is possible.

7.30 Both direct and indirect impacts are considered. Direct ecological impacts are changes that are directly attributable to a defined action (e.g. the physical loss of habitat occupied by a species during the construction process). Indirect ecological impacts are attributable to an action but affect ecological resources through effects on an intermediary ecosystem, process or feature (e.g. fencing of a development site may cause scrub to invade marshy grassland).

Determining Sensitivity of Receptors

7.31 In determining the sensitivity of each ecological feature, the vulnerability, recoverability and value/importance of that ecological feature is taken into consideration. For the purposes of this assessment, the predicted sensitivity of an ecological feature is categorised as ‘negligible’, ‘low’, ‘medium’, ‘high’ and ‘very high’, based on the definitions in **Table 7.3**.

7.32 Sensitivity has been determined using professional judgement on the basis of the following matrix in **Table 7.3**.

Table 7.3 Sensitivity Criteria

Sensitivity	Description
Very High	Nationally and internationally important ecological feature with high vulnerability and no ability to recover.
High	Regionally important ecological feature with high vulnerability and no ability to recover. Nationally and internationally important ecological feature with high vulnerability and low recoverability.
Medium	Nationally and internationally important ecological feature with medium vulnerability and medium recoverability. Regionally important ecological feature with medium to high vulnerability and low recoverability. Locally important ecological feature with high vulnerability and no ability to recover.
Low	Nationally and internationally important ecological feature with low vulnerability and high recoverability. Regionally important ecological feature with low vulnerability and medium to high recoverability.

Sensitivity	Description
	Locally important ecological feature with medium to high vulnerability and low to medium recoverability.
Negligible	Locally important ecological feature with low vulnerability and very high recoverability. Ecological feature is not vulnerable to impacts regardless of value/importance.

Determining Level of Impact Magnitude

7.33 The CIEEM guidelines state that impacts should be quantified, if possible, and expressed in absolute or relative terms (e.g. the amount of habitat lost, percentage change to habitat area, percentage decline in a species population). That approach has been followed here, where possible. For the purposes of this assessment, the predicted impacts on an ecological feature are categorised as ‘no impact’, ‘negligible’, ‘low’, ‘medium’ or ‘high’, based on the definitions in **Table 7.4**.

7.34 The magnitude of change has been assessed using professional judgement and the guidance criteria presented in **Table 7.4**.

Table 7.4 Magnitude criteria

Magnitude	Description
High	Irreversible impact on the status of the nature conservation designation, habitat or species and likely to threaten the long-term integrity of the feature. Not reversible or replaceable. Will remain detectable in the medium and long term (see below).
Medium	Detectable impact on the status of the nature conservation designation, habitat or species population in the medium term but is reversible/replaceable given time, and not a threat to the long-term integrity of the feature.

Magnitude	Description
Low	Detectable impacts, and may be irreversible, but either of sufficiently small-scale or of short-term duration to have no material impact on the conservation status of the nature conservation designation, habitat or species population.
Negligible	Detectable impact but reversible within 12 months. Not expected to affect the conservation status of the nature conservation designation, habitat or species under consideration.
No Impact	No detectable impacts on the ecological resource, even in the immediate term.

The following definitions have been applied in respect to timescales:

- Immediate: Within approximately 12 months.
- Short term: Within approximately 1-5 years.
- Medium term: Within approximately 6-15 years.
- Long term: More than 15 years.

The following definitions have been applied in respect to reversibility:

- High reversibility: Reversible within 12 months (e.g. removal and reinstatement of grassland habitat).
- Medium reversibility: Reversible in the medium term (6-15 years), not a threat to the long-term integrity of the feature (e.g. removal and reinstatement of scrub or hedgerow habitat).
- Low reversibility: Reversible but will take an extended period of time (e.g. 15-50 years) and will require mitigation (e.g. removal and reinstatement of immature or semi-mature woodland).
- Irreversible: The impact is one from which recovery is not possible within a reasonable timescale and there is no reasonable chance of action being taken to reverse it (e.g.

Magnitude	Description
	removal of veteran trees or compaction of soil within ancient woodland which will irreversibly damage ground flora).

Determining Ecologically Significant Effects

7.35 The predicted significance of the effect was determined through a standard method of assessment based on professional judgement, considering both sensitivity and magnitude of change as detailed in **Table 7.5** below. Major and moderate effects are considered significant in the context of the EIA Regulations.

Table 7.5 Significance criteria

Significance of Effect	Description
Major	Irreversible impact on the status of the nature conservation designation, habitat or species and likely to threaten the long-term integrity of the feature. Not reversible or replaceable. Will remain detectable in the medium and long term.
Moderate	Detectable impact on the status of the nature conservation designation, habitat or species population in the medium term but is reversible/replaceable given time, and not a threat to the long-term integrity of the feature.
Minor	Detectable impacts, and may be irreversible, but either of sufficiently small-scale or of short-term duration to have no material impact on the conservation status of the nature conservation designation, habitat or species population.
Negligible	Detectable impact but reversible within 12 months. Not expected to affect the conservation status of the nature conservation designation, habitat or species under consideration.
No Impact	No detectable impacts on the ecological resource, even in the immediate term.
The following definitions have been applied in respect to timescales:	

Significance of Effect	Description
	■ Immediate: Within approximately 12 months. ■ Short term: Within approximately 1-5 years. ■ Medium term: Within approximately 6-15 years. ■ Long term: More than 15 years.

7.36 An EcIA is undertaken in relation to the baseline conditions that will be expected to occur in the absence of a Proposed Development and, therefore, may include possible predictions of future changes to baseline conditions, such as environmental trends and other completed or planned development. Both adverse and beneficial impacts/effects are possible.

7.37 A significant effect, in ecological terms, is defined as an effect (whether adverse or beneficial) on the integrity of a defined site or ecosystem and/or the conservation status, e.g. favourable conservation status (FCS) or current conservation status (CCS), of habitats or species within a given geographical area, including cumulative and in-combination impacts.

7.38 In accordance with the CIEEM guidelines, the approach adopted in this chapter aims to determine if the effect of an impact is significant or not based on a discussion of the factors that characterise it, i.e. the ecological significance of an effect is not dependent on the value of the feature in question. For example, an effect on a species which is on a national list of species of principal importance for biodiversity may not have a significant effect on its national population. As such, the value of a feature that will be significantly affected is used to determine the geographical scale at which the effect is significant.

7.39 In accordance with the current CIEEM guidelines, effects of impacts are assessed in the presence of standard mitigation measures. Additional mitigation may be identified where it is required to reduce a significant effect.

7.40 Any significant effect remaining post-mitigation (the residual effect), together with an assessment of the likelihood of success of the mitigation, are the factors to be considered against legislation, policy and development control in determining the application.

7.41 In addition to determining the significance of effects on IEFs, this chapter also identifies any legal requirements in relation to wildlife.

Assessment Limitations

7.42 Whilst some information gaps have been identified, it is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and assessment of likely significant environmental effects on Ecology. However, some limitations were encountered, as described in the corresponding appendices. The following outlines the main limitations encountered:

- UK HAB and NVC Survey limitations.

7.43 For much of the survey area, surveys were undertaken within the optimal season for conducting vegetation surveys, with a single exception of an approximately 10-hectare piece of land. This is not considered to have hindered the results of the survey, as experienced surveyors are able to identify enough vegetative species to be able to determine habitat types to a level sufficient for the aims of the survey. The ecological surveys undertaken to support this DNS application have not therefore produced a complete list of plants and the absence of evidence of any particular species should not be taken as conclusive proof that the species is not present or that it will not be present in the future. However, the results of these surveys have been reviewed and are considered to be sufficient to undertake the assessment.

7.44 For the southern field at the survey area marked in **Figure 5** in **Appendix 7.2**, the survey was undertaken in December 2023, which is outside the optimal survey period. This is not considered a limitation however as much confidence is given to the survey results due to surveyor experience..

7.45 None of the notable plant species identified in the desk study as having been recorded on Site or within the local area were recorded in the habitat surveys despite optimal survey period timings. The main part of the Site is improved grassland, which has been significantly overgrazed in the past, although grazing pressures have since reduced. It is possible that some of the species occur in other parts of the Site where grazing levels have not been deleterious to these species but if that is the case, numbers are low or they would otherwise have been

recorded. As such, this is not considered a survey limitation, and instead a change in habitat suitability.

Bat Survey Limitations

7.46 Field Survey: Survey limitations are detailed in full within the bat survey reports (**Appendix 7.5, Annex A and B**). There were access restrictions during the 2020 surveys, which prevented the surveyors completing the PRA and static detector surveys within the eastern reaches of the Site as discussed in the report (**Appendix 7.5, Annex A**). These areas were covered in the 2022 and 2023 surveys including at-height sampling of bat activity within the plantation woodland areas at the east where keyholing is proposed. Weather data was not collected during the 2022 survey period due to access issues that prevented the installation of a weather mast. The lack of weather data from 2022 meant that it was not possible to determine if differences in bat activity between 2020 and 2022 may have been the result of more favourable weather conditions in 2022. However, these limitations do not affect the overall conclusions of the Bat Risk Assessment (**Appendix 7.5**).

7.47 Ecobat and Analysis: The guidance document for onshore windfarms (NatureScot *et al.* 2021) and the Bat Conservation Trust guidelines (Collins, 2023) recommend the use of Ecobat, a web based tool hosted and developed by the Mammal Society (Lintott *et al.*, 2018)³⁹, as it compares the data gathered at the Site to a stratified reference range of data from other Sites in the same region to allow bat activity to be categorised into percentiles (NatureScot *et al.*, 2021). This allows for an evidence-based interpretation of bat activity levels in the context of the Site location. This data is then used to define the potential risk of the Proposed Development to the local bat population. The Ecobat tool also compares bat activity to known roost emergence times for different bat species, this allows for the data to be used to indicate where roosts may be in proximity to detectors.

7.48 Ecobat was used to analyse the 2020 survey data, however the Ecobat tool was offline between June 2022 and August 2024 and was not available initially to analyse the 2022 bat survey data. An alternative methodology was used when producing the 2022 bat report, to allow

³⁹ Lintott, P. R., Davison, S., van Breda, J., Kubasiewicz, L., Dowse, D., Daisley, J., Haddy, E. and Mathews, F. (2017) Ecobat: An online resource to facilitate transparent, evidence-based interpretation of bat activity data. *Ecology and Evolution* 2017; 00:1-7.

levels of bat activity to be described and allow for an assessment of potential risk to bats, at a Site and individual turbine level (**Appendix 7.5, Annex B**).

7.49 Ecobat became available for use in 2024 and was used to reanalyse the 2022 data to inform the Bat Risk Assessment (**Appendix 7.5**). Due to restriction on species names when completing the Ecobat Proforma, 11 records of 'NSL' bat passes (either noctule, Leisler's or serotine) could not be included within the 2022 Ecobat analysis. Where relevant, the discussion in relation to NSL from Appendix 7.5, Annex B is included within the risk assessment.

7.50 To be confident in the relative activity level that Ecobat provides, The Mammal Society recommend that the 'reference range' (e.g. number of nights for each species that the data is compared to) is over 200. For the 2024 analysis, the lowest reference range was '1964' for Natterer's bat, and the highest reference range was '1,585,948' for common pipistrelle. Therefore the reference range far exceeded the minimum and the analysis is considered to provide an accurate measure of relative activity levels.

7.51 Change in turbine layout: The 2020 and 2022 surveys were based on an earlier turbine layout. The survey guidance (NatureScot *et al.*, 2021) recommends the following for developments of more than ten turbines:

- *"Detectors should be placed within the developable area at ten potential turbine locations plus a third of additional potential turbine sites up to a maximum of 40 detectors for the largest developments"; and*
- *"The selection of locations at which to place detectors should be based on professional judgement, but at large sites, it is recommended that beyond the initial ten detectors placed at proposed turbine sites (if known), the remainder should be distributed according to a system of stratified sampling based on the availability of different habitats and topographical features on the site".*

7.52 Therefore, for the Proposed Development of 30 turbines it is recommended that a minimum of 17 detectors should be deployed with ten placed at proposed turbine locations where the layout is known. The guidance recognises that turbine layouts will often change after the surveys are undertaken, as is the case with the Proposed Development. As a result, no detectors have been sited within proximity (based on a static detector acoustic range of

between 30m to 100m) to the final proposed turbine locations. However, as shown on Drawings 7.5.1 and 7.5.2 in **Appendix 7.5**, the static detectors have provided good coverage of the overall Site and different key habitats within. In 2020, 33 detectors were deployed with 16 of those within 250m of a proposed final turbine location. In 2022, 24 detectors were deployed with 13 of those within 250m of a proposed final turbine location. In conclusion, the lack of data at exact turbine locations is not considered to be a significant limitation to the overall Bat Risk Assessment.

Protected Mammal Survey Limitations

7.53 The Site and 100m buffer were fully accessible at the time of survey; however, the full extent of the 250m buffer could not be accessed to complete the otter survey. All watercourses were walked up to 100m from the Site boundary to check for evidence of otter. The majority of watercourses within 250m of the Proposed Development were surveyed with the exception of five small stretches of watercourses (as shown on Drawing 2 in **Appendix 7.6**). Three of these are separated from the Site by the A44 which will likely act as a barrier to disturbance from the Proposed Development. The fourth was a minor tributary over 100m from the Proposed Development boundary with habitats that were unsuitable for holt construction. Therefore, lack of survey data for these four watercourses is not considered a significant limitation to this assessment. However, the southern stretch of the Black Brook, where evidence of otter presence including a resting site (hover) were found, is within 250m of the proposed felling area and may contain suitable habitat for holt construction. This watercourse will be surveyed fully as part of the preconstruction surveys to ensure any resting sites are identified and the appropriate mitigation measures are adopted.

Otter Survey Limitations

7.54 Due to the steep topography and dense forestry, some areas were difficult to access. In addition, a number of the forestry road gates were locked and an area to the far north-east of the Site (Craig Hill and Graig Hill) was impossible to get to for this reason. This location supports several small pools that may have some potential for otter activity as they may be suitable as otter feeding sites due to the potential presence of fish and amphibians. Given that the ponds are open, exposed habitat, they are unlikely to provide suitable resting places/holts

for otter, therefore lack of access to these sites is not considered to be a significant issue. Mitigation measures as outlined in paragraph 7.179 will remove any potential significant impacts on foraging otter in this area.

GCN Survey Limitations

7.55 Fluctuating water levels on Site meant that, during 2021 and 2022 HSI assessments, 12 ponds were dry or unidentifiable during attempts to conduct the surveys.

7.56 Many ponds appeared to be heavily poached by livestock, in particular during periods of reduced water levels. The impact of livestock likely hinders surrounding vegetation in and around the waterbodies and reduces water quality through eutrophication from their faeces and waste.

7.57 Two ponds were considered inaccessible due to lack of landowner permission in the 2021/2022 HSI assessments: NM-48 and NM-18 , however these have now been assessed within the 2024 update surveys.

7.58 HSI methodology includes assessment of suitability partly based on scores for the location of waterbodies within a UK-wide context, largely based on altitude and known GCN locations. The HSI assessments conducted in 2021 were undertaken by Vital Ecology employees with local ecological expertise and so despite the location scores within 2021 HSI assessments differing from those conducted in 2022 by similarly competent surveyors with local knowledge, the ambiguity between location scores within the HSI assessment process suggests decisions should be based on surveyor judgement and the potential ambiguity of location divisions within the HSI assessment guidance. To overcome this potential constraint as GCN are now confirmed as present on Site and to fully inform mitigation and licencing requirements, an update desk based appraisal, and HSI and eDNA surveys were completed of ponds on Site. Where these ponds were considered suitable and within 250m of the Proposed Development, presence/absence surveys and population size class assessments were undertaken as required to inform an update status of GCN on Site.

7.59 Ponds considered suitable for supporting GCN may have been unsuitable for eDNA due to variance in water levels within the study area and the likelihood of ponds being dry during the survey period.

7.60 Due to access restrictions, the PSCA surveys in 2024 were delayed and were conducted between 20th May and 20th June 2024. Although this is within the general survey window, half the assessments were not completed in the mid-April to Mid-May survey window, as per guidance. It is considered that due to the poor weather in Spring 2024, GCN breeding is less likely to have occurred early in the season due to potential low activity in cooler conditions. It is therefore considered that the later start to the population assessment from mid-May is unlikely to present a significant constraint to the assessment, and that the majority of breeding adults would still have been present within ponds at this time.

Aquatic Habitat Assessment

7.61 Not all sites could be surveyed as planned, such as an unnamed tributary near to the summit of Great Rhos. On the 11 December 2023, surveyors achieved access to the Site via a forestry track but unfortunately ran out of daylight to survey the location safely. The surveyors attempted a second visit on the 14 December 2023 however the gate to the forestry track was locked preventing vehicular access, therefore surveyors were unable to survey this location. Through the use of aerial imagery/topography, the watercourse was assessed and is considered to be comparable with other areas comprising a mixture of overland runoff in the head reaches as well as a series of shallow runs and cascades which will be suitable for minor fish species such as bullhead and potentially white clawed crayfish.

7.62 Some rainfall was recorded at the time of surveys however this did not notably increase river flows or turbidity therefore this is not considered to have impacted the results of the surveys or the recommendations provided.

Fish and white-clawed crayfish Survey Limitations

7.63 At the time of the survey a number of the target sites were found to be dry. These included Llan-Evan Dingle, Mithil Brook (Downstream) and Cwm Nantwyllan (Upstream). Where possible, sampling sites were moved further downstream, where the watercourse became wetted. Although some of these sites were outside of the Site boundary, the survey results will provide information on species that may migrate upstream to the target sites under higher flows.

7.64 Cwm Nantywylan (Downstream) and Maes Brook (Downstream) were sampled for eDNA only, due to access restrictions. There was no safe access to Maes Brook (Upstream) to undertake an electric fishing survey. Maes Brook is located within a steep valley, and as such, it was not possible to transport the electric fishing equipment safely to the brook. White-clawed crayfish and eDNA surveys were however undertaken at this brook.

7.65 Despite these limitations, the results are considered sufficient to inform the requirements for mitigation.

Bryophyte Survey Limitations

7.66 No significant survey constraints were encountered.

NVC Survey of Areas of Concern Limitations

7.67 No significant survey constraints were encountered.

Existing Conditions and Current Baseline

7.68 This section of the chapter details the results the desk study and field surveys conducted across the Site and respective study areas, which provides the baseline conditions from which the impact assessment is based. This includes:

- Designated sites and desk study/external data;
- Habitats and vegetative communities;
- Protected or otherwise notable species; and,
- An evaluation of ecological features (see **Table 7.9**).

Statutory Nature Conservation Designations

7.69 As described in **Appendix 7.1** and shown on **Figure 7.1a**, 34 Statutory Nature Conservation Designations (including overlapping designations) are present in the local area within 10km of the Site. Radnor Forest SSSI overlaps the Site boundary in the east and the River Wye SAC and SSSI lies within 1.6km west of the Site boundary with connectivity between the Site's watercourses and are assessed further within this EIAR. All other statutory

designations are either listed for habitats and/or plant species interests only and will not be affected by the Proposed Development or there is no connectivity. The River Wye SAC and SSSI covers an area of 2,234.89 ha. Designated features of the River Wye SAC and SSSI are listed on Natural Resources Wales⁴⁰ website as including:

- Annex I habitats that are a Primary reason for selection of this Site:
 - Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation.
- Annex II species that are a Primary reason for selection of this Site:
 - White-clawed (or Atlantic stream) crayfish (*Austropotamobius pallipes*);
 - Sea lamprey (*Petromyzon marinus*);
 - Brook lamprey (*Lampetra planeri*);
 - River lamprey (*Lampetra fluviatilis*);
 - Twaite shad (*Alosa fallax*);
 - Atlantic salmon (*Salmo salar*);
 - Bullhead (*Cottus gobio*); and,
 - Otter (*Lutra lutra*).
- Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:
 - Transition mires and quaking bogs.
- Annex II species present as a qualifying feature, but not a primary reason for site selection:
 - Allis shad (*Alosa alosa*).

7.70 The current conservation status of the River Wye SAC and SSSI is mostly unfavourable due to invasive species, nutrient enrichment and habitat and population fragmentation.

⁴⁰ NRW (2024) Find protected areas of land and sea

7.71 Radnor Forest SSSI covers an area of 836 ha. Designated features of Radnor Forest SSSI are listed on Natural Resources Wales as including:

- Dry heath;
- Blanket bog;
- Rocks supporting a variety of mosses and liverworts including several scarce species;
- Locally rare plants; and,
- Upland breeding birds.

7.72 The current conservation status of Radnor Forest SSSI is favourable for blanket bog, unknown for dry heath and unknown for natural inland rock exposures, screes & upland ledges (NRW, 2020)..

Non-Statutory Nature Conservation Designations

7.73 As described in **Appendix 7.1** and shown on **Figure 7.1b** five non-statutory nature conservation designations are present in the local area within 2km. Of these, the Mynydd Ffoesidoes Radnorshire Wildlife Trust (RWT) Reserve sits directly adjacent to the eastern Site boundary and forms part of Radnor Forest SSSI. Qualifying features of Mynydd Ffoesidoes RWT reserve are listed on RWT as including:

- Heathland and moorland;
- Heather (*Calluna vulgaris*); and,
- Brown hare (*Lepus europaeus*).

7.74 These features will not be affected by the Proposed Development and the RWT reserve is therefore not considered any further.

7.75 The remaining non-statutory designations listed in **Appendix 7.1**, are located over 400m from the Site boundary and will not be affected by the Proposed Development owing to the separation distance and the nature of the qualifying features, which comprise habitat and species interests which are not functionally linked to the Proposed Development. These sites are therefore not considered any further.

7.76 Finally, as described in **Appendix 7.1** and shown on **Figure 7.1b**, 159 areas of Ancient Woodland were identified within 2km of the Site boundary. Of these, 1 area of Ancient Woodland is present within the Site itself.

Habitats

7.77 The Site is located approximately 1.5km to the east of Llandegley, Powys, and occupies an area of upland ground in the vicinity of Radnor Forest. Land ranges in elevation from 259m Above Ordnance Datum (AOD) to 660m AOD covering approximately 1,773ha. Habitats include dry heath, mires and flushes, woodlands, grasslands and bracken. Parts of the Site comprises common land subject to grazing by livestock, mainly sheep but also including cattle and ponies.

7.78 A summary of the UKHab habitats and NVC results is provided in **Table 7.6** below and shown on **Figure 7.2** and **Figure 7.3**, respectively. Detailed descriptions of the habitat types and NVC communities recorded in the Study Area, including sub-communities and variations from the published descriptions where relevant, are presented in **Appendix 7.4**, which also provides scientific names of species mentioned below.

7.79 The dominant habitats include improved grassland, dry dwarf shrub heath, semi-improved acid grassland and continuous bracken. The Site also includes coniferous woodland plantation, semi-natural broadleaved woodland, wet dwarf shrub heath and dry heath/acid grassland mosaic. The majority of the area around the Proposed Development is closely grazed pasture.

Table 7.6 UKHab habitats and Constituent NVC Communities

Phase 1 Habitat	UKHAB Habitat	Constituent NVC Communities/ Variants	Description	Extent on Site (ha or metres (m))
A1.1.1 Semi natural broadleaved woodland	w1a5 Western acidic oak woodland	W11 <i>Quercus petraea</i> – <i>Betula pubescens</i> – <i>Oxalis acetosella</i> woodland	Oak (<i>Quercus petraea</i>) and downy birch (<i>Betula pubescens</i>) species are abundant within this community with wood-sorrel (<i>Oxalis acetosella</i>) a key feature of the ground flora community. The community is abundant across higher elevations of the west coast of the UK, although on this site the stands located are on the northern boundary of the Site, at median to lower elevations of the site. The total area of habitat on Site is limited to six small areas.	0.95ha
		W17 <i>Quercus petraea</i> – <i>Betula pubescens</i> – <i>Dicranum majus</i> woodland	<i>Quercus petraea</i> and <i>Betula pubescens</i> and greater forkmoss (<i>Dicranum majus</i>) is a characteristic feature of the ground flora. Vascular plants diversity is low or near absent in the understory, replaced with high bryophyte	2.38ha

Phase 1 Habitat	UKHAB Habitat	Constituent NVC Communities/ Variants	Description	Extent on Site (ha or metres (m))
			ground cover. The community is abundant across higher elevations of the west coast of the UK, and conforming to the community's upland distribution nationally, this small area is situated at the Site's higher elevations near the centre of the Site. In particular, the habitat is found growing alongside the Nant Mithil (Mithil stream) watercourse.	
	W1d5 Wet woodland	W7 <i>Alnus glutinosa</i> – <i>Fraxinus excelsior</i> – <i>Lysimachia nemorum</i> woodland	Within the survey area this is a rare habitat limited to small areas adjacent to watercourses and areas with a high-water table. Alder (<i>Alnus glutinosa</i>), and <i>Fraxinus excelsior</i> are the key component species in this habitat, though may not be the most abundant species recorded. This is the most common <i>Alnus</i> woodland in upland Wales. Ground flora community includes yellow	3.44ha

Phase 1 Habitat	UKHAB Habitat	Constituent NVC Communities/ Variants	Description	Extent on Site (ha or metres (m))
			pimpernel (<i>Lysimachia nemorum</i>). The habitat is rare on Site consisting of small patches on the northern boundaries of the Site.	
	w2c Other coniferous woodland	N/A	Large stands of non-native coniferous woodland exist within the survey area, the largest of which is Radnor Forest. Multiple very small stands or lines of conifers are also found across the survey Site.	134.28ha
A1.2.2 Coniferous woodland plantation	h3e Gorse scrub	W23 <i>Ulex europaeus</i> – <i>Rubus fruticosus</i> scrub	Common gorse (<i>Ulex europaeus</i>) and bramble (<i>Rubus fruticosus</i>) are key features of this community and can often create a canopy, shading out any ground flora. Relating to the Development, the habitat was confined to the steepest slopes in both the higher and lower elevations where, along with scrub vegetation, it forms 'ffridd' habitat which is noted for its nomination on the	4.67ha

Phase 1 Habitat	UKHAB Habitat	Constituent NVC Communities/ Variants	Description	Extent on Site (ha or metres (m))
			PNRAP. The habitat is primarily found at median elevations on the western sections of the Site.	
A2 Scrub	g1b Upland acid grassland (g1b6)	U5 <i>Nardus stricta</i> – <i>Galium saxatile</i> grassland community	The U5 grassland community is dominated by mat-grass (<i>Nardus stricta</i>), interspersed with heath bedstraw (<i>Galium saxatile</i>) and occasionally common bent (<i>Agrostis capillaris</i>). Moss species are scattered throughout at ground level, such as common haircap (<i>Polytrichum commune</i>) and red-stemmed feather-moss (<i>Pleurozium schreberi</i>), along with <i>Cladonia</i> lichen species. This habitat is present on the median plateau of the Proposed Development Site, is well-grazed and is commonly associated with heavily-grazed examples of H18, with poorly-defined boundaries between the two.	90.23ha

Phase 1 Habitat	UKHAB Habitat	Constituent NVC Communities/ Variants	Description	Extent on Site (ha or metres (m))
B1.2 Semi- improved acid grassland		U4 <i>Festuca ovina</i> – <i>Agrostis capillaris</i> – <i>Galium saxatile</i> grassland	The U4 grassland community is dominated by sheep fescue (<i>Festuca ovina</i>), interspersed with <i>Galium saxatile</i> . On this site it forms part of the upland acid grassland habitat, which is frequent across the median and most elevated areas of the Site. Bryophytes are abundant amongst the sward in this habitat. This habitat is well-grazed and is commonly associated on this site with heavily-grazed examples of MG6 and H18, with poorly-defined boundaries between the two.	69.24ha
	g3c8 <i>Holcus-Juncus</i> neutral grassland	MG10 <i>Holcus lanatus</i> – <i>Juncus effusus</i> rush- pasture <i>Holco-Juncetum</i> effusi	The MG10 grassland community is dominated by Yorkshire fog (<i>Holcus lanatus</i>) and soft rush (<i>Juncus effusus</i>). There are typically prominent tussocks on grassland with a short, species-poor sward.	0.32ha

Phase 1 Habitat	UKHAB Habitat	Constituent NVC Communities/ Variants	Description	Extent on Site (ha or metres (m))
B2 Neutral grassland	g3c6 <i>Lolium-Cynosurus</i> neutral grassland	MG6 <i>Lolium perenne</i> - <i>Cynosurus cristatus</i> grassland	The MG6 grassland community is dominated by perennial rye-grass (<i>Lolium perenne</i>), interspersed with crested dog's-tail (<i>Cynosurus cristatus</i>). This represents one of the most abundant habitats on site (28.62%) and is dominant across much of the median and elevated portion of the Site.	478.61ha
B4 Improved grassland	N/A	MG7 <i>Lolium perenne</i> leys and related grassland community	MG7 is abundant across the Site, where the land is used for cow and sheep grazing on both the lower and median altitudes. It comprises 97.71 ha, approximately 5.84% of the total area. The habitat supports a low diversity of floral species which is dominated by <i>Lolium perenne</i> , <i>Holcus lanatus</i> and white clover (<i>Trifolium repens</i>).	72.93ha

Phase 1 Habitat	UKHAB Habitat	Constituent NVC Communities/ Variants	Description	Extent on Site (ha or metres (m))
	N/A	MG7a <i>Lolium perenne</i> - <i>Trifolium repens</i> leys	MG7 is abundant across the Site, where the land is used for cow and sheep grazing on both the lower and median altitudes. It comprises 97.71 ha, approximately 5.84% of the total area. The habitat supports a low diversity of floral species which is dominated by <i>Lolium perenne</i>, <i>Holcus lanatus</i> and white clover (<i>Trifolium repens</i>). M23 accounts for 8.32ha within the study area and is generally found scattered across the central and southern regions of the Site in small discrete areas. Overall, the rush-pasture vegetation comprises a fairly homogenous community in terms of species and structure, being typically rank. Most of it is of limited diversity, with marsh-bedstraw (<i>Galium palustre</i>), white water-crowfoot	24.78ha
	N/A	M23 <i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> mire		8.32ha

Phase 1 Habitat	UKHAB Habitat	Constituent NVC Communities/ Variants	Description	Extent on Site (ha or metres (m))
			(<i>Ranunculus aquatilis</i>) and a water starwort (<i>Callitriche</i> sp.) being other common species found.	
B5 Marshy grassland	f2b Purple moor grass and rush pasture	M25 <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire	M25 accounts for 3.27ha within the study area and is found within two separate areas within the northern half of the Site, at the north edge of the southern parcel of forestry. <i>Molinia caerulea</i> is the predominant species, with an assemblage comprising <i>Juncus effusus</i> , <i>Juncus squarrosus</i> , <i>Potentilla erecta</i> , <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Galium saxatile</i> , <i>Pleurozium schreberi</i> and <i>Rhytidiadelphus squarrosus</i> . The M25 habitat within the Site is located on shallower peat (<0.3m) hence it's categorization under marshy grassland rather than blanket bog. This habitat is noted as a priority habitat for the PNRAP.	3.27ha

Phase 1 Habitat	UKHAB Habitat	Constituent NVC Communities/ Variants	Description	Extent on Site (ha or metres (m))
	g1c Bracken	U20 <i>Pteridium aquilinum</i> – <i>Galium saxatile</i> grassland community	The U20 <i>Pteridium aquilinum</i> – <i>Galium saxatile</i> community has vegetation dominated by bracken (<i>Pteridium aquilinum</i>), which can form extensive stands. Within this community, species diversity is very limited due to the dense cover of <i>Pteridium aquilinum</i> , although around the edges where it is more easily grazed and along mown pathways <i>Galium saxatile</i> is abundant with instances of <i>Polytrichum commune</i> .	134.18ha
C1.1 Bracken	g1c Bracken N/A	U20c <i>Pteridium aquilinum</i> – <i>Galium saxatile</i> grassland community, species poor sub- community	U20c <i>Pteridium aquilinum</i> - <i>Galium saxatile</i> , species-poor sub-community is present at Cowlod Common on the lower slopes (Figure 7.3). <i>Pteridium aquilinum</i> is overwhelmingly dominant in this community with very sparse heath bedstraw, tormentil (<i>Potentilla erecta</i>) and occasional sheep's fescue (<i>Festuca ovina</i>).	53.50ha

Phase 1 Habitat	UKHAB Habitat	Constituent NVC Communities/ Variants	Description	Extent on Site (ha or metres (m))
		OV27 <i>Epilobium angustifolium</i> community	Roseby willowherb (<i>Epilobium angustifolium</i>) is dominant with few other ground flora species. The community is associated with disturbed ground such as railway banks, quarries and scrapes. The habitat on Site is limited to a single parcel within the north eastern section (Figure 7.3a).	0.14ha
C3.1 Tall ruderal	h1b5 Dry heaths, upland	H12 <i>Calluna vulgaris</i> – <i>Vaccinium myrtillus</i> heath	Areas of H12 comprise a total of 86.50ha and are affiliated with the H18 community with respect of location where it occurs on the higher slopes. The vegetation is dominated by heather (<i>Calluna vulgaris</i>) and bilberry (<i>Vaccinium myrtillus</i>) although at ground level, moss and lichen species such as <i>Pleurozium schreberi</i> , broom forkmoss (<i>Dicranium scoparium</i>), heath plait-moss (<i>Hypnum jutlandicum</i>) and reindeermoss (<i>Cladonia</i>	86.50ha

Phase 1 Habitat	UKHAB Habitat	Constituent NVC Communities/ Variants	Description	Extent on Site (ha or metres (m))
			<i>arbuscula</i>) occur. Grass species such as wavy hair-grass (<i>Deschampsia flexuosa</i>) and less commonly <i>Nardus stricta</i> are present in between the dwarf shrubs.	
D1.1 Dry dwarf shrub heath – acid	h1b5 Dry heaths, upland N/A	H18 <i>Vaccinium myrtillus</i> – <i>Deschampsia flexuosa</i> heath	H18 cloaks 393.52 hectares of the higher slopes of the Site and is in relatively good condition having been subjected to lighter grazing pressures historically, although is noted to be heavily grazed in areas where there are mosaics between this community and the U5 <i>Nardus stricta</i> - <i>Galium saxatile</i> grassland. The heath community best fits with the H18 community identification, with bilberry (<i>Vaccinium myrtillus</i>) and wavy hair-grass (<i>Deschampsia flexuosa</i>) very common throughout and other species noted such as crowberry (<i>Empetrum nigrum</i>), lingonberry (<i>Vaccinium vitis-idaea</i>), <i>Calluna</i>	393.52ha

Phase 1 Habitat	UKHAB Habitat	Constituent NVC Communities/ Variants	Description	Extent on Site (ha or metres (m))
			<i>vulgaris</i> , <i>Pleurozium schreberi</i> , purple moor grass (<i>Molinea caerulea</i>), broom forkmoss (<i>Dicranium scoparium</i>) and deergrass (<i>trichophorum cespitosum</i>), amongst others.	
		M19 (non-mire) community	The high frequency of both <i>Calluna vulgaris</i> and <i>Eriophorum vaginatum</i> , together with frequent tussocks of <i>Empetrum nigrum</i> , is typical of this community. Given the high frequency of <i>Vaccinium vitis-idaea</i> , the vegetation is most similar to the M19c <i>Vaccinium vitis-idaea</i> - <i>Hylocomium splendens</i> sub-community. <i>Sphagnum capillifolium</i> , which is usually a colourful and characteristic member of M19 vegetation, is absent. This may be due to high grazing pressure coupled with a lack of deep and saturated peat, as the community here	9.4 ha

Phase 1 Habitat	UKHAB Habitat	Constituent NVC Communities/ Variants	Description	Extent on Site (ha or metres (m))
			occupies a relatively dry, peaty loam soil on gently sloping land, and is thus on the edge of the environmental niche usually occupied by the community.	
N/A	r1a6 Other eutrophic standing water	Standing open water and aquatic communities	Several permanent ponds were identified as well as ephemeral peaty pools scattered across the elevated areas of the site, totalling in 19 standing bodies of water with varying nutrient load. This habitat is noted as a priority habitat for the PNRAP. Small and occasionally temporary water bodies that are stained dark from peaty soils are also present across the Site.	1.89ha
G.1.1 Eutrophic	r1c7 Acid peat-stained lakes and ponds	Standing open water and aquatic communities	Several permanent ponds were identified as well as ephemeral peaty pools scattered across the elevated	1.89ha

Phase 1 Habitat	UKHAB Habitat	Constituent NVC Communities/ Variants	Description	Extent on Site (ha or metres (m))
open standing water			areas of the site, totalling in 19 standing bodies of water with varying nutrient load. This habitat is noted as a priority habitat for the PNRAP.	12,641.40 m
G.1.4 Dystrophic open standing water	h2a Native hedgerow	N/A	Small and occasionally temporary water bodies that are stained dark from peaty soils are also present across the Site. Native scrub species typically forming boundary areas between land parcels. This is a Welsh priority habitat, as well as PNRAP Priority habitat. The habitat is characterised by 80% or more of the hedgerow consisting of native species.	
J.2.3.1 Native	R2a Rivers (priority habitat)	N/A	Waterways qualified on this site due to the following criteria. <i>“A watercourse within 2.5km of its furthest source, as marked with a blue line on Ordnance Survey</i>	15,457.59 m

Phase 1 Habitat	UKHAB Habitat	Constituent NVC Communities/ Variants	Description	Extent on Site (ha or metres (m))
species rich hedgerow			(OS) maps at a scale of 1:50,00". Approximately 15.46km of waterways were identified with the majority located exiting to the west of the survey area.	
G2 Running water	R2a Rivers (priority habitat)	N/A	Waterways qualified on this site due to the following criteria. "A watercourse within 2.5km of its furthest source, as marked with a blue line on Ordnance Survey (OS) maps at a scale of 1:50,00". Approximately 15.46km of waterways were identified with the majority located exiting to the west of the survey area.	15,457.59 m
Mosaics	N/A	MG6/7 Mosaic	A mosaic of MG6 Lolium perenne-Cynosurus cristatus grassland and MG7 Lolium perenne leys and related grassland community.	109.94ha

Phase 1 Habitat	UKHAB Habitat	Constituent NVC Communities/ Variants	Description	Extent on Site (ha or metres (m))
B4 Improved grassland	N/A	MG6/U4 Mosaic	A mosaic of MG6 <i>Lolium perenne</i> - <i>Cynosurus cristatus</i> grassland and U4 <i>Festuca ovina</i> – <i>Agrostis capillaris</i> – <i>Galium saxatile</i> grassland.	76.71ha
N/A	N/A	U20/H18 Mosaic	A mosaic of U20 <i>Pteridium aquilinum</i> – <i>Galium saxatile</i> grassland community and <i>Vaccinium myrtillus</i> – <i>Deschampsia flexuosa</i> heath.	8.45ha
N/A	N/A	U20/H18 Mosaic	A mosaic of U20 <i>Pteridium aquilinum</i> – <i>Galium saxatile</i> grassland community and <i>Vaccinium myrtillus</i> – <i>Deschampsia flexuosa</i> heath.	8.45ha
Unclassifiable Under NVC	N/A	N/A	Presence of ‘ffridd’ habitat is noted toward the bottom of the slopes cloaked in Bracken with species such as Hawthorn <i>Crataegus monogyna</i> , blackthorn <i>Prunus spinosa</i> and bramble forming the habitat.	150.23ha

Phase 1 Habitat	UKHAB Habitat	Constituent NVC Communities/ Variants	Description	Extent on Site (ha or metres (m))
A2 Scrub	W1 Broadleaved and mixed woodland	N/A	A number of small pockets of woodland are present in the west and lowland region of the Proposed Development. None conform to an NVC classification, and comprise species such as blackthorn, goat willow <i>Salix caprea</i> , crack willow <i>Salix fragilis</i> , English oak <i>Quercus robur</i> , ash, holly, hawthorn hazel <i>Corylus avellana</i> , elder <i>Sambucus nigra</i> , sycamore <i>Acer pseudoplatanus</i> and field maple <i>Acer campestre</i> . There is a similarity with the woodlands present and the NVC community W7 <i>Alnus glutinosa-Fraxinus excelsior-Lysimachia nemorum</i> woodland. Areas are wet in places, corresponding with the alluvial nature of W7, but the management of the surrounding land has degraded the habitat to an extent where it is not able to be categorised by the NVC.	150.23ha

Phase 1 Habitat	UKHAB Habitat	Constituent NVC Communities/ Variants	Description	Extent on Site (ha or metres (m))
A1.1.1 Broadleaved semi-natural woodland	h2 Hedgerows	N/A	Hedgerow networks are largely found within the west region of the survey area. They are associated with field boundaries and flanking the road. The ground flora is synonymous with the surrounding grassland, predominantly improved, and hedgerows are a combination of intact and defunct. Only three examples of a species-rich hedgerow were noted, with notable species such as elder <i>Sambucus nigra</i> , meadowsweet <i>Filipendula ulmaria</i> and yellow iris <i>Iris pseudacorus</i> . A single instance of Himalayan balsam <i>Impatiens glandulifera</i> was observed within a hedgerow adjacent to a watercourse (Appendix 7.4, Figure 8) downstream of the Proposed Development boundary. This species is listed on Schedule 9 of the Wildlife and Countryside Act 1981, to	

Phase 1 Habitat	UKHAB Habitat	Constituent NVC Communities/ Variants	Description	Extent on Site (ha or metres (m))
			which Section 14 applies, where it is an offence to allow this species to establish itself in the wild.	
J2.1 Intact hedge and J2.2 Defunct hedge	u1 Built up areas and gardens	N/A	A number of agricultural farmsteads and associated structures are present within the Site although are excluded from this assessment on the grounds that they are floristically irrelevant. Instances of what appear to be old/disused quarries or landslips are present infrequently across the Proposed Development on steeply-sloping ground.	
J3 Built up areas and J4 Bare ground				

7.80 The plant communities are described in greater detail in **Appendix 7.4** and **Appendix 7.14**

GWDTEs

7.81 As shown on **Figure 7.4**, several of the plant communities are potentially groundwater dependent (SEPA, 2017)⁴¹. The degree to which each of these plant communities is groundwater fed was assessed and this process is described in **Chapter 11**. **Chapter 11** also provides a full assessment of the potential impact of the Proposed Development on these communities.

Protected or Otherwise Notable Species – External Data

7.82 As detailed in **Appendix 7.1**, and summarised in **Table 7.7** below, a number of protected or otherwise notable non-avian species have been recorded in the local area.

⁴¹ Scottish Environment Protection Agency (2017) Planning guidance on on-shore windfarm developments – Land Use Planning System SEPA Guidance Note 4 (Version 9)

Table 7.7 External data on protected or otherwise notable species

Common Name	Scientific Name	Legal Protection (if any)	Species of Principal Importance in Wales	Powys Priority Species	Notes
Flora					
Bluebell	<i>Hyacinthoides non-scripta</i>	Schedule 8 of the Wildlife and Countryside Act 1981)	N/A	N/A	No records from within Site.
Wood bitter-vetch	<i>Vicia orobus</i>	N/A	Yes	N/A	No records from within Site.
Witches' whiskers lichen	<i>Usnea florida</i>	N/A	Yes	N/A	No records from within Site.
Mammals					
Otter	<i>Lutra lutra</i>	Strictly protected as an EPS under the Conservation of Habitats and	Yes	Yes	No records from within Site.

Common Name	Scientific Name	Legal Protection (if any)	Species of Principal Importance in Wales	Powys Priority Species	Notes
		Species Regulations 2017 (as amended)			
Badger	<i>Meles meles</i>	Protection of Badgers Act 1992	N/A	N/A	Records from within Site.
Pine marten	<i>Martes martes</i>	Wildlife and Countryside Act 1981 (as amended)	Yes	N/A	No records from within Site.
Polecat	<i>Mustela putorius</i>	Wildlife and Countryside Act 1981 (as amended)	Yes	N/A	No records from within Site.
Brown hare	<i>Lepus europaeus</i>	Wildlife and Countryside Act 1981 (as amended)	Yes	N/A	Records from within Site.
Hedgehog	<i>Erinaceus europaeus</i>	Wildlife and Countryside Act 1981 (as amended)	Yes	Yes	Records from within Site.

Common Name	Scientific Name	Legal Protection (if any)	Species of Principal Importance in Wales	Powys Priority Species	Notes
Hazel dormouse	<i>Muscardinus avellanarius</i>	Strictly protected as an EPS under the Conservation of Habitats and Species Regulations 2017 (as amended)	Yes	Yes	No records from within Site.
Brown long-eared bat	<i>Plecotus auritus</i>	Strictly protected as an EPS under the Conservation of Habitats and Species Regulations 2017 (as amended)	Yes	Yes	No records from within Site.
Common pipistrelle	<i>Pipistrellus pipistrellus</i>	Strictly protected as an (EPS) under the Conservation of Habitats and Species Regulations 2017 (as amended)	Yes	Yes	No records from within Site.
Daubenton's bat	<i>Myotis daubentonii</i>	Strictly protected as an EPS under the Conservation of Habitats and	N/A	Yes	No records from within Site.

Common Name	Scientific Name	Legal Protection (if any)	Species of Principal Importance in Wales	Powys Priority Species	Notes
		Species Regulations 2017 (as amended)			
Greater horseshoe bat	<i>Rhinolophus ferrumequinum</i>	Strictly protected as an EPS under the Conservation of Habitats and Species Regulations 2017 (as amended)	Yes	Yes	No records from within Site.
Lesser horseshoe bat	<i>Rhinolophus hipposideros</i>	Strictly protected as an EPS under the Conservation of Habitats and Species Regulations 2017 (as amended)	Yes	Yes	No records from within Site.
<i>Myotis</i> bat species	<i>Myotis</i> spp.	Strictly protected as an EPS under the Conservation of Habitats and Species Regulations 2017 (as amended)	N/A	N/A	No records from within Site.

Common Name	Scientific Name	Legal Protection (if any)	Species of Principal Importance in Wales	Powys Priority Species	Notes
Natterer's bat	<i>Myotis nattereri</i>	Strictly protected as an EPS under the Conservation of Habitats and Species Regulations 2017 (as amended)	N/A	Yes	No records from within Site.
Noctule bat	<i>Nyctalus noctula</i>	Strictly protected as an EPS under the Conservation of Habitats and Species Regulations 2017 (as amended)	Yes	Yes	No records from within Site.
Pipistrelle bat species	<i>Pipistrellus</i> spp.	Strictly protected as an EPS under the Conservation of Habitats and Species Regulations 2017 (as amended)	Yes (if <i>P. pipistrellus</i> or <i>P. pygmaeus</i>)	Yes (if <i>P. pipistrellus</i> or <i>P. pygmaeus</i> or <i>P. nathusii</i>)	No records from within Site.
Serotine bat	<i>Eptesicus serotinus</i>	Strictly protected as an EPS under the Conservation of Habitats and	N/A	N/A	No records from within Site.

Common Name	Scientific Name	Legal Protection (if any)	Species of Principal Importance in Wales	Powys Priority Species	Notes
		Species Regulations 2017 (as amended)			
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>	Strictly protected as an EPS under the Conservation of Habitats and Species Regulations 2017 (as amended)	Yes	Yes	No records from within Site.
Whiskered bat	<i>Myotis mystacinus</i>	Strictly protected as an EPS under the Conservation of Habitats and Species Regulations 2017 (as amended)	N/A	Yes	No records from within Site.
Unknown bat species	<i>Chiroptera</i> spp.	Strictly protected as an EPS under the Conservation of Habitats and Species Regulations 2017 (as amended)	N/A	N/A	No records from within Site.

Common Name	Scientific Name	Legal Protection (if any)	Species of Principal Importance in Wales	Powys Priority Species	Notes
Reptiles					
Slow worm	<i>Anguis fragilis</i>	Wildlife and Countryside Act 1981 (as amended)	Yes	Yes	No records from within Site
Common lizard	<i>Zootoca vivipara</i>	Wildlife and Countryside Act 1981 (as amended)	Yes	Yes	Records from within Site.
Amphibians					
GCN	<i>Triturus cristatus</i>	Strictly protected as an EPS under the Conservation of Habitats and Species Regulations 2017 (as amended)	Yes	Yes	No records from within Site.
Palmate newt	<i>Lissotriton helveticus</i>	Wildlife and Countryside Act 1981 (as amended)	N/A	Yes	No records from within Site.

Common Name	Scientific Name	Legal Protection (if any)	Species of Principal Importance in Wales	Powys Priority Species	Notes
Smooth newt	<i>Lissotriton vulgaris</i>	Wildlife and Countryside Act 1981 (as amended)	N/A	Yes	No records from within Site.
Common toad	<i>Bufo bufo</i>	Wildlife and Countryside Act 1981 (as amended)	Yes	Yes	Records from within Site.
Common frog	<i>Rana temporaria</i>	Wildlife and Countryside Act 1981 (as amended)	N/A	N/A	Records from within Site

Protected or Otherwise Notable Species – Field Survey Data

7.83 Full details of the survey methods adopted for each of the species referred to below, as well as the field survey results, can be found in **Appendix 7.5** (bats), **Appendix 7.6** (badger), **Appendix 7.6** (otter and water vole), **Appendix 7.7** (Otter), **Appendix 7.8** (GCN), **Appendix 7.9** (Aquatic habitat assessment) and the figures therein. Summaries are provided below.

Bats

Habitats

7.84 As described in **Appendix 7.5**, the Site is upland in nature lying between approximately 259m and 660m above sea level. The Site is directly south of the A488 and is predominantly comprised of rough grazing land with sections of commercial plantation forestry in the north-east (Fforest Fach) and south-east (Warren Wood) as well as smaller sections of woodland and treelines scattered throughout. Radnor Forest SSSI is located in the east of the Site. Several waterbodies are present within the Site including three waterbodies in the north of the Site near Graig Hill and a further five water bodies in the centre of the south of the Site. Additionally, several watercourses are present throughout the Site. Tributaries of the River Aran including the Maes Brook and Cwm Ffrwd are present within the north and east of the Site. Tributaries of the River Ithon including the Mithil Brook are located in the centre and south-west of the Site. Tributaries of the River Edw are present in the very south of the Site. Lastly, tributaries of the River Lugg including the Summergil Brook, Black Brook and Ystol Back Brook are present in the north, east and south-east of the Site.

7.85 A large proportion of the Site is grazed and situated on upland ground, much of which supports dwarf acid heath vegetation, acid grassland, improved grassland, areas of dense bracken, gorse and marshy grassland. Areas with wet substrates such as blanket bog and those dependent on groundwater such as valley mire are present locally. Hedgerows and treelines are infrequent. Where they are present, they link the lowland area to the north and west with the main upland area.

7.86 Between the lowland and the upland are the steep-sided valleys which are populated with dense areas of bracken, gorse and 'ffridd' habitat. Ffridd is a diverse mosaic of scrub, bracken, small broadleaved trees and other such vegetation. Synonymous with the 'upland

fringe', this habitat, where present, connects the more open and unenclosed uplands with the traditionally-farmed lowlands.

7.87 Lowland habitats within the Site comprise improved pastoral fields bordered by hedgerows, tree lines and watercourses. Small areas of coniferous woodland are present, with broadleaved and mixed woodland being more common.

7.88 Areas and features generally considered to be of high foraging value for bats comprise broadleaved woodland, woodland edge, individual and scattered trees, tree lines, hedgerows and watercourses. Treelined watercourses, small areas of woodland and hedgerows are present in the lowland areas and are considered to be of high value for foraging bats. These features are almost entirely absent from the majority of the upland, although isolated instances of these habitats do occur. Open areas are less valuable to foraging and commuting bats, aside from *Nyctalus* species (noctule, Leisler's) which are known to utilise more open areas.

7.89 Based on the NatureScot *et al.* (2021) guidance, the habitats within the Site and surrounding area were assessed as being a **Moderate overall risk** as features suitable for roosting, foraging and commuting bats are present, though often fragmented and not strongly connected to suitable habitat within the wider landscape.

Preliminary Roost Assessment

7.90 As described in **Appendix 7.5**, Preliminary Roost Assessments (PRAs) of trees and buildings within the main Site and a 250m buffer were carried out between May 2020 and December 2023.

7.91 A total of 54 buildings or structures were assessed. Llanevan Farm lies within the south-west of the Site and includes a farmhouse with associated outbuildings, assessed as having Negligible (2 buildings) to Moderate (3 buildings) bat roost suitability. The remaining buildings and structures assessed as having potential roost features comprised residential dwellings, farmhouses, buildings and other structures are located outside the Site to the west, or close to the western Site boundary. Three were identified as having High suitability to support roosting bats; 14 to have Moderate suitability; nine as Low suitability and 23 as having Negligible suitability. Seven trees within the Site were also identified with features suitable for use by bats. Six had Low suitability (or PRF-I) and one was assessed as PRF-M.

7.92 As all potential roost features are situated over 300m from a potential turbine location and over 50 m from other infrastructure (as shown on **Drawings 7.5.3 and 7.5.4, Appendix 7.5**) and will therefore not be impacted, no further survey effort was undertaken to ascertain presence/likely absence of a roost.

Automated Bat Detector Surveys

7.93 As described in **Appendix 7.5**, in 2020, 23 automated static detectors (a combination of Elekon Batlogger A+ and Anabat Swift full spectrum detectors) were deployed for the spring survey period (late May/early June), with 24 deployed for the Summer survey period (late July/early August) and Autumn survey period (September).

7.94 In 2022, 22 automated static bat detectors were deployed for the spring survey period (May), with 24 deployed for the Summer survey period (July) and Autumn survey period (September) during 2022.

7.95 In line with the NatureScot et al. (2021) guidance, detector locations were based on the proposed turbine location (correct at the time of the surveys) and also the locations were chosen for being close to either the proposed turbine locations (based on the proposed turbine layout in spring 2020) or to habitats or features of interest and based on professional judgment. As noted within the limitations. Due to a reduction in the number and location of the turbines, the static detectors were not in proximity (30m-100m) to a proposed turbine location, though a number (16 in 2020 and 13 in 2022, as detailed in Annex D, **Appendix 7.5**) were between 100m to 250m. However, good coverage of bat activity within the Site, including the turbine envelope, and the key habitats within, was achieved. The locations of the static detectors in relation to the final turbine layout are shown on **Drawings 7.5.2 and 7.5.3 of Appendix 7.5**.

7.96 The static detectors were set to record for a minimum of 10-night periods from half an hour before sunset to half an hour after sunrise, the period during which bats are usually active away from their roosts. The duration of recording per night varied throughout the survey period according to day/night length.

Assessment of Potential Risk

7.97 An assessment of site risk levels based on the NatureScot et al., (2021) guidance, described in full within **Appendix 7.5**, assessed the Site as having a '**Moderate**' habitat risk.

Due to the size of the turbines the project size is classed as '**Large**'. The overall site risk based on habitats and project size is **High (4)**.

7.98 By multiplying the site risk against the observed bat activity category, the overall risk for each bat species per detector can be examined. This is described in full within **Appendix 7.5** and is summarised within this chapter. As described in **Appendix 7.5**, an objective assessment of bat activity and a measure of relative activity was made through using the online tool "Ecobat", hosted and developed by the Mammal Society (Lintott *et al.*, 2017)⁴². The data input reveals a percentile score and categorised level of bat activity and the results can be interpreted at the local scale and Site scale. This method was used to analyse the 2020 and 2022 data. For both data sets, the median pass rate has been chosen to present the data, as bat activity levels between nights can be highly variable, and thus the median provides a more reliable value than the mean.

Summary of Overall Bat Activity

7.99 In 2020, nine species (or genera in the case of more cryptic species) were recorded on the static detectors: common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, noctule, Leisler's, brown long-eared, serotine, *Myotis* species and barbastelle. Across all detectors, the total number of passes of all bat species was 30,176. The most commonly recorded species was common pipistrelle (74.98% of all bat passes) followed by soprano pipistrelle (15.12% of all bat passes). 5.26% of all bat passes recorded were from *Myotis* species, followed by noctule (3.3%) and brown long-eared bat (1.13%). Serotine, Nathusius' pipistrelle, Leisler's and barbastelle were recorded but their combined activity accounted for less than 1% of the bat passes recorded.

7.100 In 2022, thirteen species (or genera in the case of more cryptic species) were recorded on the static detectors: common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, noctule, brown long-eared, *Myotis*, Daubenton's, Natterer's, Brandt's, whiskered, barbastelle, lesser horseshoe and NSL spp. (either noctule, Leisler's or serotine). Across all detectors, the total number of passes of all bat species was 73,299. Similar to 2020, the most commonly recorded

⁴² Lintott, P. R., Davison, S., van Breda, J., Kubasiewicz, L., Dowse, D., Daisley, J., Haddy, E. and Mathews, F. (2017) Ecobat: An online resource to facilitate transparent, evidence -based interpretation of bat activity data. Ecology and Evolution 2017; 00:1-7.

species was common pipistrelle (72.07% of all bat passes) followed by soprano pipistrelle (19% of all bat passes). 3.91% of all bat passes recorded were from *Myotis* species (when combined as was the case in 2020), followed by noctule (2.53%) and brown long-eared bat (2.42%). Barbastelle, Nathusius' pipistrelle and lesser horseshoe were recorded but their combined activity accounted for less than 1% of the bat passes recorded.

7.101 Activity overall was higher in 2022 than 2020 with an average of 92.66 bat passes per night (BPPN) in 2022 compared to 30.24 in 2020. As discussed within the Bat Risk Assessment (**Appendix 7.5**) without weather data from 2022, it is not possible to definitively state whether weather was an influencing factor in the higher bat activity levels observed in 2022. The Met Office provide historic weather data and the nearest weather station is in Ross-on-Wye approximately 55km south-west of the Site. Using this weather station to compare the 2020 and 2022 weather data between May and October, would suggest that there was higher rainfall in 2020, particularly in June and August where in 2020 the rainfall was at least double that recorded in 2022. This may have resulted in reduced recorded bat activity in 2020 if the recording periods coincided with periods of heavy rain.

Bat Species Assemblage

7.102 The Bat Mitigation Guidelines (Reason *et al*, 2023)⁴³ provide guidance on assessing the importance of the bat species assemblage within a Site. It notes that for sites which are functionally linked to a SAC where bats are a qualifying interest species, the site is automatically defined as being of International importance for the qualifying bat species. The River Ithon SSSI, which forms part of the River Wye SAC, lies within 2.9km. Bats are not listed as a qualifying interest species for this SAC though the River Ithon is noted to be an important habitat for Daubenton's bat (see also the Ecological Desk Study within the bat survey reports (Annex A and B)).

7.103 The Bat Mitigation guidance uses a scoring system based on the number of different bat species present to determine the level of Site importance (see Table 3.3, pp 30, Reason *et al*, 2023). The maximum score for a site in north or mid Wales is 36, based on the presence of three widespread species (1 point per species – score 3), five less-abundant species (2 points

⁴³ Reason, P. F. and Wray, S. (2023) UK Bat Mitigation Guidelines: a guide to impact assessment, mitigation and compensation for developments affecting bats (Version 1.1)

per species – score 10), one rare species (3 point per species – score 3), and five very rare species (4 point per species – score 20).

7.104 The thresholds are as follows:

- 45% county importance (16 to 18);
- 55% regional importance (19 to 24); and,
- 70% national importance (25 or above).

7.105 The bat species assemblage score for the Proposed Development is calculated as shown in **Table 7.8** below. On this basis, the species assemblage within the Site scores 33 (33/36 = 91.6%). This Site will therefore meet the threshold for National importance.

7.106 However, this score is based on presence/absence only and does not take into account variations in the level of bat activity/frequency of occurrence between species. If lesser horseshoe, barbastelle, serotine, Leisler's and Nathusius' pipistrelle are removed from the calculation, as their activity accounted for less than 1% of the bat activity recorded within the Site in 2022 (equating to a total of 54 bat passes which would suggest very low numbers of these species are present), the assemblage would score 13 (13/36 = 36.1%), which is of less than County importance.

7.107 Overall, a site level importance of Regional is considered appropriate.

Table 7.8 Bat species assemblage importance

Rarity Category (points/species)	Species Recorded Within the Site (2020 and 2022)	Score
Widespread all geographies [score 1]	Soprano pipistrelle Common pipistrelle Brown long-eared	3
Widespread in many geographies, but not as abundant in all [score 2]	Whiskered bat Brandt's bat	10

Rarity Category (points/species)	Species Recorded Within the Site (2020 and 2022)	Score
	Noctule Daubenton's Natterer's	
Rarer or restricted distribution [score 3]	-	0
Rarest Annex II species and very rare [score 4]	Lesser horseshoe Nathusius' pipistrelle Barbastelle Serotine Leisler's	20
Total		33

Impact Assessment

7.108 Full details on species composition and rate of passes at the static detectors in 2020 and 2022 is provided within **Appendix 7.5**. Using the NatureScot criteria (NatureScot *et al.*, 2021), which multiplies site risk (High, 4) against Ecobat activity category (or equivalent), the overall level of risk for species across the whole site, and per detector, can be examined.

High Collision Risk Species

Common Pipistrelle

2020 (**Appendix 7.5**, Table E1, Annex E)

7.109 Common pipistrelles were active throughout the Site. Activity levels (median) percentile varied between 0 and 98th percentile and was highest (98th percentile) at static location O in September, which was located adjacent to a network of hedgerows, over 1km from the nearest turbine outside the south-western boundary of the Site.

7.110 The median site risk was Low within areas of open improved grassland, woodland edge habitat and upland moorland including areas within 250m of turbines T5, T6, T15, T17, T19, T22, T25, T26 and T31. The median site risk was medium within areas of open grazed fields, woodland edges, riparian habitats and open upland including within 250m of turbine locations T2, T3, T5, T6, T12, T13, T14, T15, T17, T19, T22, T24, T25, T26 and T31. The median site risk was High within open grazed fields, woodland edges and riparian edge habitat including within 250m of turbines T13, T15, T17, T24, T25, T26, T30 and T31.

7.111 Static detectors located within open grassland or upland where the median site risk was Medium or High were A, AA, AB, AE, AF, AG, E, G, H, K, N, P, Q, R, S, V, X and Y (as shown on **Drawing 7.5.6, Appendix 7.5**). Turbines located within 250m of these detectors are T5, T6, T12, T14, **T15, T17**, T22, **T24**, T26, and **T31**. Those in bold (T15, T17, T24 and T31) are where the median site risk was High. All of these locations recorded higher levels of activity in spring/early summer (May or June).

2022 (**Appendix 7.5, Table E10, Annex E**)

7.112 Common pipistrelles were active throughout the Site. Activity levels (median) percentile varied between 0 and 72nd percentile and was highest (72nd percentile) at static detector 9 in July 2022, which was located on the edge of a coniferous plantation and adjacent to a track. This was over 350 m from the nearest turbine at the north-east of the Site.

7.113 The overall median site risk was Low within areas of open grassland, woodland edges, riparian edge habitat and at height (above plantation woodland) including areas within 250 m of turbines T9, T10, T12, T18, T21, T22, T23, T24, T25, T28, T30 and T31.

7.114 The overall median site risk was Medium within areas of open grassland habitat and woodland edge habitat including areas within 250 m of turbines T23, T25 and T28.

7.115 The overall median site risk was High within woodland edge habitat, as noted above this was recorded at detector 9 which was over 250 m from the nearest turbine.

7.116 Static detectors located within open grassland or upland where the overall median site risk was Medium were static detectors 4 and 19 (as shown on **Drawing 7.5.6, Appendix 7.5**). Turbine T23 is located within 250 m of detector 4. The nearest turbine to detector 19 is T2, which is located over 930 m away. Detector 4 recorded no common pipistrelle activity in Spring,

low activity in Summer and low/moderate activity in Autumn. Detector 19 recorded low common pipistrelle activity in Spring and Summer and low/moderate activity in Autumn.

Soprano Pipistrelle

2020 (**Appendix 7.5**, Table E2, Annex E)

7.117 Soprano pipistrelles were active throughout the Site. Activity levels (median) percentile varied between 0 and 97th percentile and like common pipistrelle, was highest (97th median percentile) at static location O in June and September, which was located adjacent to a network of hedgerows, over 1km from the nearest turbine outside the south-western boundary of the Site.

7.118 The median site risk was Low within areas of open improved grassland, open upland, riparian edge and woodland edge including areas within 250m of turbines T2, T3, T12, T15, T17, T19, T22, T24, T25, T26 and T31. The median site risk was Medium within areas of open grazed fields, woodland edges, riparian habitats and open upland including within 250m of turbine locations T2, T3, T5, T6, T12, T13, T14, T15, T17, T22, T24, T25, T26, T30 and T31. The median site risk was High mostly within edge habitats, though also within some areas of open grazed and upland habitat including within 250m of turbines T2, T3, T12, T22, T24, T30 and T31.

7.119 Static detectors located within open grassland or upland where the median site risk was Moderate or High were AB, AE, AG, E, H and P (as shown on **Drawing 7.5.7, Appendix 7.5**). Turbines located within 250m of these detectors are T5, T6, T12, T14, T15, T24, T26 and **T31**. Those in bold (T31) are where the median site risk was High. The majority of these locations recorded higher levels of activity in the summer (June/July) with the exception of static location AE which recorded the highest level of activity in the autumn (September).

2022 (**Appendix 7.5**, Table E11, Annex E)

7.120 Soprano pipistrelles were active throughout the Site. Activity levels (median) percentile varied between 0 and 51st percentile and, like common pipistrelle, was highest (51st median percentile) at static detector 9 in July, which was located at the north-east of the Site, on the edge of a coniferous plantation and adjacent to a track, over 350 m from the nearest turbine.

7.121 The median site risk was Low within areas of open improved grassland, riparian edge, woodland edge and at height (over plantation woodland) including areas within 250 m of turbines T9, T10, T12, T18, T21, T22, T23, T24, T25, T28, T30 and T31.

7.122 The median site risk was Medium within areas of open grazed fields and woodland edges including within 250 m of turbine locations T23 and T28.

7.123 Static detectors located within open grassland or upland where the overall median site risk was Medium were detector 4 (as shown on **Drawing 7.5.7, Appendix 7.5**). Turbine T23 is located within 250 m of detector 4. Detector 4 recorded low soprano pipistrelle activity in Spring and Summer and low/moderate activity in Autumn. There were no areas identified as being High median site risk.

Nathusius' Pipistrelle

2020 (**Appendix 7.5**, Table E3, Annex E)

7.124 Nathusius' pipistrelles were active in low numbers at three locations within the Site (total 5 bat passes, averaging 0.1 bat passes per night). Activity level (both median and max) was 0 percentile. The bats were recorded in woodland edge habitat within the eastern reaches of the north of the site and within the southern area of the Site. They were also recorded within an area of open upland moorland in the mid-north of the Site towards the east. There is insufficient data to indicate any trend in seasonal variation or habitat use. No Nathusius' pipistrelles were recorded within 250m of a proposed turbine location. The overall median site risk is Low.

2022

7.125 Two Nathusius' pipistrelle passes were recorded during the 2022 survey programme in August. One pass was recorded at static detector 1 (located adjacent to a plantation edge, and within 250m of T31) and one pass was recorded at static detector 7 (located in open improved grassland adjacent to the field boundary and within 250m of T21). As with the 2020 data there is insufficient data to indicate any trend in seasonal variation or habitat use. The overall median site risk is Low.

Noctule

2020 (**Appendix 7.5**, Table E4, Annex E)

7.126 Noctules were active throughout the Site. Activity levels (median) percentile varied between 0 and 89th percentile and was highest (89th median percentile, 96th maximum percentile) at static location M in July, which was located adjacent to a riparian corridor within the central area of the Site.

7.127 The median site risk was Low within areas of open improved grassland, open upland habitats and woodland edge habitat including areas within 250m of turbines T5, T6, T12, T14, T17, T19, T22, T24, T26, T30 and T31.

7.128 The median site risk was Medium within areas of open grazed fields, woodland edges and along riparian corridors within 250m of turbine locations T2, T3, T5, T12, T15, T24, T25, T26, T30 and T31.

7.129 The median site risk was High largely within open habitats but also within edge habitat including within 250m of turbines T5, T6, T13, T24 and T31.

7.130 Static detectors located within open grassland or upland where the median site risk was Medium or High were A, AA, AE, AG, E and Q (as shown on **Drawing 7.5.8, Appendix 7.5**). Turbines located within 250m of these detectors are **T5**, T26 and **T31**. Those in bold (T5 and T31) are where the median site risk was High. All of these locations recorded higher levels of activity in the spring (May) and summer (June/July).

2022 (**Appendix 7.5**, Table E13, Annex E)

7.131 Noctule were active throughout the Site. Activity levels (median) percentile varied between 0 and 24th percentile and was highest (24th median percentile) at static detector 20 in July, which was located within an open area of grassland, at the south of the Site, over 350 m from the nearest turbine.

7.132 The median site risk was Low within areas of open improved grassland, woodland edge habitat, riparian edge habitat and at height (over woodland plantation) including areas within 250 m of turbines T9, T10, T12, T18, T21, T22, T23, T24, T25, T28, T30 and T31.

7.133 The median site risk was Medium at static detector 20 as discussed above. There are no turbines within 250 m of this detector as shown on **Drawing 7.5.8, Appendix 7.5**. There were no areas identified as being High median site risk.

Leisler's Bat

2020 (Appendix 7.5, Table E5, Annex E)

7.134 Leisler's bats were active in low numbers at two locations within the Site in July. Activity levels (both median and max) were between the 0 and 32nd percentile. The bats were recorded in open grazed fields in the south-west of the Site (static detector AB) and along a riparian corridor in the central southern areas of the Site (static detector M). There is insufficient data to indicate any trend in seasonal variation or habitat use. The median site risk was Medium at detector AB within 250m of T24 and the median site risk was low at detector M within 250m of T13.

2022

7.135 In 2022 potential Leisler's were grouped with *Nyctalus* and serotine into 'NSL' due to difficulties differentiating between the bat calls. As a group 'NSL' were recorded at detectors 1 (within 250m T31), 7 (within 250m T22), 8 (within 250m T25), 9, 15 (within 250m T10), and 21 (within 250m T9). BPPH was <0.01 at all locations and the median site risk is considered to be Low.

Medium Collision Risk Species

Serotine

2020 (Appendix 7.5, Table E6, Annex E)

7.136 Serotines were active throughout the Site. Activity levels (median) percentile varied between 0 and 47th percentile and was highest (47th median percentile) at static location C in May which was located in riparian edge habitat within the southern reaches of the Site.

7.137 The median site risk was Low within areas of open improved grassland, open upland and woodland edge including areas within 250m of turbines T24, T25, T26, T30 and T31.

7.138 The median site risk was Medium within areas of open grazed fields and woodland edges including within 250m of turbine locations T2, T3, T13 and T24.

7.139 There were no areas identified as being High median site risk.

7.140 The static detector located within open grassland or upland where the median site risk was noted to be Medium was static detector AB which was located within 250m of T24. There was more activity recorded in summer (June/July) and autumn (September), than spring.

2022 (Appendix 7.5, Table E14, Annex E)

7.141 In 2022, the majority of potential serotine calls were grouped with *Nyctalus* and Leisler's into 'NSL' due to difficulties differentiating between the bat calls. As a group 'NSL' were recorded at detectors 1 (within 250 m T31), 7 (within 250 m T22), 8 (within 250 m T25), 9, 15 (within 250 m T10), and 21 (within 250 m T9). BPPH was <0.01 at all locations and the median site risk is considered to be Low.

7.142 One confirmed serotine pass was recorded in August 2022 at static detector 6, which is located within open grassland habitat and within 250 m of the T24. The median site risk is Low.

Barbastelle

2020 (Appendix 7.5, Table E7, Annex E)

7.143 Barbastelle bats were active in low numbers at one location (detector AD) within the Site. Activity level (both median and max) was 0 percentile. The bat(s) were recorded in woodland edge habitat adjacent to a pond within the north of the Site towards the eastern boundary. There is insufficient data to indicate any trend in seasonal variation or habitat use. The bat(s) were recorded within 250m of T30. The overall median site risk is Low.

2022 (Appendix 7.5, Table E15, Annex E)

7.144 Barbastelle bats were recorded in open grassland, woodland edge, riparian edge and at height (above woodland plantation) in low numbers at detectors 1 (within 250 m of T31), 5 (within 250 m of T21), 6 (within 250 m of T24), 15 (within 250 m of T10), 19, 21 (within 250 m of T9), 22 and 24.

7.145 The majority of activity was recorded in August and September, with activity in July recorded at detectors 6 and 19 only.

7.146 The overall median site risk was Low.

Low Collision Risk Species

Myotis

2020 (Appendix 7.5, Table E8, Annex E)

7.147 *Myotis* bats were active throughout the Site. Activity levels (median) percentile varied between 0 and 92nd percentile and was highest (92nd median percentile) at static location O in September, which was located adjacent to a network of hedgerows, over 1km from the nearest turbine outside the south-western boundary of the Site.

7.148 The median site risk was Low within areas of open improved grassland, open upland, riparian edge and woodland edge including areas within 250m of turbines T2, T3, T5, T6, T12, T14, T15, T17, T19, T22, T24, T25, T26, T30 and T31.

7.149 The median site risk was Medium within areas of open grazed fields, woodland edges, riparian habitats and open upland including within 250m of turbine locations T6, T12, T13, T14, T15, T19, T22, T24, T25, T26, T30 and T31.

7.150 The median site risk was High within woodland edge and along hedgerows, all locations were over 250m from a proposed turbine location.

7.151 Static detectors located within open grassland or upland where the median site risk was Medium or High were AA, AB, AE, AF, AG, G, H, K, N, P, S, U and Y. Turbines located within 250m of these detectors are T6, T12, T14, T15, T17, T24, T26 and T31. Overall, there was no strong seasonal variation in activity.

2022 (Appendix 7.5, Table E16, Annex E)

7.152 *Myotis* bats were active throughout the Site. Activity levels (median) percentile varied between 0 and 43rd percentile and was highest (43rd median percentile) at static detector 8 in August 2022, which was located on the edge of a coniferous plantation in the north of the Site, within 149 m of turbine T25. Median activity at this detector was Low in May and July.

7.153 The median site risk was Low within areas of open improved grassland, riparian edge, woodland edge and at-height (over plantation woodland) including areas within 250 m of turbines T9, T12, T24, T25, T28 and T31.

7.154 The median site risk was Medium at static detector 8 in August, located within 250 m of turbine T25, as discussed above. There were no areas identified as being High median site risk.

Daubenton's, Natterer's, Brandt's and Whiskered – 2022

7.155 As *Myotis* species are a low collision risk a detailed assessment of site risk based on BAI was not completed within the 2023 report.

Daubenton's (**Appendix 7.5**, Table E17, Annex E)

7.156 Daubenton's bats were active throughout the Site. Activity levels (median) percentile varied between 1st and 51st percentile and was highest (51st median percentile) at static detector 9 in July, which was located at the north-east of the Site, on the edge of a coniferous plantation and adjacent to a track, over 350 m from the nearest turbine. Median activity at this detector was Low in May, and no *Myotis* bats were recorded at this detector in the Autumn.

7.157 The median site risk was Low within areas of open improved grassland, riparian edge, woodland edge and at-height (over plantation woodland) including areas within 250 m of turbines T9, T10, T12, T18, T21, T22, T23, T24, T25, T28, T30 and T31.

7.158 The median site risk was Medium within woodland edge, riparian edge and open grassland habitats all detectors which recorded this level of activity were located over 250 m from a turbine location.

There were no areas identified as being High median site risk.

7.159 Static detectors located within open grassland where the median site risk was Medium were detectors 19 and 23. These detectors were both located over 900 m from the nearest turbine.

Natterer's (**Appendix 7.5**, Table E18, Annex E)

7.160 Natterer's bats were active throughout the Site. Activity levels (median) percentile varied between 5th and 100th percentile and was highest (100th median percentile) at static detectors 8 and 19 in September. Static detector 8 was located at the edge of a coniferous plantation in the north of the Site, within 250 m of turbine T25. Static detector 19 is located within open improved grassland habitat, 930 m from the closest turbine (T2).

7.161 The median site risk was Low within areas of open improved grassland, riparian edge, woodland edge and at-height (over plantation woodland) including areas within 250 m of turbines T9, T10, T12, T18, T22, T25, T28, T30 and T31.

7.162 The median site risk was Medium within areas of woodland edge and open grassland habitats including within 250 m of T8. The median site risk was High at detectors 8 and 19 as discussed above.

7.163 Static detectors located within open grassland where the median site risk was Medium or High were detectors 19 and 23. These detectors were both located over 900 m from the nearest turbine.

Brandt's (**Appendix 7.5**, Table E19, Annex E)

7.164 Brandt's bats were recorded at ten out of twenty-four of the static detectors but were widespread across the Site. Activity levels (median) percentile varied between 1st and 3rd percentile and was highest (3rd percentile) at static detector 8 which was located at the edge of a coniferous plantation at the north of the Site within 250 m of turbine T25.

7.165 The median site risk was Low within woodland edge and open grassland habitats including areas within 250 m of turbines T10, T12, T24, T25 and T31. There were no areas within the Site identified as being a Medium or High median site risk.

Whiskered bat (**Appendix 7.5**, Table E20, Annex E)

7.166 Whiskered bats were recorded at seven out of twenty-four of the static detectors mainly within the north or south of the Site. Activity levels (median) percentile varied between 1st and 5th percentile and was highest (5th percentile) at static detector 6 which was located in open grassland habitat at the north-west of the Site within 250 m of turbine T24.

7.167 The median site risk was Low within woodland edge and open grassland habitats including areas within 250 m of turbines T24, T25, T28 and T31. There were no areas within the Site identified as being a Medium or High median site risk.

Brown Long-eared Bat

2020 (**Appendix 7.5**, Table E9, Annex E)

7.168 Brown long-eared bats were active throughout the Site. Activity levels (median) percentile varied between 0 and 68th percentile and was highest (68th median percentile) at static location Z in September, which was located adjacent to woodland edge within the mid-north area of the Site within 250m of T25.

7.169 The median site risk was Low within areas of open improved grassland, open upland, riparian edge and woodland edge including areas within 250m of turbines T2, T3, T5, T12, T13, T15, T17, T19, T24, T26, T30 and T31.

7.170 The median site risk was Medium within areas of open grazed fields, woodland edges and open upland including within 250m of turbine locations T5, T6, T13, T14, T25, T26 and T31.

7.171 The median site risk was High within woodland edge and along hedgerows, including within 250m of T25.

7.172 Static detectors located within open grassland or upland where the median site risk was Medium or High were AA, AE, E, G, N, Q, R and X. Turbines located within 250m of these detectors are T5, T16, T14, T26 and T31. The median site risk at these locations was Moderate. Overall, there was no strong seasonal variation in activity, activity was slightly less in the spring compared to summer and autumn.

7.173 2022 (**Appendix 7.5**, Table E21, Annex E)

7.174 Brown long-eared bats were active throughout the Site. Activity levels (median) percentile varied between 0 and 69th percentile and was highest (69th median percentile) at static detector 8 in August, which was located adjacent to coniferous plantation edge within the mid-north area of the Site within 250 m of T25.

7.175 The median site risk was Low within areas of open improved grassland, woodland edge and at height (over plantation woodland) including areas within 250 m of turbines T9, T10, T12, T21, T22, T23, T24, T25, T28, T30 and T31.

7.176 The median site risk was Medium within areas of open grazed fields and riparian edge habitat all over 250 m from the nearest turbine.

7.177 The median site risk was High at static detector 8 as discussed above.

7.178 Static detectors located within open grassland where the median site risk was Medium was static detector 19. This was located over 930 m from the nearest turbine (T2).

Lesser Horseshoe

2022 (Appendix 7.5, Table E22, Annex E)

7.179 This species was not recorded during the 2020 survey programme. In 2022, lesser horseshoe bats were recorded at four detectors located along the north-eastern boundary, the mid-north and at the south of the Site. Activity levels (median) percentile varied from 2nd to 11th percentile. All bat passes were recorded in August.

7.180 The median site risk was Low within areas of woodland edge and open improved grassland habitats including within 250 m of turbines T25, T28 and T31. There were no areas within the Site identified as being a Medium or High median site risk.

Seasonal Trends in Bat Activity

7.181 During the 2022 surveys bat activity was observed to be much lower within the Spring (SP1) period with c. 12 % of bat passes recorded in SP1 compared to 33% in summer (SP2) and 55% in the autumn (SP3). In 2020, seasonal trends varied dependent on the species of bat and static detector location, with some statics recording higher levels of activity in the Spring.

Badger

7.182 As described in **Appendix 7.6**, the Site and up to 100m buffer were surveyed for signs of badger between September and November 2022 and followed survey methods described by Roper (2010). **Figure 7.5** presents the results of the survey and full results are presented in **Appendix 7.6**. In summary the survey results indicate that badgers are currently active within the Site, with 47 setts identified; including four potential main (breeding) setts, five annexe setts; nine subsidiary setts and 29 outlier setts. From a high-level review of sett distribution, six to seven potentially separate social groups have been provisionally identified.

7.183 Evidence of foraging was recorded in several locations within the Site, with much of this evidence associated with identified setts. Field signs included latrines, badger runs, several push throughs and badger hairs. The Site is surrounded by agricultural fields and grassland,

with several small areas of woodland. Warren Wood and Radnor Forest lie to the east, both are areas of coniferous woodland. These provide suitable foraging habitats, as well as the potential for further setts.

Otter

7.184 As described in **Appendix 7.6** and **Appendix 7.7**, the otter surveys followed best practice guidance (Chanin 2003), with a survey buffer area of watercourse habitat up to a minimum of 250m upstream and downstream of the Site. A search was undertaken of the riparian zone and up to 20m away from the water's edge (where suitable habitat was found to be present).

7.185 A potential otter resting site was identified on the west bank of Davy Morgan's Dingle; a mammal run led from the water to an area under an overhanging rock. A spraint was recorded c.170m north, on the east bank. No further evidence of otter was identified during the survey.

7.186 The watercourses within the Site and surrounding Study Area offer some opportunity for foraging and commuting otter; however, this is likely limited to the lower reaches where more suitable bankside cover and foraging opportunities are present. The small tributaries within the Site are considered unsuitable due the exposed nature of the habitats and small size.

Water Vole

7.187 As described in **Appendix 7.6**, the water vole survey was completed concurrently with the initial otter survey over several days between September and November 2022. This followed best practice guidance (Dean *et al.*, 2016), with a survey area of up to 100m from Site upstream and downstream the Site along the watercourse. A search for potential water vole evidence was undertaken in the riparian zone and up to 20m away from the water's edge (where suitable habitat was found to be present).

7.188 No evidence of water vole was identified during the survey. Suitable habitat is available within the Site in the form of small watercourses, surrounded by rush and tussocky grassland; however, these areas are heavily grazed by sheep which may limit their suitability.

GCN

7.189 As described in **Appendix 7.8**, GCN surveys have included a combination of HSI assessments, eDNA, conventional presence/absence surveys and population surveys.

7.190 Of the initial 48 waterbodies identified, a total of 14 waterbodies were not initially HSI assessed, 12 of which were not assessed due to being dry at the time of survey, and two were not assessed due to lack of landowner access permission at the time of survey.

7.191 During the 2021/2022 HSI assessments, 23 ponds were considered to be of poor suitability for GCN and so were not subject to any further assessment or survey, as it was assumed GCN would likely be absent from these ponds. These ponds appear predominantly dry though it is acknowledged that water levels may fluctuate and as GCN are confirmed present on Site, update assessments during the 2024 breeding were undertaken to reassess these ponds and inform mitigation requirements.

7.192 Eleven ponds were found to be either below average, average or good for GCN and so were considered further. The eDNA survey results were positive for the two eDNA surveyed ponds (NM-38 and NM-43) within the study area. A further waterbody, Pond NM-56 was not initially considered during HSI assessments for this Proposed Development, however the waterbody was eDNA assessed and the results showed the pond to be negative for GCN eDNA.

7.193 Pond NM-43 tested positive for eDNA; however, further population assessments were not initially carried out as the pond remained dry throughout the rest of the 2023 breeding season, so surveys were not possible. The pond was reassessed during the 2024 update surveys and a single GCN was recorded during PSCA. It is therefore concluded that this pond likely acts as a temporary loafing pond for a small number of newts and does not support a breeding population.

7.194 Following conventional presence/absence surveys in 2023, no GCN were identified during the four initial surveys for presence and absence within ponds NM-12 and NM-11, therefore these ponds were not assessed further and likely absence of GCN is concluded.

7.195 GCNs were found in the ponds NM-1, NM-2, NM-3, NM-4, NM-5 and NM-38. Pond NM-1 supports a medium population of GCN with a peak count of 28. All other ponds support a small

population with peak counts below 10. Due to the proximity of ponds NM-1 and NM-2, it is assumed that these ponds support a metapopulation of GCN, located to the north-east of the Site. Ponds NM-3, NM-4 and NM-5 all support small populations of GCN and lie within 300m of the NM-1/NM-2 cluster and so it is assumed that the metapopulation may utilise all of these ponds also. NM-52 also lies to the north-east of the Site and was found to support a small population during the 2024 PSCA surveys. This pond is however located over 350m from the previous cluster but as it is within 500m, it may also be considered to support the same population, though individual newts are less likely to frequently move between this pond and the others on a regular basis due to the larger distance. With the combined totals, this metapopulation is of a medium population size.

7.196 Due to many waterbodies being dry, inaccessible, not in surveyable condition, a further desk-based assessment using previous survey data and aerial imagery of all waterbodies (which were not already subject to presence/absence or PSCA surveys) along with eight further potential waterbodies, was undertaken in January 2024. This then informed the requirement for an update HSI of 24 ponds which are within 250m of the proposed works, due to the time elapsed since the original surveys. Of these 24 ponds, 19 scored above average of higher and so were subject to eDNA surveys in April and May 2024. This confirmed presence of GCN in an additional 11 ponds (NM-52 as noted above, NM-8, NM-10, NM-13, NM-14, NM-27, NM-ZA, NM-28, NM-37, NM-43, and NM-55), and so these were subject to full population assessments in May to June 2024. GCN were recorded in eight of these ponds (NM-43, NM-28, NM-8, NM-27, NM-14, NM-55, NM-37 and NM-52), and were not recorded in three ponds (NM-10, NM-ZA, and NM-13). It is assumed that the ponds where GCN were not recorded during the PSCA may either be due to a false positive eDNA result, or may just support newts on an occasional basis for loafing/resting whilst travelling to breeding ponds in the local area. The ponds where GCN were recorded in the 2024 season all confirmed a 'small' population of GCN. A number of these ponds to the south of the Site are clustered together (NM-27, NM-14 and NM-55), and so they are considered likely to support a metapopulation of GCN also, with GCN moving between them. The population sizes of each were small based on the small total number of peak counts.

7.197 The terrestrial GCN habitat on Site comprises areas of neutral grassland and heathland, which may be used for commuting and shelter either side of the breeding season. Woodland,

scrub and hedgerows may be used for hibernation, particularly those areas within 250m of breeding ponds. The improved grassland which is heavily grazed is unlikely to be of value to GCN due to lack of shelter; though short expanses may be used for commuting to other suitable terrestrial habitat. Areas of bracken may be used for commuting and shelter but unlikely to support hibernating GCN.

Aquatic Habitat Assessment

7.198 An aquatic habitat survey assessment was undertaken in December 2023. The methodology was adapted from that described in Hendry and Cragg-Hine (1997) and included all watercourses within the Site. A summary of the results is presented in **Table 2 of Appendix 7.9**. The survey identified suitable habitats to support minor fish species in 15 watercourses, habitats suitable for juvenile salmonids in five watercourses and habitats suitable to support white-clawed crayfish populations in 12 watercourses.

Fish and white-clawed crayfish Survey

7.199 As described in **Appendix 7.12** surveys were undertaken over two days in August 2024 by a team of two experienced aquatic ecologists. Electric fishing surveys followed best practice guidelines (Environment Agency, 2019). Manual searching for white-clawed crayfish was also undertaken by two experienced and licensed surveyors following best practice methodology (Peay, 2003). eDNA samples were collected for white-clawed crayfish and fish metabarcoding to supplement the electric fishing and manual search surveys.

7.200 The survey identified fish presence including brown trout, bullhead and river/brook lamprey in two watercourses, namely Mithil brook and Maes brook. No fish were recorded in Cwm Nantwylyan or Afon Edw tributary. White-clawed crayfish were not recorded in any of the watercourses and all of the eDNA samples for this species came back negative. It is therefore considered that white-clawed crayfish are absent from within the Site boundary and the wider catchment.

Bryophyte Survey

7.201 As described in **Appendix 7.13** surveys were undertaken in October 2024 by a highly experienced professional bryologist. All potential habitat for *Barbilophozia kunzeana*,

Biantheridion undulifolia and *Hamatocaulis vernicosus* was visited and searched in detail which comprised all springs, flushes and mires.

7.202 The survey identified no specimens of any of the target species within the Site boundary. It is concluded that all three species are likely absent from the Site.

7.203 Land within the Site contains no legally protected bryophyte species, or any bryophyte species or assemblage of significant conservation interest, that could be impacted by the Proposed Development.

NVC Survey 2024

7.204 An NVC habitat survey assessment was undertaken of three areas identified by NRW as requiring further survey and potentially comprising M19/M20 blanket bog. The areas identified by NRW are shown in Figure 1 of **Appendix 7.14** as areas 1 to 3. The aim of the survey was to assess the NVC communities present within the survey areas and map their distribution.

7.205 The NVC communities recorded include H18 *Vaccinium myrtillus* – *Deschampsia flexuosa* heath and M19 *Calluna vulgaris* – *Eriophorum vaginatum* blanket mire. The location of each community is presented in Figure 2 of **Appendix 7.14** and **Figure 7.3a**.

7.206 As described in **Appendix 7.14**, H18 occupies the drier parts of the areas surveyed on peaty loam soil on gently sloping land. M19 occupies the remainder of the areas surveyed with a high frequency of both *Calluna vulgaris* and *Eriophorum vaginatum*, though with *Sphagnum capillifolium* completely absent.

Evaluation of Ecological Features

7.207 An evaluation of the baseline ecological features is presented in **Table 7.9**, below. Features of local or higher value are considered IEFs and are carried forwards to the next stage of the assessment.

Table 7.9 Evaluation of ecological features

Feature	Evaluation Reasoning	Level of Importance
Ecological Designations		
River Wye SAC	The level of value follows the level of designation.	International
Radnor Forest SSSI	The level of value follows the level of designation. Overlaps the Site. Designated for habitats.	National
Ancient Woodland areas listed on the Ancient Woodland Inventory	The level of value follows the level of designation.	Council Area
Habitats		
W11 <i>Quercus petraea</i> – <i>Betula pubescens</i> – <i>Oxalis acetosella</i> woodland	Areas of W11 western acidic oak woodland occur in mainly the northern part of the Study Area. All areas of this woodland habitat correspond to the Section 7 habitat ‘upland oak woodland’ and align with woodland priorities in the PNRAP. Most are relatively small.	Local

Feature	Evaluation Reasoning	Level of Importance
W17 <i>Quercus petraea</i> – <i>Betula pubescens</i> – <i>Dicranum majus</i> woodland	Areas of W17 western acidic oak woodland occur in mainly the central part of the Study Area. All areas of this woodland habitat correspond to the Section 7 habitat ‘upland oak woodland’ and align with woodland priorities in the PNRAP. Most are relatively small and growing alongside the Mithil brook.	Local
W7 <i>Alnus glutinosa</i> – <i>Fraxinus excelsior</i> – <i>Lysimachia nemorum</i> woodland	Areas of W7 woodland occur as several small patches at the northern boundary of the Site. All areas of this woodland habitat correspond to the Section 7 habitat ‘wet woodland’ and align with the woodland priorities in the PNRAP. The largest example includes ancient woodland and is evaluated as part of that category.	Local
A1.2.2 Coniferous plantation woodland	Plantation dominated by exotic species. Does not align with nature conservation priorities.	Less than local
W23 <i>Ulex europaeus</i> – <i>Rubus fruticosus</i> scrub	Areas of W23 scrub habitat occurs on the steepest slopes in both the higher and lower elevations of the Site. This area of scrub habitat aligns with the scrub and Ffridd priority habitat in the PNRAP.	Local

Feature	Evaluation Reasoning	Level of Importance
U4 <i>Festuca ovina</i> – <i>Agrostis capillaris</i> – <i>Galium saxatile</i> grassland	Areas of U4 acid grassland occurs across the median and most elevated areas of the Site. Though not a priority habitat in itself, it is a component of Ffridd habitat.	Less than local
U5 <i>Nardus stricta</i> – <i>Galium saxatile</i> grassland community	Areas of U5 acid grassland occur on the median plateau of the Site. Though not a priority habitat in itself, it is a component of Ffridd habitat.	Less than local
MG10 <i>Holcus lanatus</i> – <i>Juncus effusus</i> rush- pasture <i>Holco-Juncetum</i> <i>effusi</i>	Areas of MG10 neutral grassland form prominent tussocks on grassland with a short, species-poor sward. This grassland type does not correspond to the Section 7 ‘Lowland meadows habitat’.	Less than local
MG6 <i>Lolium perenne</i> - <i>Cynosurus cristatus</i> grassland	This grassland type is dominant across much of the median and elevated portion of the Site. It does not correspond to the Section 7 ‘Lowland meadows habitat’.	Less than local

Feature	Evaluation Reasoning	Level of Importance
MG7 <i>Lolium perenne</i> leys and related grassland community	This grassland type occurs on both the median and lower slopes of the Site. It does not correspond to the Section 7 'Lowland meadows habitat'.	Less than local
M23 <i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> mire	This rush-pasture community occurs across the central and southern regions of the Site in small discrete areas and is species poor and typically rank. Does not align with nature conservation priorities.	Less than local
U20 <i>Pteridium aquilinum</i> – <i>Galium saxatile</i> grassland community	This community is dominated by bracken and forms extensive stands throughout the Site. It forms a component of Ffridd habitat.	Less than local
OV27 <i>Epilobium angustifolium</i> community	This habitat on site is limited to a single parcel within the north-eastern section. Does not align with nature conservation priorities.	Less than local
H12 <i>Calluna vulgaris</i> – <i>Vaccinium myrtillus</i> heath	This habitat type is dominated by heather and bilberry and is located on the higher slopes of the Site. It corresponds to the Section 7 habitat 'Upland heathland' and aligns with the 'Upland and heathland' priority habitat in the PNRAP.	National/ Local

Feature	Evaluation Reasoning	Level of Importance
H18 <i>Vaccinium myrtillus</i> – <i>Deschampsia flexuosa</i> heath	This habitat cloaks the higher slopes of the Site and is dominated by bilberry and wavy hair grass. It corresponds to the Section 7 habitat 'Upland heathland' and aligns with the 'Upland and heathland' priority habitat in the PNRAP.	Local
M19 (non-mire) community	The M19 (non-mire) community identified during the update NVC survey, while not considered to be blanket bog, is located adjacent to Radnor Forest SSSI and forms an extension of the habitats within the SSSI.	Local
M25 <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire	Purple moorgrass-dominated vegetation corresponds to the Section 7 habitat 'Purple Moor Grass and Rush Pastures'. It also aligns with the priority grassland habitats in the PNRAP.	Local
Standing open water and aquatic communities	Nineteen standing bodies of water of which hold water year-round, with varying nutrient load were identified within the Site. These correspond to the Section 7 habitat 'Ponds' and aligns with the Freshwater and wetlands priority habitat in the PNRAP.	Local
Rivers and streams	A number of small watercourses originate from the high plateau of the Site. These are typically small and shallow, aquatic vegetation is uncommon. These streams align with the Section 7 habitat 'Rivers' and the Freshwater and wetland priority in the PNRAP.	Local

Feature	Evaluation Reasoning	Level of Importance
Native species rich hedgerow	Native scrub species typically forming boundary areas between land parcels. This habitat corresponds with the Section 7 habitat 'Hedgerows' and aligns with the 'Linear habitat' priority in the PNRAP.	Local
Species		
Plants	None of the notable plant species identified in the desk study as having been recorded on Site or within the local area were recorded in the habitat surveys. The main part of the Site is improved grassland, which has been significantly overgrazed in the past, although grazing pressures have since reduced. It is possible that some of the species occur in other parts of the Site where grazing levels have not been deleterious to these species but if that is the case, numbers are low or they would otherwise have been recorded. As such, although notable plant species are evaluated as having less than local value in the assessment, mitigation is proposed to protect occurrences of these species during the construction phase.	Less than local
Bryophytes	A historical record of Hamatocaulis vernicosus exists from within the Site. Hamatocaulis vernicosus is specially protected under Schedule 8 of the Wildlife and Countryside Act 1981. However, a dedicated bryophyte survey of the Site in October 2024 (Appendix 7.13)	Less than local

Feature	Evaluation Reasoning	Level of Importance
	concluded that land within the application boundary contains no legally protected bryophyte species, or any bryophyte species or assemblage of significant conservation interest, that could be impacted by the proposed development.	
Bats	Roosting: All bat species are protected in Wales under the Conservation of Habitats and Species Regulations 2017 (as amended) and the WCA. Of the 17 species of bat known to breed in the UK, eight are also WPL listed, 12 are priority species under the PNRAP. The PRA surveys identified potential roost features in buildings/structures and trees within the Study Area. However, all features lie over 300m from a proposed turbine location and over 50m from all other infrastructure.	Less than local
	Commuting/Foraging: All bat species are protected in Wales under the Conservation of Habitats and Species Regulations 2017 (as amended) and the WCA. Of the 17 species of bat known to breed in the UK, eight are also WPL listed, 12 are priority species under the PNRAP. The field surveys recorded eight bat species and one genera (in the case of more cryptic species) in 2020 and eleven species and two genera in 2022, foraging and commuting within the Site. When considering high collision risk species, the median site risk was	Regional

Feature	Evaluation Reasoning	Level of Importance
	between Low and High for common pipistrelle (Favourable Current Conservation Status (CCS) in Wales), soprano pipistrelle (Favourable CCS in Wales), and noctule (Unknown CCS in Wales); the median site risk was low for Nathusius' pipistrelle (Unknown CCS in Wales) and Leisler's (Unknown CCS in Wales). Medium collision risk species serotine (Unknown CCS in Wales) and barbastelle (Unknown CCS in Wales) were recorded in low numbers and the median site risk was between Low and Medium. <i>Myotis</i> species (including Daubenton's (Favourable CCS in Wales), Brandt's (Unknown CCS in Wales), Natterer's (Favourable CCS in Wales) and whiskered (Unknown CCS in Wales)), brown long-eared bat (Favourable CCS in Wales) and lesser horseshoe bat (Favourable CCS in Wales) have a Low collision risk, and the median site risk was between Low and High. Though the upland, open areas of the Site are fairly exposed and less suitable for smaller bat species such as pipistrelles, suitable habitat features including plantation and woodland edges, and stream corridors are present within the Site.	

Feature	Evaluation Reasoning	Level of Importance
Badger (<i>Meles meles</i>)	Badgers are protected under the Protection of Badgers Act 1992. Four main setts were identified within the Site as well as three more outliers on the outer edges of the Site boundary.	Local
Otter (<i>Lutra lutra</i>)	Otters are strictly protected as an EPS under the Conservation of Habitats and Species Regulations 2017 (as amended). Current Conservation Status in Wales is Favourable. Otter presence has been confirmed along Davy Morgan's Dingle and this indicates otter use of the catchment. As the potential resting site is c. 180m from the nearest potential felling zone and c. 270m from the Proposed Development, it is not considered likely that there will be a significant impact on otter. Although otters are present in the local area, their use of the Study Area appears to be low.	Less than local
Water vole (<i>Arvicola amphibius</i>)	Water vole is a Species of Principal Importance in Wales as well as a Powys Priority Species. It is fully protected under the Wildlife and Countryside Act 1981 (as amended). No evidence of water vole was identified, and no records of water vole were identified during the desk study (ITPEnergised, 2021). The habitats of the Site and buffer area are considered sub-optimal for use. Water vole presence on Site is therefore considered unlikely.	Less than local

Feature	Evaluation Reasoning	Level of Importance
Pine marten (<i>Martes martes</i>)	The species occurs in the local area but was not recorded in the Study Area during the protected mammal survey and hence are considered likely absent from the Site.	Less than local
Polecat (<i>Mustela putorios</i>)	The species occurs in the local area but was not recorded in the Study Area during the protected mammal survey. It is therefore considered likely absent from the Site.	Less than local
Brown hare (<i>Lepus europaeus</i>)	The species is a Welsh priority species and has been recorded in the local area and within the Site as identified through the desk study.	Less than local
Hedgehog (<i>Erinaceus europaeus</i>)	The species is a Welsh priority species and has been recorded in the local area and within the Site as identified through the desk study.	Less than local
Hazel dormouse (<i>Muscardinus avellanarius</i>)	The species occurs in the local area but was not recorded in the Study Area.	Less than local
Reptiles	The Site is likely to support common species of reptile, including slow worm and common lizard.	Local

Feature	Evaluation Reasoning	Level of Importance
GCN	Several ponds within the Site have been confirmed as supporting populations of GCN, with medium and small populations confirmed across the Site. GCN are strictly protected as a EPS under the Conservation of Habitats and Species Regulations 2017 (as amended). Current Conservation Status in Wales is unfavourable at a national and county level.	Local
Atlantic Salmon	The species occurs in the local area but was not recorded within the Study Area	Less than Local
Brown trout	Brown trout are a Section 7 species of Principal Importance in Wales (Environment (Wales) Act 2016). The species occurs in the local area and was recorded within the Study Area.	Local
Bullhead	Bullhead is an Annex II species and a primary reason for the selection of the River Wye SAC and was recorded within the Study Area.	Local
River/brook Lamprey	Lamprey is an Annex II species and a primary reason for the selection of the River Wye SAC and was recorded within the Study Area.	Local
White-clawed crayfish	The species is an Annex II species and a primary reason for the selection of the River Wye SAC. It is also a Section 7 species of Principal Importance and a Powys priority PNRAP species. It occurs in the local area however was not recorded within the Study Area.	Less than Local

Future Baseline in the Absence of the Proposed Development

7.208 In the event that the Site remained undeveloped, the vegetation would likely continue to be overgrazed in areas, habitats would remain species poor, water quality would remain the same, hedgerows on Site would remain mostly species poor. Certain ponds would remain unsuitable for wildlife including GCN and some existing breeding ponds may become unsuitable overtime due to siltation, excess drying (see below) or continued poaching of banks. It is possible that agricultural support mechanisms would change over time and make biodiversity enhancement measures more financially attractive.

Implications of Climate Change

7.209 The summary of the relevant climate change projections using the UK Climate Change Projections (Met Office, 2022) are as follows:

- Temperatures are projected to increase, particularly in summer;
- Winter rainfall is projected to increase and summer rainfall is most likely to decrease;
- Heavy rain days (rainfall greater than 25mm) are projected to increase, particularly in winter;
- Near surface wind speeds are expected to increase in the second half of the 21st Century with winter months experiencing more significant effects of winds; however, the increase in wind speeds is projected to be modest; and,
- There will be an increase in frequency of winter storms.

7.210 The non-avian ecological baseline is unlikely to change significantly over the coming years as a direct result of climate change. However, changes to the local climate, such as higher temperatures and reduced rain fall in summer, may lead to gradual changes to habitats and associated species at the Site, particularly wetlands, such as ponds, marshy grassland, mire and flush habitats locally declining. The process is likely to be relatively slow but a decline

of wetlands may take place over the lifetime of the Proposed Development which will be operational for 40 years.

Design Considerations (Embedded Mitigation)

7.211 The ecological baseline has been considered throughout the design process for the Proposed Development (see **Chapter 3: Site Selection and Design Strategy**), including design meetings where representatives of each specialist subject have provided input to subsequent design options. The aim of this has been to either avoid or minimise the potential for any significant effects on important features. Non-avian ecology factors considered throughout the design process have included the following:

- Recommended disturbance buffers for protected species were adhered to wherever practicable.
- As necessary, the design iteration process aimed to avoid woodland edge and linear features likely to be used by bats for foraging and commuting.
- Avoiding or minimising losses of priority habitats.
- Avoiding areas of peat soils (i.e. areas of >0.3m depth).
- Avoidance of long undisturbed soils where possible.
- Implementing a minimum 50m buffer for any infrastructure or construction activity around all watercourses, except where watercourse crossings/upgrading works are required. The design process has actively minimised the number of watercourse crossings required for associated infrastructure.
- Minimising the take of potential GWDTEs even if these were subsequently assessed as being predominantly surface water or rain fed.
- 250m buffer round GWDTE's where possible. Where this is not possible, **Chapter 11** specifies additional mitigation that is required.

Micrositing

7.212 It is proposed that the turbines and other infrastructure will be subject to a standard 50m micrositing allowance which will be applied should adverse ground conditions be encountered during pre-construction ground investigations, or where more optimal ground conditions are available. The assessment presented in this chapter has been undertaken on that basis. A number of restrictions to the allowance are therefore described in **Chapter 4**, of which the following relate to non-avian ecology:

- Minimum bat buffers are to be maintained around suitable bat features (e.g. woodland edge, riparian corridors, boundary features) as described in paragraphs 7.291-7.308. Micrositing of turbines must be completed with consideration of these buffers and based on the turbine specification. The aim should be to maximise the distance between the works and suitable bat habitat features.
- Where badger sett buffers are present, micrositing will be used to reduce the potential for impacts and avoid the need for sett closure and licencing, where possible.
- Where GCN ponds are present, micrositing will be used, where possible, to maximise the distance between any GCN ponds (or ponds that could be restored for GCN) to limit the impacts to immediate terrestrial habitat around ponds.

7.213 Any movement of infrastructure will be dependent on other onsite constraints and subject to advice from an Environmental and Ecological Clerk of Works (ECoW).

Table 7.10 Summary of micrositing restrictions

Infrastructure	Micrositing Restrictions
1	Any movement north needs to consider the presence of a pond and maintain suitable buffers.
2	Any movement east needs to consider the presence of a pond and maintain suitable buffers.

Infrastructure	Micrositing Restrictions
3	Any movement west needs to consider the presence of a pond and maintain suitable buffers.
4	None.
5	Any movement east needs to consider the presence of a pond and maintain suitable buffers.
6	None.
7	None.
8	None.
9	Any movement east needs to consider protected species buffers, subject to pre-construction survey.
10	Any movement east, south, south-east or south-west needs to maintain a required bat buffer around forestry, subject to pre-construction habitat survey.
11	None.
12	Any movement north or west needs to maintain a required bat buffer around forestry, subject to pre-construction habitat survey. In addition, any movement north or west needs to consider the presence of a pond and maintain suitable buffers.
13	None.
14	None.
15	None.
16	None.

Infrastructure	Micrositing Restrictions
17	None.
18	None.
19	Any movement to the east, north-east, or north needs to maintain a required bat buffer around forestry, subject to pre-construction habitat survey.
20	Any movement to the east, north-east or north needs to maintain a required bat buffer around forestry, subject to pre-construction habitat survey.
21	Any movement east or south-east needs to also consider the presence of a pond and maintain suitable buffers.
22	Any movement west needs to also consider the presence of a pond and maintain suitable buffers.
23	Any movement east needs to also consider the presence of a pond and maintain suitable buffers.
24	None.
25	Any movement north or east needs to maintain a required bat buffer around forestry, subject to pre-construction habitat survey. In addition, any movement east needs to also consider the presence of a pond and maintain suitable buffers.
26	Any movement north or east needs to maintain a required bat buffer around forestry, subject to pre-construction habitat survey and also consider buffers for protected species habitat, also to be informed by pre-construction survey.
28	Any movement north or east needs to maintain a required bat buffer around forestry, subject to pre-construction habitat survey.

Infrastructure	Micrositing Restrictions
29	Any movement west needs to consider the presence of a pond and maintain suitable buffers.
30	Any movement south needs to maintain a required bat buffer around forestry, subject to pre-construction habitat survey. In addition, any movement north needs to consider the presence of a pond and maintain suitable buffers.
31	Any movement south or east needs to maintain a required bat buffer around forestry, subject to pre-construction habitat survey. In addition, any movement east needs to consider the presence of a pond and maintain a suitable buffer.
Access Tracks	None.
Construction Compound 1	Any movement north needs to consider the presence of a pond and maintain suitable buffers.
Construction Compound 2 & Borrow Pit 3	None.
Borrow Pit 1	None.
Borrow Pit 2	None.

Good Practice Measures (Applied Mitigation)

7.214 In line with the current CIEEM guidelines, the assessment of likely effects is carried out in the presence of standard mitigation measures. The following good practice and mitigation measures will be applied (post consent) during construction to ensure that effects on IEFs are reduced:

- Protective fencing and buffer zones will be implemented around sensitive areas (designated sites, priority habitat, water features etc).
- Pre-construction, an updated survey will be carried out of features within 30m of works that have the potential to support roosting bats and which could be directly or indirectly affected by the Proposed Development. If any evidence of a roost is identified, additional mitigation and/or compensation will be identified and implemented to ensure no breach in legislation will occur.
- Pre-construction, a protected species survey and bat PRA of the mature tree to be felled at Option North-B at the Site Access North (as described in **Chapter 3**), will be undertaken.
- A pre-construction survey for protected species including otter will be carried out. If evidence or a high likelihood of protected species presence is identified, additional mitigation may be identified and implemented to prevent impacts on individuals. This will be secured through SPPs.
- In the interim between the original site surveys and commencement of construction works, there is potential for newly established invasive non-native species to establish within the Site. A pre-construction survey will be carried out and an invasive species management plan will be developed to eradicate invasive species present on Site and ensure biosecurity measures are implemented to avoid the introduction of invasive species during construction. A Biodiversity Risk Assessment will also be implemented.
- The Applicant will appoint a suitably qualified Ecological Clerk of Works (ECoW) prior to the commencement of any construction activities take place. The ECoW will be present on a regular basis to oversee site clearance and construction activities, provide toolbox talks to site personnel with regards to priority species and habitats, as well as undertake monitoring works, as appropriate.
- A Site speed limit of 15 mph will be in place at all times to reduce the risk of faunal collisions with construction vehicles.
- Excavations will be covered at the end of each working day or a wooden plank placed inside to allow protected faunal species to escape, should they enter the hole. Any

temporarily exposed open pipe system will be capped in such a way as to prevent wildlife gaining access.

- A precautionary working method statement will be produced for dormouse prior to commencement of any construction activities.
- Where appropriate and safe to do so, all construction working areas with potentially suitable open habitats for reptiles will initially be cut during the active season for reptiles (April to October), under the guidance of the ECoW (e.g., using a brush cutter), to reduce the height of vegetation and make it less attractive for reptile habitation. The ECoW, or an approved contractor under the supervision of the ECoW, will move any potential refugia or hibernacula from working areas, either by hand or sensitively by machine. Working areas will then be kept unsuitable for reptiles through regular cutting until construction in that location commences.
- In order to prevent pollution of watercourses within the Site (with particulate matter or other pollutants such as fuel), standard construction practice measures will be employed as set out in the Outline CEMP (**Appendix 4.2**). Full details of construction mitigation measures will be provided in the CEMP, post-consent but prior to the development commencing.
- It is proposed that all ecological avoidance, mitigation and compensation works described in this chapter will be delivered through an Ecological Compliance Audit (ECA) scheme. The ECA scheme will be agreed with the LPA post consent but will identify Key Performance Indicators (KPIs) that are to be used for the purposes of assessing and evidence compliance of all identified ecological actions.

IEFs Scoped In or Out of the Assessment

7.215 Following evaluation of the baseline data, including desk study and field survey data, and considering the embedded mitigation measures described above, some potential effects on IEFs (features of Local or higher value) can be scoped out of the assessment, as described in **Table 7.11** below. This is based on professional judgement and experience from other relevant projects in Wales. Decommissioning effects are likely to be similar (albeit on a smaller scale) to those for the construction phase and are therefore not highlighted in the table.

Table 7.11 Important ecological features scoped in or out of the assessment

IEF	Rationale for Scoping In/Out	Scoped In/Out
Ecological Designations		
River Wye SAC	Several of the watercourses that run through the Site are tributaries of the River Wye SAC. As such there is connectivity between the Site and the SAC. The watercourses on Site provide suitable habitat for bullhead and river/brook lamprey which are both qualifying features of the SAC. Impacts are possible on the qualifying features during the construction phase and operational phase of development.	Construction: In Operation: In
Radnor Forest SSSI	Radnor Forest SSSI overlaps the Site and is designated for dry heath, bog habitat, rocks with scarce bryophytes and lichens and locally rare plants. The Proposed Development infrastructure lies to the west of the SSSI site boundary with access track being 19 m distant at the closest point. No part of the Proposed Development will be within the SSSI. While there will not be any direct impacts on the SSSI, indirect impacts could occur during construction. Any further impact during the operational phase is unlikely.	Construction: In Operation: Out

IEF	Rationale for Scoping In/Out	Scoped In/Out
Ancient Woodland areas listed on the Ancient Woodland Inventory	As shown on Figure 7.1b , Ancient Woodland sits within the Site, and is located more than 400 m from the Proposed Development infrastructure. Therefore, significant impacts will be avoided.	Construction: Out Operation: Out
Habitats		
W11 <i>Quercus petraea</i> – <i>Betula pubescens</i> – <i>Oxalis acetosella</i> woodland	As shown on Figure 7.3 , no W11 woodland overlaps with or is located within 15 m of the Proposed Development.	Construction: Out Operation: Out
W17 <i>Quercus petraea</i> – <i>Betula pubescens</i> – <i>Dicranum majus</i> woodland	As shown on Figure 7.3 , a small area of W17 woodland could potentially be permanently lost by an underground cable route during the construction phase. However, the cable route will be microsituated as such that significant impacts will be avoided.	Construction: Out Operation: Out
W7 <i>Alnus glutinosa</i> – <i>Fraxinus excelsior</i> – <i>Lysimachia nemorum</i> woodland	As shown on Figure 7.3 , no W7 woodland overlaps with or is located within 15 m of the Proposed Development.	Construction: Out Operation: Out

IEF	Rationale for Scoping In/Out	Scoped In/Out
W23 <i>Ulex europaeus</i> – <i>Rubus fruticosus</i> scrub	As shown on Figure 7.3 , a small area of W23 scrub could be impacted by an access track during the construction phase only. However, micro-siting will be implemented here and significant impacts will therefore be avoided.	Construction: Out Operation: Out
H12 <i>Calluna vulgaris</i> – <i>Vaccinium myrtillus</i> heath	As shown on Figure 7.3 , a small area of H12 heathland will be impacted during construction. No additional impacts are anticipated during the operational phase.	Construction: In Operation: Out
H18 <i>Vaccinium myrtillus</i> – <i>Deschampsia flexuosa</i> heath	H18 will be impacted both directly and indirectly during construction. No additional impacts are anticipated during the operational phase.	Construction: In Operation: Out
M25 <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire	M25 Purple moor grass and rush pasture will be impacted both directly and indirectly during construction. No additional impacts are anticipated during the operational phase.	Construction: In Operation: Out
M19 (non-mire) community	M19 (non-mire) community will be directly impacted during construction. No additional impacts are anticipated during the operational phase.	Construction: In Operation: Out
Standing open water and aquatic communities	No standing open water habitats will be impacted by the Proposed Development. Two dried up ponds which no longer function as ponds will be lost to T21 and T25.	Construction: Out Operation: Out

IEF	Rationale for Scoping In/Out	Scoped In/Out
Rivers and streams	Eight watercourse crossings will be included in the Proposed Development. Rivers and streams are both a Section 7 and PNRAP habitat. Watercourses will be impacted during construction and possibly during operation.	Construction: In Operation: In
Native species rich hedgerow	Some native species rich hedgerows will be impacted during construction. No additional impacts are anticipated during the operational phase.	Construction: In Operation: Out
Species		
Bats	Bats are confirmed to be active, foraging and commuting, within the Site including High collision risk species. Roosting bats are scoped out of the assessment as no roosts were identified within 300 m of the proposed turbine locations or within 50 m of the infrastructure during the baseline surveys and pre-construction surveys for roosting bats. As a precaution, additional mitigation measures detailed within the SPP, will ensure avoidance of significant effects on bats during the construction phase. Habitat loss effects on foraging and commuting bats are scoped out of the assessment as the main part of the Site, where turbines are proposed, is largely comprised of open habitat.	Construction: Out Operation: In

IEF	Rationale for Scoping In/Out	Scoped In/Out
	Linear features such as woodland edges and stream corridors will remain available for use by bats both during and post construction therefore no impacts are anticipated. <i>Myotis</i> species, brown long-eared bats, lesser horseshoe bats, Nathusius' pipistrelle, serotine, barbastelle and Leisler's bats are scoped out of the assessment. Based on the NatureScot <i>et al.</i> (2021) guidance and Reason <i>et al.</i> (2023), brown long-eared bat and <i>Myotis</i> bats in mid-Wales are of low population vulnerability to windfarms, relating to their relative abundance and low collision risk. Lesser horseshoe bats in mid-Wales are of medium population vulnerability due to their relative abundance, though they are a Low collision risk. Nathusius' pipistrelle (5 passes 2020, 2 passes 2022), serotine (50 passes 2020, 11 max passes 2022 (part of NSL agg)), barbastelle (1 pass 2020, 27 passes 2022) and Leisler's (4 passes 2020, 11 max passes 2022 (part of NSL agg)) are of high population vulnerability relating to their rarity and collision risk. Though these species are considered to have medium or high population vulnerability to windfarms, the low numbers encountered means that impacts are likely to be negligible. Impacts on foraging and commuting common pipistrelle, soprano pipistrelle, and noctule bats are possible during the operational phase.	

IEF	Rationale for Scoping In/Out	Scoped In/Out
Badger (<i>Meles meles</i>)	Badger setts within the forestry and in the north-east of the Site could potentially be affected by felling plans within the forestry, as well as construction of infrastructure.	Construction: In Operation: In
Reptiles	Reptiles are likely to be present on Site but are scoped out of the assessment because the measures ensured by the pre-construction surveys and, if relevant, SPP and checks completed by the designated ECoW will ensure the avoidance of any impacts on reptile.	Construction: Out Operation: Out
GCN	Several ponds within the Site have been confirmed as supporting populations of GCN. Some of the proposed infrastructure is within 250 m of GCN ponds and as such could have an impact on GCN habitat as well as the newts themselves. The Proposed Development will not likely result in the direct loss of any breeding or resting ponds, however there are risks associated with 'immediate' and 'intermediate' habitat loss and habitat fragmentation of groups of ponds supporting metapopulations during the construction phase. Operational effects may occur due to killing/injury by vehicles if GCN pass across access tracks located between ponds that likely support a metapopulation.	Construction: In Operation: In
Fish	Brown trout, Bullhead and river/brook Lamprey have been recorded in watercourses within the Study Area. Brown trout is a Section 7 species and Bullhead and Lamprey are Annex II	Construction: In Operation: Out

IEF	Rationale for Scoping In/Out	Scoped In/Out
	species and a primary reason for the selection of the River Wye SAC. Fish species could be impacted during construction.	

Assessment of Construction Effects

7.216 The assessment of effects is based on the **Project Description** as outlined in **Chapter 4**. Unless otherwise stated, potential effects identified are adverse.

Predicted Construction Effects

7.217 The main elements of the Proposed Development which have the potential to impact on IEFs during construction are:

- Existing track upgrades (1.8km);
- Cut (23.61km) track construction, including bridging/culverting of watercourses and mobile plant traffic movements;
- An electrical substation compound, consisting of a switching station, gantry, transformer area and control building;
- Onsite underground electrical cables connecting the turbines back to the energy park substation, generally laid in cable trenches alongside the access tracks;
- Temporary borrow pit operations;
- Turbine foundation creation (including excavation);
- Crane pad construction;
- Temporary lay-down and site compound areas;
- Temporary materials storage (soils);
- Site water management;
- Site restoration (temporary lay-down areas, track batters, compounds, etc.); and,
- Watercourse crossings.

7.218 The above activities have the potential to cause the following construction impacts to the IEFs identified:

- Direct loss of habitat.
- Direct loss of foraging habitat and/or breeding habitat for protected species.

- Indirect loss of foraging habitats and/or breeding habitat for species, through displacement.
- Disturbance to habitats and species (including noise, vibration, pollution), due to track and turbine base construction, as well as turbine erection, heavy machinery, noise and human activity on the site. Disturbance of vegetation will affect a 10m zone around all infrastructure.
- Fragmentation (of fish habitat) due to the construction of watercourse crossings.

7.219 In accordance with the CIEEM guidelines, effects of impacts are assessed in the presence of applied mitigation measures (as described above); where possible, design iteration has ensured avoidance of the highest quality and most sensitive areas of habitat.

7.220 Habitat lost to the Proposed Development has been calculated using the following assumptions:

- Permanent loss:
 - All habitat under permanent dug track/hardstanding will be lost; and,
 - A 3m radius of habitat from all dug track will be lost (due to embankments and drainage ditches).
- Temporary loss (habitats lost during construction but re-instated subsequently):
 - All habitats under temporary dug infrastructure (e.g. temporary borrow pit search areas).
- Temporary disturbance of habitats (overlaps with 'degradation' category below but is a construction phase impact):
 - 2m radius from all permanent and temporary lost habitat.
- Degradation (drying) of wet peat during operation (overlaps with 'temporary disturbance' category above but is an operation phase impact):
 - 10m radius from all permanent and temporary losses of wet habitat.
- Disruption of water flows in wetland habitats:
 - 10m radius from the degenerated habitats.

7.221 The access track, to be constructed for the Proposed Development, is assumed as being 5.5m wide.

7.222 All habitat loss calculations are presented in **Table 7.12**. Only those subject to direct or indirect losses are included in the table, and habitats not listed are therefore predicted to not undergo direct or indirect impacts. Categories marked with an asterisk are IEFs. Note that figures in the table have been rounded up to two digits but calculations have been done using the unrounded figures.

Table 7.12 Direct and indirect habitat losses

Habitat	Total Extent within Site	Direct Habitat Loss	Indirect Effects from Disturbance and Degradation (Worst Case)	Area of Direct and Indirect Effects	Direct and Indirect Effects as % of Total Extent Within Site (%)
A1.2.2 Coniferous plantation woodland	137.57 ha	5.21 ha	2.58 ha	7.79 ha	5.66%
*W23 <i>Ulex europaeus</i> – <i>Rubus fruticosus</i> scrub	4.68 ha	0.03 ha	0.005 ha	0.035 ha	0.74%
U4 <i>Festuca ovina</i> – <i>Agrostris capillaris</i> – <i>Galium saxatile</i> grassland	69.24 ha	5.26 ha	1.44 ha	6.7 ha	9.67%
U5 <i>Nardus stricta</i> – <i>Galium saxatile</i> grassland community	90.23 ha	8.39 ha	2.6 ha	10.99 ha	12.18%

Habitat	Total Extent within Site	Direct Habitat Loss	Indirect Effects from Disturbance and Degradation (Worst Case)	Area of Direct and Indirect Effects	Direct and Indirect Effects as % of Total Extent Within Site (%)
MG6 <i>Lolium perenne</i> - <i>Cynosurus cristatus</i> grassland	478.61 ha	28.71 ha	10.55 ha	39.26 ha	8.20%
MG7 <i>Lolium perenne</i> leys and related grassland community	72.93 ha	1.55 ha	0.68 ha	2.23ha	3.06%
MG6/7 mosaic	109.94 ha	7.05 ha	2.93 ha	9.98 ha	9.07%
MG6/U4 mosaic	76.71 ha	3.72 ha	0.99 ha	4.71 ha	6.14%
M23 <i>Juncus effusus</i> / <i>acutiflorus</i> – <i>Galium palustre</i> mire	8.32 ha	0.14 ha	0.95 ha	1.09 ha	13.1%

Habitat	Total Extent within Site	Direct Habitat Loss	Indirect Effects from Disturbance and Degradation (Worst Case)	Area of Direct and Indirect Effects	Direct and Indirect Effects as % of Total Extent Within Site (%)
U20 <i>Pteridium aquilinum</i> – <i>Galium saxatile</i> grassland community	134.18 ha	0.88 ha	0.22 ha	1.1 ha	0.82%
*H12 <i>Calluna vulgaris</i> – <i>Vaccinium myrtillus</i> heath	86.50 ha	0.36 ha	0.14 ha	0.5 ha	0.57%
*H18 <i>Vaccinium myrtillus</i> – <i>Deschampsia flexuosa</i> heath	393.52 ha	14.92 ha	5.96 ha	20.88 ha	5.30%
M19 (non-mire) community	9.4ha	1.13ha	1.05ha	2.18ha	23.19%
Running water	15,457.59 m	482.35 m	1424 m	1906.35 m	12.33%
*Hedgerows	12641.40 m	16.94 m	156.56 m	173.5 m	1.37%

Habitat	Total Extent within Site	Direct Habitat Loss	Indirect Effects from Disturbance and Degradation (Worst Case)	Area of Direct and Indirect Effects	Direct and Indirect Effects as % of Total Extent Within Site (%)
Totals – Habitats in Hectares	1,671.83 ha	77.35 ha	106.31 ha	183.66ha	10.98M%
Totals – Linear features in metres	28,098.99 m	499.29 m	1580.56 m	2079.85 m	7.4%

7.223 As evaluated in **Table 7.10**, the following IEFs are scoped into the construction phase assessment:

- River Wye SAC;
- Radnor Forest SSSI;
- Upland dry dwarf shrub heath (NVC Communities: H12 and H18);
- M19 (non-mire) community
- Native species rich hedgerows;
- Rivers and Streams;
- Badger;
- GCN; and,
- Fish.

Assessment of Effects

River Wye SAC

7.224 Feature Value and Status: As per **Table 7.9**, the SAC site is of **International** importance and is of **high** sensitivity. The condition of the SAC is unfavourable.

Impact

7.225 The Site is located 1.6km east of the River Wye SAC; however, watercourses within the Site form tributaries of the SAC. There is therefore connectivity between the two. Five watercourse crossings are needed over these tributaries and as such potential impacts may include direct impacts on aquatic species including bullhead and river/brook lamprey which may form part of the SAC population, such as mortality, injury or fragmentation/removal of habitat. Indirect impacts may occur through accidental spillages and siltation of the downstream environment. This may result in pollution to the tributary and downstream SAC.

Magnitude

7.226 Five watercourses within the Site, all of which are tributaries of the River Wye SAC, will be impacted by watercourse crossings of defined channels. An additional three crossings

include dry gullies which likely represent flow paths during times of heavy rainfall. Four of these watercourses namely; Maes brook, Mithil brook, Cwm Merwys and Llan-Evan Dingle were identified as supporting bullhead and river/brook lamprey in Maes brook (downstream) (both SAC qualifying species) during the fish survey (**Appendix 7.12**). Fish species may hide under stones etc during construction to avoid disturbance and may therefore be crushed or injured by plant or machinery. Works will however be temporary in nature and the level to which the watercourse will be physically impacted will be very limited in both temporal and physical extent.

7.227 Indirect impacts from construction of watercourse crossings may include the potential for habitat fragmentation, due to crossings impacting on fish migration. A potential temporary reduction in water quality is also possible due to accidental spillages and silt runoff. Reference should be made to **Chapter 11** for full details of these impacts and proposed mitigation. This could lead to a reduction in water quality of watercourses downstream including the SAC and likely significant effects on the species/habitats for which the SAC is designated.

7.228 Without mitigation and as a worst-case scenario the Magnitude is considered to be **Medium** and **short term**.

Significance of Effect

7.229 Given the IEF's importance at an International level, direct effects are considered to be moderate adverse and significant under the EIA regulations. Indirect effects are considered to be **moderate adverse** and **significant** in the context of the EIA regulations.

Radnor Forest SSSI

7.230 Feature Value and Status: As per **Table 7.9**, SSSIs are of **National** importance and **high** sensitivity. The condition of the SSSI is favourable for blanket bog, unknown for dry heath and unknown for natural inland rock exposures, screes and upland ledges (NRW, 2020)⁴⁴. .

Impact

7.231 An NVC update survey was undertaken in August to assess the areas of habitat adjacent to Radnor Forest SSSI as requested by NRW (Appendix 7.14) who were concerned that areas

⁴⁴ NRW, 2020. Welsh Designated Site Baseline project – Available at: <https://naturalresources.wales/evidence-and-data/research-and-reports/protected-sites-baseline-assessment-2020/?lang=en>

of M19/M20 blanket bog were missed. The NVC survey noted an M19 (non-mire) vegetative community adjacent to the SSSI. As described in **Table 7.10**, and shown in Figure 7.3a T19 of the Proposed Development lies partially within this area noted as M19 (non-mire) community, which lies adjacent to the Radnor Forest SSSI. However, the M19 community described here is not considered to be M19 blanket bog and is not a notified feature of the SSSI. While the vegetation is somewhat indicative of M19, it is most likely to be transitional habitat and is not what would be considered M19 blanket bog with many of the typical indicator species missing, such as *Sphagnum capillifolium*. As described in **Appendix 7.14** this may be due to high grazing pressure coupled with a lack of deep and saturated peat. The NVC surveyor identified the community here as occupying a relatively dry peaty loam soil on gently sloping land and is thus on the edge of the environmental niche usually occupied by this vegetative community.

7.232 Further to the NVC assessment, soil gauges were undertaken within this area (Aquaterra Consulting, November, 2024) to assess the soil conditions. The results found there to be no peat within any of the positions sampled and no evidence of peat from the surface and instead an abundance of organic rich soils. Furthermore, it was found that the soils present have a maximum depth of 0.16m. Crucially this area is not located on peat and does therefore not have the substrate conditions, nor the species assemblage, to be defined as bog. Given that this area is not located on deep peat (or peaty soils) and does not contain bog mosses, it is not considered that this community aligns with that of M19 blanket mire. Instead, it is considered that the allocation of an M19 community here is only as a “best-fit” into a community and does not reflect a true M19 community and species assemblage. Therefore there is not likely to be significant impacts on the blanket bog feature of the SSSI. Please refer to **Chapter 11** for full details of any potential hydrological impacts.

7.233 Turbines 18, 19 and 20 and the proposed tracks between them cross the area of ground immediately downslope of the peatland of the SSSI. There is therefore the risk that this infrastructure provides a preferential drainage pathway, which in turn leads to the drying of soils in the Great Rhos area. Reference should be made to **Chapter 11** for full assessment of potential hydrological impacts and proposed mitigation. Impacts resulting from accidental spillage are considered unlikely due to the lie of the land which slopes downhill into the Site and away from the SSSI. If not monitored correctly, vehicles could potentially enter the SSSI during

construction. Litter and dust within the SSSI could also increase due to increased human activity within the area.

Magnitude

7.234 The SSSI covers an area of approximately 836 ha. The development footprint is set back from the SSSI boundary by at least 19 m and is downslope of the SSSI boundary. Blanket bog is not present within the EZoI and is therefore not connected with the SSSI blanket bog and so this feature of the SSSI will not be impacted. However, proposed track infrastructure could result in the drying of the adjacent peatland indirectly through preferential drainage pathways. The Proposed Development could therefore affect the water table of the SSSI blanket bog at the current level, potentially compromising the condition of the SSSI. Without mitigation and as a worst-case scenario, magnitude is considered to be **medium, permanent and indirect**.

Significance of Effect

7.235 Given the above consideration of sensitivity and magnitude, the effect significance is considered to be **moderate adverse** and **Significant** in the context of the EIA regulations.

Upland Dry Dwarf Shrub Heath

7.236 Feature Value and Status: As per **Table 7.9**, upland dry dwarf shrub heath is of National/**Local** importance and **medium** sensitivity.

Impact

7.237 As shown in **Table 7.11**, the Proposed Development is predicted to reduce the extent of upland dry dwarf shrub heath. Dry dwarf shrub heath accounts for 480.02ha of the Site and comprises of H12 *Calluna vulgaris* – *Vaccinium myrtillus* and H18 *Vaccinium myrtillus* – *Deschampsia flexuosa* communities. Upland dry heath is a section 7 habitat and a priority habitat in the PNRAP. H12 NVC community near Esgairnantau also forms part of Radnor Forest SSSI notified features that lie adjacent to the Proposed Development and are therefore considered to be of national importance.

Magnitude

7.238 Of these two NVC communities, a total of 15.28ha will be directly lost to the Proposed Development (**Table 7.11**). Direct and permanent habitat loss due to infrastructure is therefore

predicted to be at most 3.18% of the dry heath vegetation found within the Site. The direct loss of this habitat is of a relatively small extent in the local context.

7.239 As such, when considering the relatively small areas of direct habitat loss (i.e. 15.28ha), the magnitude of impact within a regional context (11,709ha in Powys (PNRAP)) is considered to be of **Low** and **irreversible**.

7.240 A small section of access track will cut through some of the H12 heath community near Esgairnantau which forms an extension to the Radnor Forest SSSI upland heath notified feature. The development will therefore lead to the loss of a portion of this habitat as well as potential fragmentation. The area which will be lost to the Proposed Development, however, is very small (approximately 0.05ha) in comparison to the area of the SSSI (836 ha) and lies on the periphery of the upland heath notified feature. The magnitude of impact is considered to be low and irreversible.

Significance of Effect

7.241 Given the above consideration of sensitivity and magnitude, the effect significance for upland heath of Local value is considered to be minor adverse and not significant. For upland heath which is of National value at Esgairnantau the effect significance is considered to be minor adverse and not significant.

M19 (non-mire) community

7.242 Feature Value and Status: As per **Table 7.9**, M19 is of **Local** importance and **Medium** sensitivity.

Impact

7.243 As shown in Table 7.11, the Proposed Development will reduce the extent of the M19 (non-mire) community which was recorded during the 2024 NVC survey (Appendix 7.14) adjacent to Radnor Forest SSSI. The habitat description as well as peat depth and soil gauge surveys, however, indicate that this habitat should not be considered blanket bog. No Sphagnum mosses, typical indicators of blanket bog habitat, were recorded within the community. The results of the soil gauge surveys within this area also shows that the community clearly occupies organic rich soils and not peat.

7.244 Given the above, it is clear that the conditions present in this location are not conducive to the presence of bog. Instead, it is considered to be a transitional habitat between the Radnor Forest SSSI heath/blanket bog and the heavily grazed H18 dry heath/acid grassland on the eastern slopes of Cowlod common.

Magnitude

7.245 Given that the area of concern is not considered to be blanket bog, the magnitude of impact is considered to be **Negligible**

Significance of Effect

7.246 Given the above consideration of sensitivity and magnitude, the effect significance is considered to be **minor adverse** and **not significant** in the context of the EIA Regulations.

Hedgerows

7.247 Feature Value and Status: As per **Table 7.9**, hedgerow is of **Local** importance and **medium** sensitivity.

Impact

7.248 Hedgerows are both a Section 7 and priority PNRAP habitat. A 29.36m length of hedgerow will be directly lost as part of the proposed construction works.

Magnitude

7.249 According to the previous Powys LBAP, it is estimated that the length of hedgerow in Powys, including the Brecon Beacons National Park is 9,100,000m of ancient or species rich hedgerows. The length to be permanently lost within the Site will constitute 0.2% of that which is located within the Site (12,641.40 m) and 0.0003% of the Local amount. The magnitude of impact is considered to be **low** and **medium** reversibility.

Significance of Effect

7.250 Given the above consideration of sensitivity and magnitude, the effect significance is considered to be **minor adverse** and **not significant** in the context of the EIA Regulations.

Rivers and Streams

7.251 Feature Value and Status: As per **Table 7.9**, Rivers and streams are of **Local importance** and **medium** sensitivity.

Impact

7.252 Rivers and streams are both a Section 7 and PNRAP habitat and four watercourses within the Site form tributaries of the River Wye SAC. The Proposed Development involves eight watercourse crossings, five of which cross defined channels. An additional three crossings include dry gullies, which likely represent flow paths during times of heavy rainfall. Direct impacts on rivers and streams within the Site could result from construction of watercourse crossings including the release of sediment and debris downstream. The use of machinery in and around watercourses may also result in accidental fuel/oil spillages into the watercourses. Indirect impacts from silt runoff/fuel leaks could also occur, resulting in a reduction in water quality of the watercourses within the Site. Reference should be made to **Chapter 11** for full details of these impacts.

Magnitude

7.253 Measures included within the embedded and applied mitigation (CEMP and SWMP) will contribute to effectively managing this risk during the construction phase. The magnitude of impact is considered to be **medium** and **temporary**.

Significance of Effect

7.254 Given the above consideration of sensitivity and magnitude, the effect significance is considered to be **moderate adverse** and **significant** in the context of the EIA Regulations.

Badger

7.255 Feature Value and Status: As per **Table 7.9**, badger is of **Local** importance and **low** sensitivity. Badgers are protected under the Protection of Badgers Act 1992. Badger has most recently been assessed for The IUCN Red List of Threatened Species in 2015 and is listed as Least Concern (Kranz *et al.*, 2016). Badgers are widely distributed and locally common in Wales. 'A Review of the Population and Conservation Status of British Mammals', produced by the Mammal Society in collaboration with Natural England, NatureScot (formerly SNH) and

Natural Resources Wales (Matthews *et al.*, 2018) estimates the badger population within Wales to be 85,000 but notes that this is likely overestimated. Generally, the population is considered to be stable with positive drivers in population change being the implementation of the Protection of Badgers Act in 1992 and negative drivers of change being vehicle collision.

Impact

7.256 As described in **Appendix 7.6**, the protected species survey results indicate that badgers are currently active within the Site, with 47 setts identified; including four potential main (breeding) setts, five annexe setts; nine subsidiary setts and 29 outlier setts.

7.257 The following sections describe the likely short-term and long-term impacts on badger due to the works, without mitigation:

■ Short-term impacts:

- Disturbance: Works within 30m of a badger sett may result in the disturbance due to noise, dust and vibration of badgers present within the setts at the time of the works. Temporary lighting installed during works could disrupt foraging and commuting behaviour within the vicinity of the Site. One outlier sett is confirmed to lie under the footprint of felling works with an additional three setts, including a disused outlier, an outlier and a subsidiary sett lying at the edge of the felling plan footprint. All four could be maintained but would be subject to disturbance.
- Killing or injury of individual badgers: The destruction of setts that lie under the footprint of the felling plan or works within 30m of setts (due to the risk of collapsing tunnels) may result in the killing or injury of individual badgers.

■ Long term impacts:

- Sett loss: Should felling works not allow for the maintenance of setts, then one outlier sett is likely to be destroyed as a result of the development. Another three setts, including a disused outlier, an outlier and a subsidiary sett lie at the edge of the felling plan footprint and could be affected by the works. Though all setts within a social groups' territory are considered to have value, outlier setts and subsidiary setts are of lower conservation significance than main or annex setts being by their nature occasionally

used. Loss of an outlier sett or subsidiary sett could therefore have a Low impact on the local badger population. No main setts will be lost due to the Proposed Development.

- Loss of foraging habitat: Suitable foraging habitat within the Site includes areas of modified grassland and coniferous woodland. Approximately 7.7% of the total extent of modified grassland and 4.96% of mature conifer plantation within the red line boundary lies under the footprint of the permanent and temporary works and will be lost. Suitable habitat in the wider area includes rough grassland, and mature woodland habitat. This foraging habitat will remain available for use by badgers both during and post-construction.

Magnitude

7.258 A total of 47 setts including at least four main setts were found within the Study Area. A maximum of four social groups are considered likely to be present within the Site and immediate environs which may be impacted by the Proposed Development. The average social group size in Wales is 6.74 adults (Roper, 2010). Taking the higher figure, if four social groups are present this will equate to 26.96 adult badgers, which is c. 0.03 % of the Welsh population that could be impacted by the Proposed Development.

7.259 No loss of main setts will occur as a result of the Proposed Development. Only one outlier sett could be directly lost and another three outlier/subsidiary setts potentially impacted, and so this is likely to result in a medium impact to the local badger population. Loss of foraging habitat is low in the context of the remaining available resource.

7.260 Magnitude is considered to be **medium** and **short term**.

Significance of Effect

7.261 Given the above consideration of sensitivity and magnitude, the effect significance is considered to be **moderate adverse** and **significant** under the terms of the EIA Regulations.

GCN

7.262 Feature Value and Status: As per **Table 7.9**, GCN is of **Local** importance and a EPS under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) and **medium** sensitivity.

Impacts

7.263 Overall, 14 ponds have been confirmed as supporting GCN during the breeding season, with a further three potentially supporting GCN on an occasional basis for resting/loafing. A medium sized metapopulation of GCN has been identified within the pond cluster to the north-east of the Site and several small populations have been recorded elsewhere on Site to the south and centre. The population is of **Local** importance. It has been assumed that a metapopulation exists within the northern cluster of ponds NM-1 and NM-2, and though approximately 300m away, it is assumed that the same population may be present within ponds NM-3, NM-4, NM-5 and NM-52 (small populations were encountered in the latter ponds). A further metapopulation may exist around ponds to the south (pond NM-27, NM-14 and NM-55) and this population is of small size. Other small populations lie to the south and centre of the Site. These ponds will not be directly impacted by the Proposed Development and so no direct impacts to confirmed breeding ponds will occur.

7.264 Calculations have been undertaken to confirm the amount of terrestrial habitat loss as a result of the Proposed Development (see Figure 7.8.3 for buffers around ponds). In total, 0.106ha of 'immediate' GCN habitat (within 50m of ponds) will be impacted around ponds NM-28 and NM-14, both of which support small populations. This loss is of small scale as it is associated with access track construction in proximity to pond NM-14, within currently grazed improved grassland and so would be considered as 'modified management, resurfacing, etc', which equates to a 'medium' impact as per the GCN Mitigation Guidelines (English Nature, 2001). Impacts within 50m of NM-28 specifically relate to the proposed cable route within existing improved grassland. As works here are likely to be of 'temporary destruction, then reinstatement', then this is considered to be a 'low' impact as per the GCN Mitigation Guidelines (English Nature, 2001).

7.265 The proposed access track passes approximately 70m at its closest point to the north-west of the cluster of ponds NM-2 and NM-1, and approximately 120m to the south-east of the cluster of ponds comprising NM-3, NM-4 and NM-5. 'Intermediate' terrestrial habitat (50-250m from ponds) loss will also take place around ponds NM-52, NM-43, NM-8, NM-28, NM-27, NM-14, NM-55, and NM-38, with a total loss/modification of 16.99ha of 'intermediate' terrestrial habitat. At this distance terrestrial habitat will be lost under the footprint of infrastructure

including the turbine pads, trench digging for cabling, earthworks cut and fill and access track construction. As the impacts (destruction of terrestrial habitat) will be over 50m from the ponds, this equates to a 'medium' impact as per the GCN Mitigation Guidelines (English Nature, 2001). This habitat is primarily improved grassland and is sheep grazed, so is likely used primarily for commuting, rather than foraging, sheltering or hibernation habitat. No loss of key hibernation habitat is therefore anticipated.

7.266 A further total loss of 45.41ha of 'distant' GCN terrestrial habitat (250-500m from ponds) will occur as a result of the Proposed Development. The access track itself passes between the two clusters of ponds and, if metapopulations exists here, it is possible that the proposed access track may result in habitat fragmentation for the metapopulations. The construction will likely involve digging and use of trenching for the cable which could result in killing or injury to GCN passing across the working area if they become trapped in trenches or are killed by machinery. The presence of these works may also act as a barrier to newt movement and prevent them from reaching their hibernation habitat, which is assumed may include the woodland to the south of ponds NM-1 and NM-2.

7.267 These impacts are considered to be temporary in nature for the duration of the construction period in this area, however, may result in:

- Loss of a proportion of the population;
- Reduction in breeding success due to fragmentation of the metapopulation; and/or,
- Loss of a proportion of the population due to inability to reach hibernation habitat if those newts from the NM-3, NM-4, NM-5 pond cluster use the area of woodland to the south for hibernation.

7.268 Thus, this will impact the favourable conservation of this species on Site. Both 'immediate' and 'intermediate' GCN habitat will be lost, and the scale of impact in both scenarios is 'Medium' based on the nature of proposed works within those distances. However, the overall risk level is considered moderate based on the amount of habitat loss and medium to small sized population size.

7.269 GCN presence through eDNA was indicated in three other ponds within the central region and southern region of the Site (NM-10, NM-ZA and NM-13), however no GCN were

recorded in these ponds during PSCA surveys. . It is likely that small numbers of GCN may exist in these areas and use these ponds occasionally for loafing/resting whilst travelling to breeding ponds in the area. As water levels are known to fluctuate however, there is potential for these ponds to be used for breeding in the future and so these will be considered within the mitigation requirements.

7.270 There are numerous ponds elsewhere on the Site, however the majority of these were considered unsuitable for newts due to frequent drying and heavy poaching of banks and scored poor in the HSI assessments. However, due to fluctuation of water levels across the Site, it is possible that GCN may occur elsewhere on Site in the future. Due to the number of ponds in close proximity to the proposed works, particularly within 250m (English Nature, 2001), there is potential for impacts on a Site-wide basis, which will also require further mitigation.

Magnitude

7.271 Current conservation status of GCN in its natural range is assessed to be unfavourable (English Nature, 2001). It is considered that the population are also unfavourable at a national and county level in Wales (Natural Resources Wales, 2018). Wales is marginal for GCN based on the HSI location criteria (ARG UK, 2010). It is considered however that due to the formation of metapopulations, and delayed recruitment of young into the breeding population, it is assessed that as a worst-case scenario, in the absence of mitigation, the loss of/impact to 0.106ha of immediate GCN habitat and 16.99ha of intermediate GCN habitat, in the context of the Site, will not detrimentally impact the future maintenance of the favourable conservation status of the wider Regional population. It is therefore considered to be of medium magnitude and medium-term impact.

Significance of Effect

7.272 Given the above consideration of sensitivity and magnitude, the effect significance is considered to be **moderate adverse** and **significant** under the terms of the EIA Regulations.

Fish

7.273 Feature Value and Status: As per **Table 7.9**, Fish is of **Local** importance and **medium** sensitivity.

Impact

7.274 Fish species including brown trout (Section 7 species), bullhead and river/brook lamprey (Annex II species and SAC qualifying species) have been recorded in the watercourses within the Study Area (**Appendix 7.12**). Construction of watercourse crossings could directly impact fish species within the watercourses affected through crushing or injury by machinery or plant. Works within watercourses could indirectly result in habitat fragmentation, due to crossings impacting fish migration. Water quality could also be impacted either directly through instream works or indirectly through sediment runoff/fuel leaks etc, which fish are sensitive to. Works are however considered to be temporary in nature and the extent to which each watercourse will be impacted is likely to be limited in extent.

Magnitude

7.275 Given that the works are temporary in nature and embedded and applied mitigation (CEMP and SWMP) is included, it is considered in the absence of further mitigation and as a worst-case scenario that the loss of a proportion of the fish population from the Site or downstream of the Site will not detrimentally impact the wider regional population of fish including bullhead which has favourable conservation status. It is considered therefore to be of **medium** magnitude and **short term** impact.

Significance of Effect

7.276 Given the above consideration of sensitivity and magnitude, the effect significance is considered to be **moderate adverse** and **significant** under the terms of the EIA Regulations.

Proposed Mitigation (Additional Mitigation) and Compensation

Protected Sites

River Wye SAC

7.277 In order to monitor water quality within the Site during construction, a water quality monitoring program must be developed to detect and rectify any pollution incidents that occur immediately. This will begin prior to construction to determine the baseline data and continue regularly throughout the construction period. The ECoW will also monitor the water quality and will have the right to stop work as deemed necessary. All details of water quality monitoring

including locations will be agreed with statutory consultees and included within a water quality monitoring plan and the CEMP.

7.278 Any upgrades of existing watercourse crossing points will implement best practice techniques as mentioned above, as standard for any watercourse on the Site as recommended by the Guidance for Pollution Prevention (GPP) document list, in particular documents 5 and 6.

7.279 A foul drainage strategy will be produced and submitted to and approved by the local planning authority prior to commencement of any works.

7.280 An Outline Drainage Strategy has also been produced and will be appended to the CEMP.

7.281 During the construction phase of the works, control measures will be implemented to minimise the risk of fine sediment/debris (construction derived or otherwise) from being washed into the watercourse by installing silt screens/fences or similar. In addition, oil and fuel can be toxic for aquatic life, furthermore hydrocarbons such as oil or fuel do not degrade quickly and can remain present in the environment for some time after the spill. Industry best practice guidelines for fuel storage, refuelling and mitigation (spill kits/bunds/refuelling protocol) should be followed at all times when on Site.

7.282 All works within or in proximity to the river channel will be undertaken during the summer months (mid-June – end of September) to minimise potential disruption or disturbance during key fish migration/spawning periods.

7.283 Should dewatering be required during construction, a fish rescue will be undertaken immediately prior to dewatering or fluming of the channel to reduce the risk of fish being harmed by the works. An Ecological Clerk of Works (ECoW) will be present during the construction and de-watering of any works required in the vicinity of a watercourse.

7.284 Although no aquatic invasive non-native species (INNS) were observed within the Site, works will adhere to construction best practice and an appropriate INNS method statement will be followed during the works to reduce the potential risk of spreading INNS on, or out of the working area. A Biosecurity Risk Assessment will also be implemented.

7.285 An Aquatic Species Mitigation Plan will be produced and submitted to and approved by the local planning authority prior to construction.

7.286 Measures to avoid impacting the natural flow of water will be implemented including the use of the largest box culvert possible to maintain continuity of flow in any channels.

7.287 Prior to commencement full watercourse crossings designs will be submitted to and approved by the local planning authority.

Radnor Forest SSSI

7.288 Details of all measures to mitigate the potential risk of the tracks at turbines 18, 19 and 20 becoming preferential drainage pathways resulting in dewatering are described in **Chapter 11**.

7.289 In addition, and as previously discussed, the M19 vegetative community recorded here is in fact likely to be transitional habitat and without the ground conditions (i.e. substrate type or depth) conducive to supporting blanket bog. To enhance this habitat and its condition, additional measures will be undertaken as described within the OHMP, including conservation grazing in and around this area. This will not only enhance habitats adjacent to the SSSI but extend the extent of good quality habitat outside the SSSI boundary thereby improving good quality ecological networks. Reference to Appendix 7.10 (OHMP) should be made here for the full details of the approach to be undertaken.

7.290 If not monitored correctly, vehicles could enter the SSSI during construction. Litter within the SSSI could also increase due to increased human activity within the area.

7.291 To mitigate this, signage and cones will be erected along the length of the SSSI boundary within the Site to prevent any vehicles, machinery or construction workers from entering the SSSI and avoid accidental damage to the habitats within the SSSI. This must be checked on a regular basis to ensure compliance along with litter checks. All checks will be laid out in the CEMP.

Habitats

7.292 A Habitat Management Plan (HMP) will be implemented during the construction and operation phases. An OHMP is presented in **Appendix 7.10** which also includes a Net Benefits for Biodiversity (NBB) assessment, in order to identify and confirm that a measurable gain can be achieved on Site through a detailed HMP (to be secured by planning condition).

7.293 Habitat enhancement measures include riparian restoration of watercourses within the Site. Measures including tree planting and planting/establishment of marginal/riparian vegetation will be implemented along water margins. This will not only improve habitat for aquatic fauna through the provision of shade, shelter and nutrients, it will also reduce surface water run-off and sedimentation of watercourses from the surrounding landscape, thereby reducing the impacts of the Proposed Development on the River Wye SAC downstream. Riparian restoration will however avoid Cwm Blithus SSSI to maintain the favourability of its geological features.

7.294 Other measures will include hedgerow/shelterbelt and woodland planting away from the turbine area, which will benefit commuting badgers, bats and other species. Pond creation/enhancement measures are also included in the OHMP which will focus on enhancing ponds which scored as poor in the GCN HSI assessments, to improve them for GCN and other aquatic species. Pond creation will also take place in areas where there are existing GCN metapopulations in order to increase connectivity and compensate for loss of dried out ponds.

7.295 Bracken control will take place within the Site and allowed to reseed naturally with upland species such as heather and/or acid grassland species.

7.296 Conservation grazing in the upland areas of the Site where it is mostly dry dwarf shrub heath (priority habitat) and acid grassland which are overgrazed, will be undertaken to improve the condition of the habitat in terms of species diversity and sward structure.

7.297 Improved grassland will be enhanced through re-seeding with species rich swards then grazed using conservation grazing measures.

7.298 The loss of the small area of H12 heath at Esgairnantau will be compensated for through the creation and enhancement of heathland habitat in this area, which will extend the extent of good quality heathland beyond the boundaries of the SSSI and enhance that which is already present.

7.299 Reference to **Appendix 7.10** (OHMP) should be made here for the full details of the approach to be undertaken.

7.300 Peatland restoration measures including gully and drain blocking are proposed within areas of Radnor Forest SSSI which lie within the Site boundary along with conservation grazing. Please refer to **Appendix 7.10** for further details.

Rivers and Streams

7.301 All mitigation described above for the River Wye SAC will be implemented for all watercourses within the Site boundary. Reference should also be made to **Chapter 11** for further mitigation measures.

Species

Badger

7.302 If required, following pre-construction surveys and monitoring, an NRW badger development licence will be applied for and granted prior to any works commencing on Site for the closure of an outlier sett and potential impact to three subsidiary/outlier setts. The licence will be supported by a Badger Protection Plan detailing mitigation and compensation measures to minimise the impact on individual badgers and the local badger population. The strategy could include:

- All works which may impact badgers or their setts will be supervised by a suitably qualified ecologist experienced in badger mitigation design and implementation.
- Temporary or permanent exclusion of outlier setts will be undertaken where there is a risk of setts being destroyed or damaged by the works.
- Net loss of foraging habitat will be minimised through creation of suitable habitat within the landscape design.
- Boundary features such as the fence lines and hedgerows can be important landscape features for badgers and used to delineate social group territory boundaries. Removal of boundary features will be minimised.
- A 20-30 cm gap will be maintained between the base of security fencing and the ground to permit passage of badger and other mammals through the Site and minimise loss of foraging habitat.

- The design of temporary site lighting must ensure that boundary features are not illuminated as badgers (and other mammals) will often avoid lit areas.
- Vehicular traffic will be restricted to a 15mph speed limit at night between sunset and sunrise.
- Where identified badger tracks in regular use are intersected by the access track it is recommended that these are connected using a mammal underpass beneath the access track.

GCN

7.303 An NRW mitigation licence will be required for the proposed works on a project-wide basis due to the spread of GCN in different areas of the Site.

7.304 A GCN Species Protection Plan will be required as part of the NRW mitigation licencing requirements. This will detail mitigation and compensation measures. The SPP will include the following:

- Details of the specific requirements for mitigation of impacts on GCN across the site. This will include any need for trapping and translocation of newts (if required). The use of trapping and translocation and need for temporary amphibian fencing as a mitigation measure will be reduced where possible, due to the sheer size of the area. Focus instead will be on sensitive timing of works, habitat manipulation and enhancement.
- Details of ECoW supervision as required.
- Details of toolbox talks.
- Details of habitat compensation measures and enhancement including provision of a long-term great crested newt conservation area, as set out in the OHMP. Many of the ponds on site are currently of poorer condition and scored low on the HSI, primarily due to their drying annually, and heavily poached banks due to livestock leading to a lack of emergent vegetation and poor water quality from livestock waste eutrophication. These factors likely make the waterbodies unsuitable for breeding. The enhancements will be focused on these ponds and their surrounding terrestrial habitats and will be detailed within the GCN mitigation and enhancement plan. The enhancements could include:

- De-silting or extending existing ponds to ensure there are deeper sections year-round; and,
 - Sensitive management and enhancement of surrounding terrestrial habitat – to include:
 - a. Stock fencing ponds to prevent livestock poaching.
 - b. Enhancement of marginal and emergent vegetation by plug planting with locally native species, re-seeding pond banks and creating log piles around the ponds.
 - c. Pond creation and terrestrial habitat enhancement in areas where existing meta-population is located. This will include sensitive management of connecting grasslands between ponds and hibernation habitat (e.g. woodland) through reducing grazing or mowing, creating log piles and planting scrub pockets across terrestrial habitat to enhance connectivity for GCN.
- Details of long-term monitoring of breeding ponds, terrestrial habitat and GCN populations, in according with the Wales GCN Monitoring Scheme.

7.305 It is considered that following implementation of these measures, the three licencing tests are likely to be met as required by the Conservation of Habitats and Species Regulations 2017, as outlined below:

- The development is considered to provide other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment.
- There is no satisfactory alternative – the design of the development has considered protected species and habitat and has therefore avoided key sensitive areas and reduced impacts wherever possible.
- With mitigation and enhancement measures in place, no significant impacts to GCN are likely to occur and so the proposed development is not considered to be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.

Fish

7.306 All mitigation described above for the River Wye SAC and its qualifying fish species will be implemented, including an aquatic species mitigation plan, for all watercourses within the Site boundary. Reference should also be made to **Chapter 11** for further mitigation measures.

7.307 It should be noted that riparian restoration along watercourses within the Site will be implemented as part of the OHMP, which will improve habitat quality in these areas and provide further shade, shelter and nutrients for fish species in watercourses within the Site.

Residual Construction Effects

Protected Sites

River Wye SAC

7.308 The mitigation strategy involves measures to prevent pollutants entering the watercourses and a water quality monitoring program will detect any incidents and rectify them immediately during construction. A surface water management plan is also included in the CEMP and this will detail measures to prevent contaminated run-off from construction.

7.309 Following implementation and monitoring of mitigation measures, residual effects on the protected sites during construction are considered to be **negligible and not significant**.

Radnor Forest SSSI

7.310 The mitigation strategy outlined in **Chapter 11** reduces the risk of tracks adjacent to the SSSI becoming preferential drainage pathways thereby removing the likelihood of the SSSI habitats being affected through drying.

7.311 Further measures within the OHMP including conservation grazing in this area and peatland restoration within the SSSI, will help enhance the M19 (non-mire) community resulting in a better sward and potentially the establishment of Sphagnum mosses.

7.312 Heathland creation and enhancement measures at Esgairnantau will compensate for the loss of H12 habitat in this area which forms an integral part of the SSSI notified feature. These measures will also extend the habitat outside the SSSI boundary and help improve the notified feature around its periphery.

7.313 The mitigation strategy prevents all vehicular access within the SSSI during construction as well as measures to prevent litter encroachment.

7.314 With the implementation of these measures, the residual effects on the SSSI will be **negligible** and **not significant**.

Habitats

7.315 The permanent losses of dry heath and hedgerow, cannot be mitigated; the residual construction effect is therefore assessed to remain **minor adverse** and **not significant** under the EIA Regulations, but it should be noted that habitat management is proposed that will enhance habitats and compensate losses in the long term and deliver a net benefit for biodiversity, focussed on habitat enhancements of hedgerow and heathlands, riparian corridors and improved grassland. In the long term the residual construction effect is therefore assessed as **minor beneficial** and **not significant**.

Rivers and Streams

7.316 As stated above for the River Wye SAC, following implementation and monitoring of mitigation measures, residual effects on the watercourses during construction are considered to be **negligible** and **not significant**.

Species

Badger

7.317 The mitigation strategy will prevent direct impacts on individual badgers throughout the Site, through a variety of good practice measures. If buffers cannot be maintained at the setts, an NRW licence will be required as well as further mitigation measures to protect the badgers and their setts during construction and operation of the Proposed Development. If these are implemented the residual effects on the badger population within the Site will reduce to **negligible** and **not significant**.

GCN

7.318 The mitigation and compensation strategy will prevent significant impacts to the local GCN population, and the favourable conservation status of the population will be maintained.

With additional compensation and enhancement measures implemented, it is considered that the population on Site can increase over time as more suitable habitat is created. With measures in place, the residual effects on the GCN population within the Site will reduce to **minor beneficial** and **not significant**.

Fish

7.319 The mitigation strategy will prevent significant impacts to the local fish population, and the favourable conservation status of bullhead will be maintained. With measures in place, the residual effects on the fish population within the Site will reduce to **minor adverse** and **not significant**.

Assessment of Operational Effects

7.320 The main elements of the Proposed Development which have the potential to impact on IEFs during operation are:

- Pollution of watercourses and direct impacts on SAC qualifying species;
- Bats colliding with turbine blades or experiencing barotrauma;
- Badgers colliding with vehicles; and
- GCN being killed/injured by vehicles.

Predicted Operational Effects

7.321 As evaluated in **Table 7.10**, the following IEFs are scoped into the operation phase assessment:

- River Wye SAC;
- Rivers and Streams
- Bats;
- Badger; and
- GCN.

Assessment of Effects

River Wye SAC

Impact

7.322 During operation, the outline drainage strategy will be implemented (**Appendix 11.2**). Borrow pits and any excavations will be reinstated after construction, therefore any exposed soil will be minimised. Vehicular access will generally be reduced to maintenance and survey work and pre-existing farming practices.

Magnitude

7.323 There is expected to be a reduction in the magnitude of impact compared to the construction period. Any likely impacts on SAC qualifying species have been identified within the construction phase above. Reference should be made to **Chapter 11** for impacts on water quality. Magnitude is considered to be **low** and **short term**.

Significance of Effect

7.324 Operational effects to the SAC are therefore considered to be **negligible** and **not significant**.

Rivers and streams

Impact

7.325 As detailed above for the River Wye SAC impacts on rivers and streams will be significantly reduced during the operational phase of the Proposed Development.

Magnitude

7.326 There is expected to be a reduction in the magnitude of impact compared to the construction period. Reference should be made to **Chapter 11** for impacts on water quality. Magnitude is considered to be **low** and **short term**.

Significance of Effect

7.327 Operational effects on Rivers and Streams are therefore considered to be **negligible** and **not significant**.

Bats

Impact (all species)

7.328 During the operational phase, there is a potential for bats to collide with turbine blades or to suffer ‘barotrauma’ when flying in close proximity to rotors. For the purposes of this assessment, impacts from barotrauma are assumed to be the same as for collision risk, owing to the paucity of published empirical evidence in causes of bat fatalities around windfarms and the difficulties in determining whether bat fatalities are caused by collisions or barotrauma.

7.329 Findings of a study completed by Exeter University (Mathews *et al.*, 2016⁴⁵) found that most UK onshore windfarm bat fatalities consisted of common pipistrelle, soprano pipistrelle and noctule bats. The findings indicated that collision rates were proportionately higher than the calls recorded during ground-level, static detector surveys, but numbers were more affiliated to the recordings made at turbine hubs. Other findings of the study concluded that the risk presented to bats from onshore windfarms increased with the number of turbines as well as increased rotor size. Conversely, the hub height and the operational period of a given windfarm were not found to be significant in terms of the collision risk presented to bats from onshore windfarms.

7.330 NatureScot *et al.* (2021) indicate that vulnerability to collision is likely to depend on bat activity relative to the location of turbines and that, due to the non-uniformity of bat activity across a site, risks are also not uniform. Design of the bat surveys, to provide good coverage by detectors, can be an important factor in assessing areas of greatest risk of collision/barotrauma from turbine siting.

7.331 Risk also reduces with a greater distance from the foraging or commuting habitat; following NatureScot *et al.* (2021) a minimum buffer of 50m is required between the rotor tip and habitat features to lower the risk of collision. For the turbines chosen for the Proposed Development (i.e. maximum 145.5m hub height and 79.7m blade length and assuming 20m forestry height), and following the buffer calculation (NatureScot *et al.*, 2021) to ensure this minimum buffer is achieved, a distance of between 33m and 85m between a turbine base and

⁴⁵ Mathews, F., Richardson, S., Lintott, P. and Hosken, D. (2016) Understanding the risk to European Protected Species (bats) at onshore wind turbine sites to inform risk management

the forestry edge (and other suitable linear features) is required (as detailed within **Table 7.13**). This minimum buffer has been incorporated within the design of the Proposed Development.

7.332 With a proposed tip height exceeding 150m, the turbines are required to be equipped with aviation lighting, pursuant to Article 222 of the UK Air Navigation Order (ANO), 2016. Please see **Chapter 4** and **Chapter 12: Aviation** for more details on the aviation lighting specifications required and which turbines will have this installed. The lighting will be mounted on the hub of each turbine.

7.333 Recent evidence indicates that migratory pipistrelle bats may be attracted to red lights, which, may potentially lead to an increased risk of collision with wind turbines (Voigt *et al.*, 2018)⁴⁶. It was noted, however, that while bats were recorded as being attracted to red LED lighting, there was a lack of foraging activity once closer to the light source, indicating that the attraction of migratory bats to red light sources is not caused by foraging and is more likely a positive phototaxis⁴⁷ response (Voigt *et al.*, 2018). There is only a vague understanding of the migratory behaviour of bats in the UK, but the baseline study results (see **Appendix 7.5**) suggest that no significant migratory movements are likely to have occurred within the study area, and the potential for increased risk of turbine collisions associated with foraging bats being attracted to red lights is considered to be **Negligible**.

Noctule, Common Pipistrelle and Soprano Pipistrelle *Sensitivity*

7.334 Noctule are considered to be of Local Area Nature Conservation Value (see **Table 7.9**). Following NatureScot *et al.* (2021) and Reason *et al.* (2023) guidance, noctule bats are considered to be widespread in many geographies in mid-Wales with the highest collision risk and therefore have a High population vulnerability within mid-Wales.

7.335 Common pipistrelle and soprano pipistrelle are considered to be of Local Nature Conservation Value (see **Table 7.9**). Following NatureScot *et al.* (2021) these are considered to

⁴⁶ Voigt, C. C., Azam, C., Dekker, J., Ferguson, J., Fritze, M., Gazaryan, S., Hölker, F., Jones, G., Leader, N., Lewanzik, D., Limpens, H. J. G. A., Mathews, F., Rydell, J., Schofield, H., Spoelstra, K. and Zagmajster, M. (2018) Guidelines for consideration of bats in lighting projects – Technical Report

⁴⁷ Phototaxis is where bats (and other organisms) will move towards or away from a light source. A positive phototaxis response is where the bat moves towards the light source.

be common and widespread species; however, as they have a high collision risk, overall they have a Medium population vulnerability within mid-Wales.

Impact

7.336 See paragraphs 7.323-7.328.

Magnitude

7.337 NatureScot *et al.* (2021) recommend a two-stage process to enable the assessment of potential risk to bats presented by an onshore windfarm development. Stage 1 considers potential risk through consideration of the habitats within a site and development-related features (i.e. size and number of turbines). Stage 2 is then undertaken by completing an overall assessment of risk which is then informed by considering the results in relation to the bat activity output from the Ecobat analysis software while also taking into account the relative vulnerability of individual species of bat at the population level.

7.338 As already noted (see Assessment of Potential Risk; paragraph 7.92), the Site was assessed as having moderate habitat risk, as there are potential roost features ranging from Negligible to High suitability within the Site and surrounding area. There were also areas of optimal bat foraging and commuting habitat, though these features were often fragmented and not well connected to suitable habitat within the wider landscape.

7.339 Though the number of turbines falls within the medium sized project category (>10-40 turbines), the size of the turbines is >100m in height, it is therefore classed as a large project size. As such, following NatureScot *et al.* (2021)¹⁰, the site risk level has been assessed as High site risk (out of five categories: lowest, low, medium, high and highest).

7.340 The NatureScot *et al.* (2021) guidance recommends Stage 2 is followed by using the Ecobat software analysis tool (or a suitable alternative) to categorise the recorded activity levels by each deployment season. The overall risk for noctule, common pipistrelle and soprano pipistrelles is therefore considered to be High; this is a factor of the High site risk level combined with the Moderate/High activity level category (see **Table 7.13**).

Table 7.13 Risk summary table for noctule, soprano pipistrelle and common pipistrelle

Species	Site Risk	Median Activity Level	Max Activity Level	Collision Risk	Overall Risk
Noctule	High	2020 - High 2022 - Low	2020 - High 2022 - Moderate	High High	High
Common pipistrelle	High	2020 - High 2022 - Low	2020 – High 2022 - High	High	High
Soprano pipistrelle	High	2020 - High 2022 - Low	2020 – High 2022 - High	High	High

Significance of Effect

7.341 Given the above consideration of Nature Conservation Value, Conservation Status and Magnitude, the effect significance of collision risk on noctule, common pipistrelle and soprano pipistrelle in the absence of mitigation is considered to be **moderate adverse** and **significant** under the context of the EIA Regulations. The effect will apply to the time of year when bats are moving in the landscape, typically April through to October, during operation of the Proposed Development.

Badger

Impacts

7.342 Potential impacts on badger include collision with vehicles. Vehicular presence on Site will be much reduced compared to the construction phase and as such there will be a reduced risk of impact on badgers. Pre-existing vehicular activities will remain however, including use of the BOAT by vehicles for off-roading leisure activity and scrambler bikes that use the forest tracks.

Magnitude

7.343 Badger is considered to have a Favourable Conservation Status in its natural range, being assessed as locally common in Wales. The predicted impact is not expected to significantly impact the FCS of badger in its natural range as the works will be temporary and badgers are assessed to be important at the Local level. Magnitude is expected to reduce during operation to **negligible** and **long term**.

Significance of Effect

7.344 Effects from these impacts are considered to be **minor adverse** and **not significant**.

GCN

Impacts

7.345 Operational effects relate primarily to the potential for use of vehicles on access tracks on Site, as it is considered very unlikely that any further habitat will be impacted during the operational phase of the Proposed Development. Due to the presence of GCN ponds within proximity to access tracks and presence of access tracks between two potential metapopulations, there is a likelihood that GCN will cross the access tracks and may be at risk of killing/injury from vehicles. However as noted in **Chapter 10; Access, Traffic and Transport**, traffic levels are predicted to be very low during the operational phase with two to three vehicles per week for maintenance purposes. Due to the limited frequency of vehicles, which are highly unlikely to be present at night when newts are active, this presents a minor risk to individual newts on a long-term basis.

Magnitude

7.346 Current conservation status of GCN in its natural range is assessed to be unfavourable (English Nature, 2001). The national and county population is also considered unfavourable (Natural Resources Wales, 2018). Due to the minor risk level posed there is potential for loss of only a very small number of GCN during the operational phase. If this occurs, this will not detrimentally impact the future maintenance of the favourable conservation status of the wider Regional population. It is therefore considered to be of negligible magnitude and long-term temporal impact.

Significance of Effect

7.347 Given the above consideration of sensitivity and magnitude, the effect significance is considered to be **negligible** and **not significant**. Precautionary additional mitigation will be implemented however to further reduce the potential for killing or injury of individual newts over the lifespan of the Proposed Development.

Proposed Mitigation (Additional Mitigation) and Compensation

River Wye SAC

7.348 The OHMP incorporates measures such as riparian restoration to reduce the potential for impacts to the SAC downstream of the Site. Riparian restoration will reduce sedimentary runoff to the watercourses as well as improve habitat for SAC qualifying species. Conservation grazing measures will be implemented during the operational phase which will mean a reduction in grazing pressure therefore a longer sward and less diffuse pollution reaching tributaries of the SAC. A reduction in livestock in these areas will also reduce the volume of agricultural pollutants (including Phosphorus) seeping into watercourses. Further, mitigation measures in relation to water quality are detailed in **Chapter 11**. The same can also be said for all rivers and streams within the Site.

Bats

Operational Phase: Additional Mitigation and Compensation

7.349 Due to the overall magnitude of risk to bats (High) identified within this ES Chapter, a Bat Mitigation and Monitoring Strategy will be required. The strategy will comply with Regulation 52 of the Conservation of Habitats and Species Regulations 2017 in respect of the monitoring of incidental capture/killing of EPS (e.g. bats) and Regulation 53 of the Conservation of Habitats and Species Regulations 2017 in respect of the prevention of incidental capture/killing of EPS (e.g. bats). This can be secured through an appropriately worded, pre-commencement condition, to be agreed with NRW.

7.350 The strategy will detail the three key mitigation options that can be adopted at each turbine location to reduce the risk to bats. These mitigation options are provided within the NatureScot *et al.* (2021) guidance and include; repositioning of turbines to maintain a buffer

from bat features (described as ‘micro-siting’ within the guidance), blade alteration and curtailment. The repositioning of turbines to maintain a buffer from bat features will avoid areas where peaks in bat activity have been observed, whilst altering blade rotation to reduce rotation speed whilst idling (during the active bat season) will aim reduce to reduce mortality incidents. These will be the principal mitigation measures adopted on Site. Due to the potential loss of power output that can result due to curtailment, this is usually only applied to sites where the risk cannot be sufficiently reduced through repositioning of turbines and altering of blade rotation. These mitigation measures will be detailed within a Bat Mitigation and Monitoring Strategy, to be secured by planning condition, whereby specific mitigation measures at each turbine location will be detailed. However, an overview is discussed below.

Buffers

7.351 As described in **Appendix 7.5**, a minimum buffer of 50m is required between the turbine blade tip and suitable habitat features such as woodland edges and watercourses, where bat activity has been observed to be higher.

7.352 For the Proposed Development, three turbine configurations are proposed as detailed below along with recommended minimum buffer distances in **Table 7.14** below. The extent of these buffers is shown on **Figure 7.5.1** and **Figure 7.5.2**, **Appendix 7.5** (the calculation is based on a feature height of 20m).

Table 7.14 Recommended minimum buffer distances (between turbine base and habitat features)

Turbine Specification Option	Blade Length (m)	Hub Height (m)	Woodland Edge Buffer (m)	Other Habitat Feature (e.g. watercourse or road/track) (m)
1 (Turbines 29/30/31)	76	113.5	85	55
2 (Turbines 1 – 24)	76	130.5	61	50
3 (Turbines 25/26/28)	79.7	145.5	33	50

7.353 The final turbine layout was informed by the bat survey programme and bat guidance to ensure the above minimum buffer distances were embedded within the design. Based on the current turbine layout all turbines maintain the recommended minimum buffers from habitat features as shown on **Figures 7.5.1 and 7.5.2, Appendix 7.5**, therefore **no** repositioning of turbines is required.

Key-holing

7.354 Key-holing is required within the plantation at the east of the Site to install turbines T7, T8 and T9. The minimum radius of the key-holed area must be the minimum buffer described in **Table 7.14** above, based on the turbine specification at that location.

Altering Blade Rotation

Reduced Rotation Speed Whilst Idling

7.355 Bat casualties have been shown to be reduced by up to 50% at wind farms where the blades are pitched out of the wind ('feathered') to reduce rotation speeds below two rotations per minute (rpm) while idling, rather than normal idling. This does not result in any loss of power output and therefore is considered best practice wherever it is practically possible (NatureScot *et al.*, 2021). This mitigation measure will be applied during the bat active season (April – October) only.

Curtailment

7.356 Where any level of curtailment is required on account of the risk to bats is required, a 'smart' curtailment strategy will be included within the Bat Mitigation and Monitoring Strategy to minimise impacts to bats.

7.357 As detailed within **Appendix 7.5**, when considering turbines where additional mitigation (e.g. curtailment) may be required to reduce the risk to bats, the strategy focuses on areas within the site where the median site risk was assessed as Medium or High, and where the higher levels of activity cannot be attributed to the presence of habitat features (e.g. woodland edges, hedgerows, riparian corridors). In these instances, other mitigation strategies such as repositioning turbines to maintain a suitable buffer will not sufficiently reduce the collision risk to bats.

7.358 Where the above method does not provide sufficient risk reduction to bats at a Site, curtailment is recommended (NatureScot *et al.*, 2021). This involves raising the cut-in speed with associated loss of power generation in combination with reducing the blade rotation below the cut-in speed, as above. The curtailment is achieved by feathering (not the actual braking of the turbine) so that the blades continue to rotate slowly (at ~2 rpm or less).

7.359 Turbines located within open habitats and within 250m of detectors where a median site risk of Medium or High was recorded for high collision risk species during the 2020 and/or 2022 surveys are summarised in **Table 7.15** below. Those in bold are where the median site risk was High.

Table 7.15 Collision risk turbines

Species	2020	2022
Common pipistrelle	T5, T6, T12, T14, T15, T17 , T22, T24 , T26 and T31	T23
Soprano pipistrelle	T5, T6, T12, T14, T15, T24, T26 and T31	T23
Nathusius's pipistrelle	Not applicable	Not applicable
Noctule	T5 , T26 and T31	Not applicable
Leisler's	T24	Not applicable

7.360 Based on the results of the impact assessment it is recommended that an initial curtailment strategy is applied to the seven turbines (T5, T6, T14, T15, T17, T23 and T26) detailed in **Table 7.16** below.

Turbines T12, T22, T24 and T31, were also considered for the curtailment strategy based on the 2020 Ecobat analysis results (analysis completed in 2021, **Appendix 7.5**, Annex B) which indicated Medium to High median site risk for common pipistrelle, soprano pipistrelle and/or noctule bats at these turbine locations. However, as detailed in **Table 7.17**, the median site risk

to these species based on the Ecobat analysis completed in November 2024, was Low at these turbine locations. The Mammal Society have advised that as the most recent Ecobat analysis results are based on a more comprehensive and current dataset, it supersedes the 2021 analysis results.

Table 7.16 Turbines to be included within initial curtailment strategy – activity trends

Turbine	Nearest detector 2020	Nearest detector 2022	Species	Trends in bat activity 2020			Trends in bat activity 2022		
				SP1	SP2	SP3	SP1	SP2	SP3
T5	E (200 m)	No detector within 250 m	Common pipistrelle	Med	None	None	No detector within 250 m		
			Soprano pipistrelle	None	None	Med			
			Noctule	High	None	None			
T6	G (187 m)	No detector within 250 m	Common pipistrelle	Med	None	None	No detector within 250 m		
			Soprano pipistrelle	Med	None	None			
			Noctule	None	Low	None			
T14	N (130 m)	No detector within 250 m	Common pipistrelle	None	Med	None	No detector within 250 m		
			Soprano pipistrelle	None	None	Med			
			Noctule	None	Low	None			
T15	P (230 m)	No detector within 250 m	Common pipistrelle	None	High	None	No detector within 250 m		
			Soprano pipistrelle	None	Med	None			
			Noctule	None	None	Med			
T17	AF (245 m)	No detector within 250 m	Common pipistrelle	None	High	None	No detector within 250 m		
			Soprano pipistrelle	None	Low	None			
			Noctule	None	None	Low			

Turbine	Nearest detector 2020	Nearest detector 2022	Species	Trends in bat activity 2020			Trends in bat activity 2022		
				SP1	SP2	SP3	SP1	SP2	SP3
T23	No detector within 250 m	4 (250 m)	Common pipistrelle	No detector within 250 m			Low	Low	Med
			Soprano pipistrelle				Low	Low	Med
			Noctule				Low	Low	Low
T26	AA (163 m)	No detector within 250 m	Common pipistrelle	None	High	None	No detector within 250 m		
			Soprano pipistrelle	None	Med	None			
			Noctule	None	Med	None			

Table 7.17 Turbines where median risk was Medium to High based on 2021 Ecobat analysis, but reduced to Low based on 2024 Ecobat analysis – activity trends

Turbine	Nearest detector 2020	Nearest detector 2022	Species	Trends in bat activity 2020			Trends in bat activity 2022		
				SP1	SP2	SP3	SP1	SP2	SP3
T12	K (200 m)	14 (119 m)	Common pipistrelle	None	Med	None	Low	Low	Low
			Soprano pipistrelle	None	Med	None	Low	Low	Low
			Noctule	None	Med	None	Low	Low	Low
T22		7 (122 m)	Common pipistrelle	None	Med	None	Low	Low	Low

Turbine	Nearest detector 2020	Nearest detector 2022	Species	Trends in bat activity 2020			Trends in bat activity 2022		
				SP1	SP2	SP3	SP1	SP2	SP3
	V (125 m)		Soprano pipistrelle	None	Low	None	Low	None	Low
			Noctule	None	Low	None	None	Low	Low
T24	AB / Y (240 m)	6 (142 m)	Common pipistrelle	None	High	None	None	Low	Low
			Soprano pipistrelle	None	Med	None	None	Low	Low
			Noctule	None	Low	None	None	Low	Low
T31	AE (185 m)	1 (123 m)	Common pipistrelle	None	High	None	Low	Low	Low
			Soprano pipistrelle	None	High	None	Low	Low	Low
			Noctule	None	High	None	Low	Low	Low

Seasonal Variation in Curtailment

7.361 Table 7.16 also describes any observed trends in bat activity that could inform a tailored bat mitigation strategy particularly with regards to seasonal timing of curtailment, as the majority of the statics recorded lower levels of activity in the spring (SP1). On this basis it is recommended that the initial curtailment strategy is applied to T5 and T6 in SP1, SP2 and SP3 (e.g. April to October), whilst the remaining five turbines are only curtailed in SP2 and SP3 (e.g. June to October).

Weather Parameters for Curtailment

7.362 As there were no strong correlations observed between bat activity and weather parameters (temperature and wind speed) during the surveys, it is not possible to use the Site weather data to inform the initial curtailment strategy. The bat survey guidelines (Collins, 2023) note that studies of bat activity on windfarms (Slack and Tinsley, 2015⁴⁸) have found no activity below 6°C and a reduction in bat activity at wind speeds of greater than 5.4 metres per second (m/s).

7.363 On the basis of the above it is recommended that the initial curtailment is applied between sunset and sunrise when temperatures are above 6°C and wind speed is below 5.5 m/s/F4/12 mph).

Further Monitoring

7.364 During the operational phase post-construction monitoring involving acoustic surveying and carcass searches at turbine locations will be carried out to monitor the success of the mitigation and potentially influence future operation of the Site (e.g. determine if the curtailment strategy needs to be adjusted). Monitoring methods are detailed within the guidance (NatureScot *et al.*, 2021). Carcass searches will be carried out using dogs at 15 turbines (the seven turbines that are included within the curtailment strategy (T5, T6, T14, T15, T17, T23 and T26) and eight randomly selected turbines) using a 100m x 100m area around each of the 15 turbines as per the guidance for bat survey and assessment at onshore windfarms (NatureScot *et al.*, 2021). The full details of the fatality monitoring protocols will be agreed with NRW.

⁴⁸ Slack, G. and Tinsley, L. (2015) Linking Bat Surveys With Meteorological Data: A Way To Target Operational Wind Farm Mitigation. In Practice. Issue 87 p.34-38

Monitoring is usually required for at least three years post construction and should aim to measure bat activity, including any seasonal variation, and collect data on bat fatalities/injuries at each turbine location.

Bat Mitigation and Monitoring Strategy

7.365 A detailed Bat Mitigation and Monitoring Strategy will be produced in consultation with NRW and the PCC. The initial bat mitigation plan will be informed by the bat impact assessment and any additional pre-construction data. The plan will include the above mitigation and will fully outline the curtailment strategy and post-construction monitoring methods, which will be in line with the NatureScot *et al*, 2021 guidance. The Bat Mitigation and Monitoring Strategy will be a 'live' document informed by monitoring data that will be reviewed on a yearly basis for a minimum of three years to ensure the curtailment strategy is fit for purpose.

7.366 An indicative overview of information to be detailed within the curtailment strategy and post construction monitoring is provided below:

■ Curtailment Strategy:

- The turbines to be included within the curtailment strategy;
- The times of the day when curtailment will restrict operations;
- The times of the year when curtailment will restrict operations;
- The weather conditions (temperature, wind speed and precipitation) when curtailment will restrict turbine operation;
- The submission of details concerning the technical specifications of equipment to confirm suitability for proposed curtailment;
- Confirmation as to whether SMART technologies are appropriate to implement curtailment; and,
- Mechanisms that will be undertaken to evidence and audit implementation of the curtailment plans.

■ Post Construction Monitoring:

- Methods for data gathering and analysis;

- Location of monitoring;
 - Timing and duration of monitoring;
 - Appropriate persons and equipment to carry out monitoring;
 - Timing and format for presenting and dissemination of monitoring results including submission to all relevant databases, NRW and the LPA;
 - Remedial measures to reduce any impacts identified through monitoring including in respect of turbine curtailment; and,
 - Contingency prescriptions that will be carried out in the event of failure to undertake required surveillance.
- With the provision of a Bat Mitigation and Monitoring Strategy (to be conditioned), it is considered that the proposals will not have a detrimental impact to the favourable conservation status of the bat assemblage within the site.

Lighting

7.367 Any lighting required for the operational phase (e.g. for maintenance works) will be directed away from any of the identified commuting and foraging routes (i.e. woodland edges and watercourses) to avoid unnecessary disturbance to bats.

GCN

7.368 To further reduce the potential for killing or injury of GCN during the operation phase, it is proposed that appropriate signage to alert road users to take extra care is installed in areas along the access track that pass between clusters of ponds where metapopulations may be present. Speed limits will also be reduced in these areas to a maximum 10mph. Details of this will be included within the GCN SPP.

Residual Operational Effects

River Wye SAC

7.369 Effects during operation were considered to be minor adverse and not significant based on rare incidents occurring, which will likely be localised and discreet. Riparian restoration as proposed in the OHMP will reduce pollution as well as provide habitat for SAC qualifying

species. Residual impacts are therefore considered to be **minor beneficial** and **not significant**. The same can be said for all rivers and streams within the Site.

Bats

7.370 Taking into account the proposed mitigation and compensation measures, it is concluded that the Moderate adverse effect on bats can be reduced through an appropriate mitigation strategy that will be tailored to the Site. On completion of the three-year post-construction monitoring the residual effect for bats is considered to be **minor to negligible adverse** and **not significant**.

Badger

7.371 Taking into account the proposed mitigation as outlined in the construction phase, it is concluded that the minor adverse effect on badgers can be reduced through an appropriate mitigation strategy that will be tailored to the Site. On completion of the mitigation strategy the residual effect for badger is considered to reduce to **negligible** and **not significant**.

GCN

7.372 Taking into account the proposed mitigation and compensation measures, it is concluded that the minor adverse effect on GCN can be reduced through appropriate mitigation. With implementation of the proposed mitigation, compensation and enhancement, the residual effect for GCN is considered to be **minor beneficial** and **not significant**.

Assessment of Cumulative Effects

Predicted Cumulative Effects During Construction

7.373 The approach to the assessment of cumulative effects is set out in full in **Chapter 2: Approach to the EIA**. The assessment of cumulative effects on receptors takes into consideration other operational, under construction, and in planning developments. The assessment does not include for developments at the Scoping Stage, in accordance with Planning Policy Wales and Guidance and given the lack of detailed information on such proposed developments. The assessment takes into account all types of developments

considered to be relevant in the context of the assessed impacts, not just wind farm developments. Developments which are assessed are detailed within **Appendix 2.6**.

7.374 The assessment of ecological effects associated with the Proposed Development alone have predicted no significant residual effects for protected sites, habitats, badger or GCN. The cumulative assessment for these features will incorporate a wind farm within 5km of the site; Hendy Wind Farm, which is currently under construction (constructed but not operational) and located 3.5km south-west. Hendy Wind farm was subject to EIA which concluded negligible and non-significant residual impacts to designated sites, habitats, badger and GCN. It is therefore considered unlikely that cumulative effects will occur in combination with the Proposed Development and Hendy Wind Farm. Cumulative effects for these IEFs are thus scoped out of further assessment.

7.375 The assessment of ecological effects associated with the operational phase of the Proposed Development alone have predicted an adverse, Minor to Negligible and not significant effect on bats. The majority of bat species recorded during the baseline surveys are unlikely to range in excess of 5km, although individual bats of some species such as noctule can commute and forage up to 10km. On this basis developments greater than 10km from the Site are unlikely to be relevant.

7.376 As detailed within Table 7, Annex A, **Appendix 7.5**, a number of single turbine developments are located within 10km of the Site. Due to the fact that bat surveys are not normally a requirement for single turbine developments, there has been no assessment for such projects, and they are not considered as part of the cumulative assessment.

7.377 The impacts on all bats during construction due to disturbance and habitat loss are considered to be negligible and were scoped out of the assessment. The cumulative impacts are therefore concentrated on collision risk/barotrauma during operation.

7.378 One wind Farm is located within 10km of the Site, as listed in **Table 7.18** with a description of the bat-related impacts where information was publicly available.

Table 7.18 Cumulative wind farm projects within 10 km

Wind Farm	Status	No. of Turbines	Distance	Tip Height	Information
Hendy	Under construction	7	c. 3.5 km south-west	110 m tip, 80 m hub	The Ecology Technical Appendix 7.5 'Bat Survey Report' Chapter (Churton Ecology, 2013) ⁴⁹ within the Hendy Windfarm EIAR, concluded that the proposed wind farm may affect the use of the Site by bats, including increasing the mortality risk for bats locally, particularly common pipistrelle (this being by far the most frequently recorded bat on Site) and noctule.

Cumulative Effects During Operation

7.379 When assessing potential cumulative effects, only common pipistrelle, soprano pipistrelle and noctule are considered as other species have been scoped out of the assessment (**Table 7.10**). Common pipistrelles and soprano pipistrelles generally do not forage more than 1.5km from their roost site (Dietz & Kiefer, 2016)⁵⁰, therefore due to the separation distance between the proposed development and Hendy Wind Farm being >3km, common pipistrelle and soprano pipistrelle bats recorded at Hendy Wind Farm are unlikely to be impacted by the Proposed Development. Noctule bats can commute up to 10km from their roost site therefore there is potential for the same population to use both Hendy Wind Farm and the Site. Hendy Wind Farm

⁴⁹ Churton Ecology (2013) Ecology Technical Appendix 7.5: Bat survey report for wind turbines at LLandegley Rhos dated January 2013

⁵⁰ Dietz, C. and Kiefer, A. (2016) Bats of Britain and Europe

ES concluded that with the implementation of mitigation measures, all identified operational significant effects in relation to bats were reduced to non-significant (Cunnane Town Planning, 2014)⁵¹. The cumulative effect is considered to be **Negligible** and therefore **Not Significant**.

Combined Effects

7.380 The effects assessed within this chapter are considered likely to act in combination with the effects assessed in **Chapter 11** and this chapter should be read with reference to **Chapter 11**.

Further Survey Requirements and Monitoring

Habitats

7.381 Post construction monitoring of habitats will be implemented through the OHMP.

Otter

7.382 Further pre-construction otter surveys are proposed to inform any further mitigation for this species that may be required.

Badgers

7.383 Further pre-construction badger surveys are proposed to confirm the use of the 13 setts ahead of construction, where the buffer cannot be maintained. This will involve camera trapping of all 13 setts. Should they be determined as active and therefore in use, an application will be made to NRW for a development license.

GCN

7.384 Post-construction monitoring of GCN populations and habitats will be incorporated through the GCN SPP, in accordance with requirements of the NRW derogation licence and in line with the Wales GCN Monitoring Scheme. Following guidance, population monitoring (PSCA surveys) should be carried out for four years post-development of the medium sized population

⁵¹ Cunnane Town Planning (2014) Hendy Wind Farm Environmental Statement dated 27 June 2014

on Site and two years post-development of small populations on Site. Monitoring of new ponds will also be conducted in years 2,3,5 and 7 and appropriate population targets for the Site will be set as recommended following guidance and in consultation with NRW.

Bats

7.385 It is recommended that further bat surveys are completed prior to the operational phase using static detectors placed at each turbine location for a minimum of ten nights per season (spring, summer and autumn) to provide information on bat activity at each specific turbine location. Weather data should also be recorded to identify any patterns in bat activity. This information can then be used to further refine the curtailment strategy in consultation with NRW and PCC, to ensure the risk to bats is minimised whilst ensuring unnecessary curtailment is avoided.

7.386 Details of post-construction monitoring will be outlined within the Bat Mitigation and Monitoring Strategy.

Summary of Effects

7.387 **Table 7.19** below summarises the predicted effects of the Proposed Development on Ecology.

Table 7.19 Summary of effects

Predicted Effect	Importance	Sensitivity	Magnitude	Significance	Mitigation	Significance of Residual Effect
Construction						
River Wye SAC	International	High	Medium and short term	Moderate adverse and significant	CEMP, SWMP, Foul waste disposal scheme, Aquatic species mitigation	Negligible and not significant
Radnor Forest SSSI	National	High	Medium and permanent	Moderate adverse and significant	Signage and cones, CEMP, hydrological mitigation (Chapter 11)	Negligible and not significant

Predicted Effect	Importance	Sensitivity	Magnitude	Significance	Mitigation	Significance of Residual Effect
Upland dry dwarf shrub heath	National	Medium	Low and irreversible	Minor adverse and not significant	ECoW and OHMP	Minor adverse and not significant (short term); minor beneficial and not significant (long term following habitat management plan)
M19 (Non-mire) community	Local	Medium	Negligible, immediate and permanent	Minor adverse and not significant	ECoW and OHMP	Minor adverse and not significant (short term); minor beneficial and not significant (long term following habitat management plan)

Predicted Effect	Importance	Sensitivity	Magnitude	Significance	Mitigation	Significance of Residual Effect
Hedgerows	Local	Medium	Low and irreversible	Minor adverse and not significant	ECow and OHMP	Minor adverse and not significant (short term); minor beneficial and not significant (long term following habitat management plan)
Rivers and streams	Local	Medium	Medium magnitude and temporary impact	Moderate adverse and significant	CEMP, SWMP, Foul waste disposal scheme, Aquatic species mitigation	Negligible and not significant
Badger	Local	Low	Medium and short term	Moderate adverse and significant	Badger Development License and Badger Protection Plan	Negligible and not significant

Predicted Effect	Importance	Sensitivity	Magnitude	Significance	Mitigation	Significance of Residual Effect
GCN	Local	Medium	Medium and medium term	Moderate adverse and significant	GCN SPP and NRW mitigation Licence	Minor beneficial and not significant
Fish	Local	Medium	Medium and short-term	Moderate adverse and significant	CEMP, SWMP, Foul waste disposal scheme, Aquatic species mitigation plan	Minor adverse and not significant (short term); Minor beneficial and not significant (long term following habitat management plan)
Operation						
River Wye SAC	International	High	Low and short term	Minor adverse and not significant	OHMP	Minor beneficial and not significant

Predicted Effect	Importance	Sensitivity	Magnitude	Significance	Mitigation	Significance of Residual Effect
Rivers and streams	Local	Medium	Low and short-term	Negligible and short term	OHMP	Minor beneficial and not significant
Bats	Local	High	Medium and long-term	Moderate adverse and significant	Bat Mitigation and Monitoring Strategy	Minor to Negligible adverse and not significant
Badger	Local	Low	Negligible and long term	Minor adverse and not significant	SPP	Negligible and not significant
GCN	Local	Medium	Low and long-term	Negligible and not significant	GCN SPP	Minor beneficial and not significant



**Nant Mithil
Energy Park Limited**

Environmental Statement

Chapter 8: Ornithology



Chapter 8

Ornithology

Introduction

8.1 This chapter considers the potential effects of the Proposed Development on ornithology. It details the ornithology baseline conditions and identifies Important Ornithology Features (IOFs) active within and connected to the Site. An Ornithological Impact Assessment is then carried out for IOFs which may be vulnerable to effects resulting from the Proposed Development.

8.2 The Ornithology chapter should be read with reference to the scheme description in **Chapter 4: Project Description**, as well as other chapters as referenced throughout. This chapter relates entirely to ornithology. Refer to **Chapter 7: Ecology** (non-avian) for non-avian ecology baseline details and assessment.

8.3 The ornithology assessment was authored by ITP Energised (see **Appendix 1.1: Statement of Expertise**).

8.4 This chapter is supported by the following figures in **Volume 2**:

- Figure 8.1: Viewpoint Locations, Viewsheds and Survey Area Year 1
- Figure 8.2: Viewpoint Locations, Viewsheds and Survey Area Year 2
- Figure 8.3: Ornithology Designations

8.5 This chapter is informed by, and should be read in conjunction with, the following appendices provided in **Volume 3**:

- Appendix 8.1: Ornithology Technical Report and accompanying Figures 1-5 (note that Figure 5s, 6a-6e, 7, 9 and 10 are confidential and are provided in Volume 5: Confidential Appendix)
- Appendix 8.2 Collision Risk Modelling and Population Viability Analysis Report

- Appendix 7.10: Outline Habitat Management Plan and Net Benefit for Biodiversity Assessment

Scope of the Assessment

Effects Assessed in Full

8.6 The following effects were identified at the Scoping stage for consideration in this assessment:

- Direct effects during construction and operation on Ornithology:
 - Damage/destruction of nests;
 - Removal/fragmentation of important foraging habitat;
 - Pollution events;
 - Habitat fragmentation; and
 - Disturbance and displacement of bird species.
- Indirect effects during construction and operation on Ornithology:
 - Injury or death to birds via collision with turbine blades; and
 - Displacement from habitats as a result of disturbance i.e. foraging/nesting.
- Cumulative effects during construction on Ornithology; and,
- Cumulative effects during operation on Ornithology.

Effects Scoped Out

8.7 Based on the desk based and field survey work undertaken, the professional judgement of the EIA team, experience from other relevant projects and policy guidance or standards, and feedback received from consultees, the following topic areas have been ‘scoped out’ of detailed assessment, as proposed in the Scoping Report:

- Common and/or low conservation species not recognised in statute as requiring special conservation measures i.e. not listed on Annex 1 to the EU Birds Directive or Schedule 1 to the Wildlife & Countryside Act 1981 (as amended).

Assessment Methodology

Legislation and Guidance

Legislation

8.8 The assessment is carried out in accordance with the following legislation:

- The Environment (Wales) Act 2016¹;
- EU Council Directive 2009/147/EC on the Conservation of wild birds (the ‘Birds Directive’) 2009²;
- The Ramsar Convention on Wetlands 1975;
- Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017³ (as amended by the Environmental Assessments and Miscellaneous Planning (Amendment) (EU Exit) Regulations 2018);
- The Wellbeing of Future Generations (Wales) Act 2015⁴;
- The Conservation of Habitats and Species Regulations 2017; and,
- The Wildlife and Countryside Act 1981⁵ (WCA).

Policy and Guidance

8.9 This assessment is carried out in accordance with the principles contained within the following documents:

- Future Wales: The National Plan 2040 (Welsh Government, 2021)⁶;
- Planning Policy Wales (Edition 12) (PPW) (Welsh Government, 2024)⁷;

¹ [Welsh Government \(2016\) Environment \(Wales\) Act](#)

² [European Parliament \(2009\) EU Council Directive 2009/147/EC on the Conservation of wild birds](#)

³ [Welsh Government \(2017\) The Town and Country Planning \(Environmental Impact Assessment\) \(Wales\) Regulations 2017](#)

⁴ [Welsh Government \(2015\) Well-being of Future Generations \(Wales\) Act 2015](#)

⁵ [UK Government \(1981\) Wildlife and Countryside Act 1981](#)

⁶ [Welsh Government \(2021\) Future Wales: The National Plan 2040](#)

⁷ [Welsh Government \(2024\) Planning Policy Wales \(Edition 12\)](#)

- Technical Advice Note (TAN) 5: Nature Conservation and Planning (Welsh Government, 2009)⁸;
- Natural Resources Policy (Welsh Government, 2017)⁹; and
- Powys Local Development Plan 2011-2026 (Powys County Council, 2011 adopted 2018)¹⁰.

8.10 Current best practice guidance on assessing ornithological interests in relation to onshore wind farm developments was followed. A full description of relevant guidance is presented in **Appendix 8.1**; however, of particular relevance to ornithology are:

- Guidelines for Ecological Impact Assessment in the UK and Ireland (Chartered Institute of Ecology and Environmental Management (CIEEM), 2018)¹¹;
- Guidelines for Environmental Impact Assessment (Institute of Environmental Management and Assessment (IEMA), 2005)¹²;
- Survey Methods for Use in Assessing the Impacts of Onshore Wind Farms on Bird Communities (Scottish Natural Heritage (SNH), 2017)¹³;
- Windfarms and Birds: Calculating a Theoretical Collision Risk Assuming No Avoiding Action (SNH, 2000)¹⁴;
- Use of Avoidance Rates in the SNH Wind Farm Collision Risk Model (SNH, 2018)¹⁵;
- Developing field and analytical methods to assess avian collision risk at wind farms (Band *et al.*, 2007)¹⁶;

⁸ [Welsh Government \(2009\) Technical Advice Note 5: Nature Conservation and Planning](#)

⁹ [Welsh Government \(2017\) Natural Resource Policy](#)

¹⁰ [Powys County Council \(2011\) Local Development Plan 2011-2026 \(Adopted\)](#)

¹¹ Chartered Institute of Ecology and Environmental Management (CIEEM) (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine

¹² Institute of Environmental Management and Assessment (IEMA) (2005) Guidelines for Environmental Impact Assessment

¹³ Scottish Natural Heritage (SNH) (2017) Survey Methods for Use in Assessing the Impacts of Onshore Wind Farms on Bird Communities

¹⁴ SNH (2000) Windfarms and Birds: Calculating a Theoretical Collision Risk Assuming No Avoiding Action

¹⁵ SNH (2018) Use of Avoidance Rates in the SNH Wind Farm Collision Risk Model

¹⁶ Band, W., Madders, M. and Whitfield, D. P. (2007) Developing field and analytical methods to assess avian collision risk at wind farms. In de Lucas, M., Janss, G. and Ferrer, M. (eds) Birds and Wind Power

- Assessing Significance of Impacts from Onshore Windfarms on Birds outwith Designated Areas (SNH, 2006 updated 2018)¹⁷;
- Assessing the Cumulative Impacts of Onshore Wind Farms on Birds (SNH, 2018)¹⁸;
- Assessing Connectivity with Special Protection Areas (SNH, 2016)¹⁹; and,
- Assessing the Cumulative Impact of Onshore Wind Energy Developments (SNH, 2012)²⁰.

8.11 Further key guidance documents relating to the assessment of effects of wind farms developments on ornithological receptors that have been referenced in this assessment include the following:

- Birds of Conservation Concern (BoCC) Wales 4: the population status of birds in Wales (Johnstone *et al.*, 2022)²¹;
- Environmental Statements and Annexes of Environmentally Sensitive Bird Information; Guidance for Developers, Consultants and Consultees (SNH, 2016)²²;
- Species and habitats of principal importance in Wales, as listed in Section 7 of the Environment (Wales) Act 2016¹;
- Mid Wales Area Statement (Natural Resource Wales (NRW), 2024)²³; and,
- Powys Nature Recovery Action Plan (PNRAP) (Powys County Council (PCC), 2022)²⁴.

8.12 Where appropriate, more detail relating to specific legislation, guidance or policy is provided in the corresponding appendix (i.e. **Appendices 8.1 to 8.2**).

¹⁷ SNH (2018) Assessing Significance of Impacts from Onshore Windfarms on Birds Outwith Designated Areas

¹⁸ SNH (2018) Assessing the Cumulative Impacts of Onshore Wind Farms on Birds

¹⁹ SNH (2016) Assessing Connectivity with Special Protection Areas

²⁰ SNH (2012) Assessing the Cumulative Impact of Onshore Wind Energy Developments

²¹ Johnstone, I. G., Hughes, J., Balmer, D. E., Brenchley, A., Facey, R. J., Lindley, P. J., Noble, D. G. & Taylor, R. C. (2022) Birds of Conservation Concern Wales 4: the population status of birds in Wales

²² SNH (2016) Environmental Statements and Annexes of Environmentally Sensitive Bird Information; Guidance for Developers, Consultants and Consultees

²³ Natural Resource Wales (NRW) (2024) Mid Wales Area Statement

²⁴ Powys County Council (2022) Powys Nature Recovery Action Plan (PNRAP)

Consultation

8.13 In undertaking the assessment, consideration has been given to the Scoping Responses and other consultation which has been undertaken as detailed in **Table 8.1**.

Table 8.1 Consultation Responses

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Powys County Council (PCC)	Formal Scoping Consultation	The Powys Nature Recovery Action Plan (PNRAP) is the updated version of the Powys Local Biodiversity Action Plan (PLBAP). Consideration of species and habitats identified within the PLBAP would ensure locally important species and habitats can be appropriately accounted for and for net biodiversity loss of these species and habitats to be avoided and opportunities for enhancement can be maximised. The PNRAP is available on Powys County Council website at https://en.powys.gov.uk/article/2573/Powys-Nature-Recovery-Action-Plan .	The PNRAP has been considered as part of the assessment.
		Suggest a comparison of impact based on 'acceptable' losses from collisions using current guidance, how the general upward trend in red kite	A Population Viability Assessment (PVA) with respect to the collision risk modelling results has been undertaken for red kite.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		population will affect this figure and what further increase is expected as a result of Gigrin Farm specifically, i.e. is there actually a Gigrin Farm effect?	The impacts on red kite due to the presence of feeding at Gigrin Farm is subjective and difficult to establish, but the significant rise in red kite numbers in Radnorshire occurs at the time that significant feeding commenced (1994), which attracted up to 15 birds initially, peak counts at the Site included 400 birds in December 2003 and 600 birds in January 2010 (Jennings, P., 2013) ²⁵ . It is likely a daily feeding resource year-round, which is used during difficult periods such as snowy and cold weather (as seen with the peak counts outlined above) when food sources would normally be scarce, will lead to a reduction in natural fatalities of kite due to a lack of food.

²⁵ Jennings, P. (2013) The Birds of Radnorshire

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			A point noted by Welsh Kite Trust (2020)²⁶ in their studies on Welsh red kite populations: <i>“Feeding stations could, however, have an effect on adult and 1st winter survival, especially during periods of snow cover when food is difficult to obtain in the wider countryside, and it is changes in survival that are most likely to have led to the population changes witnessed”</i>. The resource is likely to also be utilised by immature and sub-adult birds during the breeding season when territories are defended locally, meaning the young birds remain in the local area rather than dispersing further distances. It is therefore considered there is a Gigrin Farm effect, which is likely leading to an inflated red kite

²⁶ Welsh Kite Trust (2020) How Many Kites are there in Wales?

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			population in this part of Powys, although it is more difficult quantifying by how much.
Natural Resource Wales 24/11/2022	Formal Scoping Consultation	We agree that the study areas for the respective ornithological receptors are suitable.	Noted.
		Section 7.5 states that the search area has been expanded to take into account chough but it is not clear how this species has been considered in terms of the EIA process.	The extension of the search area for chough was in order to take into account the wide-ranging nature of chough and therefore the extended distances that may need to be considered for connectivity to protected sites that are in part designated for this species. Chough were not recorded during any survey over the full survey period and therefore are not included in the assessment.
		Within Section 7.12, parts have been redacted so it is unclear as to the full details of the surveys. The	NRW's agreement that the suite of ornithology surveys appears appropriate is noted.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		suite of surveys proposed and conducted to date appears appropriate. However, it is not clear how much survey effort was undertaken for the wintering birds' surveys. Section 7.26 states that "<i>A winter walkover survey was completed covering open areas of the Site including three visits completed between October 2019 and March 2021, to identify winter roosting and foraging bird populations</i>". This seems to imply just a total of three survey visits across two winters – this would be deemed an inadequate level of survey effort.	To clarify, the text should read that a winter walkover survey was completed between October and March in both survey years (Year 1 2019-2020 and Year 2 2020-2021), each survey comprising three visits.
		Species such as merlin and hen harrier need to be assessed year-round – especially in relation to designated sites (i.e. breeding populations can be affected by winter mortality).	All Schedule 1 species such as merlin and hen harrier are considered year-round, both in relation to designated sites and also to the wider area populations.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		We note that survey effort (e.g. the areas covered) was curtailed during 2020 owing to Covid-19 restrictions. The EIA should make it clear how, without additional surveys of these areas in 2022, this disparity has been accounted for.	The survey effort in 2020 involved only a compression of the required surveys into a shorter time frame than is usual due to the Covid-19 lockdown. All the required hours and survey visits for the season and the survey were completed. The same surveys were repeated across the full time period in 2021 and adhered to the standard of SNH Guidance current at the time of the commencement of baseline surveys (SNH, 2017)¹³, meaning a full 2 years of survey data was collected. The truncated season in 2020 is not seen as a limitation to the dataset, only acknowledging the spread of survey time across the overall survey period was compressed more than it would be otherwise.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		The first bullet point within Section 7.38 needs to include Section 7 species. NRW would need to see the results of the survey and the list of species proposed to be scoped out before we can comment further and therefore request this information is provided. It also needs to be clear which species group is being discussed. The last bullet point <i>“Passerine species, which are not generally considered to be at risk from wind farm or solar farm developments, except for any species that are particularly rare or vulnerable at a national level such as nightjar and quail”</i>. The two referenced species are non-passerine species. Clarification is also required in terms of what is meant by national (Wales or UK).	This point has been noted and the results reassessed meaning that Section 7, BoCC Welsh Red list passerine species as well as Schedule 1 and Annex 1 species nightjar and quail are all scoped into the assessment. In this instance species considered vulnerable at a national level will mean Wales.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Natural Resource Wales 12/09/2023	Consultation	In reference to a request for further clarity on issues relating to ornithology (sent 28.03.2023) NRW responded that no specialist advisors were available to provide formal comments.	No action required.
Natural Resource Wales 24/06/2024	Statutory Pre-application consultation	We have concerns regarding the cumulative impact assessment which does not fully acknowledge that the proposed application accounts for 88% of the cumulative total, describing it as a “slight increase in the collision risk” whereas it represents a 6-fold increase against the current collision risk in the area.	The text that states that there is a ‘slight increase’ has led to NRW misinterpreting the intended wording, the slight increase is in fact between the results of the Site to the cumulative figure and not the other way round. The text has been clarified in Section 8.284 below.
		We have concerns in relation to the survey information detail in relation to breeding birds and breeding raptors. The breeding surveys miss out the early part of the season. We do not concur with the	The SNH guidance (SNH, 2017) ¹³ section for breeding raptor surveys recommends following the methodology as outlined in Hardey <i>et al.</i> (2013) ³⁰ which suggest that four survey visits are undertaken between April and July. It is fully understood that the

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		levels of spatial magnitude of impact on bird populations and advise these are reviewed. Chapter 8 – Volume 1 – Ornithology Clarification is required on the dates of the raptor survey mentioned in Section 8.24 which states that the raptor breeding survey began in May and April in 2020 and 2021 respectively, missing out the early part of the season in both years, which is particularly important for the detection of species such as goshawk. However, 4.2.5 Breeding Raptor Survey (Appendix 8.1) states a March survey date in 2020. This late start is similarly referred to for the wider breeding bird surveys. We refer to the Bird Survey Guidelines (via CIEEM) which states that “The bird breeding season is generally acknowledged to occur from late February to early August inclusive, although the	breeding season extends slightly beyond these dates, with some species showing breeding behaviour in March and August but the period April to July is used to cover the peak breeding season across all species. The one exception to this is breeding eagles which often show breeding behaviour between January and March; however, as eagles do not currently breed in Wales it was not considered proportionate or appropriate undertaking surveys at these times for these species. As part of the winter walkover the third visit in both Year 1 and Year 2 of the survey was completed in March (2021 and 2022). The March visits included checks of suitable breeding habitat for woodland nesting species most notably goshawk and the relevant section for winter walkover in Volume 3 –

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		majority of breeding activity occurs between March and early July.” Whilst this late start to the survey is acknowledged as a limitation, and NRW appreciate the unprecedented situation in 2020, we note that winter walk over surveys were conducted in March in both the 2019-2020 and 2020-2021 winter season (Section 8.22 Walkover Survey) and therefore we question the validity of using the 2020 lockdown for a rationale for missing the early part of the breeding season. Similarly, we note that Section 4.2.8 in Chapter 8 – Volume 3 - Appendix 8.1 Ornithology Technical Report Annex B states that the third visit was conducted in March (in 2020 on the 17th) which we would consider in the breeding season (or at the very	Appendix 8.1 has been modified to reflect this. It should also be noted any records of breeding activity (alarm calling, display flight etc.) from vantage points surveys and vantage point survey walk-ins completed throughout March are also included in the assessment if relevant into the breeding results. It is considered that all the relevant bird populations have been adequately surveyed, reported upon and assessed in line with the relevant legislation and guidance.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		least “spring passage”) and a month when the majority of overwintering birds will have moved away to breeding areas.	
		Clarifications are needed on the estimated collision impacts on nightjar. Section 8.79 Nightjar From the wording of this section we understand that no risk can be predicted because this nocturnal species was not detected during daylight survey (which does not mean that a conclusion of no collision risk can be made) rather than no risk of collision is predicted because the species was not found on site. This needs to be clarified.	This point has been clarified in Section 8.79 below.
		Table 8.2 Evaluation criteria for NCI Clarification is needed as to why Wales level important	The NCI classification is used as a tool to separate the sensitivity of bird species with specific reference

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		populations/areas of a bird species listed as a Priority Species on Section 7 of the Environment (Wales) Act 2016) or breeding species noted on the latest BoCC Red-listed species (Johnstone <i>et al.</i> , 2022) are not included as “high”.	to the development being assessed, in this case a windfarm. To include all Priority (Section 7) Species and BoCCW4 Red-list species would mean these distinctions would not always be clear. The SNH guidance states that “passerine species are not significantly impacted by wind farms” (SNH, 2017)¹³ and these species make up the majority of the red listed and Priority Species on Section 7. The NCI is used to separate species out in order to classify species for their sensitivity to the proposed development and this is the reason the species classified as High are those species on the Schedule 1 list or species considered to have connectivity to a protected site. There are a number of BoCCW4 red-list species and Section 7 species that fall into this higher category

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			and would therefore be classified as High NCI, examples being hen harrier, golden plover and merlin. To include all the Section 7 and BoCCW4 Red-list species in higher category would mean species such as skylark and willow warbler (which are highly numerous and widespread with Welsh populations numbering in the tens and hundreds of thousands) being assessed as having the same sensitivity level to the development of a wind farm as species such as hen harrier and merlin with breeding populations of a few hundred pairs of less.
		Table 8.3 Levels of spatial magnitude of impact It is not clear what geographical area “regional population” refers to here. Under Section 8.38 Conservation Status, county and Welsh level population estimates are discussed.	Noted. Every effort to use a regional population (local county scale) was taken and where an estimate was possible the figure for Radnorshire was used to establish this. The figure for Radnorshire was

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		These are very disparate spatial scales and used interchangeable for “regional population” would likely under estimate impacts where Welsh level populations are used. For context, a site holding greater than 1% of the Welsh population of a species would be considered highly significant (for Annex 1 species, it would potentially qualify as a Species Action Plan); a 1-5% reduction at a Welsh level population would not be considered “low”. It is therefore important that the spatial magnitude of impact reflects the spatial scale of the population estimate being used.	available for the majority of the sensitive species in the assessment most notably the Schedule 1 raptor species. In the absence of a figure for Radnorshire, or indeed Powys, then the only population figures readily available were for Wales. When these figures have been used it has been clearly detailed in the chapter, although as outlined above, the Welsh figure was only used when necessary and in general was only used for more common and widespread species. In order to illustrate this, the point has been clarified in Table 8.3 below.
		Assessment of Operational Effects, Collision, Section 8.201 to Section 8.250. Throughout most of the species accounts no measure of background mortality is provided to substantiate the claims that	We disagree with this point. The statement where the wording “ a very small increase in baseline mortality” is used where the predicted collision risk figures are so small as to be barely detectable (i.e. less than

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		the predicted collision risk mortality represents a “...very small increase in baseline mortality...”. The proportion of the population impacted, and baseline mortality are different metrics and cannot be used interchangeable to assess impact. An assessment of impacts on baseline mortality, using survival estimates, is required.	0.01 birds per annum). In these instances, the figures are so low that they can be scoped out of the assessment. In order to illustrate this the relevant wording has been clarified (See Sections 8.204, 8.209 and 8.214)
		Details of appropriate mitigation (following the PPW12 step-wise approach) for any likely significant effects identified should be provided along with appropriate enhancements. In some instances, mitigation may need to take the form of curtailment or redirection of activities during particular times of year. A scheme of post construction monitoring for collision risk monitoring (flight activity surveys and	Noted. Appendix 7.10: Outline Habitat Management Plan (OHMP) has been updated to fully incorporate the points from NRW regarding the impacts on (in particular wintering) red kite. The OHMP details areas of conservation grazing, grassland seeding and enhancement and scrub creation and enhancement which aims to discourage

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		carcass searches) and to assess the effectiveness of mitigation is required. In relation to collision risk monitoring, this should include details of additional steps that would be taken to mitigate impacts should either a higher rate of mortality be detected than predicted or mitigation is not working. It should also detail how carcass search efficiency is determined.	foraging of red kite within the turbine array, focussed around the six turbines in the south-west of the Site (T1-T6) and the north-west of the Site (T21-T24) and during the winter months when red kite flight activity is at its highest. The longer sward in fields around the turbines as well as the creation and enhancement of scrub habitat combined with reduced numbers of livestock would significantly reduce attractiveness of these areas for foraging kite, due to a reduction in the presence of carrion in the form of fallen livestock and a reduction in the availability of invertebrate and small mammal prey. (see Appendix 7.10 for full details, including Drawing 1 for the relevant management areas).

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			A full monitoring programme has been included in the OHMP and detailed in Sections 8.262-8.266 below. The programme includes details of breeding bird surveys, vantage point surveys and carcass search methodology, albeit full details to be agreed with NRW and other stakeholders ahead of defining the detailed HMP.
		Section 8.75 Golden Plover This section needs to provide clarity that collision risk has not been averaged across the year (this would represent an underestimation of impact).	The text has been modified to clarify that the resultant collision risk value relates only to the winter season rather than the full year (See Section 8.76 below)
		Post construction monitoring Details of appropriate mitigation (following the PPW12 step-wise approach) for any likely significant effects identified should be provided along with appropriate enhancements. In	As mentioned above, a full and detailed monitoring programme is included in Sections 8.262-8.266. The monitoring programme will include vantage point

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		some instances, mitigation may need to take the form of curtailment or redirection of activities during particular times of year. A scheme of post construction monitoring for collision risk monitoring (flight activity surveys and carcass searches) and to assess the effectiveness of mitigation is required. In relation to collision risk monitoring, this should include details of additional steps that would be taken to mitigate impacts should either a higher rate of mortality be detected than predicted or mitigation is not working. It should also detail how carcass search efficiency is determined.	surveys, breeding bird surveys and carcass searches. As discussed above, the OHMP has been extended to cover areas of high flight activity for red kite with specific measures in place to discourage the presence of red kite in the non-breeding season, these measures include grazing management, native scrub planting and enhancement and native wild flower seeding. The post construction monitoring programme will aim to test the efficacy of the HMP through the calculations of collision risk values for the operational Site through a combination of vantage point surveys and carcass monitoring.
		We have concerns regarding red kite and the mitigation proposed. The EIA in its current form does	Noted. As a result, additional mitigation has been proposed in the form of winter weekly checks for

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		not adequately address the disparity in predicted mortality from collision between the breeding and non-breeding season. We have also concerns in the mitigation proposed to reduce red kite mortality, as this aims solely at reducing food sources during the breeding season, when the majority of impact is predicted during the non-breeding season. We also consider that fallen stock from the proposed winter grazing could increase the value of the site during winter for non-breeding red kite, when highest collision risk is predicted, This aspect has not been considered. Red Kite We have concerns regarding red kite and the mitigation proposed. The EIA in its current form does not adequately address the disparity in predicted	fallen stock done throughout the non-breeding season with all potential carrion removed from the turbine array. As mentioned in the sections above, the OHMP has been modified and extended with one of the primary aims of the plan to reduce the attractiveness of the habitats in proximity to the turbines with the highest flight activity for red kite. The OHMP will aim to develop grassland and scrub habitats and through grazing management produce areas with longer swards over the winter months. The presence of both longer sward grasses and native scrub species will improve the area for a number of ground and scrub nesting passerines while reducing the potential for foraging opportunities in terms of invertebrates, small mammals as well as

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		mortality from collision between the breeding and non-breeding season. As described under Section 8.224 (Chapter 8 – Volume 1) the non-breeding season population will comprise a large proportion of first-year and sub-adult birds. However, the EIA does not fully address specific population impacts on the non-breeding season mortality. Our concerns are reflected in the main proposal for mitigation to reduce red kite mortality (Section 8.251, Land Management Methodology). This aims solely at reducing food sources during the breeding season when the majority of impact is predicted during the non-breeding season. We have concerns regarding the appropriateness of the approach as described under Section 8.251, particularly in terms of practicality, as it is not clear	reducing and / or removing the number of livestock to reduce foraging opportunities for red kite over the winter months. See Section 8.252- 8.259 below and Appendix 7.10 for full details, including Drawing 1 for the relevant management areas.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		how these measures will be secured and enforced during the lifetime of the development. In addition, the outline Habitat Management Plan (HMP) (Chapter 7 – Ecology - Volume 3 - Appendix 7.10) suggests year round grazing of the site, including winter grazing, to enhance on site habitat; winter grazing through fallen stock may increase the value of the site during winter for non-breeding red kite when highest collision risk is predicted, yet this does not appear to have been considered. Development of further mitigation is required particularly to reduce the impacts on non-breeding red kite.	
		While we welcome the Population Viability Analysis for red kite (PVA), we have concerns regarding potential inconsistencies in the approach. Section 8.263 states that ‘.,a population viability analysis	The Population Viability Analysis has been updated as suggested and recalculated for the Radnorshire population estimate of red kite, as used in the other section of this Chapter (i.e. a total of 296 pairs – 592

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		(PVA) has been undertaken, using the deterministic model, to investigate how this level of collision risk would impact the Powys red kite population. The deterministic model uses a matrix table in which the various parameters associated with the life-stages of red kite can form an assessment of population viability over time starting from the current population number.' This is also repeated under Section 3.2 - Population Viability Analysis in Chapter 8 Ornithology Volume 3 - Appendix 8.2 Collision Risk Modelling and population Viability Analysis Report. However, the PVA and its results appear to be based on the Welsh population. Table 8.15 (Chapter 8 – Volume 1) states	individuals). The resulting analysis still shows that the local red kite population would remain viable. In terms of the cumulative assessment and PVA the assessment references the BTO study (based on Hereward et al. (2024)²⁸) which is a detailed countrywide assessment on the impacts of windfarms on red kite. As mentioned above, the text for the cumulative assessment on red kite collisions has been updated to provide more clarity as the original text was misinterpreted.

²⁸ Hereward, H. F. R., Macgregor, C. J., Gabb, O., Connell, A., Thomas, R. J., Cross, A. V. and Taylor, R. C. (2024) Modelling population-level impacts of wind farm collision risk on Welsh Red Kites (BTO Research Report 766)

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		a starting population used in the PVA of 4,832 birds (based on Hereward et al. (2024)²⁷, yet under Section 8.2.3 (Chapter 8 Volume 1) its stated that the Radnorshire population to ‘...be approximately 232-296 (average 264) breeding pairs’, i.e. a breeding population of c600 birds. It is also not clear how cumulative impacts were considered within the PVA. (Section 8.274 Chapter 8 Volume 1). We have concerns regarding the cumulative impact assessment which does not fully acknowledge that the proposed application accounts for 88% of the cumulative total of 11.855, describing it as a “slight increase in the collision risk” whereas it represents a	

²⁷ Hereward, H. F. R., Macgregor, C. J., Gabb, O., Connell, A., Thomas, R. J., Cross, A. V. and Taylor, R. C. (2024) Modelling population-level impacts of wind farm collision risk on Welsh Red Kites (BTO Research Report 766)

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		6-fold increase against the current collision risk in the area.	
		Section 3.2 Birds of Conservation Concern in Wales (Chapter 8 Ornithology – Volume 3 - Appendix 8.1). Clarity is required over which Birds of Conservation Concern was used in this appendix. This section conflates BoCC Wales 3 (Bladwell et al. 2018) with BoCC Wales 4 (BoCCW4, Johnstone et al. 2023), and BoCCW4 with BoCC UK 5 (Stanbury et al. 2021). Conservation Concern listing should be based on Birds of Conservation Concern Wales 4 (BoCCW4).	Noted and Volume 3 - Appendix 8.1 updated accordingly.

Study Area

8.14 A range of surveys were employed to accurately record baseline ornithological conditions within the Site and appropriate survey buffers. Terms referred to are as follows:

- ‘Survey area’ is defined as the area covered by each survey type at the time of survey; and
- ‘Study area’ is defined as the area of consideration of effects on each species at the time of assessment and as the area used for desk-based studies.

8.15 This chapter considers the survey and study areas listed below which are detailed on **Figure 8.1** and **Figure 8.2** and in **Appendix 8.1** and associated Annexes:

- Designated sites: Site and up to a 20km distance in line with SNH (2016)¹⁹.
- Schedule 1 breeding raptors: Site and a 2km distance (the ‘Breeding Raptor Study Area’) in line with SNH (2017)¹³.
- Nightjar: Site and a 1km distance (the ‘NJ Study Area’) in line SNH (2017)¹³.
- Black Grouse: Site and a 1.5km distance (the ‘BK Study Area’) in line with SNH (2017)¹³.
- Breeding upland waders, raptors, owls and wildfowl: Site and (where access was available) a 500m distance (the Breeding Bird Survey ‘BBS Study Area’) in line with SNH (2017)¹³.
- Wintering waders, raptors, owls and wildfowl: Site and (where access was available) a 500m distance (the ‘WB Study Area’) in line with SNH (2017)¹³.
- Cumulative assessment: All equivalent proposals within a 10km for national designations and 20km for international designations radius of the Proposed Development in accordance with SNH (2018)¹⁸.

8.16 Following the flight activity surveys, a Collision Risk Area (CRA) was established in line with guidance issued by SNH (2017)¹³, which is also the applicable standard in Wales. The CRA for the initial Collision Risk Modelling (CRM) incorporated a larger area than just the final turbine area, with flight activity records of any species’ flight activity that was in proximity to, but not necessarily within the Site (at the time of surveys) and was calculated in a 180-degree arc and up to 2km from survey locations (See **Figure 8.1** and **Figure 8.2**). In order to allow for the mitigation by design process, which involves the development of a layout avoiding areas of high

flight activity or key flight corridors, the CRA was modified and the CRM recalculated with results used for this assessment was an area covering all of the 30 turbines and 250m buffer, which allows for a 200m user error during data collection as outlined by Band *et al* (2007)¹⁶.

Desk Based Research and Data Sources

8.17 The following data sources have informed the assessment:

- Biodiversity Information Service (BIS) for Powys and Brecon Beacons National Park (BIS, 2021 and 2025);
- National Biodiversity Network (NBN) Atlas (NBN Atlas, 2025)²⁹ (only those records publicly available without a licence are included in this assessment);
- Natural Resources Wales: Designated Sites Search; and,
- MAGIC: Nature on the Map (MAGIC, 2024).

Field Survey

8.18 The following field surveys were carried out to inform the assessment and further details on the approaches for each are outlined within **Appendix 8.1**:

Flight Activity – Vantage Point (VP) Surveys

8.19 Flight activity surveys were undertaken over two breeding seasons and two non-breeding seasons. The NatureScot (SNH, 2017)¹³ guidance advises that vantage point (VP) locations should be selected to achieve maximum visibility from the minimum number of survey locations. In this survey method an arc of up to 180 degrees and extending to 2km from the observer can be surveyed from each VP, subject to topography, vegetative screening and any other constraints to effective survey. A minimum of 36 hours of survey effort was completed at each VP during both the breeding season and winter periods, and the timing of VP watches varied to ensure that all times of day were covered.

8.20 Seven VPs were initially selected following review of aerial imagery and Ordnance Survey maps, and the locations confirmed during a ground-truthing exercise when the locations were

²⁹ [National Biodiversity Network \(NBN\) Atlas website](#)

micrositied to the optimal locations in October 2019. This was extended to ten VPs following an extension in the Site Boundary in March 2020. The locations of the VPs and their respective viewsheds are presented in **Figure 8.1** and **Figure 8.2**.

8.21 VP surveys were completed to cover 24 months at each VP, from October 2019 to March 2022, inclusive. A total of 72 hours were undertaken at each VP during the breeding season and 72 hours at each VP during the non-breeding season, which equates to a total of 144 hours at each VP over the 24 months. VP watches were conducted for periods of no longer than three hours in a single watch. A minimum 30-minute break was observed between watches to allow the surveyor an adequate rest time. Full details of the survey methodology are described in **Appendix 8.1** and the survey timings, dates and weather details in **Appendix 8.1, Annex B, Table B1**.

Winter Walkover Survey

8.22 Winter walkover surveys were conducted of the WB Study Area within accessible areas of land ownership or on public rights of way (PRoW) (**Figure 8.1**); a wintering bird walkover survey was completed each winter during both survey years and involved three visits between October and March in both winter seasons: Year 1 2019-2020 and Year 2 2020-2021. Full details of the survey dates and methodology are described in **Appendix 8.1**.

Breeding Bird Survey

8.23 A breeding bird survey (BBS) comprising four visits was conducted between April and July in both the 2020 and 2021 breeding seasons and covered the BBS Study Area within accessible areas of land ownership or PROW (**Figure 8.1** and **Figure 8.2**); a walkover technique based on the Brown and Shepherd (1993)³⁰ method was employed and involved approaching within 100m of all parts of the BBS Study Area to record the presence of waders. The survey was further extended to record all breeding records of Section 7 and Welsh BoCC Red listed species. SNH (2017)¹³ guidance recommends that four survey visits should be completed over the breeding season, based on recommendations as set out in Calladine *et al.* (2009)³¹. Four

³⁰ Brown, A. F. and Shepherd, K. B. (1993) A method for censusing upland breeding waders. *Bird Study*, 40: p.189-195.

³¹ Calladine, J., Garner, G., Wernham, C. and Thiel, A. (2009) The influence of survey frequency on population estimates of moorland breeding birds. *Bird Study*, 56: 3, p.381-388.

survey visits were therefore conducted during survey Year 1 from May to July 2020, inclusive, and in Year 2 April to July 2021, inclusive, with a minimum two-week gap between survey visits. Full details of the survey dates and methodology are described in **Appendix 8.1**.

Breeding Raptor Survey

8.24 Two years of breeding raptor surveys (two breeding seasons) were conducted of the Breeding Raptor Study Area (**Figure 8.1** and **Figure 8.2**). Surveys were conducted for nesting raptors and owls in two consecutive years; Year 1 May to July 2020, inclusive, and Year 2 April to August 2021, inclusive. The survey methods followed Hardey *et al.* (2013)³² and involved four survey visits (minimum of two weeks apart) walking transect routes focusing on suitable habitat and any prominent features, such as rock outcrops or fence lines, within the Breeding Raptor Study Area. Full details of the survey dates and methodology are described in **Appendix 8.1**.

Black Grouse Survey

8.25 Black grouse surveys (two breeding seasons) were completed of the BK Study Area (**Figure 8.1** and **Figure 8.2**). Due to the presence of suitable habitat for breeding black grouse, dedicated black grouse surveys were undertaken covering all suitable habitat within the Site and accessible areas of the 1.5km Study Area buffer as recommended in SNH (2017)¹³. The survey methods followed those recommended by Gilbert *et al.* (2011)³³, with full details of the survey dates and methodology described in **Appendix 8.1**.

Nightjar Survey

8.26 Nightjar surveys (two breeding seasons) were completed of the NJ Study Area (**Figure 8.1** and **Figure 8.2**). A nightjar habitat assessment was completed in spring of 2020 and when that demonstrated the presence of suitable habitat for breeding nightjar, dedicated nightjar transect surveys were undertaken in June and July in both 2020 and 2021. The survey methods followed those recommended by Gilbert *et al.* (2011)³³, with full details of the survey dates and methodology described in **Appendix 8.1**.

³² Hardey, J., Crick, H. Q. P., Wernham, C. V., Riley, H. T., Etheridge, B. and Thompson, D. B. A. (eds) (2013) Raptors: a field guide to survey and monitoring (3rd edition)

³³ Gilbert, G., Gibbons, D. W. and Evans, J. (2011) Bird Monitoring Methods: A Manual of Techniques for Key UK Species

Survey Limitations

8.27 In the 2020 breeding season, field surveys experienced a slightly delayed start because of the Covid-19 pandemic and the first national lockdown in 2020, when government guidelines restricted movement in the countryside. The Year 1 breeding season VP surveys, Year 1 breeding bird survey and Year 1 breeding raptor surveys therefore all commenced later than originally planned, with no surveys undertaken in April and the first half of May 2020. Although the required number of survey hours and days for each respective survey was completed throughout the 2020 breeding season, due to the shorter survey season owing to the Covid-19 restrictions, it is therefore possible that some early-season breeding activity of nesting birds was missed, with species such as goshawk and red kite actively displaying at this time of year. Following the restart of surveys, and in order to maintain social distancing, some parts of the survey buffers (but none within the Site) were not accessed throughout the surveys; this included checking buildings and structures for evidence of breeding target species. Survey areas without access permissions were scanned, where possible, with binoculars from a distance.

8.28 Due to a change in the design of the Proposed Development in March 2020, a further three VPs were added to the original seven, and therefore had missed the first non-breeding season of surveys. The VP surveys at these three locations continued for an additional non-breeding season (2022-2023) meaning a continuous two-year period was maintained for all ten VPs and this has not resulted in any significant limitation to the assessment.

8.29 It should be noted that the completion of a second year of ornithology surveys, including a full breeding season of surveys from April to August, had full access to the wider survey buffers which means the required number of hours for each survey methodology was completed as per the NatureScot (SNH, 2017)¹³ guidance. With similar species recorded in both of the two breeding season surveys, it is considered that the truncated 2020 survey season has not resulted in significant limitations to the assessment.

Impact Assessment Methods

8.30 The approach to the Ecological Impact Assessment (EclA) follows the Chartered Institute of Ecology and Environmental Management guidelines (CIEEM, 2018)¹¹, which prescribe an

industry-standard method to define, predict and assess potential ecological effects of a Proposed Development. Starting with establishing the baseline through a mix of desk study and field survey, IOFs are first identified and then evaluated in terms of their vulnerability to the Proposed Development through a reasoned process considering factors such as statutory requirements, policy objectives for biodiversity, conservation status of the IOF, connectivity and spatial separation from the Proposed Development. An impact assessment is then undertaken for scoped-in IOFs that assumes construction industry-standard mitigations will be followed to ameliorate impacts as far as practicably possible. Additional mitigation strategies can then be determined to minimise any residual impacts that will otherwise be experienced by the IOF and any opportunities for enhancement identified.

8.31 In summary, the impact assessment process (CIEEM, 2018)¹¹ involves:

- Identifying IOFs vulnerable to effects;
- Identifying and characterising impacts and their effects;
- Incorporating measures to avoid and mitigate negative effects;
- Assessing the significance of any residual effects after mitigation;
- Identifying the appropriate compensation methods to offset significant residual effects; and,
- Identifying opportunities for ecological enhancement.

Assessing Significance

8.32 When there is the potential for the Proposed Development to have an effect on a bird species or population that may be part of, or linked to, a designated population, whether internationally such as a Special Protection Area (SPA) or Ramsar population, or nationally, such as a Site of Special Scientific Interest (SSSI) population, impacts are assessed on whether they affect the integrity of the protected site and, as such, the conservation objectives of the designation.

8.33 The species link to the protected site may be throughout the year but as detailed in the site citation documentation for the protection, it may be specific to the species' activity or the time of year. For example, the protected site may be designated solely for its breeding, wintering, passage or migratory species meaning at other times of year, these species have no link to the

protected site. In the situation where the bird population recorded is not considered to be protected by a designation such as an SPA, pSPA, Ramsar or SSSI, the individuals are considered to be part of the 'wider area population' and in this scenario the assessment concentrates on whether there are effects on the overall population of the species in both a local (county) and wider area (Wales) context.

8.34 The significance of the effect on an ornithological feature is determined by assessing the following three factors:

- The Nature Conservation Importance (NCI) of the species;
- The conservation status of the species; and,
- The magnitude of the impact.

Nature Conservation Importance

8.35 Determination of the level of sensitivity of an IOF (CIEEM, 2018)¹¹ to be taken forward for assessment is based on a combination of the feature's Nature Conservation Importance (NCI) and its conservation status.

8.36 **Table 8.2** lists the criteria used to determine the NCI value assigned ornithological features.

Table 8.2 Evaluation criteria for NCI

Importance	Criteria
High	Populations of species receiving protection due to their inclusion as designating features of a SPA, pSPA, Ramsar or SSSI including birds outside of protected areas when there is considered to be connectivity to the site. Breeding population of a species listed on Schedule 1 of the WCA.
Medium	Presence of target species listed on Annex 1 species of the Birds Directive but not considered to be protected by a designated site. More than infrequent presence of target species (but not breeding) listed on Schedule 1 of the WCA.

Importance	Criteria
	A council-scale (PCC) important population/area of a bird species listed as a Priority Species on Section 7 of the Environment (Wales) Act 2016) as requiring conservation action. The presence of council-scale (PCC) breeding species noted on the latest BoCC Red-listed species (Johnstone <i>et al.</i>, 2022)²¹. The presence of significant number of migratory, passage or wintering species, notable due to using the Site as a staging post, wintering grounds or notable migration route.
Low	All other species not mentioned in categories above.

8.37 Where a feature qualifies under two or more criteria, the higher value is applied to the feature.

Conservation Status

8.38 Where possible, the conservation status for each species population was considered within the local context. The relevant population scale for assessing potential effects on breeding species in is considered to be the appropriate region or county. The Site is fully within PCC and where possible the conservation status will be based on this area. Powys is made up of three historic council areas at which level bird recording is completed. The Site lies fully in Radnorshire and bird figures for Radnorshire will be used to estimate the council populations where possible. If sufficient information on these local populations does not exist, the national (Welsh) population estimate is used. For wintering or migratory species, the national (Welsh) population is considered.

8.39 For these purposes, conservation status was taken to mean the sum of the influences acting on a population which may affect its long-term distribution and abundance. The conservation status of a species is defined by SNH (2018)¹⁷ as *“the sum of the influences acting on it which may affect its long-term distribution and abundance, within the geographical area of interest”* and they state that:

“A species’ conservation status is favourable when:

- population dynamics indicate that the species is maintaining itself on a long-term basis and is therefore likely to persist in the habitat it occupies; and*
- the natural range of the species is not being reduced, nor is likely to be reduced for the foreseeable future; and,*
- there is (and will probably continue to be) a sufficiently large habitat to maintain its populations on a long-term basis.*

We recommend here that the concept of favourable conservation status of a species should be applied at the level of its Scottish population, to determine whether an impact is sufficiently significant to be of concern.”*

* N.B. The relevant population scale for this assessment is the Welsh population.

Magnitude

8.40 For the purposes of this assessment, magnitude was determined by consideration of the spatial and temporal nature of each impact. The levels of spatial magnitude on an ornithological feature are categorised as ‘negligible’, ‘low’, ‘medium’, ‘high’ or ‘very high’, based on the definitions in **Table 8.3**, below, with the temporal impacts categorised in **Table 8.4**.

Table 8.3 Levels of spatial magnitude of impact

Spatial Magnitude	Description
Very High	Total/near total loss of a bird population due to mortality or displacement. Total/near loss of productivity in a bird population due to disturbance. Guide: >80% of regional (Radnorshire) population affected (>8% of a Welsh population if regional figure not available).
High	Major reduction in the status or productivity of a bird population due to mortality, displacement or disturbance.

Spatial Magnitude	Description
	Guide: 21-80% of regional (Radnorshire) population affected (2.1-8% of a Welsh population if regional figure not available)
Medium	Partial reduction in the status or productivity of a bird population due to mortality, displacement or disturbance. Guide: 6-20% of regional (Radnorshire) population affected (0.6-2% of a Welsh population if regional figure not available)
Low	Small but discernible reduction in the status or productivity of a bird population due to mortality, displacement or disturbance. Guide: 1-5% of regional (Radnorshire) population affected (0.1-0.5% of a Welsh population if regional figure not available).
Negligible	Very slight reduction in the status or productivity of a bird population due to mortality, displacement or disturbance. Reduction barely discernible, approximating to the 'no change' situation. Guide: <1% of regional (Radnorshire) population affected (<0.1% of a Welsh population if regional figure not available).

Table 8.4 Levels of temporal magnitude of impact

Temporal Magnitude	The following definitions have been applied in respect to timescales
Immediate	Within approximately 12 months.
Short term	Within approximately 1-5 years.
Medium term	Within approximately 6-15 years.
Long term	Between 15-40 years.

Temporal Magnitude	The following definitions have been applied in respect to timescales
Permanent	Over 40 years (impacts broadly spanning longer than the lifetime of the Proposed Development, for the purpose of this assessment over 40 years).

Temporal Scope

8.41 Potential impacts on ornithological features have been assessed in the context of how the predicted baseline conditions within the Study Area might change between the surveys and the start of construction. It is anticipated that construction will take approximately 23 months to complete and will be expected to commence in 2027 and that the baseline conditions will not materially change in the intervening time period.

Determining Ecologically Significant Effects

8.42 An EclA is undertaken in relation to the baseline conditions that will be expected to occur in the absence of a Proposed Development and, therefore, may include possible predictions of future changes to baseline conditions, such as environmental trends and other completed or planned development. Both adverse and beneficial impacts/effects are possible.

8.43 A significant effect, in ornithological terms, is defined as an effect (whether negative or positive) on the conservation status of a species within a given geographical area, including cumulative and in-combination impacts.

8.44 Following the classification of each species' sensitivity and consideration of the magnitude of each effect, professional judgement is used to make a reasoned assessment of the likely effect on the conservation status of each potentially affected species.

8.45 In accordance with the EIA Regulations (2017)³, each likely effect is evaluated and classified as either significant or not significant. The significance levels of effect on bird populations are described in **Table 8.5**. Detectable changes, i.e. those of 'major' or 'moderate' significance, in the conservation status of regional populations of NCI are considered to be significant effects under the EIA Regulations. Non-significant effects are those which are likely to result in barely detectable (minor) or non-detectable (negligible) changes in the conservation status of regional (and therefore national) bird populations.

Table 8.5 Significance level of effects

Significance of Effect	Description
Major	A detectable change to regional populations, resulting in total population loss or severe impacts to their conservation status.
Moderate	A detectable change to regional populations, resulting in population losses that are likely to impact their conservation status.
Minor	Small or barely detectable changes to regional populations that are unlikely to impact their conservation status.
Negligible	No or barely discernible changes to regional populations, with no impact on their conservation status.

8.46 In accordance with the current CIEEM guidelines¹¹, effects of impacts are assessed in the presence of standard mitigation measures. Additional mitigation may be identified where it is required to reduce a significant effect.

8.47 Any significant effect remaining post-mitigation (the residual effect), together with an assessment of the likelihood of success of the mitigation, are the factors to be considered against legislation, policy and development control in determining the application.

8.48 In addition to determining the significance of effects on important ornithological features, this chapter also identifies any legal requirements in relation to wildlife.

Assessment Limitations

8.49 As outlined in paragraph 8.19-26 above all the surveys were completed in line with recommended guidance (SNH, 2017¹³), although in 2020 the breeding season surveys were truncated into a shorter time period (end of May-August) instead of April to August due to the Covid-19 lockdown. The full breeding season period of April to August was completed in the 2021 breeding season and it was considered that the truncated season did not provide any

limitation to the results as discussed in this assessment. For full details of the survey timings see **Appendix 8.1**.

Existing Conditions

Overview

8.50 This section of the chapter details the results of the desk study and field surveys conducted across the Site and respective study areas, which provides the baseline conditions from which the impact assessment is based. This includes:

- Designated sites and desk study/external data; and,
- Protected or otherwise notable bird species.

8.51 Specific details relating to field survey methodologies and results are included within each of the relevant **Appendix 8.1** and **Appendix 8.2**. The following section summarises the baseline conditions with a review of relevant results used to inform the assessment of likely ornithological impacts provided below.

8.52 Details of the numbers, timings, scientific names as well as the locations of breeding and wintering species are presented in full in **Appendix 8.1** and shown in **Figures 1, 7, 8 and 11** in **Appendix 8.1** and Confidential **Figures 2-6, 9 and 10** in **Volume 5**.

Current Baseline

Nature Conservation Designations

8.53 Information gathered in the desk study confirmed there are no statutory conservation designations specifically for ornithological features within the Site. One designation of international importance, Elenydd-Mallaen (Marcheini Uplands Gilfach Farm and Gamallt) SPA, is located within the 20km search area from the Site and two designations of national importance, River Wye (Tributaries)/Afon Gwy (Isafonydd) SSSI and Maelienydd SSSI, are located within the 10km search area. The locations are shown on **Figure 8.3** and the three designations are described below.

8.54 The Elenydd-Mallaen SPA is located 18.3km west of the Site at its closest point and its qualifying features are detailed in **Table 8.6**.

Table 8.6 Qualifying features of Elenydd-Mallaen SPA

Qualifying Feature	Scientific Name	Condition (if cited)	Description
Breeding merlin	<i>Falco columbarius</i>	Condition not provided	During the period 1987 to 1991 a mean of 7 pairs (>1% of the British population).
Breeding red kite	<i>Milvus milvus</i>	Condition not provided – likely favourable	During the count of 1997 a total of 34 pairs (34% of the British population at the time). Updated figures from 2011 include 18 within SPA boundary, 57 within SPA and 1km buffer, 55 within SPA boundary and 2km buffer, 67 within SPA boundary and 3km buffer (RSPB, 2013) ³⁴ .

8.55 River Wye (Tributaries)/Afon Gwy (Isafonydd) SSSI is located 3.5km west of the Site at its nearest point and Maelienydd SSSI is located 4km north of the Site. The designated features are detailed in **Table 8.7** and **Table 8.8**.

Table 8.7 Qualifying features of River Wye (Tributaries)/Afon Gwy (Isafonydd) SSSI

Feature	Scientific Name	Condition (if cited)	Description
Wintering goosander	<i>Mergus merganser</i>	Condition not provided	100 individuals at time of notification, mean peak 2005-2010.

Table 8.8 Qualifying features of Maelienydd SSSI

Feature	Scientific Name	Condition (if cited)	Description
Lowland damp grasslands	N/A	Condition not provided	The site is noted for its wader interests including lapwing (<i>Vanellus vanellus</i>),

³⁴ Royal Society for the Protection of Birds (RSPB) (2013) A report on bird features on SSSI in Wales

Feature	Scientific Name	Condition (if cited)	Description
breeding bird assemblage			snipe (<i>Gallinago gallinago</i>), curlew (<i>Numenius arquata</i>) and redshank (<i>Tringa totanus</i>).

Species Records – External Data

8.56 Biodiversity Information Service (BIS) for Powys and Bannau Brycheiniog National Park provided a total of 161 records of breeding, migratory and over-wintering bird species from within 5km of the Site. Of these, 13 species are listed under Schedule 1 of the WCA, five are listed within Annex 1 of the Birds Directive, 24 are listed as Priority Species on Section 7 of the Environment (Wales) Act 2016¹, and two species with dedicated species action plans on the Powys LBAP have been recorded.

8.57 The full bird species list provided by BIS can be found in the Ecological and Ornithological Desk Study as presented in **Appendix 7.1**.

Flight Activity Summary

8.58 As discussed above, a total of two years of flight activity surveys were completed at the Site between October 2019 and March 2022. A summary of the results showing all target species is detailed below in **Table 8.9** which shows:

- The total number of flights recorded;
- The total number of birds recorded;
- The total number of flights second which are calculated for each observation as the product of flight duration and number of individuals;
- The total number of full and/or in-part flights in the Collision Risk Area (CRA) which is defined as an area of 250m around each of the 30 turbines;
- The total number of full and/or in-part flights in the Collision Risk Zone (CRZ) which is defined as flights at Collision Risk Height (CRH) within the CRA, CRH is defined as between 50m-205m for Turbines 1-24; 57m-220m for Turbines 25, 26, 28; and 25m-180m for Turbines 29, 30 and 31; and,

- Flight seconds in CRZ.

8.59 For full detail on individual flights, timings and locations see Appendix 8.1, Annex B, Tables AB-B12 and Figures 1 and 7 in Appendix 8.1 and Confidential Figures 2-6 in Volume 5.

Table 8.9 Target species activity recorded during two years of flight activity surveys (October 2019 to March 2022)

Species	Total Flights	Total Count	Total Flight Seconds Recorded*Total Flight Seconds (birds*flight time)	Flights in CRA – (all or in part) within 250 m of all 30T	Flights in CRZ – In CRA at Collision Risk Height (CRH)*	At-risk Seconds – Flight Seconds in CRZ
Curlew	1	1	40	0	0	0
Golden plover	31	936	249,139	15	13	118,706
Goshawk	36	37	7,371	13	12	707
Greylag goose	1	2	150	0	0	0
Hen harrier	6	6	675	2	1	37
Hobby	42	44	3,195	4	4	140
Lapwing	2	2	70	0	0	0
Merlin	2	2	185	2	2	11
Osprey	2	2	360	2	2	134

Species	Total Flights	Total Count	Total Flight Seconds Recorded*Total Flight Seconds (birds*flight time)	Flights in CRA – (all or in part) within 250 m of all 30T	Flights in CRZ – In CRA at Collision Risk Height (CRH)*	At-risk Seconds – Flight Seconds in CRZ
Peregrine	83	95	11,833	22	16	339
Red kite	3,441	6,775	3,915,255	736	487	170,172

8.60 Band *et al.* (2007)¹⁶ devised a method by which field data on bird flight activity can be gathered and used to quantify the likelihood of bird collisions with turbines; this is known as the ‘Band’ Collision Risk Model (CRM). The Band CRM involves two methods to predict estimated collision fatalities, depending on the pattern of flight of the species involved: ‘predictable’ and ‘unpredictable’ flight methods. The model inputs the ‘at-risk’ flight seconds or number of ‘at-risk’ flights into the appropriate model along with a number of parameters such as the bird’s biometrics, the number and types of turbines and using established, pre-defined ‘avoidance rates’ (the likelihood of a particular species flying into a turbine) predicts a collision risk value.

8.61 As part of the design process for the Proposed Development, the CRM methodology was used to help inform the site design in two ways, firstly by helping to identify areas to avoid which were particularly sensitive in terms of flight activity (such as flight corridors) and secondly by identifying flight activity at certain heights which was significant. The collision risk model therefore was used to mitigate by design of the resultant layout, with both the location and turbine specifications being modified to reduce the impacts on sensitive bird species.

8.62 The collision risk modelling process began on the scoping layout of 36 turbines and with a standard sweep of 45m-200m of the rotor blades. Both the number of turbines and the rotor sweep have been modified as part of the design process and in part due to ornithological reasons. **Table 8.10** provides a summary of the results of the CRM following the mitigation by design process from 36 to 31 to 30 turbines and also the modification of the turbine sweep. **Table 8.10** also displays a summary of the results of this process for completeness, For full details of the workings of the CRM see **Appendix 8.2**.

Table 8.10 Collision modelling results (collision rate per season)

Species	36T Full Site (45m-200m sweep)	36T Full Site (50m-205m sweep)	31T Full Site (50m-205m sweep)	30T Site – 250m Buffer (sweeps as paragraph 8.56 above)
Golden plover				
Non-Breeding Season	8.163	8.103	6.977	11.25

Species	36T Full Site (45m-200m sweep)	36T Full Site (50m-205m sweep)	31T Full Site (50m-205m sweep)	30T Site – 250m Buffer (sweeps as paragraph 8.56 above)
Goshawk				
Breeding Season	0.117	0.099	0.085	0.03
Non-Breeding Season	0.261	0.232	0.200	0.053
Total	0.189	0.165	0.143	0.083
Hobby				
Breeding Season	0.023	0.020	0.046	0.016
Osprey				
Breeding Season	0.015	0.015	0.018	0.017
Peregrine				
Breeding Season	0.122	0.009	0.008	0.013
Non-Breeding Season	0.262	0.207	0.178	0.029
Total	0.384	0.216	0.186	0.042
Red kite				
Breeding Season	1.974	1.291	1.112	1.089
Non-Breeding Season	15.340	11.001	9.473	9.217
Total	17.314	12.292	10.585	10.306

Raptors

Goshawk

8.63 Goshawk were confirmed to be holding a territory within the Breeding Raptor Study Area in both the 2020 and 2021 breeding seasons (**Appendix 8.1** and **Confidential Figure 6** in **Appendix 2.5: Forestry Assessment**).

8.64 Flight activity surveys recorded 36 flights (**Appendix 8.1, Annex B, Table B4** and **Confidential Figure 1**), of which 12 flights were identified to be 'at-risk' (**Table 8.9**), predicting a mean annual collision risk of 0.083, or one bird fatality every 12.04 years (**Table 8.10**).

Hen Harrier

8.65 Flight activity surveys registered six hen harrier flights (**Appendix 8.1, Annex B, Table B6** and **Confidential Figure 1**); however, a single flight and 37 seconds were considered to be 'at-risk' (**Table 8.9**) and therefore no significant collision risk (a mean annual collision risk of less than 0.01) is predicted for hen harrier. All the flight activity was recorded during the non-breeding season (September to March) and no evidence of breeding activity was recorded for this species.

Hobby

8.66 Flight activity surveys recorded 42 flights (**Appendix 8.1, Annex B, Table B7** and **Confidential Figure 1**), of which four registrations were considered to be 'at-risk' (**Table 8.8**), and predicted mean annual collision risk of 0.016, or one bird fatality every 62.6 years (**Table 8.9**). All the flight activity was recorded between May and September; however, no evidence of breeding activity was recorded for this species.

Merlin

8.67 Flight activity surveys recorded two merlin flights (**Appendix 8.1, Annex B, Table B9** and **Confidential Figure 1**) a total of 11 seconds were considered to be 'at-risk' (**Table 8.9**) and therefore no significant collision risk (a mean annual collision risk of less than 0.01) is predicted for merlin. No evidence of breeding activity was recorded for this species.

Osprey

8.68 Flight activity surveys recorded two osprey flights (**Appendix 8.1, Annex B, Table B10** and **Confidential Figure 1**) and both flights were identified to be 'at-risk' (**Table 8.9**), predicting a mean annual collision risk of 0.017, or one bird fatality every 62.5 years (**Table 8.10**). No evidence of breeding activity was recorded for this species.

Peregrine

8.69 Peregrine was confirmed to be holding one territory in 2020 and one territory in 2021 and a second possible territory was identified in 2021. In both years the confirmed breeding territory was in the Site (**Appendix 8.1** and **Confidential Figure 6** in **Appendix 2.5**). The two breeding attempts in 2020 and 2021 combined were considered to have fledged three juveniles.

8.70 Flight activity surveys recorded 83 peregrine flights (**Appendix 8.1, Annex A, Table B11** and **Confidential Figure 2**), of which 16 flights were considered to be 'at-risk' (**Table 8.9**), predicting a mean annual collision risk of 0.042, or one bird fatality every 23.8 years (**Table 8.10**).

Red Kite

8.71 Red kite were confirmed to be holding a total of ten territories across the 2020 and 2021 breeding seasons. Of the ten probable or confirmed breeding locations, one was recorded in the Site, three were close to the Site boundary and the remaining six located in the wider Raptor Study Area (**Appendix 8.1** and **Confidential Figure 6** in **Appendix 2.5**). An update survey was conducted in 2024 to check on a single (probable) breeding location, the pair were not present an old nest was present but unused. Flight activity surveys recorded 3,441 red kite flights over the two years of survey (**Appendix 8.1, Annex B, Table B12** and **Confidential Figures 6a-6e**), of which 487 flights were considered to be 'at-risk' (**Table 8.9**), predicting a mean annual collision risk of 10.306, or one bird fatality every 0.1 years (**Table 8.10**).

Waders

Curlew

8.72 Curlew were not confirmed as breeding within the Site or BBS Study Area; however, two probable breeding territories were identified between 500m-1.5km west of the Site boundary (**Appendix 8.1** and **Confidential Figure 7** in **Appendix 2.5**).

8.73 Flight activity surveys recorded one flight (**Appendix 8.1, Annex A, Table A3 and Figure 2**), however, the flight was not considered to be 'at-risk' (**Table 8.8**). Therefore, no collision risk is predicted.

Golden Plover

8.74 Golden plover was not recorded during the breeding surveys within the Site or BBS Study Area; all flight activity was registered during the winter season only. Flight activity surveys recorded 31 flights (**Appendix 8.1, Annex B, Table B3 and Figure 4**), of which 12 flights were considered to be 'at-risk' (**Table 8.9**), predicting a mean wintering collision risk of 11.25, which equates to one bird every 0.09, if combined with a breeding season collision risk of zero this would total 11.25 birds per annum. (**Table 8.10**). A maximum of two individuals were recorded on a single visit during winter walkover surveys (**Appendix 8.1, Annex A, Table A3 and Figure 8**).

Lapwing

8.75 Lapwing was not recorded during the breeding surveys within the Site or BBS Study Area. Flight activity surveys recorded two lapwing flights (**Appendix 8.1, Annex B, Table B8 and Figure 4**); however, neither flight was considered to be 'at-risk' (**Table 8.8**). Therefore, no collision risk is predicted. No evidence of breeding activity was recorded for this species.

Snipe and Jack Snipe

8.76 Snipe and jack snipe were not confirmed as breeding within the Site or BBS Study Area; however, a single probable breeding territory for snipe was identified between over 1km west of the Site boundary (**Appendix 8.1 and Confidential Figure 7 in Appendix 2.5**).

8.77 A maximum of five individuals and one individual were recorded for snipe and jack snipe respectively recorded during winter walkover surveys (**Appendix 8.1, Annex A, Table A3 and Figure 8**).

Other Species

Nightjar

8.78 A total of five churring males (male territorial vocalisation) were recorded during the two survey visits in June and July 2020 and six were recorded during visits in June and July 2021.

None of the territories were recorded within the Site, all were within regrowth in plantation forestry in the NJ Study Area (**Appendix 8.1** and **Confidential Figure 7** in **Appendix 2.5**). Nightjar is a nocturnal species and, as flight activity surveys are conducted during daylight hours as per the recommended guidance (SNH, 2017)¹³, it was not recorded during flight activity surveys and as such no collision risk can be made for this species.

Quail

8.79 A single calling male (male territorial vocalisation) was recorded on two different survey days on the 4th BBS visit in July 2021. One was in the Site and the other just outside the Site boundary in the BBS Study Area (**Appendix 8.1** and **Confidential Figure 7** in **Appendix 2.5**). Quail is a cryptic species and rarely seen and, as would be expected, was not recorded during flight activity surveys and as such no collision risk is predicted for this species.

Wildfowl

8.80 Wildfowl species were only recorded infrequently at the Site with a single greylag goose flight (**Appendix 8.1**, **Annex B**, **Table B5** and **Figure 7**), three flights of both mallard and Canada goose and one of goosander. Mallard and Canada goose were recorded as breeding in small numbers of on waterbodies within the Site and BBS Study Area. The winter walkover identified low numbers of goosander, mallard and teal in the Site (**Appendix 8.1**, **Annex A**, **Table A3** and **Figure 11**).

Gulls

8.81 No gull species were recorded as holding breeding colonies or territories within the Site or wider BBS Study Area. Three gull species: herring gull, lesser black-backed gull and great black-backed gull, were infrequently recorded during flight activity surveys, with lesser black-backed the most frequently recorded with 36 registrations across the two years of survey.

Other Breeding Passerines

8.82 One Schedule 1 species (firecrest), 18 Section 7 birds (of which 13 are Welsh BoCC Red listed species and four are Welsh BoCC Amber listed), plus an additional six Welsh BoCC Red listed species and ten Welsh Amber listed species, were confirmed as breeding within the BBS Study Area during the 2020 and 2021 breeding bird walkover surveys. The results are detailed in **Table 8.11** below and shown in **Figure 8a** and **Figure 8b**.

Table 8.11 Assessed no. of breeding territories (Sch.1, S.7, Welsh R/A List species)

Species	Territories in BBS Study Area	Territories in Site	Territories within 50m/10m of Site Infrastructure
Schedule 1 Species			
Firecrest	1 (possible breeding)	0	0
Section 7 and Welsh Red List Species			
Bullfinch	3	0	0
Cuckoo	3	1-2	0
Kestrel	1	0	0
Lesser redpoll	3	2	0
Linnet	6	1	0
Marsh tit	1	0	0
Red grouse	3	2	0
Ring ouzel	1	1	0
Skylark	227+	210	40/15
Spotted flycatcher	4	2	0
Tree pipit	21	5	0
Wood warbler	3	0	0
Yellowhammer	13	7	0
Section 7 and Welsh Amber List Species			
Dunnock	27	10	0

Species	Territories in BBS Study Area	Territories in Site	Territories within 50m/ 10m of Site Infrastructure
House sparrow	12	0	0
Pied flycatcher	12	1	0
Song thrush	16	5	0
Section 7 and Welsh Green List Species			
Reed bunting	7	5	0
Welsh Red List Species			
Goldcrest	Yes*	-	-
Meadow pipit	73+	65	12
Rook	Yes*	-	-
Whinchat	14	9	0
Whitethroat	Yes*	-	-
Willow warbler	79+	29	2/0

*Territories were not mapped as not amber or red-listed at time of survey (2020/2021).

8.83 A further 30 common species were recorded as breeding within the BBS Study Area, see (**Appendix 8.1, Annex A, Table A2 and Figures 8a and 8b**).

Evaluation of Ornithological Features

8.84 An evaluation of the baseline ecological features is presented in **Table 8.12**, below.

Features of medium or higher NCI value are considered IOFs and are brought forward to the next stage of the assessment.

Table 8.12 Summary of evaluation of IOFs

Feature	Evaluation Reasoning	NCI
Elenydd-Mallaen SPA	The level of value follows the level of designation.	High
River Wye (Tributaries)/ Afon Gwy (Isafonydd) SSSI	The level of value follows the level of designation.	High
Maelienydd SSSI	The level of value follows the level of designation.	High
Goshawk	Goshawk is fully protected as a Schedule 1 species. It is also a PNRAP species of local concern (PCC, 2022)²⁴. In addition, it is a Welsh BoCC Green listed species (Johnstone <i>et al.</i>, 2022)²¹. Goshawk is considered to be at risk from wind farms in NatureScot guidance (SNH, 2018)¹⁷. Goshawk was recorded breeding within 2km of the Site and was recorded regularly during activity surveys.	High
Hen harrier	Hen harrier is fully protected as a Schedule 1 species. It also listed in Annex 1 of the Birds Directive, but no SPA designated for hen harrier is present within 20km of the Site and this assessment therefore deals with the wider area population only. Hen harrier is a Section 7 Welsh Priority Species. It is also a PNRAP species of local concern (PCC, 2022)²⁴. In addition, it is a	Low

Feature	Evaluation Reasoning	NCI
	Welsh BoCC Red-listed species (Johnstone <i>et al.</i>, 2022)²¹ because hen harrier numbers have declined across the Wales. Hen harrier is considered to be at risk from wind farms in NatureScot guidance (SNH, 2018)¹⁷. Hen harrier was infrequently (six flights in two years) recorded during activity surveys. No evidence was recorded of the species breeding within 2km of the Site. Despite the conservation status of the species, with such low activity, the Site is assessed as low for hen harrier.	
Hobby	Hobby is fully protected as a Schedule 1 species. Hobby is a PNRAP species of local concern (PCC, 2022)²⁴. Due to the fact that hobby numbers remain stable across Wales, hobby is a Welsh BoCC Green listed species (Johnstone <i>et al.</i>, 2022)²¹. There is no SPA designated for hobby within 20km of the Site, therefore the birds recorded at the Site are considered to be the wider area population only. Hobby was not recorded breeding within 2km of the Site but was recorded on 34 occasions in the activity surveys during the breeding season.	Medium
Merlin	Merlin is fully protected as a Schedule 1 species. Also listed in Annex 1 of the Birds Directive. The nearest SPA designated for (breeding) merlin is located 18.3km west of the Site. This distance is further than the identified connectivity distance outlined in the guidance which states a maximum range of 5km (SNH, 2016)¹⁹ and therefore the birds recorded at the Site are considered to be the wider area population only.	Low

Feature	Evaluation Reasoning	NCI
	Merlin is a PNRAP species of local concern (PCC, 2022)²⁴. Merlin is a Welsh BoCC Red listed species (Johnstone <i>et al.</i>, 2022)²¹ due to the fact that merlin numbers are declining across Wales. Merlin is considered to be at risk from wind farms in NatureScot guidance (SNH, 2018)¹⁷. Merlin was infrequently recorded during activity surveys. No breeding was recorded within 2km of the Site. Despite the conservation status of this species, with such low flight activity and no breeding records, the Site is assessed as low for this species.	
Peregrine	Peregrine is fully protected as a Schedule 1 species. It also listed in Annex 1 of the Birds Directive, but no SPA designated for peregrine is present within 20km of the Site and this assessment therefore deals with the wider area population only. Due to a stable population in Wales peregrine is a Welsh BoCC Green listed species (Johnstone <i>et al.</i>, 2022)²¹. Peregrine is considered to be at risk from wind farms in NatureScot guidance (SNH, 2018)¹⁷. There is no SPA designated for peregrine within 20km of the Site, therefore the birds recorded at the Site are considered to be the wider area population only. Peregrine was recorded breeding within 2km of the Site and was recorded regularly during activity surveys.	High
Red kite	Red kite is fully protected as a Schedule 1 species. It also listed in Annex 1 of the Birds Directive. The nearest SPA designated for (breeding) red kite is located 18.3km west of the Site. This distance is further than the identified connectivity distance outlined in the	High

Feature	Evaluation Reasoning	NCI
	guidance which states a maximum range of 6km (SNH, 2016)¹⁹ and therefore the birds recorded at the Site are considered to be the wider area population only. Red kite is a Welsh BoCC Green listed species (Johnstone <i>et al.</i>, 2022)²¹ due to the continued success of reintroduction programs across Wales. Recent studies show numbers of red kite in Mid Wales and Wales as a whole to be an estimated 1,488 and 2,117 breeding pairs respectively. Red kite is considered to be at risk from wind farms in NatureScot guidance (SNH, 2018)¹⁷. Red kite was recorded breeding within the Site as well as in the wider 2km Study Area and was recorded frequently during activity surveys all year round. With confirmed breeding and with such regular flight activity, red kite is classed as high NCI.	
Golden plover	Golden plover is listed in Annex 1 of the Birds Directive but no SPA featuring golden plover is present within 20km of the Site. This assessment therefore deals with the wider area wintering population only. It is also a Section 7 Welsh Priority Species. It is also a PNRAP species of local concern (PCC, 2022)²⁴. Due to declining breeding numbers, it is a Welsh BoCC Red listed species (Johnstone <i>et al.</i>, 2022)²¹. Golden plover is considered to be at risk from wind farms in NatureScot guidance (SNH, 2018)¹⁷. Golden plover was not recorded breeding within the BBS Study Area of the Site and the Site is at the very southern fringes of their breeding range. Golden plover was recorded regularly during	Medium

Feature	Evaluation Reasoning	NCI
	activity surveys throughout the winter months, however, but not recorded between May to August.	
Curlew	Curlew is a Section 7 Welsh Priority Species. It is a Welsh BoCC Red listed species (Johnstone <i>et al.</i>, 2022)²¹ and is the subject of a Welsh country wide BAP (Gylfinir Cymru/Curlew Wales, 2021)³⁵ and is also a PNRAP species of local concern (PCC, 2022)²⁴. Curlew were infrequently recorded during activity surveys and no confirmed evidence of breeding was recorded in the BBS Study Area. Despite the conservation status, with such low activity, curlew is assessed as low NCI for the Site.	Low
Lapwing	Lapwing is a Section 7 Welsh Priority Species. It is a Welsh BoCC Red listed species (Johnstone <i>et al.</i>, 2022)²¹. Lapwing were infrequently recorded during activity surveys and no evidence of breeding was recorded. Despite the conservation status this species, with such low activity, Lapwing is assessed as low NCI for the Site.	Low
Snipe	Snipe is a Welsh Amber listed species (Johnstone <i>et al.</i>, 2022)²¹. Snipe is also a PNRAP species of local concern (PCC, 2022)²⁴. Snipe were not recorded during activity surveys and no evidence of breeding was recorded in the BBS Study area. Snipe was recorded in low numbers during winter walkover surveys. Despite the conservation status of this species, with such low activity, the NCI is assessed as low for this species.	Low

³⁵ Gylfinir Cymru/Curlew Wales (2021) Wales Single Species Action Plan for the Conservation of Eurasian Curlew

Feature	Evaluation Reasoning	NCI
Jack snipe	Jack snipe is a Welsh Amber listed species (Johnstone <i>et al.</i>, 2022)²¹. Jack snipe is also a PNRAP species of local concern (PCC, 2022)²⁴. Snipe were not recorded during activity surveys and no evidence of breeding was recorded. Jack snipe was recorded once during winter walkover surveys. Despite the conservation status of this species, with such low activity, the NCI is assessed as low for this species.	Low
Nightjar	Nightjar is an Annex 1 listed species, but no SPA designated for nightjar is present within 20km of the Site and this assessment therefore deals with the wider area population only. It is a Section 7 Welsh Priority Species and is also a PNRAP species of local concern (PCC, 2022)²⁴. Nightjar is a Welsh BoCC Green listed species (Johnstone <i>et al.</i>, 2022)²¹. Nightjar is considered to be at risk from wind farms in NatureScot guidance (SNH, 2018)¹⁷. Nightjar was recorded as a probable breeding species assessed as breeding outside the Site but within the wider NJ Study Area.	Medium
Quail	Quail is fully protected as a Schedule 1 species. Quail is a Welsh Amber listed species (Johnstone <i>et al.</i>, 2022)²¹. A single bird was heard calling in two locations on different days in July 2021, indicating one or two possible breeding locations. One location in the Site and one outside the Site. Calling birds are an indication of a breeding territory.	High

Feature	Evaluation Reasoning	NCI
Wildfowl	Greylag goose and teal are Welsh BoCC Amber listed and goosander and mallard are Welsh BoCC Green listed, goosander is a PNRAP species of local concern (PCC, 2022)²⁴. These species were recorded occasionally with infrequent flights and small numbers of breeding records.	Low
Gulls	Herring gull is a Section 7 Welsh Priority Species. Great black-backed gull and herring gull are Welsh BoCC Red listed species, and lesser black-backed gull is Welsh BoCC Amber listed (Johnstone <i>et al.</i>, 2022)²¹. These species were not recorded as breeding and were infrequently recorded during flight activity surveys.	Low
Breeding bird assemblage	A total of one Schedule 1 species (firecrest) and 18 Section 7 species (13 of which are also Welsh Red listed (bullfinch, cuckoo, grasshopper warbler, kestrel, linnet, marsh tit, red grouse, ring ouzel, skylark, spotted flycatcher, tree pipit, wood warbler and yellowhammer), four also Welsh Amber listed (dunnock, house sparrow, pied flycatcher and song thrush) and one Welsh Green listed species (reed bunting)) were noted as breeding with the BBS Study Area. Of the 18 section species, all bar ring ouzel, tree pipit and wood warbler are PNRAP species of local concern (PCC, 2022)²⁴. An additional six Welsh Red listed species (goldcrest, meadow pipit, rook, whinchat, whitethroat and willow warbler) and nine Welsh Amber listed species (chaffinch, coal tit, grey wagtail, green woodpecker, house martin, mistle thrush, tawny owl, wheatear and woodpigeon) were also recorded as breeding within the BBS Study Area. Of the additional nine species, four (meadow pipit, whinchat,	Medium

Feature	Evaluation Reasoning	NCI
	whitethroat and wheatear) are PNRAP species of local concern (PCC, 2022)²⁴. Skylark and meadow pipit were the most common and widespread and found throughout the open areas of the BBS Study Area. The majority of other species were recorded away from the Proposed Development with a significant proportion of records registered outside the Site, the most frequently recorded species were willow warbler, dunnoek, tree pipit, yellowhammer and pied flycatcher. The detailed results are summarised in Table 8.11 with further details including all scientific names in Appendix 8.1, Annex A, Table A2, locations of all the records are shown in Appendix 8.1, Figures 8a and 8b and Confidential Figure 10. These species are typical of the breeding bird assemblage for these habitats in this part of Wales and are considered to be a council-scale breeding assemblage and therefore, as per the criteria outlined in Table 8.2, are medium NCI.	
Wintering bird assemblage	The wintering bird survey identified occasional records of six target species (golden plover, goshawk, jack snipe, peregrine, red kite and snipe). A total of seven Schedule 1 or Section 7 species (crossbill, fieldfare, kestrel, red grouse, skylark, starling and willow tit) were recorded with each only recorded during one visit over the two years survey. A further nine common and widespread species (the results are shown in Appendix 8.1, Annex A, Table A3, locations of all the records are shown in Appendix 8.1, Figure 11). Activity surveys identified winter flocks of starlings, with groups of up to 9,000 birds recorded, primarily from VP5 in the south-west of the Site. The majority of records were at dusk and involved birds	Low

Feature	Evaluation Reasoning	NCI
	flying in the very west of the Site or further to the west or north-west outside the Site. There is a known roost of starling over 2km outside the Site at Llandegley Rhos and it is likely these records are associated with this roost. With the starling roost located over 2km outside the Site it is unlikely to be impacted by the Proposed Development and with low numbers of other common and widespread species recorded, the wintering bird assemblage is considered to be typical of these habitats in Wales and a not a county-scale assemblage and therefore as per Table 8.2 are low NCI.	

Implications of Climate Change

8.85 The summary of the relevant climate change projections using the UK Climate Projections 2018 (UKCP18)³⁶ are as follows:

- Temperatures are projected to increase, particularly in summer;
- Winter rainfall is projected to increase and summer rainfall is most likely to decrease;
- Heavy rain days (rainfall greater than 25 millimetres (mm)) are projected to increase, particularly in winter;
- Near surface wind speeds are expected to increase in the second half of the 21st Century with winter months experiencing more significant effects of winds; however, the increase in wind speeds is projected to be modest; and,
- There will be an increase in frequency of winter storms over the UK.

8.86 In ornithological terms, the ornithological baseline is unlikely to change significantly over the coming years as a direct result of climate change. A majority of species using the Site will be on migration from areas further north or further south, depending on the season, and an

³⁶ Met Office (2018) UK Climate Projections (UKCP)

increase in extreme weather may influence the productivity and therefore the numbers of migratory species using the Site, such as golden plover, hobby and nightjar as well as a large number of passerine species, e.g. spotted flycatcher and whinchat. Changes to the local climate, such as the expected increase in summer temperatures, may result in changes to the assemblage of species at the Site, a phenomenon which can already be seen with an increasing number of birds from Continental Europe now found breeding in the south and south-west of the UK.

8.87 A study by the British Trust for Ornithology (BTO) on the impacts of climate change on bird species identified a number of likely additional species arriving from continental Europe, as populations continue to shift their distributions northwards in response to warming (Pearce-Higgins, 2021)³⁷. Colonisations are most likely to occur if species' populations are increasing on the continent and there are significant breeding populations near to the southern shores of England (Ausden *et al.*, 2015)³⁸. Eleven waterbird species, two lowland terrestrial species and two woodland species were identified by Ausden *et al.*, 2015³⁸ as being likely to colonise the UK as breeding species, in addition to those which have recently done so, including night heron, little bittern, cattle egret and great white egret.

8.88 However, the process is likely to be relatively slow and not significant over the lifetime of the Proposed Development. In addition to direct effects, indirect effects on bird numbers in response to climate change may also be possible, e.g. from land use changes in parts of the world that are used by migratory birds at other times of the year.

Design Considerations (Embedded Mitigation)

8.89 The ornithological baseline has been considered throughout the design process for the Proposed Development (see **Chapter 3: Site Selection and Design Strategy**), including design meetings where representatives of each specialist subject have provided input to subsequent design options. The aim of this has been to either eliminate or reduce the potential

³⁷ Pearce-Higgins, J. W. (2021) Climate Change and the UK's Birds

³⁸ Ausden, M., Bradbury, R., Brown, A., Eaton, M., Lock, L. and Pearce-Higgins, J. (2015) Climate change and Britain's birdlife: What might we expect. *British Wildlife*, 26: p.161-174.

for any significant effects on valued features. Embedded mitigation factored into the design of the Proposed Development has included the following:

- Recommended disturbance buffers for protected bird species at their nest sites, namely those that have protection as Schedule 1 or Annex 1 species, with recommended distances outlined by Goodship and Furness (2022)³⁹ and the Forestry Commission Scotland (FCS, 2007)⁴⁰. Any disturbance to these species will be against the law and therefore the iterative design process has ensured no turbines or heavy construction works will be within the recommended guidance distances.
- Turbine design and locations including length and height of blade sweep.
- As necessary the design iteration process aimed to avoid flight corridors and migration routes.
- The avoidance of areas of higher conservation or biodiversity value for the turbines and associated infrastructure, as far as practicable.

Micrositing

8.90 A standard 50m micrositing allowance is being sought and will be used to determine the final position of the turbines, substation and associated infrastructure, although it will not be varied to such a degree as to cause a notable change in the predicted environmental effects and the assessment presented in this chapter has been undertaken on that basis.

8.91 There are no ornithological features or constraints which have influenced the micrositing allowance.

³⁹ Goodship, N. M. and Furness, R. W. (MacArthur Green) (2022) Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species (NatureScot Research Report 1283)

⁴⁰ FCS (2007) FCS Guidance Note 32: Forest operations and birds in Scottish forests – The law and good practice

Good Practice Measures (Applied Mitigation)

Applied Mitigation

8.92 As previously noted, in accordance with CIEEM guidance (CIEEM, 2018)¹¹, the assessment process assumes the application of standard mitigation measures (applied mitigation). This section details the mitigation measures that are recommended to ameliorate effects associated with the construction and operational phase of the Proposed Development. These measures are aimed to prevent, reduce or offset any likely significant effects of the Proposed Development on identified ornithological receptors. This approach is in accordance with best practice guidance and UK, Welsh and Local Government environmental, planning and sustainability policies.

8.93 Mitigation includes best practice methods and principles applied to the Proposed Development as a whole (generic measures) as well as site specific mitigation measures applied to individual locations (specific measures).

8.94 Ornithological mitigation will be incorporated into a Construction Environmental Management Plan (CEMP). An outline CEMP is provided in **Appendix 4.2, Volume 3**. The final CEMP will provide details on timelines for undertaking mitigation for each IOF. The final CEMP will also provide a timetable of actions and form part of the contract documents to ensure delivery of mitigation specified in this chapter. In addition, the CEMP will incorporate the provision of an Ecological Clerk of Works (ECoW) to oversee the implementation of recommended mitigation.

8.95 Applied mitigation measures of relevance to ornithological features include the following:

- Prior to construction of the Proposed Development, the Applicant will engage a Suitably Qualified Ecologist (SQE) to undertake a series of pre-construction ornithological surveys to update the baseline information reported in this chapter. The surveys will concentrate on breeding locations of protected species and will be done to provide up to date information in order to finalise the mitigation proposals. This will be in addition to completing a final check prior to construction for protected species (see **Chapter 7**) and will be discussed and agreed with PCC and NRW.

- Further to or incorporated into the update surveys above, protection of breeding bird nests from damage and/or destruction during the breeding season will need to be ensured. Wherever possible, all vegetation clearance including plantation forestry will occur outside the breeding season (i.e. between September-February, inclusive), to ensure that no active nests are damaged or destroyed by the proposed works. This will include any areas of shrub clearance and vegetation removal for access tracks, compounds or turbine bases due to the populations of ground nesting birds on and around the Site. If the works cannot be completed outside the breeding season as outlined all clearance works will be overseen by an ECoW and any active breeding attempts/nesting sites will be protected by species-suitable no-disturbance buffers until chicks have fledged.
- Removing vegetation from working areas outside the breeding season, wherever possible, between October and February inclusive, and ideally between November and January, will also reduce the attractiveness of those areas to breeding birds the following season, which means that birds are less likely to breed in those areas. If the works cannot be completed outside the breeding season, as outlined, all clearance works will be overseen by an ECoW and breeding attempts will be protected by no-disturbance buffers until completed.
- Should peregrine be confirmed as breeding in the known eyrie site during pre-construction surveys, all construction activity within 750m of the nest location will be completed outside the nesting season (April to August, inclusive). All construction traffic passing within the 750m no-disturbance buffer of the nest will be subject to a 10mph speed limit, these areas will be a no stopping zone and site vehicle 'beepers' will be deactivated in this area.
- All construction works within 200m of plantation clearfell areas or regrowth up to 10 years old within the plantation forestry in the south-east of the Site will be completed outside the nightjar breeding season (September to April).
- Avoidance of unnecessary disturbance to habitats by minimising the extent of ground clearance and other construction practices as far as practicable.
- An ecological toolbox talk will be given to all construction personnel as part of the site induction and will include the potential presence of ornithological species and measures that need to be undertaken should such species be discovered during construction

activities. The toolbox talk will also include the requirement to report and log any bird casualties at the Proposed Development during construction and operation of the Site.

8.96 As part of the Proposed Development, it will be necessary to develop and implement a Site Restoration Plan (SRP) as part of the CEMP to ensure the regeneration of those areas of habitat that have been temporarily lost through development (see **Appendix 4.2, Volume 3**).

8.97 In order to facilitate restoration, disturbed ground will be restored as soon as practicably possible using materials removed during the construction of access tracks, excavation of cable trenches and turbine foundations. To achieve this, any excavated soil will need to be stored in such a manner that is suitable to facilitate retention of the seed bank. This will aid site restoration and help conserve the pre-construction floristic interests at the Site.

IOFs Scoped In or Out of the Assessment

8.98 As noted in paragraph 8.31, under evaluation methods for IOFs, ornithological features of medium and higher NCI value are considered IOFs. Due to a range of factors, some of these IOFs can be scoped-out of further consideration if they are not vulnerable to effects from the Proposed Development.

8.99 Following evaluation of the baseline data, including desk study and field survey data, and considering the embedded mitigation measures described above, some potential effects on IOFs can be scoped out of the assessment, as described in **Table 8.13** below. This is based on professional judgement and experience from other projects and in line with the guidance outlined in paragraph 8.10.

8.100 The subsequent assessment of effects will be applied to IOFs considered to be of high or medium Nature Conservation Value (**Table 8.2**) that are known to be present within the Site or surrounding area (as confirmed through survey results and consultations outlined above).

Table 8.13 Ornithological features scoped in or out of the assessment

IOF	Rationale for Scoping In/Out	Scoped In/Out
Elenydd-Mallaen SPA	The Elenydd-Mallaen SPA is located 18.3km west at its nearest point and impacts on birds or habitats within the SPA boundary are very unlikely given this distance. The potential for impacts is therefore limited to those affecting populations of qualifying species when they are out with the SPA boundary. The SPA is designated for breeding merlin and red kite (see Table 8.6). A NatureScot study (SNH, 2016)¹⁹ investigated the core ranges from breeding and wintering roost grounds for a number of species. The purpose of the study was to help to identify potential connectivity between proposals and SPAs. The study outlines the red kite has a core range of 4km with a maximum range of 6km and merlin have a range of 5km (SNH, 2016)¹⁹. Merlin and red kite were recorded at the Site but given the significant distance to the SPA, which is more than 10km than the typical ranges for both species, it is considered there will be no connectivity between the Site and the SPA. Considering this information, no likely significant effects are predicted, and the Elenydd-Mallaen SPA is scoped out of the assessment.	Out: All qualifying features.
River Wye (Tributaries)/ Afon Gwy (Isafonydd) SSSI	River Wye SSSI which is 3.6km west of the Site at its nearest point and is designated for wintering goosander. Goosander were recorded twice during the two full years of survey, once from VP surveys and once during winter walkover surveys. Given the very low levels of activity for	Out: All qualifying features.

IOF	Rationale for Scoping In/Out	Scoped In/Out
	goosander and the separation distance of over 3.5km it is considered there will be no connectivity between the Site and the SSSI. Considering this information, no likely significant effects are predicted, and the River Wye SSSI is scoped out of the assessment.	
Maelienydd SSSI	Maelienydd SSSI which is 3.6km north of the Site at its nearest point and is designated for its breeding bird assemblage. The site description details that the breeding bird assemblage includes breeding wader species such as lapwing, snipe, curlew and redshank. Given the very low levels of flight activity for these species during survey, the lack of confirmed breeding activity for wader species at the Site and the separation distance of over 3.5km it is considered there will be no connectivity between the Site and the SSSI. Considering this information, no likely significant effects are predicted, and the Maelienydd SSSI is scoped out of the assessment.	Out: All qualifying features.
Goshawk	Goshawk is listed as an introduced resident breeder in Radnorshire with the first record of breeding following reintroduction being in 1980, rising to six pairs in 1986 increasing to a probable 30 breeding pairs in 2000 (Jennings, P., 2013)²⁵. Hardey <i>et al.</i> (2013)³² estimate a Welsh breeding population of between 51-102 pairs. Hughes <i>et al.</i> (2020)⁴¹ created bird population estimates for Wales based on the Bird Atlas Results 2007-2011 which	In: Breeding and non-breeding goshawk.

⁴¹ Hughes, J., Spence, I. M. and Gillings, S. (2020) Estimating the sizes of breeding populations of birds in Wales. *Birds in Wales* 17:1.

IOF	Rationale for Scoping In/Out	Scoped In/Out
	showed goshawk present in a total of 120 of the 10km squares, leading to a population estimate of 310 goshawk territories in Wales. The total of 310 territories makes approximately 50% of the UK breeding population and given Wales making up 6.5% of the UK landmass shows Wales is a stronghold for goshawk. The presence of a Schedule 1 species breeding in the Breeding Raptor Study Area and the fact that goshawk use the Site all year round means goshawk are scoped into the assessment. Goshawk are considered to have a stable or increasing breeding population in Wales and are a Welsh BoCC Green list species and as such are considered to have a favourable population.	
Hobby	Hobby is listed as a rare breeding bird and passage migrant in Radnorshire. A difficult species to monitor accurately, a total of 3-7 pairs were identified in the 1990s with a noticeable increase in summer records and breeding attempts since 2000 with a peak of 11 nests identified in 2011 (Jennings, P., 2013)²⁵. Hardey <i>et al.</i> (2013)³² estimate a Welsh breeding population of between 51-102 pairs. Birds in Wales (Hughes <i>et al.</i>, 2020)⁴¹ created bird population estimates for Wales based on the Bird Atlas Results 2007-2011 which showed hobby present in a total of 83 of the 261 10km squares, leading to a population estimate of 205 hobby territories in Wales.	In: Breeding hobby. Out: Non-breeding hobby.

IOF	Rationale for Scoping In/Out	Scoped In/Out
	Hobby are considered to have a stable breeding population in Wales and are a Welsh BoCC Green list species and as such are considered to have a favourable population. The regular presence of a Schedule 1 species using the Site during the breeding season means breeding hobby are scoped into the assessment. Hobby is a migratory species and not present in the UK in the winter months.	
Peregrine	Peregrine is listed as a resident breeder; winter visitor and passage migrant in Radnorshire. Numbers had dropped to a single pair in Radnorshire in 1959 due to the widespread use of pesticides. The ban on pesticides saw an increase in numbers with 22 occupied sites in 1991 although a recent decline thought linked to reduced available prey species (black-headed gull and racing pigeon) meaning between 12 and 19 occupied sites were recorded between 2008-2012 (Jennings, P., 2013)²⁵. Hardey <i>et al.</i> (2013)³² estimate a Welsh breeding population of 264 pairs. The Welsh Ornithological society estimate a breeding population of around 300 noted in 2014 (The Welsh Ornithological Society, 2014)⁴². The presence of a Schedule 1 species breeding in the Breeding Raptor Study Area and using the Site all year round means breeding and non-breeding peregrine are scoped into the assessment.	In: Breeding and non-breeding peregrine.

⁴² The Welsh Ornithological Society (2014) Birds in Wales, Volume 11, No. 2 – Welsh Bird Report No. 27 for 2013

IOF	Rationale for Scoping In/Out	Scoped In/Out
	Peregrine is considered to have a stable breeding population in Wales and is a Welsh BoCC Green list species and as such is considered to have a favourable population.	
Red kite	Red kite is listed as a resident breeder; winter visitor and passage migrant in Radnorshire. Formerly common in Radnorshire, red kite were thought to be extinct in 1927 before ringed birds being released in the region in the late 1950's. Sightings were regular in the 1960's and the first breeding record confirmed in the 1970's. Five to seven pairs were identified to be breeding by 1989, increasing to 22 pairs out of 259 pairs in all of Wales during a census survey in 2000. Numbers continue to increase rapidly with 45 occupied territories in 2003, 84 in 2006, 130 in 2009 and 144 in 2010 (out of approximately 1,000 in Wales). Feeding commenced at Gigrin farm (16km west of the Site) in 1994, attracting 15 birds, numbers increased to 400 in 2003 and peaked at 600 in 2010 (Jennings, P., 2013)²⁵. Hardey <i>et al.</i> (2013)³² estimate a Welsh breeding population of 556 pairs in 2010, but also states the recorders consider this figure to be a significant underestimate, with Holling <i>et al.</i> (2012)⁴³ suggesting there are 2,200 breeding pairs in the combined Wales and Southern English populations. Birds in Wales (Hughes <i>et al.</i>, 2020)⁴¹ created bird population estimates for Wales based on the Bird Atlas Results 2007-2011 showed red kite present in a total of 175	In: Breeding and non-breeding red kite.

⁴³ Holling, M. and the Rare Breeding Birds Panel (2012) Rare breeding birds in the UK in 2010. British Birds, 105: p.352-416.

IOF	Rationale for Scoping In/Out	Scoped In/Out
	of the 261 10km squares leading to a population estimate of 1,350 red kite territories in Wales. A further study completed by the Welsh Kite Trust (2020)²⁶ calculated that the Welsh red kite breeding population was 2,500 breeding pairs. A BTO study completed in 2024, generated an estimated population figure of 2,117 breeding pairs across Wales based on results for 2022. Of the 2,117 pairs the study outlines the Mid Wales population to be 1,488 pairs, approximately 70% of the total population for Wales (Hereward <i>et al.</i>, 2024)⁴⁴ The presence of a Schedule 1 species frequently recorded foraging over the Site during both breeding and non-breeding season mean red kite are scoped into the assessment. The red kite population has increased dramatically in Wales in recent years and is a Welsh BoCC Green list species and as such is considered to have a favourable population status.	
Golden plover (non-breeding)	Golden plover is listed as a rare breeding bird; widespread passage migrant and winter visitor in Radnorshire with a noticeable increase in winter records since 2000 (Jennings, 2013)²⁵. It is a scarce and declining breeding species in Wales (The Welsh Ornithology Society, 2014)⁴² with Welsh breeding	In: Non-breeding golden plover. Out: Breeding golden plover.

⁴⁴ Hereward, H. F. R., Macgregor, C. J., Gabb, O., Connell, A., Thomas, R. J., Cross, A. V. and Taylor, R. C. (2024) Modelling population-level impacts of wind farm collision risk on Welsh Red Kites (BTO Research Report 766)

IOF	Rationale for Scoping In/Out	Scoped In/Out
	densities being low (following a loss of a fifth of their British range over the last 40 years) in comparison to the core UK breeding range (in the uplands of Scotland) (Balmer <i>et al.</i>, 2013)⁴⁵. Wintering population estimates are less frequently monitored on a wide scale, with inland counts of upland sites not widely completed. The total number of wintering golden plover for the local region or Wales are not widely published, but numbers are significantly increased on breeding figures as migratory birds arrive to overwinter from breeding pastures to the north and east. The UK wintering population of golden plover is estimated at 400,000 which represents a 36% increase between 1980-2010 (BTO, 2023)⁴⁶. Although they don't indicate any numbers of the Welsh wintering population, Bladwell <i>et al.</i> (2018)⁴⁷ outline a 7.8% increase in the UK wintering range of golden plover between 1970-2010 which equates to a 36% increase in winter distribution. If the 7.8% of the UK range estimate is considered, then this equates to approximately 31,200 individuals (7.8% of 400,000). Thus, it is considered likely that wintering golden plover has a favourable status. Golden plover is a Welsh BoCC Red listed species due to historic declines in the breeding population.	

⁴⁵ Balmer, D., Gillings, S., Caffrey, B., Swann, B., Downie, I. and Fuller, R. (2013) Bird Atlas 2007-2011 – The breeding and wintering birds of Britain and Ireland

⁴⁶ [British Trust for Ornithology \(BTO\) \(2023\) BirdFacts](#)

⁴⁷ RSPB, BTO, NRW and Welsh Ornithological Society (2018) The State of Birds in Wales 2018

IOF	Rationale for Scoping In/Out	Scoped In/Out
	Not recorded during the breeding season but frequently recorded roosting and flying over the Site in large flocks in the winter means golden plover is scoped into the assessment.	
Nightjar	Nightjar is listed as a rare breeding summer visitor in Radnorshire, although there was a significant increase in the 1990's following the clear-fell of significant areas mature conifer plantations planted post-war. Population numbers are likely to be linked to available habitat, i.e. clear fell areas and areas of young regrowth of plantation forests and a record regional count of 33+ territories in 2010 may be considered a peak should areas continue to be re-forested (Jennings, P., 2013)²⁵. Nightjar are a migratory species therefore only breeding nightjar are considered in this assessment. Nightjar is a Welsh BoCC Green listed species due to the recent increase in numbers. Primarily nightjar was associated with lowland heathland habitats; however, in recent decades it is being increasingly recorded in upland forestry sites in Wales with areas of clear fell mimicking the heathland habitats. Numbers of nightjar in upland sites are considered to be increasing, as increasing areas are cleared for felling, although the knowledge of this cryptic species may just now be more widely recorded due to increased survey effort in particular for windfarms. A UK wide study outlined an estimated Welsh population 188 males on territory in 1992, increasing to 219 in 2004	In: Breeding nightjar. Out: Non-breeding nightjar.

IOF	Rationale for Scoping In/Out	Scoped In/Out
	(Conway and Henderson, 2005)⁴⁸. With numbers of breeding nightjar thought to be increasing in Wales and recent trends seeing it move from the red to amber to green list, nightjar is considered to have a favourable population. The presence of an Annex 1 species which is breeding in the NJ Study Area means nightjar is scoped into the assessment.	
Quail	Quail is listed as a rare summer visitor and occasional breeder in Radnorshire (Jennings, P., 2013)²⁵. Quail is an eruptive species with number generally low across the UK occasional years can see significant increases. Most records in Radnorshire were of birds calling from cereal crops, tall improved grassland or oil-seed rape with frequent records noted since 2010. A record count of calling males was 42 (237 across Wales) in 1989, likely to be one the eruptive years (Jennings, P., 2013)²⁵. The presence of a Schedule 1 species which is breeding in the Site means quail is scoped into the assessment.	In: Breeding quail. Out: Non-breeding quail.
Breeding bird assemblage	A total of 35 species of conservation concern (either Schedule 1, Section 7, Welsh BoCC Red and Amber list species) were recorded as breeding across the BBS Study Area. All the species (bar reed bunting, which is a Section 7 Priority species but Welsh BoCC Green listed) are considered to have unfavourable populations. Despite being	In.

⁴⁸ Conway, G. and Henderson, I. (2005) The Status and Distribution of the European Nightjar *Caprimulgus Europaeus* in Britain in 2004 (BTO Research Report No.398)

IOF	Rationale for Scoping In/Out	Scoped In/Out
	common and widespread species, due to there being an assemblage of species and 13 being Section 7 Priority species and can be considered to be a council scale population and therefore medium NCI, the breeding bird assemblage is scoped into the assessment.	

Assessment of Construction Effects

8.101 The assessment of effects is based on the project description as outlined in **Chapter 4**. Unless otherwise stated, potential effects identified are considered to be negative.

8.102 The elements of the Proposed Development which have the potential to impact on IOFs during construction are:

- Up to 30 wind turbines each with a three-blade rotor, and a micrositing allowance of 50m (any micrositing restrictions being applied to the Proposed Development are detailed in **Chapter 4**);
- Two options for a new access junction off the highway;
- Crane hardstandings and adjacent laydown areas for each wind turbine location;
- Approximately 23.61 km of access tracks (of which approximately 21.81 km will be new track and 1.8 km will be upgraded existing track) including turning heads, passing places and associated ancillary engineering works;
- An electrical substation compound, consisting of a switching station, gantry, transformer area and control building;
- Onsite underground electrical cables connecting the wind turbines back to the energy park substation, laid in cable trenches alongside the access tracks or near existing tracks on Site;
- Watercourse crossings and associated infrastructure;
- Site signage, permanent PRow diversions, vehicle parking and security fencing; and,

- Biodiversity enhancement proposals.
- Three temporary construction and storage compounds.
- The creation of up to three temporary borrow pits for the extraction of stone (subject to detailed site investigation). The northernmost temporary borrow pit will be used as a secondary temporary construction compound following extraction.
- A temporary security cabin at the Site entrance.
- Felling to accommodate turbines and associated infrastructure within the forested area onsite (a maximum of 52.60ha of temporary and permanent felling);

Predicted Construction Effects

Goshawk

8.103 Impact: Displacement of breeding or foraging goshawk from the Site during construction, either by disturbance or direct habitat loss.

8.104 NCI/Conservation Status of the Receptor: As per **Table 8.12** goshawk are High NCI. Goshawk is a Welsh Green list species due to a constant or increasing population in Wales and as such the conservation status of goshawk is considered to be favourable.

8.105 Magnitude of Impact: Breeding walkover surveys identified one probable and two possible breeding attempts for goshawk. The breeding attempts were all outside the Site but within the Breeding Raptor Study Area, recorded in woodland in both 2020 and 2021. The probable nest location lies over 1km from the nearest infrastructure meaning no turbine locations or Site infrastructure will be within 300m-500m of the breeding location, the recommended minimum disturbance buffer required from heavy construction activities for goshawk (Goodship, N. M. and Furness, R. W., 2022)³⁹. Goshawk will typically nest in the same nest or in a nest in close proximity to previous years and generally in areas of forestry rather than individual trees (Hardey *et al.*, 2013)³². Given that they prefer stands of mature trees and often are more or less site faithful, it is unlikely that goshawks will nest within the Site in the near future.

8.106 Goshawk were recorded hunting or commuting during flight activity surveys with a total of 36 flights recorded over the full survey period. Goshawk typically hunt over woodland or along

woodland fringes in search of prey such as woodpigeons or corvids, although they are occasionally noted hunting over open areas for lagomorphs (hares and rabbits). The majority of the 36 flights was recorded outside the Site boundary over plantation woodland to the north-east and south-east of the Site.

8.107 The loss of habitat due to the Proposed Development will predominantly be in areas of open grassland habitats during construction and is unlikely to have any noticeable impact of foraging goshawk. Given the limited potential for disturbance to foraging goshawk, the construction period is considered to result in an overall impact of negligible and short-term magnitude.

8.108 Significance of Effect: As outlined above, the magnitude of the impact on the PCC and Welsh goshawk population as a result of construction is deemed to be negligible and short-term, the NCI is high and the conservation status is favourable. The effect is therefore considered to be **negligible** and **not significant** under the EIA Regulations.

Hobby

8.109 Impact: Displacement of foraging hobby from the Site during construction, either by disturbance or direct habitat loss.

8.110 Sensitivity of the Receptor: As per **Table 8.12** hobby is a Medium NCI. Hobby is a Welsh Green list species due to a constant population in Wales and as such hobby numbers are considered to be favourable.

8.111 Magnitude of Impact: The breeding raptor surveys did not identify any behaviours indicative of a breeding attempt for hobby in either the 2020 or 2021 breeding seasons within the Site and wider Raptor Study Area.

8.112 Hobby was recorded on 42 occasions from flight activity surveys, with all registrations being made between June and September 2020 and May and September 2021. The flight activity peaked in July 2021 with 27 of the 42 flights, all the flights were of birds hunting for insects and predominantly in open upland areas in the east of the Site.

8.113 Hobby will hunt in open areas or along tree lines and hedgerows, with a preference for areas high in numbers of winged insects and passerines species, typically species such as swallow and sand martin. The majority of the flight activity was recorded over habitats within the

Radnor Forest SSSI, within the Site but in an area that is not being considered for development due to its protected status. The loss of habitat due to the Proposed Development will predominantly be in areas of grassland habitats, which will be used by hobby. The fact that there is available hunting habitat in surrounding fields and the low number of birds recorded, the loss of habitat due to the Proposed Development is unlikely to significantly affect their hunting opportunities. Given the potential of disturbance affecting breeding hobby and the potential disturbance on foraging hobby during the construction period, the overall impact on hobby is considered to result in an impact of short-term and negligible magnitude.

8.114 Significance of Effect: As outlined above the magnitude of the impact on the PCC and Welsh hobby population as a result of construction is concluded to be a low and short-term impact and the NCI is medium and the conservation status favourable. The effect is therefore considered to be **negligible** and **not significant** under the EIA Regulations.

Peregrine

8.115 Impact: Displacement of breeding or foraging peregrine from the Site during construction, either by disturbance or direct habitat loss.

8.116 NCI/Conservation Status of the Receptor: As per **Table 8.12** peregrine are High NCI. Peregrine is a Welsh Green list species due to a constant or increasing population in Wales and as such the conservation status of peregrine is considered to be favourable.

8.117 Magnitude of Impact: Breeding surveys identified one confirmed breeding attempt within the Site in both 2020 and 2021 and a second possible breeding attempt outside the Site in the wider Raptor Study Area in 2021. The recommended no-disturbance buffer required for heavy construction activities is 500m-750m for breeding locations of peregrine (Goodship, N. M. and Furness, R. W., 2022)³⁹. The Site design process involved the avoidance of any Site infrastructure within 500m of the known nest site (bar a proposed underground cable route which will be installed outside the breeding season). There are two turbines located within the 750m buffer, one over 600m away and due to the aspect or direction of the nesting location, as well as the topography at this location, will not be visible from the nest. The second turbine is located over 550m away from the eyrie and the location of the turbine will not be visible at ground level, but the turbine will be visible from the nest at approximately 5m-10m above ground level.

8.118 Peregrine were registered on 83 occasions in flight activity surveys, with birds using the Site to hunt and to commute to hunting grounds elsewhere in the local area. Peregrines will generally hunt within 2km of their nest locations during the breeding season although this may be extended up to 6km depending on prey availability (Hardey *et al.*, 2013)³².

8.119 The majority of the flight activity recorded is linked to the breeding attempt within the Site and 54 of the 83 flights were recorded across the two breeding seasons. There is very little flight activity recorded within 250m of the proposed turbines with a significant corridor of flights identifiable from the nest location and away from the turbine locations (see **Appendix 8.1** and **Confidential Figure 6** in **Volume 5**).

8.120 Peregrine are highly adaptable and will hunt in almost all habitats for prey, including highly urbanised habitats, with pigeon species the preferred prey, although Jennings, P. (2013)²⁵ details that over 60 birds species as well as mammals (such as grey squirrel and rabbit) that have been identified as prey species from peregrine nests in Radnorshire.

8.121 With a wide range of hunting habitats in the local area, the loss of habitat during the construction phase is unlikely to have a significant impact on foraging peregrines, although it is considered that there may be a possibility of disturbance to the breeding pair during the two breeding seasons during construction.

8.122 Powys covers the same area as the historic counties of Montgomeryshire, Radnorshire, and Brecknockshire and as mentioned above, the population of peregrine in Radnorshire was considered to be between 12-19 pairs (2008-2012) and the estimated breeding population for Wales was outlined to be approximately 300 pairs in 2014 (Welsh Ornithological Society, 2014)⁴². Given Powys is made up of the three historic counties, it is likely to have a breeding population of between 30-50 pairs, meaning the disturbance of a single breeding attempt will impact a total of between 2-3.33% of the Powys breeding population and 0.33% of the Welsh breeding population. The potential impact, if any, will be temporary and short temporal, lasting one or two breeding seasons.

8.123 Given the limited impact on foraging and breeding peregrine during the construction period, the overall impact on peregrine is considered to be of low and short-term magnitude.

8.124 Significance of Effect: As outlined above, the magnitude of the impact on the PCC and Welsh peregrine population as a result of construction is deemed to be minor and short-term impact and the NCI is high and the conservation status favourable. The effect is therefore considered to be **minor** and **not significant** under the EIA Regulations.

Red Kite

8.125 Impact: Displacement of breeding or foraging red kite from the Site during construction, either by disturbance or direct habitat loss.

8.126 NCI/Conservation Status of the Receptor: As per **Table 8.12** are High NCI. Red kite is a Welsh Green list species due to an increasing population in Wales and as such the conservation status of red kite is considered to be favourable.

8.127 Magnitude of Impact: A total of ten breeding attempts were identified for red kite across the two years of survey. Although, of the ten, only two were recorded within the Site. All proposed works and infrastructure are proposed to be over 500m from nine of the ten attempted breeding locations with the only possible exception being one of the two proposed access routes into the Site. This track (if used – note that only one not both of the Site Access options will be constructed) will pass within 300m of the nesting location, although it will be separated by a busy A-road and a significant block of broad-leaved woodland. The breeding record was assessed as being a probable territory and no nest was confirmed in this location. Should this section of the access track be constructed, pre-construction checks for a red kite nest will aim to identify the nest location and an appropriate mitigation strategy will be implemented to ensure no disturbance to the breeding pair if present. Even if this pair were displaced from the local area during construction, given the large and increasing population of red kite in the Region as well as Wales, it is considered the displacement of a single pair will not be a significant impact.

8.128 Red kite were registered on a total of 3,441 occasions during flight activity surveys. Although areas of higher levels of activity were identified, activity was spread widely across the survey area as well as throughout each survey year. Red kites are generally carrion eaters but will forage for insects and rodents and are often seen ‘worming’ or following farm machinery, as they are attracted to soil disturbance. Red kite will forage over wide areas on a daily basis and are highly adaptable, hunting over moorland, agricultural fields as well as seeking carrion in urban areas and by roads. Given their regular presence over the Site, it is considered likely that

red kite will be exposed to disturbance during construction, but the effects of the disturbance are likely to be localised and very limited with plentiful foraging and breeding opportunities available in areas in direct proximity to the Site and wider area. Given the limited potential for disturbance to foraging red kite, the construction period is considered to result in an overall impact of negligible and short-term magnitude.

8.129 Significance of Effect: As outlined above, the magnitude of the impact on the PCC and Welsh red kite population as a result of construction is deemed to be negligible and short-term, the NCI is high and the conservation status is favourable. The effect is therefore considered to be **negligible** and **not significant** under the EIA Regulations.

Golden Plover

8.130 Impact: Displacement of foraging or roosting wintering golden plover from the Site during construction, either by disturbance or by direct habitat loss.

8.131 NCI/Conservation Status of the Receptor: As per **Table 8.12** golden plover is Medium NCI. Golden plover is a Welsh Red list species due to a decreasing breeding population in Wales, although in terms of wintering populations, the population numbers are more difficult to quantify but are considered to be stable, as such wintering golden plover conservation status is favourable.

8.132 Magnitude of Impact: Groups of up to 200 golden plover were recorded utilising the airspace over the Site between October 2019 and February 2020 and groups of up to 54 were recorded flying over the Site between September 2020 and April 2021. A total of 31 registrations of golden plover were recorded utilising the airspace over the Site with flights concentrated on two distinct areas, one in the east of the Site, on Great Rhos and one in the south-east of the Site close to Nyth-grug. No significant roosts were identified within the Site during the winter walkover surveys with single or records of two birds the only registrations, although it is considered likely that golden plover were roosting in the areas of significant flight activity.

8.133 Golden plover roost and forage on open fields in winter, generally preferring either arable or grassland fields which provide the suitable invertebrates for foraging and roosting on fields

with a short sward, enabling a clear line of sight for potential predators (Gillings and Fuller, 1999)⁴⁹.

8.134 Given their presence over the winter months, it is considered possible that golden plover will be subjected to disturbance during construction although the impacts of the disturbance are likely to be localised and limited, given the high abundance of habitats available to roosting and foraging golden plover elsewhere within the Site and in the surrounding area. Given the potential of disturbance/displacement of roosting golden plover during the construction period, the overall impact is considered to result in an impact of low adverse and short-term magnitude.

8.135 Significance of Effect: As outlined above, the magnitude of the impact on PCC and Welsh wintering golden plover population as a result of construction is deemed to be a short-term, low adverse impact, the NCI is medium and the conservation status favourable. The effect is therefore considered to be **minor** and **not significant** under the EIA Regulations.

Nightjar

8.136 Impact: Displacement of breeding or foraging nightjar from the Site during construction, either by disturbance or direct habitat loss.

8.137 NCI/Conservation Status of the Receptor: As per **Table 8.12** nightjar is of Medium NCI. Despite its conservation status, nightjar is a Welsh Green list species due to an increasing population in Wales therefore nightjar conservation status is considered to be favourable.

8.138 Magnitude of Impact: As a nocturnal species, as expected, nightjar were not recorded during flight activity surveys. A total of five churring males (male territorial vocalisation) were recorded during the two survey visits in June and July 2020 and six were recorded during visits in June and July 2021.

8.139 Nightjars are migratory birds arriving in May and leaving in September and in Wales breeding is almost exclusively limited to commercial plantation forestry (CIEEM, 2015)⁵⁰. In Wales, the breeding pairs use areas of clearfell within commercial forestry which are thought to mimic more typical breeding habitats such as lowland heath to provide a suitable mixture of

⁴⁹ Gillings, S. and Fuller, R. J. (1999) Winter ecology of Golden Plovers and Lapwings: a review and consideration of extensive survey methods (BTO Research Report No. 224)

⁵⁰ Shewring, M. and Carrington, D. (Natural Power Consultants Ltd) (2015) European Nightjar – Best Practice Mitigation Measures during Windfarm Construction. CIEEM inpractice, Issue 88, p.19-23.

open ground for nesting and have a high load of insects which the species require to forage. Nightjar will only breed within plantation forestry of a certain age and, although a difficult and cryptic species to monitor accurately, its breeding habitats can be predicted due to the age and type of tree structure. Forestry is thought to be unsuitable once trees reach 8-10 years, with a study in South Wales showing nightjars spent approximately 70% of their nocturnal activity in areas of replanted blocks aged 0-5 years (Jenks *et al.*, 2014)⁵¹.

8.140 Of the 11 churring males recorded across during the two breeding season of surveys, all eleven records were outside the Site boundary and the nearest of the 11 records to Site infrastructure was 175m away, with the other ten records over 250m from proposed infrastructure. The recommended no-disturbance buffer for nightjar is 150m-500m (Goodship, N. M. and Furness, R. W., 2022)³⁹, although the longer distances are considered to be more relevant for nightjar nesting in traditional lowland heath habitats whereas the majority of the Welsh population a 150m-200m buffer is considered to be significant (CIEEM, 2015)⁵⁰. Although a good indicator of both the number of breeding territories and also the location of nightjar nests, the nest locations are very difficult to predict without further detailed survey work (that is not a requirement as part of the NatureScot guidance (SNH, 2018)¹⁸) meaning it is possible one or more breeding locations could be within 200m of proposed works.

8.141 Construction activities are therefore considered to have the potential to impact on breeding nightjar through disturbance during the breeding season, although any disturbances are likely to be localised and very limited (likely only one or possibly two pairs). With no requirement to clear plantation woodland within the areas of plantation forestry where nightjars were recorded as breeding, there will be no loss or disturbance of breeding habitat for nightjar or significant construction activity during the nighttime periods when birds are actively foraging. The temporary loss of one or two breeding attempts would equate to between 3-6 % of the Radnorshire population (33+ pairs in 2010), (Jennings, P., 2013)²⁵ and 0.4-0.8% of the Wales population (244 pairs in 2004) (Jennings, P., 2013)²⁵. Given the limited potential for disturbance to breeding and foraging nightjar during the construction period, the overall impact is considered to result in an impact of low and short-term magnitude.

⁵¹ Jenks, P., Green, M. and Cross, T. (2014) Foraging activity and habitat use by European Nightjar *Caprimulgus europaeus* in a South Wales Forest. British Birds, 107:7 p.413-419.

8.142 Significance of Effect: As outlined above the magnitude of the impact on PCC and Welsh nightjar population as a result of construction is deemed to be low and short-term impact and the NCI is high and the conservation status favourable. The effect is therefore considered to be **minor** and **not significant** in the context of the EIA Regulations.

Quail

8.143 Impact: Displacement of breeding or foraging quail from the Site during construction, either by disturbance or direct habitat loss.

8.144 NCI/Conservation Status of the Receptor: As per **Table 8.12** quail is of High NCI. Quail is a Welsh Amber list species due to a decline in population in Wales therefore quail conservation status is considered to be unfavourable.

8.145 Magnitude of Impact: As a secretive and generally ground dwelling species and as expected quail were not recorded during flight activity surveys. A single 'calling' male was recorded once within the Site and once outside the Site on different days in during the 2021 BBS, calling males may but not always indicate the potential presence of a breeding pair of quail.

8.146 Quails are migratory birds arriving in April/May and leaving in September, although some birds do not arrive in the UK until July and are thought to be birds born in the same year elsewhere in Europe (Gilbert *et al*, 2011)³³. The registrations of quail during the BBS were only heard during July surveys and only in 2021 meaning it is possible they weren't breeding birds but birds arriving from elsewhere and calling onsite. As a cryptic species to monitor (being small and secretive birds often hiding fully in long grass or cereal crops) there is no other method to estimate breeding numbers other than identifying them through recording the calling male birds, therefore it is necessary to consider the possibility that these were records relating to a breeding pair.

8.147 The two records of calling males are both over 200m from the nearest proposed infrastructure meaning at these distances' construction activities are not considered to significantly impact on breeding quail through disturbance during the breeding season. Given the limited potential for disturbance to breeding and foraging quail during the construction

period, the overall impact is considered to result in an impact of negligible and short-term magnitude.

8.148 Significance of Effect: As outlined above the magnitude of the impact on PCC and Welsh quail population as a result of construction is deemed to be negligible and short-term impact and the NCI is high and the conservation status unfavourable. The effect is therefore considered to be **negligible** and **not significant** in the context of the EIA Regulations.

Breeding Bird Assemblage

8.149 Impact: Displacement of breeding bird assemblage from the Site during construction, either by disturbance or direct habitat loss.

8.150 NCI/Conservation Status of the Receptor: As per **Table 8.12** breeding bird assemblage are of Medium NCI. The 35 species of conservation concern recorded are either Schedule 1, Section 7, Red and Amber Welsh list species and for all species bar reed bunting (which is a Section 7 and Green Welsh listed species) due to decreases in numbers their status is therefore considered to be unfavourable.

8.151 Magnitude of Impact: A total of 35 species of conservation concern (Schedule 1, Section 7, Welsh BoCC Red and Amber list) not covered in the sections above were recorded as breeding within the BBS Study Area. Likely impacts on these breeding species during construction could include potential mortality as a result of construction activities, temporary disturbance as a result of soil stripping and increased noise and vibration and temporary habitat loss. Mortality may result if construction activities are undertaken during the bird breeding season where nests and chicks may be destroyed.

8.152 Potential disturbance during construction may result in displacement from the areas of land clearance and a slightly wider area adjacent to it. During the breeding season, to avoid the abandonment of nests or breeding territories as a result of disturbance, the standard mitigation outlined in the Good Practice Measures section above, including the pre-construction checks, will be implemented. The appointed ECoW will identify active nesting locations prior to any works taking place. If nest sites are identified, then appropriate mitigation measures (such as suitable exclusion zones/buffers) to protect nest sites will be implemented.

8.153 There was a single Schedule 1 species recorded with one record of a possible firecrest, the records being over 200m from the nearest proposed infrastructure within woodland means it is unlikely to be impacted. Of the 18 Section 7 species, the most commonly record species were skylark (227+ territories), dunnock (27), tree pipit (21), song thrush (16), house sparrow (12+) and pied flycatcher (12). The most commonly recorded Welsh BoCC Red listed species were meadow pipit (73+) and willow warbler (70+).

8.154 The majority of territories recorded for these species are associated with deciduous woodland, gardens and hedgerows which are not found within the Site and the only species with over ten territories located within the Site are skylark (210+ in the Site) and meadow pipit (65+) which are associated with grassland and heathland habitats.

8.155 Of the 26 Schedule 1, Section 7 and Welsh BoCC Red list species mapped (See **Appendix 8.1, Figure 5a and 5b**) only four species were recorded holding territories with 50m of the proposed Site infrastructure (skylark, meadow pipit, willow warbler and yellowhammer), See **Table 8.11** above. The majority of territories recorded for the other 23 species were recorded outside the Site in deciduous woodland, gardens and farmland habitats to the site to the north, north-west and south-west, meaning the site is unlikely to have any impact on these 23 species.

8.156 Of the three species recorded within 50m of Site Infrastructure the most commonly recorded were skylark with 40 (17.6%) and 15 (6%) territories of the 227 recorded within 50m and 10m respectively of the proposed infrastructure. A total of 12 (16.4%) and five (6.7%) of the 73 mapped meadow pipit territories were located within 50m and 10m respectively, for willow warbler and yellowhammer a total of two and one territories respectively were located within 50m but over 10m of the Site infrastructure.

8.157 Despite the presence of 35 species recorded as breeding during the BBS surveys, the small physical footprint of the Site infrastructure as compared to the BBS Study Area mean it is considered unlikely that the Proposed Development will impact more than a very small number of species. While it is considered a possibility that bird nesting attempts may be lost, in practice it is unlikely that many pairs if any will be lost to the local breeding population, with birds more likely to move away from the disturbance areas into nearby suitable habitat that is adjacent and widespread.

8.158 As mentioned above only three species (skylark, meadow pipit and yellowhammer) were noted within 10m of the Proposed Development, which equates to less than 10% of the records for these species at the Site. The Welsh breeding populations of the three scrub and grassland species outlined above are as follows: skylark: 115,000; meadow pipit: 170,000 breeding pairs; willow warbler: 265,000 breeding pairs and yellowhammer: 31,500 (Hughes *et al.*, 2020)⁴¹; meaning the disturbance or displacement of a small number of breeding pairs makes up a small proportion of the populations present in the Site and only tiny fraction of the Welsh breeding populations.

8.159 Given the limited potential of disturbance and displacement to the breeding bird assemblage during the construction period, the overall impact on the breeding bird assemblage is considered to be negligible and short-term.

8.160 Significance of Effect: As outlined above the magnitude of the impact on the PCC and Welsh breeding bird assemblage populations as a result of construction is deemed to be a negligible and short-term impact, the NCI is medium and the conservation status unfavourable. The effect is therefore considered to be **negligible** and **not significant** in the context of the EIA Regulations.

Residual Construction Effects

8.161 Taking into account the proposed generic/embedded mitigation measures outlined above, it is concluded that the Proposed Development will not have a significant adverse effect during construction at greater than the minor level for any species using the Site and immediate surrounding area.

8.162 The significance of the effect during construction is predicted to be negligible for all IOF's, with the exception of breeding peregrine and nightjar and wintering golden plover, where it is assessed to be minor. With the implementation of the generic/embedded mitigation, which includes updated nest checks and the implementation of no-disturbance buffers, the predicted effect on breeding peregrine and nightjar will be reduced from **minor** to **negligible**. In terms of the disturbance and displacement of wintering golden plover, it is considered unlikely that the effect will be changed with the implementation of the generic mitigation measures and remain **minor**.

Assessment of Operational Effects

Predicted Operational Effects

8.163 Effects of land take on birds (i.e. decreased resource availability) are considered to be limited given the small percentage (<5%) of the Site that will be occupied by the footprint of the Proposed Development (1773 hectares (ha), see **Chapter 4**). There is the potential for a component of the Proposed Development to be sited on, or close to, a specific type and area of habitat used by one or more bird species carried through in this assessment. That potential effect is assessed, where relevant, in the species text that follows.

8.164 The two main ways in which birds can be affected by operational wind farms are:

- Through displacement due to ongoing disturbance caused by wind turbine structures (i.e. including barrier effect) and associated equipment (and by periodic servicing of them); and,
- Potential mortality through collision with moving blades or associated infrastructure.

Displacement

8.165 A range of studies have concluded that most bird species are not significantly affected by operational wind farms (e.g. Vauk, 1990⁵²; Percival, 2005⁵³; Devereux *et al.*, 2008⁵⁴; Winkelmann, 1994⁵⁵; Langston and Pullan, 2003⁵⁶; Hotker *et al.*, 2006⁵⁷). This is reflected, in part, by NatureScot guidance (SNH, 2017)¹³ on birds and wind farms which does not, for example, normally recommend surveys for breeding passerines. The NatureScot guidance, which is the UK standard for assessing baseline conditions in relation to proposed onshore wind farm developments, indicates that effort should focus on species and/or species groups that are

⁵² Vauk, G. (1990) Biological and ecological study of the effects of construction and operation of wind power land ownerships

⁵³ Percival, S. M. (2005) Birds and wind farms: What are the real issues? *British Birds*, 98: p.194-204.

⁵⁴ Devereux, C. L., Denny, M. J. H. and Whittingham, M. J. (2008) Minimal effects of wind turbines on the distribution of wintering farmland birds

⁵⁵ Winkelmann, J. E. (1994) Bird/wind turbine investigations in Europe. Proc. of the National Avian Wind Power Planning Meeting, Denver, Colorado, p.43-48.

⁵⁶ Langston, R. H. W. and Pullan, J. D. (2003) Wind farms and Birds: An analysis of the effects of wind farms on birds, and guidance on environmental assessment criteria and site selection issues

⁵⁷ Hötter, H., Thomsen, K-M. and Koster, H. (2006) The impact of renewable energy generation on biodiversity with reference to birds and bats – Facts, gaps in our knowledge, areas for further research and ornithological criteria for the expansion of renewables

thought to be susceptible to the effects of wind farms or highly protected species on which potential effects remain unclear.

8.166 Turbines may also present a barrier effect to the movement of birds across a site, restricting them from accessing wider areas. The effect this will have on a population is difficult to predict. If birds have to regularly fly over or around an array this may result in greater energy expenditure, while birds displaced into other, suboptimal habitats may experience reduced foraging potential. Such impacts could effectively limit birds being able to build energy reserves, potentially affecting survival and/or breeding success. Barrier effects are most frequently considered to be an issue in situations where the operating windfarm is located on the regular flight paths of a bird species as they move to and from nest or roost sites to foraging grounds, such flight activity is shown as defined flight paths and often flights are in straight lines or 'linear' flights. The flight activity recorded over the Site was noted to be all 'random' with clear flight paths or routes through the Proposed Development not being recorded and, for this reason, operational barrier effects are scoped out of the assessment.

8.167 Given the fact that there is limited evidence to display any negative impacts during displacement and the fact they were not confirmed as breeding close to the operational wind farm, goshawk and hobby are not considered likely to be impacted by displacement of the operational wind farm. The Site currently only offers limited foraging opportunities for these species and is not considered optimal foraging habitat. It is expected that these species will therefore hunt over several square kilometres in the local area. Through design iteration (i.e. application of no disturbance buffers) and due to lack of suitable breeding habitat close to turbines, there is not considered to be any impacts on the breeding locations during the operation of the wind farm. Nature Scot in their guidance (SNH, 2017)¹³ state that *"It is generally considered that passerine species are not significantly impacted by wind farms"*.

8.168 For this reason, the breeding bird assemblage is scoped out of the operational section of the assessment.

Golden Plover

8.169 Impact: Golden plover may be at risk from displacement from roosting and foraging habitat leading to reduced survival rates.

8.170 NCI/Conservation Status of the Receptor: Medium/Favourable.

8.171 Magnitude of Impact: In addition to disturbance of birds during the construction phase, the operation of turbines and associated human activities for maintenance purposes also has the potential to disturb birds and displace them from the Site. Existing information (e.g. de Lucas *et al.*, 2007⁵⁸; Douglas *et al.*, 2011⁵⁹; Haworth and Fielding, 2012⁶⁰) and reviews of effects (e.g. Madders and Whitfield, 2006⁶¹; Hötter *et al.*, 2006⁵⁷; Gove *et al.*, 2013⁶²; Harrison *et al.*, 2017⁶³) suggest that most birds are affected only slightly, if at all, although these effects require further study. Other studies involving long-term monitoring of golden plover (Fielding and Haworth, 2010⁶⁴, 2012⁶⁵, 2013⁶⁶; Douglas *et al.*, 2011⁵⁹), found no evidence of displacement due to wind farm infrastructure for either species.

8.172 However, contradictorily in other studies, breeding birds have been found to be displaced within 300m from a turbine (e.g. Gill *et al.*, 1996⁶⁷; Percival, 1998⁶⁸; Hötter *et al.*, 2006⁵⁷), with some studies suggesting some potential for partial displacement effects at greater distances (Pearce-Higgins *et al.*, 2009)⁶⁹. Wind turbines might also displace birds from much larger areas if they act as a barrier to bird movements, or if availability of suitable habitat is restricted.

8.173 The evidence suggests that impacts vary between species and sites (Madders and Whitfield, 2006)⁶¹. There is potential for some disruption of feeding and nesting due to increased

⁵⁸ de Lucas, M. G. F., Janss, S. F. E. and Ferrer, M. (2007) Birds and wind farms: Risk assessment and mitigation

⁵⁹ Douglas, D., Bellamy, P. and Pearce-Higgins, J. (2011) Changes in the abundance and distribution of upland breeding birds at an operational wind farm. *Bird Study*, 58:1.

⁶⁰ Haworth, P. and Fielding, A. (2012) A Review of the Impacts of Terrestrial Wind Farms on Breeding and Wintering Hen Harriers (Haworth Conservation Report)

⁶¹ Madders, M. and Whitfield, D. P. (2006) Upland raptors and the assessment of wind farm impacts. *Ibis*, 148: p.43-56.

⁶² Gove, B., Langston, R. H. W., McCluskie, A., Pullan, J. D. and Scrase, I. (2013) Wind Farms and Birds: An Updated Analysis of the Effects of Wind Farms on Birds, and Best Practice Guidance on Integrated Planning and Impact Assessment

⁶³ Harrison, A. L., Petkov, N., Mitev, D., Popgeorgiev, G., Gove Geoff, B. and Hilton, M. (2017) Scale dependent habitat selection by wintering geese: implications for landscape management. *Biodiversity and Conservation*, 27: p.167-188.

⁶⁴ Fielding, A. H. and Haworth, P. F. (2010) Golden Eagles and Wind Farms

⁶⁵ Fielding, A. H. and Haworth, P. F. (2012) Multi-species raptor monitoring – Providing the evidence for future EIAs

⁶⁶ Fielding, A. H. and Haworth, P. F. (2013) Farr Wind Farm: A Review of Displacement Disturbance on Golden Plover Arising from Operational Turbines 2005-2013

⁶⁷ Gill, J. P., Townsley, M. and Mudge, G. P. (1996) Review of the impacts of wind farms and other aerial structures upon birds. *Scottish Natural Heritage Review*, 21: p.68.

⁶⁸ Percival, S. M. and Percival, T. (1998) Breeding waders at the Nasudden wind farm, Gotland, Sweden

⁶⁹ Pearce-Higgins, J. W., Stephen, L., Langston, R., Bainbridge, I. and Bullman, R. (2009) The distribution of breeding birds around upland wind farms. *Journal of Applied Ecology*, 46: p.1323–1331.

human activity for routine maintenance purposes, though this would usually be undertaken by a handful of operatives in a single small localised area at a time. This maintenance will be restricted to areas of the Site accessible by tracks and is unlikely to create any increased disturbance, compared to current land use practices which sees regular activity of recreational users of the Site such as dog walkers and farmers using quad bikes and other farm vehicles, as well as disturbance pressures resulting from grazing livestock, which will continue during operation. Therefore, the overriding source of disturbance and displacement of birds during the operational period is considered to be the turbines operating (Pearce-Higgins *et al.*, 2009)⁶⁹. A review undertaken by Whitfield (2007)⁷⁰ on effects of wind farms on waders, with particular reference to golden plover, suggested that the main potential impact on golden plover is from disturbance displacement, and is particularly likely to affect wintering birds. Hötter also suggested displacement by wind farms is generally more of an issue for non-breeding birds (Hötter *et al.*, 2006)⁵⁷.

8.174 Groups of golden plover, generally of less than 100 (one record of 200), were recorded utilising the airspace over the Site in the winter months. A total of 31 records (14 records on seven different days in Year 1 and 17 records on nine different days in Year 2) were recorded on flight activity surveys with 24 of the 31 flights recorded between 10th September and 10th January. Only one or two birds were recorded on the Site winter walkover survey visits in both Year 1 and Year 2 surveys. The results indicate that the Site is used occasionally by golden plover, with groups roosting on or near the Site in first half of the winter before moving to other areas, such as the coast, during colder weather.

8.175 There are two clear areas of flight activity (see **Appendix 8.1, Figure 4**), one on Great Rhos and one in the south-east of the Site. As discussed above it is considered that wintering golden plover may be displaced from wind farm sites due to operating turbines with any roosting birds likely to be displaced by a minimum of 200m from operating turbines (Goodship, N. M. and Furness, R. W., 2022)³⁹. There is a significant area on Great Rhos which is over 200m from turbines to the east of the Proposed Development (approximately 60 ha) and a smaller equivalent area (20 ha) over 200m south-east of the Site.

⁷⁰ Whitfield, D. P. (2007) The effects of wind farms on shorebirds (Waders: Charadrii), especially with regard to wintering golden plovers

8.176 Given golden plover only use the Site on an occasional basis as a roosting location and there are significant alternative roost locations away from operational disturbance, the impact on golden plover is considered to be of long term and negligible magnitude.

8.177 Significance of Effect: As outlined above the magnitude of the impact on the PCC and Welsh wintering golden plover population, as a result of displacement, is deemed to be a negligible and long-term impact, the NCI is medium and the conservation status is favourable. The effect is therefore considered to be **negligible** and **not significant** under the EIA Regulations.

Nightjar

8.178 Impact: Displacement of nesting or foraging nightjar may be at risk of displacement from habitat around turbines or other infrastructure, thereby impacting on productivity or survival rates.

8.179 NCI/Conservation Status of the Receptor: Medium/Favourable.

8.180 Magnitude of Impact: The majority of studies initially outlined that nightjar were sensitive to operational turbines and the disturbance caused by an operational wind farm, with studies from a wind farm in Goole, Yorkshire, indicating that this impact will extend to 400m from turbines (Arcus Renewable Energy Consulting Ltd, 2011)⁷¹. The study, undertaken in England relates to more traditional breeding habitat (lowland heath) for breeding nightjar.

8.181 BSG Ecology (2022)⁷² completed a study on nightjar displacement at Pen y Cymoedd wind farm, the largest existing onshore wind farm in Wales, built in an area of commercial forestry which was home to up to 24 breeding pairs of nightjars. The initial results of the study concluded that nightjars do not appear to be displaced by operational turbines. In fact, one pair had nested and successfully fledged two young within 58m of an operational turbine (BSG Ecology, 2022)⁷². The results indicate that the clearfell areas around the turbines provided good breeding habitat for nightjar and rather than being displaced by turbines the selection of suitable breeding habitat is a higher determining factor in nest locations.

⁷¹ Arcus Renewable Energy Consulting Ltd (on behalf of RWE Power Renewables Ltd) (2011) Goole Fields II Wind Farm Environmental Energy

⁷² BSG Ecology (2022) Case Study: Nightjar Monitoring At Pen Y Cymoedd Wind Farm: No Evidence Of Displacement Of Breeding Birds

8.182 The BSG study is directly relevant to nightjar recorded at the Site as the birds recorded during surveys at the Site were all recorded within commercial forestry plantations, specifically within areas of clearfell or young regrowth. A total of five and six churring males, which are indicative of a nightjar territory were recorded during surveys in 2020 and 2021 respectively. The presence of a churring male doesn't accurately define the breeding location of nightjar nest locations but provides a good indication of likely locations. Of the 11 churring records across the two breeding seasons, none of the records were within 150m of any of the proposed Site Infrastructure with a single record within 200 m.

8.183 Given the evidence from the BSG study to indicate this species are not displaced by operational turbines and the fact that all records of nightjar recorded during surveys were outside the Site boundary mean that any potential displacement impact exerted on breeding nightjar is considered to be of short term and negligible magnitude.

8.184 Significance of Effect: As outlined above the magnitude of the impact on the PCC and Welsh nightjar populations as a result of displacement is deemed to be a negligible and long-term impact, the NCI is medium and the conservation status favourable. The effect is therefore considered to be **negligible** and therefore **not significant** in the context of the EIA Regulations.

Peregrine

8.185 Impact: Nesting or foraging peregrine may be at risk of displacement from habitat around turbines or other infrastructure, thereby impacting on productivity or survival rates.

8.186 NCI/Conservation Status of the Receptor: High/Favourable.

8.187 Magnitude of Impact: A single breeding attempt for peregrine was recorded within the Site. There is no proposed Site infrastructure within 500m of the known eyrie site and the two proposed turbine locations and the majority of the track infrastructure within the 750m of known eyrie site is not visible from the nest location due to contours of the land around the nest site.

8.188 Peregrine was recorded on 83 occasions during flight activity surveys, with the majority of the flight activity leading to and from the known nest site during the breeding season and heading away from the turbine array. Of the 83 flights recorded during the full survey period, 22 were recorded within 250m of the proposed turbine locations. The majority of the Site comprises open grassland and heathland habitats which is not optimal foraging habitat for peregrine that

prefer hunting in a mosaic of habitats containing a wider variety of bird prey species such as woodpigeon and the flight corridor shown during flight activity surveys appears to confirm this.

8.189 Given the fact that the only known breeding attempt is over 500m from any proposed infrastructure and the fact that the majority of flight activity for peregrine is away from the turbine array means that the overall impact on breeding and foraging peregrine is considered to be of long term and negligible magnitude.

8.190 Significance of Effect: The magnitude of the impact the PCC and Welsh peregrine populations as a result of displacement is deemed to be a negligible and long-term impact, the NCI is high and the conservation status favourable. The effect on peregrine as a result of displacement is therefore considered to be **negligible** and therefore **not significant** under the EIA Regulations.

Red Kite

8.191 Impact: Nesting or foraging red kite may be at risk of displacement from habitat around turbines or other infrastructure, thereby impacting on productivity or survival rates.

8.192 NCI/Conservation Status of the Receptor: High/Favourable.

8.193 Magnitude of Impact: A total of ten probable or confirmed breeding locations were identified across the 2020 and 2021 breeding seasons. Of the ten locations, two were in the fringes of the Site and two were close to but outside the Site boundary with the remaining six being located in the Raptor Study Area. There are no proposed turbine locations within 500m and no tracks located within 300m of any of the known breeding territories with the exception of one section of access track which may be required but is one of two proposed access options into the Site (note that only one will be constructed). It should also be noted that surveys completed in 2024 identified this breeding territory was not occupied by red kite.

8.194 The recommended no-disturbance distance buffer for red kite is 150m-300m (Goodship, N. M. and Furness, R. W., 2022)³⁹, although Forest and Land Scotland (FLS), formerly known as FCS, uses a more precautionary distance of 300m-600m for forestry activities (FCS, 2007)⁴⁰. The upper end of the FLS figure relate specifically to more impactful practices such as thinning, ground preparation and tree felling and therefore not likely to be applicable during operation of the wind farm. Given there is only a single breeding attempt within 300m of any proposed

infrastructure it is considered unlikely that operation of the Proposed Development will impact significantly on the breeding population of red kite.

8.195 Red kite were recorded on a total of 3,441 occasions during activity surveys with 736 of these flights and 487 flights were considered 'at-risk' meaning they were within 250m of the turbines at a height that will potentially collide with the operating turbine blades. In their study on the impacts of operating wind farms in upland habitats, Pearce-Higgins *et al.* (2009)⁶⁹, studied a number of species across 12 wind farm locations. While red kite was not one of the chosen species, they do outline that buzzard, a similar size raptor to red kite and one that resides in similar habitats and will also spend long periods ranging for food in flight, was identified as having avoidance of turbines up to 500m from the turbine locations.

8.196 Studies of red kite at operational wind farms though contradict this possibility. In a study at the operational Bryn Titli wind farm in Powys, vantage point surveys were undertaken in 2016-2017, a total of 581 flights were recorded for red kite. The surveys did identify some clear avoidance behaviour from turbines by red kite; however, records of birds within 200m of turbines were frequently registered and significant displacement from the operating wind turbines was not recorded (Innogy, 2017)⁷³. It should be noted that the operational turbines were less than 100m in height, less than half of the size of the majority of the proposed turbines at the Proposed Development.

8.197 It is considered that even if red kites are displaced from the direct proximity of the Proposed Development, they are unlikely to be lost to the local population and will simply use other areas in the local and wider landscape, which is optimal habitat for red kite.

8.198 Given the fact that the breeding attempts are over 500m from any proposed turbines; that all bar one breeding attempt is over 300m from any infrastructure; and given it is not considered likely that the displacement of red kite due to the operating turbines will be limited to birds relocating in the local area, mean that the overall impact on breeding and foraging red kite due to displacement is considered to be of long term and negligible magnitude.

8.199 Significance of Effect: The magnitude of the impact the PCC and Welsh red kite populations as a result of displacement is deemed to be a negligible and long-term impact, the

⁷³ Innogy (2017) Bryn Titli Wind Farm Life Extension Environmental Statement: Non-Technical Summary

NCI is high and the conservation status favourable. The effect on red kite as a result of displacement is therefore considered to be **negligible** and therefore **not significant** under the EIA Regulations.

Collision

8.200 For the purposes of this Section of the ornithology chapter, all CRM and analyses were completed following best practice guidelines and recommended species-specific biometrics and avoidance rates (Band *et al.*, 2007¹⁶; SNH, 2000¹⁴, 2013/14⁷⁴, 2017¹³, 2018¹⁷). Collision risk analysis was informed by the data obtained during the flight activity surveys and corresponding flight lines (**Figures 1-4** in **Appendix 8.1**); full details of the calculations are provided in **Appendix 8.2**.

Goshawk

8.201 Impact: Collision of goshawk with the turbines leading to injury and potentially mortality.

8.202 NCI/Conservation Status of the Receptor: High/Favourable.

8.203 Magnitude of Impact: A total of 18 goshawk fatalities due to collision with wind turbines have been reported across Europe, between 2002 and August 2023 (Dürr, 2023)⁷⁵. Of the 18 fatalities reported 11 were recorded in Germany and four in Spain, with none recorded in the UK. In the context of European breeding and wintering populations, this level of mortality is very low. Despite these figures, NatureScot (SNH, 2017)⁷⁶ has outlined a somewhat precautionary default avoidance rate of 98% for this species.

8.204 Goshawk were recorded on 36 occasions during flight activity surveys, although the majority of the flight activity was recorded outside the Site boundary and over areas of commercial forestry. Of the 36 flights a total of 12 flights considered at-risk, with an annual collision risk of 0.083 (or one bird every 12.05 years) predicted. This equates to 0.14% of the Radnorshire population (30 breeding pairs in 2000 (Jennings, P., 2013)²⁵) which as one of the three old council areas of Powys, is potentially only one-third of the PCC population and is 0.01% of the Welsh population (310 pairs (Hughes *et al.*, 2020)⁴¹). This is a very small increase

⁷⁴ NatureScot (2014) Wind farm impacts on birds – Flight Speeds and Biometrics for Collision Risk Modelling

⁷⁵ Dürr, T. (2023) Vogelverluste an Windenergieanlagen/bird fatalities at wind turbines in Europe

⁷⁶ SNH (2017) SNH Information and Guidance Note: Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model

in mortality to the local population and is therefore predicted to result in an impact that is considered to be of negligible and long-term magnitude.

8.205 Significance of Effect: The magnitude of the impact on the PCC and Welsh goshawk populations as a result of collision risk is deemed to be a negligible and long-term impact and the NCI is high and the conservation status favourable. The effect on goshawk as a result of collisions is therefore considered to be **negligible** and therefore **not significant** under the EIA Regulations.

Hobby

8.206 Impact: Collision of hobby with the turbines leading to injury and potentially mortality.

8.207 NCI/Conservation Status of the Receptor: High/Favourable.

8.208 Magnitude of Impact: A total of 47 fatalities due to collision with wind turbines have been reported across Europe between 2002 and August 2023 (Dürr, 2023)⁷⁵. Of the 47 fatalities, 22 were recorded in France, 17 in Germany and seven in Spain, with none recorded in the UK. In the context of European breeding populations, this level of mortality is low. NatureScot (SNH, 2018)¹⁵ has outlined a default avoidance rate of 98% for this species.

8.209 Hobby were recorded on 42 occasions during flight activity surveys, with a total of four flights considered 'at-risk', with an annual collision risk of 0.016 (or one bird every 62.6 years) predicted, which equates to 0.08% of the Radnorshire population of up to 10 Pairs in 2011 (Jennings, P., 2013)²⁵ which as one of the three old Council areas of Powys, is potentially only one-third of the PCC population and <0.01% of the Welsh population (205 pairs). This is a very small potential increase in mortality to the local population and is therefore predicted to result in an impact that is considered to be of negligible and long-term magnitude.

8.210 Significance of Effect: The magnitude of the impact the PCC and Welsh hobby populations as a result of collision risk is deemed to be a negligible and long-term impact, the NCI is high and conservation status is favourable. The effect on hobby as a result of collisions is therefore considered to be **negligible** and therefore **not significant** under the EIA Regulations.

Peregrine

8.211 Impact: Collision of peregrine could collide with the turbines leading to injury and potentially mortality.

8.212 NCI/Conservation Status of the Receptor: High/Favourable.

8.213 Magnitude of Impact: A total of 46 peregrine known fatalities due to collision with wind turbines have been reported across Europe between 2002 and August 2023 (Dürr, 2023)⁷⁵. Of the 34 fatalities, 30 were recorded in Germany and seven in Spain and one recorded in the UK and none in Wales. In the context of European breeding and wintering populations, this level of mortality is low. NatureScot (SNH, 2018)¹⁵ has outlined a default avoidance rate of 98% for this species.

8.214 Peregrine were recorded on 83 occasions during flight activity surveys, with a total of 16 flights considered at-risk, with an annual collision risk of 0.042 (or one bird every 23.8 years) predicted which equates to 0.11% of the Radnorshire population of up to 19 Pairs in 2012 (Jennings, P., 2013)²⁵ which as one of the three old council areas of Powys, is potentially only one-third of the PCC population and <0.01% of the Welsh population (300 pairs). This is a very small potential increase in mortality to the local population and is therefore predicted to result in an impact that is considered to be of negligible and long-term magnitude.

8.215 Significance of Effect: The magnitude of the impact the PCC and Welsh peregrine populations as a result of collision risk is deemed to be a negligible and long-term impact, the NCI is high and the conservation status favourable. The effect on peregrine as a result of collisions is therefore considered to be **negligible** and therefore **not significant** under the EIA Regulations.

Red Kite

8.216 Impact: Collision of red kite with the turbines leading to injury and potentially mortality.

8.217 NCI/Conservation Status of the Receptor: High/Favourable.

8.218 Magnitude of Impact: A total of 864 known fatalities due to collision with wind turbines have been reported across Europe between 2002 and August 2023 (Dürr, 2023)⁷⁵. The majority of collisions are reported from Germany (751) with a further 51 collisions in France and 34 collisions recorded in Spain and 12 in Sweden. A total of five collisions have been recorded in

the UK: two from wind farms located in Wales and three at the Braes of Doune wind farm in Stirlingshire, Scotland, where satellite tagging and monitoring of red kite was included as part of the post construction work for that scheme (Dürr, 2023)⁷⁵.

8.219 The high numbers of collisions recorded in Germany are likely attributable to the significantly higher population in Germany (up to nine times higher than the UK) and also potentially the fact that red kite are considered sedentary in the UK, meaning birds become habituated to the presence of turbines. Whereas in Germany red kite often migrate to and from the Iberian Peninsula, passing through wind farm areas on passage. Despite the high number of collisions across Europe, given the lack of evidence of red kite collisions at wind farms in the UK⁷⁷ (SNH, 2018)¹⁵. Further research as part of post construction monitoring is more usual in recently approved schemes and this will likely lead to more available data to update the avoidance rate, if appropriate, for this species.

8.220 Red kite were recorded on a total of 3,441 occasions during activity surveys with 736 flights recorded within 250m of the turbines, of which 487 flights were registered as 'at-risk'. Of all the flights registered, a total of 1,536 were recorded during the breeding season and 1,905 in the non-breeding season. Flight activity was significantly higher in the west and south-west of the Site, with 819 and 743 flights (45% of the total flights) recorded from two VP locations (VP1 and VP10) which were located in the west of the Site (**Figure 8.1** and **Figure 8.2**). The total number of flights in Year 1 (i.e. 1,243 flights, totalling 2,374 birds) to 2,198 flights (and 4,401 individuals) in Year 2, although the total flight time in Year 2 was lower (see **Table 8.14** below).

⁷⁷ Urquhart, B. and Whitfield, D. P. (2016) Natural Research Information Note 7: Derivation of an avoidance rate for red kite *Milvus milvus* suitable for onshore wind farm collision risk modelling

Table 8.14 Red kite flight details

Red Kite Flights – By Season	Total Flights	Total Count	Total Flight Time (no. of birds recorded x total flight seconds)	Flights in CRZ – In CRA at Collision Risk Height (CRH)	At-risk Seconds – Flight Seconds in CRZ	Collision Risk Value (annual mean)
All	3,441	6,775	3,915,255	487	170,172	10.306
Breeding Season	1,536	2,167	700,909	166	16,246	1.089
Non-Breeding Season	1,905	4,608	3,214,346	321	153,926	9.217

8.221 The total number of flights was relatively stable between the breeding and non-breeding seasons. However, the number of birds recorded was more than double in the non-breeding season (2,167 in the breeding season and 4,607 in the non-breeding season). As a result, the number of flight seconds in the non-breeding season, over the whole survey area, is 4.5 times higher in the non-breeding season and the number of 'at-risk' flight seconds (i.e. within 250m of the proposed turbines) is over ten times higher in the non-breeding season. This is reflected in the significant difference in the collision risk values between the breeding and non-breeding seasons (i.e. 1.089 and 9.217 birds per annum, respectively).

8.222 It is clear from the results as shown above that the Site is used in different ways by red kite in the breeding season as compared to the non-breeding season. There are ten breeding territories on the fringes of the Site, or within the Raptor Survey Buffer. This species is known to defend their nesting locations and generally have a home range of up to 3km (Hardey *et al.*, 2013)³². Although Hotker *et al.* (2006)⁵⁷ describes how red kite spend the majority of their time within 1km of the nest sites. Although they do not defend their home ranges, red kite will defend their nest sites during the breeding season and spend the winter either in the home range or close in small groups or using communal roosts (Hardey *et al.*, 2013)³². The data indicates that this appears to be the case at the Site, and so during the breeding season the majority of red kite using the Site belong to the local breeding population and remain closer to breeding sites effectively spending less overall time close to proposed turbine locations.

8.223 In the winter months numbers of birds using the Site increases significantly with the local breeding pairs supplemented by their own fledged offspring (average productivity of 0.94 fledglings per pair from 171 monitored nests in 2018 (Welsh Kite Trust, 2020)²⁶ as well as immature, sub-adult birds and adults likely from elsewhere within the wider Region and Wales. This area of Powys provides optimal habitat for kites with both sheep and chicken farming widespread which provides a year-round source of food in addition to large areas of wet grassland which provides a valuable food source of invertebrates such as worms. As mentioned above, Gigrin farm feeding station lies 16km west of the Site and provides an all year-round food resource and may be utilised by birds in difficult feeding conditions such as following periods of snow or hard frosts.

8.224 The flight data also reveals how red kite use the Site in a different way between the breeding and non-breeding season. During the breeding season flights (1,536) a total of 1,401 consisted of one or two birds, and a total of 13 flights consisted of six birds or more. In the non-breeding seasons, of the 1,905 flights a total of 1,431 comprised one or two birds with 172 flights registered with five birds or more, of which 52 flights recorded consisted of 11 or more birds.

8.225 The modelled collision risk predicted for red kite at the Site is 10.408 birds per annum (with a significant disparity of 1.089 collisions during the breeding season and 9.217 in the non-breeding season, reflecting the different population dynamics described above). These figures were calculated while applying the recommended NatureScot avoidance rate of 99% (SNH, 2018)¹⁵.

8.226 Post-construction monitoring data for red kite in the UK is currently limited, although a detailed study in Scotland at Braes of Doune wind farm was completed over three years to calculate whether the predicted collision values were correct. This work consisted of vantage point observations, radio tagging and tracking of individual kites, turbine searches and carcass removal/persistence trials. A total of 1,486 hours of vantage point observations were completed from six vantage points. Eighty-four kites were radio tagged and 79 of these were studied. The study confirmed several cases of red kite actively taking evasive action to avoid turbines. The survey identified a total of three collisions across the study period (Duffy, K. and Urquhart, B., 2014)⁷⁸. Surveys completed by BSG Ecology at Bryn Titli wind farm, located in Powys approximately 24km north of the Site, as part of a repowering scheme, identified 588 flights within turbine areas and identified no collisions (Innogy, 2017)⁷³.

8.227 As mentioned above, the Radnorshire red kite population has increased from 5-7 pairs in 1990 to 15 pairs by 1998, 22 pairs (out of 200 in Wales) in 2000, to 45 in 2003, 84 in 2006, 130 in 2009 and 144 (out of c.1,000 birds in Wales) in 2010 (Jennings, P., 2013)²⁵.

8.228 Population estimates for total breeding pairs in Wales vary with the most recent estimate undertaken by (Hereward *et al.*, 2024)⁷⁹, outlining an estimated total of 2,117 breeding pairs of

⁷⁸ Duffy, K. and Urquhart, B. (2014) Braes of Doune Windfarm – Report on Red Kite Studies 2004-2012

⁷⁹ Hereward, H. F. R., Macgregor, C. J., Gabb, O., Connell, A., Thomas, R. J., Cross, A. V. and Taylor, R. C. (2024) Modelling population-level impacts of wind farm collision risk on Welsh Red Kites (BTO Research Report 766)

which 1,488 were identified as breeding in Mid Wales. Given kites only breed in their third or fourth year, the total countrywide population could be estimated as being potentially significantly higher again.

8.229 Given this latest figure detailed above local to the Site for red kite was for 2010 and the constant increase in numbers indicate it is likely the current Radnorshire population is significantly higher than 144 pairs. The Radnorshire figure in the Wales wide populations in 2000 and 2010 were approximately 10% (11% and 14%) of the Welsh population. Therefore, using the BTO figure outlined above for 2022, the Radnorshire figure (using the same 11-14%) will be approximately 232-296 (average 264) breeding pairs.

8.230 With an annual collision risk of 10.304 (or one bird every 0.097 years) predicted this equates to 1.97% of the Radnorshire breeding population (estimated 264 pairs), or 0.35% of the Mid Wales breeding population (estimated 1,488 pairs) and 0.25% of the Welsh population (2,117 pairs, (Hereward *et al.*, 2024)⁸⁰.

8.231 It is considered that the predicted losses of red kite to the Mid Wales population are approximately 0.35% which following the EIA guidelines outlined above therefore predicted to result in an impact that is considered to be of negligible (<1%) and long-term magnitude. The situation of red kite in this part of Wales is a unique one in terms of population density of a UK Schedule 1 species. There are no other Schedule 1 species of raptor found in the UK that has such high numbers, which ultimately leads to the calculations predicting an impact of negligible; however, it is considered that due to the conservation status of red kite and the predicted collision risk values that the level of impact should be given further consideration. This area of Powys is the centre of a successful reintroduction program and this 'hotspot' that has been created for red kite will provide, over time through natural dispersal, further natural increase in red kite numbers throughout Wales and the southern counties of England (Jennings, P., 2013)²⁵. Given the many birds now dispersed across Wales and southern England along with several other reintroduction programs, the importance of the Powys 'hotspot' is significantly reduced. It is therefore considered that a collision figure for a Schedule 1 species should be

⁸⁰ Ibidem

considered a significant impact and for this reason the impact on red kite is predicted to result in an impact that is considered to be of medium and long-term magnitude.

8.232 Significance of Effect: The magnitude of the impact on the PCC and Welsh red kite population as a result of collision risk is deemed to be a medium and long-term adverse impact, the NCI is high and the conservation status favourable. The effect on red kite as a result of collisions is therefore considered to be **moderate** and therefore **significant** under the EIA regulations.

Golden Plover

8.233 Impact: Collision of golden plover with the turbines leading to injury and potentially mortality.

8.234 NCI/Conservation Status of the Receptor: Medium/Favourable.

8.235 Magnitude of Impact: A total of 47 golden plover fatalities due to collision with wind turbines in Europe have been reported up to August 2023 (Dürr, 2023)⁷⁵, with none recorded in the UK. In the context of European breeding and wintering populations, this level of mortality is very low. There have been no records of fatalities recorded from wind farms within the UK. Despite these figure NatureScot (SNH, 2018)¹⁵ has outlined a default avoidance rate of 98% for this species.

8.236 Golden plover were recorded on a total of 31 occasions during activity surveys with 13 of these flights being registered as ‘at-risk’ height. The flight activity was almost entirely recorded in the non-breeding season (September to March) and the non-breeding season collision risk calculated at 11.25 (or one bird every 0.089 years) predicted. It should be acknowledged that a figure of 11 fatalities per non-breeding season for golden plover is considered to be highly precautionary, with the collision modelling process considered to be unsuitable for modelling species due to its flight patterns, forming large flocks with spontaneous, random flights formed by the whole flock.

8.237 The Band model (Band *et al.*, 2007)¹⁶ that is used to calculate the collision risk of a wind farm was created with two typical scenarios in mind: firstly for a single bird, such as raptor species like red kite and golden eagle flying through a wind farm and using the airspace in a random way; this is called ‘the random model’. The second approach is that the airspace is

being overflowed by individuals or large groups of species, such as divers, geese and swan, in a predictable manner being on migration or moving through the area from nesting grounds or roost sites to foraging areas and flying through the proposed wind farm in a straight line. This is termed the 'linear' model. The two flight behaviours use the collected data which is input into either the 'random' or 'regular/linear' models in order to calculate the collision risk value.

8.238 Golden plover, and other waders, most notably in the winter, form flocks which will fly in an irregular manner and circle in large groups often due to being disturbed by predators, human activity or natural situations such as rising tides or also on arrival or dispersal to feeding grounds when selecting safe areas to feed or roost. As such the presence of large groups of birds, such as golden plover can lead produce significantly higher collision values, with a single flock (consisting of large numbers of individuals) at times being recorded multiple times during the same survey and effectively skewing or weighting the data for the flights, with the same groups presumed to repeatedly display the same (or lack of) avoidance behaviour. This is demonstrated in the proportionately higher collision risk outputs from the CRM for golden plover which, when in comparison to other species flight activity registered during VP surveys, can be seen to be based on far fewer flights (i.e. significantly fewer flightlines and presented in **Appendix 8.1, Figure 4**) than red kite for example (**Appendix 8.1, Confidential Figures 3a-3e**).

8.239 A number of other wind farm applications in Wales have encountered similar inflated collision risk values and with no known collisions for this species. A recently (2024) consented planning application for Garn Fach Wind Farm⁸¹ also in Powys, mid-Wales, outlines an annual collision risk value estimate for the 17 turbines of 7.89 leading a total of 236.7 over the proposed 30-year lifetime of the scheme (Dulas Ltd, 2022)⁸². The surveys at Garn Fach identified 22 observations of golden plover and included flocks of up to 350 birds and the assessment further discussed the limits of the CRM process in terms of this species (Dulas Ltd, 2022)⁸², stating that the CRM:

⁸¹ Garn Fach was consented on 22/10/2024, after the 1/10/2024 cumulative cut off date for the Proposed Development so its status is 'Application Submitted' for the purposes of this cumulative assessment

⁸² Dulas Ltd (on behalf of EDF Renewables) (2022) Garn Fach Wind Farm: ES – Volume 1: Written Statement

“...is not suitable for flocking species that undertake nondirectional, wheeling flights, such as golden plover. SNH reportedly accept the limitations of their model, and it is not always used for modelling likely effects on the basis that there is little faith in the outputs”.

8.240 An application for Mynydd y Glyn Wind Farm in South Wales identified flocks of between 100 and 322 golden plover recorded flying for extended periods over and is currently at the statutory consultation stage of the consenting process. The draft Environmental Statement outlines a predicted winter collision risk figure for golden plover of 345, a figure which is actually higher than the largest flock recorded during surveys. The text outlines that further investigation into golden plover activity is ongoing at the site and argues the collision figure is likely to be significantly lower than the amount predicted once you consider that birds will be displaced away from the turbine array (WSP, 2022)⁸³.

8.241 In relation to an approved application at Upper Ogmore Windfarm in South Wales, the issue of inflated collision risk values is raised with the annual collision value of 0.24 per annum for seven turbines, the ES (BSG Ecology, 2018)⁸⁴ outlines the figure for golden plover may be inflated, stating:

“...collision risk modelling, which either assumes a random flight path is taken by (typically) a single bird (such as an eagle or a kite) or a predictable flight path is taken by flocks of birds (such as geese or swans), is not suitable for flocking species that undertake non-directional, wheeling flights, such as golden plover. SNH reportedly accept the limitations of their model, and it is not always used for modelling likely effects on the basis that there is little faith in the outputs.”

8.242 The data collected for the Proposed Development clearly demonstrates the issues created in the collision modelling process by the big flocks of golden plover, which skew the results of the CRM. A total of 118,706 flight seconds were recorded ‘at-risk’ across the full survey period of which just four flights total 110,704 of the ‘at-risk’ seconds (93.3%) due

⁸³ WSP Environment and Infrastructure Solutions UK Limited (2022) Mynydd y Glyn WF Draft Environmental Statement – Chapter 9: Ornithology

⁸⁴ BSG Ecology (on behalf of RES) (2018) Upper Ogmore Wind Farm and Energy Storage Facility: Environmental Statement – Ecology and Biodiversity

prolonged flights of large groups of birds (200 birds for 265 at-risk seconds, 48 for 465 seconds, 60 birds for 540 seconds and 39 birds for 1,160 seconds).

8.243 The statements outlined above are further backed up by the results of post construction monitoring at an operational wind farm in South Wales. Mynydd y Gwair Wind Farm, located near Swansea, comprises of 16 operating turbines and has been operational since 2019. The ornithology surveys at the site pre-construction identified a total of 40 golden plover flights with a maximum of 260 birds recorded. Post construction monitoring at the site in the three years post construction identified a total of 34 golden plover flights during the Year 1 surveys (BSG Ecology, 2021)⁸⁵, 49 golden plover flights during the Year 2 surveys (BSG Ecology, 2022)⁸⁶ and a total of eight flights in the Year 3 surveys (BSG Ecology, 2023)⁸⁷. The reports further outline that golden plover flew through the turbine array regularly, including in large flocks sometimes at collision height and also on occasions landed close to the operating turbines. As part of the monitoring process carcass searches were undertaken for all bird and bat species across the three survey years which, and despite the regular presence of groups of golden plover, did not identify any collisions for this species (BSG Ecology 2021, 2022, 2023). The results of the three years of monitoring indicate that the collision figures predicted for golden plover are inflated due their particular situation with large winter flock sizes that often fly for extended periods wheeling over the same area leads to high collision figures are higher than in reality, with no collisions recorded in three full years of survey.

8.244 As mentioned above, NatureScot outlined a default avoidance rate for golden plover of 98%. The information provided by Dürr (2023)⁷⁵ outlines there have been no recorded fatalities of golden plover in the UK. Therefore, the 98% industry standard avoidance rate appears highly precautionary. A review on the impacts of collision risk on waders by Whitfield (2007)⁷⁰ outlined the risk was generally low. Data from UK and European wind farms was limited, but studies on the equivalent species, such as American golden plover (a species very similar in size and behaviour to the European golden plover found in the UK) were studied across two wind farms

⁸⁵ BSG Ecology (2021) Mynydd y Gwair Wind Farm: Year 1 Species Monitoring Report (2020). Report to RWE Renewables Ltd., Baglan.

⁸⁶ BSG Ecology (2022) Mynydd y Gwair Wind Farm: Year 2 Species Monitoring Report (2021). Report to RWE Renewables Ltd., Baglan.

⁸⁷ BSG Ecology (2023) Mynydd y Gwair Wind Farm: Year 3 Species Monitoring Report (2022). Report to RWE Renewables Ltd., Baglan.

and outlined that collision was low with an avoidance rate of between 99.1-99.9 outlined for waders. With these avoidance figures in mind if the CRM were to be recalculated for the Proposed Development presuming avoidance figures of 99% and 99.5% the collision figures will be significantly lower (7.793 and 3.89 birds, respectively).

8.245 Using a modification to the precautionary avoidance rate from 98% to 99% or 99.5% reduces the average collision risk from 11.25 per non-breeding season to 5.614 and 2.807 birds, respectively.

8.246 In addition to the above, Hotker *et al.* (2006)⁵⁷ and Pearce-Higgins *et al.* (2009)⁶⁹ identified that it is possible that wintering golden plover will be displaced by operational wind farms and given displacement away from turbines and the construction of the wind farm may in fact lead golden plover moving to other similar habitat in proximity, either within or close to the Site, such as areas in the east of the Site or further south-east of the Site.

8.247 Given the fact that the collision risk figure of 11.25 is considered to be a significant over estimate, this potential increase in mortality of the wintering golden plover population is therefore predicted to result in an impact that is considered to be of minor and long-term magnitude.

8.248 Significance of Effect: The magnitude of the impact on the PCC and Welsh wintering golden plover population as a result of collision risk is deemed to be a minor and long-term adverse impact and the sensitivity is considered to be low. The effect on golden plover as a result of collisions is therefore considered to be **minor** and therefore **not significant** under the EIA regulations.

Proposed Mitigation (Additional Mitigation) and Compensation

8.249 Under the CIEEM guidance no significant impacts have been predicted for any species or designation with the exception of the potential operational (collision risk) impacts presented for red kite. Therefore, in order to mitigate for the operational impacts on red kite, additional measures are required as part of the Proposed Development. The following mitigation set out below includes land management and outline Habitat Management Plan (HMP) methodology which aims to reduce the impacts of collision risk on red kite. The outline HMP which will be implemented prior to construction and continued throughout operation with the aim to improve

current ecological baseline conditions, enhancing biodiversity and as well as having the aim to reduce collision risk of red kite will create new foraging and breeding habitats for ornithological features across the Site. The outline HMP is provided in **Appendix 7.10**.

Land Management Methodology

8.250 One significant food source for red kite within Welsh upland farms is found during the breeding season where red kite can be attracted to the waste and by-products associated with sheep farming and management practices and/or the by-product any sheep or lambs during lambing. In order to reduce red kite flight activity within 500m of the turbines, and therefore reduce the potential for collisions with turbines, during lambing all areas (within 500m of turbines) used for grazing sheep during the lambing season (April/May) will be checked on a twice weekly basis and any dead sheep or by products of lambing moved away from the turbines and discarded as per the regulations. This will reduce the potential for collision.

8.251 In addition to the twice-weekly checks completed during the lambing season, it is proposed that weekly checks will be undertaken between June and March of any fields within 500m of the turbines containing livestock to check for any dead animals. If any carcasses are identified they will be removed offsite.

Habitat Management Plan

8.252 The outline HMP includes for the reinstatement/enhancement of several habitats including mire, wet heathland mosaic, unimproved and marshy grassland. This will predominantly be achieved by the careful management of grazing levels in specific areas of the Site (see **Appendix 7.10**).

8.253 Benefits to Ornithology: The managed grazing will aim to allow dominant plant species within each community to flourish without the pressures of over grazing meaning, each habitat will be restored to good condition. The restoration of these habitats will lead to both improved breeding habitats and foraging potential through an increase in species such as invertebrates and other insect species and likely facilitate an increase in small mammals. Improved grassland succession towards more rank and acidic grassland, for example, will create improved habitat for ground nesting species such as skylark, meadow pipit and whinchat and potentially for wading birds that historically bred in the locality but are now scarce, such as curlew. An

increase in invertebrates and small mammals could lead to improved foraging for a number of species including red kite, nightjar and hobby while if the area sees an increase in small passerine species this will also provide prey for the larger raptor species such as goshawk, hen harrier and peregrine.

Scrub Regeneration and wild meadow

8.254 Areas of land in the south-west and west of the Site will be managed to improve the habitats but also discourage the presence of foraging red kite, most notably in the winter months when flight activity was registered at its highest. A combination of managed grazing (ensuring a long sward between September and March), the regeneration of areas from grassland into regrowth of native scrub species and native meadow planting, are primarily aimed at modifying the ground cover and making the ground sub-optimal foraging for red kite. These areas around the six turbines in the south-west of the Site (T1-T6) and the north-west of the Site (T21-T24) are associated with the highest red kite flight activity that was recorded in proximity to the Proposed Development. By discouraging red kite from the areas close to these turbines it will reduce the potential for collision risk.

8.255 Benefits to Ornithology: As well as discouraging red kite, the enhanced grassland areas plus the scrub habitat will provide significant foraging and breeding habitat for a number of other bird species including yellowhammer, linnet, whinchat and stonechat.

Hedgerow Reinstatement and Planting

8.256 Sections of the Site will have native species rich hedgerows planted and sections reinstated and improved.

8.257 Benefits to Ornithology: The increase in the number and length of species rich native hedgerows provides significant benefits for birds with increased areas for breeding for nesting species such as yellowhammer and dunnoek and also provide a food source both during the breeding season and the non-breeding season with many native hedgerow species providing berries all year round.

Bracken Control and Riparian Planting

8.258 Benefits to Ornithology: The removal of large areas of bracken (which are generally considered to be rarely used by most bird species) along riparian slopes along with riparian

planting of broadleaved species such as willow will create significant areas of grassland, scrub and riparian woodland which will be new and improved breeding habitats for a number of bird species such as tree pipit, meadow pipit and whinchat.

Pond Creation and Modification

8.259 Benefits to Ornithology: The creation and deepening of current ponds, which are known to dry out, will provide an increased foraging and drinking resource for birds both within the ponds themselves, for species such as wildfowl, and the mud exposed around the edges, for wading bird species such as curlew and lapwing. Species that rely on wet areas such as dragonflies and damselflies will increase in numbers and in turn are prey species for larger species such as hobby.

Post Construction Monitoring – HMP and Mitigation Efficacy

8.260 There is an inherent level of uncertainty associated with ecological assessment (as is acknowledged in CIEEM Guidance). However, post-construction monitoring (PCM) is proposed to assess the efficacy of the mitigation measures proposed and the results of mitigation through the outline HMP and allow opportunity to refine the prescribed measures over time (informed by the ongoing monitoring results) to improve the likelihood of achieving the desired outcomes and objectives of the HMP.

8.261 Monitoring will take place in years: 1, 2, 3, 5, 10 and 15. Reviews of the requirement for continuation of the monitoring programme will be undertaken in Years 5 and 10. Survey methods and timings may be adjusted across monitoring years according to each year's survey results, as well as assisting when considering other habitat management factors (e.g. grazing densities, for example).

8.262 The monitoring will comprise the following surveys:

- **Breeding Bird Survey** - A breeding bird survey of the turbine area plus 500m survey buffer – to monitor whether there are any impacts due to the Proposed Development in terms of displacement of the breeding bird assemblage as well as to check the efficacy of the HMP and whether it is producing the desired results, i.e. improved breeding densities of grassland and scrub species. The survey will comprise 4 visits between April and July as per the NatureScot (2017)¹³ guidance.

- **Vantage Point surveys** – will be undertaken across the year with a total of 72 hours completed at each of 5 VP locations, the locations will be selected (and agreed with NRW) to cover the areas where HMP is proposed (i.e. the south-west and western hot spots of red kite activity) as well as control points where the HMP is less prevalent. The results will be used to calculate the collision risk at the operational site and also can be used to study whether there is any operational displacement due to the turbines. This will enable the ability to both monitor whether HMP is working to displace from areas of high potential collision and see whether the CRM calculations were accurate.
- **Fatality monitoring (carcass searches)** – searches will be carried out using dogs at 15 of the 30 turbines, using a 100mx100m area around each of the 15 turbines as per the guidance for bat survey and assessment at onshore windfarms (SNH *et al.*, 2019). The full details of the fatality monitoring protocols will be agreed with NRW and run in combination with the bat monitoring as discussed in **Chapter 7**.

Residual Operational Effects

- The significance of the effect during operation is predicted to be negligible or minor for all IOFs, with the exception of the collision risk for red kite. The successful implementation of the mitigation and enhancement measures outlined in this chapter, land management measures and a habitat management plan are considered likely to reduce the effects of collision and therefore, the predicted effect on red kite is considered to be reduced from **moderate to minor adverse and not significant**.

Red Kite – Population Viability Analysis

- An annual collision risk for red kite is predicted to be 10.306 (birds per annum although this value is considered to, in reality, reduce with the measures proposed following the land management plan and outline HMP. These measures include for making areas of the Site closer to the turbine array less attractive for foraging kites thus reducing these areas in terms of attractiveness to kites and thus reducing potential for collisions further.
- Regardless of the mitigation measures proposed, at 10.306 birds per annum the level of collision risk presented to red kite is high. This species was almost extinct in the local area, although through reintroductions (and the population supplemented by feeding stations) the

local population has expanded very quickly. Given this high rate of expansion and the CRM outputs for red kite associated with the Proposed Development, a population viability analysis (PVA) has been undertaken, using the deterministic model, to investigate how this level of collision risk will impact the Powys red kite population. The deterministic model uses a matrix table in which the various parameters associated with the life-stages of red kite can form an assessment of population viability over time starting from the current population number. The PVA has been modelling using the full collision risk value of 10.306.

Table 8.15 Population viability modelling – summary parameters

Parameter	Value	Source of Parameter Value
Starting population size	592 birds	Calculation for Radnorshire as per section 8.231 above Hereward <i>et al.</i> (2024) ⁸⁸
Age at first breeding	3	Hardey <i>et al.</i> (2013) ³²
Productivity (fledglings per pair)	0.95	Welsh Kites Trust (2020) ²⁶
First year survival	$\bar{x}$ 0.720	Smart <i>et al.</i> (2010) ⁸⁹ Bellebaum <i>et al.</i> (2013) ⁹⁰
Second year survival	$\bar{x}$ 0.825	Smart <i>et al.</i> (2010) Bellebaum <i>et al.</i> (2013)
Adult survival	$\bar{x}$ 0.850	Smart <i>et al.</i> (2010) Bellebaum <i>et al.</i> (2013)

⁸⁸ Hereward, H. F. R., Macgregor, C. J., Gabb, O., Connell, A., Thomas, R. J., Cross, A. V. and Taylor, R. C. (2024) Modelling population-level impacts of wind farm collision risk on Welsh Red Kites (BTO Research Report 766)

⁸⁹ Smart, J. S., Amar, A., Sim, I. M. W., Etheridge, B., Cameron, D., Christie, G. and Wilson, J. D. (2010) Illegal killing slows population recovery of a re-introduced raptor of high conservation concern – the red kite *Milvus milvus*. Biological Conservation, 143: p 1278-1286.

⁹⁰ Bellebaum, J., Korner-Nievergelt, F., Durr, T. and Mammen, U. (2013) Wind turbine fatalities approach a level of concern in a raptor population. Journal for Nature Conservation, p.394-400.

8.263 The initial model for the deterministic model fixed the baseline parameters (as per summary **Table 8.17**, with sources and assumptions detailed in **Appendix 8.2**) over a 40-year lifespan of the Proposed Development. However, this was further refined to factor for the specific situation for the Welsh red kite population, which appears to still be in an expansion phase (likely artificially supported as a result of the feeding stations) so population dynamics over time will be expected to change to reflect the maturation of the population as well as the carrying capacity of the region as resources become increasingly limited. As a result, a second version of the model was derived where key population measures (i.e. 1st year survival and productivity rates) declines over time to simulate population density dependence and increased resource competition occurring was also developed.

8.264 With little evidence in the published literature about effects of density dependency on red kite populations, values were based on informed assumptions. As such, the values for survival and productivity rates were reduced every five years from year 0 to year 15, at which point it is assumed that the kite population will expand into areas beyond Powys due to resource competition and so the same rate is used through to year 40 (i.e. the final year of operation).

Table 8.18 presents the stepped variance in survival rate and productivity by year of operation.

Table 8.16 Variance in parameters associated with density dependence

Years in Model	1 st Year Survival Rate	Productivity
0-5 years	0.72	0.95
6-10 years	0.67	0.90
11-15 years	0.62	0.85
16-40 years	0.57	0.80

8.265 Table 8.19 presents a summary of the different population outcomes of the PVA, firstly with no collision risk and then including collision risk for both the no density dependence and density dependant scenarios.

Table 8.17 Deterministic results for population viability assessment accounting for collision risk

Model	Variant	Starting Population	Final Population
No density dependence	No collision risk	592	16,370
	Collision risk 10.304– see Chart 8.1	592	13,384
Density dependence	No collision risk	592	2,489
	Collision risk 10.306 – see Chart 8.2	592	1,807

8.266 The resulting population expansion when excluding for density dependence demonstrates the unrealistic situation of an ever-increasing kite population when not accounting for population dynamics and density dependence (presented in **Chart 8.1**). The results for the PVA when for both the collision risk and factoring density dependence is presented in **Chart 8.2**. The full PVA matrices are presented in **Appendix 8.2**.

Chart 8.1: PVA – Powys red kite population, assuming no density dependence

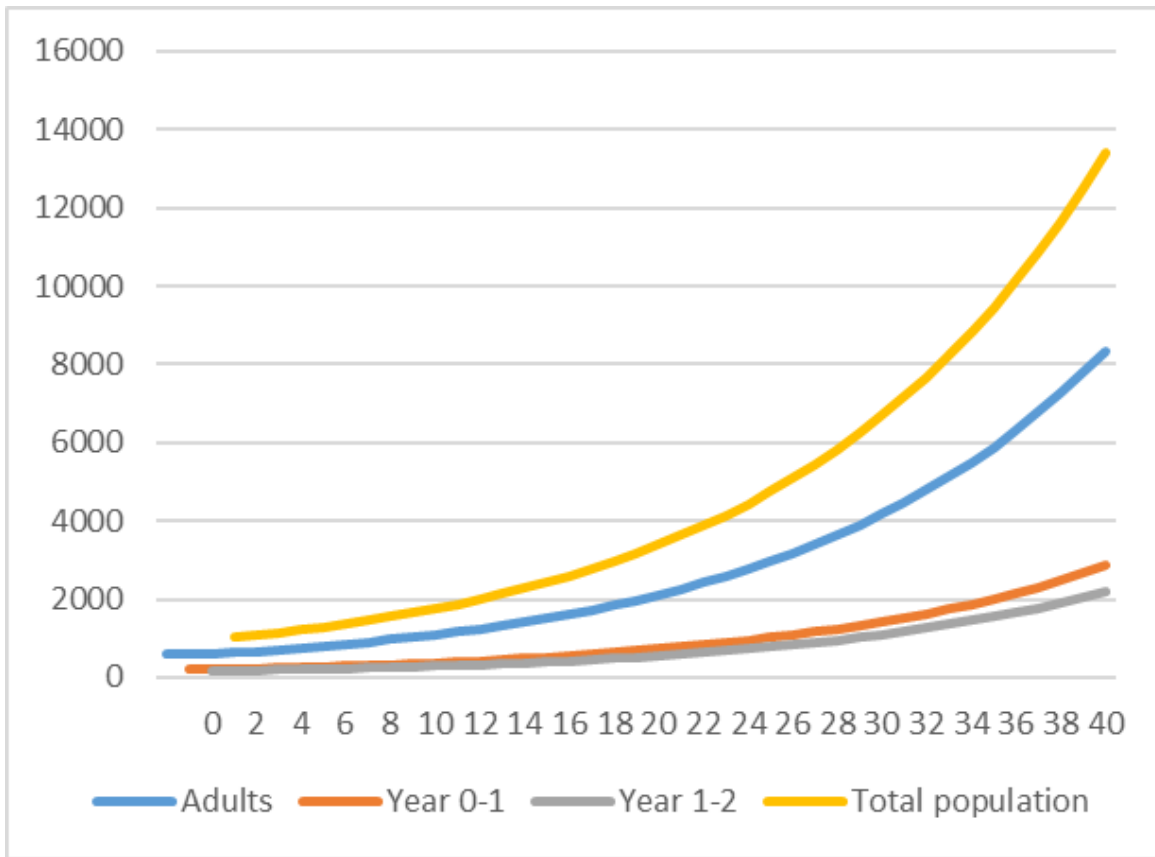
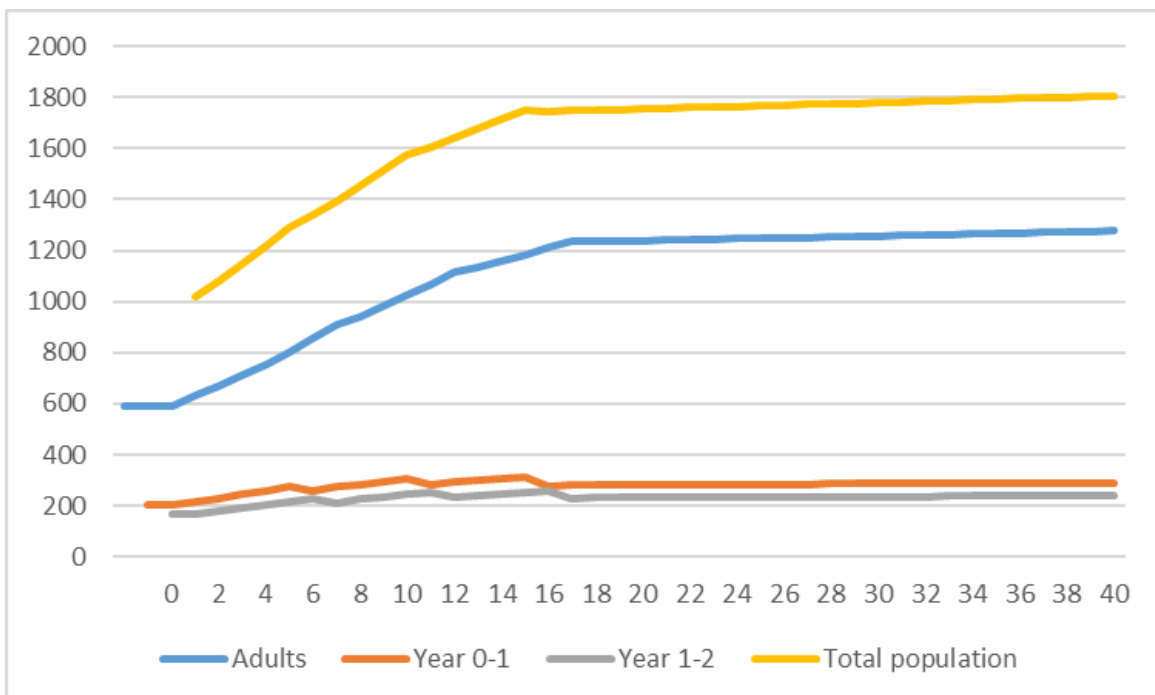


Chart 8.2: PVA – Powys red kite population, assuming density dependence



8.267 The increased mortality reduces the forecasted final population slightly, as is the case when considering the density dependence dynamics. However, in both versions of the model, population growth continues to be strong and there is no evidence of a significant adverse impact on the overall red kite population of Radnorshire at this level of predicted collision risk.

Welsh Wide PVA (BTO Study)

8.268 In addition to the PVA at a local level as described above, the BTO completed a Wales-wide PVA published in 2024, using a worst-case scenario with nine of the largest wind farm developers having all their Welsh schemes approved and operational (the results of over 50 confidential proposed schemes included in the study). The study, while concentrating on the impacts on the two SPA populations of red kite (Berwyn and Elenydd-Malleen SPAs), does outline the scenario for the effects of collision risk across Wales as a whole. The study concluded that even through the running all of the different scenarios within the models for all of the proposed schemes in combination, the population growth of red kite will be considered to more probably than not keep increasing and that currently proposed levels of wind farm developments are unlikely to prevent the continued growth of the Welsh red kite populations (Hereward *et al.*, 2024)⁹¹Error! Bookmark not defined.

Assessment of Cumulative Effects

Predicted Cumulative Effects

8.269 The assessment of cumulative effects on receptors takes into consideration other operational, under construction and in planning developments. The assessment does not include for developments at the scoping stage given the lack of detailed information on such proposed developments. The assessment takes into account all types of developments considered to be relevant in the context of the assessed impacts, not just wind farm developments.

8.270 A total of nine developments were identified for inclusion in the cumulative assessment. The approach to cumulative assessment for this ES is set out in **Chapter 2: Approach to the**

⁹¹ Hereward, H. F. R., Macgregor, C. J., Gabb, O., Connell, A., Thomas, R. J., Cross, A. V. and Taylor, R. C. (2024) Modelling population-level impacts of wind farm collision risk on Welsh Red Kites (BTO Research Report 766)

EIA. Cumulative Developments considered are set out in **Appendix 2.6, Volume 3** and shown on **Figure 2.2: Cumulative Developments: wind farms** and **Figure 2.3: Cumulative Developments: non-wind developments**.

8.271 The impacts on all receptors during construction due to disturbance and habitat loss and displacement due to habitat loss during operation of the wind farm are all considered to be minor or negligible. The cumulative impacts are therefore concentrated on the collision risk. Collision risk modelling for important ornithological features (IOF) at the Site identified negligible effects for all species, with the exception of red-kite and golden plover where an annual collision risk of 10.304 collisions for red kite and 11.25 for wintering golden plover were predicted, respectively.

8.272 The details in terms of ornithology are detailed in **Table 8.20** below.

Table 8.18 Cumulative wind farm projects within 35km

Wind Farm	No. of Turbines	Distance (km)	Maximum Blade Tip Height	Information
Operational				
Garreg Lwyd Hill	17	13.13 NNW	126.5	Operational in 2017. No ornithology information publicly available at time of study.
Llandinam	102	21.67 NW	45.5	Existing collision risk will be replaced by the approved repowered scheme below, and the results indicate a reduction in collision risk will occur due to the reduced number of turbines.
Bryn Titli	22	24.58 NW	53.5	No publicly available information is available for the original operational windfarm however surveys completed in 2016/7 by BSG for the extended life of the windfarm identified a collision risk of 2.3 for red kite should the turbine continue to operate. No collision results were produced for golden plover (Innogy, 2017) ⁷³ .
Bryn Blaen	6	30.33 NW	100	A figure of 2.9 is quoted for red kite collisions for this site in the Garn Fach HRA although no publicly available data is available for the ornithology surveys

Wind Farm	No. of Turbines	Distance (km)	Maximum Blade Tip Height	Information
				(Dulas Ltd, 2022) ⁹² This is likely completed with a 98% rate therefore for comparison 1.45 collisions will be used.
Under Construction / Not Operational				
Hendy	7	3.08 SW	110	No raptors or waders recorded as breeding onsite. Two pairs of curlew recorded offsite in 2013. Two or three pairs of red kite recorded breeding over 1km but less than 2km from the site. Winter walkovers identified two groups of golden plover, the largest being 30 birds. VP surveys identified red kite all year round and golden plover in winter months.

⁹² Dulas Ltd (on behalf of EDF Renewables) (2022) Garn Fach Wind Farm – Appendix 8-8 (Version 5): Report to Inform HRA for Two European Sites: River Wye Special Area of Conservation (SAC) and Elenydd-Mallaen Special Protection Area (SPA)

Wind Farm	No. of Turbines	Distance (km)	Maximum Blade Tip Height	Information
				Red kite collision risk was calculated at 1.218 birds in winter and 1.675 birds in summer (total 2.893) calculated at 98% avoidance – given the current avoidance figure of 99% this would be the equivalent of $(2.893/2)$ 1.447. Golden plover winter collision figure was 1.74 (Cunnane Town Planning, 2014) ⁹³ .
Consented				
Llandinam Repowering	34	21.5 NW	121.2	Predicted collision risk for red kite of 1.24 (CeltPower Ltd, 2013) ⁹⁴ .
Garn Fach	17	19.32NW	149.9	A total of 554 flights were recorded within 250m of the turbines of red kite and a collision risk of 2.61 per year. Golden plover collision risk of 7.89 per year.

⁹³ Cunnane Town Planning (on behalf of Hendy Wind Farm Limited) (2014) Environmental Statement – Volume 1: Main Text for Hendy Wind Farm

⁹⁴ CeltPower Ltd (2013) Llandinam Windfarm Repowering and Extension – Supplementary Environmental Information – Non-Technical Summary

Wind Farm	No. of Turbines	Distance (km)	Maximum Blade Tip Height	Information
				Collision risks were calculated for peregrine (0.07), goshawk (0.02), hen harrier (0.02). Irregular numbers of wintering golden plover onsite (Dulas Ltd, 2022) ⁹² .
Application Submitted				
Bryngydfa	12	13.05 NNW	126.6	No ornithology information was publicly available at the time of writing the assessment.

8.273 Table 8.20 details that a collision risk value was detailed for a total of five further sites (Garn Fach: 2.61; Llandinam repowering: 1.24; Hendy: 1.447; Bryn Blaen: 1.45; and Bryn Titli: 2.3) which totals 9.047 and when considered in combination with the Site (10.306) combines to a total of 22.353. A NatureScot study (SNH, 2016)¹⁹ investigated the core ranges from breeding and wintering roost grounds for a number of species. The purpose of the study was to help to identify potential connectivity between proposals and SPAs. The study outlines the red kite has a core range of 4km with a maximum range of 6km (SNH, 2016)¹⁹. Of the eight sites, only four lie within 20km of the Site (Garreg Lwyd Hill, Garn Fach, Bryngydfa and Hendy) and only one (Hendy) lies within 10km of the Site. Given there is unlikely to any connectivity between populations over 10km for the Site, only the results for Hendy are considered relevant to this study. This results in a cumulative total of 11.753 (10.306 + 1.447). The cumulative figure shows a slight increase in the collision risk to the results for the Site (i.e. 10.306 to 11.753) and therefore the impacts on the red kite population are predicted to be on a similar level.

8.274 Table 8.20 details that a collision risk value was detailed for a total of two further sites for golden plover (Garn Fach: 7.89 (annual) and Hendy: 1.74 (winter only)) and when considered in combination with the Site (11.25) combines to a total of 20.88. A NatureScot study (SNH, 2016)¹⁹ investigated the core ranges from breeding and wintering roost grounds for a number of species. The purpose of the study was to help to identify potential connectivity between proposals and SPAs. The study outlines the golden plover has a core range of 4km with a maximum range of 13km (SNH, 2016)¹⁹. Of the eight sites, only one (Hendy) lies within the maximum range 13km of the Site. Given there is unlikely to any connectivity between populations over 13km for the Site, only the results for Hendy are considered relevant to this study. This results in a cumulative total of 12.99 (11.25 + 1.74). The cumulative figure shows a slight increase in the collision risk to the result assessed above for the Site (i.e. 11.25 to 12.99) and therefore the impacts on the wintering golden plover population are predicted to be a similar level.

Residual Cumulative Effects During Operation

8.275 As outlined above there is no change in the predicted effects in terms of collision risk during operation on red kite and wintering golden plover, both remain as minor and therefore not significant.

Summary of Effects

8.276 Table 8.21 below summarises the predicted effects of the Proposed Development on Ornithology.

Table 8.19 Summary of effects

Predicted Effect	Sensitivity	Magnitude	Embedded Mitigation	Significance	Additional Mitigation	Significance of Residual Effect
Construction						
Breeding/foraging goshawk displaced due to disturbance/habitat loss.	High NCI	Negligible and short-term	Appointment of ECoW. Pre-construction nest checks. Timing of works. CEMP.	Negligible and not significant		Negligible and not significant
Breeding/foraging hobby displaced due to disturbance/habitat loss.	High NCI	Negligible and short-term	Appointment of ECoW. Pre-construction nest checks. Timing of works. CEMP.	Negligible and not significant		Negligible and not significant

Predicted Effect	Sensitivity	Magnitude	Embedded Mitigation	Significance	Additional Mitigation	Significance of Residual Effect
Breeding/foraging peregrine displaced due to disturbance/habitat loss.	High NCI	Low and short-term	Appointment of ECoW. Pre-construction nest checks. Timing of works. CEMP.	Minor adverse and not significant		Negligible and not significant
Breeding/foraging red kite displaced due to disturbance/habitat loss.	High NCI	Negligible and short-term		Negligible and not significant	Appointment of ECoW. Pre-construction nest checks. Timing of works. CEMP.	Negligible and not significant

Predicted Effect	Sensitivity	Magnitude	Embedded Mitigation	Significance	Additional Mitigation	Significance of Residual Effect
Breeding/foraging nightjar displaced due to disturbance/habitat loss.	Medium NCI	Low and short-term	Appointment of ECoW. Pre-construction nest checks. Timing of works. CEMP.	Minor adverse and not significant		Negligible and not significant
Breeding/foraging quail displaced due to disturbance/habitat loss.	Medium NCI	Negligible and short-term	Appointment of ECoW. Pre-construction nest checks. Timing of works. CEMP.	Negligible and not significant		Negligible and not significant

Predicted Effect	Sensitivity	Magnitude	Embedded Mitigation	Significance	Additional Mitigation	Significance of Residual Effect
Wintering foraging/roosting golden plover displaced due to disturbance/ habitat loss.	Medium NCI	Low and short-term	Appointment of ECoW. CEMP.	Minor adverse and not significant		Minor adverse and not significant
Breeding bird assemblage displaced due to disturbance/habitat loss.	Medium NCI	Negligible and short-term	Appointment of ECoW. Pre-construction nest checks. Timing of works. CEMP.	Negligible and not significant		Negligible and not significant
Operation						
Breeding/foraging nightjar displaced due to operating turbines and/or habitat loss.	Medium NCI	Negligible and long-term		Negligible and not significant	Implementation of habitat management plan.	Negligible and not significant

Predicted Effect	Sensitivity	Magnitude	Embedded Mitigation	Significance	Additional Mitigation	Significance of Residual Effect
Wintering roosting/foraging golden plover displaced due to operating turbines and/or habitat loss.	Medium NCI	Negligible and long-term		Negligible and not significant	Implementation of habitat management plan.	Negligible and not significant
Breeding/foraging peregrine displaced due to operating turbines and/or habitat loss.	High NCI	Negligible and long-term	Pre-construction nest checks for maintenance work.	Negligible and not significant	Implementation of habitat management plan.	Negligible and not significant
Breeding/foraging red kite displaced due to operating turbines and/or habitat loss.	High NCI	Negligible and long-term	Pre-construction nest checks for maintenance work.	Negligible and not significant	Implementation of habitat management plan.	Negligible and not significant
Potential injury or mortality of foraging goshawk due to collision risk.	High NCI	Negligible and long-term		Negligible and not significant	Implementation of habitat management plan.	Negligible and not significant

Predicted Effect	Sensitivity	Magnitude	Embedded Mitigation	Significance	Additional Mitigation	Significance of Residual Effect
Potential injury or mortality of foraging hobby due to collision risk.	High NCI	Negligible and long-term		Negligible and not significant	Implementation of habitat management plan.	Negligible and not significant
Potential injury or mortality of foraging peregrine due to collision risk.	High NCI	Negligible and long-term		Negligible and not significant	Implementation of habitat management plan.	Negligible and not significant
Potential injury or mortality of foraging red kite due to collision risk.	High NCI	Medium and long-term		Moderate adverse and significant	Implementation of habitat management plan. Implementation of land management.	Minor adverse and not significant
Potential injury or mortality of foraging golden plover due to collision risk.	Medium NCI	Low and long-term		Minor adverse	Implementation of habitat management plan.	Minor adverse and

Predicted Effect	Sensitivity	Magnitude	Embedded Mitigation	Significance	Additional Mitigation	Significance of Residual Effect
						not significant
Breeding bird assemblage.	Medium NCI			Negligible	Implementation of habitat management plan.	Minor beneficial and not significant
Cumulative Construction						
N/A						
Cumulative Operation						
Potential injury or mortality of foraging red kite due to collision risk.	High NCI	Medium and long-term		Moderate adverse and significant	Implementation of habitat management plan. Implementation of land management.	Minor adverse and not significant

Predicted Effect	Sensitivity	Magnitude	Embedded Mitigation	Significance	Additional Mitigation	Significance of Residual Effect
Potential injury or mortality of foraging golden plover due to collision risk.	Medium NCI	Low and long-term		Minor adverse and not significant	Implementation of habitat management plan. Implementation of land management.	Minor adverse and not significant
Combined Construction						
N/A						
Combined Operation						
N/A						



**Nant Mithil
Energy Park Limited**

Environmental Statement

Chapter 9: Noise and Vibration



Chapter 9

Noise and Vibration

Introduction

9.1 This chapter considers the potential effects of the Proposed Development on neighbouring dwellings in respect of noise. It details the construction and operational noise assessment resulting from the Proposed Development.

9.2 The Noise and Vibration assessment was undertaken by Hoare Lea LLP and this chapter has been prepared by Bow Acoustics Limited on behalf of Hoare Lea LLP (see **Appendix 1.1: Statement of Expertise**).

9.3 This chapter is supported by the following figures in **Volume 2**:

- **Figure 9.1: Noise Measurement and Assessment Locations**
- **Figure 9.2: Noise Contour Plot**

9.4 This chapter is informed by, and should be read in conjunction with the following appendix, provided in **Volume 3**:

- **Appendix 9.1: Noise Assessment**

Scope of the Assessment

Effects Assessed in Full

9.5 The following effects were identified at the Scoping stage for consideration in this assessment:

- Noise and vibration effects during construction on noise-sensitive receptors:
 - The vehicle movements, provision and use of access tracks, cabling and upgrades to local roads; and,

- Blasting at borrow pit locations.
- Noise effects during operation on noise-sensitive receptors:
 - The turbines to be introduced as part of the Proposed Development; and,
 - The proposed substation.
- Cumulative noise effects during operation on noise-sensitive receptors:
 - The ‘in construction’ (constructed but not operational) Hendy wind farm located to the south-west of the Site.

Effects Scoped Out

9.6 Based on the desk and field survey work undertaken, the professional judgement of the EIA team, experience from other relevant projects and policy guidance or standards, and feedback received from consultees, the following topic areas have been ‘scoped out’ of detailed assessment, as proposed in the Scoping Report:

- Construction activities associated with offsite works;
- Operational vibration from the wind turbines;
- Road traffic noise during the operation of the Proposed Development;
- Infrasound and Low frequency noise; and,
- Decommissioning effects (as it is considered that effects will be no greater than for construction).

9.7 Relevant evidence and guidance on operational vibration, infrasound and low frequency noise is provided in **Appendix 9.1**.

Assessment Methodology

Legislation and Guidance

Legislation and Policy

9.8 The assessment is carried out in accordance with the following legislation and policy documentation:

- The Town and Country Planning (Environmental Impact Assessment) Regulations (2017)¹;
- Future Wales – The National Plan 2040 (2021)²;
- Noise and Soundscape Plan for Wales (2023)³;
- Planning Policy Wales – Edition 12 (February 2024)⁴;
- Technical Advice Note (TAN) 11 – Noise (1997)⁵;
- Minerals Technical Advice Note (MTAN) Wales 1: Aggregates (2004)⁶;
- Powys Local Development Plan 2011-2026 (2018)⁷; and,
- Designing for Renewable Energy in Wales (2023)⁸.

9.9 A description of these policy documents and their relevance to noise is provided in **Appendix 9.1**.

Guidance

9.10 This assessment is carried out in accordance with the principles contained within the following documents:

¹ Welsh Government (2017) The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017

² The Welsh Government (2021) Future Wales: The National Plan 2040

³ The Welsh Government (2023) Noise and Soundscape Plan for Wales 2023 to 2028

⁴ The Welsh Government (2024) PPW12, Planning Policy Wales (Edition 12)

⁵ The Welsh Government (1997) Technical Advice Note 11: Noise (TAN11)

⁶ The Welsh Government (2004) Minerals Technical Advice Note Wales 1: Aggregates (MTAN1)

⁷ Powys Council (2018) Local Development Plan

⁸ Welsh Government (2023) Designing for Renewable Energy in Wales

- ETSU-R-97, The Assessment and Rating of Noise from Wind Farms (1996)⁹;
- A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise (May 2013)¹⁰;
- BS 5228 Code of Practice for Noise and Vibration Control on Construction and Open Sites (2014)¹¹;
- BS 4142 Methods for Rating and Assessing Industrial and Commercial Sound (2019)¹²;
- BS 6472-2 Guide to Evaluation of Human Exposure to Vibration in Buildings Blast-induced Vibration¹³;
- Developments of National Significance Guidance: Procedural Guidance. Appendix 3: Environmental Impact Assessment (2019)¹⁴; and
- Institute of Environmental Management and Assessment (IEMA) (2014). Guidelines for Environmental Noise Impact Assessment¹⁵.

9.11 Set out below is a summary of these guidance documents and their relevance to noise, further detail is provided in **Appendix 9.1**.

9.12 The ETSU-R-97 assessment procedure and associated Good Practice Guide (GPG) specifies that noise limits should be set relative to existing background noise levels at the nearest noise sensitive receptors (NSRs) and that these limits should reflect the variation in both turbine source noise and background noise with wind speed.

9.13 Separate noise limits apply for the daytime and night-time which equate to a lower fixed limit or 5 dB above the prevailing background noise, whichever is greater. The lower fixed portion of the daytime noise limit is in the range of 35 dB(A) to 40 dB(A), the precise choice of

⁹ DTI (1996) ETSU-R-97, The Assessment and Rating of Noise from Wind Farms

¹⁰ Institute of Acoustics (2013) A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise

¹¹ BSI (2009 + 2014) BS 5228 Code of Practice for Noise and Vibration Control on Construction and Open Sites

¹² BSI (2014 + 2019) BS 4142 Methods for Rating and Assessing Industrial and Commercial Sound

¹³ BSI (2008) BS 6472-2 Guide to Evaluation of Human Exposure to Vibration in Buildings Blast-induced Vibration

¹⁴ The Welsh Government (2019), Developments of National Significance Guidance: Procedural Guidance. Appendix 3: Environmental Impact Assessment.

¹⁵ Institute of Environmental Management and Assessment (2014). Guidelines for Environmental Noise Impact Assessment.

value depends on several factors as set out below and discussed further specifically for the Proposed Development in **Paragraph 9.42**:

- The number of noise-affected properties;
- The likely duration and level of exposure; and,
- The consequences of the choice on the potential power generating capability of the wind farm.

9.14 The lower fixed portion of the night-time noise limit recommended in ETSU-R-97 is 43 dB(A). The prevailing background noise level for the daytime is derived from noise data measured during the quiet daytime periods¹⁶ and, for the night-time from noise measured during 23:00 to 07:00 hours.

9.15 The exception to the setting of both the daytime and night-time lower fixed limits occurs in instances where a property occupier has a financial involvement in the Proposed Development^{17,18}. Where this is the case then the lower fixed portion of the noise limit at that property may be increased to 45 dB(A) during both the daytime and the night-time periods alike.

Consultation

9.16 In undertaking the assessment, consideration has been given to the Scoping Responses and other consultation which has been undertaken as detailed in **Table 9.1**. Consultation was undertaken with Powys County Council (PCC)'s Environmental Health Officers (EHO) and PCC's appointed noise consultant to discuss the approach to the assessment and background noise survey.

¹⁶ Quiet daytime periods are defined in ETSU-R-97 as: all evenings from 18:00 to 23:00, plus Saturday afternoon from 13:00 to 18:00, plus all day Sunday 07:00 to 18:00.

¹⁷ DTI (1996) ETSU-R-97, The Assessment and Rating of Noise from Wind Farms, p66

¹⁸ Institute of Acoustics (2013) A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise, Paragraph 3.2.10

Table 9.1 Consultation responses

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
PCC EHO and appointed noise consultant, Dick Bowdler 7 September 2022	Directly contacted via email/letter to agree general assessment method and background survey locations.	Letter provides an overview of the Proposed Development and sets out the basis of the noise assessment and potential background noise survey locations. See response below 31 March 2023.	This chapter is based on the methodology set out in the consultation letter, with consideration of the response as detailed below (see response below 31 March 2023).
PCC EHO and appointed noise consultant, Dick Bowdler 11 January 2023	Directly contacted via email/letter to advise background survey locations and details.	Letter provides a summary of the selected noise monitoring locations, equipment used and relevant factors considered during the background noise survey. See response below 31 March 2023.	This chapter reflects the information contained in the consultation letter, with consideration of the response as detailed below (see response below for 11 August 2023).
Planning and Environment	Formal Scoping Consultation	Advised to liaise with PCC's EHO to ensure matters that fall within their remit have been properly considered.	Paragraph 9.16 confirms the consultation with PCC. All other table entries detail consultation content.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Decision Wales (PEDW) 13 January 2023		Advised to consult directly with PCC to agree if any NSRs are to be disturbed during construction of the new bridge crossing of the River Wye. If any NSRs are near, then this element may need to be scoped into the ES in a proportionate manner.	The proposed bridge to cross the River Wye that was discussed during scoping no longer forms part of the Proposed Development and therefore, will not require assessment.
PCC EHO and appointed noise consultant, Dick Bowdler 31 March 2023	Letter in response to points raised in earlier consultation.	Assessment is to refer to Future Wales, PCC Local Development Plan, ETSU-R-97 and the GPG.	As set out in Paragraph 9.8 these have been considered.
		Any water noise should only be included at a level that is typical of all times of the year. Sites with water noise should not be used as proxy locations for other properties except where it is clear that conditions are similar.	Rainfall has been accounted for in the assessment, see Paragraphs 9.67 and 9.68 . Choice of monitoring locations and their representation took into account concerns regarding water noise influence which was minimised.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Cumulative impacts are to be assessed following guidance set out in ETSU-R-97, the GPG and in the article at P44 and following of the Acoustics Bulletin Vol 41-1, Jan/Feb 2016.	The methodology applied reflects the guidance provided in the listed documents with regard to cumulative noise assessments. In particular Paragraph 9.62 sets out the assumptions made regarding operational noise from the Hendy Wind Farm.
		Consideration is to be given to the description of any noise impacts and recent report by the consultancy WSP for the Department for Business, Energy & Industrial Strategy ¹⁹ .	The comments in the WSP report relate to planning policy in England which does not apply here. The current ES chapter sets out adverse impacts and their significance in line with relevant guidance in Welsh Planning Policy and the requirements of the EIA regulations.

¹⁹ BEIS (2023) A Review of Noise Guidance for Onshore Wind Turbines

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Construction noise levels should generally be kept significantly lower than normal threshold levels. Construction noise can be controlled by a Construction Environmental Management Plan (CEMP).	Predicted worst-case construction noise impacts are reported from Paragraph 9.83 , and are clearly lower than threshold values for significant impacts. The CEMP will include noise control measures.
		The ES is to provide details of the measures taken, by the consultant responsible for wind monitoring during the background noise survey, to ensure the accuracy of the SoDAR data.	The SoDAR was installed and managed by an appropriate professional, see Paragraph 9.31 .
PCC EHO and appointed noise consultant, Dick Bowdler 11 August 2023	Meeting and follow up correspondence to review background noise survey findings and discuss noise limits.	No concerns raised regarding the background survey. It was agreed with PCC that 40 dB L_{A90} is an appropriate value for the lower fixed portion of the daytime noise limit, provided that the value is also applied as the lower fixed portion of the	Paragraphs 9.13, 9.42 and 9.43 discuss the lower fixed portion of the noise limits. The value applied for night-time periods in the assessment is agreed with PCC and lower than that recommended in ETSU-R-97.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		night-time noise limit to avoid the risk of any increase in noise in the night.	
PCC EHO and appointed noise consultant, Dick Bowdler 7 November 2023	Email to advise on PCC's stance on noise limits for the camping pods near to the Warren.	PCC would like the noise limit for the overnight camping pods near to the Warren to reflect that of a normal residential dwelling.	As set out in Paragraphs 9.20, 9.44 and 9.50 , this assessment has considered the pods near to the Warren as noise-sensitive but with a reduced sensitivity to noise and therefore a specific criterion has been applied which is in line with policy on noise for residential dwellings at night.
PCC EHO and appointed noise consultant, Dick Bowdler 17 June 2024	Pre-application Review of the Noise Section (report)	The review agrees that the properties considered are representative and the background noise levels measured are suitable for most of the properties considered (except for camping pods near to the Warren). The measurements and predictions (including cumulative noise level assumptions) are in line	Noted agreement on these points and this chapter maintains that approach.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		with current good practice and that construction can be scoped out of the noise assessment.	
		The justifications for considering some properties as financially involved should be clarified.	The financially involved properties listed in Table 9.3 are all owned and occupied by individuals that are financially benefitting from the scheme.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Further discussion required regarding the status of the camping pods near to the Warren and the applicable background noise levels for these locations. Background noise level measurements at the Warren (influenced by water noise) may not be representative of those experienced at the camping pods near to the Warren.	See discussion below regarding the pods near to the Warren. The assessment at the pods has been revised to be based on background noise levels measured at Caebanal Farm, which is the second nearest property and which was not affected by water noise to the same extent as those measured at the Warren which were used previously.
		The review also argues that the significance of the impact is not sufficiently characterised in the noise chapter and that additional methods of assessing the impacts (in addition to ETSU-R-97) should be considered in the	The EIA Regulations require a description of significant impacts. This was done in this chapter for operational noise from wind turbines with reference the relevant method in ETSU-R-97. Additional descriptions are provided where effects are adverse but not significant and those which are negligible (see

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		assessment, such as research on health effects or comparison with background noise levels.	Paragraph 9.60). Based on the review of the Planning Policy Wales guidance, it is not considered appropriate or necessary to consider an additional assessment with other methods such as those proposed by Dick Bowdler.
		Noise conditions attached to any consent should include a penalty for Amplitude Modulation and a requirement to disclose operational modes of the turbines.	Noted and this will be considered further in progressing planning conditions for the project, including controls for Amplitude Modulation.
PCC EHO and appointed noise consultant, Dick Bowdler 24 July 2024	Memorandum on the subject of the camping pods near to the Warren.	Memorandum sets out the rationale for the Council considering the status of the pods to be residential. It argues that some precedents exist for camping spaces or caravans to be considered with the same or, in one case, more stringent noise limits as residential uses.	The cabins are designed to provide “basic overnight shelter” rather than extended stays and therefore have very limited outdoor space, with livestock present at times in the surrounding field. They are therefore closer in nature to shelters for temporary overnight use

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Predicted levels at some of the pods are above the criteria for night-time periods of 40 dB(A) agreed for residential properties. If an increase night-time limit of 43 dB(A) is applied, then arguably a day-time noise limits of 38 dB(A) would apply. Therefore, noise limits are exceeded and mitigation would be required.	by travellers rather than campsites. The transient, short-term recreational use of the pods means they are considered to have a reduced sensitivity to noise. The use of the minimum noise limit of 43 dB(A) defined in ETSU-R-97 for residential properties at night-time periods is therefore considered reasonable in this instance (rather than applying the more stringent noise limit of 38 or 40 dB(A)). The Applicant considers that the energy cost over the entire year involved with achieving a marginally reduced noise limit based on 40 rather than 43 dB(A) would be disproportionate given their proposed use.

Study Area

9.17 The study area for the assessment of operational noise has been defined in accordance with the GPG to include NSRs where the predicted cumulative wind farm noise immission level is greater than 35 dB $L_{A90,10min}$, at up to 10 m/s wind speed, and the Proposed Development contributes to this level. If noise immission levels from the Proposed Development are predicted to be within 10 dB of those from other relevant wind energy developments, the Proposed Development will be contributing to the overall wind turbine noise level.

9.18 Note that in the above, and subsequently in this assessment, the term ‘noise emission’ relates to the sound power level radiated from each wind turbine, whereas the term ‘noise immission’ relates to the sound pressure level (the perceived noise) at any receptor location due to the combined operation of all wind turbines on the Proposed Development. All wind farm noise immission levels in this report are presented in terms of the L_{A90} noise indicator in accordance with the recommendations of the ETSU-R-97 report, obtained by subtracting 2 dB(A) from the calculated L_{Aeq} noise levels based on the turbine sound power levels (see **Appendix 9.1** for more details and explanation of chapter-specific terminology).

9.19 The full list of NSRs considered in the assessment are included in **Appendix 9.1** and shown in **Figure 9.1**. **Table 9.2** below presents a summary of those residential receptors closest to the Proposed Development, the coordinates of their location and the nearest turbine. These receptors have been selected to show a representative assessment for groups of dwellings situated in the same general direction from the Proposed Development. The assessment has included receptors representative of other receptors that are in the same general direction but further from the Proposed Development, and does not consider every dwelling within the study area. This is in line with current best practice.

Table 9.2 Summary of residential noise assessment locations

NSR ID	NSR Name	Easting	Northing	Nearest Turbine, Distance (metres)
NSR02	Gwernargllwydd	315353	259875	T01, 980
NSR03	Cwm Farm	315452	264366	T21, 640

NSR ID	NSR Name	Easting	Northing	Nearest Turbine, Distance (metres)
NSR06	Upper Trewern	315429	262145	T12, 870
NSR07	New Trewern	315214	262084	T12, 1,090
NSR08	Llanevan	315681	261203	T05, 850
NSR09	The Warren	318320	260133	T07, 1,080
NSR10	Old Hall	316347	266699	T29, 780
NSR13	Gryliss	316648	259217	T03, 1,110
NSR15	Wern Fach	314783	264305	T21, 1,220
NSR18	Penllanlas	315147	263073	T14, 1,120
NSR27	Pye Corner	314395	260356	T01, 1,740
NSR28	Corn Hill	314695	260690	T01, 1,460
NSR33	1 and 2 Cwmygerwyn	318999	266950	T31, 730
NSR36	Graig	317199	267481	T29, 880
NSR40	Upper Penrhiw	315358	266043	T23, 880
NSR42	Caebanal Farm	317099	258780	T03, 1,470
NSR43	The Old Mill	315846	266963	T29, 1,320

9.20 In addition to the NSRs listed in **Appendix 9.1** and **Table 9.2** The Warren, New Radnor, has planning consent²⁰ for six ‘glamping pods’, separate eco-composting toilets but no other services or amenities, referred to as ‘the Pods’, on land between The Warren and the Proposed Development. Whilst the Pods are not residential dwellings, it is recognised that the occupants

²⁰ 20/1107/Ful Siting of 6 glamping pods including eco-composting toilets and associated works.

will be sensitive to noise. The Planning Statement submitted with the application for the Pods confirms that they will only be accessed by foot and are designed to be used by walkers, cyclists and horse-riders using the local public right of way network, principally for overnight stay as part of longer distance travel. Although they will be considered noise-sensitive in this chapter, they are considered separately (see **Paragraphs 9.91** and **9.97** for construction and operational noise impact respectively) and as having a reduced sensitivity to noise than the properties of **Table 9.2**.

9.21 A total of eight nearby NSRs are classified to be financially involved with the Proposed Development. These are listed in **Table 9.3**. Each of these properties is owned and occupied by an individual that is financially benefitting from the scheme.

Table 9.3 Financially involved locations

NSR ID	NSR Name	Easting	Northing
NSR01	Little Trewern	315289	262269
NSR02	Gwernargllwydd	315353	259875
NSR03	Cwm Farm	315452	264366
NSR04	Lower Cwm Farm	315343	264478
NSR06	Upper Trewern	315429	262145
NSR08	Llanevan	315681	261203
NSR17	Vronlace	315319	263112
NSR22	Treforgan	315872	266692

9.22 The study area for construction noise considers the NSRs closest to the construction works, including access tracks, onsite cabling, the substation and NSRs on public roads with respect to construction traffic.

Desk Based Research and Data Sources

9.23 The following data sources have informed the assessment:

- Ordnance Survey (OS) information and aerial mapping concerning the location of all NSRs in the vicinity of the Site;
- Turbine locations as defined in **Chapter 4: Project Description**;
- OS Terrain data;
- Manufacturer data for the Nordex N149 and N163 turbine and Hendy Wind Farm turbine source noise levels; and,
- Planning consent conditions for the Hendy Wind Farm (planning reference: P/2014/0672).

9.24 The Nordex N149 and N163 turbines have been selected for the noise assessment as representative of turbines that are currently available of the scale proposed.

Field Survey

9.25 A background noise survey was carried out at ten monitoring locations (ML) around the Site, as shown at **Figure 9.1** and listed in **Table 9.4**. The locations were chosen based on the preliminary turbine layout provided as part of the Scoping Report for the Proposed Development and with due regard to the existing Hendy Wind Farm. The monitoring locations were discussed with PCC (see **Table 9.1**) prior to the monitoring being undertaken as being representative of the background noise environment for the nearest residences to the Proposed Development. Minor alterations have been made as compared with that originally proposed, following visits to the area where the most appropriate locations could be determined and, in some cases, due to access issues. PCC were informed of the final survey locations (letter dated 11 January 2023, see **Table 9.1**) and confirmed they were suitable for the assessment of other residential properties (confirmed in meeting on 11 August 2023 and in June 2024 memo).

Table 9.4 Background noise monitoring locations

ID	Property	Easting	Northing
ML1	Graig	317203	267431

ID	Property	Easting	Northing
ML2	Great Trewern	315067	262451
ML3	Lower Cwm Farm	315342	264490
ML4	Rocks View	314346	261772
ML5	The Old Mill	315846	266963
ML6	The Warren	318305	260127
ML7	Upper Penrhiw	315357	266044
ML8	Vronlace	315244	263098
ML9	3 Cwmygerwen (Lethr Du Farm)	319176	266856
ML10	Caebanal Farm	317086	258843

9.26 The background noise monitoring exercise was conducted over a period of approximately four weeks. The equipment used for the survey comprised one Rion NL 31 and nine Rion NL 52 logging sound level meters and two Davis tipping-bucket rain gauges. All sound level meters were enclosed in environmental cases and continuous logging was undertaken at the required ten-minute averaging periods. Outdoor enhanced windshield systems were used to reduce wind-induced noise on the microphones and provide protection from rain. These windshield systems were supplied by the sound level meter manufacturer and maintain the required performance of the whole measurement system when fitted. The environmental enclosures provided an installed microphone height of approximately 1.2 to 1.5 metres above ground level, consistent with the requirements of ETSU-R-97 and the GPG.

9.27 The sound level meters were located on the wind farm side of the dwelling where possible, never closer than 3.5 metres from the façade of the property and as far away as was practical from obvious atypical localised sources of noise such as running water, trees or boiler flues.

9.28 All measurement systems were calibrated on their deployment on 18/19 October 2022, during an interim service visit two weeks later and upon collection of the equipment on 15/16 November 2022. No acoustically important²¹ (>0.5 dB(A)) drifts in calibration were found to have occurred on any of the systems.

9.29 The sound level meters logged the $L_{A90,10min}$ and $L_{Aeq,10min}$ noise levels continuously over the survey period, using Greenwich Mean Time (GMT) time reference. Wind data was measured by the SoDAR unit installed on the Site, which also logged using the same 10-minute periods and GMT reference. The rain gauges also logged using GMT reference and were installed at Great Trewern (south-west of the Site) and 3 Cwmygerwen (Lethr Du Farm) (north-east of the Site).

9.30 In accordance with the IOA GPG, the ten metre height wind speed data required by ETSU-R-97 was derived (or “standardised”) from measurements made at heights representative of the hub heights of the proposed turbines. This therefore accounts for potential effect of site-specific wind shear. Wind speeds were measured using the SoDAR at multiple heights, including 120m and 140m. Values of wind speed at a standardised height of ten metres were calculated from those measured by the SoDAR unit (“standardised wind speed”). Full details of the calculation method are given in **Appendix 9.1**.

9.31 The SoDAR wind monitor was installed by trained and experienced technicians from Dulas Ltd, an appropriate expert within the field, in an area with no obstructions that could affect the data (location NGR 316158 264657). It was near the top of a hill in an open grazing field with low level fencing and no trees or structures. The SoDAR remained in good working condition throughout the survey.

Construction Noise and Vibration

9.32 The assessment of construction effects is based on the project description as outlined in **Chapter 4** and further details are provided in **Appendix 9.1**. Unless otherwise stated, potential effects identified are negative.

²¹ Institute of Acoustics (2013) A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise, Paragraph 2.4.3

9.33 BS 5888-1 has been used as the appropriate reference for the method of calculation and assessment of construction noise effects. At this stage of a project it is not feasible to accurately specify exact construction techniques or locations where construction activity is likely to take place. Therefore, various assumptions have been made based on best practice and typical wind farm construction projects. The calculation follows Annex F of BS 5228-1 and assumes the following:

- Plant is operational for between 75% and 100% of the working day;
- There will be no screening effects;
- Propagation over mixed ground (50% hard 50% soft); and
- Construction activity is assumed to occur at a single point from receiver (closest point to the nearest receiver to represent a worst case).

9.34 The above assumptions are generally precautionary, as for example soft ground conditions will prevail in many cases, and distances will be larger in many cases, therefore lower noise levels will occur in practice for the majority of the construction programme. The calculated construction noise levels are compared with absolute noise limits for temporary construction activities which are commonly regarded as providing an acceptable level of protection from the short-term noise levels associated with construction activities, based on guidance from BS 5228-1.

9.35 Rock extraction from borrow pits by means of blasting operations could be required and has been included in the assessment. Blasting operations can generate airborne pressure waves or “air overpressure” which contains both audible (approximately 20 Hz to 20 kHz) and infrasonic pressure waves (<20 Hz), which, although outside the range of human hearing, can sometimes be felt. The relevant guidance documents advise controlling air overpressure with good practices during the setting and detonation of charges as opposed to absolute limits on the levels produced; therefore, no absolute limits for air overpressure or noise from blasting can be presented in the assessment. Other site activity associated with quarrying, such as stone crushing and the operation of plant including excavators, breakers and conveyors have been included in the noise assessment.

9.36 In accordance with the guidance in BS 6472 and Minerals Technical Advice Note (Wales) 1 (MTAN1)²², ground vibration caused by blasting operations will be considered acceptable if peak particle velocity (PPV) levels, at the nearest sensitive locations, do not exceed 6 mm/s for 95% of all blasts measured over any 6-month period, and no individual blast exceeds a PPV of 10 mm/s. This is best controlled in practice through onsite testing processes with progressively increased charges.

9.37 Separate consideration is also given to the possible noise effects of construction-related traffic passing to and from the Site along local surrounding roads. In considering potential noise levels associated with construction traffic movement on public roads, reference is made to the accepted UK prediction methodology provided by the Calculation of Road Traffic Noise (CRTN)²³.

9.38 Road traffic data has been provided for roads used by construction vehicles which represents the Average Annual Weekday Total (AAWT) two-way flows between the hours of 06:00 and 24:00 for the worst-case period of construction. The full prediction given in CRTN results in an absolute road traffic noise level at a receiver location. For the purpose of this assessment, it is the change in road traffic noise which is relevant and not the absolute level. This has been considered by calculating the Basic Noise Level (BNL) with corrections for heavy vehicles and low flow as described in CRTN. This is considered acceptable to provide a reasonable estimate of the likely change in road traffic noise. For any roads considered with a traffic flow below the applicability threshold of CRTN (1000 vehicles per day), the haul route method specified in BS5228-1 has been used.

Operational Noise

9.39 The assessment of operational effects is based on **Chapter 4** and further details are provided in **Appendix 9.1**, including all relevant information relating to the candidate turbine. **Appendix 9.1** also details the assumptions made regarding the Hendy Wind Farm. Unless otherwise stated, potential effects identified are negative.

²² National Assembly for Wales (2004) Mineral Planning Policy (Wales), Minerals Technical Advice Note (Wales) 1: Aggregates

²³ Department of Transport Welsh Office (1988) Calculation of Road Traffic Noise

9.40 The ISO 9613-2 model²⁴ has been used to calculate the noise immission levels at the NSRs as advised in the GPG. The model accounts for the attenuation due to geometric spreading, atmospheric absorption, and barrier and ground effects and assumes the following parameters:

- Octave band data which accounts for the sound frequency characteristics of the turbines;
- Receiver height of 4m above local ground;
- Mixed ground ($G=0.5$ or 50% hard 50% soft);
- An air absorption based on a temperature of 10°C and 70% relative humidity;
- Attenuation due to terrain screening has been limited to a maximum of 2 dB(A); and
- In situations of propagation above concave ground, a correction of +3 dB was added.

9.41 The above method is consistent with the recommendations of the GPG. The GPG also allows for directional effects to be taken into account within the noise modelling which can reduce the noise immission level at a receptor. However, predictions have been made assuming downwind propagation from every turbine to every receptor at the same time as a worst case.

9.42 As set out in **Paragraph 9.13**, the lower fixed portion of the daytime noise limit should lie within the range of 35 dB L_{A90} and 40 dB L_{A90} . In the case of the Proposed Development, there are very few NSRs that will be downwind of the turbines under the prevailing south-westerly wind direction. Therefore, under prevailing conditions, the majority of the NSRs will be upwind, or in a cross-wind direction relative to the turbines. The wind farm noise immission level at an upwind receiver can be as much as 10 dB(A) to 15 dB(A) lower, and for a cross-wind receiver at least 2 dB(A) lower, than the level predicted using the ISO 9613-2 model. A value for the fixed portion of the daytime noise limit of 40 dB L_{A90} has been applied as appropriate due to the small number of affected properties (particularly to the east), the duration and level of exposure and the large generation capacity of the Proposed Development (nationally significant).

9.43 During consultation, the fixed portion of the noise limit was discussed and it was agreed with PCC, for the reasons stated above, that it will be appropriate to use a value of 40 dB L_{A90}

²⁴ ISO (1996) Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation

during the daytime for residential properties, provided that immission levels did not increase notably during the night-time period. The lower fixed portion of the night-time noise limit is normally set in ETSU-R-97 at 43 dB LA90, as discussed in **Paragraph 9.14**. For the case of the Proposed Development the lower fixed portion of the noise limit for both the daytime and the night-time has been set at 40 dB LA90 for residential properties to avoid any potential increase in noise at night, as agreed in consultation with PCC.

9.44 There are two exceptions to the lower fixed portion of the noise limit discussed above. The first is when a property occupier has a financial involvement in the Proposed Development, as listed in **Table 9.3**. Where this is the case then the lower fixed portion of the noise limit at that property may be increased to 45 dB LA90 during both the daytime and the night-time periods alike. The second exception are the Pods discussed in **Paragraph 9.20**. As set out subsequently in **Paragraph 9.50**, the applicable fixed part of the noise limit is based on protecting amenity overnight, for which ETSU-R-97 advises an appropriate value of 43 dB LA90.

9.45 In addition to operational noise from the turbines, noise from the operation of the substation has been assessed. The main noise sources associated with the substation are likely to be the power transformers and their cooling fans. The transformer noise is generally fairly constant, once energised, whereas the cooling fans operate as needed, depending on load and ambient temperature. The noise from the transformers is usually tonal in nature with most energy contained within discrete frequency components at 100 Hz and harmonics thereof. The cooling fans are likely to be broad-band in nature but switch on and off.

9.46 The proposed substation is located approximately 760m from the nearest residential property, Gryliss. The specifications of the transformers likely to be used for the substation are not defined at this stage; therefore, it is assumed that there will be two transformers, each with a sound power level of 85 dB(A), based on experience of typical installations for energy parks of this scale and representative manufacturer data considered by the Applicant.

9.47 The operational noise from the substation has been predicted at the nearest residential property following the methodology set out in ISO 9613-2. The substation operational noise level predictions have been undertaken using a receiver height of four metres above local ground level, soft ground (G=1) and an air absorption based on a temperature of 10°C and 70%

relative humidity. No allowance has been included for screening provided by terrain or intervening buildings.

9.48 In accordance with the method described in BS 4142 a correction, based on professional judgement, for the potential acoustic features has also been included to provide the 'rating level'. Corrections can be applied for tonal, impulsive and/or intermittent characteristics that have the potential to lead to increased awareness of a sound. As a precaution, +2 dB has been included for a tone that is just perceptible. The 'rating level' is compared against the typical background noise levels to estimate the likely impact. An essential part of the BS4142 assessment is to consider the context of the Proposed Development in the surrounding area, which has been taken into account through the consideration of several factors including the absolute level of the noise, as discussed further in **Paragraph 9.57**.

Assessing Significance

Sensitivity

9.49 With the only exception of the Pods, the relevant NSRs within the assessment area are dwellings, which are of high sensitivity. This applies to both construction and operational noise.

9.50 As discussed in **Paragraph 9.20**, the Pods are not dwellings, but are sensitive to noise, with a reduced (medium) sensitivity.

Magnitude

9.51 BS 5228-1 informative Annex E provides example criteria that may be used to consider the magnitude of any construction noise impacts. The criteria do not represent mandatory limits but rather a set of example approaches intended to reflect the type of methods commonly applied to construction noise. The example methods are presented as a range of possible approaches (both facade and free field noise levels, hourly and day-time averaged noise levels) according to the ambient noise characteristics of the area in question, the type of development under consideration, and the expected hours of construction activity. In broad terms, the example criteria are based on a set of fixed limit values which, if exceeded, may result in a large impact unless ambient noise levels (i.e. regularly occurring levels without construction) are sufficiently high to provide a degree of masking of construction noise.

9.52 Based on the range of guidance values set out in BS 5228 Annex E and MTAN1, the following impact assessment scale has been derived. The values have been chosen in recognition of the relatively low ambient noise typically observed in rural environments. The presented criteria have been normalised to free-field day time noise levels occurring over a time period, T, equal to the duration of a working day on site. BS 5228-1 Annex E provides varied definitions for the range of day time working hours which can be grouped for equal consideration. The values presented in **Table 9.5** have been chosen to relate to day time hours from 07:00 to 19:00 on weekdays, and 07:00 to 13:00 on Saturdays.

Table 9.5 Magnitude criteria for construction noise

Magnitude	Noise Level dB $L_{Aeq, T}$		Description
	4 weeks or more	Up to 4 weeks	
High	>75	>85	Trigger level for noise insulation works, or costs thereof, as set out in E.4 of BS 5228 1.
Medium	>65 ≤75	>75 ≤85	Most stringent threshold values for potential significant effects given in Annex E of BS 5228-1 for example methods relevant to Proposed Development is exceeded.
Low	>55 ≤65	>65 ≤75	Noise is likely to be audible, but unlikely to change behaviour. Of BS 5228-1 thresholds not exceeded.
Negligible	≤55	≤65	At least 10 dB below the most stringent criteria provided in of BS 5228-1.

9.53 When considering the impact of short-term changes in traffic associated with the construction activities on existing roads in the vicinity of the Proposed Development, reference

can be made to the criteria set out in the Design Manual for Roads and Bridges (DMRB)²⁵, as summarised in **Table 9.6**. The change in noise level is calculated using the CRTN methodology to compare HGV corrected Basic Noise Level (BNL) with and without construction traffic, as described in **Paragraph 9.38**.

Table 9.6 Magnitude criteria for construction traffic

Magnitude	Definition
High	Change in HGV corrected BNL of 5 dB or greater.
Medium	Change in HGV corrected BNL of at least 3 dB and less than 5 dB.
Low	Change in HGV corrected BNL of at least 1 dB and less than 3 dB.
Negligible	Change in HGV corrected BNL of less than 1 dB.

9.54 Operational noise effects have been determined following ETSU-R-97 and the GPG, which if they do not exceed noise limits derived following the same guidance, whilst potentially adverse, are considered to be not significant in EIA terms.

9.55 ETSU-R-97 noise limits of 40 dB, or 5 dB above prevailing background, whichever is greater have been applied for residential properties such as those of **Table 9.2**. These limits apply during the daytime and night-time periods and are below those recommended in ETSU-R-97 for the night-time period of 43 dB or 5 dB above background.

9.56 Whilst not residential, it is considered reasonable to consider protection of night-time noise levels experienced at the Pods. The lack of indoor and outdoor amenity and the clear intention for their use to be for an over-night stay, suggests any one occupant will not be expected to spend any length of time during the day at a Pod. Therefore, an ETSU-R-97 limit of 43 dB, or 5 dB above prevailing background, whichever is greater, has been applied at the Pods, which is in line with the recommendations in ETSU-R-97 for a dwelling during the night-

²⁵ Welsh Government (2020) Design Manual for Roads and Bridges – LA 111 Noise and Vibration

time period. Whilst these limits are aimed to protect noise levels at the Pods during the night-time, these limits will apply 24 hours a day.

9.57 Noise from the operation of the substation has been assessed using the methodology in BS 4142, which compares the ‘rating level’ from the specific source with typical baseline background noise levels in the context of the Proposed Development. An important factor when considering the context is the absolute level of sound, where it is stated in BS4142 that “*Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night*”. The standard offers no guidance about what background and rating levels are considered low; however, the 1997 version of the standard stated that background sound levels below around 30 dB LA90, and rating levels below around 35 dB LA_r, were considered very low and therefore outside the scope of the assessment method.

9.58 **Table 9.7** sets out the magnitude of criteria for operational noise impacts from the substation, based on the above considerations.

Table 9.7 Magnitude criteria substation operational noise

Magnitude	Definition
High	Rating level exceeds background by 10 dB or more, and is greater than 35 dB.
Medium	Rating level exceeds background by 5 dB to 10 dB, and is greater than 35 dB.
Low	Rating level exceeds background, by a maximum of 5 dB, or is less than 35 dB.
Negligible	Rating level equal to, or less than, background and less than 35 dB.

Significance

9.59 The predicted significance of the effect was determined through a standard method of assessment based on professional judgement, considering both sensitivity and magnitude of change as detailed in **Table 9.8** below. As discussed in **Paragraph 9.49**, all residential

receptors have an equal sensitivity of 'High' and the Pods have 'Medium' sensitivity. Major and moderate effects are considered significant in the context of the EIA Regulations.

Table 9.8 Significance criteria

Magnitude of Impact	Significance of Effect for Receptor Sensitivity	
	High Sensitivity	Medium Sensitivity
High	Major	Moderate
Medium	Moderate	Minor
Low	Minor	Minor
Negligible	Negligible	Negligible

9.60 The assessment of the significance of effects from operational and cumulative wind turbine noise is made as follows, with reference to ETSU-R-97 and Welsh Planning Guidance:

- For receptors outside the study area, with predicted levels below the lowest ETSU-R-97 noise limit of 35 dB(A), the effects are considered negligible and not significant;
- Where operational and cumulative operational noise levels at receptors within the study area are below the relevant ETSU-R-97 noise limits, this is determined to be adverse but 'not significant'; and
- Where operational and cumulative operational noise levels at receptors are above the relevant ETSU-R-97 noise limits, this is determined to be adverse and 'significant'.

Assessment Limitations

9.61 For operational noise, the exact model of turbine to be used at the Site will be the result of a future tendering process and therefore, indicative turbine models (Nordex N149 and N163 5.7MW) has been assumed for the operational noise assessment. The N163 was assumed for turbines T25, T26 and T28 only. The turbine models assumed are considered representative of the upper end of the range of noise emissions for turbines which may be installed at the Site. In

line with current good practice, a 2 dB uncertainty correction was added to the manufacturer data for this turbine model. This represents a representative worst-case for the basis of the operational noise analysis.

9.62 For the Hendy Wind Farm, robust assumptions of the potential noise emissions which may be allowed for that site under its consent were also considered in line with current good practice. As for the Nordex turbines, a 2 dB uncertainty was added to emission data for the REpower/Senvion MM82 turbine model (the model installed at Hendy Wind Farm). In addition, consideration has been given to any further uplift that could be applied to the Hendy Wind Farm turbines such that the consented noise limit is just met at any of the nearby properties. However, no further uplift could be applied to the noise emission data for Hendy Wind Farm without the predicted immission levels from Hendy Wind Farm at the Pye Corner NSR exceeding the consented noise limit for this property (as detailed in **Appendix 9.1**). This was agreed with PCC (see **Table 9.1**)

9.63 For construction noise and vibration, predicted noise levels are based on assuming standard machinery and equipment are used and that these are operated in the way intended by their manufacturers. It is also assumed, on a precautionary basis, that these items of equipment are all used at the closest point of the proposed works area to each of the receptor locations. These are considered to be a precautionary assumption, with noise/vibration levels lower than predicted for much of the construction period.

9.64 For the operational substation, although the final equipment selection and installation arrangements are not known, the assessment is based upon experience of similar schemes and typical associated noise emission levels.

Existing Conditions

Overview

9.65 The current baseline noise environment is described from **Paragraph 9.71. Appendix 9.1** provides further information and shows the range of wind conditions experienced during the noise survey period. During the quiet daytime and night-time periods wind speeds were of up to

11 m/s. The wind was observed to be directed from the south-west for the majority of the survey period, consistent with the typical prevailing wind direction for the UK.

9.66 **Appendix 9.1** also shows the results of the background noise measurements at each of the ten survey locations. The background noise data are presented in terms of $L_{A90,10min}$ background noise levels plotted as a function of standardised wind speed. Two plots are shown for each location, one for quiet daytime periods and the other for night-time periods, both derived in accordance with ETSU-R-97.

9.67 Data from all survey locations were inspected to identify periods which may have been influenced by extraneous noise sources, giving rise to atypical and elevated levels. ETSU-R-97 requires that any data affected by rainfall be excluded from the analysis. The rain gauges installed during the noise survey period were used to exclude those periods where rain was indicated.

9.68 In addition to the impact noise on surrounding vegetation and the sound level meter itself, in some environments rainfall can result in appreciable changes in background sound levels, for example as a result of wet roads which increase tyre noise emissions or dissipating flow noise in watercourses and drainage systems. The monitoring locations were also positioned as far as practically possible from any residential drainage systems, and watercourses to minimise any associated noise influence. Based on the above, rainfall is considered to have a limited effect on background sound levels. Periods affected by atypical levels of elevated background following rainfall were excluded as indicated in **Appendix 9.1**.

9.69 The measured background noise data may also have been increased by other extraneous sources or atypical events. Time histories of the noise levels at each survey location were therefore inspected to look for any atypical relationships when compared to the wind speeds present during that time. Any elevated levels found in this way were excluded. The trend of the data when plotted against wind speed was also inspected to look for atypical relationships or outliers within the data-set (particularly at low wind speeds) which were excluded. Any data removed from the analysis in this way is indicated on the charts included in **Appendix 9.1** as red circles. The analysis and filtering of the data was therefore undertaken in accordance with current good practice as set out in the GPG.

9.70 Hendy Wind Farm was not operating at the time of the baseline survey, therefore measured levels have not been influenced by any contribution from existing wind turbine noise, as required by ETSU-R-97 and the GPG.

Current Baseline

9.71 The current soundscape at NSRs located around the Site is noted to be typical for a rural environment, described by a mixed of natural sounds such as wind-induced vegetation, birdsong and animal activity together with localised sources from human activity and distant or local road traffic. Watercourses were also observed at some of the properties.

9.72 Following removal of extraneous data points, as described in **Paragraphs 9.67 to 9.69**, best fit lines were generated using a polynomial fit of a maximum of 4th order, as summarised in **Table 9.9** and **Table 9.10**, for the daytime and night-time respectively for each monitoring location. As advised above, background noise data was measured during windspeed of up to 11 m/s, so data is provided in **Table 9.9** and **Table 9.10** up to this value. For locations where data is limited at higher wind speeds, the background noise level for the highest included wind speed has been used to inform the noise limit at this point and all wind speeds above. The use of such data caps is in accordance with the GPG.

Table 9.9 Daytime measured background noise levels

Property	Background Noise Level, dB LA90, for Standardised Wind Speed, m/s							
	4	5	6	7	8	9	10	11
Graig	25	27	30	32	35	38	41	43
Great Trewern	28	29	30	31	33	37	42	49
Lower Cwm Farm	31	32	33	34	36	39	43	49
Rocks View	29	29	29	29	31	34	38	45
The Old Mill	33	34	34	34	35	36	38	40
The Warren	24	29	33	37	40	41	41	41

Property	Background Noise Level, dB LA90, for Standardised Wind Speed, m/s							
	4	5	6	7	8	9	10	11
Upper Penrhiw	27	29	30	33	35	38	42	46
Vronlace	28	28	30	32	35	38	43	49
3 Cwmygerwen	31	32	33	34	35	37	38	40
Caebanal Farm	30	31	32	33	35	37	40	42

Table 9.10 Night-time measured background noise levels

Property	Background Noise Level, dB LA90, for Standardised Wind Speed, m/s							
	4	5	6	7	8	9	10	11
Graig	22	25	27	30	33	36	40	44
Great Trewern	28	28	28	30	32	34	38	42
Lower Cwm Farm	30	30	31	33	35	37	40	44
Rocks View	25	25	25	26	28	31	35	39
The Old Mill	34	34	34	34	34	35	37	39
The Warren	36	37	37	37	37	37	37	37
Upper Penrhiw	27	28	30	32	34	37	41	45
Vronlace	26	27	28	30	32	35	38	42
3 Cwmygerwen	32	33	33	33	34	35	37	41
Caebanal Farm	20	22	24	26	29	32	35	39

9.73 The data obtained from the ten survey positions has been used to represent the background environment expected to occur at other nearby assessment locations. This approach is discussed in more detail in **Appendix 9.1** and is consistent with the guidance provided by ETSU-R-97 and current good practice as set out in the IOA GPG.

9.74 The background noise levels are then used to set appropriate noise limits at each of the assessment locations for the daytime and night-time periods as summarised in **Table 9.11** and **Table 9.12** respectively. These limits are based on a fixed lower limit of 40 dB(A) for daytime and night-time periods. The choice of the daytime fixed lower limit in the range of 35 to 40 dB(A) is justified in Section 5.7 of **Appendix 9.1** as summarised in **Paragraph 9.42**, on the basis of the relevant factors set out in ETSU-R-97: the number of noise-affected properties, the likely duration and level of exposure and the potential power generating capability of the Proposed Development. This was also discussed and agreed in consultation with PCC. For financially involved properties, the minimum noise limit was increased to 45 dB for both day and night-time periods. The noise limit applicable to the Pods is fixed at 43 dB L_{A90} for all wind speeds.

Table 9.11 Summary of ETSU-R-97 daytime noise limits for selected properties

NSR ID	NSR Name	ETSU-R-97 Noise Limit dB L_{A90} for Standardised Wind Speed, m/s							
		4	5	6	7	8	9	10	11+
NSR02	Gwernargllwydd	45	45	45	45	45	45	45	50
NSR03	Cwm Farm	45	45	45	45	45	45	48	54
NSR06	Upper Trewern	45	45	45	45	45	45	47	54
NSR07	New Trewern	40	40	40	40	40	42	47	54
NSR08	Llanevan	45	45	45	45	45	45	47	54
NSR09	The Warren	40	40	40	42	45	46	46	46
NSR10	Old Hall	40	40	40	40	40	41	43	45

NSR ID	NSR Name	ETSU-R-97 Noise Limit dB L _{A90} for Standardised Wind Speed, m/s							
		4	5	6	7	8	9	10	11+
NSR13	Gryliss	40	40	40	40	40	40	43	50
NSR15	Wern Fach	40	40	40	40	41	44	48	54
NSR18	Penllanlas	40	40	40	40	40	43	48	54
NSR27	Pye Corner	40	40	40	40	40	40	43	50
NSR28	Corn Hill	40	40	40	40	40	40	43	50
NSR33	1 and 2 Cwmygerwyn	40	40	40	40	40	42	43	45
NSR36	Graig	40	40	40	40	40	43	46	48
NSR40	Upper Penrhiw	40	40	40	40	40	43	47	51
NSR42	Caebanal Farm	40	40	40	40	40	42	45	47
NSR43	The Old Mill	40	40	40	40	40	41	43	45

Table 9.12 Summary of ETSU-R-97 night-time noise limits for selected properties

NSR ID	NSR Name	ETSU-R-97 Noise Limit dB L _{A90} for Standardised Wind Speed, m/s							
		4	5	6	7	8	9	10	11+
NSR02	Gwernargllwydd	45	45	45	45	45	45	45	45
NSR03	Cwm Farm	45	45	45	45	45	45	45	49
NSR06	Upper Trewern	45	45	45	45	45	45	45	47
NSR07	New Trewern	40	40	40	40	40	40	43	47

NSR ID	NSR Name	ETSU-R-97 Noise Limit dB L _{A90} for Standardised Wind Speed, m/s							
		4	5	6	7	8	9	10	11+
NSR08	Llanevan	45	45	45	45	45	45	47	54
NSR09	The Warren	41	42	42	42	42	42	42	42
NSR10	Old Hall	40	40	40	40	40	40	42	44
NSR13	Gryliss	40	40	40	40	40	40	40	44
NSR15	Wern Fach	40	40	40	40	40	42	45	49
NSR18	Penllanlas	40	40	40	40	40	40	43	47
NSR27	Pye Corner	40	40	40	40	40	40	40	44
NSR28	Corn Hill	40	40	40	40	40	40	40	44
NSR33	1 and 2 Cwmygerwyn	40	40	40	40	40	40	42	46
NSR36	Graig	40	40	40	40	40	41	45	49
NSR40	Upper Penrhiw	40	40	40	40	40	42	46	50
NSR42	Caebanal Farm	40	40	40	40	40	40	40	40
NSR43	The Old Mill	40	40	40	40	40	40	42	44

Future Baseline in the Absence of the Proposed Development

9.75 Future baseline/background noise levels are not expected to change significantly in the absence of the Proposed Development. At some properties, when Hendy Wind Farm becomes operational, this would increase background noise levels in some weather conditions. However,

the ETSU-R-97 guidelines are clear that baseline levels on which the noise limits are based do not include a contribution from any existing turbine noise, to prevent unreasonable cumulative increases. The generalised noise sources found at dwellings neighbouring the Site, as listed at **Paragraph 9.71** are expected to remain the same in general terms.

Implications of Climate Change

9.76 The effects of climate change are not expected to significantly affect the baseline conditions found at the Site. The generalised noise sources found at dwellings neighbouring the Site, as listed at **Paragraph 9.71** will remain the same regardless. However, it is accepted that the effects of climate change may alter the timing of increased rainfall and the potential for relative drought during certain times of the year which, in turn, will affect the timing for which, higher or lower background noise levels should normally be expected without a change in climate. The background noise survey has been undertaken in a manner that minimises the influence of water flow in the current background noise environment, by placing equipment away from atypical extraneous sources of noise where possible, and by excluding data where water noise is obviously having a significant effect on the measured noise levels. Accordingly, it is considered that the baseline background noise levels will remain representative for the purposes of an ETSU-R-97 assessment when considering the potential effects of climate change.

Design Considerations (Embedded Mitigation)

9.77 Noise levels were calculated for progressive configurations of the Proposed Development and compared against the derived noise limits. Advice was provided to the design team, including confirmation that noise levels for the final layout complied with the ETSU-R-97 criteria, mainly due to the separation distances involved.

Micrositing

9.78 The proposed micrositing tolerance of 50m for turbines will correspond to potential differences in the wind turbine noise level of less than 0.5 dB(A) at any given property. A level change of this order will generally not alter the findings of this assessment with respect to

construction or operational noise. Irrespective of the degree of micro-siting employed (within the consented tolerance), noise immissions from the Proposed Development will still be required to meet the derived noise limits.

Good Practice Measures (Applied Mitigation)

9.79 In terms of operational noise generated by the Proposed Development, the turbine considered here includes for serrated trailing edge (STE) blade modifications, which have the effect of reducing source noise levels as compared with turbine blades that do not have such modifications. Turbines of the size and scale considered for the Proposed Development typically include this feature as a matter of course, and it is expected that the actual turbine for potential installation at the Site, should planning consent be granted, will have similar blade modifications. Nevertheless, noise associated with the operation of the Proposed Development will be required to meet any noise limits imposed by planning condition(s) in this respect, regardless of the specific design of turbine, and appropriate due diligence and/or further planning submissions will be required to ensure that this is the case.

9.80 To reduce the potential effects of construction noise, the following good practice measures are proposed and where appropriate are to be included in the CEMP:

- Those activities that may give rise to audible noise at the surrounding properties and heavy goods vehicle deliveries to the Site will be limited to the hours 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays. Turbine deliveries will only take place outside these times with the prior consent of PCC and the Police. Those activities that are unlikely to give rise to noise audible at the site boundary may continue outside of the stated hours.
- All construction activities shall adhere to good practice as set out in BS 5228-1.
- All equipment will be maintained in good working order and any associated noise attenuation such as engine casing and exhaust silencers shall remain fitted at all times.
- Where flexibility exists, activities will be separated from residential neighbours by the maximum possible distances.
- Plant such as generators will cease operation when not required.

- A site management regime will be developed to control the movement of vehicles to and from the Site.
- Construction plant capable of generating significant noise and vibration levels will be operated in a manner to restrict the duration of the higher magnitude levels.

9.81 If blasting is used at the proposed borrow pits, the following additional measures will also be implemented through the CEMP:

- Blasting should take place under controlled conditions with the agreement of PCC.
- Good practices during the setting and detonation of charge should be followed, in order to control air overpressure, in line with guidance set out in MTAN1 and British Standard BS 5228-2.
- Vibration levels at the nearest sensitive properties are best controlled through onsite testing processes, with progressively increased charges, carried out in consultation with PCC. Ground vibration caused by blasting operations at the nearest sensitive locations, should not exceed 6 mm/s for 95% of all blasts measured over any 6-month period, and no individual blast exceeding a PPV of 10 mm/s.

9.82 An Outline CEMP is provided at **Appendix 4.2, Volume 3**. The detailed CEMP will be subject to approval by PCC under the terms of a suitably worded planning condition.

Assessment of Construction Effects

Predicted Construction Effects

9.83 **Appendix 9.1**, Section 5.1 provides details of the key construction activities, the associated types of plant normally involved, the expected worst-case sound power level over a working day for each activity, the property which will be closest to the activity for a portion of construction, and the predicted noise level. A summary of the key activities associated with the construction of the Proposed Development is below:

- Construct temporary site compounds;
- Upgrade existing access tracks;

- Construct new access tracks;
- Construction of the onsite substation;
- Construction of crane hardstandings and laydown/storage areas;
- Construction of turbine foundations at each turbine location ;
- Erection of turbines ;
- Excavation of trenches for laying electrical cable;
- The working of borrow pits (as required); and,
- Forestry felling around turbines and access tracks.

9.84 Activities associated with upgrade of existing tracks or construction of a new access route will occur at shorter distances to some properties. Most of the track upgrade work is likely to be relatively limited and completed in a very short time, in particular for properties such as Gwernargllwydd, and the predicted noise levels are likely to represent those for a very short-term period (less than one week) when activity is closest to these receptors. Noise levels will quickly diminish as this construction activity progresses, moving the activity further from the properties, with the impact similar in nature to road maintenance work. The short-term nature of this activity consequently categorises the impact to be of negligible magnitude at most.

9.85 Quarrying at borrow pit one is calculated to result in noise levels that will not exceed 56 dB at the nearest NSR, Grylliss. If this borrow pit is in use for four weeks or longer, this noise impact will be of low magnitude according to **Table 9.5**. All other construction activity, including quarrying at the more distant borrow pits two and three, were calculated to be associated with predicted levels below 55 dB L_{Aeq} which corresponds to a negligible magnitude (**Table 9.5**). An impact of low magnitude upon a receptor with high sensitivity gives a temporary minor effect, which is **not significant** in EIA terms.

9.86 Because of the difficulties in predicting noise and air overpressure resulting from blasting operations at onsite borrow pits, these activities are best controlled following the use of good practice during the setting and detonation of charges. Vibration associated with blasting is also best controlled through onsite testing processes. These measures are set out in **Paragraph 9.81**.

9.87 In addition to onsite activities, construction traffic passing to and from the Site will also represent a potential source of noise to surrounding properties. The peak of construction in terms of vehicular movements is reported in **Chapter 10: Access, Traffic and Transport** to occur in month seven and will compromise 344 daily journeys (82 light vehicles and 262 HGVs).

9.88 A total of 15 roads have been included in the construction traffic noise assessment, Table 8 and Table 9 of **Appendix 9.1** summarise the traffic data used and the increase in traffic noise levels due to construction vehicles. One road, the A44 near to the site access, is predicted to increase in traffic noise by just under 2 dB during month 7, all other roads will increase in traffic noise by less than 1 dB during this busiest month. An increase in traffic noise of 2 dB is of low magnitude and an increase of less than 1 dB is of negligible magnitude (see **Table 9.6**).

9.89 The A44 east of the A44/A481 junction currently has a total daily vehicle flow of less than 1,000 and as set out in **Paragraph 9.38**, the haul route method of BS5228-1 has been used to calculate the noise level from construction vehicles. At a nominal distance of 10 m from the road, construction traffic noise is calculated not to exceed 64 dB which is of low magnitude of impact (see **Table 9.5**).

9.90 An impact of low magnitude upon a receptor with high sensitivity results in a minor significant effect and will be **not significant** in EIA terms.

9.91 In addition to the above impacts upon dwellings, construction noise levels at the Pods have been calculated to not exceed 52 dB L_{Aeq} as detailed in **Appendix 9.1**. This corresponds to a negligible magnitude of impact according to **Table 9.5**. A negligible impact upon a medium-sensitive receptor results in a negligible effect and will be **not significant** in EIA terms.

Proposed Mitigation (Additional Mitigation) and Compensation

9.92 The construction noise impacts are predicted to be not significant. Therefore, no additional mitigation will be required.

Residual Construction Effects

9.93 As discussed above, noise resulting from the construction of the Proposed Development is expected to meet typical noise limits for activities of this type without any specific mitigation

being required, corresponding to a temporary minor adverse effect. As a result, the residual effect remains as **not significant**.

Assessment of Operational Effects

Predicted Operational Effects

9.94 The assessment of operational noise is summarised below and presented in full in **Appendix 9.1**. Predictions of operational wind turbine noise for the Proposed Development in isolation at the residential assessment locations are summarised in **Table 9.13**, shown in full in Table 10 of **Appendix 9.1** and shown in **Figure 9.2**.

Table 9.13 Summary of predicted Proposed Development operation noise immission levels for selected properties

NSR ID	NSR Name	Proposed Development Immission dB LA90 for Standardised Wind Speed, m/s						
		4	5	6	7	8	9	10+
NSR02	Gwernargllwydd	28	33	37	37	37	37	37
NSR03	Cwm Farm	32	37	41	42	42	42	42
NSR06	Upper Trewern	31	36	40	40	40	40	40
NSR07	New Trewern	30	35	39	39	39	39	39
NSR08	Llanevan	32	37	41	41	41	41	41
NSR09	The Warren	29	34	38	38	38	38	38
NSR10	Old Hall	31	36	40	40	40	40	40
NSR13	Gryliss	28	33	37	38	38	38	38
NSR15	Wern Fach	29	33	37	38	38	38	38

NSR ID	NSR Name	Proposed Development Immission dB LA90 for Standardised Wind Speed, m/s						
		4	5	6	7	8	9	10+
NSR18	Penllanlas	29	34	38	38	38	38	38
NSR27	Pye Corner	26	31	35	35	35	35	35
NSR28	Corn Hill	28	33	37	37	37	37	37
NSR33	1 and 2 Cwmygerwyn	30	35	39	39	39	39	39
NSR36	Graig	31	36	40	40	40	40	40
NSR40	Upper Penrhiw	30	35	39	40	40	40	40
NSR42	Caebanal Farm	26	30	34	35	35	35	35
NSR43	The Old Mill	28	32	36	37	37	37	37

9.95 ETSU-R-97 requires consideration of cumulative wind turbine noise levels when assessing against appropriate noise limits. The Proposed Development noise levels were added to predictions from the Hendy Wind Farm (including robust assumptions, see **Paragraph 9.62**) providing a cumulative total wind turbine noise, as summarised in **Table 9.14** and listed in full in Table 12 in **Appendix 9.1**.

Table 9.14 Summary of predicted cumulative operation noise immission levels for selected properties

NSR ID	NSR Name	Proposed Development Immission dB LA90 for Standardised Wind Speed, m/s						
		4	5	6	7	8	9	10+
NSR02	Gwernargllwydd	30	35	39	39	39	39	39

NSR ID	NSR Name	Proposed Development Immission dB LA90 for Standardised Wind Speed, m/s						
		4	5	6	7	8	9	10+
NSR03	Cwm Farm	32	37	41	42	42	42	42
NSR06	Upper Trewern	31	36	40	40	40	40	40
NSR07	New Trewern	30	35	39	40	40	40	40
NSR08	Llanevan	32	37	41	41	41	41	41
NSR09	The Warren	29	34	38	38	38	38	38
NSR10	Old Hall	31	36	40	40	40	40	40
NSR13	Gryliss	29	33	38	38	38	38	38
NSR15	Wern Fach	29	34	38	38	38	38	38
NSR18	Penllanlas	29	34	38	39	39	39	39
NSR27	Pye Corner	30	35	39	40	40	40	40
NSR28	Corn Hill	30	35	39	40	40	40	40
NSR33	1 and 2 Cwmygerwyn	30	35	39	39	39	39	39
NSR36	Graig	31	36	40	40	40	40	40
NSR40	Upper Penrhiw	30	35	39	40	40	40	40
NSR42	Caebanal Farm	26	31	35	35	35	35	35
NSR43	The Old Mill	28	32	36	37	37	37	37

9.96 The comparisons undertaken confirm that the predicted (cumulative) wind turbine noise levels, as summarised in **Table 9.14**, are compliant with the relevant noise limits, as

summarised in **Table 9.11** for the daytime and **Table 9.12** for the night-time, at all assessment locations. The operational wind turbine noise from the Proposed Development can be considered as an adverse impact for those dwellings located closest; however, as the ETSU-R-97 noise limits are not exceeded, operational noise effects are considered to be **not significant**. For those dwellings located further away, outside the study area, operational wind turbine noise from the Proposed Development will be of negligible impact.

9.97 In addition to the assessment of operational wind turbine noise impacts at nearby dwellings, the Pods have also been assessed. The wind turbine noise immission levels at the Pods vary between 28-30 dB(A) at low wind speeds and 40-42 dB(A) at high wind speeds. These predictions are therefore lower than the relevant noise limit determined in line with ETSU-R-97, based on a fixed lower limit of 43 dB(A), as discussed in **Paragraph 9.44 and 9.74**.

9.98 Operational noise from the substation for the Proposed Development at the nearest NSR, Gryliss, is calculated to be less than 20 dB. When including a potential +2 dB penalty for the character of the noise, the resulting 'rating level' will be of no more than 22 dB(A). Background noise measurements were not measured at Gryliss; however, they were measured at several representative locations nearby. The measurement proxy location of Rocks View has been applied for Gryliss. It can be seen from **Table 9.10** that the typical background noise at this location is around 25 dB at low wind speeds during the night-time. When assessed against the criteria derived in **Table 9.7**, this will correspond to a negligible noise impact on a highly sensitive receptor, with negligible impacts at other properties located further away, and therefore result in a negligible effect which is **not significant**.

Proposed Mitigation (Additional Mitigation) and Compensation

9.99 The Proposed Development has been designed such that predicted operational noise levels associated with the Proposed Development can meet the limits derived in accordance with ETSU-R-97 without the need to curtail the operation of the turbines to reduce noise levels. However, as discussed in **Paragraph 9.79**, appropriate due diligence will need to be undertaken in respect of the actual turbine to be installed at the site such that the site-specific noise limits summarised in **Table 9.15** and listed in full in Table 17 of **Appendix 9.1** are achieved at the surrounding properties. These specific noise limits for the Proposed Development were derived by reducing the total ETSU-R-97 limits derived and accounting for the contribution of the Hendy

Wind Farm, in line with current good practice. A single limit is proposed based on the lowest of the resulting day-time and night-time noise limits, for simplicity.

9.100 Noise levels from the substation will be negligible at the nearest residential property. Therefore, no further mitigation will be required.

Residual Operational Effects

9.101 The operational noise assessment indicates that predicted turbine noise levels, based on the installation of an appropriate candidate turbine, can meet the requirements of ETSU-R-97 without the requirement for mitigation/curtailment. Appropriate control measures can be put in place through the imposition of planning conditions which will enforce this in practice.

9.102 At some locations, under some wind conditions and for a certain proportion of the time, the wind farm noise may be audible, which represents an adverse noise effect. However, the noise effect associated with the operation of the Proposed Development is considered to be **not significant**.

Assessment of Cumulative Effects

Predicted Cumulative Effects During Construction

9.103 There are no known construction projects that will result in any additional noise being received at neighbouring properties during the potential construction phase of the Proposed Development. As a result, this aspect is considered **not significant**.

Proposed (Additional) Mitigation

9.104 Due to the above, no further mitigation measures are prescribed.

Residual Cumulative Effects During Construction

9.105 There are no known construction projects that will result in any additional noise being received at neighbouring properties during the potential construction phase of the Proposed Development. As a result, this aspect is considered **not significant**.

Predicted Cumulative Effects During Operation

9.106 Cumulative operational noise effects are considered as an inherent part of the assessment methodology and are detailed in full in **Appendix 9.1**. Cumulative operational noise effects from the turbines when operating alongside Hendy Wind Farm has been incorporated into the assessment of the Proposed Development set out above. It was concluded that the cumulative operational noise levels at residential properties remain acceptable in line with ETSU-R-97 and are therefore **not significant**.

Proposed (Additional) Mitigation

9.107 Cumulative operational noise levels associated with the Proposed Development operating at the same time as the Hendy Wind Farm will meet the requirements of ETSU-R-97. Planning condition noise limits will be imposed on the Proposed Development, which will consider the existing noise limits for Hendy Wind Farm, such that overall noise levels will not breach the overall requirements of ETSU-R-97. Satisfactory control of cumulative noise immission levels will be achieved through enforcement of the individual consent limits for each of the individual wind farms. For Hendy Wind Farm, these have been set in the relevant conditions within its planning permission. For the Proposed Development, the relevant noise limits are those prescribed in Table 17 of **Appendix 9.1** and summarised below in **Table 9.15** for the nearest receptors, as set out in **Table 9.2**.

Table 9.15 Summary of site-specific noise limits for selected properties

NSR ID	NSR Name	Standardised Wind Speed (m/s), Site Noise Limit (dB LA90)						
		≤6	7	8	9	10	11	12
NSR02	Gwernargllwydd	45	45	45	45	45	45	45
NSR03	Cwm Farm	45	45	45	45	45	49	49
NSR06	Upper Trewern	45	45	45	45	45	47	47
NSR07	New Trewern	40	40	40	40	43	47	47

NSR ID	NSR Name	Standardised Wind Speed (m/s), Site Noise Limit (dB LA90)						
		≤6	7	8	9	10	11	12
NSR08	Llanevan	45	45	45	45	45	47	47
NSR09	The Warren	40	42	45	46	46	46	46
NSR10	Old Hall	40	40	40	40	42	44	44
NSR13	Gryliss	40	40	40	40	40	44	44
NSR15	Wern Fach	40	40	40	42	45	49	49
NSR18	Penllanlas	40	40	40	40	43	47	47
NSR27	Pye Corner	36	36	36	36	36	40	40
NSR28	Corn Hill	38	38	38	38	38	41	41
NSR33	1 and 2 Cwmygerwyn	40	40	40	40	42	46	46
NSR36	Graig	40	40	40	41	45	49	49
NSR40	Upper Penrhiw	40	40	40	42	46	50	50
NSR42	Caebanal Farm	40	40	40	40	40	40	40
NSR43	The Old Mill	40	40	40	40	42	44	44

Residual Cumulative Effects During Operation

9.108 The cumulative operational noise assessment indicates that predicted turbine noise levels for the Proposed Development, based on the installation of an appropriate turbine and using a conservative basis of assessment for Hendy Wind Farm, will meet the requirements of ETSU-R-97 without the requirement for mitigation/curtailment. Appropriate control measures can be put in place through the imposition of planning conditions which will help to ensure this

will be the case in practice. As a result, the cumulative operational noise effect associated with the Proposed Development is considered to be **not significant**.

Combined Effects

9.109 The potential for interrelationships between the noise effects associated with the Proposed Development and other disciplines are considered within **Chapter 15: Summary of Interrelated Cumulative Effects and Likely Significant Effects** of the ES. Information contained within **Chapter 10** has been used to inform the assessment of construction traffic noise.

9.110 Based on recent reviews of the available evidence (such as that of the World Health Organisation, 2018²⁶) the only potential health effect for which there is some evidence of a relationship with noise levels typically occurring in the vicinity of wind farm, is annoyance. However, given the proposed noise limits for the Proposed Development, which are in line with national guidelines, no significant effects are expected in terms of annoyance. There is no clear evidence for any other direct health effect associated with wind turbine noise. No significant health effects are therefore expected.

Further Survey Requirements and Monitoring

9.111 Should the Proposed Development be granted planning permission a suitably worded noise condition(s) will be attached to any permission that will require that operational noise monitoring is undertaken should complaints in respect of noise be received by the operator directly or via PCC.

Summary of Effects

9.112 **Table 9.12** below summarises the predicted effects of the Proposed Development on noise and vibration.

²⁶ World Health Organisation (2018) Environmental Noise Guidelines for the European Region

Table 9.16 Summary of effects

Predicted Effect	Sensitivity	Magnitude	Significance	Mitigation	Significance of Residual Effect
Construction					
Construction	High (dwellings)	Low adverse temporary	Not significant	None required	Not significant
Construction	Medium (the Pods)	Negligible	Not significant	None required	Not significant
Operation					
Operation	High (dwellings)	Adverse	Not significant	None required	Not significant
Operation	Medium (the Pods)	Adverse	Not significant	None required	Not significant
Cumulative Construction					
Cumulative Construction	High (dwellings)	Low adverse temporary	Not significant	None required	Not significant
Cumulative Construction	Medium (the Pods)	Negligible	Not significant	None required	Not significant
Cumulative Operation					
Cumulative Operation	High (dwellings)	Adverse	Not significant	None required	Not significant
Cumulative Operation	Medium (the Pods)	Adverse	Not significant	None required	Not significant



**Nant Mithil
Energy Park Limited**

Environmental Statement

Chapter 10: Access, Traffic and Transport



Chapter 10

Access, Traffic and Transport

Introduction

10.1 This chapter considers the potential effects of the Proposed Development on Access, Traffic and Transport. It describes/assesses the following:

- The existing access network and transport baseline;
- The assessment methodology and significance criteria used in completing the impact assessment;
- The potential effects, including direct, indirect and any potential cumulative effects;
- The mitigation measures proposed to address likely significant effects; and
- The residual effects remaining following the implementation of mitigation.

10.2 The assessment is based on the project description outlined in **Chapter 4: Project Description**. Offsite works to facilitate the movement of abnormal loads will be subject to separate applications and do not form part of the DNS application.

10.3 The Access, Traffic and Transport assessment was undertaken by Pell Frischmann Consultants Limited. The technical reviewer is Gordon Buchan BEng (Hons), MSC, CMILT, FCIHT, Divisional Director of Pell Frischmann. He has over 27 years' experience of undertaking transport assessments associated with new development and has worked on renewable energy and energy distribution projects across the UK, Ireland and Northern Europe. The author is Elaine Moran BEng (Hons), MSC, MCIHT, Senior Transport Planner. She has over eight years of experience in the transport planning industry (see **Appendix 1.1: Statement of Expertise**).

10.4 This chapter is supported by the following figures in **Volume 2**:

- **Figure 10.1: Study Area**
- **Figure 10.2: Traffic Count Locations**

■ **Figure 10.3: Personal Injury Accident Plan**

■ **Figure 10.4: Abnormal Indivisible Load Delivery Routes**

10.5 This chapter is informed by, and should be read in conjunction with the following appendix, provided in **Volume 3**:

■ **Appendix 10.1: Transport Assessment**

■ **Appendix 10.2: Transport Management Plan**

Scope of the Assessment

Effects Assessed in Full

10.6 The following effects were identified at the Scoping stage for consideration in this assessment:

- Potential effects (of changes in traffic flows) on local roads and the users of those roads; and
- Potential effects (of changes in traffic flows) on land uses and environmental resources fronting these roads, including the relevant occupiers and users.

10.7 The following effects have also been considered in this chapter:

- Potential effects (of changes in traffic flows) on the Public Right of Ways (PRoWs) within the Site.

10.8 Assessment scenarios were used to predict the magnitude of change to baseline conditions of roads within the study area. To meet the criteria set out in the EIA guidance, a review of the above effects on severance, driver delay, pedestrian delay, non-motorised user amenity, fear and intimidation, road safety and large loads has been undertaken.

Effects Scoped Out

10.9 Based on the desk based and field survey work undertaken, professional judgement, experience from other relevant projects, policy guidance or standards and feedback received from consultees, the following topic areas have been 'scoped out' of detailed assessment, as proposed in the Scoping Report (**Appendix 2.1**):

- **Operational Phase:** The traffic effects during the operational phase of the Proposed Development will be low, with two to three vehicles per week for maintenance purposes, far below the recognised thresholds for triggering a formal transport assessment. As such, the effects during the operational phase are scoped out of the assessment.
- **Decommissioning Phase:** The traffic effects during the decommissioning phase can only be fully assessed closer to that period, 40 years on from the completion of construction of the Proposed Development. As elements of the Proposed Development are likely to remain in-situ (such as cable trenches, some access tracks, etc.), the traffic flows associated with the decommissioning works will be lower than those associated with the construction phase. The construction phase therefore represents a worst-case assessment, and as such Decommissioning effects are considered to be less than or equal to, the predicted construction phase effects. As such, the effects during the decommissioning phase are scoped out of the assessment.

Assessment Methodology

Legislation and Guidance

Legislation and Policy

10.10 This assessment is carried out in accordance with Town and County Planning (Environmental Impact Assessment) (Wales) Regulations 2017.

10.11 This assessment is carried out in accordance with the principles contained within the following documents:

- Planning Policy Wales Edition 12 (Welsh Government, 2024);
- Future Wales – The National Plan 2040 (Welsh Government, 2021);
- Welsh Transport Appraisal Guidance (Welsh Government, 2017);
- Powys Local Development Plan (2011-2026); and
- Technical Advice Note 18: Transport (Welsh Government, 2007).

Guidance

10.12 This assessment is carried out in accordance with the principles contained within the following documents:

- Guidelines for Environmental Impact Assessment (Institute of Environmental Management and Assessment (IEMA), 2005);
- Environmental Assessment of Traffic and Movement (IEMA, 2023);
- Guideline for the Environmental Assessment for Road Traffic (Institute of Environmental Assessment (IEA), 1993);
- Design Manual for Roads & Bridges (DMRB) LA 104 Environmental Assessment and Monitoring (Revision 1) (National Highways); and
- Design Manual for Roads & Bridges (DMRB) Volume 15, Part 5 'The NESA Manual' (SIAS Limited).

Consultation

10.13 In undertaking the assessment, consideration has been given to the Scoping Responses and other consultation which has been undertaken as detailed in **Table 10.1**.

Table 10.1 Consultation responses

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Planning and Environment Decisions Wales (PEDW) 13/01/2023	Scoping Direction	Cumulative Assessment PEDW welcomes this paragraph in the SR that notes that the cumulative effects of the proposed development will look at other wind farms and large-scale solar developments where relevant. However, as noted in section five of this Scoping Direction, the cumulative assessments should not automatically be restricted to wind and solar developments; it is possible that other types of development could have cumulative impacts. The LPA, NRW, Brecon Beacons National Park Authority and Natural England (as the Shropshire Hills Area of Outstanding Natural Beauty is within 9km of the site) should be in a position to be able to advise which	A review of Local Authority planning portals (including Powys, Shropshire and Herefordshire), PEDW's DNS casework portal and National Infrastructure Planning Projects was undertaken to establish if other developments are to be included in the access, traffic and transport cumulative assessment. Details of the review are set out in the Assessment of Cumulative Effects section of this chapter.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		other developments should be included in this assessment.	
		Consultee Responses The Applicant's attention is drawn to comments made by PCC's Highway Engineer and the Welsh Government's Transport division regarding this chapter. PEDW agrees with these comments and requests that the Applicant consults directly with these consultees.	Comment noted.
		Offsite Works The Applicant acknowledges that access widening works may be required, 'including the trimming of roadside vegetation'. The extent of this would need to be known in the ES, and the Applicant should be aware that any trimming of hedgerows may require	Any trimming of roadside vegetation required to facilitate the chosen AIL delivery route will, where required, be subject to approval via other consents, separate to the DNS application. As part of this separate application for offsite works to facilitate the movement of AIL deliveries, all

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		ecological surveys to be carried out to ensure that any impacts are mitigated. The Applicant is advised to directly liaise with PCC's Ecologists.	mitigation measures proposed along the delivery route will be discussed and agreed with the appropriate Council Officers prior to works commencing. A Route Survey Report (RSR) will be part of the separate application and will identify likely issues associated with the offsite transport and access for AIL traffic and identify what if any remedial works, either in the form of physical works or as traffic management interventions are required.
		Public Rights of Way (PRoW) PEDW notes that the impact of the proposal on PRoW is not considered within the SR. The Applicant's attention is drawn to comments made by the LPA's Rights of Way Officer contained at Appendix 1.	Details of the PRoWs which are located within the Site are shown and listed in Appendix 10.1. The PRoWs located within the Site are included as part of the assessment within this Chapter during the construction phase. It is recognised that it will be necessary to divert PRoWs, either temporarily or permanently, for both

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			the construction and operational phases of the Proposed Development. While the operational phase is scoped out, it should be noted that any necessary permanent diversions to the PRow network will be discussed and agreed with PCC. This will be set out in a Path Management Plan (PaMP), the content of which is outlined within the Proposed Mitigation (Additional Mitigation) and Compensation section of this chapter.
Powys County Council (PCC), Public Right of Way, Common Land and	Scoping Direction	The proposals at Nant Mithil will have both direct and indirect impacts on public rights of way, common land and access land as set out below. Consideration of these impacts should form part of the Environmental Impact Assessment.	Comment noted. Details of the PRowS and Common Land which are located within the Site are shown and listed in Appendix 10.1. The PRowS and Common Land located within the Site are included as part of the assessment within this chapter.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Access Land Team 13/01/2023		1. There are 25 public rights of way within the proposed red line development area; four footpaths, 15 bridleways and six sections of BOAT.	See also the Common Land Report submitted for secondary consent alongside the DNS application. It is proposed that a PaMP is prepared which will contain measures to address the potential interactions between PRow users and construction traffic. Further details of the PaMP are outlined in the Proposed Mitigation (Additional Mitigation) and Compensation section of this chapter.
		2. The development also takes in a significant area of designated open access land, where the public has a right of access on foot for recreation. As the developer acknowledges, part of this is registered common land, being RCL35 (known as Cowlod Common.) Common land does benefit from a high degree of legal protection. Under section 38 of the Commons Act 2006, it is unlawful for 'restricted	The Applicant notes that common land consent is required. The relevant applications are submitted for secondary consent alongside the DNS application.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		works' to take place on common land without prior consent. The developer will need to obtain common land consent as a secondary consent for any changes to the access track, new access tracks, fences, ditches, embankments or other work on the common.	
		3. There are a number of offsite works which have the potential to directly affect public rights of way, such as the proposed Erwood blade transfer location, the Fforest Inn turning area and oversail and overrun areas along the abnormal load route, all have the potential to have a direct impact on public rights of way, but there is in-sufficient information to comment at this time.	Since the submission of the ES Scoping Report (September 2022), alternative AIL delivery routes have been investigated. Two possible AIL delivery options are being proposed and swept path analysis reviews have been undertaken on both options. These are presented in Appendix 10.1. All measures proposed along the proposed delivery route will be discussed and agreed with the appropriate PCC Officers prior to works commencing.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			Any highway works required to facilitate the chosen route, with the exception of the Site access junction, will be subject to approval via other consents, separate to the DNS application.
		4. The developer must avoid siting turbines on any of the public rights of way. In addition, micro-siting of turbines that may result in public rights of way being located within the topple zone of turbines should be avoided. If turbines are located on the public rights of way, or the public rights of way are within topple zones, then a permanent legal diversion will be required, as a secondary consent, before any construction affecting the line of the public right of way can commence. Details of any proposed diversion route must be agreed with the Countryside Access and Recreation team beforehand, to ensure	In consideration of the constraints relating to siting of the wind turbines and associated infrastructure, it has not been possible to locate all wind turbines out of the tip height stand-off distance from PRowS or completely avoid some infrastructure interface with PRowS. It has been discussed and acknowledged by PCC that the extent of any PRowS diversions is to be determined post-consent, following the micro-siting of turbines. The Applicant is liaising directly with PRowS officers at PCC regarding suitably worded condition(s), ensuring measures to manage and enhance use of

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		that the diversion route is appropriately located for accessibility, maintenance and connections with the surrounding network.	the PRowWs are agreed prior to commencement/operation. This will include a condition that secures the PaMP. Discussion and agreement of these conditions will evolve during Examination and will be reflected in the schedule of conditions or discussed within the Statement of Common Ground (SoCG) with PCC.
		5. New access tracks constructed for the wind farm can adversely affect the public rights of way due to changes of level and surfacing, new drainage ditches, culverts and fencing. These details must be agreed with the Countryside Access and Recreation team in advance, at all locations where an access track will cross or coincide with the line of a public right of way.	As above. In addition, it is proposed that a PaMP is undertaken which will contain measures to address the potential interactions between PRow users and construction traffic. Further details of the PaMP are outlined in the Proposed Mitigation (Additional Mitigation) and Compensation section of this chapter. The access tracks will be designed and constructed so that they will not adversely affect the PRowWs

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			during the operational phase of the Proposed Development. It should be noted that once the Proposed Development is operational, the access tracks and the Strategic Recreation Framework also have the potential to positively affect public access to the Site.
		6. If borrow pits are to be used for quarrying stone for the access tracks, the locations need to be sited away from the public rights of way to ensure that gradients and surface levels are not changed. Transportation of material from the borrow pits to the turbine tracks should be managed to minimise disturbance to the public rights of way.	Borrow Pit Two is located in proximity to but is set away from PRow 141/1252/4 (BOAT). Wherever possible, the design of the Proposed Development avoids PRowS, however there are short sections of the turbine tracks that will be located on the PRow network (as shown in Appendix 10.1: Figure 8). All works proposed along and in the vicinity of PRowS will be discussed and agreed with the

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			appropriate PCC Officers prior to works commencing, and relevant consents will be secured. Any adverse impacts on the PRow network during the construction phase will be addressed in the PaMP. Measures to be delivered as part of the plan include that users of the PRows will be separated from construction traffic using barriers (where permitted and appropriate), which will ensure that safe access to the Site for recreational purposes will be maintained.
		7. Temporary closures of public rights of way may be required during construction. Details of the phasing and timing of these closures and any alternative routes must be agreed with the Countryside Access and Recreation team before work commences. The developer must also note	Comment noted. This will be discussed and agreed with the appropriate PCC Officers post consent and prior to works commencing, and relevant consents will be secured.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		that there is a lead time of up to ten weeks to implement a new temporary closure and must plan their activities and liaise with the Countryside Access and Recreation and Streetworks teams accordingly.	As previously noted, the Applicant is liaising directly with PRow officers at PCC to discuss the requirement for any permanent or temporary PRow diversions and opportunities for securing recreational enhancements.
		8. Temporary site compounds, cables and substations and environmental measures such as new fencing and watercourses or ponds may also impact on public rights of way. These features must be located to avoid public rights of way.	Wherever possible, the design of the Proposed Development avoids PRowS. However, there are elements of the Proposed Development located on and in the vicinity of the PRow network. All works proposed along and in the vicinity of PRowS will be discussed and agreed with the appropriate PCC Officers prior to works commencing. As previously noted, a PaMP will be produced which will contain measures to address the potential adverse effects of PRow users. Further details of

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			the PaMP are outlined in the Proposed Mitigation (Additional Mitigation) and Compensation section of this chapter. A Strategic Recreation Framework will also be submitted with the DNS application, which will set out proposals of how access to and across the Site for recreation will be enhanced.
		9. The proposals will impact on outdoor recreation opportunities within the site, which is within 5km of Llanfihangel Rhydithon, New Radnor and Penybont villages. The importance of public rights of way and other outdoor recreation opportunities for our residents and visitors are highlighted in the Council's Rights of Way Improvement Plan 2018-28, which can be found at	As noted earlier, it is proposed that a PaMP will be developed that will manage the impact on PRow users during the construction period. It is considered that this will form a planning condition should the Proposed Development be granted planning consent. As noted above, a Strategic Recreation Framework is submitted with the DNS application which

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		https://en.powys.gov.uk/article/2439/Rights-of-Way-Improvement-Plan .	illustrates possible improvement measures and opportunities for recreational enhancements
		The Rights of Way Improvement Plan sets out the Council's strategic aspirations in terms of maintaining and enhancing the public rights of way network. Open, waymarked and easy to use paths are key to realising the benefits of public rights of way for health and wellbeing and for their economic benefits. 10. We note that the developer acknowledges the need to explore mitigation in relation to impacts on public rights of way and access to the countryside. The Countryside Access and Recreation team seek the following mitigation: ■ a. That the developer ensures that the public paths within the site are fully open for use and	Comments noted. The Rights of Way Improvement Plan will be considered as part of the PaMP. As stated above, consultation is ongoing with the PCC Public Right of Way, Common Land and Access Land Team to explore mitigation and enhancement for all users (walkers, cyclists, equestrians and users of the BOAT) of the Site. This ongoing consultation also includes discussions relating to measures to enhance PRowS and open access land. The Strategic Recreation Framework submitted with the DNS application sets out illustrative proposals of

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		where appropriate, seeks to enhance the paths e.g. via replacement of stiles with gates and improved drainage and surfacing. ■ b. Section 106 funds to enhance offsite public rights of way and open access land, payable on commencement of development.	how access to and across the Site for recreation could be enhanced. At a meeting on 10 Oct 24, the Applicant has raised concern with PCC Officers regarding the necessity of Section 106 contributions towards offsite PRoW enhancements. This may not be compliant with S.122 of The Community Infrastructure Levy Regulations 2010 which sets out the limitations on the use of planning obligations. Further consideration of this will be addressed in the SoCG with PCC.
Powys County Council, Highways, Transport & Recycling	Scoping Direction	Response to Question 9.1: Is the proposed methodology acceptable, including what is proposed to be scoped out and the approach to the cumulative assessment?	Comment noted. It anticipated that the operational phase will result in approximately two to three 4x4 vehicles per week which is not considered significant. The operational phase has therefore been scoped out of the

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		■ The proposed methodology appears broadly appropriate but, will need to remain flexible to accommodate any matters identified as the project develops. ■ In terms of what is proposed to be scoped out we would recommend that points of access/egress for the operational phase should be scoped into the assessment for safety reasons. ■ With regard to cumulative effects it is suggested that due to the rural location this is extended from “adjoining or neighbouring” [para 9.32] to anything along the section of A44 between the junction with the A488 at Penybont and A481 at Forest Inn.	assessment. It is proposed that a finalised access strategy will be agreed by a planning condition for the construction and operational phases. A review of PCC’s planning portal and the Welsh Government’s Developments of National Significance webpage was undertaken to determine if cumulative developments are to be included in the access, traffic and transport assessment. Further details are provided in the Assessment of Cumulative Effects section of this chapter.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Response to Question 9.2: Are the proposed traffic survey locations acceptable? We would recommend that consideration be given to undertaking surveys at the following locations: ■ 1. On the three legs of the junction of the A44/A481 at Forest Inn [sometimes referred to as Fforest Mill in EA Scoping Report?] [OSGR 317066 258508] ■ 2. On the three legs of the junction of the A481 and B4567 at Llanfaredd [OSGR 306181 251786] Counts at these locations would inform both movements on the section for the proposed site access and key junctions for the movement of AIL's.	1. An ATC survey was undertaken on the A44 to the east of the A44/A481 junction to determine a baseline average daily traffic flow at this location (see Table 10.5: Baseline 24-hour Average Traffic Data (2023)). 2. It is not proposed that construction-related traffic will travel along the B4567 and as such no traffic surveys are required on this section of the study area.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Response to Question 9.3: Is the use of Low National Road Traffic Forecasts (NRTF) acceptable for the whole of the study to determine future year traffic flows? Yes.	Comment noted.
		Response to Question 9.4: What committed development traffic flows should be included in the baseline traffic flows? None at present.	A review of PCC's planning portal and the Welsh Government's Developments of National Significance webpage did not establish any significant developments which should be included as committed developments.
		Response to Question 9.5: Is a Framework Abnormal Load Transport Management Plan sufficient for the planning consideration stage? We would expect initial versions of the documents identified at para. 9.40 i.e.:	A framework abnormal load Transport Management Plan (TMP) is provided in Appendix 10.2 . A framework Construction Traffic Management Plan (CTMP) and measures to be included in the Staff Sustainable Access Plan are presented as part of

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		■ Construction Management Traffic Plan; ■ Access arrangements [for construction and operational phases]; ■ Staff Sustainable Access Plan; and ■ Framework Abnormal Transport Management Plan. In addition to the specific questions posed, we would comment in relation to para. 9.22 under Proposed Study Area. Low rail bridges to the west of the site on the A44 [OSGR 309269 264846] and A483 [OSGR 308825 264757] may affect some deliveries. Whilst numbers are likely to be relatively low, considerations should be given as to whether additional road links need to be included in the study	the Proposed Mitigation (Additional Mitigation) and Compensation section of this chapter. The finalised access strategy will be agreed by condition for the construction and operational phases. The proposed study area is presented in Figure 10.1. The Study Area within the assessment is based on the most likely origins of material suppliers. The exact origin of materials cannot be known until a Balance of Plant (BoP) contractor has been appointed post-consent. Measures will be included within the final CTMP to manage deliveries, including route restrictions, to minimise potential impacts on affected structures and to reduce the adverse effects on the wider highway network. It should be noted that effects associated with

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		area to accommodate these restrictions. These could potentially be: ■ A44 east of Crossgates to junction with C1214 [Gravel Road] 308828 264932 ■ C1214 Gravel Road to C1202 307747 265349 ■ C1202 Llanyre to A4081 304562 263601 ■ A4081 to B4358 304436 262246 ■ B4358 to A470T Newbridge on Wye 303531 261059 ■ A470T to A483T 301613 258246 ■ A483 to A481 304165 251507 to 304764 251885	construction traffic generated by the Proposed Development would be most pronounced in close proximity to the Site access and on the final approaches to the Site. As vehicles travel away from the Proposed Development, they would disperse across the wider road network, thus diluting any potential effects. It is therefore expected that the effects relating to construction traffic are unlikely to be significant beyond the study area identified above. As such, the extent of the Study Area is considered appropriate for the Access, Traffic and Transport Assessment.
Welsh Government,		Having reviewed the submitted pre-application information, I would advise that, should you decide	Two access junction options are considered as part of the Proposed Development. The finalised access

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Department for Economy and Infrastructure 01/11/2022 and 31/05/2024	Scoping Direction and Post PAC	to progress to full planning stage, the Welsh Government will require the submission of the following: 1) The Applicant will be required to provide full Design Manual for Roads and Bridges (DMRB)-compliant engineering details in respect of the proposed site access from the A44.	strategy will be agreed by condition for the construction and operational phases. Detailed DMRB compliant engineering details will be provided post-consent once the final access strategy has been determined.
		2) The Applicant will be required to submit visibility splay and Stopping Sight Distance (SSD) information relating to the proposed site access in accordance with the requirements of both CD 109 and CD 123 of the DMRB.	Visibility splays at the locations of the Site access options are provided in Appendix 10.1: Annex A . To facilitate safer access to and from the Site access/es during the construction phase, it is proposed that traffic management in the form of temporary traffic signals will be provided at the proposed access during the construction phase. The

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			finalised access strategy will be agreed by condition for the construction and operational phases..
		3) The Applicant will be required to identify and provide full details of all accommodation works required on the trunk road network in order to facilitate the transportation of all development components to the site.	The finalised access strategy will be agreed by condition for the construction and operational phases. The AIL delivery route will be subject to approval via a separate application. A detailed RSR examining the selected delivery route from the port through to the Site access junction will be undertaken as part of this separate application. Full details of all trunk road network accommodation works will not be known until a tendering process and turbine selection is made post-consent. Any accommodation works on the trunk will be agreed with the Welsh Government prior to deliveries commencing.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		4) The Applicant will be required to provide a Transport Assessment.	A Transport Assessment is provided as Appendix 10.1 .
		5) The Applicant will be required to submit a Construction Traffic Management Plan that shall be to the satisfaction of both the Local Authority and the Welsh Government and which shall contain details of all required Abnormal Indivisible Load (AIL) movements along the trunk road network.	An outline CTMP is included within Appendix 10.1 and an indicative AIL TMP is provided as Appendix 10.2 . Note that accommodation works proposed along the AIL route do not form part of the DNS Application.
		6) The Applicant is advised that they will be required to enter into a S278 Agreement under the Highways Act with the Welsh Ministers prior to the construction of the proposed site access.	Comment noted. The finalised access strategy will be agreed by condition for the construction and operational phases.
		As regards the submitted Scoping Report, I would advise that the Welsh Government Strategic Road Network (SRN) team would like to be consulted	Noted. Regular maintenance will be undertaken to keep the Site access track drainage systems fully operational

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		regarding environmental impacts on the SRN and associated soft estate during design development and the Environmental Statement. It would be expected that: ■ a) potential pathways to environmental contamination of the SRN, including the soft estate and water drainage system, are anticipated and controlled appropriately; ■ b) the loss of semi-natural habitats of value to biodiversity on the SRN soft estate is avoided where possible and mitigated and compensated for where impacts cannot be avoided; ■ c) opportunities to provide biodiversity enhancements within and adjacent to the SRN soft estate should be perused such that there is a net benefit for biodiversity resulting from any	and to ensure there are no run-off issues onto the public road network. Net benefit for biodiversity (NBB) will be provided on Site as part of the Proposed Development. The AIL delivery route will be subject to approval via separate applications as required. Any environmental impacts on the SRN will be assessed within separate applications.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		works related to the SRN, in accordance with the Section 6 Enhanced Biodiversity Duty under the Environment (Wales) Act 2016.	
British Horse Society 08/03/2024	Microsoft Teams call between Bute and the BHS Access Officer for Wales.	2013 BHS Guidance. Query on potential to re-route bridleways during construction or provide permissive routes. Strategic Recreation Framework and ongoing engagement. Alternative routes where possible during construction to avoid disruptions. BHS support on any framework design and feeding back concerns from local groups.	There is a preference to the 2013 BHS guidance to be followed, however it was noted by the BHS representative that this is not always possible, for example around separation distances between wind turbines, infrastructure, and bridleways. However, where preferable there will be clear separation or, if possible, alternative routes for horses less comfortable near turbines. The Applicant will consider these points in further detail post-consent and as part of the micro-siting of wind turbines. The Applicant will continue to liaise with the PCC PRow officer regarding diversions. This will also be

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			progressed with the local BHS representative support. The local BHS representative is keen to engage on the Strategic Recreation Framework. This is noted and the Applicant will continue to engage accordingly. The BHS is looking to engage with local groups to gather feedback and how Bute and BHS can work together to address any concerns.
Powys County Council, PROW Officer 25/10/2024	Post-PAC (see PAC Report submitted with the Application)	It is assumed that the Path Management Plan will focus on management of the impacts of the construction phase on public access to the rights of way network and open access land. We understand that post construction and longer term recreational aspirations will be set out in the Strategic	The PaMP will take account of the considerations provided by PCC PROW Officer in the following rows, where appropriate. The final PaMP will be agreed with PCC and will be secured through a suitably worded planning condition.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Recreational Framework. The comments below are made on that basis.	
		Considerations that should be addressed in the Path Management Plan include: ■ 1. Proposals to establish a construction liaison committee to ensure the smooth management of the project/public interface with the Applicant, the construction contractors, the local community, and if appropriate, the police forming the committee. This committee will form a means of communicating and updating on forthcoming activities and dealing with any potential issues arising. a. For example, there may be site preparation work (erection of newt fencing etc) that could impact on	Noted, this will be included as part of the PaMP as noted in the Proposed Mitigation (Additional Mitigation) and /Compensation section of this Chapter.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		public paths, in addition to the main construction and reinstatement. b. If the work is to be geographically phased across the site, it would assist in understanding that to be able to advise on management of temporary closures and other measures.	
		2. An assessment of the extent of any temporary closures that may be needed and whether alternative routes can be provided. This will need to take into account: a. Suitability of the surface and gradient of alternative routes, for the modes of transport permitted on the affected paths. A firm grass surface is generally appropriate for pedestrian, off road cycle and equestrian use. However, it may not be sufficiently durable to withstand motor vehicular use	Plans of the proposed diversions are to be shared and discussed with PCC and stakeholders such as the British Horse Society post-consent once the detailed design of the Proposed Development and its impacts on these routes are known. This will be included as part of the PaMP as noted in the Proposed Mitigation (Additional Mitigation) and /Compensation section of this Chapter.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		for any period of time, especially in very wet weather and winter, when a hard surface would be needed. Neither are certain types and sizes of stone suited to equestrian traffic, so any temporary surfacing would need to be agreed with the Council beforehand. b. Whether, in view of the surface requirements, there will be a need to close the byway open to all traffic for any period of time without an alternative route. If there is, this is subject to additional consultation; the Council will seek the view of the Powys Byways User Group, as well as other statutory consultees. c. Phasing of temporary closures; if the work is not taking place across the whole site at any one time, it may be possible to close paths on a rolling basis when directly affected by work and then reopen	

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		them, which could facilitate availability of alternative routes.	
		3. Management of temporary accommodation work affecting rights of way and access: a. Temporary fencing may be required during construction work, whether to control livestock movement or for ecological reasons e.g. newt fencing. If this is across the line of a public path, then separate authorisation is needed under section 147 of the Highways Act 1980 to install a new gate, even if temporary. This authorisation can only be given for the purpose of controlling the movement of livestock or horses. Please note that new gates cannot be authorised under this section of the Highways Act 1980 on the byway open to all traffic.	Noted. This will be included as part of the PaMP as noted in the Proposed Mitigation (Additional Mitigation) and /Compensation section of this Chapter.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		As such, temporary fencing would need to be placed alongside, not across the byway. b. Construction compounds and designated parking areas must not be located on the rights of way and we would also ask that vehicle turning areas be located away from public paths. If this cannot be avoided, then we would recommend that temporary closures with alternative routes be put in place. c. Temporary drainage and environmental control measures (e.g. silt traps) need to be located to avoid impacts on public paths. If new ditches are required temporarily or permanently, then suitable culvert crossings will be needed. The widths of these must allow for convenient use by the permitted modes of transport. They must be sited and given a suitable width to allow manoeuvring space for mobility	

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		scooters, cyclists, pedestrians, or motor vehicles, for example where there is a need to open a gate on one side of the culvert.	
		4. Measures to manage the risks associated with construction traffic encountering members of the public, especially where the room for avoidance is limited. a. It is noted that Chapter 10 sets out the potential impacts of site traffic on public rights of way users, acknowledging that the impacts could be major. This is particularly with reference to the effects on equestrian traffic. b. We support the proposed measures to ensure that speed limits are adhered to by drivers and	Noted. This will be included as part of the PaMP as noted in the Proposed Mitigation (Additional Mitigation) and /Compensation section of this Chapter.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		subcontractors and the placement of advisory speed limit signage. c. We note and support the proposal to provide barriers to separate rights of way users from construction traffic where appropriate, subject to the comments above and to provide designated crossing points. d. We also welcome the recognition of the particular impacts of HGV traffic on horses and risk of a serious accident, with the BHS recommended measures forming part of site training for all HGV staff.	
		5. Effective and up to date public information will be key to maintaining positive relationships and avoiding frustration, especially as the Radnor Forest	Noted. This will be included as part of the PaMP as noted in the Proposed Mitigation (Additional

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		area does attract visitors from some distance away from the county. a. Discussions with local equestrian groups during the construction period will assist with dynamic management of risks and ensuring that they are kept up to date with changes as work progresses. We would suggest that this could be extended to other user groups and community representatives through a liaison group. b. Legal signage with a map must be placed at the ends of each affected section of path, where a temporary closure is in place. This is a minimum requirement; it is usually supported by larger plain language, commonly used signs (e.g. 'footpath closed', 'alternative route') and barriers.	Mitigation) and /Compensation section of this Chapter.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		c. Appropriately placed advisory signage can warn members of the public of any closures ahead of them, at a point when they can take an alternative route without incurring significant additional distance on non-motorised transport. Consideration needs to be given to where this will be most effective, including designated parking areas, key access points and settlements. For example, it is known that the adjoining forestry is a popular recreational destination, from which the public may travel onto the open hills of the Radnor Forest range. d. Subject to mobile phone coverage, consideration could also be given to linking signage to website-based information. In any event, web-based	

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		information would assist the public in planning ahead of a journey to the area.	
		6. Reinstatement plans for public paths, following completion of work which will need to include: a. The phasing of reinstatement, if some paths can be reopened earlier than others. b. Clarity around whether the reinstated route will be on a permanently diverted route or the original (pre-construction) line. c. The surface specification for each affected route, taking into account permitted modes of transport and any proposals in the Strategic Recreational Framework. d. Any path furniture that will remain in place on the reinstated paths e.g. new gates or culvert crossings.	Noted. This will be included as part of the PaMP as noted in the Proposed Mitigation (Additional Mitigation) and /Compensation section of this Chapter.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
PCC Highway Officer	PAC Consultation (see PAC Report submitted with the Application)	(PAC Reference 10.9) ¹ Operational Phase - An appropriately designed point of access/egress is required for use during the operational phase. It is accepted that additional traffic effects on existing highway links can be scoped out for the operational period.	Noted. A planning condition is proposed which requires the finalised access strategy to be submitted and agreed with the local planning authority prior to commencement.
		(PAC Reference 10.15) Delivery of abnormal indivisible loads [AILs] from the Port of Swansea are likely to be affected by a restriction on the A4358 at Glasbury bridge [OSGR 317968 239252]. AIL movements are not currently being permitted to use the bridge. It is probable that work to alleviate the issue will not be completed within the timescale of this project.	Noted. The Applicant will consult with PCC and NMWTRA with regards the most suitable of the two assessed routes to deliver the AILs once the delivery dates and method of transport are established. A Route Survey Report of the decided route will be submitted post consent and will be secured through a suitably worded planning condition.

¹ Please note that the PAC References are in relation to the documents sent for pre-application consultation. Changes have been made to these submission documents and as such the reference numbers between both documents do not necessarily align.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		(PAC Reference 10.18) See comment for (PAC Reference) 10.15 in relation to Glasbury bridge impact on Port of Swansea AIL route.	As above.
		(PAC Reference 10.19) Site Access Option A (South) – see comment for (PAC Reference) 10.15 in relation to Glasbury bridge impact on Port of Swansea AIL route. More detailed consideration is required of how this access could be configured and what traffic management arrangements are appropriate during the construction phase. Use during the operational phase also requires more detailed consideration to consider appropriateness of access through the existing layby facility and the impact that may have for existing use. Detailed engineering drawings of proposals will be required to assess likely impacts.	The finalised access strategy will be agreed by condition for the construction and operational phases.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		(PAC Reference 10.20) Site Access Option B (North) More detailed consideration is required of how this access could be configured and what traffic management arrangements are appropriate during the construction phase. Use during the operational phase also requires more detailed. The need to introduce control measures [left-in / left-out] and enforceability of those, suggest an unsafe access arrangement. Detailed engineering drawings of proposals will be required to assess likely impacts.	As noted above, the finalised access strategy will be agreed by condition for the construction and operational phases. Detailed engineering drawings of the selected Site access will be provided post consent and will be secured through an appropriately worded planning condition.
		(PAC Reference 10.21) Access options will need to be reviewed once details are firmed up. Consideration of two points of access for the construction phase should not be discounted.	The finalised access strategy will be agreed by condition for the construction and operational phases.
		(PAC Reference 10.46, Table 10.5) baseline traffic data suggests flows that differ from our perception	A review was undertaken and count points 2 and 3 have been updated. The remaining counts have

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		particularly in respect of count ref.'s 1, 2, 3, 4, 5, 14 and 15. Suggest a review of source data to ensure there are no transcription errors.	been sourced from the DfT traffic count database. A full summary of the traffic count data is included in Appendix 10.1 .
		(PAC References 10.49 – 10.54) Accident Review. The 5-year record [2018 to 2022] suggests there are 14 PIAs on the immediate approaches to the proposed locations for the site access points A and B. It is recommended that more detailed examination of these is carried out to inform the access and traffic management arrangements.	Additional information has been added to Appendix 10.1 .
		(PAC Reference 10.62, Table 10.8) The A44 at this location is a local A class road not Trunk.	Noted and updated as part of the assessment.
		(PAC Reference 10.71) The possibility of utilising two points of access should not be ruled out at this stage.	The finalised access strategy will be agreed by condition for the construction and operational phases.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		(PAC Reference 10.75) The need for high grade materials to be imported for concrete batching on site is noted with detail in (PAC Reference) para 6.1.5 of Appendix 10.1 of the Transport Assessment. The provision of a single substation building is also noted. It is not clear if any AIL movements will be associated with this and whether they are factored in to existing figures or will be additional.	There will be two AIL deliveries associated with the substation. These trips are reflected in the AIL deliveries contained in the Construction Traffic Profile in Appendix 10.1.
		(PAC Reference 10.84) A detailed discussion on the figures in (PAC Reference) Table 10.9 would be beneficial.	Details of the construction traffic calculations are outlined in Appendix 10.1 .
		(PAC Reference 10.87) The A44 is not a trunk road at this location. It should not be assumed that the	Noted. The sensitivity of the A44 has been updated to medium sensitivity within the assessment.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		A44 was designed to accommodate this composition of traffic as this is unlikely to be the case.	
		(PAC Reference 10.90) Is this average data and if so what is the potential for peak capacity?	Peak construction flows have been used in these calculations.
		(PAC Reference 10.89) It would be helpful to see the baseline data used to review theoretical road capacity.	As noted in the ES Chapter and Transport Assessment, the NESA Manual was used to estimate theoretical capacity of the highway links within the study area.. Further information regarding baseline data is presented in Appendix 10.1 .
		(PAC Reference 10.96) Detailed consideration will be required once access arrangements are firmed up. The Highway Authority would welcome the opportunity to feed into the development of the CTMP and TMP [Appendix 10.2].	The finalised access strategy will be agreed by condition for the construction and operational phases. Detailed drawings on the proposed access will be provided post consent and will be secured through an appropriately worded planning condition.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			The final CTMP and TMP will be developed in consultation with PCC Highways Authority and secured through an appropriately worded planning condition.
		(PAC Reference 10.100) Any review should cover the full width of highway including any verge area or highway land adjacent to the surfaced carriageway.	Noted. The road edge review will include the area within the highway boundary.
		(PAC Reference 10.119) The design of junctions to be used during the operational phase should be considered.	The finalised access strategy will be agreed by condition for the operational phase.

Study Area

10.14 The study area includes local roads that are likely to experience increased traffic flows resulting from the construction of the Proposed Development. The study area also includes PRoWs both within and in the vicinity of the Site which may be affected by the presence of construction traffic. The geographic scope was determined through a review of Ordnance Survey (OS) plans and an assessment of the potential origin locations of construction staff and supply locations for construction materials.

10.15 There are two route options being considered for the delivery of abnormal indivisible loads (AILs) which will be delivered to the Site either from selected Port of Entry (PoE) at Port of Swansea or Port Birkenhead.

10.16 The study area for this assessment is as follows, which has been agreed with the relevant transport authorities, as part of the formal Scoping Consultation process:

- The A44 between Kington and Crossgates;
- The A470 between Builth Wells and Bronllys;
- The B4567 between Erwood Station and Llanelwedd;
- The A481 between Llanelwedd and Fforest Inn;
- The A483 between Builth Wells and Crossgates; and
- The A483 between Builth Wells and Llanelwedd.

10.17 The study area is illustrated in **Figure 10.1**.

10.18 The Proposed Development will be accessed from the A44. Two separate ports are considered in this assessment as the Port of Entry (PoE) from which the AIL components will be delivered which are Port of Swansea and Port of Birkenhead. There are currently two Site access options being considered along the A44 (see **Appendix 10.1, Figure 4: Site Access Option Locations**). The finalised access strategy will be agreed by condition for the construction and operational phases.

Desk Based Research and Data Sources

10.19 The following data sources have informed the assessment:

- Assumed construction programme (see **Chapter 4**);
- Accident data – www.crashmap.co.uk;
- Traffic data – Department for Transport Road Traffic Statistics;
- Sensitive locations within the study area – www.google.co.uk/maps;
- Any other traffic sensitive receptors in the area (core paths, routes, communities, etc.) – www.google.co.uk/maps, <https://en.powys.gov.uk/article/13184/Public-Rights-of-Way-Map> and <https://www.sustrans.org.uk/national-cycle-network>;
- Potential origin locations of construction staff and supply locations for construction materials to inform extent of local area roads network to be included in the assessment – www.google.co.uk/maps; and
- Constraints to the movement of AILs through a Route Survey including swept path assessments – site visits, OS plans, video footage and Google Streetview.

Field Survey

10.20 The following field surveys were carried out to inform the assessment:

- Site visits to review the potential access routes and potential constraints was undertaken.
- Automatic Traffic Counts (ATC) surveys to measure traffic flows and speeds within the study area were undertaken in October 2023. The ATC locations are shown on **Figure 10.2**.

Assessing Significance

10.21 The Institute of Environmental Management and Assessment (IEMA) ‘Guidelines for Environmental Impact Assessment’ (2005) notes that the separate IEMA Guidelines should be used for characterising the environmental traffic and transport effects (offsite effects) and the assessment of significance of major new developments. Recent guidance published by the IEMA, namely ‘Environmental Assessment of Traffic and Movement’ (2023) provides an update to the previously used guidance, ‘Guidelines for the Environmental Assessment of Road Traffic’ (1993) document, that should be used to characterise the environmental traffic and transport effects (offsite effects) and the assessment of significance of major new developments. The

guidelines intend to complement professional judgement and the experience of trained assessors.

10.22 In terms of traffic and transport impacts, the receptors are the users of the roads within the study area and the locations through which those roads pass.

10.23 The IEMA Guidelines include guidance on how the sensitivity of receptors should be assessed. Using that as a base, professional judgement was used to develop a classification of sensitivity for users based on the characteristics of roads and locations. This is summarised in **Table 10.2**.

Table 10.2 Classification of receptor sensitivity

Sensitivity	Description
High	Where the road is a minor rural road, not constructed to accommodate frequent use by HGVs. Includes roads with traffic control signals, waiting and loading restrictions, traffic calming measures. Where a location is a large rural settlement containing a high number of community and public services and facilities.
Medium	Where the road is a local A or B class road, capable of regular use by HGV traffic. Includes roads where there is some traffic calming or traffic management measures. Where a location is an intermediate sized rural settlement, containing some community or public facilities and services.
Low	Where the road is Trunk or A-class, constructed to accommodate significant HGV composition. Includes roads with little or no traffic calming or traffic management measures. Where a location is a small rural settlement, few community or public facilities or services.

Sensitivity	Description
Negligible	Where roads have no adjacent settlements. Includes new or existing strategic trunk roads that would be little affected by additional traffic and suitable for Abnormal Loads, and new strategic trunk road junctions capable of accommodating Abnormal Loads. Where a location includes individual dwellings or scattered settlements with no facilities.

10.24 Where a road passes through a location, users are considered subject to the highest level of sensitivity defined by either the road or the location characteristics.

Magnitude

10.25 The magnitude of change has been assessed in accordance with the following rules which are outlined in the IEMA Guidelines, and are used to inform a screening exercise to determine which links within the study area are to be considered for detailed analysis in the assessment:

- Rule 1: Include highway links where traffic flows are predicted to increase by more than 30% (or where the number of heavy goods vehicles (HGVs) is predicted to increase by more than 30%).
- Rule 2: Include any other specifically sensitive areas where total traffic flows are predicted to increase by 10% or more.

10.26 The IEMA Guidelines identify the key impacts when assessing the magnitude of traffic effects from an individual development:

- Severance – The IEMA Guidance advises that *“The Department for Transport has historically set out a range of indicators for determining the significance of severance. Changes in traffic flow of 30%, 60% and 90% are regarded as producing ‘slight’, ‘moderate’ and ‘substantial’ changes in severance respectively. Although these thresholds no longer appear in Department for Transport guidance, they have not been superseded by*

subsequent changes to guidance and are established through planning case law. However, caution needs to be observed when applying these thresholds as very low baseline flows are unlikely to experience severance impacts even with high percentage changes in traffic” (Para 3.16). The Guidelines acknowledge that changes in traffic flows should be used cautiously, stating that *“the assessment of severance should pay full regard to specific local conditions, e.g. sensitivity of adjacent land uses, prevalence of vulnerable people, whether or not crossing facilities are provided, traffic signal settings, etc.”* (Para 3.17).

- Driver delay – The IEMA Guidelines note that these delays are only likely to be *“significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system”* (Para 3.20).
- Pedestrian delay (incorporating delay to all non-motorised users) – The IEMA Guidance advises that *“pedestrian delay and severance are closely related effects and can be grouped together. Changes in the volume, composition or speed of traffic may affect the ability of people to cross roads. In general, increases in traffic levels are likely to lead to greater increases in delay. Delays will also depend on the general level of pedestrian activity, visibility and general physical conditions of the development site”* (Para 3.24). Furthermore, the guidance advises that *“...it is not considered wise to set down definitive thresholds. Instead, it is recommended that the competent traffic and movement expert use their judgement to determine whether pedestrian delay constitutes a significant effect”* (Para 3.26).
- Non-motorised user amenity – The IEMA Guidance advises that *“The 1993 Guidelines suggest that a tentative threshold for judging the significance of changes in pedestrian amenity would be where the traffic flow (or HGV component) is halved or doubled. Although these thresholds no longer appear in Department for Transport guidance, they have not been superseded by subsequent changes to guidance and are established through planning case law”* (Para 3.30).
- Fear and intimidation – There are no commonly agreed thresholds for estimating levels of fear and intimidation, from known traffic and physical conditions. However, as the impact is considered to be sensitive to traffic flow, changes in traffic flow of 30%, 60% and 90% are regarded as producing minor, moderate and substantial changes respectively in the

guidelines (Para 2.19). As such, this has been used to assess the potential impacts associated with construction activities around fear and intimidation on people near the Proposed Development.

- Road safety – Professional judgement would be used to assess the implications of local circumstances, or factors which may elevate or lessen risks of accidents. In line with the IEMA Guidance, those areas of collision clusters would be subject to detailed review.
- Road safety audits – It would be proposed to undertake any necessary Road Safety Audits (RSA) post consent, and it is considered that this can be secured via a planning condition.
- Large loads – The movement of the AILs associated with the construction of the Proposed Development have been considered in full, within a separate route survey assessment, which identifies physical mitigation measures required to accommodate the predicted loads. Additional mitigation in terms of addressing potential impacts on sensitive receptors are included as standard within the mitigation section of this chapter.

10.27 While not specifically identified, as more vulnerable road users, cyclists are considered in similar terms to pedestrians.

10.28 Table 2.2 of Volume 11, Section 2, Part 5 of the DMRB sets out four levels against which the magnitude of these impacts should be assessed – major, moderate, minor and negligible. The impacts and levels of magnitude are discussed in **Table 10.3**.

Table 10.3 Magnitude of effect

Magnitude	Description
Major	These effects are considered to be material in the decision-making process.
Moderate	These effects may be important but are not likely to be material factors in decision making. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a receptor.
Minor	These effects may be raised as local factors. They are unlikely to be critical in the decision-making process but are important in improving the subsequent design of the project.

Magnitude	Description
Negligible	No effects or those that are imperceptible.

Significance

10.29 To determine the overall significance of effects, the results from the receptor sensitivity and magnitude of change assessments are correlated and classified using a scale set out in Table 3.8.1 of LA 104 Environmental Assessment and Monitoring (Revision 1) the DMRB and summarised in **Table 10.4**.

Table 10.4 Significance criteria

Sensitivity	Magnitude of Effect			
	Major	Moderate	Minor	Negligible
High	Major	Major/Moderate	Moderate/Minor	Minor
Medium	Major/Moderate	Moderate	Minor	Minor/Negligible
Low	Moderate/Minor	Minor	Minor	Minor/Negligible
Negligible	Minor	Minor/Negligible	Minor/Negligible	Negligible

10.30 Significance is categorised as major, moderate, minor or negligible. Effects judged to be of **Major** or **Moderate** significance will be considered to be significant in accordance with the EIA Regulations and require mitigation.

10.31 Where an effect could be one of **Major/Moderate** or **Moderate/Minor** significance, professional judgement will be used to determine which option should be applicable, as these effects can be classed as significant. Effects judged to be of minor or negligible significance will be considered not significant.

Assessment Limitations

10.32 This assessment is based upon average traffic flows obtained from Department for Transport (DfT) database and project specific 7-day ATC surveys. There may be localised peaks within construction days where flows can be higher for a specific hour, such as a shift change onsite.

10.33 Whilst some information gaps have been identified, such as limited traffic speed information as detailed further in the chapter (see **Table 10.6**), it is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and assessment of likely significant environmental effects on Access, Traffic and Transport.

Existing Conditions

Overview

10.34 The following subsections detail the existing road access conditions within the study area, the existing active travel networks in the vicinity of the Site and recorded road traffic accidents between 2018 and 2022.

Current Baseline

Road Access

10.35 The transport routes within the study area are described below:

- The A44 is a major road which runs from Oxford, England to Aberystwyth, Wales. Within the study area, the A44 is a two-way single carriageway road and is mainly subject to the national speed limit, however at some locations along the road, the speed limit is reduced and signposted. Within the Welsh section of the study area, the A44 is maintained by PCC and appears to be in good condition. Within the English section of the study area, the A44 is maintained by Herefordshire County Council. To the south-east of Penybont, there are two cattle grids located on the A44 and this section of road is signposted to warn for young lambs along the road. There are several locations where vehicles can park up along the A44.

- The A483 is known as the Swansea to Manchester Trunk Road, which runs from Swansea, Wales to Chester, England. The A483 is maintained by North and Mid Wales Trunk Road Agent (NMWTRA) and appears to be in good condition. Within the study area, the A483 is a two-way single carriageway road and is mainly subject to either the national speed limit or 50 mph, however at some locations along the road, the speed limit is reduced and signposted.
- The A470 is a trunk road which is also known as the Cardiff to Glan Conwy Trunk Road and connects Cardiff to Llandudno. The A470 is maintained by NMWTRA and appears to be in good condition. Within the study area, the A470 is mainly subject to the national speed limit, which reduces and is signposted when travelling through more built-up areas.
- The A481 is a two-way single carriageway road that is mainly subject to the national speed limit, this reduces to 40 mph when travelling through more built-up areas. A short section of road between Llanelwedd and the A481/Wyeside Enterprise Park access Roundabout is signed as being unsuitable for HGVs. The A481 is maintained by PCC and appears to be mainly in good condition. There are a small number of passing places along the A481 within the study area.

10.36 To assess the impact on the transport routes within the study area, a series of Automatic Traffic Count (ATC) sites were established between 21 and 27 October 2023.

10.37 To complement the ATC surveys, Annual Average Daily Traffic (AADT) flows were also obtained from the UK Department for Transport (DfT) traffic database. Available 2018 and 2019 flow information was obtained for all locations, as these flows would be unaffected by Covid-related travel restrictions.

10.38 Traffic data has been used for the following locations:

- A44, near the Site access (ATC Survey);
- A44, east of A44/A481 Priority Junction (ATC Survey);
- A481, south-west of A44/A481 Priority Junction (ATC Survey);
- A44, south of Walton (DfT Count Site 655);
- A44, south-east of Pen-y-Bont Rail Station (DfT Count Site 40519);

- A483, south of Crossgates (DfT Count Site 546);
- A483, Llandrindod Wells (DfT Count Site 20555);
- A483, south of Ridgebourne (DfT Count Site 40557);
- A483, north-east of A470/A483 Roundabout (DfT Count Site 10556);
- A483, south of A470/A483 Roundabout (DfT Count Site 10544);
- A470, Aberduhonw (DfT Count Site 40544);
- A470, at Lady Milford's Bridge (DfT Count Site 20543);
- A470, north of A470/A438 Priority Junction (DfT Count Site 538);
- A481, south-west of Hundred House (DfT Count Site 10590); and
- A481, north-east of Franksbridge (DfT Count Site 91153).

10.39 The traffic data retrieved from the ATCs and the DfT count sites allowed the traffic flows to be split into vehicle classes. The data has been summarised into cars/light goods vehicles (Lights) and HGVs (all goods vehicles >3.5 tonnes gross maximum weight, as well as buses).

10.40 A National Road Traffic Forecast (NRTF) low growth factor was applied to the 2018 and 2019 flows obtained from the DfT database to estimate 2023 flows.

10.41 The NRTF low growth from 2018 to 2023 is 1.035 and 2019 to 2023 is 1.027. These factors were applied to the respective 2018 and 2019 traffic flows retrieved from the DfT database to estimate 2023 flows.

10.42 The ATC survey locations and the DfT count site locations are shown in **Figure 10.2**.

10.43 **Table 10.5** summarises the 24-hour average daily traffic data at the count sites.

Table 10.5 Baseline 24-hour average traffic data (2023)

Count Ref.	Survey Location	Cars/LGV	HGV	Total	% HGV
1	A44, near the Site access	1,461	456	1,917	24%
2	A44, east of A44/A481 Priority Junction	1,864	672	2,537	27%
3	A481, south-west of A44/A481 Priority Junction	553	213	766	28%
4	A44, south of Walton	3,114	635	3,749	17%
5	A44, south-east of Pen-y-Bont Rail Station	4,377	309	4,686	7%
6	A483, south of Crossgates	7,668	266	7,934	3%
7	A483, Llandrindod Wells	6,814	166	6,981	2%
8	A483, south of Ridgebourne	7,723	325	8,048	4%
9	A483, north-east of A470/A483 Roundabout	6,452	351	6,803	5%
10	A483, south of A470/A483 Roundabout	9,715	576	10,292	6%
11	A470, Aberduhonw	4,826	380	5,206	7%
12	A470, at Lady Milford's Bridge	6,408	370	6,778	5%
13	A470, north of A470/A438 Priority Junction	4,223	264	4,487	6%

Count Ref.	Survey Location	Cars/LGV	HGV	Total	% HGV
14	A481, south-west of Hundred House	934	78	1,012	8%
15	A481, north-east of Franksbridge	935	79	1,014	8%

Please note that variances may occur due to rounding.

10.44 The ATC surveys also provided speed information, which is as follows:

- Count Reference 1: A44, near the Site Access: 7-day mean speed and 85th percentile speed were recorded as 41.7 mph and 46.8 mph, respectively.
- Count Reference 2: A44, east of A44/A481 Priority Junction: 7-day mean speed and 85th percentile were recorded as 33.9 mph and 39.2 mph, respectively.
- Count Reference 3: A481, south-west of A44/A481 Priority Junction: 7-day mean speed and 85th percentile were recorded as 45.3 mph and 53.0 mph.

10.45 Speed information from the ATC surveys suggests that there are no speeding issues at these locations.

Accident Review

10.46 Personal Injury Accident (PIA) data for the five-year period covering 2018 to 2022 for the roads within the study area was obtained from the online resource CrashMap, which uses data collected by the Police about road traffic crashes occurring on Welsh roads where someone is injured.

10.47 TA Guidance requires an analysis of the PIA on the road network in the vicinity of any development to be undertaken for at least the most recent 3-year period, or preferably a 5-year period, particularly if the site has been identified as being within a high accident area.

10.48 The statistics are categorised into three categories, namely “Slight”, for damage only incidents, “Serious”, for injury accidents, and “Fatal”, for those accidents that result in a death. The general locations and severity of the recorded accidents within the study area are summarised in **Table 10.6**, while **Figure 10.3** shows their general locations.

Table 10.6 Personal injury accident summary

Survey Location	Slight	Serious	Fatal	HGV Incidents
A44, between Crossgates Roundabout and Kington	20	13	3	7
A483, between Crossgates and Llanelwedd	26	9	0	8
A483, linking A470 over the River Wye	2	0	0	0
A470, between Builth Wells and Llyswen	9	9	0	8
A470, between the A470/A479 junction and the A470/A438 junction	9	4	2	4
A481, between A483 (Llanelwedd) and A44 (Llanfihangel-Nant-Melan)	4	2	0	1
B4567	3	1	0	1
Total	73	38	5	29
Percentage	62.93%	32.76%	4.31%	25.00%

10.49 The analysis indicates that most recorded accidents are classed as being slight (62.93%), with accidents classed as serious representing approximately 32.76% of all accidents. There were five fatalities recorded within the study area. Further information regarding the recorded accidents are presented in **Appendix 10.1 Transport Assessment**.

10.50 The majority of PIAs recorded occurred at or on approach to junctions/access to properties, where there is an increased interaction between vehicles, and on bends.

10.51 HGVs were involved in 25% (29 accidents) of accidents recorded within the study area.

Active Travel Networks

10.52 There are limited pedestrian facilities, such as footways, in the immediate vicinity of the Site, reflecting the rural nature of the location. There are no facilities on the A44 between the western extents of Llanfihangel and the eastern extents of Llandegley.

10.53 Further away from the Proposed Development in the wider study area, there are pedestrian facilities within the larger settlements and road network.

10.54 A review of PCC's PRoW plan indicates that there are several PRoWs within the Site which comprise footpaths, bridleways and byways open to all traffic (BOATs). Further details of the PRoWs are presented in **Appendix: 10.1**.

10.55 A review of Sustrans' National Cycle Route (NCR) map shows that there is a section of NCR 8, which comprises an on-road route, located along the A483 in Builth Wells and a section of NCR 825, which comprises an on-road route, along the A483 in Llandrindod Wells, within the study area, and are approximately 255m and 215m in length, respectively. These sections of road are subject to a reduced speed limit.

Future Baseline in the Absence of the Proposed Development

10.56 It is anticipated that construction of the Proposed Development will commence in 2026, if consent is granted. It is expected that construction of the project will take up to 23 months, depending on weather conditions. It should be noted that should construction of the Proposed Development commence at a later date, the assessment based on 2026 provides a worst case assessment.

10.57 The NRTF low growth factors were applied to the 2023 traffic data presented in **Table 10.5** to estimate 2026 baseline traffic flows which are shown in **Table 10.7** below. The NRTF low growth factor for 2023 to 2026 is 1.016.

Table 10.7 Future baseline 24-hour average traffic data (2026)

Count Ref.	Survey Location	Cars/LGV	HGV	Total	% HGV
1	A44, near the Site access	1,484	463	1,947	24%
2	A44, east of A44/A481 Priority Junction	1,894	683	2,577	27%
3	A481, south-west of A44/A481 Priority Junction	562	216	778	28%
4	A44, south of Walton	3,164	645	3,809	17%
5	A44, south-east of Pen-y-Bont Rail Station	4,447	314	4,761	7%
6	A483, south of Crossgates	7,790	270	8,061	3%
7	A483, Llandrindod Wells	6,923	169	7,092	2%
8	A483, south of Ridgebourne	7,847	330	8,176	4%
9	A483, north-east of A470/A483 Roundabout	6,555	357	6,912	5%
10	A483, south of A470/A483 Roundabout	9,871	585	10,456	6%
11	A470, Aberduhonw	4,903	386	5,289	7%
12	A470, at Lady Milford's Bridge	6,511	376	6,887	5%
13	A470, north of A470/A438 Priority Junction	4,291	268	4,559	6%

Count Ref.	Survey Location	Cars/LGV	HGV	Total	% HGV
14	A481, south-west of Hundred House	948	79	1,028	8%
15	A481, north-east of Franksbridge	950	80	1,030	8%

Please note that variances may occur due to rounding.

10.58 In the absence of the Proposed Development, it is anticipated that traffic growth will occur regardless throughout the study area as a result of other development pressures, tourism and population flows. It is anticipated that there would be negligible impacts on the PRoW networks and Common Land in the absence of the Proposed Development.

10.59 A review of sensitive receptors has been undertaken within the study area. **Table 10.8** details the receptors and their sensitivities for use within the following assessment. A justification for the sensitivity has been provided, based upon the details contained in **Table 10.2**.

Table 10.8 Receptor sensitivity summary

Receptor	Sensitivity	Justification
Users of A44	Medium	Where the road is a local A or B class road, capable of regular use by HGV traffic.
Users of A481	Medium	Where the road is a local A or B class road, capable of regular use by HGV traffic.
Users of A483	Low	Where the road is Trunk or A-class, constructed to accommodate significant HGV composition.
Users of B4567	Medium	Where the road is a local A or B class road, capable of regular use by HGV traffic.

Receptor	Sensitivity	Justification
Residents along A44 (outside of villages/towns)	Negligible	Where a location includes individual dwellings or scattered settlements with no facilities.
Llandegley Residents	Low	Where a location is a small rural settlement, few community or public facilities or services.
Penybont Residents	Low	Where a location is a small rural settlement, few community or public facilities or services.
Crossgates Residents	Medium	Where a location is an intermediate sized rural settlement, containing some community or public facilities and services.
Residents along A483 (outside of villages/towns)	Negligible	Where a location includes individual dwellings or scattered settlements with no facilities.
Llandrindod Wells Residents (including Ridgebourne)	High	Where a location is a large rural settlement containing a high number of community and public services and facilities.
Crossway Residents	Low	Where a location is a small rural settlement, few community or public facilities or services.
Builth Wells Residents (including Llanelwedd)	High	Where a location is a large rural settlement containing a high number of community and public services and facilities.
Residents along A470 (outside of villages/towns)	Negligible	Where a location includes individual dwellings or scattered settlements with no facilities.
Erwood Residents	Low	Where a location is a small rural settlement, few community or public facilities or services.

Receptor	Sensitivity	Justification
Llyswen Residents	Low	Where a location is a small rural settlement, few community or public facilities or services.
Residents along B4567 (outside of villages/towns)	Negligible	Where a location includes individual dwellings or scattered settlements with no facilities.
Residents along A481 (outside of villages/towns)	Negligible	Where a location includes individual dwellings or scattered settlements with no facilities.
PRoW Users/Common Land Users/Access Land	High	Minor paths used by walkers, cyclists and horse riders, not constructed to accommodate HGV traffic flows/Common and open access land used by walkers and for grazing, not constructed to accommodate HGV traffic flows.

10.60 Based on the indicators which are stated within the IEMA Guidelines, the villages of Llandegley, Penybont, Crossgates, Erwood and Llyswen and towns of Llandrindod Wells (including Ringbourne) and Builth Wells (including Llanelwedd) are identified as a sensitive receptor in this assessment. These locations will be subject to the ‘Rule 2’ of the IEMA Guidelines which requires a full assessment of effects if the traffic count locations are anticipated to be subject to an increase in 10% of total traffic.

10.61 All other locations within the study area are subject to ‘Rule 1’ and are assessed if traffic flows (or HGV flows) on highway links are anticipated to increase by more than 30% as a result of the construction of the Proposed Development.

Implications of Climate Change

10.62 Chapter 14: Climate Change provides details of the climate change projections. The UK Climate Projections (UKCP18)² show a general trend towards warmer, wetter winters and

² Met Office (2018) UK Climate Projections 2018 (UKCP18)

hotter, drier summers. It is considered that climate change projections will not have a discernible impact on the baseline conditions for road traffic within the timescales of the Proposed Development.

10.63 It is assumed that, at the regional level, appropriate measures will be put in place to ensure flood risk is managed and does not have long term effects on transport infrastructure.

Design Considerations (Embedded Mitigation)

10.64 Borrow pits will be located onsite which are considered to be sufficient to meet 100% material requirements for the access tracks, hardstandings and compound sub-bases. For the purpose of the assessment, it has been assumed that 50% of material requirements will be brought to Site.

10.65 Where possible, existing tracks within the Site have been used.

10.66 Concrete batching will be accommodated onsite, which will result in fewer trips than if ready-mix concrete were to be delivered to Site.

Micrositing

10.67 The layout of the turbines, and the associated infrastructure such as tracks and cables, would be subject to 50m micrositing allowance. The assessment of effects presented within this chapter have been based on the layout defined in **Chapter 4**. The mitigation measures outlined in this chapter would be applicable to changes in the layout of the Proposed Development as a result of any micrositing of turbines and associated infrastructure and would adequately mitigate any adverse effects relating to access, traffic and transport.

Good Practice Measures (Applied Mitigation)

Access Junction

10.68 Access to the Proposed Development will be from the A44. The finalised access strategy will be agreed by condition for the construction and operational phases.

Assessment of Construction Effects

10.69 The assessment of effects is based on the information outlined in **Chapter 4**. Unless otherwise stated, potential effects identified are adverse.

Predicted Construction Effects

10.70 The assessment is based upon the construction effects that may occur within the study area during the 23-month construction programme. To assess the effects, it is necessary to determine the likely traffic generation associated with the Proposed Development during the peak construction month.

10.71 During the assumed 23-month construction period, the following traffic will require access to the Site:

- Staff transport, either cars or staff minibuses;
- Construction equipment and materials, deliveries of machinery, and supplies such as concrete materials and some aggregate materials;
- AILs consisting of the wind turbine components and heavy lift crane(s); and
- Escort vehicles for AIL deliveries.

10.72 Except for the turbine components and high-capacity cranes, most traffic will be normal construction plant and will include grading tractors, excavators, forklifts and dumper trucks. Most will arrive at the Site on low loaders.

10.73 The turbines will be delivered in component sections (approximately 14 one-way movements per turbine – see **Appendix 10.1**) for ease of transport and will be assembled at the Site. The nacelle, hub, drive train, blade and tower sections are classified as AIL due to their weight and/or length, width and height when loaded.

10.74 The components can be delivered on a variety of transport platforms with typical examples illustrated in **Appendix 10.1**.

10.75 In addition to the turbine deliveries, two high-capacity erection cranes will be needed to offload some components and erect the turbines. One crane is likely to be a mobile crane with a capacity up to 1,000 tonnes that will be escorted by boom and ballast trucks to allow full

mobilisation on Site. A smaller erector/assist crane will also be present to allow the assembly of the main cranes and to ease overall erection of the turbines.

10.76 The resulting traffic generation profile is included in **Appendix 10.1**. The assessment is based upon an assumed construction programme for the Proposed Development, lasting 23 months. Alterations in this programme may increase or decrease traffic flows per month, however, it should be noted that the assessment is considered sufficiently robust.

10.77 The peak of construction occurs in Month seven with 344 movements per day (82 Car/Lights and 262 HGV journeys). These figures on average indicate approximately an additional 22 HGV movements per hour on the network at the peak of construction activities.

10.78 The distribution of development traffic on the network will vary depending on the types of loads being transported. The assumptions for the distribution of construction traffic during the peak months will be as follows:

- All construction traffic enters the Site via the proposed access on the A44.
- Deliveries associated with concrete materials, such as cement powder and water will be sourced from local concrete suppliers to the east via the A44.
- Whilst it is anticipated that onsite borrow pits will be able to meet up to 100% of the aggregate requirements, for the purpose of this assessment it is proposed that 50% of track and hardstanding aggregate requirements will be sourced from local quarries, which are assumed to originate from the east. Although the Scoping Report indicated that deliveries would be from the west, further investigation determined that quarries/concrete plants to the east may be more suitable. The BoP contractor will confirm final quarry and material sourcing with PCC and NMWTRA in the final CTMP.
- HGV deliveries associated with cabling and associated materials will arrive predominantly from the south and will travel to the Site via the A483 and A44.
- Staff working at the Site are likely to be based locally. It is assumed that 35% will come from Llandrindod Wells to the west via the A483 and A44, 35% will come from Kington via the A44, 15% will come from Rhayader to the west via the A44 and 15% will come from Builth Wells and the south and will travel via the A481 and A44.

- General site deliveries are assumed to arrive predominantly from the west via the A483 and A44.

10.79 The proposed AIL delivery route options A and B and the construction vehicle delivery route, within the study area, is presented in **Figure 10.4**. To estimate the total trips through the study area during the peak of the construction phase (Month 7), traffic generation was calculated for the 23-month construction programme and distributed through the network (based on traffic distribution assumptions) and combined with the 2026 baseline traffic data (see **Table 10.7**).

10.80 The resulting figures were compared with the 2026 baseline traffic to provide a percentage change in movements at each count location within the study area, as shown in **Table 10.9**.

Table 10.9 Peak construction traffic network impact

Count Ref.	Survey Location	Cars & Lights	HGV	Total	% Increase in Cars & Lights	% Increase in HGV	% Increase in Total Traffic
1	A44, near the Site access	1,566	725	2,291	5.53%	56.43%	17.64%
2	A44, east of A44/ A481 Priority Junction	1,923	935	2,858	1.52%	36.92%	10.90%
3	A481, south-west of A44/A481 Priority Junction	574	216	790	2.19%	0.00%	1.58%
4	A44, south of Walton	3,192	897	4,089	0.91%	39.12%	7.38%

Count Ref.	Survey Location	Cars & Lights	HGV	Total	% Increase in Cars & Lights	% Increase in HGV	% Increase in Total Traffic
5	A44, south-east of Pen-y-Bont Rail Station	4,488	323	4,811	0.92%	2.96%	1.06%
6	A483, south of Crossgates	7,819	280	8,099	0.37%	3.44%	0.47%
7	A483, Llandrindod Wells	6,952	178	7,130	0.41%	5.50%	0.54%
8	A483, south of Ridgebourne	7,875	330	8,205	0.37%	0.00%	0.35%
9	A483, north-east of A470/A483 Roundabout	6,567	357	6,924	0.19%	0.00%	0.18%
10	A483, south of A470/A483 Roundabout	9,883	585	10,469	0.12%	0.00%	0.12%
11	A470, Aberduhonw	4,915	386	5,301	0.25%	0.00%	0.23%
12	A470, at Lady Milford's Bridge	6,523	376	6,899	0.19%	0.00%	0.18%

Count Ref.	Survey Location	Cars & Lights	HGV	Total	% Increase in Cars & Lights	% Increase in HGV	% Increase in Total Traffic
13	A470, north of A470/A438 Priority Junction	4,303	268	4,571	0.29%	0.00%	0.27%
14	A481, south-west of Hundred House	961	79	1,040	1.30%	0.00%	1.20%
15	A481, north-east of Franksbridge	962	80	1,042	1.30%	0.00%	1.19%

Please note that variances may occur due to rounding.

10.81 The highest total traffic movement increase within the study area is along the A44, near the Site access with a total traffic increase of 17.64%. The second highest total traffic movement increase within the study area is expected on the A44, east of the A44 / A481 priority junction with a total increase in traffic of 10.90%. The total increase along the other links within the study area are less than 10% which is considered to be within daily flow variations.

10.82 The total HGV traffic movements are expected to increase by 56.43% (262 two-way HGV movements) on the A44 near the Site access, by 39.12% (252 two-way HGV movements) on the A44, south of Walton, and by 36.92% (252 two-way HGV movements) on the A44 to the east of A44 / A481 priority junction.

10.83 Whilst these could be considered a large increase in percentage terms, it is not considered to be a significant increase when considering vehicle numbers, with the maximum average 262 HGV movements per day predicted along the A44, which equates to approximately 22 two-way HGV movements per hour over a typical 12 hour working day. As the A44 is a local class A road, it is capable of accommodating HGV traffic.

10.84 It should be noted the construction phase is transitory in nature and the peak of construction activities is short lived, occurring over a relatively short timeframe when taking account of the whole construction programme.

10.85 A review of existing theoretical road capacity has been undertaken using The NESAs Manual, formerly part of the Design Manual for Roads and Bridges, Volume 15, Part 5. The theoretical road capacity has been estimated for each of the road links for a 12-hour period that makes up the study area. The results are summarised in **Table 10.10**.

Table 10.10 2026 daily traffic (12h) capacity review summary

Count Ref.	Survey Location	2026 Baseline Flow (total traffic)	2026 Base + Development Flows (total traffic)	Theoretical Road Capacity (12hr)	Spare Road Capacity %
1	A44, near the Site access	1,947	2,291	21,600	89%
2	A44, east of A44/A481 Priority Junction	2,577	2,858	28,800	90%
3	A481, south-west of A44/A481 Priority Junction	778	790	28,800	97%
4	A44, south of Walton	3,809	4,089	21,600	81%
5	A44, south-east of Pen-y-Bont Rail Station	4,761	4,811	28,800	83%
6	A483, south of Crossgates	8,061	8,099	28,800	72%

Count Ref.	Survey Location	2026 Baseline Flow (total traffic)	2026 Base + Development Flows (total traffic)	Theoretical Road Capacity (12hr)	Spare Road Capacity %
7	A483, Llandrindod Wells	7,092	7,130	19,200	63%
8	A483, south of Ridgebourne	8,176	8,205	19,200	57%
9	A483, north-east of A470/A483 Roundabout	6,912	6,924	19,200	64%
10	A483, south of A470/ A483 Roundabout	10,456	10,469	19,200	45%
11	A470, Aberduhonw	5,289	5,301	28,800	82%
12	A470, at Lady Milford's Bridge	6,887	6,899	28,800	76%
13	A470, north of A470/ A438 Priority Junction	4,559	4,571	21,600	79%
14	A481, south-west of Hundred House	1,028	1,040	21,600	95%
15	A481, north-east of Franksbridge	1,030	1,042	21,600	95%

Please note that variances may occur due to rounding.

10.86 The results indicate there are no road capacity issues with the addition of construction traffic associated with the proposed development and ample spare capacity exists within the trunk and local road network to accommodate all construction phase traffic.

10.87 In accordance with IEMA Guidelines 1 and 2, detailed assessments have been undertaken on the following receptors as construction traffic impacts were assessed to be over 30% increase in total flows/HGV traffic flows (as detailed in the **Assessing Significance – Magnitude** section earlier in this chapter):

- Users of the A44, near the Site access, east of the A44/A481 priority junction and to the south of Walton; and
- PRoW path users/open access and Common Land users.

Assessment of Effects

10.88 The significance of the potential effects on the above receptors has been determined using the rules and thresholds previously outlined in the Assessing Significance section. **Table 10.11** summarises the significance on the receptors for the construction phase prior to additional mitigation measures being applied.

Table 10.11 Construction phase effects summary

Receptors	Potential Effect	Magnitude of Effect	Significance of Effect	Comment
A44 Users (near the Site access, to the east of the A44/A481 priority junction and to the south of Walton)	Severance	Moderate	Moderate (Significant)	The maximum increase in HGV traffic is anticipated to be 56.43%, although the overall increase in traffic is forecast to be 17.64%. The effect of severance is therefore considered to be moderate.
(Medium Sensitivity)	Driver Delay	Minor	Minor (Not Significant)	There is ample spare capacity along the existing link road,

Receptors	Potential Effect	Magnitude of Effect	Significance of Effect	Comment
				therefore the effect on driver delay is considered minor.
	Pedestrian Delay	Minor	Minor (Not Significant)	There are limited pedestrian facilities located along the A44 within the study area, therefore the effect on pedestrian delay is considered minor.
	Non-motorised User Amenity	Minor	Minor (Not Significant)	There are limited pedestrian and cyclist facilities located along the A44 within the study area. The effect is therefore considered minor.
	Fear and Intimidation	Moderate	Moderate (Significant)	The maximum increase in HGV traffic is anticipated to be 56.43%, although the overall increase in traffic is forecast to be 17.64%. The effect on fear and intimidation is therefore considered to be moderate.
	Road Safety	Major	Major/Mode rate (Significant)	Two accidents which resulted in fatalities were recorded within approximately 2km of each other (to the east and west of the A44/A481 priority junction) between 2018 and 2022. Another accident which

Receptors	Potential Effect	Magnitude of Effect	Significance of Effect	Comment
				resulted in a fatality occurred along the A44 to the west of Walton within this time period. Therefore the effect of road safety is considered major/moderate.
	Large Loads	Major	Major/Moderate (Significant)	It is anticipated that the Proposed Development will require 334 AILs to be delivered to Site over a ten month period. These loads will be delivered in convoys of three AILs per convoy and will be accompanied by three escort vehicles. The effect is therefore considered major/moderate.
PRoW users/Common Land users (High Sensitivity)	Severance	Major	Major (Significant)	The presence of construction traffic within the Site where there was previously no traffic will lead to severance of some of the PRoW network. A section of the Proposed Development's access track is located along a BOAT, which will need to have management

Receptors	Potential Effect	Magnitude of Effect	Significance of Effect	Comment
				measures put in place to ensure the safety of all users. The effect, without additional mitigation, is therefore considered to be major.
	Driver Delay	Negligible	Negligible (Not Significant)	Negligible.
	Pedestrian Delay	Moderate	Major/Mode rate (Significant)	Pedestrians could experience delays if their movements interact with construction traffic along the PRow network which will not be experienced prior to the construction period. The effect is therefore considered major/moderate.
	Non-motorised User Amenity	Major	Major (Significant)	The presence of traffic flows along a location where there would have been no traffic prior to the construction phase could affect the amenity of the PRow network for users. The effect is therefore considered major.

Receptors	Potential Effect	Magnitude of Effect	Significance of Effect	Comment
	Fear and Intimidation	Major	Major (Significant)	The presence of traffic flows along a location, where there would have been no traffic prior to the construction phase could cause fear and intimidation of the PRow network for users. The effect is therefore considered major.
	Road Safety	Moderate	Major/Moderate (Significant)	There is potential to impact the safety of the PRow users interacting with construction delivery vehicles. The effect is therefore considered major/moderate.
	Large Loads	Major	Major/Moderate (Significant)	There is potential to impact the safety of the PRow users interacting with AIL delivery vehicles. The effect is therefore considered major/moderate.

10.89 The assessment of significance identifies that total traffic flows which may impact users of the PRow network during peak construction works are considered to result in significant adverse effects, prior to the application of additional mitigation measures.

10.90 The assessment of significance also identifies that users of the A44 (near the Site access, to the east of the A44/A481 priority junction and to the south of Walton) may experience

significant adverse effects relating to road safety and large loads. All other effects on these receptors are considered to be not significant.

10.91 It should be noted that the effects relate solely to the peak of construction activities (Month 7), and that the construction period is short lived and the effects transitory in nature. The assessment is also considered robust as the assessment assumes that 50% of aggregate materials for hardstandings and tracks will be delivered to Site which accounts for over half of the HGV movements included in the assessment. It is expected that onsite borrow pits will be able to provide 100% of these requirements, thus reducing the number of HGV movements within the study area to that assessed.

Proposed Mitigation (Additional Mitigation) and Compensation

Outline Construction Traffic Management Plan (CTMP)

10.92 The following measures would be implemented during the construction phase through the CTMP, to be secured via an appropriately worded planning condition. It should be noted that the final CTMP and TMP will be developed in consultation with PCC Highways Authority.

- Agree AIL route modifications and improvements with PCC, NMWTRA and other relevant stakeholders.
- Where possible the detailed design process will minimise the volume of material to be imported to site to help reduce HGV numbers.
- Where necessary, a site worker Staff Travel Plan, including transport modes to and from the worksite (including pick up and drop off times) will be prepared.
- Information regarding AIL deliveries.
- All materials delivery lorries (dry materials) should be sheeted to reduce dust and stop spillage on public roads.
- Specific training and disciplinary measures should be established to ensure the highest standards are maintained to prevent construction vehicles from carrying mud and debris onto the carriageway.

- Wheel cleaning facilities may be established at the site entrance, depending on the views of PCC.
- Unless otherwise agreed with the roads authorities, normal site working hours will be limited to between 0700 and 1900 Monday to Friday and 0700 and 1300 Saturday though component delivery, foundation pours and turbine erection may take place outside these hours. No work is proposed on Sundays and public holidays unless otherwise agreed with the Local Planning Authorities.
- Appropriate traffic management measures would be put in place on the A44 leading through to the Site, to avoid conflict with general traffic, subject to the agreement of PCC. Typical measures would include HGV turning and crossing signs and/or banksmen at the site access and warning signs.
- Provide construction updates on the project website and or a newsletter to be distributed to residents within an agreed distance of the Site.
- Adoption of a voluntary speed limit of 15 mph through Llandegley, Penybont, Crossgates, Llandrindod Wells, Ridgebourne, Crossway, Builth Wells, Llanellwedd Erwood and Llyswen for HGV construction traffic. Site specific speed limits will be adhered to within the Site.
- All drivers will be required to attend an induction to include:
 - A tool box talk safety briefing;
 - The need for appropriate care and speed control;
 - A briefing on driver speed reduction agreements (to slow site traffic at sensitive locations through the villages); and
 - Identification of the required access routes and the controls to ensure no departure from these routes.

10.93 PCC and the Welsh Government may request that an agreement to cover the cost of abnormal wear on the A44 is made. If required, provisions for this will be detailed within the CTMP and any necessary agreements will be entered into.

10.94 Video footage of the pre-construction phase condition of the abnormal loads access route and the construction vehicles route will be recorded to provide a baseline of the condition of the

road prior to any construction work commencing. This baseline will inform any change in the road condition during the construction phase. Any necessary repairs will be coordinated with the relevant authority. Any damage caused by traffic associated with the Proposed Development during the construction period that will be hazardous to public traffic will be repaired immediately.

10.95 Damage to road infrastructure caused directly by construction traffic arising from the Proposed Development will be repaired and street furniture that is removed on a temporary basis will be fully reinstated.

10.96 There will be a regular road and road edge review, which will include the areas within the highway boundary and any debris and mud will be removed from the public highway to keep the road clean and safe during the initial months of construction activity, until the site entrance and immediate access track works are complete. Before the AILs traverse the chosen transport route, the following tasks will be undertaken to ensure load and road user safety:

- Ensure any vegetation that may foul the loads is trimmed back to allow passage;
- Confirm there are no roadworks or closures that could affect the passage of the loads;
- Check no new or diverted underground services on the proposed route are at risk from the abnormal loads; and
- Confirm the police are satisfied with the proposed movement strategy.

Abnormal Load Transport Management Plan (TMP)

10.97 An Abnormal Load Transport Management Plan will be prepared to cater for all movements to and from the Proposed Development. An outline TMP is included in **Appendix 10.2**. Upon confirmation of the candidate turbine, the finalised TMP will include the following further details:

- Procedures for liaising with the emergency services to ensure that police, fire and ambulance vehicles are not impeded by the loads. This is normally undertaken by informing the emergency services of delivery times and dates and agreeing communication protocols and lay over areas to allow overtaking.

- A diary of proposed delivery movements will be used to liaise with the communities to avoid key dates, such as the Royal Welsh Show and other local events that could be affected.
- A protocol for working with local businesses to ensure the construction traffic does not interfere with deliveries, normal business traffic or school traffic.
- Proposals to establish a construction liaison committee to ensure the smooth management of the project/public interface with the Applicant, the construction contractors, the local community, and if appropriate, the police forming the committee. This committee will form a means of communicating and updating on forthcoming activities and dealing with any potential issues arising.

Onsite Measures Delivered Using a Path Management Plan (PaMP)

10.98 It is recognised that it will be necessary to divert PRowS, either temporarily or permanently, for both the construction and operational phases of the Proposed Development. A PaMP is to be secured by planning condition and will be developed in consultation with PCC and other relevant stakeholders. The PaMP will establish the extent and location of diversions that will be necessary and will be confirmed following the micro-siting exercise post-consent. The temporary and permanent diversions will be secured through the appropriate processes to secure the requisite consents to facilitate them. It should be noted that there is sufficient land within the Site to accommodate any necessary diversions.

10.99 The PaMP will include:

- proposals to establish a construction liaison committee to ensure the smooth management of the project/public interface with the Applicant, the construction contractors, the local community, and if appropriate, the police forming the committee. This committee will form a means of communicating and updating on forthcoming activities and dealing with any potential issues arising;
- details of temporary closures that may be needed and whether alternative routes can be provided;
- details outlining the management of temporary accommodation work affecting rights of way and access;

- measures to manage the risks associated with construction traffic encountering members of the public, especially where the room for avoidance is limited;
- public information including legal and advisory signage; and
- plans for the reinstatement of public paths.

10.100 Within the PaMP, consideration will be given to pedestrians, cyclists and horse riders alike due to potential interactions between construction traffic and users of the PRow network, as well as vehicle users of the BOAT during the construction and operational phase. Appropriate measures will be formulated into a PaMP.

10.101 The Principal Contractor will ensure that speed limits are always adhered to by their drivers and associated subcontractors. This is particularly important within proximity to the PRow network, on Common Land and at crossing points. Advisory speed limit signage will also be installed on approaches to areas where PRow users may interact with construction traffic.

10.102 Signage will be installed on the Site exit that makes drivers aware of local speed limits and reminding drivers of the potential presence of pedestrians, cyclists, equestrians and users of the BOAT in the area, as well as the potential presence of animals. This will also be emphasised in weekly toolbox talks.

10.103 Users of the PRowS will be separated from construction traffic using barriers (where permitted and appropriate) which will ensure that safe access to the Site for recreational purposes will be maintained. Crossing points will be provided where required, with path users having right of way and diversions will be provided where necessary. It should be noted that any necessary temporary diversions (during the construction phase) or permanent diversions (during the construction and operational phase) to the PRow network will be discussed and agreed with PCC. The diversions will be applied for through a separate consent.

10.104 Appropriate Traffic Signs Manual Chapter 8 compliant temporary road signage would be provided to assist at these crossings for the benefit of all users.

10.105 The British Horse Society recommendations on the interactions between HGV traffic and horses state that horses are normally nervous of large vehicles, particularly when they do not often meet them. Horses are flighty animals and will run away in panic if really frightened. Riders will do all they can to prevent this but, should it happen, it could cause a

serious accident for other road users, as well as for the horse and rider. The BHS has confirmed that they will coordinate with the Applicant on mitigation and enhancement in relation to equestrian use of the Site during construction and operation. .

10.106 The main factors causing fear in horses in this situation are:

- Something approaching them, which is unfamiliar and intimidating;
- A large moving object, especially if it is noisy;
- Lack of space between the horse and the vehicle;
- The sound of air brakes; and
- Anxiety on the part of the rider.

10.107 The British Horse Society recommends the following actions that will be included in the Site training for all HGV staff:

- On seeing riders approaching, drivers must slow down and stop, minimising the sound of air brakes, if possible.
- If the horse still shows signs of nervousness while approaching the vehicle, the engine should be shut down (if it is safe to do so).
- The vehicle should not move off until the riders are well clear of the back of the HGV.
- If drivers are wishing to overtake riders, please approach slowly or even stop to give riders time to find a gateway or lay by where they can take refuge and create sufficient space between the horse and the vehicle. Because of the position of their eyes, horses are very aware of things coming up behind them.
- All drivers delivering to the Site must be patient. Riders will be doing their best to reassure their horses while often feeling a high degree of anxiety themselves.

10.108 Discussions with local equestrian groups will be held during the construction period to keep riders informed of works and activities. These discussions will also allow the contractors to tailor their toolbox talks to specific equestrian issues.

Strategic Recreational Framework

10.109 A Strategic Recreational Framework will also be submitted with the DNS application, which will set out proposals of how access to and across the Site for recreation could be enhanced.

A Staff Travel Plan

10.110 A Staff Travel Plan will be deployed where necessary, to manage the arrival and departure profile of staff and to encourage sustainable modes of transport, especially car-sharing. A package of measures could include:

- Appointment of a Travel Plan Coordinator;
- Provision of public transport information;
- Mini-bus service for transport of site staff;
- Promotion of a car sharing scheme; and
- Car parking management.

Public Information

10.111 Information on the turbine convoys will be provided to local media outlets to help assist the public. These could include:

- Local newspapers;
- Online media outlets;
- Community Councils; and
- PCC website.

10.112 Information will relate to expected vehicle movements from the PoE through to the Site access junction. This will assist residents becoming aware of the convoy movements and may help reduce any potential conflicts.

Off Site Mitigation

10.113 It is anticipated that an agreement on wear and tear on road infrastructure caused directly by construction traffic will be established prior to construction commencing. The agreement will set out the area of review, scope and response requirement of any dilapidations that can be proven to be linked to construction traffic.

10.114 Any temporary road changes required to facilitate the movement of AILs will be agreed with the appropriate roads authority.

Residual Construction Effects

10.115 The identification of residual construction effects considers the assessment of traffic impacts following the incorporation of the identified additional mitigation measures. An evaluation of the potential effects of the temporary increase in traffic on the study area roads used for the construction traffic has been undertaken. To avoid repetition below, the summary of this assessment of residual effects is presented in **Table 10.12**.

Assessment of Operational Effects

10.116 Once operational, it is envisaged that the level of traffic associated with the Proposed Development will be minimal.

10.117 Regular weekly visits will be made to the Site for maintenance checks. The vehicles used for these visits are likely to be 4x4 vehicles and there may also be the occasional need for an HGV to access the Site for specific maintenance and/or repairs. It is considered that there will be no significant effects resulting from operational traffic and therefore no detailed assessment of the operational phase of the Proposed Development is required.

10.118 It is anticipated that permanent diversions will be necessary along the PRoW network as a result of the construction of the Proposed Development which will remain in place during the operational phase. The permanent diversions will be discussed and agreed with PCC, and any changes to the PRoW network will be applied for through the appropriate application process as a separate consent.

10.119 No potential significant operational effects are predicted as part of the Proposed Development and this topic has been scoped out of the assessment.

10.120 It should be noted that once the Proposed Development is operational, the access tracks and the Strategic Recreation Framework also have the potential to positively affect public access to the Site.

10.121 No potential residual operational effects are predicted as part of the Proposed Development and this topic has been scoped out of the assessment.

10.122 No potential residual decommissioning effects are predicted as part of the Proposed Development and this topic has been scoped out of the assessment.

Assessment of Cumulative Effects

Predicted Cumulative Effects During Construction

10.123 The use of NRTF low growth assumptions has provided a basis for general local development growth within the study area.

10.124 In line with the agreed approach in the transport section of the Scoping Report (**Appendix 2.1**), only committed developments (i.e. those with planning approval) are included in the cumulative assessment in line with good practice for transport planning projects. The review of PCC online planning portal and PEDW's DNS Casework portal was undertaken to determine which committed developments should be considered in the assessment. The review did not establish any consented developments whose trips are considered significant in scale (i.e. has associated traffic impact of over 10%).

10.125 Projects in Scoping or not yet determined cannot be included in cumulative assessments in the transport assessments as they have yet to be determined. As traffic impacts are short lived for construction projects, the potential traffic impact is highly speculative for these projects and as such, cannot be included in the assessment.

10.126 Any effects of multiple sites being constructed at the same time would be mitigated using an overarching Traffic Management and Monitoring Plan and by introducing a

phased delivery plan which would be agreed with local council roads department, NMWTRA and the Police.

10.127 Further details of the review are presented in **Appendix 10.1**.

10.128 It is therefore considered that there will be no cumulative transport or access effects predicted as part of the Proposed Development.

Combined Effects

10.129 IEMA guidelines also refer to visual effects, noise and hazardous loads associated with traffic generation. Visual effects and noise are addressed in **Chapter 5: Landscape and Visual Amenity** and **Chapter 9: Noise and Vibration** respectively. No hazardous loads are required to support construction activities for the Proposed Development.

Further Survey Requirements and Monitoring

10.130 Site entrance tracks will be maintained and monitored during the operational life of the Proposed Development. Regular maintenance will be undertaken to keep the Site access track drainage systems fully operational and to ensure there are no run-off issues onto the public road network.

Summary of Effects

10.131 **Table 10.12** below summarises the predicted residual effects of the Proposed Development on Access, Traffic and Transport, following implementation of the additional mitigation.

Table 10.12 Summary of effects

Predicted Effect	Sensitivity	Magnitude	Significance	Mitigation	Significance of Residual Effect
Construction					
A44 Users (near the Site access, east of the A44/A481 priority junction and to the south of Walton)					
Severance	Medium	Moderate	Moderate (Significant)	CTMP – Temporary signage/route signage	Minor (Not Significant)
Fear and Intimidation	Medium	Moderate	Moderate (Significant)	CTMP – Temporary signage/route signage	Minor (Not Significant)
Road Safety	Medium	Major	Major/Mode rate (Significant)	CTMP – Temporary signage/route signage	Minor (Not Significant)
Large Loads	Medium	Major	Major/Mode rate (Significant)	AIL TMP	Minor (Not Significant)
PRoW Users					
Severance	High	Major	Major (Significant)	CTMP – Temporary signage/route signage and PaMP	Minor (Not Significant)

Predicted Effect	Sensitivity	Magnitude	Significance	Mitigation	Significance of Residual Effect
Driver Delay	High	Negligible	Negligible (Not Significant)	CTMP – Temporary signage/route signage and PaMP	Minor (Not Significant)
Pedestrian Delay	High	Moderate	Major/ Moderate (Significant)	CTMP – Temporary signage/route signage and PaMP	Minor (Not Significant)
Non-motorised User Amenity	High	Major	Major (Significant)	CTMP – Temporary signage/route signage and PaMP	Minor (Not Significant)
Fear and Intimidation	High	Major	Major (Significant)	CTMP – Temporary signage/route signage and PaMP	Minor (Not Significant)
Road Safety	High	Moderate	Major/ Moderate (Significant)	CTMP – Temporary signage/route signage and PaMP	Minor (Not Significant)
Large Loads	High	Major	Major/ Moderate (Significant)	CTMP – Temporary signage/route signage and PaMP	Minor (Not Significant)



**Nant Mithil
Energy Park Limited**

Environmental Statement

**Chapter 11: Hydrology, Hydrogeology, and Geology
(including peat)**



Chapter 11

Hydrology, Geology and Hydrogeology (including peat)

Introduction

11.1 This chapter considers the potential effects of the Proposed Development on Hydrology, Hydrogeology and Geology associated with the construction and operation of the Proposed Development.

11.2 Liaison has been undertaken with other specialists involved in the EIA, where relevant. The assessment of effects on soils, peatland and groundwater dependant terrestrial ecosystems (GWDTEs) as receptors is assessed in this chapter. The reader is referred to **Chapter 7: Ecology** for details on the baseline assessment of habitats within areas of peatland and GWDTEs.

11.3 The Hydrology, Hydrogeology and Geology assessment was undertaken by Aqua Terra Consultants Ltd. The chapter has been authored by Mary Jeddere-Fisher, Anneliese Whiteley and James Mortimer (see **Appendix 1.1: Statement of Expertise**).

11.4 This chapter is supported by the following figures in **Volume 2**:

- **Figure 11.1: Study area**
- **Figure 11.2: Flood risk zones**
- **Figure 11.3: Water features**
- **Figure 11.4: Groundwater dependent terrestrial ecosystems**
- **Figure 11.5: Private water supplies**
- **Figure 11.6: Published geology – Superficial Geology**
- **Figure 11.7: Published geology – Bedrock Geology**
- **Figure 11.8: Long undisturbed soil**

■ **Figure 11.9: UXO risk zones**

11.5 This chapter is informed by, and should be read in conjunction with the following appendices, provided in **Volume 3**:

- **Appendix 11.1: Flood Consequence Assessment**
- **Appendix 11.2: Outline Surface Water Drainage Strategy**
- **Appendix 11.3: Geological and Ground Conditions Desk Study**
- **Appendix 11.4: Outline Soils Management Plan, including Peat**
- **Appendix 11.5: Water Resources Assessment**
- **Appendix 11.6: Preliminary Slope Stability Assessment**
- **Appendix 11.7 UXO Mitigation Completion Report**

Scope of the Assessment

Effects Assessed in Full

11.6 The following effects were identified at the Scoping stage for consideration in this assessment:

- Direct effects during construction on Hydrology, Hydrogeology and Geology:
 - Pollution of public/private drinking water supplies;
 - Pollution of ground water and surface watercourses;
 - Modifications to natural overland drainage pathways, including changes to runoff rates and volumes;
 - Localised flooding and bank erosion as a result of impediments to flow and/or uncontrolled water discharge;
 - Loss of or disturbance to peat and to soils;
 - Loss of or disturbance to groundwater-dependent terrestrial ecosystems (GWDTEs);and,

- Erosion and compaction of soils as a result of excavation and reinstatement activity.
- Indirect effects during construction on Hydrology, Hydrogeology and Geology:
 - Effect on offsite flood risk; and,
 - Effect on downstream water quality.
- Direct effects during operation on Hydrology, Hydrogeology and Geology:
 - Modifications to natural overland drainage pathways, including changes to runoff rates and volumes;
 - Pollution of public/private drinking water supplies;
 - Pollution of surface watercourses;
 - Alteration of groundwater flow towards GWDTEs; and,
 - Alteration of groundwater or surface water flow to peatland.
- Indirect effects during operation on Hydrology, Hydrogeology and Geology:
 - Effect on offsite flood risk.
- Cumulative effects during construction on Hydrology, Hydrogeology and Geology:
 - These are considered to be the same in scope as those set out above for the Proposed Development itself.
- Cumulative effects during operation on Hydrology, Hydrogeology and Geology:
 - These are considered to be the same in scope as those set out above for the Proposed Development itself.

Effects Scoped Out

11.7 Decommissioning was scoped out of this ES in accordance with the Scoping Direction. Notwithstanding this, recent representations made by the Welsh Government Welsh Government Soil, Peatland & Agricultural Planning Unit (also known as the Land Quality Advice Service, LQAS) on similar upland wind farm projects has provided focus on the adherence to Policy 18(11) of Future Wales, which states that *“proposals for renewable and low carbon energy projects (including repowering) qualifying as Developments of National Significance will*

be permitted subject to... (the requirement that)... there are acceptable provisions relating to the decommissioning of the development at the end of its lifetime, including the removal of infrastructure and effective restoration". In order to address this point, the impact that decommissioning may have on soils and peatland has been added to the scope of this chapter. All other aspects of decommissioning remain scoped out.

11.8 In order to demonstrate beyond significant doubt that satisfactory reclamation can be achieved on the Site during decommissioning, an Outline Decommissioning Plan (ODP) has been produced (**Appendix 4.4**). This describes the sequence of works and series of environmental considerations that will be deployed in decommissioning the permanent infrastructure at the end of the operational phase (so far as can be reasonably determined several decades before these works will be required). The applied mitigation represented in the ODP is sufficient to demonstrate that there is no significant doubt whether restoration can be achieved, and that this can be undertaken without significant adverse environmental impacts. It also concludes that the range of potential changes associated with decommissioning are identical to, and of lower magnitude than those assessed for the construction phase. As such, decommissioning has been scoped out of this chapter.

11.9 The direct impact on habitats supported by soils and peatland is outside the scope of this chapter. **Chapter 7** provides an assessment of the direct impact (loss) of habitats, including the direct loss of wet habitat where the formation of cut slopes causes drying to the immediately adjacent soils. Conversely, the effect that areas of cut may have in intercepting drainage flow pathways (either above ground or below ground) are within the scope of this chapter.

11.10 In addition to the above, agricultural land quality has been scoped out of this assessment, as discussed in **Chapter 2**. This is based on the desk based and field survey work undertaken, the professional judgement of the EIA team, experience from other relevant projects and policy guidance or standards, and feedback received from consultees.

Assessment Methodology

Legislation and Guidance

Legislation

11.11 The assessment is carried out in accordance with the following legislation:

- The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017¹;
- The EU Water Framework Directive (2000/60/EC)²;
- Environmental Protection Act 1990³;
- Land Drainage Act 1991⁴;
- Environment Act 1995⁵;
- Control of Pollution Act 1974⁶;
- Environmental Permitting Regulations 2016⁷;
- Environmental Damage (Prevention and Remediation) Regulations 2015⁸; and,
- Construction (Design & Management) Regulations 2015⁹.

Policy

11.12 The assessment is carried out in adherence with the following policy:

- Future Wales: The National Plan 2040 (2021);

¹ HM Government (2017) The Town and Country Planning (Environmental Impact Assessment) Regulations 2017

² European Commission (2007) The Water Framework Directive 2007/60/EC

³ HM Government (1990) Environmental Protection Act 1990

⁴ HM Government (1991) Land Drainage Act 1991

⁵ HM Government (1995) The Environment Act 1995

⁶ HM Government (1974) Control of Pollution Act 1974

⁷ HM Government (2016) Environmental Permitting (England and Wales) Regulations 2016

⁸ HM Government (2015) The Environmental Damage (Prevention and remediation) (England) (Amendment) Regulations 2015

⁹ HM Government (2015) The Construction (Design and Management) Regulations 2015

- Planning Policy Wales Chapter 6, Edition 12 (February 2024)¹⁰;
- Planning Policy Wales Technical Advice Note (TAN) 15: Development and flood risk (2004)¹¹;
- Minerals Technical Advice Note (MTAN) Wales 1: Aggregates (2004)¹² as it pertains to the proposed borrow pits within the Site; and,
- Adopted Powys Local Development Plan, Policy DM6 (Flood Prevention Measures and Land) (2018)¹³.

Guidance

11.13 This assessment is carried out in accordance with the principles contained within the following documents:

- Countryside Council for Wales (CCW) (2010) Guidance Note: Assessing the impact of wind farm developments on peatlands in Wales¹⁴;
- Natural Resources Wales (NRW) (2017) Flood estimation, Technical Guidance Reference Number: GN008¹⁵;
- Welsh Government (2018) Statutory standards for sustainable drainage systems – designing, construction, operating and maintaining surface water drainage systems¹⁶;
- The Water Supply (Water Quality) Regulations 2000¹⁷;
- British Standards Institution (2020) BS 10175 Investigation of potentially contaminated sites¹⁸;

¹⁰ Welsh Government (2024) Planning Policy Wales (Edition 12)

¹¹ Welsh Government (2004) Technical Advice Note (TAN) 15: Development and flood risk

¹² Welsh Government (2004) Minerals Technical Advice Note (MTAN) Wales 1: Aggregates

¹³ Powys County Council (2018) Adopted Powys Local Development Plan

¹⁴ Countryside Council for Wales (2010) Guidance Note: Assessing the impact of wind farm developments on peatlands in Wales

¹⁵ Natural Resources Wales (2017) Flood estimation: Technical Guidance GN008

¹⁶ Welsh Government (2018) Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems

¹⁷ HM Government (2000) The Water Supply (Water Quality) Regulations 2000

¹⁸ British Standards Institution (2017) BS 10175:2011+A2:2017 Investigation of potentially contaminated sites

- British Standards Institution (2020) BS 5930:2015+A1:2020 Code of practice for ground investigations¹⁹;
- British Standards Institution (2015) BS 3882:2015 Specification for topsoil²⁰
- Environment Agency (2018) The Environment Agency's approach to groundwater protection²¹;
- CIRIA (2001) CIRIA Report C532 – Control of Water from Construction Sites²²;
- CIRIA (2010) CIRIA Report C692 – Environmental Good Practice on site (3rd Edition)²³;
- DEFRA (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites²⁴;
- SEPA (2017) Land Use Planning System Guidance GU31: Guidance on assessing the impacts of development on groundwater abstractions and groundwater dependent ecosystems²⁵; and,
- SNH (now NatureScot; 2017) Guidance on Developments on Peatland – Peatland Survey²⁶.

Consultation

11.14 In undertaking the assessment, consideration has been given to the Scoping Responses and other consultation which has been undertaken as detailed in **Table 11.1**.

¹⁹ British Standards Institution (2020) BS 5930:2015+A1:2020 Code of practice for ground investigations

²⁰ British Standards Institution (2015) BS 3882:2015 Specification for topsoil

²¹ Environment Agency (2018) The Environment Agency's approach to groundwater protection

²² CIRIA (2001) CIRIA Report C532, Control of water pollution from construction sites. Guidance for consultants and contractors

²³ CIRIA (2010) CIRIA Report C692, Environmental good practice on site (third edition)

²⁴ DEFRA (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites

²⁵ SEPA (2017) Land Use Planning System Guidance GU31: Guidance on assessing the impacts of development on groundwater abstractions and groundwater dependent ecosystems

²⁶ Scottish Natural Heritage (2017) Guidance on Developments on Peatland – Peatland survey

Table 11.1 Consultation responses

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Natural Resources Wales 24/11/2022	Formal Scoping Consultation	NRW have not reviewed the Scoping Report in relation to peat, owing to resource issues. NRW advise that further information relating to this receptor could be required at a later date if an application proposal is brought forward.	NRW's scoping responses and recent hearings on other similar developments reviewed and advice followed.
		NRW advise that the proposed outline CEMP needs to include a Pollution Prevention Plan and Emergency Response Plan.	The Outline CEMP (Appendix 4.2) includes a Pollution Prevention Plan and Emergency Response Plan.
		An outline Habitat Management plan has not been listed in relation to peat and peatland restoration areas, which NRW would like to see included in the HMP.	Chapter 7 includes reference to the outline Habitat Management Plan, which forms Appendix 7.10 to that chapter. The OHMP incorporates reference to peat and peatland where relevant.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		NRW consider that there may be some impact on Mithil Brook & Cwm Blithus SSSI but without more detailed information on the construction/location of new site access and onsite access tracks, it is difficult to assess precisely what that impact might be. The geological interest is distributed both in rock exposures along the bank of Mithil Brook but also in natural rock exposures in the cwm. NRW are likely to require much more specific locational data with regard to any new tracks in the vicinity of the SSSI.	This is covered in Appendix 11.3: Geological and Ground Conditions Desk Study .
		NRW note that the Site is within the catchment of the River Wye Special Area of Conservation (SAC). On the 21 st January 2021 NRW published an evidence package outlining phosphorus levels for all river SACs across Wales. In line with Planning Advice (July 2022), under the Habitats Regulations,	There will be no source of phosphorous associated with the operational phase of the Proposed Development. During the construction phase wastewater will be removed from Site as discussed in Appendix 11.2: Outline Drainage Strategy .

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Planning Authorities must consider the phosphorus impact of proposed developments on water quality within SAC river catchments. From the information submitted as part of the ES Scoping Report, there does not appear to be a source of phosphorous as part of the Proposed Development, however it is a matter for the LPA to determine. NRW therefore advise that as part of any future planning application submission, you provide the LPA with sufficient details regarding any source of phosphorus arising from the proposal to inform their Habitats Regulations Assessment (HRA) or to confirm whether or not any additional wastewater would be discharged from the Site. If additional wastewater is to be discharged, it is likely the LPA will require further information from you to inform their HRA.	

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		The construction and operation of the Proposed Development could denigrate the 'outstanding geological status' covering the vast majority of the Site, which is also inherently linked with the RIGS. The Site is also located within the River Wye Phosphorus Sensitive SAC, within the Radnor Forest SSSI and within a Medium (northern section) to High (southern section) Groundwater Vulnerability Secondary Aquifer system. The Well-being of Future Generations (Wales) Act 2015, requires consideration within the EIA in terms of how the proposed development could affect well-being aspects such as enjoyment, visitation and research opportunities associated with the RIGS (and the SSSI areas) both now but also for future generations.	The Mithil Brook and Cwm Blithus SSSI and Gwernargllwyd Cutting RIGS have been assessed in Appendix 11.3 and are identified as sensitive receptors. The hydrology of the Radnor Forest SSSI has been assessed in Appendix 11.5 and is identified as a sensitive receptor. The Secondary (A) Aquifer beneath the Site has been assessed Appendix 11.5 and is identified as a sensitive receptor as a sensitive receptor. The impact on the outstanding geological (landscape) status is considered in Chapter 5: Landscape and visual assessment.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		It is therefore important for applicants to consider how 'well-being' factors embedded within the WFGA are being considered against development impacts that may affect RIGS and SSSI areas.	
		NRW do not agree that the subject area of hydrology, hydrogeology and geology can be scoped out of the EIA. This is due to it not being possible to determine without further specific assessment what the potential effects on both flows and water quality of the watercourses could be from the construction and operation of the windfarm infrastructure.	Hydrology, hydrogeology and geology have been scoped into the EIA.
		The Scoping Report stated that the proposed Energy Park does not fall within medium or high risk flood zones. These zones are associated with the FRAW data and must not be confused with Flood	The Flood Map for Planning (FMfP) has been used throughout the FCA Appendix 11.1 and referred to within this chapter.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Zones 2 and 3 of the FMfP. The flood zones 2 & 3 of the FMfP include climate change, whereas the FRAW data covers present day flood risk. For any proposed crossings of non-main river watercourses, the Applicant will need to contact Powys County Council as the lead Local Flood Authority (LLFA) who regulate these watercourses under the requirements of the Land Drainage Act 1991. Reference to a FCA has been stated in the Scoping Report. It is essential the impacts of flooding elsewhere resulting from any permanent and/or temporary works are clearly set out, together with any proposed mitigation measures necessary to offset any negative increase in flood risk within the	Proposed crossings of non-main river watercourses have been identified within Appendix 11.2: Outline Drainage Strategy and ordinary watercourse consent will be sought from the LLFA. The FCA is provided in Appendix 11.1 and contains impacts of flooding elsewhere resulting from any permanent and/or temporary works, together with any proposed mitigation measures.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		main rivers and ordinary watercourses affected by the project.	
Welsh Government – Soil, Peatland & Agricultural Land Use Planning Unit, Department for Climate Change 10/12/2022	Formal Scoping Consultation	WG have commented that ‘peat soil’ is defined as: a. More than 40cm of organic (O horizon) material within the upper 80cm, excluding fresh litter (L) and living moss; or b. More than 30cm of organic (O horizon) material resting directly on the bedrock (R or Cr) or extremely stony material; and c. No overlying non-humose material mineral horizon that has a colour value of 4 or more and extends below 30cm depth.	This definition of ‘peat soil’ has been used throughout the ES and supporting chapters.
		The initial peat probing has identified a significant extent of peatland within the application site that	The only significant area of peatland on Site is within that area of the Radnor Forest SSSI that sits within the Site. The Proposed Development has been

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		requires further assessment as part of the ES process. The Department expects the ES to robustly meet the objectives of avoiding impacts on peat deposits and avoid siting borrow pits on peat areas.	designed to avoid this area as part of the step-wise approach to the design of the development. A Phase 1 and Phase 2 peat survey has been undertaken on Site in accordance with NatureScot (SNH) guidance. There is no peat present in any of the proposed borrow pit search areas.
		The Department considers that the proposed study area should also consider any offsite peat areas that are integral to the hydrological functioning of the onsite peat bodies. The applicant should discuss the peat survey methodology with NRW Lead Specialist Advisor – Peatlands.	The potential impact on the hydrology of the Radnor Forest SSSI area of peatland is assessed in Table 11.13 in this chapter, and associated paragraphs. The peat survey methodology adheres to the available guidance as set out in Appendix 11.4. NRW have been requested to provide advice on peat assessment methodology, but have not been able to provide resource to do so.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		The Department considers that a soil resource and physical characteristics report should be produced for areas of any proposed infrastructure siting.	Appendix 11:4 Outline Soil Management Plan includes an assessment of the soil resource and depth across the Site.
		The Department considers that the potential impacts of all proposals and infrastructure on hydrological function of peatland bodies and disturbance to all soils should be considered, assessed and evidenced.	All of these aspects have been assessed and considered in this chapter and the accompanying appendices.
		A Soil management scheme should be prepared by the developer, informed by a baseline soil resources and physical characteristics report, and be considered as part of the ES process. This should be a clear scheme and programme setting out how all soils and their function will be conserved and reinstated.	Appendix 11.4: Outline Soil Management Plan includes details of the proposed soil management scheme.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
NRW 24/06/2024	Statutory Consultation Response	Section 11.25 Overview. This section refers to the Site being situated on a mountainous plateau of moorland that lies in the headwaters of the River Lugg. We consider the application site falls within the upper catchment of the River Ithon/Wye rather than the River Lugg.	ES Chapter Overview text updated within this chapter.
		Section 11.48 - Peat and Soils. This section states that 'The Peatland of Wales dataset identifies the presence of peat deeper than 40cm across a large area of upland plateau to the east of Cwm Bwch. This stretches beneath the forestry plantation to the north of Great Rhos and across Llethr Du, extending across Black Mixen summit'.	Text correct as per the published dataset used. Additional data from NRW not provided for review. However, Phase 1 and 2 surveys have been conducted across the Site to demonstrate the site specific conditions.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		These findings are not in line with our own monitoring and habitat records as we consider the Great Rhos peat body to extend to the top of Cwm Bwch.	
		Section 11.50 states the layout of the proposed development has been designed to avoid areas of peatland with soil depths greater than 30cm. Whilst we acknowledge that peat depth towards the top of Cwm Bwch may be less than 30cm, the habitat here still supports characteristic blanket bog vegetation. Thus, proposed turbine locations T18, T19, T20 and associated tracks and underground cabling will potentially cause significant disturbance to the western edge of the Great Rhos peat body.	Phase 1 and 2 peat and soil surveys have been conducted across the Site to demonstrate the site specific conditions. All turbines and infrastructure have been designed using a step-wise approach to avoid areas of peat and habitats. The turbines listed are noted in Table 11.10 and carried through the assessment and mitigation.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Table 11.10 Summary of peat and long undisturbed soil where they interact with the Proposed Development. The table identifies T16 to T20 to be situated in areas of upland heath on the flanks of Great Rhos/around the rim of Cwm Bwch, and states that organic-rich peaty topsoil is present in some parts of the infrastructure footprint. We advise that locations T18, T19 and T20 may be located in blanket bog vegetation overlying shallow peat. Table 11.13 identifies a permanent major impact to this type of habitat.	Agreed. We have identified those turbines in the same table (11.10) and carried them through the assessment.
		Section 11.103 Peatland on Great Rhos, including within SSSI.	Agreed. The Developer has committed to further investigation, design and specific mitigation in this area as detailed in Chapter 11, Section 11.103.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		This section recognises that ‘Turbines T18, T19 and T20 and the trackways between them cross the area of ground immediately downslope of the peatland. There is therefore the risk that this infrastructure provides a preferential drainage pathway, which in turn leads to the drying of soils in the Great Rhos area’ and suggest potential mitigation techniques. We advise that based on Aerial imagery and ground observations by NRW staff, the proposed turbine locations T18-T20 and associated track would cut across the edge of the peat body. For this reason excavations here could lead to the loss of shallow peat and the hydrological connection to the main peat body within the Radnor Forest SSSI. It is acknowledged that more work is needed at the detailed design phase to evaluate the impact on	

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		peat soils in the area and possible mitigation. We refer you to our comments in Section 7.187 above. Chapter 11 Volume 3 - Appendix 11.4 Outline Soil Management Plan including peat Figure 2.2 Peat probe data from initial survey, indicates pockets of peat greater than 20cm on the western side of the Great Rhos peat body and connected to the main area within the SSSI by peat 10-20cm deep extending beneath proposed turbine locations T18-T20 and connecting track. This is confirmed within Figure 2.3 Soil depths as recorded during probing fieldwork – north.	
		Hydrogeology - Land Contamination and Pollution of controlled waters	We have assigned the sensitivity based on site specific factors with the overall groundwater body as medium due to it being a Secondary B Aquifer. However, this is regularly increased to high where

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Based on the information reviewed, we consider the groundwater beneath the site has a high groundwater vulnerability and sensitivity, and a number of groundwater dependent features. We also consider there is the potential for areas of contamination following farm-activities at the site and areas of infilling.	important features exist including Private Water Supplies and GWDTEs as can be seen in Table 11.13 and which is used throughout the assessment. Whilst there could be potential areas of contamination these are considered unlikely in the context of the overall site and the Developer has committed to further investigation as required at the detailed design stage (see Section 11.8 - Applied Mitigation).
		Chapter 11 – Volume 1 - Hydrology, Hydrogeology and Geology (including Peat) We note that under Section 11.17 Field survey, no specific reference has been made to any groundwater level monitoring being undertaken so far.	No groundwater level monitoring has been undertaken. This has been committed to by the Developer as part of the detailed design underpinned by a proposed planning condition for a Water Monitoring Plan.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Section 11.37 Existing conditions – groundwater The majority of the site is underlain by Secondary A / Secondary B Aquifers, and it is noted that there is an absence of superficial deposits across the majority of the site with only a small areas of glacial till present in the far north-east and far west of the site. This will result in a high groundwater vulnerability in areas where there is not superficial coverage as the introduction of any contamination at surface will migrate directly into the aquifer. This may have a resulting negative impact on any dependent features. Due to this, we advise you to review the medium sensitivity designation in Table 11.7.	We have reviewed the medium sensitivity and, for the overall aquifer body, feel this is appropriate. As noted above, Table 11.13 goes into more detail about specific sensitivities and why they have been assigned.
		Section 11.44 Water Quality	Agreed. The Developer has committed to further investigation, design and specific mitigation

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		The information here relates to surface water quality but no reference is made to groundwater quality data. It is recommended that this is scoped into the intrusive ground investigation at good spatial coverage to understand groundwater quality across the site area. Section 11.95 - Proposed Mitigation (additional mitigation) and compensation We welcome the proposal to install a number of borehole monitoring wells to assess groundwater level and elevations over the long-term, in addition to gathering information to assess the connectivity of GWDTEs. Chemical analysis of recovered groundwater samples should be undertaken to gather a baseline dataset for groundwater quality in the study area.	including a Water Monitoring Plan as detailed in Section 11.103 - Further Survey Requirements and Monitoring. This is proposed to be secured by condition, requiring a Water Monitoring Plan to be submitted and approved prior to commencement of the development.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Chapter 11 – Volume 3 - Appendix 11.3: Geological and Ground Conditions Desk Study Our comments in this section are in relation to risk to controlled waters receptors. In this case, there is currently insufficient information on groundwater elevation, groundwater quality, soil quality in the locations where the desk study has highlighted potentially contaminative land use (farming activities and land infilling). We therefore cannot have confidence in the conclusion that “the ground conditions on site do not pose unacceptable risk to either human health or the wider environment, and as such no further assessment or consideration of land quality matters are required”. We recommend the desk-based information is	The overall context of the Site is of a greenfield nature which has had a long agricultural history. The desk study identifies potential risks to construction workers and also both surface water and groundwater bodies in Table 3.1 of Appendix 11.3. However, the conclusions remain valid that it is unlikely that further works would be required in terms of land quality. Notwithstanding this, the Developer has committed to undertaking a suitable ground investigation and assessments including a Water Monitoring Plan. Where required, this will be used to 1) create a proposed remediation/ reaction strategy, 2) inform the detailed CEMP and 3) provide site specific data on both ground and groundwater conditions.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		supplemented by a targeted intrusive investigation to bridge identified data gaps. We note that no information has been included on anticipated groundwater depths and that Figure 2-6 of this appendix makes reference to a number of British Geological Survey (BGS) boreholes in the vicinity of the site, however no information in relation to encountered groundwater depths in these have been included. It is crucial to understand groundwater elevations at sites such as this, where significant subsurface disturbance is proposed (excavation for borrow pits, foundations, cable trenches etc.) and sensitive receptors have been identified.	
		Tables 2-4 and 2-5	Agreed

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		We agree with the comments whereby potential contamination may be associated with land infilling works and farming land uses. These should be further investigated through intrusive investigation.	
		Table 3-1 On-site Pollutant linkage assessment The potential for contamination from current agricultural use through leaching and/or water mobile constituents passing through permeable sub-surface soils and/or preferential pathways has been discounted; there is no supportive evidence for this, i.e. whether fertilisers/herbicides/pesticides etc. have been or are used at the site, and given the groundwater vulnerability of the site it is recommended this is detailed. Table 2-5 identified four records of potentially infilled land (non-water) on site; this has not been included	The Developer has committed to a suitable site investigation.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		in this table identifying pollutant linkages. There remains a high level of uncertainty for the contaminants potential of any infilled material as no intrusive investigation has been done to characterise this material. We would therefore recommend a conservative approach. Chapter 11 – Volume 3 - Appendix 11.5: Water Resources Assessment Please note our comments only relate to the hydrogeology Section 5.4. Groundwater strikes in the BGS boreholes surrounding the site have been identified between 9 and 36m below ground level. Groundwater elevations within the site should be confirmed through intrusive investigation considering the potential for dewatering during operation. This is	Agreed. This will be set out in the Water Monitoring Plan secured via condition.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		also crucial in understanding the potential impacts of climate change on a development, which is particularly important for projects such as this with a long lifespan.	
		Chapter 11 – Volume 3 – Appendix 11.1 Flood Consequence Assessment (FCA) Most of the site is located outside the flood outlines shown on the Flood Map for Planning (FMfP) and therefore confirmed in the FCA as being within Flood Zone 1. There is also no historical flooding and any associated flooding issues within the existing site due to the topography and elevated location. Chapter 11 – Volume 2 - Figures	Noted

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		As illustrated in Figure 11.2 (Flood Risk Zones) only track construction works across watercourses will fall within Flood Zones 2 or 3 of the FMfP or Surface Water Flood Risk Zones. Since the locations of any temporary compounds or welfare facilities will be situated outside these areas we have no objections to this proposal in flood risk terms.	
		Water Framework Directive (WFD) Chapter 11 – Volume 1 – Hydrology, Hydrogeology and Geology (including peat) Table 11.3 categories the sensitivity of potentially affected receptors and Table 11.4 categorises the magnitude of change for water quality. We are not in full agreement with the categorisation provided as it	The sensitivities in Table 11.3 already identify a large, medium or small waterbody with a water quality classification of ‘High’ or ‘Good’ as being of High sensitivity with the magnitude of change in Table 11.4 linked to the River Basin Management cycle. Importantly the matrix identifies both medium and high magnitude of change to result in a moderate to major effect (i.e. significant) as such these would be carried through the assessment. We

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		does not seem to take into account the elemental level of individual watercourses. The criteria in Table 11.4 indicates that ‘moderate’ change in water quality with recovery over a 5-10 years period. We would consider a recovery period of this scale to be a ‘high’ impact not medium. Even a slight change in water quality over 1-5 year period (which the criteria have as a ‘low’ magnitude of change), if it changes the WFD status of the watercourse then we would consider this to be a deterioration and a high impact. We would consider temporary impacts to be 6 months or less.	would note that temporary impacts are indeed of short-term duration which differs to a significant effect.
		Table 11.9 Summary of receptors (water quality) We note the Nant Mithil receptor has been given medium sensitivity based on Moderate Ecology. However, one of the ecological elements (the	This is covered in Section 3.3 of Appendix 11.8 (WFD Assessment). Importantly a change to high sensitivity would not impact the assessment.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		invertebrates) are classed as Good and therefore we consider the sensitivity should be high. The 'waterbodies on site / ordinary watercourses' receptor in this table has been categorised as having a non-classification for WFD classification and was given a 'medium' sensitivity. In the absence of any classification, or evidence to the contrary; it should be assumed that they are at 'good' status and any deterioration from 'good status' be assessed as a result of a new activity (This would make the sensitivity high following the criteria in table 11.3).	
		It is recommended that ground investigation surveys target the areas of the proposed borrow pit locations to understand the land condition.	Agreed. This is proposed by the developer, with a commitment to undertake detailed GI in post-consent, pre-commencement phase.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Further information is also required to establish groundwater depths and how any abstracted water will be managed. Groundwater investigations surveys, to include chemical analysis of recovered groundwater samples, are required to establish the quality and level of groundwater and how it connects to GWDTEs.	This is agreed, with a commitment in place to undertake such work in post-consent, pre-commencement phase. This is set out within the ES.
		We recommend robust and sufficient pollution prevention controls are considered within the CEMP due to the high groundwater vulnerability status of the site.	This is agreed, with a commitment in place to develop a detailed CEMP, building on the outline CEMP, in post-consent, pre-commencement phase. This is set out within the ES.
		We have records of <i>Hamatocaulis vernicosus</i> , <i>Jamesoniella undulifolia</i> and <i>Barbilophozia kunzeana</i> in the area, the former being located just to the west of proposed T5 in a flush complex. All three of these bryophytes are hydrology-dependent	A bryophyte and lichen survey of all flushes and mires has been undertaken. None of these species were recorded within the Site as detailed in Appendix 7.12 and discussed within Chapter 7.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		and could be affected by the construction (especially the extensive track network) if flush hydrology is impacted upon.	
		We advise that flushes likely to be affected by the development are surveyed in detail for the presence of bryophytes and lichens.	A bryophyte and lichen survey of all flushes and mires has been undertaken. None of these species were recorded within the Site as detailed in Appendix 7.12 and discussed within Chapter 7.

Study Area

11.15 The Site boundary straddles the watershed between catchments draining to the River Lugg (via Ystol Bach Brook, Black Brook and Summergil Brook) to the north and east, and the River Wye (via Mithil Brook and tributaries of the River Aran) to the west and south. The Study Area has been defined cognisant of this, as set out in **Table 11.2** below. The extent of the Study Area is also illustrated in **Figure 11.1**.

Table 11.2 Study area

Topic	Study Area
Geology and soils	The Site.
Hydrology (surface water features, flood risk)	The Site, plus 500m buffer around the entire Site boundary. Study area was extended to 5km downstream on Mithil Brook, River Aran and Summergil Brook.
Hydrogeology (groundwater and groundwater-dependent terrestrial ecosystems)	The Site, plus 250m buffer around the entire Site boundary.
Public and Private Water Supplies	The Site, plus 250m buffer around the entire Site boundary. The Study area was extended to up to 750m downstream along all watercourses draining the Site in order to capture any potential PWS that take water from the watercourse itself.

Desk Based Research and Data Sources

11.16 Numerous data sources have informed the assessment, and these are set out in detail in **Appendices 11.1 to 11.6**. These include:

- NRW flood risk data – Flood Map for Planning²⁷;

²⁷ [Natural Resources Wales \(2023\) Flood Map for Planning](#)

- Powys Strategic Flood Consequence Assessment – Level 1²⁸;
- Rainfall and hydrological descriptors from the Centre for Ecology and Hydrology²⁹;
- Environmental database report³⁰;
- British Geological Survey (BGS) mapping data and borehole logs³¹;
- LiDAR digital terrain model (DTM) 1m resolution³²; and,
- The Mines of Montgomery and Radnorshire³³

Field Survey

11.17 The following field surveys were carried out to inform the assessment:

- Phase 1a peat survey (pre-2022 in part, completed in summer 2022) – Survey consisted of a probing on a 100m grid across the entirety of the Site where peat presence likelihood was assessed as being higher than Low.
- Phase 1b peat survey (winter 2023) – Probing on a 50m grid within the area of forestry on Esgairnantau where localised pockets of peat had been identified during the Phase 1a survey.
- Geomorphological mapping (July 2023) – Geomorphological mapping to define key landslip features identified during assessment of aerial imagery and lidar mapping. The survey involved rock-slope mapping focussed on discontinuities such as bedding and joints, slope angle, and stability indicators. Proposed turbine locations that were also located in proximity to steep slopes were also assessed for signs of instability.
- Phase 2 peat survey (November 2023) – Survey consisted of a much denser peat and soil probing survey on all areas of proposed infrastructure and along all proposed access track alignments. A 10m grid spacing/offset was adopted in areas of high potential of peat being

²⁸ Powys County Council (2012) Powys Strategic Flood Consequence Assessment – Level 1

²⁹ [UK Centre for Ecology & Hydrology \(2023\) Flood Estimation Handbook Web Service](#)

³⁰ [Envirocheck \(2022\)](#)

³¹ [British Geological Society website](#)

³² [Welsh Government \(2023\) LiDAR viewer](#)

³³ Foster-Smith, J.R., 1978. The Mines of Montgomery and Radnorshire. A monograph of the Northern Mine Research Society.

present. This was reduced to a 50m grid/offset spacing in areas where the Phase 1 survey indicated an absence of peat. Extra points were undertaken in areas where peat was found in order to provide higher resolution for mapping and constrain areas of peat close to proposed infrastructure.

- Water Feature survey (July 2022 and November 2023) – The entire Site was surveyed to map water features, including GWDTEs, springs, flushes, ditches and watercourses.
- Private Water Supply (PWS) survey (January 2024) – Following a desk-based assessment to identify the presence, location and type of private water supplies, a small number of properties were identified within 250m of the Site for which no details were available as to the location and type of water supply. Some additional properties were identified that were outside of this 250m buffer, but which may have a PWS extracting from streams that drain the Site. These were all visited, and details collated from interviews with the property owner/occupier (see **Appendix 11.5**).
- Additional peat survey (October 2024) – Survey focussed on mapping soil profiles within the three borrow pit locations and the mapped M19 habitat, as well as a probing survey for the revised locations of turbines T29/ T28/ T25/ T11 and the cable route where it departs from running alongside the proposed access tracks.

Assessing Significance

Sensitivity

11.18 Sensitivity has been determined on the basis of the importance of environmental features on or near to the Site, and/or the sensitivity of potentially affected receptors **Table 11.3** details the criteria used for determining the sensitivity of receptors.

Table 11.3 Sensitivity criteria

Sensitivity of Receptor	Description
High	Flooding and Drainage ■ Receptor acts as an active floodplain or receptor acts as a flood defence that is protecting residential properties from flooding. Water Resource ■ Land use that is highly sensitive to hydrological change (e.g. peat and blanket bog). ■ A large, medium or small waterbody with a water quality classification of 'High' or 'Good'. ■ Receptor used for recreational use. ■ Receptor and downstream environment have limited capacity to attenuate natural fluctuations in hydrochemistry or absorb further changes without fundamentally altering its baseline characteristics/ natural processes. ■ Receptor supports abstractions for public water supply, or private water abstractions for the production of mass-produced food and drinks and/or supply more than 25 people, or 200 livestock (at any given point in the year). ■ Receptor is of high environmental importance (i.e. a Special Area of Conservation, Site of Special Scientific Interest or wetland of international and/or national importance). ■ The local groundwater constitutes a valuable resource because of its high quality and yield. ■ Aquifer classified by the BGS as 'highly productive aquifer' or 'moderately producing aquifer' and is of regional or local importance.

Sensitivity of Receptor	Description
	■ Statutorily designated nature conservation sites dependent on groundwater either in the form of GWDTEs, or in the form of baseflow to aquatic environments). Geology and Soils ■ Environment is very sensitive and would respond in major ways to environmental impact (for example, an active geomorphological landscape such as river meanders, deep-seated landslide etc). ■ SSSIs notified for their geodiversity. ■ Soils supporting protected features within a SSSI or European site (e.g. SAC, Ramsar). ■ Peat soils, and other long undisturbed soils. ■ Important surface mineral reserves that would be sterilised (i.e. without future access).
Medium	Flooding and Drainage ■ Flood defence or area of floodplain protecting ten or fewer industrial properties from flooding. Water Resource ■ Land use that is moderately sensitive to hydrological change (e.g. commercial forestry). ■ A large medium, or small waterbody with a water quality classification of 'Moderate'. ■ Receptor and downstream environment have moderate capacity to attenuate natural fluctuations in hydrochemistry or absorb further changes

Sensitivity of Receptor	Description
	without fundamentally altering its baseline characteristics/natural processes. ■ Receptor supports abstractions for private water abstractions for less than 25 people, or 200 livestock (at any given point in the year). ■ Receptor is of local environmental importance, such as Local Nature Reserves. ■ Aquifer classified by the BGS as 'low productive aquifer' as water quality does not allow potable or other quality sensitive uses. ■ Groundwater dependent terrestrial ecosystems (GWDTEs) which are highly groundwater dependent and have no or minor functional impairment by man-made influence (such as drainage or forestry). Geology and Soils ■ Environment is sensitive and would respond in a moderate way to environmental impacts (e.g. shallow slope instability). ■ Soils supporting protected or valued features within non-statutory designated sites (e.g. Local Wildlife Sites (LWS), Local Nature Reserves (LNR), Sites of Importance for Nature Conservation (SINCs). ■ Local Geological Sites (LGSs) or Regionally Important Geological Sites (RIGS). ■ Natural soils that are not long undisturbed (as referenced in Chapter 6 of Planning Policy Wales, see Appendix 11.4 for details).
Low	Flooding and Drainage ■ Flood plain with limited constraints and low probability of flooding of residential and industrial properties.

Sensitivity of Receptor	Description
	Water Resource ■ A large medium, or small waterbody with a water quality classification of 'Poor' or 'Bad'. ■ Groundwater dependent terrestrial ecosystems (GWDTEs) which are moderately groundwater dependent or, which are highly groundwater dependent and have no or minor functional impairment by man-made influence (such as drainage or forestry). Geology and Soils ■ Environment is not very sensitive and responds in a minimum way to environmental impacts. ■ Land of ALC Grades 3b or 4 & 5 or LCA Grades LCA Grade 3.2 and 4.1 to 7 or Urban soils. ■ Surface mineral reserves that would remain accessible for extraction.
Negligible	The receptor is resistant to change and is of little environmental value.

Magnitude

11.19 The magnitude of change has been assessed using the guidance criteria presented in **Table 11.4**.

Table 11.4 Magnitude criteria

Magnitude of Change	Description
High	The Proposed Development could result in a significant change in terms of flooding, surface water drainage, hydrology, hydromorphology, water quality,

Magnitude of Change	Description
	hydrogeology, soils, peat or other ground conditions which will cause irreversible or long term (over 10 years) changes to the receptor.
Medium	The Proposed Development could result in moderate changes to flooding, surface water drainage, hydrology, hydromorphology, water quality, hydrogeology, soils, peat or other ground conditions, which will recover over a medium period of time (5 to 10 years).
Low	The Proposed Development could result in a slight change in terms of flooding, surface water drainage, hydrology, hydromorphology, water quality, hydrogeology, soils, peat or other ground conditions in the short term (1 to 5 years). Conditions will recover within a short period of time (1 to 5 years).
Negligible	No effect detectable.

Significance

11.20 The predicted significance of the effect was determined through a standard method of assessment based on professional judgement, considering both sensitivity and magnitude of change as detailed in **Table 11.5** below. Major and moderate effects are considered significant in the context on the EIA Regulations.

Table 11.5 Significance criteria

Sensitivity of Receptor	Magnitude of Impact			
	High	Medium	Low	Negligible
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Minor	Negligible

Sensitivity of Receptor	Magnitude of Impact			
	High	Medium	Low	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

Assessment Limitations

11.21 The gathering and interpretation of data on ground conditions, hydrogeology and hydrology inevitably requires interpolation of data between available data points, with heterogeneity to be expected both temporally and spatially. The fieldwork was undertaken across several visits to Site over the course of in excess of one year. As a result, the data collected represents a range of weather and Site conditions. In combination with the desk study assessments also undertaken, it is considered that there is sufficient information to characterise this heterogeneity. Hence this has enabled a suitably informed identification and assessment of likely significant environmental effects to be undertaken for hydrology, hydrogeology and geology.

Existing Conditions

Overview

11.22 The Site is situated on an upland plateau that lies in the headwaters of the River Lugg, Ithon and Aran, all of which drain into the River Wye. The Site is a greenfield site, covered with a mix of natural surfaces including grassland, scrub, heath/moorland and plantation forestry. Ground elevations fall from peak elevations of approximately 660m above Ordnance Datum (m aOD) to the lower elevations in the west (at the Nant Mithil valley) at approximately 270m aOD, north (around the A488 road) and the south (the Cwm Du valley).

11.23 The Site lies on the western side of the upland plateau known as Radnor Forest. The highest point on Site lies on its eastern edge, near to the summit of Great Rhos, which is off Site to the east. South of Great Rhos, the Site includes the north-south aligned ridge of Esgairnantau, which is covered in commercial conifer forestry. Esgairnantau is separated from other high ground on Site by two streams. The headwaters of Mithil Brook flows north to south

on the south-western flanks of Great Rhos, before turning to flow westward. A small saddle of higher ground separates this upper section of Mithil Brook from the headwaters of Nant Cwm Du, which flows north-south on the western flank of Esgairnantau, before descending the waterfall known as Water-break-its-neck, off Site to the south.

11.24 Cefn-y-grug and Great Rhos are separated by an extremely steep-sided and incised valley known as Cwm Bwch, which has two upper arms orientated east-west, draining to Maes Brook, which flows northwards offsite.

11.25 Great Rhos, Cwm Bwch, Cowlod, Foel and the western flanks of Esgairnantau are covered in heath vegetation with few fences or boundary lines. Elsewhere, the land is predominantly covered in semi-improved and improved grazing land separated into large fields by post and wire fencing, with some fields in northern and southern ends of the Site supporting winter forage crops.

11.26 The streams on Site typically have formed incised rocky gullies, with exposures of weathered mudstone evident in numerous areas.

Current Baseline

Flooding and Drainage

11.27 The majority of the Site lies within Flood Zone 1 (the lowest risk zone that is mapped) as shown in **Figure 11.2**. This is due to its elevated position, which makes it at very low risk of flooding from rivers. The Mithil Brook valley, in the south-western corner of the Site, and the Cwm Merwys valley in the north of the Site are designated as Flood Zone 3 and therefore at high risk of flooding. The numerous small watercourses across the Proposed Development are also designated as at high risk of flooding, however flood extents and flow paths do not extend beyond the immediate vicinity of the watercourses. There are no flood defences on Site. The River Ithon (to the west) and the River Lugg (to the east) to which all of the watercourses within the Site drain, are both designated Main Rivers and have extensive floodplain with areas known to flood. The River Ithon and Lugg floodplains and associated properties are therefore both considered to be a receptor of High sensitivity.

11.28 The Site has not experienced historical flooding according to NRW data.

11.29 Much of the centre of the Site comprises upland heath, with semi-improved and improved grazing land elsewhere. Due to the improved nature of the agricultural land in some of the Site, it is considered likely that some land drains are present. There are a series of three small embankment dams towards the south of the Site, on the south side of Nyth-grug, which retain water within small depressions for agricultural purposes. With these exceptions, there is currently no surface water drainage infrastructure within the Site.

Surface Water Features

11.30 Minor tributaries of the River Lugg drain, eastwards off the Site via Hindwell Brook, these include the tributaries of Ystol Back Brook, which drains the very eastern margin of the Site and Nant Cwm Du which flows north-south, over the Water-break-its-neck waterfall, and off Site to the south. The remainder of the Site drains into tributaries of the River Wye (via Mithil Brook and the River Aran), which flow in a westward and south-westward direction and join the River Wye around 12km to the south-west of the Site boundary (via the larger Rivers Ithon and Edw).

11.31 During numerous phases of fieldwork, several additional watercourses have been identified in addition to those marked on published mapping. These have been included as assumed Ordinary Watercourses. During a Site walkover survey in July 2022, all streams on the Site were dry, with the exception of the very downstream reaches of Nant Cwm Du. During surveys in November and December 2023 and January 2024, all streams encountered were flowing.

11.32 Several watercourses around the Site emanate directly from springs within the Site. With two exceptions, all of the springs on Site are located on the slopes of the very incised valleys that fringe the Site. The two exceptions are the springs that feed Mithil Brook and Nant Cwm Du, which are both situated within the eastern upland plateau areas of the Site.

11.33 In order to provide access to the turbine locations, 8 watercourse crossings are required (see **Figure 11.3**). These locations are summarised in **Table 11.6** below:

Table 11.6 Summary of surface water features within 50m of Proposed Development

Feature ID	Type	Water Feature Name	Comment
Crossing 1	Watercourse crossing required	Unnamed tributary of Cwm Nantwylyan.	Watercourse is small (less than 1m wide) and can be bridged using standard culverting techniques, suitably sized and designed to avoid impact on flooding, drainage and water resources in accordance with good practice during design and construction.
Crossing 2	Watercourse crossing required	Unnamed tributary of Cwm Merwys.	Watercourse is moderate in size (2 to 3m wide). Proposed crossing is immediately downstream of an existing access track bridge. Watercourse can be bridged using standard culverting techniques, suitably sized and designed to avoid impact on flooding, drainage and water resources in accordance with good practice during design and construction.
Crossing 3	Watercourse crossing required	Cwm Merwys.	Watercourse is small (less than 1m wide) and can be bridged using standard culverting techniques, suitably sized and designed to avoid impact on flooding, drainage and water resources in accordance with good practice during design and construction.

Feature ID	Type	Water Feature Name	Comment
Crossing 4	Watercourse crossing required	Ephemeral watercourse, tributary of Mithil Brook.	Watercourse is ephemeral and small (less than 1m wide) and can be bridged using standard culverting techniques, suitably sized and designed to avoid impact on flooding, drainage and water resources in accordance with good practice during design and construction.
Crossing 5	Watercourse crossing required	Black Brook.	Watercourse is small (less than 1m wide) and can be bridged using standard culverting techniques, suitably sized and designed to avoid impact on flooding, drainage and water resources in accordance with good practice during design and construction.
Crossing 6	Watercourse crossing required	Unnamed tributary of River Edw.	Watercourse is small (less than 1m wide). Proposed crossing is at a location of an existing track. Watercourse can be bridged using standard culverting techniques, suitably sized and designed to avoid impact on flooding, drainage and water resources in accordance with good practice during design and construction.
Crossing 7	Watercourse crossing required	Crossing a ditch connecting two small embanked ponds.	Ditch is ephemeral and small (less than 1m wide) and can be bridged using standard culverting techniques, suitably sized and designed to avoid impact on

Feature ID	Type	Water Feature Name	Comment
			flooding, drainage and water resources in accordance with good practice during design and construction.
Pond under T21	Replacement pond	N/A	Small ponds within turbine footprint, which are man-made hollows for agricultural purposes. Replacement ponds will be provided within the micro-siting buffer nearby.
Pond under T26	Replacement pond	N/A	
Crossing 8	Temporary works to install cabling	Mithil Brook	Watercourse is ephemeral and option remains to install the cable route during a period of no flow to mitigate impact on flooding, drainage and water resources in accordance with good practice during design and construction. Directional drilling may be required if Mithil Brook is flowing, following good design and construction principles no impacts on the watercourse are anticipated from this method of installation.

Groundwater and GWDTEs

11.34 The Ludlow Argillaceous Rocks that form the bedrock across the majority of the Site is classified as a Secondary B Aquifer. The rocks are characterised by their fine-grained texture, resulting from the accumulation of clay and silt particles. The rock mass is well fractured, with several joint sets present. It is anticipated that groundwater flow and storage will be dominated by fractures, with limited intergranular permeability. There is an absence of superficial deposits across the majority of the Site, with only small areas of glacial till present in the far north-east

and in the far west of Site. This till is likely to be of low permeability, albeit with the potential for small-scale localised sand and gravel dominated higher permeability lenses. Both the Ludlow Argillaceous Rocks and Glacial Till aquifers are aquifers of low productivity and therefore receptors of Medium sensitivity.

11.35 Drainage within the topographical low points is considered likely to be inhibited by the low permeability substrate, and the accumulation of organic-rich topsoil can be seen in a number of linear features in the south-west of the Site. In some isolated points this organic topsoil is of sufficient thickness and sufficiently free of mineral material to be assessed as peat. Some of these areas as assessed as having sufficient element of groundwater feed to be classified as GWDTEs (see **Figure 11.4**). In the main though, the relatively small elevation difference between topographical low points and high ground indicates that the dominant factor in providing water feed to the areas of wetland and peat in these small topographical depressions is that of surface drainage, via overland flow and soil through-flow. In most cases, groundwater does not provide a significant contribution to these features.

11.36 The larger area of peatland present within the Radnor Forest SSSI is also assessed to have negligible groundwater feed. This is because it covers an elevated area of upland across the watershed between the surrounding valleys, and as such does not have a significant catchment from which groundwater could flow.

11.37 In some places, there are some distinct groundwater flushes, springs and seeps on the steeper slopes beneath the plateau tops that have been identified on Site (see **Figure 11.4**), and which provide groundwater feed to habitats and soils in some locations. These are considered likely to be associated with a change in bedrock lithology, and are typically discrete localised features, as would be expected in a fracture-led aquifer. The link to bedrock lithology is most likely demonstrated in the slope to the south of Maes Brook, where a well-defined springline can be seen (and has contributed to the landslip instability in this valley – See ground conditions section below). Where these flushes, seeps and springs sustain a water-dependent habitat, they have been identified as GWDTEs, as illustrated in **Figure 11.4**.

11.38 A detailed baseline assessment of GWDTEs is provided in **Appendix 11.5**. The design process was undertaken with the aim of placing all infrastructure outside of a 250m buffer of GWDTEs. However, the balance of constraints required that some areas of the Proposed

Development fell within this buffer. All identified GWDTEs within 250m of the Proposed Development have been assessed as to their sensitivity to change (based on likely groundwater dependence), and their potential connectivity to the Proposed Development. This assessment follows the guidance set out in SEPA LUPS-GU31 Guidance³⁴, whereby the vegetation assemblage type (NVC) informs an assessment of Likely Groundwater Dependence, and hydrological observations made in the field are used to class the Sensitivity of receptor to change. This baseline assessment is summarised in **Table 11.7** below. GWDTEs with a high likely groundwater dependence have been classified as receptors of Medium sensitivity, and GWDTEs with a moderate likely groundwater dependence as receptors of Low sensitivity. This table also provides a summary of the baseline conditions as they relate to the proposed infrastructure.

³⁴ SEPA (2017a) Land Use Planning System SEPA Guidance Note 31: Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions

Table 11.7 Summary of GWDTEs

GWDTE ID	Likely Groundwater Dependence	Sensitivity of Receptor	Distance to Closest Cut	Likely Connectivity to Proposed Development	Considerations for Design
F	High	Medium	22	Medium	GWDTE is downstream of proposed access track. Flow to GWDTE must be maintained.
G	High	Medium	107	Medium	GWDTE is downstream of proposed turbine T21 and access track. Flow to GWDTE must be maintained.
H	Moderate	Low	214	Medium	GWDTE is downstream of T06. Flow to GWDTE must be maintained.
I	Moderate	Low	140	Medium	GWDTE is downstream of T06. Flow to GWDTE must be maintained.
J	Moderate	Low	32	Medium	GWDTE is cross-slope from access track. Cut on T06 may cause preferential flow path for groundwater away from the GWDTE which should be redirected back towards the GWDTE.

GWDTE ID	Likely Groundwater Dependence	Sensitivity of Receptor	Distance to Closest Cut	Likely Connectivity to Proposed Development	Considerations for Design
K	Moderate	Low	0	High	GWDTE runs parallel and downslope of access track. Flow to GWDTE must be maintained.
L	Moderate	Low	0	High	GWDTE runs parallel to access track, although upslope of the track. Cut on the track may cause preferential flow path to drain the GWDTE.
M	Moderate	Low	90	Low	GWDTE is situated on opposite side of watershed to T04 to the east, and at higher elevation than track proposed to west.
N	Moderate	Low	160	Low	GWDTE is situated on opposite side of watershed to T04 to the east, and at higher elevation than track proposed to west.
O	Moderate	Low	156	Low	GWDTE is situated on opposite side of watershed to T04 to the east, and at high elevation than track proposed to west.

PWSs

11.39 As might be expected in such a rural location, most of the surrounding residential and agricultural properties are fed by PWS, with very limited areas of mains water connection available. These comprise a mixture of springs, wells and boreholes. The locations of PWSs are provided in **Figure 11.5**. A detailed baseline assessment of PWSs is provided in **Appendix 11.5**. All PWS are considered to each support less than 25 properties or 200 livestock and so are classed as being of Medium sensitivity in accordance with SEPA LUPS-GU31 Guidance.

11.40 All identified PWSs within 250m of the Proposed Development have been reviewed as to their potential connectivity to the Proposed Development. This assessment has also been undertaken for those PWSs that are greater than 250m from the Proposed Development, but which extract (or are assumed to extract) from watercourses that drain catchments in which the Proposed Development will sit. A total of 78 PWSs have been reviewed, with 30 of them identified as having a potential linkage with the Proposed Development. These are summarised in **Table 11.8** below. All PWSs on Site or with a viable pathway connection to Site are considered to be receptors of Medium sensitivity as they support less than 25 properties or 200 livestock.

Table 11.8 Summary of PWSs

PWS ID	Type	NGR Eastings	NGR Northings	Property or Farm Supplied	Potential SPR Linkage?	Information
1	Spring	317956	268049	Brynywellan	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.
6	Spring	317216	267507	Graig	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.
7	Spring	317292	267489	Nr Graig	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.
30	Spring	315490	266033	Nr Upper Penrhiw	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.
36	Well	316114	265319	Unknown	Yes	Site within predicted supply catchment.
38	Spring	314967	265082	Climaenowydd	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.

PWS ID	Type	NGR Eastings	NGR Northings	Property or Farm Supplied	Potential SPR Linkage?	Information
39	Well	315321	264946	Climaenowydd	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.
40	Spring	315210	264799	Unknown	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.
41	Spring	315340	264477	Lower Cwm Farm	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.
42	Spring	315451	264364	Cwm Farm	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.
45	Spring	314371	263828	Llwynbyrfach	Yes	Takes supply from Cwm Farm.
47	Well	315410	263360	Vronlace	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.
48	Spring	315242	263111	Vronlace	Yes	Well take off from Vronlace Dingle, plus second supply Cowlod.
49	Spring	315147	263073	Penllanlas	Yes	Shares Vronlace supply.

PWS ID	Type	NGR Eastings	NGR Northings	Property or Farm Supplied	Potential SPR Linkage?	Information
50	Spring	314864	262719	Unknown	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.
52	Spring	315910	262316	Unknown	Yes	Site within predicted supply catchment.
53	Spring	315258	262277	Little Trewern	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.
54	Well	315311	262272	Unknown	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.
56	Spring	314869	262238	Trewern	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.
58	Well	315427	262144	Upper Trewern	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.
61	Spring	317505	261365	Unknown	Yes	Site within predicted supply catchment.

PWS ID	Type	NGR Eastings	NGR Northings	Property or Farm Supplied	Potential SPR Linkage?	Information
62	Well	315676	261201	Llanevan	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.
64	Well	315761	260835	Llanevan	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.
65	Well	315781	260835	Llanevan	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.
66	Spring	316270	260775	Unknown	Yes	Site within predicted supply catchment.
70	Well	315966	260053	Unknown	Yes	Site within predicted supply catchment.
71	Spring	317691	259891	Unknown	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.
72	Spring	315346	259872	Gwernargllwydd	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.

PWS ID	Type	NGR Eastings	NGR Northings	Property or Farm Supplied	Potential SPR Linkage?	Information
74	Spring	316714	259155	Gryliss	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.
75	Well	316752	259066	Gryliss Bungalow	Yes	Site within predicted supply catchment, however significant head drop between proposed works and spring.

Water Quality

11.41 Watercourses on the Site drain into the River Wye/ Afon Gwy Special Area of Conservation (SAC) via the River Aran, Mithil Brook and Hindwell Brook (tributary of River Lugg). The annex 1 habitat that comprises the primary reason for selection of the SAC is “3260 *Watercourses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation*”. This habitat is sensitive to nutrient enrichment, mainly from sewage inputs and agriculture, and to serious siltation from agricultural (and other) sources. The River Wye SAC therefore is a receptor of High sensitivity.

11.42 The River Aran, and Hindwell Brook (Tributary of the River Lugg) both have a Good Ecological water classification status and a High Chemical status, they are considered to be receptors of High sensitivity. Mithil Brook has a Moderate Ecological water classification and a High Chemical status³⁵ and is considered a receptor of Medium sensitivity. The smaller waterbodies on site are considered to be receptors of Medium sensitivity, best represented by the water quality classification assigned to Mithil Brook.

Table 11.9 Summary of receptors (water quality)

Receptor	Type	WFD Classification	Sensitivity
River Aran (Tributary of River Ithon)	WFD Water Body and SAC	Ecology: Good Chemical: High	High
Mithil Brook	WFD Water Body and SAC	Ecology: Moderate Chemical: High	Medium
Hindwell Brook	WFD Water Body and SAC Tributary to River Lugg	Ecology: Good Chemical: High	High
Waterbodies on site	Ordinary Watercourse	N/A	Medium

³⁵ Natural Resources Wales (2021) Baseline Classification of Quality of Surface Water Cycle 3

Peat and Soils

11.43 Published British Geological Survey (BGS) geological mapping indicates that the geology on Site comprises of small areas of superficial Glacial Till and Peat deposits overlying the Ludlow Argillaceous Rocks. The glacial till is mapped as absent across the Great Rhos plateau and Esgairnantau, where the limited peat deposits have been encountered during peat probing. The published geology of the Site is illustrated in **Figure 11.6** and **Figure 11.7**.

11.44 Cranfield University National Soils Map indicates that the Great Rhos plateau is occupied by Hafren soil association, which is described as *“loamy permeable upland soil over rock with a wet peaty surface horizon and bleached subsurface horizon, often with thin ironpan. Some peat on higher ground. Rock and scree locally”*. The majority of the remainder of the Site is mapped as being underlain by Manod soil association, which are described as *“well drained fine loamy or fine silty soils over rock. Shallow soils in places. Bare rock locally. Steep slopes common”*. The mapping indicates that less than 10% and less than 5% of the Site is occupied by Denbigh 1 soil association and Cegin soil association respectively. The Denbigh 1 soil association is described as *“well drained fine loamy and fine silty soils over rock. Some similar soils with slowly permeable subsoils and slight seasonal waterlogging. Shallow soils and some bare rock locally”*. These occupy a portion of the north-east of the Site and are described as having low carbon content. These support a range of spring and autumn sown crops; under grass the soils have a long grazing season. The Cegin soil association is described as *“slowly permeable seasonally waterlogged fine silty and clayey soils. Some fine silty and fine loamy soils with slowly permeable subsoils and slight seasonal waterlogging on slopes. Well drained fine loamy soils over rock in places”*. These occupy a very small portion of the south-west corner of the Site and are described as having medium carbon content.

11.45 The Peatland of Wales dataset identifies the presence of peat deeper than 40cm across a large area of upland plateau to the east of Cwm Bwch. This stretches beneath the forestry plantation to the north of Great Rhos and across Llethr Du, extending across Black Mixen summit. This large contiguous area lies wholly outside the Site boundary. Two separate 50 m² patches are mapped on Great Rhos itself, within the Site.

11.46 Several iterative phases of peat and soil survey have been undertaken to identify areas of peat and use this information to inform the design of the infrastructure layout, and to provide

high-level information on soils. During the surveys, it was observed that 'deep peat' (greater than 30cm as defined by Welsh Government) was confined to isolated areas within the plantation forestry on Esgairnantau, and on the Great Rhos plateau. The Great Rhos plateau also supported a larger area of shallow peaty soils, where the peat content of the soils is high, but the soils are less than 30cm thick. Elsewhere on Site, there are shallow peaty soils mapped as present in the series of topographical hollows in the landscape in the south-west of the Site, between the peaks of Llan-Evan Hill and Nyth-grug.

11.47 The layout of the Proposed Development has been designed to avoid areas of peatland soils (defined as those areas where peat is recorded at depths greater than 30cm). As a result, the Proposed Development footprint avoids peat altogether.

11.48 In the newly published Chapter 6 of Planning Policy Wales, long undisturbed soils are specifically referenced as irreplaceable habitats which must be safeguarded. No accompanying definition of long undisturbed soils has been provided. In order to enable assessment herein, it has been assumed that such soils are present beneath areas of Ancient Woodland, within peatland areas and beneath areas of upland heath on Site. This is because, by their nature, such habitats are typically established only in those areas where disturbance of the ground by humans is absent or very limited. These areas are illustrated in **Figure 11.8**. As a result, the Proposed Development infrastructure interacts with long undisturbed soils in four places, as discussed in **Table 11.10**.

11.49 Peat bodies and long undisturbed soils on site are considered receptors of High sensitivity, whilst natural soils on Site that are not long undisturbed a receptor of Medium sensitivity.

Table 11.10 Summary of peat and long undisturbed soils where they interact with the Proposed Development

Proposed Development Aspect	Description	Receptor
T16, T17, T18, T19, T20 and associated tracks	These turbines are situated in the area of upland heath on the flanks of Great Rhos/ around the rim of Cwm Bwch.	As areas of upland heath with no evidence of disturbance on aerial imagery or historic maps, these may comprise long undisturbed soils. Some of the hillside in the vicinity of T17 is heavily incised by multiple generations of drovers track however, and so this area has seen soil disturbance and has been excluded from the long undisturbed soils classification. Organic-rich peaty topsoil is present in some parts of the infrastructure footprint in this area.
T10, T11 and associated tracks	These turbines are situated in the area of upland heath on the flanks of Great Rhos.	As an area of upland heath with no evidence of disturbance on aerial imagery or historic maps, this area may comprise long undisturbed soils.
T05	This turbine is situated on the flanks of Llan-Evan Hill.	This area of upland heath, which shows no signs of having been disturbed on aerial imagery or historic maps, comprises long undisturbed soils. Area further to the east around T06 is not considered as long undisturbed as it was

Proposed Development Aspect	Description	Receptor
		used as a firing target zone and is covered in small hollows from the impact of ordnance.
Track from BOAT to T25 as it crosses Maes Brook	The land at the base of the Maes Brook valley is separated from the improved pasture to the south by a fenceline, which marks a difference in vegetation.	The base of this valley appears long undisturbed based on aerial imagery and historic maps, and hence may have comprise long undisturbed soils.
T7, T8, T9, T10 and tracks in between	Phase 1 and Phase 2 peat surveys identified a series of discrete pockets of peat >30cm deep in the Esgairnantau forest plantation.	There are several small, discrete peat-filled hollows within the forestry plantation on Esgairnantau. Embedded mitigation through design has avoided all of these peat bodies.
T5 and track from T5 to T1	There are two bodies of peat >30cm in this area, separated by a ridge of higher dry ground underlain by bedrock.	Two discrete peat bodies. The embedded mitigation through design avoids both of these peat bodies.
Cable micrositing corridor north-east of T6	There is an isolated peat-filled hollow here, with very localised peat >30cm thick.	Whilst the micrositing corridor is shown to encroach on the edge of this peat deposit the corridor width enables its avoidance in the detailed design process.

Ground Conditions: Slope Stability

11.50 During the undertaking of fieldwork, an existing large landslide was identified near to the BOAT on the southern slope of the Maes Brook valley, opposite the southern arm of Cwm Bwch. A Preliminary Slope Stability Assessment was undertaken, included in **Appendix 11.6**. The entirety of the Site was subsequently assessed for slope stability, and the Proposed Development given a risk rating of:

- Low (risk of slope stability is similar to that for any engineered structure founded on sloping ground, requires standard ground investigation and foundation/earthworks/drainage design);
- Moderate (on slopes with a similar aspect, morphology and drainage conditions to that of the active landslide, or that otherwise might indicate potential risk of instability. Requires special consideration of slope stability in the ground investigation and foundation/earthworks/drainage design); or
- High (on actively unstable slopes, requires either relocation or significant detailed ground investigation and assessment, and likely will required engineered slope stabilisation).

11.51 The conclusions of this work identified that the Proposed Development at that time included a length of track on the active landslide that was assessed as at High risk. As a result, the alignment for the trackway that descends from the BOAT towards Maes Brook and towards T25 was revised. This track was moved northwards to take it away from the landslide feature.

11.52 A number of other aspects of the Proposed Development were identified as at Moderate or Moderate to Low risk, requiring additional consideration of slope stability in the ground investigation and detailed design in due course. These were:

- Turbines 22 & 24, which lie above a slope of similar aspect, gradient and drainage to that which has failed;
- Turbines 03, 04 & 08, which lie above slopes with similar aspect and gradient to that which has failed;
- Turbines 18 & 19 which lie close to the crest of a very steep slope, which has a different aspect to that which has failed, but may suffer from more small-scale instability; and,

- Trackway between the BOAT and T25, which crosses a slope of similar aspect, gradient and drainage to that which has failed.

11.53 In all other cases, the Proposed Development was assessed as at Low risk.

Ground Conditions: Unexploded Ordnance

11.54 The Radnor Range is present immediately adjacent to the Site, in the adjacent valley to the east of Esgairnantau. The Range previously extended across that area of the Site between Esgairnantau and Nyth-grug when it was adopted into a full military training site during the Second World War and was used for military training and the testing of munitions. There are many small craters remaining in this area as a result, due to support weapons fire, including grenades and mortars. Due to the risk of encountering unexploded ordnance (UXO) in this part of the Site in particular, each peat probe location was pre-scanned using specialist equipment and any UXO located was excavated and removed. As a result of this work, the Site has been assessed for risk of further UXO, as follows:

- Peat Probing Locations Cleared. UXO Encountered. Moderate UXO Risk.
- Peat Probing Locations Cleared. No UXO Encountered. UXO Risk considered As Low as Reasonably Practicable (ALARP).

11.55 These risk zones are illustrated in **Figure 11.9** and the UXO clearance process documented in **Appendix 11.7**. Buried unexploded ordnance is considered a receptor of Medium sensitivity.

Geodiversity Protected Sites

11.56 Mithil Brook and Cwm Blithus SSSI is located in the centre of the Site. Its boundaries enclose an envelope approximately 25m wide, either side of the Mithil Brook channel and either side of the tributary to Mithil Brook known as Cwm Blithus. The Citation of the SSSI describes the nationally important sequence of rocks of early to mid-Ludlow age, which display a magnificent array of slump and slide structures, which are rare on a regional scale within the Silurian of the Welsh Basin. A full account of the Citation is included in **Appendix 11.3**.

11.57 Under the revised Earth Science Conservation Classification (ESCC), the SSSI is classified as an Exposure or Extensive Site, River and Stream Section (code EW). Exposure of

Extensive Sites exhibit geological features which are relatively extensive beneath the surface. The basic principle is that removal of material does not cause depletion or damage to the resource, as new material of the same type is being freshly exposed as material is removed. The main management aim is to achieve and maintain an acceptable level of exposure of the interest features (Natural England, 2003)³⁶. In the case of a stream section, the natural erosion by the stream is typically sufficient in providing fresh exposures.

11.58 The conservation aim for the SSSI is stated by NRW to be *“focused on maintaining the current high level and continuity of rock exposure throughout the site, as well as keeping all rock faces visible and accessible”*³⁷. The SSSI was assessed as being in Favourable condition in May 2020 (the most recent available assessment data)³⁸. The Mithil Brook and Cwm Blithus SSSI are considered to be receptors of High significance due to their classification as SSSIs.

11.59 Gwernargllwyd Cutting RIGS is situated on the boundary of the Site where it abuts the verge of the A44. The RIGS statement of interest is provided in **Appendix 11.3**. It describes this road cutting as providing a particularly well-exposed and easily accessible section through lower parts of the Bailey Hill Formation.

11.60 Under the ESCC classification, this RIGS is also an Exposure or Extensive Site, Road, Rail and Canal Cuttings (code ER). The main management aim is again to achieve and maintain an acceptable level of exposure of the interest features. No formal condition assessment is available for this RIGS, but site inspection in January 2024 identified large areas of good exposure, suggesting that it is in favourable condition at present. Continued growth of ivy or obscuring by trees and shrubs is of concern, but such is occurring on the A44 verge, rather than onsite (which is upslope of the cutting). There is an opportunity to enhance access to the Gwernargllwyd Cutting RIGS through supervised vegetation clearance, and improved signage and access to the RIGS. This could be undertaken with involvement of the Central Wales RIGS group or Mid Wales Geology Club. This opportunity is further discussed within the HMP and Strategic Recreation Framework. This potential enhancement is not considered as

³⁶ Natural England (2003) Conservation principles for geology

³⁷ Natural Resources Wales (2018) Mithil Brook and Cwm Blithus Site of Special Scientific Interest: Site management statement

³⁸ Natural Resources Wales (2018) Mithil Brook and Cwm Blithus Site of Special Scientific Interest: Site management statement

mitigation, and therefore has not been considered in the subsequent assessment. The Gwernargllwyd Cutting RIGS is considered a receptor of Medium sensitivity due to its regional significance.

Summary of Sensitive Receptors

11.61 Table 11.11 below provides a summary of the receptors that have been identified of being of High, Medium and Low sensitivity.

Table 11.11 Summary of sensitive receptors

Type of Receptor	Receptor	Sensitivity
Flooding and Drainage	River Ithon floodplain and associated properties	High
	River Lugg floodplain and associated properties	High
Water Resources	River Wye SAC	High
	River Aran (Good Ecological Status)	High
	Mithil Brook (Moderate Ecological Status)	Medium
	Hindwell Brook (tributary of River Lugg) (Good Ecological Status)	High
	GWDTE numbers F & G (those with high groundwater dependence)	Medium
	PWSs on Site, or with viable pathway connection to Site (all PWS are considered to each support less than 25 properties or 200 livestock)	Medium
	Ludlow Argillaceous Rocks and Glacial Till aquifers	Medium
	Waterbodies on site	Medium

Type of Receptor	Receptor	Sensitivity
	GWDTE numbers H, I, J, K, L, M, N, O (those with moderate groundwater dependence)	Low
Geology and Soils	Peat bodies on Site	High
	Long undisturbed soils on Site (on great Rhos, Llan-Evan Hill and Cowlod, see Figure 11.8)	High
	Mithil Brook and Cwm Blithus SSSI	High
	Natural soils on Site that are not long undisturbed	Medium
	Gwernargllwyd Cutting RIGS	Medium
	Buried unexploded ordnance	Medium

Future Baseline in the Absence of the Proposed Development

11.62 With the exception of climate change impacts as detailed below, in the absence of the Proposed Development, there is likely to be very little change from the baseline in relation to flooding and drainage, water resources, and geology.

Implications of Climate Change

Flooding and Drainage

11.63 Climate change is predicted to increase rainfall by 40% (Upper end estimate for 2080s³⁹). This will lead to increased flood extents and deeper flood waters within the numerous valleys across the Proposed Development. The cumulation of the increased flood volumes will also

³⁹ Welsh Government (2021) Flood Consequence Assessments: Climate change allowances, Welsh Government Planning Policy Branch

result in increased flooding of land and properties within the River Ithon, Lugg and Wye Valleys. The Flood Consequence Assessment in **Appendix 11.1** includes consideration of this effect of climate change, and the findings of this assessment have been incorporated into the considerations within this chapter.

Water Resources

11.64 The projected increase in winter rainfall can be anticipated to lead to increased erosion and run-off from agricultural land. Areas of the Site that are ploughed to facilitate winter forage (e.g. swede) will therefore be increasingly susceptible to soil loss and nutrient run-off.

11.65 Soil ecosystems will come under increased pressure from increased periods and intensity of desiccation and saturation.

11.66 Erosional action of watercourses can also be expected to increase with increased winter rainfall. This may also lead to increased silt run-off into downstream watercourses.

11.67 Conversely, watercourses may become increasingly ephemeral with drier summers. The depth to groundwater may increase. These factors may in turn impact on the viability of PWSs that rely on shallow wells or on spring flow.

11.68 An increase in depth to groundwater may lead to a reduction of groundwater flow to some GWDTEs.

Geology and Soils

11.69 Increased seasonal aridity and wetness as a result of climate change poses risks to soils. These include: change in ALC grades, loss of soil structural stability, loss of soil carbon/organic matter, increased erosion of soil and increased risk of land instability associated with increased soil wetness. This will have a higher effect on organic/peat soils than mineral soils⁴⁰.

Maintaining hydrological health of peatland areas will become increasingly important if the peat is to be sustained in the face of climate change.

11.70 The scope of the embedded and applied mitigation set out below has been compiled with due consideration of the above factors for hydrology, hydrogeology and geology.

⁴⁰ Welsh Government (2019) Soil Policy Evidence Programme: Assessment of Welsh Soil Issues in Context

Design Considerations (Embedded Mitigation)

Step-wise Approach to Design

11.71 As set out in **Chapter 3**, the design of the Proposed Development was undertaken in an iterative way, with increasing levels of data being collected and used to refine the design at each stage. The aim of this iterative design approach was to implement a step-wise approach to the placement of the infrastructure layout, such that it avoids interacting with sensitive receptors in the first instance. Where interaction could not be avoided (for example, where stream-crossings are required), the infrastructure layout was amended to minimise this interaction, where possible. This step-wise approach is discussed below.

Flooding and Drainage

11.72 As noted above, due to the elevated and upland nature of the Site, the majority of the Site lies outside of Zone 2 and Zone 3 flood zones (i.e. within Flood Zone 1). The vast majority of the infrastructure therefore avoids these zones.

11.73 There are 8No. watercourse crossings required to facilitate the effective connection of the turbines and associated infrastructure. In all cases, the Flood Zones 2/ 3 are constrained to the immediate vicinity of the watercourse itself. Notwithstanding this, the crossing points have been designed at the point where crossing of the watercourse is shortest, and crossings have been re-orientated to minimise crossing widths, where possible.

Water Resources

11.74 A 50m buffer around watercourses and waterbodies (and their respective flood risk areas) has been applied during the preliminary project design, and the layout of the infrastructure placed to avoid this buffer, with the exception of where a watercourse crossing is required. As noted above, the orientation of the crossing has been amended where possible to make the length of track within the buffer as short as possible. There are locations where encroachment into this buffer surrounding areas of standing water has been unavoidable, however these are all small man-made pools in areas of improved grassland.

11.75 A 250m buffer has been drawn around all GWDTEs, reflective of the maximum buffer within which consideration of the interaction of the Proposed Development with GWDTEs is required under SEPA guidance⁴¹. The infrastructure design was placed to be outside of this buffer where possible. Where this was not possible, these instances are summarised in **Table 11.7**. These are considered further in the Assessment of Construction Effects and Assessment of Operational Effects Sections below.

11.76 Similarly, a 250m buffer has been drawn around all PWS abstraction. The Proposed Development lies outside of the 250m buffer in most areas, with the exception of 4 PWSs. None of these PWS's have a clear property that they serve and are likely to be for livestock purposes. In addition another 26 PWS's have been identified beyond the 250m from the Proposed Development that may have a connectivity to it due to their type (either known or assumed to be spring flow) and their location adjacent to watercourses that drain catchments in which the Proposed Development will be constructed (and hence there may be potential for this spring flow to be from the watercourses, and hence there may be a pathway for impact via this watercourse). These are considered further in the Assessment of Construction Effects and Assessment of Operation Effects section below.

Geology and Soils

11.77 Areas of peat soils deeper than 30cm have been identified following several iterative phases of peat probing. The Proposed Development has been located to avoid these soils. Some areas of shallow peaty soils (<30cm) overlap with the Proposed Development, notably around Turbines 17, 18, 19 and 20 on the Great Rhos Plateau.

11.78 Long undisturbed soils have been mapped using habitats and land-use as indicators. The Proposed Development has been located to avoid these soils where possible.

Micrositing

11.79 It is proposed that the turbines and other infrastructure will be subject to a standard 50m micrositing allowance, which will be applied should adverse ground conditions be encountered

⁴¹ SEPA (2017) Land Use Planning System SEPA Guidance Note 31: Guidance on assessing the impacts of development proposals on groundwater abstractions and groundwater dependent terrestrial ecosystems

during pre-construction ground investigations or where more optimal ground conditions are available. Any movement of infrastructure will be dependent on other onsite constraints and subject to advice from an Environmental and Ecological Clerks of Works (ECoW). Tailored restrictions to the standard micro-siting allowance are proposed to ensure that the final position of the turbines and associated infrastructure are not varied to such a degree as to cause a notable change in the predicted environmental effects outlined in the ES. The micro-siting restrictions relating to Hydrology, Hydrogeology and Geology are detailed in **Table 11.12**. A full list of micro-siting restrictions for all constraints is provided in **Chapter 4, Table 4.2**.

Table 11.12 Summary of micro-siting restrictions

Infrastructure	Micro-siting Restrictions
1	Any movement east needs to consider the presence of a pond and maintain suitable buffers.
2	Any movement east needs to consider the presence of a pond and maintain suitable buffers.
3	Any movement west needs to consider the presence of a pond and maintain suitable buffers. Any movement east needs to consider slope stability constraints.
4	Any movement east needs to consider slope stability constraints.
5	Any movement east needs to consider the presence of a pond and ground water dependent terrestrial ecosystem (GWDTE) and maintain suitable buffers. In addition, any movement east or south-west needs to consider the presence of peat.
6	Any movement south needs to consider the presence of GWDTE and maintain suitable buffers.
7	Any movement north-west needs to consider the presence of peat deposits.

Infrastructure	Micrositing Restrictions
8	Any movement north-west or south-east needs to consider the presence of peat deposits.
9	Any movement north, south or west needs to consider the presence of peat deposits. Any movement east needs to consider slope stability constraints.
10	None.
11	No movement south-west in order to maintain the required watercourse buffer and no movement north-east to maintain the required separation distance from the Site of Special Scientific Interest (SSSI).
12	None.
13	Any movement west needs to consider slope stability constraints.
14	Any movement north needs to consider slope stability constraints.
15	None.
16	Any movement north-east needs to consider the presence of peat deposits.
17	No movement east or south to maintain the required separation distance from the Site of Special Scientific Interest (SSSI). In addition, the presence of an ephemeral drainage channel prevents any movement south.
18	Any movement north-west needs to consider the presence of a watercourse and maintain a suitable buffer. Any movement north-west needs to consider slope stability constraints.
19	Any movement west or north-west needs to consider slope stability constraints.

Infrastructure	Micrositing Restrictions
20	None.
21	None.
22	Any movement east needs to consider slope stability constraints.
23	Any movement east needs to also consider the presence of a pond and maintain suitable buffers.
24	Any movement north-west must consider the location of a Private Water Supply and retain the appropriate buffer. Any movement east needs to consider slope stability constraints.
25	Any movement east needs to also consider the presence of a pond and maintain suitable buffers.
26	None.
28	None.
29	Any movement west needs to consider the presence of a pond and maintain suitable buffers.
30	None.
31	Any movement east needs to consider the presence of a pond and maintain a suitable buffer.
Access Tracks	Micrositing restrictions are placed on sections of the access tracks for hydrology, geology and peat considerations, as follows: ■ South-east of T22 – no movement south-east due to potential slope stability considerations and landslide. ■ From T5 to T6 – any movement west or east must consider GWDTEs.

Infrastructure	Micrositing Restrictions
	■ East of T6 – any movement south where crossing watercourse must consider proximity to the spring and PWS. ■ T15/T16 towards T21 – any movement west around NGR 316712, 263333 must consider steep slopes and any movement east must consider the spring. East of T30 – any movement east must consider proximity to the water feature.
Substation & temporary construction compound	Any movement west must consider the location of a PWS.
Temporary Construction Compound 1	Any movement north needs to consider the presence of a pond and maintain suitable buffers and any movement north-east must consider the presence of GWDTE.
Temporary Construction Compound 2 & Borrow Pit 3	None.
Borrow Pit 1	Any movement north-west must consider the watercourse and associated buffer.
Borrow Pit 2	None.

Good Practice Measures (Applied Mitigation)

Flooding and Drainage

11.80 Surface water drainage will be designed to meet the requirements of the Statutory Standards for sustainable drainage systems⁴² as described in the Outline Drainage Strategy (see **Appendix 11.2**). The following measures relevant to Flooding and Drainage are included in the strategy:

- All runoff from the substation and turbine footprints will be stored and infiltrated up to the 1 in 100 year event (plus Climate Change) to manage surface water runoff effectively and return runoff back to the ground as close as possible to the source.
- Watercourse crossings, where required, will be designed to maintain and not reduce the existing capacity of the channels (including an allowance for Climate Change).
- Access tracks will be served by a network of surface water infiltration trenches, to accommodate runoff during a 1 in 30 year event (plus an allowance for Climate Change). These will include check dams to slow the flow and provide water treatment including removal of sediment. Relief drains will cross the access tracks at regular intervals to maintain the existing flow paths, in particular with reference to GWDTEs, and where surface water flowpaths have been identified that may feed areas of peat or other wetland habitat. This is discussed in detail in **Appendix 11.2**. Drainage will be installed before or during access track construction, rather than afterwards to ensure that the access track design is not compromised.

Water Resources

11.81 The construction of the Proposed Development will be managed by use of the Construction Environmental Management Plan (CEMP). An Outline CEMP is provided in **Appendix 4.2**. This document includes the following provisions for minimising effects of the Proposed Development on water resources:

- A Surface Water Management plan as an appendix to the CEMP, which includes:

⁴² Welsh Government (2018) Statutory Standards for Sustainable Drainage Systems

- Provision for protection measures to control silt and other run-off within the construction site footprint (e.g. silt fencing, earth bunds etc);
 - Temporary works requirements in containing, managing and treating surface-water runoff as it leaves the construction site, including any necessary attenuation, settlement and treatment prior to water discharge; and,
 - Requirement for works sequencing, soils management etc. in order that the impacts of each section of works are minimised.
- Proper storage and use of oils, fuels and construction chemicals;
 - Provision of Site-worker accommodation and sanitation facilities; and,
 - Management and removal of waste materials.

11.82 At least three groundwater monitoring wells will be installed in the footprint of each proposed borrow pit, and data gathered on the groundwater elevation and behaviour. This information will then be used to inform the drainage design of the borrow pit, ensuring that the associated recharge/soakaway trench is situated on the down-gradient side of the excavation (thus maintaining the overall hydrogeological regime).

Geology and Soils

11.83 The Proposed Development requires that a significant volume of soil will be stripped. These soils will then be managed according to three different scenarios:

- Immediate restoration upon excavation (i.e. simultaneous stripping and restoration on proximal development parcels).
- Temporary stockpiling for a short period (weeks) and then restoration (e.g. where earthworks cut/fill is required).
- Temporary stockpiling for a longer period (months) prior to restoration (e.g. on the footprint of temporary hardstand areas).
- Placement within the final landscaped form of development (for example placing thicker soil on earthworks batters than was initially excavated). These areas of soil could then be used

in the decommissioning phase in due course. These soils shall be those associated with the stripping of permanent hardstanding and tracks.

11.84 The Outline Soil Management Plan in **Appendix 11.4** provides the measures that will be implemented to minimise the effect that the Proposed Development has on soils in all of these scenarios.

11.85 **Appendix 4.1** provides a borrow pit restoration plan, which includes their permanent restoration at the end of the construction period.

11.86 Normal practice in energy park development is to undertake a detailed ground investigation beneath all pieces of proposed infrastructure and track, in order that the ground conditions can be characterised and detailed geotechnical design can be compiled. This process will be followed for the Proposed Development, in adherence with BS5930:2015⁴³ and EuroCode 7⁴⁴.

11.87 Good practice in undertaking ground investigation and geotechnical design in areas of steep slopes and potential slope instability requires that the scope of ground investigation and geotechnical design be expended to include consideration of, and design against, ground instability. Again, this process will be followed for the Proposed Development, in adherence with BS5930:2015 and EuroCode 7.

11.88 Good practice in undertaking activities that break ground in areas affected by UXO require that a process of pre-works survey, as set out in industry guidance including CIRIA 2019⁴⁵. This process will be followed for the Proposed Development for any areas not already designated as ALARP. This will be secured through a suitable worded planning condition.

Assessment of Construction Effects

11.89 The assessment of effects is based on the project description as outlined in **Chapter 4: Project Description**. Unless otherwise stated, potential effects identified are adverse.

⁴³ BSI Group (2015) BS5930:2015 Code of Practice for site investigations

⁴⁴ European Commission (1997) EuroCode 7: Geotechnical Design

⁴⁵ CIRIA (2019) Unexploded ordnance (UXO) risk management guide for land-based projects (C785)

Predicted Construction Effects and Assessment of Effects

11.90 Table 11.13 assesses the predicted construction effects and the assessment of those effects.

Table 11.13 Summary of construction effects

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
C1	Release of construction site run-off impacted by silt Release of pollution from construction site (leaks, spills)	River Wye SAC	High	Negligible	Magnitude of change based on limited size of affected catchment relative to contributing catchment.	Temporary, Indirect	Minor
		River Aran and Hindwell Brook	High	Negligible	Embedded and applied mitigation (CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Negligible . The effect will last for construction phase period only (temporary) and will occur via flow from tributaries that drain site (indirect).	Temporary, Indirect	Minor
		Mithil Brook	Medium	Negligible		Temporary, Indirect	Negligible
		Waterbodies on Site	Medium	Low	Magnitude of change based on limited size of affected catchment relative to contributing catchment.	Temporary, Direct	Minor

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					Embedded and applied mitigation (CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Low . The effect will last for construction phase period only (temporary) and will occur if pollution enters watercourse (direct).		
		GWDTE F and G	Medium	Medium	Magnitude of change based on likely connectivity of GWDTE to proposed development. Embedded and applied mitigation (CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Medium. Effect will be within construction period (temporary) and will	Temporary, Direct	Moderate

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					occur if pollution enters a GWDTE (direct).		
		GWDTE K and L	Low	High	Magnitude of change based on likely connectivity of GWDTE to proposed development. Embedded and applied mitigation (CEMP, SWMP) will provide some mitigation of magnitude of impact, but this remains High. Effect will be within construction period (temporary) and will occur if pollution enters a GWDTE (direct).	Temporary, Direct	Moderate
		GWDTE H, I and J	Low	Medium	Magnitude of change based on likely connectivity of GWDTE to proposed development.	Temporary, Direct	Minor

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					Embedded and applied mitigation (CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Medium . Effect will be within construction period (temporary) and will occur if pollution enters a GWDTE (direct).		
		GWDTE M, N and O	Low	Low	Magnitude of change based on likely connectivity of GWDTE to proposed development. Embedded and applied mitigation (CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Low. Effect will be within construction period (temporary) and will	Temporary, Direct	Minor

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					occur if pollution enters a GWDTE (direct).		
		PWSs on Site, or with viable pathway connection to Site	Medium	Medium	Magnitude of change based on viability of pathway connection to Site. Embedded and applied mitigation (CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Medium . Effect will be within construction period (temporary) and will occur via sub-surface flow paths on Site (indirect).	Temporary, Indirect	Moderate
		Other PWSs	Medium	Negligible	Magnitude of change based on viability of pathway connection to Site. Embedded and applied mitigation (CEMP, SWMP) is considered sufficient	Temporary, Indirect	Negligible

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					to effectively limit the magnitude of change to Negligible . Effect will be within construction period (temporary) and will occur via sub-surface flow paths from onsite pollution sources (indirect).		
		Mithil Brook and Cwm Blithus SSSI	High	Negligible	Magnitude of change based on limited size of affected catchment relative to contributing catchment. Embedded and applied mitigation (CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Negligible. Effect will be within construction period (temporary) and will occur via sub-surface flow paths from onsite pollution sources (indirect).	Temporary, Indirect	Negligible

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
		Ludlow Argillaceous Rocks and Glacial Till aquifers	Medium	Negligible	Magnitude of change based on limited size of affected catchment relative to contributing catchment. Embedded and applied mitigation (CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Negligible. Effect will be within construction period (temporary) and will occur via sub-surface flow paths from onsite pollution sources (indirect). Magnitude of change based on limited size of affected catchment relative to contributing catchment. Embedded and applied mitigation (Outline Drainage Strategy, CEMP, SWMP) is considered sufficient to	Temporary, Indirect	Negligible

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					effectively limit the magnitude of change to Negligible . Effect will be within construction period (temporary) and occur via flow from tributaries that drain site (indirect).		
		River Ithon floodplain and associated properties	High	Negligible	Magnitude of change based on limited size of affected catchment relative to contributing catchment. Embedded and applied mitigation (CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Negligible . Effect will be within construction period (temporary) and will occur via sub-surface flow paths from onsite pollution sources (indirect).	Temporary, Indirect	Minor
		River Lugg floodplain and associated properties	High	Negligible		Temporary, Indirect	Minor

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					Magnitude of change based on limited size of affected catchment relative to contributing catchment. Embedded and applied mitigation (Outline Drainage Strategy, CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Negligible. Effect will be within construction period (temporary) and occur via flow from tributaries that drain site (indirect). Magnitude of change based on limited size of affected catchment relative to contributing catchment. Embedded and applied mitigation (Outline Drainage Strategy, CEMP,		

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					SWMP) is considered sufficient to effectively limit the magnitude of change to Negligible . Effect will be within construction period (temporary) and occur via flow from tributaries that drain site (indirect).		
C2	Alteration to the volume and rate of run-off causing increased downstream flood risk	GWDTE F and G	Medium	Medium	Magnitude of change based on limited size of affected catchment relative to contributing catchment. Embedded and applied mitigation (Outline Drainage Strategy, CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Negligible. Effect will be within construction period (temporary) and	Permanent, Indirect	Moderate

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					occur via flow from tributaries that drain site (indirect). Magnitude of change based on likely connectivity of GWDTE to proposed development. Embedded and applied mitigation (CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Medium. Effect will last beyond the construction period (permanent) and will occur via changes in groundwater flow patterns (indirect).		
C3	Alteration to groundwater flow/elevations	GWDTE K and L	Low	High	Magnitude of change based on likely connectivity of GWDTE to proposed development.	Permanent, Indirect	Moderate

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					Embedded and applied mitigation (CEMP, SWMP) will provide some mitigation of magnitude of impact, but this remains High . Effect will last beyond the construction period (permanent) and will occur via changes in groundwater flow patterns (indirect).		
		GWDTE H, I and J	Low	Medium	Magnitude of change based on likely connectivity of GWDTE to proposed development. Embedded and applied mitigation (CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Medium. Effect will last beyond the construction period	Permanent, Indirect	Minor

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					(permanent) and will occur via changes in groundwater flow patterns (indirect).		
		GWDTE M, N and O	Low	Low	Magnitude of change based on likely connectivity of GWDTE to proposed development. Embedded and applied mitigation (CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Low. Effect will last beyond the construction period (permanent) and will occur via changes in groundwater flow patterns (indirect).	Permanent, Indirect	Minor
		PWSs on Site, or with viable pathway	Medium	Low	Magnitude of change based on viability of pathway connection to Site.	Permanent, Indirect	Minor

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
		connection to Site			Embedded and applied mitigation (CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Low . Effect will last beyond the construction period (permanent) and will occur via sub-surface flow paths on Site (indirect).		
		Other PWSs	Medium	Negligible	Magnitude of change based on viability of pathway connection to Site. Embedded and applied mitigation (CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Negligible. Effect will last beyond the construction period (permanent) and will occur via sub-surface flow paths on Site (indirect).	Permanent, Indirect	Negligible

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
		Ludlow Argillaceous Ricks and Glacial Till aquifers	Medium	Low	Magnitude of change based on limited size of affected catchment relative to contributing catchment. Embedded and applied mitigation (CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Low. Effect will last beyond the construction period (permanent) and will occur via changes in groundwater flow patterns (indirect).	Permanent, Indirect	Minor
		Waterbodies on Site	Medium	Negligible	Magnitude of change based on limited size of affected catchment relative to contributing catchment. Embedded and applied mitigation (CEMP, SWMP) is considered sufficient	Permanent, Indirect	Negligible

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					to effectively limit the magnitude of change to Negligible . Effect will last beyond the construction period (permanent) and will occur via changes in groundwater flow patterns (indirect).		
		Peatland on Great Rhos, including within SSSI	High	Medium	Magnitude of change based on proximity and extent of works near to the peatland. Embedded and applied mitigation (CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Medium. Effect will last beyond the construction period (permanent) and will occur through indirect alterations to surface flow paths into/out of the peatland (indirect).	Permanent, Indirect	Major

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
		Other peat bodies on Site	High	Negligible	Magnitude of change based on proximity and extent of works near to peat bodies – area of interaction is very small due to topography. Embedded and applied mitigation (Outline Soils Management Plan, including Peat, CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Negligible. Effect will last beyond the construction period (permanent) and will occur through indirect alterations to surface flow paths into/out of the peatland (indirect).	Permanent, Indirect	Minor

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
		Commercial forestry on Site	Medium	Negligible	Magnitude of change based on viability of pathway connection to Site, and limited size of affected catchment relative to contributing catchment. Embedded and applied mitigation (Outline Drainage Strategy, CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Negligible. Effect will be within construction period (temporary) and will occur via creating/obstructing preferential flow paths towards surface water features (indirect).	Temporary, Indirect	Negligible
C4	Alteration to surface-water	River Wye SAC	High	Negligible	Magnitude of change based on viability of pathway connection to Site, and	Temporary, Indirect	Minor

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
	drainage paths during temporary construction works				limited size of affected catchment relative to contributing catchment. Embedded and applied mitigation (Outline Drainage Strategy, CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Negligible. Effect will be within construction period (temporary) and will occur via creating/obstructing preferential flow paths towards surface water features (indirect). Magnitude of change based on provision of replacement pond within the micro-siting buffer as part of applied mitigation. Magnitude of change is		

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					therefore Low . Effect will be permanent and direct .		
		River Aran and Hindwell Brook	High	Negligible	Magnitude of change based on viability of pathway connection to Site, and limited size of affected catchment relative to contributing catchment. Embedded and applied mitigation (Outline Drainage Strategy, CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Negligible . Effect will be within construction period (temporary) and will occur via creating/obstructing preferential flow paths towards surface water features (indirect).	Temporary, Indirect	Negligible

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					Magnitude of change based on provision of replacement pond within the micro-siting buffer as part of applied mitigation. Magnitude of change is therefore Low. Effect will be permanent and direct. Magnitude of change based on area of interaction with long undisturbed soils is very small. Embedded and applied mitigation (Outline Soil Management plan, CEMP) is considered sufficient to effectively limit the magnitude of change to Negligible. Effect will last beyond the construction period (permanent) and will occur via direct changes (direct).		

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
		Mithil Brook	Medium	Negligible	Magnitude of change based on viability of pathway connection to Site, and limited size of affected catchment relative to contributing catchment. Embedded and applied mitigation (Outline Drainage Strategy, CEMP, SWMP) is considered sufficient to effectively limit the magnitude of change to Negligible. Effect will be within construction period (temporary) and will occur via creating/obstructing preferential flow paths towards surface water features (indirect). Magnitude of change based on provision of replacement pond within the micro-siting buffer as part of applied	Temporary, Indirect	Negligible

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					mitigation. Magnitude of change is therefore Low. Effect will be permanent and direct. Magnitude of change based on area of interaction with long undisturbed soils is very small. Embedded and applied mitigation (Outline Soil Management plan, CEMP) is considered sufficient to effectively limit the magnitude of change to Negligible. Effect will last beyond the construction period (permanent) and will occur via direct changes (direct). Magnitude of change based on area of interaction with natural soils on is small.		

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					Embedded and applied mitigation (Outline Soil Management plan, CEMP) is considered sufficient to effectively limit the magnitude of change to Low . Effect will last beyond the construction period (permanent) and will occur via direct changes (direct).		
		Waterbodies on Site	Medium	Negligible	Magnitude of change based on viability of pathway connection to Site, and limited size of affected catchment relative to contributing catchment. Embedded and applied mitigation (Outline Drainage Strategy, CEMP, SWMP) is considered sufficient to	Temporary, Indirect	Negligible
		PWSs on Site, or with viable pathway connection to Site	Medium	Negligible		Temporary, Indirect	Negligible

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
		Other PWSs	Medium	Negligible	effectively limit the magnitude of change to Negligible . Effect will be within construction period (temporary) and will occur via creating/obstructing preferential flow paths towards surface water features (indirect).	Temporary, Indirect	Negligible
		Small ponds under T21 and T26	Low	Low		Permanent, Direct	Minor
		Long undisturbed soils	High	Negligible	Magnitude of change based on provision of replacement pond within the micro-siting buffer as part of applied mitigation. Magnitude of change is therefore Low . Effect will be permanent and direct .	Permanent, Direct	Minor
		Natural soils on site that are not long undisturbed	Medium	Low		Permanent, Direct	Minor
		Long undisturbed soils	High	Low	Magnitude of change based on area of interaction with long undisturbed soils is very small.	Permanent, Direct	Minor

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					Embedded and applied mitigation (Outline Soil Management plan, CEMP) is considered sufficient to effectively limit the magnitude of change to Negligible. Effect will last beyond the construction period (permanent) and will occur via direct changes (direct). Magnitude of change based on area of interaction with natural soils on is small. Embedded and applied mitigation (Outline Soil Management plan, CEMP) is considered sufficient to effectively limit the magnitude of change to Low. Effect will last beyond the construction period (permanent) and will occur via direct changes (direct).		

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					Magnitude of change based on area of interaction with natural soils (long undisturbed and not long undisturbed) on is small. Embedded and applied mitigation (UXO survey and support during construction phase) is considered sufficient to effectively limit the magnitude of change to Low. Effect will last beyond the construction period (permanent) and will occur via direct changes (direct).		
C5	Loss of small waterbodies on Site	Natural soils not long undisturbed	Medium	Low	Magnitude of change based on area of interaction with natural soils (long undisturbed and not long undisturbed) on is small.	Permanent, Direct	Minor

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					Embedded and applied mitigation (UXO survey and support during construction phase) is considered sufficient to effectively limit the magnitude of change to Low. Effect will last beyond the construction period (permanent) and will occur via direct changes (direct). Magnitude of change based on area of interaction with natural soils (long undisturbed and not long undisturbed) on is small. Applied mitigation (ground investigation and geotechnical design with focus on slope stability where required) is considered sufficient to effectively limit the magnitude of change to Low. Effect		

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					will last beyond the construction period (permanent) and will occur via direct changes (direct).		
C6	Direct impact on soils (excavation/compaction/degradation/carbon loss)	Long undisturbed soils	High	Low	Magnitude of change based on area of interaction with natural soils (long undisturbed and not long undisturbed) on is small. Embedded and applied mitigation (UXO survey and support during construction phase) is considered sufficient to effectively limit the magnitude of change to Low. Effect will last beyond the construction period (permanent) and will occur via direct changes (direct). Magnitude of change based on area of interaction with natural soils (long	Permanent, Direct	Minor

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					undisturbed and not long undisturbed) on is small. Applied mitigation (ground investigation and geotechnical design with focus on slope stability where required) is considered sufficient to effectively limit the magnitude of change to Low. Effect will last beyond the construction period (permanent) and will occur via direct changes (direct). Magnitude of change based on area of interaction with natural soils (long undisturbed and not long undisturbed) on is small. Applied mitigation (ground investigation and geotechnical design with focus on		

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					slope stability where required) is considered sufficient to effectively limit the magnitude of change to Low . Effect will last beyond the construction period (permanent) and will occur via direct changes (direct).		
		Natural soils not long undisturbed	Medium	Low	Magnitude of change based on area of interaction with natural soils (long undisturbed and not long undisturbed) on is small. Embedded and applied mitigation (UXO survey and support during construction phase) is considered sufficient to effectively limit the magnitude of change to Low. Effect will last beyond the	Permanent, Direct	Minor

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					construction period (permanent) and will occur via direct changes (direct). Magnitude of change based on area of interaction with natural soils (long undisturbed and not long undisturbed) on is small. Applied mitigation (ground investigation and geotechnical design with focus on slope stability where required) is considered sufficient to effectively limit the magnitude of change to Low. Effect will last beyond the construction period (permanent) and will occur via direct changes (direct). Magnitude of change based on area of interaction with natural soils (long		

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					undisturbed and not long undisturbed) on is small. Applied mitigation (ground investigation and geotechnical design with focus on slope stability where required) is considered sufficient to effectively limit the magnitude of change to Low. Effect will last beyond the construction period (permanent) and will occur via direct changes (direct). Magnitude of change based on area of interaction with natural soils (long undisturbed and not long undisturbed) on is small. Applied mitigation (ground investigation and geotechnical design with focus on		

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					slope stability where required) is considered sufficient to effectively limit the magnitude of change to Low . Effect will last beyond the construction period (permanent) and will occur via direct changes (direct).		

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
C7	Risk of disturbing UXO during construction phase				Magnitude of change based on area of interaction with natural soils (long undisturbed and not long undisturbed) on is small. Embedded and applied mitigation (UXO survey and support during construction phase) is considered sufficient to effectively limit the magnitude of change to Low. Effect will last beyond the construction period (permanent) and will occur via direct changes (direct). Magnitude of change based on area of interaction with natural soils (long undisturbed and not long undisturbed) on is small.		

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					Applied mitigation (ground investigation and geotechnical design with focus on slope stability where required) is considered sufficient to effectively limit the magnitude of change to Low. Effect will last beyond the construction period (permanent) and will occur via direct changes (direct). Magnitude of change based on area of interaction with natural soils (long undisturbed and not long undisturbed) on is small. Applied mitigation (ground investigation and geotechnical design with focus on slope stability where required) is considered sufficient to effectively limit		

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					the magnitude of change to Low. Effect will last beyond the construction period (permanent) and will occur via direct changes (direct). Magnitude of change based on area of interaction with natural soils (long undisturbed and not long undisturbed) on is small. Applied mitigation (ground investigation and geotechnical design with focus on slope stability where required) is considered sufficient to effectively limit the magnitude of change to Low. Effect will last beyond the construction period (permanent) and will occur via direct changes (direct).		

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					Magnitude of change based on area of interaction with natural soils (long undisturbed and not long undisturbed) on is small. Applied mitigation (ground investigation and geotechnical design with focus on slope stability where required) is considered sufficient to effectively limit the magnitude of change to Low. Effect will last beyond the construction period (permanent) and will occur via direct changes (direct).		

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
C8	Risk of triggering land instability (landslide) as a result of earthworks or drainage				Magnitude of change based on area of interaction with natural soils (long undisturbed and not long undisturbed) on is small. Applied mitigation (ground investigation and geotechnical design with focus on slope stability where required) is considered sufficient to effectively limit the magnitude of change to Low. Effect will last beyond the construction period (permanent) and will occur via direct changes (direct).		

Proposed Mitigation (Additional Mitigation) and Compensation

GWDTEs

11.91 10No. GWDTEs have been identified where it has not been possible to avoid the placement of some parts of the Proposed Development within the 250m buffer of GWDTEs. Of these, it has been assessed that there is a potential Moderate adverse effect on GWDTEs (F, G, K and L).

11.92 In order to mitigate these potential effects, a sequence of additional mitigation actions will be undertaken. A bespoke drainage design will be implemented to maintain the groundwater feed to the GWDTE, both during the temporary works of the construction phase, and during the operational phase of the development. The sequence of works that will be undertaken is listed below, and described further in **Appendix 11.2**:

- Ground investigation, comprising the installation of groundwater monitoring wells within boreholes, positioned to enable characterisation of any connectivity between the area of Proposed Development and the GWDTE;
- Long-term monitoring of the groundwater elevations in boreholes;
- Hydrogeological assessment of the data gathered, assessing the likelihood of connectivity;
- Detailed topographical survey to determine the relative ground elevations of GWDTE and the Proposed Development infrastructure; and,
- Use of this data to inform the detailed drainage design and detailed CEMP.

11.93 Whilst the results of the above mitigation actions will ultimately inform the detailed drainage design, **Table 11.14** below provides a summary of each of these GWDTEs, and describes in outline the mitigating actions that will be undertaken to ameliorate these effects.

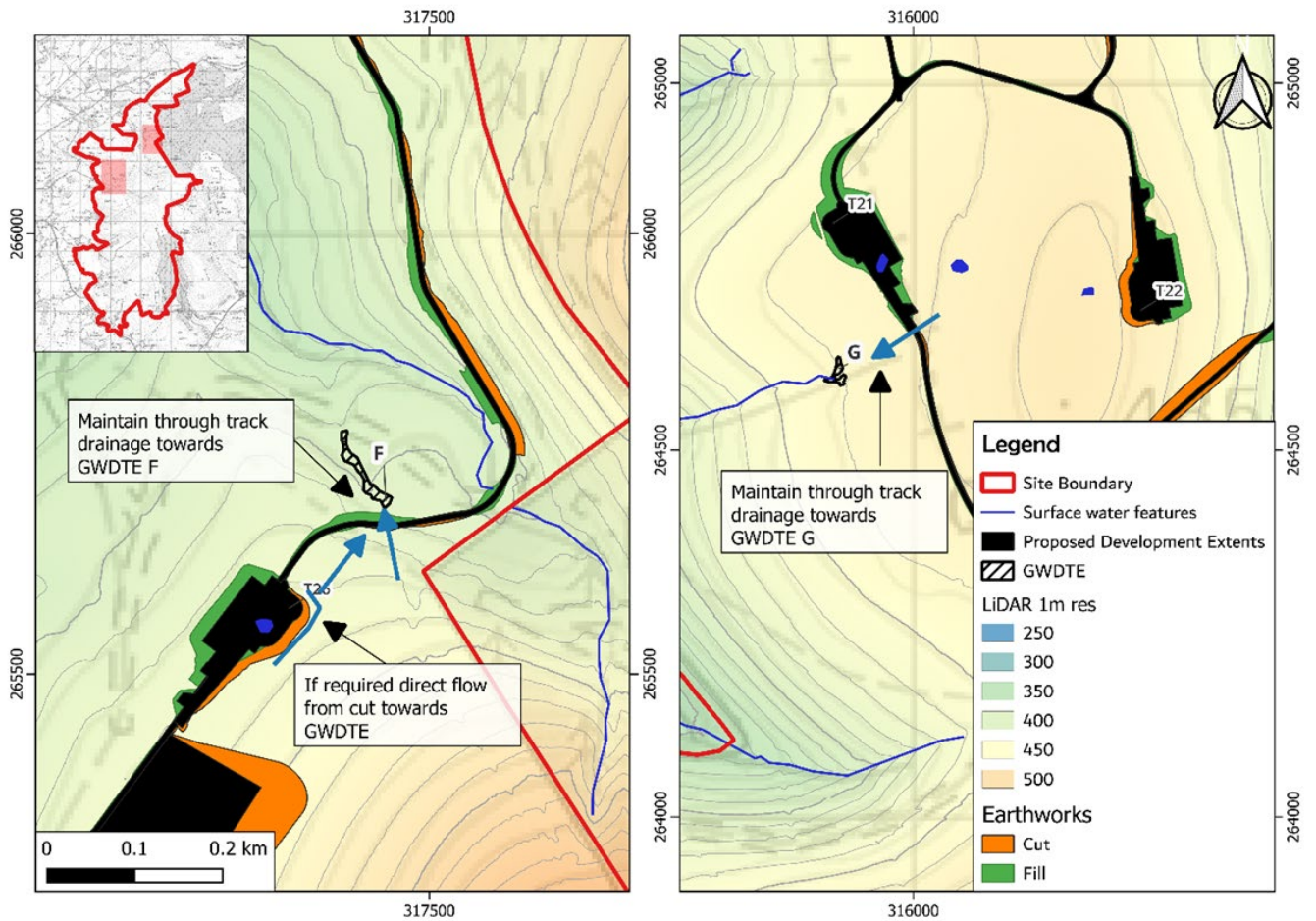
Inset Figures 11.A and 11.B provide plans showing these GWDTEs and the proposed mitigating actions. The precise design of these mitigating actions will be refined during the detailed design phase, once the results of the ground investigation, including groundwater monitoring, are available.

Table 11.14 GWDTEs requiring mitigation

GWDTE ID	Description	Mitigating Action
F	GWDTE F is located to the west and on the downslope of the access track from Turbine 26 towards Turbines 28 and 29. There is potential for the cut (located 130m away) on the south-eastern side of Turbine 26 to provide a preferential flow path towards the west, rather than towards the watercourse and GWDTE to the north-east.	See Inset Figure 11.A below. Regular cross track drainage will be installed with gravel filled recharge to maintain flow across the track towards GWDTE F. Monitoring of flow from the cut on Turbine 26, and if required, construction of a drain at the base of the cut to direct flow towards the GWDTE.
G	GWDTE G is located to the west and on the downslope of the access track to Turbine 21. The earthworks around turbine 21 consist of fill rather than cut. Turbine 22 is located 300m away on the far side of the topographic high in the area.	See Inset Figure 11.A below. Regular cross track drainage will be installed with gravel filled recharge to maintain flow across the track towards GWDTE G. As no cut is proposed for Turbine 21, it is not anticipated that flow will need to be redirected from works in that location. Turbine 22, due to its location (distance and on opposite side of topographic high) is unlikely to impact the GWDTE.
K	GWDTE K is located to the west of the access track and to the east of Turbine 5. Flow to the GWDTE may be impacted	See Inset Figure 11.B below. Careful drainage design will be required to create a new drain cut along the back

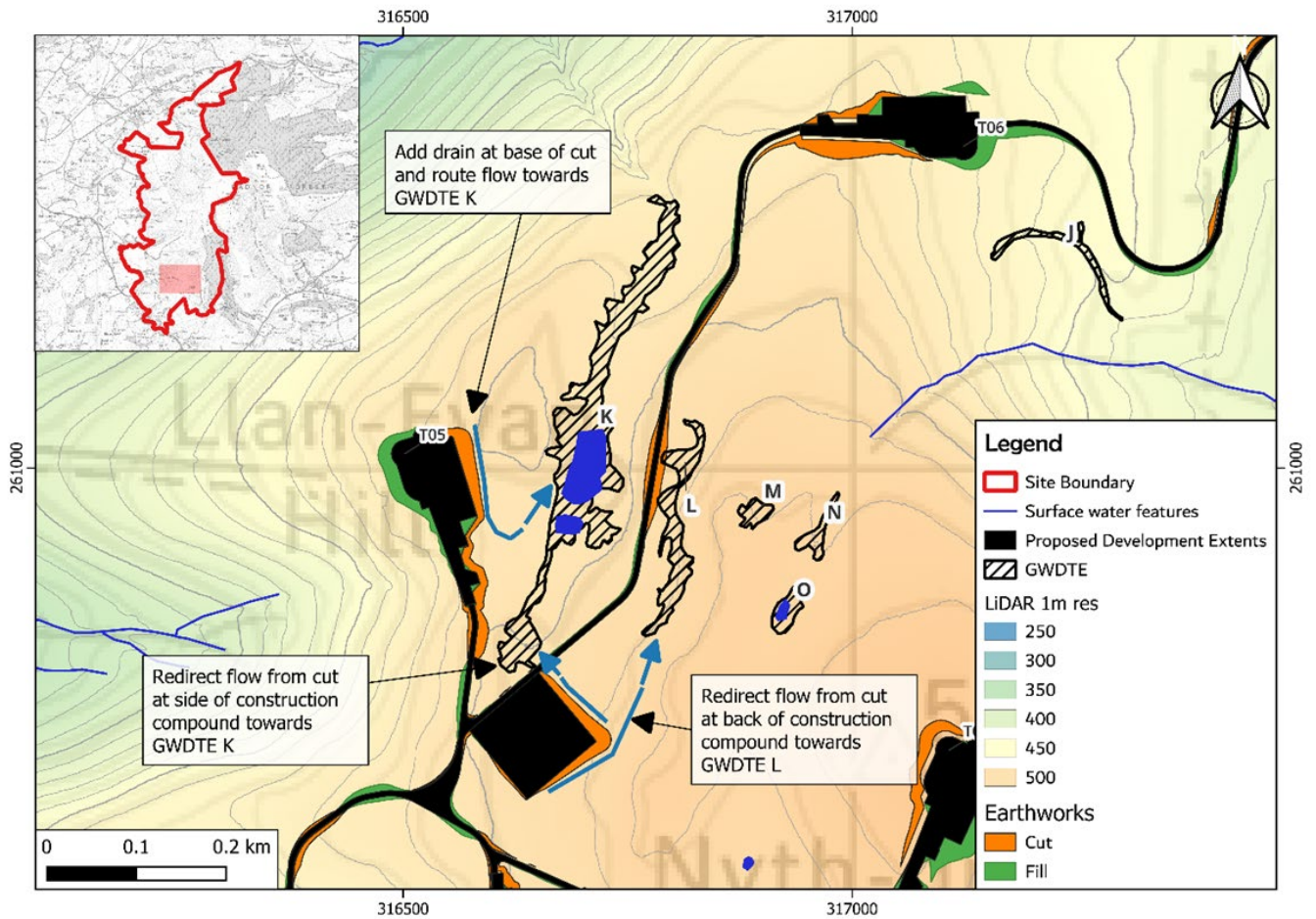
GWDTE ID	Description	Mitigating Action
	by both the cut on the western side of Turbine 5, and the cut for the construction compound to the south.	of the cut on Turbine 5, contouring around the south of the top of the hillock separating Turbine 5 from the GWDTE, and feed the central portion of the GWDTE. A secondary drain along the back of the cut that extends along the access track to Turbine 5 could also be implemented, feeding into the GWDTE further south. Flow from the cut at the construction compound can also be directed, under the access track and into the southern limit of the GWDTE.
L	GWDTE L is located to the east of the main access track towards Turbine 6. The majority of the groundwater flow to GWDTE is likely to come from the south-east from the direction of Turbine 4, which is approximately 300m away. There is therefore limited potential for the flow to the GWDTE to be impacted. The cut, associated with the track immediately downslope of the GWDTE, may provide a preferential path for flow to exit the GWDTE with a reduced retention time within the GWDTE.	See Inset Figure 11.B below. If the cut associated with the track immediately downslope of the GWDTE is found to provide a preferential path out to the GWDTE, and reduce retention time within the GWDTE, it will be possible to implement a drain along the back of the cut for the construction compound to the south, and re-direct the additional flow towards the southern end of the GWDTE, thus recirculating flow back to the habitat.

Inset Figure 11.A: GWDTE F and G – Mitigation options (indicative and subject to micrositing alterations)



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Inset Figure 11.B: GWDTE K and L – Mitigation options (indicative and subject to micrositing alterations)



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PWSs

11.94 Thirty PWSs have been identified that may be sufficiently connected to the hydrology of the Site as to be potentially affected by the Proposed Development. It has been assessed that there is a potential Moderate significance of effect on these receptors.

11.95 In order to mitigate these potential effects and minimise the likelihood and consequence of any impacts, a sequence of actions will be undertaken. This sequence of works is listed below, and described further in **Appendix 11.2**:

- Ensure culverts installed with sufficient capacity on watercourses which run beneath access track.
- Incorporate drains beneath hardstanding area and access track to facilitate surface water to pass.
- No plant, vehicles, chemicals or pollutants to be located or stationary within 250m of identified PWS source locations.
- An appropriate Water Quality Monitoring Plan (WQMP) will be designed for those PWS identified as being at risk of water quality or quantity deterioration, to include a comprehensive sampling programme.
- Frequent communication and liaison with PWS property owners for the duration of time construction is within the PWS catchment areas – principal contractor to provide a nominated person as point of contact.
- In the event that a PWS is affected by activities associated with the construction works, contingency supply arrangements will be ready for implementation. This will include ensuring that alternative sources of drinking water and water for general use will be provided will it be required.
- Where a temporary alternative supply be provided, the existing supply will be reinstated following the construction and a water quality and quantity monitoring programme will be employed to ensure the water supply is reinstated to baseline conditions.

11.96 The above points are considered sufficient to mitigate any significant adverse effect on these PWSs. However, as a failsafe additional measure, provision shall also be made for relocation/redrilling/replacing any affected PWS, if required.

11.97 In addition to the specific mitigations in place at those PWS locations deemed to be at risk, standard good practice measures to be outlined within the Construction Environmental Management Plan will be in place and will limit effects on private water supply.

11.98 In all cases apart from PWS No. 36, it is considered that the above mitigation measures will satisfactorily mitigate risk and bring the residual risk level down to low. In the case of PWS No.36, the following additional mitigation measures will be implemented:

- Installation of at least three groundwater monitoring wells in the vicinity of the well, baseline groundwater elevation and permeability data collected;
- Assessment as to the potential for cut associated with turbines T23 and T24 to intercept groundwater flow to the well; and
- Design of drainage trenches and recharge trenches around each turbine base to return any intercepted groundwater back to ground up-gradient of the well.

11.99 These mitigating actions will reduce the residual effect to Minor or Negligible (not significant).

Peatland on Great Rhos, including within SSSI

11.100 The Proposed Development has been designed to avoid directly impacting on the peatland on Great Rhos. Notwithstanding this, Turbines T18, T19 and T20 and the trackways between them cross the area of ground immediately downslope of the peatland. There is therefore the risk that this infrastructure provides a preferential drainage pathway, which in turn leads to the drying of soils in the Great Rhos area. The precise mechanisms and techniques that will be best to employ in avoiding, reducing and mitigating this effect cannot be fully defined until the detailed design phase has been entered into (as the design will necessarily be an iterative process, informed by the detailed ground investigation process). Notwithstanding this, there is a high degree of certainty that suitable mitigation can be achieved through the deployment of standard drainage controls and techniques, for which there is a long track record

of proven effectiveness. Examples include contour bunding, cross drain construction, recharge trenches, impermeable plugs within cable trenches, etc. The sequence of tasks to deliver this avoidance/ reduction and mitigation of effects will be as follows:

- Design and implement a groundwater monitoring scheme comprising a combination of shallow dipwells and deeper boreholes, with pre-commencement monitoring of groundwater elevations in order to gather data across a range of weather conditions and seasons.
- Use this data to compile a conceptual ground and groundwater model for the area, with focus on identifying and characterising the drainage mechanisms at play.
- Design an earthworks and drainage scheme for this part of the Proposed Development that addresses any drainage risks identified during the above works and ensures that the infrastructure does not become a preferential pathway for run-off. Example techniques include:
 - Sympathetic earthworks design that works with the existing topography as much as is feasible;
 - Use of SUDS techniques to return run-off from the permanent infrastructure directly to ground as close to source as possible;
 - Use of capture and recharge ditches and swales, connected by cross drains beneath the infrastructure and tracks, to maintain the natural direction and diffusivity of drainage; and,
 - Segmentation of drainage infrastructure, such that there are no alterations in direction of run-off (i.e. promoting cross-infrastructure drainage mimicking natural topography).
- Detailed hydrological and ecological survey of the area in order to identify areas where blocking of current drainage may deliver benefit to peatland and habitat, enabling that to be designed into the detailed design for the Proposed Development (e.g. blocking current drainage pathways with infrastructure to re-wet areas).

Residual Construction Effects

11.101 The additional mitigation measures described above reduce the significance of effect. This is discussed in **Table 11.15**. Each row corresponds to the same alpha-numeric row as in **Table 11.13**.

Table 11.15 Summary of residual effects

No.	Effect	Receptor	Significance of Effect Before Additional Mitigation	Additional Mitigation	Significance of Residual Effect
C1	Release of construction site run-off impacted by silt Release of pollution from construction site (leaks, spills)			Detailed investigation and assessment work will be undertaken to refine the understanding of the type, nature and connectivity of any potential pathways of pollution from the Proposed Development to each GWDTE. This will be used to inform the detailed CEMP as it is evolved from the current outline document. This will reduce the Magnitude of Change from Medium to Low or Negligible.	Minor
		GWDTE F and G	Moderate		Minor
		GWDTE K and L	Moderate		Minor
		PWSs on Site, or with viable pathway connection to Site	Moderate	Detailed investigation and assessment work will be undertaken to refine the provisions within the outline CEMP when finalising the detailed CEMP. Water quality will be monitored, with provision for replacing PWS in the very unlikely event an unacceptable impact is detected.	Minor

No.	Effect	Receptor	Significance of Effect Before Additional Mitigation	Additional Mitigation	Significance of Residual Effect
				This will reduce the magnitude of change from Medium to Low or Negligible.	
C3	Alteration to groundwater flow/elevations			Bespoke drainage solutions will be constructed at each location in order to ensure that the groundwater feed to each GWDTE is maintained in both quantity and quality. Detailed investigation and assessment work will be undertaken to refine the design of these mitigating actions. This will reduce the Magnitude of Change from Medium to Low or Negligible.	Minor
		GWDTE F and G	Moderate		Minor
		GWDTE K and L	Moderate		Minor
C4	Alteration to surface-water drainage paths during temporary				Minor
		Peatland on Great Rhos, including within SSSI	Major	Bespoke drainage solutions will be constructed for the turbine hardstandings and trackways in order to ensure that the current drainage patterns are replicated or improved upon. Detailed investigation and assessment	Minor

No.	Effect	Receptor	Significance of Effect Before Additional Mitigation	Additional Mitigation	Significance of Residual Effect
	construction works			work will be undertaken to refine the design of these mitigating actions. In addition, Chapter 7 (Ecology) also outlines additional mitigation measures including: ■ Conservation grazing in this area and peatland restoration within the SSSI to help enhance habitat; and, ■ Heathland creation and enhancement. This will reduce the Magnitude of Change from Medium to Negligible.	

Assessment of Operational Effects

11.102 The assessment of effects is based on the project description as outlined in **Chapter 4: Project Description**. Unless otherwise stated, potential effects identified are adverse.

Predicted Operational Effects and Assessment of Effects

11.103 **Table 11.16** sets out the predicted operational effects and the assessment of those effects.

Table 11.16 Assessment of operational effects

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
O1	Increase in impermeable area (turbine bases, sub-station)	River Ithon floodplain and associated properties	High	Negligible	Magnitude of change based on limited size of affected catchment relative to total contributing catchment.	Permanent, Indirect	Minor beneficial
		River Lugg floodplain and associated properties	High	Negligible	Applied mitigation (Outline Drainage Strategy) is considered sufficient to effectively limit the magnitude of change to Negligible , and potentially lead to a reduction in runoff. Effect will be permanent (permanent) and will occur via flow from tributaries that drain site (indirect).	Permanent, Indirect	Minor beneficial
O2	Alteration to overland flow	Waterbodies on Site	Medium	Negligible		Permanent, Indirect	Negligible

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
	paths, and increasing runoff in the vicinity of the tracks	River Ithon floodplain and associated properties	High	Negligible	Magnitude of change based on limited size of affected catchment relative to total contributing catchment.	Permanent, Indirect	Minor
		River Lugg floodplain and associated properties	High	Negligible	Applied mitigation (Outline Drainage Strategy) is considered sufficient to effectively limit the magnitude of change to Negligible , and potentially lead to a reduction in runoff. Effect will be permanent (permanent) and will occur via flow from tributaries that drain site (indirect).	Permanent, Indirect	Minor
		Natural soils on Site that are not long undisturbed	Medium	Low	Magnitude of change based on area of interaction with natural soils on is small. Applied mitigation (Outline Drainage Strategy) is considered sufficient to	Permanent, Indirect	Minor

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					effectively limit the magnitude of change to Low , and potentially lead to a reduction in runoff. Effect will be permanent (permanent) and will occur via flow from tributaries that drain site (indirect).		
		Peat bodies on Site	High	Negligible	Magnitude of change based on minimal interaction with peat bodies on Site and their immediate vicinity. Applied mitigation (Outline Drainage Strategy) is considered sufficient to effectively limit the magnitude of change to Negligible. Effect will be permanent (permanent) and will occur via sub-surface flow paths towards and from Peat bodies (indirect).	Permanent, Indirect	Minor

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
		Long undisturbed soils on Site	High	Negligible	Magnitude of change based on area of interaction with long undisturbed soils is very small. Applied mitigation (Outline Drainage Strategy) is considered sufficient to effectively limit the magnitude of change to Negligible. Effect will be permanent (permanent) and will occur via sub-surface flow paths on Site (indirect).	Permanent, Indirect	Minor
		PWSs	Medium	Negligible	Magnitude of change based on minimal interaction with PWSs on and around Site and their immediate vicinity. Applied mitigation (Outline Drainage Strategy) is considered sufficient to effectively limit the magnitude of change	Permanent, Indirect	Negligible

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					to Negligible . Effect will be permanent (permanent) and will occur via sub-surface flow paths on Site (indirect).		
O3	Watercourse crossings will result in a change in morphology and potential velocity of flow through the crossing	Waterbodies on Site	Medium	Negligible	Magnitude of change based on applied mitigation (Outline Drainage Strategy) ensuring capacity of existing watercourses is maintained and not reduced. Effect will be permanent (permanent) and will occur via flow from tributaries that drain site (indirect).	Permanent, Indirect	Negligible
		River Ithon floodplain and associated properties	High	Negligible		Permanent, Indirect	Minor
		River Lugg floodplain and associated properties	High	Negligible		Permanent, Indirect	Minor

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
O4	Adverse effect on soils stripped from permanent infrastructure, awaiting placement during decommissioning	Natural soils on Site that are not long undisturbed	Medium	Low	Magnitude of change based on area of interaction with natural soils on is small. Applied mitigation (Outline Soil Management Plan, Borrow-pit Restoration Plan) is considered sufficient to effectively limit the magnitude of change to Low. Effect will last during the operational period (temporary) and will occur via direct changes (direct).	Temporary, Direct	Minor
O5	Creation of borrow pit voids, with potential for land dereliction	Natural soils on Site that are not long undisturbed	Medium	Low	Magnitude of change based on area of interaction with natural soils on is small. Applied mitigation (Borrow-pit Restoration Plan) is considered sufficient to effectively limit the	Temporary, Direct	Minor

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
					magnitude of change to Low . Effect will last during the operational period (temporary) and will occur via direct changes (direct).		
O6	Potential for land or water contamination associated with coolants in substation and potential for leaks and spills during maintenance operations	Waterbodies on Site	Medium	Negligible	Applied mitigation (Operation and Maintenance plan – including pollution control and emergency protocols) is considered sufficient to effectively limit the magnitude of change to Low or negligible . Effect will be permanent and occur via indirect changes (via alterations to surface and subsurface flow paths).	Permanent, Indirect	Negligible
		Natural soils on Site that are not long undisturbed	Medium	Low		Permanent, Indirect	Minor
		Peat bodies on Site	High	Negligible		Permanent, Indirect	Minor
		Long undisturbed soils on Site	Medium	Negligible		Permanent, Indirect	Negligible

No.	Effect	Receptor	Sensitivity	Magnitude of Change	Commentary	Type of Effect	Significance of Effect
		PWSs	Medium	Negligible		Permanent, Indirect	Negligible

Assessment of Cumulative Effects

Predicted Cumulative Effects

11.104 Consideration has been given as to whether the potential flooding and drainage, water resources, and geology receptors that have been taken forward for assessment in this chapter are likely to be subject to cumulative effects because of equivalent effects generated by other operational, consented (but not yet built) and/ or proposed developments for which applications have been submitted.

11.105 For the water environment, consideration has been given to developments that would impact upon the areas immediately downstream (within 5km) of the watercourses that drain the Proposed Development. The closest schemes identified were 9km away in Llandrindod Wells. As a result, the predicted cumulative effects are considered to remain unchanged from those assessed for the Proposed Development in isolation.

11.106 For soils, including peat, consideration has been given to developments within 5km of the Site boundary. Based on this, only two significant schemes are within this search radius with one under construction (Hendy) and one operational (Cefncynfal). With Cefncynfal being operational there are considered to be no potential cumulative effects as all required mitigation will have been implemented. For Hendy, as this is in construction (consented), there are also not considered to be potential cumulative effects as required mitigation will either be implemented or secured.

Combined Effects

11.107 The effects assessed within this chapter (effects on hydrology, hydrogeology and geology) are considered unlikely to act in combination with the effects assessed in other chapters. Hence there is not considered to be any different or additional combined effects associated with this subject area over and above those assessed herein.

Further Survey Requirements and Monitoring

11.108 The following surveys and monitoring will be undertaken during the post-consent, detailed design phase of the development:

- Detailed ground investigation beneath the footprint of the Proposed Development. This will be primarily aimed at informing geotechnical and earthworks design, but will also provide information on soils, and provide the opportunity to install groundwater monitoring wells.
- Specific additional focus during the ground investigation and subsequent geotechnical assessment on slope stability in those areas identified as higher than Low risk in this regard.
- Installation of at least three groundwater monitoring wells in the vicinity of GWDTE F, G, K and L. Groundwater monitoring using dataloggers over a period of months to enable characterisation of the groundwater elevations and behaviour at each GWDTE. In addition, three groundwater monitoring wells will be installed and monitored in the vicinity of PWS No. 36.
- Groundwater and surface water quality sampling and analysis from groundwater wells installed in the vicinity of GWDTEs, and from surface water bodies on the Site. This will include monitoring of watercourses between the Proposed Development and the PWS's identified as having potential connectivity to the Proposed Development. Sampling & analysis to include baseline (pre-works, construction phase and post-construction phase monitoring).
- Water quality sampling and analysis of water abstracted from PWS's identified as having potential connectivity to the Proposed Development. Sampling & analysis to include baseline (pre-works, construction phase and post-construction phase monitoring).

11.109 The scope of the groundwater and surface water monitoring, sampling and analysis shall be set out in a Water Monitoring Plan and agreed with NRW and Powys County Council. It is intended that this Water Monitoring Plan will be the subject of a pre-commencement condition of planning permission.

Summary of Effects

11.110 Due to the embedded, applied and additional mitigation detailed above, there will be no residual adverse significant effects as a result of construction and operation of the Proposed Development.



**Nant Mithil
Energy Park Limited**

Environmental Statement

Chapter 12: Aviation



Chapter 12

Aviation and Radar

Introduction

12.1 This chapter presents the findings of the assessment of effects of the Proposed Development in relation to aviation and defence. The assessment considers potential effects on the aviation and air defence activities of the Ministry of Defence (MOD) as safeguarded by the Defence Infrastructure Organisation (DIO). It also considers the possible effects of wind turbines upon civil airports and the National Air Traffic Services En Route Ltd (NERL) communications, navigation and surveillance (CNS) systems which consist of a network of primary and secondary radars and navigation facilities around the country.

12.2 As well as examining the technical impact of wind turbines on Air Traffic Control (ATC) facilities, it is also necessary to consider the physical safeguarding of ATC operations to determine whether a development will breach obstacle clearance criteria.

12.3 Wind turbines have the potential to affect civil and military aviation. This chapter presents the methodology used to undertake the aviation safeguarding assessment, lists the aviation references used and describes the aviation baseline condition, consultation requirements and mitigations to be applied if required.

12.4 This aviation and radar assessment was undertaken by Wind Power Aviation Consultants (WPAC). The chapter has been authored by Cdr John Taylor RN (Ret). Further detail on expertise is provided in **Appendix 1.1: Statement of Expertise**.

12.5 This chapter should be read alongside **Appendix 12.1: Aviation Lighting and Mitigation Report** prepared by WPAC, and **Appendix 5.8: Aviation Lighting Impact Assessment** prepared by LUC.

Scope of the Assessment

Effects Assessed in Full

12.6 The following effects were identified at the Scoping Stage for consideration in this assessment:

- NATS En Route Ltd (NERL) surveillance radar; and
- Civil Aviation Authority (CAA) and MOD Lighting Requirements.

Effects Scoped Out

12.7 Based on the desk based and field survey work undertaken, the professional judgement of the EIA team, experience from other relevant projects and policy guidance or standards, and feedback received from consultees, the following topic areas have been ‘scoped out’ of detailed assessment, as proposed in the Scoping Report:

- MOD Air Traffic Control Radars (none affected);
- MOD Air Defence Radars (none affected);
- CAA Licensed Aerodromes (none affected); and,
- Unlicensed Aerodromes, glider, parachute and microlight sites (none affected).

Assessment Methodology

Legislation and Guidance

12.8 There are several aviation publications relevant to the interaction of wind turbines and aviation containing guidance and legislation, which cover the complete spectrum of aviation activity in the UK as shown below:

- The Air Navigation Order 2016;
- Civil Aviation Authority (2016) Policy and Guidance on Wind Turbines Version 6 CAP764 CAA;
- Civil Aviation Authority (2019) Licensing of Aerodromes Version 11 CAP 168 CAA;

- Civil Aviation Authority (2019) ATS Safety Requirements Version 3 CAP 670 CAA;
- Civil Aviation Authority (2017) UK Flight Information Services Ed 3 CAP 774 CAA;
- Civil Aviation Authority (2006) Safeguarding of Aerodromes Version 2 CAP774 CAA;
- Civil Aviation Authority (2010) Safe Operating Practices at Unlicensed Aerodromes Ed 1 CAP 783 CAA;
- Civil Aviation Authority (2017) Manual of Air Traffic Services Part 1 Ed 7.0 CAP 493 CAA;
- Civil Aviation Authority (2020) Parachuting Ed 5 CAP660 CAA;
- Ministry of Defence (2022) Military Aviation Authority Regulatory Article 2330 (Low Flying) MOD; and,
- Civil Aviation Authority (2017) CAA Policy Statement: Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150m Above Ground Level CAA.

Radar Modelling Methodology

12.9 The radar line of sight calculations are produced using specialist propagation prediction software (RView Version 5). Developed over several years, it has been designed and refined specifically for the task. RView uses a comprehensive systems database, which incorporates the safeguarding criteria for a wide range of radar and radio navigation systems. RView models terrain using the latest Ordnance Survey (OS) Terrain 50 digital terrain model, which has a post spacing of 50 metres and has a root mean square (RMS) error of 4 metres. The results are verified using the Shuttle Radar Topography Mission (SRTM) dataset, a separate smoothed digital terrain model with data spacing of 3 arc seconds. By using two separate and independently generated digital terrain models, anomalies are identified, and consistent results assured. RView models the refractive effects of the atmosphere on radio waves and the First Fresnel Zone. A feature of RView is that it enables a comparison between its results and those from simpler models. For example, RView can perform calculations using the true Earth Radius at the midpoint between the radar and the wind turbine or the simplified 4/3 Earth Radius model. If needed, RView is also capable of modelling a range of atmospheric refractive conditions. RView models the trajectory of radar signals at different elevations allowing the modelling of

both volume surveillance and pencil beam radars as well as the effects of angular sterilisation as applied, for example, in Met Office radars.

Consultation

12.10 In undertaking the assessment, consideration has been given to the scoping responses and other consultation which has been undertaken as detailed in **Table 12.1**.

Table 12.1 Consultation responses

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
PEDW EIA Scoping Direction	Scoping	The Applicant's attention is drawn to comments made by NATS contained at Appendix 1 and encourages the Applicant to consult directly with NATS.	Noted. The Applicant has engaged with NATS.
PEDW EIA Scoping Direction	Scoping	The applicant is advised to liaise with the UK Civil Aviation Authority and the LPA regarding visible turbine lighting assessments.	The Applicant has designed a CAA compliant aviation lighting scheme and obtained CAA approval (See Appendix 12.1).
NATS SG34041	Scoping	The turbines will be visible to the NATS Clee Hill Radar and the impact will be 'unacceptable'.	The Applicant is engaging with NATS to identify a suitable radar mitigation scheme.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
MOD DIO 10061485 dated 19 Feb 2024	Scoping	MOD has raised 'concerns' due to 'the potential impact to low flying aircraft operating in the development area'.	The MOD require lighting as set out in the Air Navigation Order 2016 and the installation of MOD accredited safety lighting. This is addressed in the Aviation Lighting and Mitigation Report at Appendix 12.1 .
CAA Strategy and Policy Group – Wind Farm Policy Ref Windfarms/Nant Mithil dated 19 February 2024	Aviation Lighting Dispensation Request	Aviation Lighting Requirements	Aviation Lighting has been approved by CAA in accordance with that proposed in the Aviation Lighting and Mitigation Report at Appendix 12.1 .
MOD DOI 10061485 dated 12 th July 2024	PAC response	The MOD has concerns with respect to the wind turbines and anemometer mast.	Noted, the anemometer mast is no longer a part of the Proposed Development.
		The development falls within Low Flying Area 7. To address the impact upon low flying the MOD would require that conditions are added to any consent issued	Noted, a condition relating to aviation lighting is proposed. The detailed lighting scheme will be in alignment with the objectives as set out in the Aviation Lighting

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		requiring that the development is fitted with aviation safety lighting and that sufficient data is submitted to ensure that structures can be accurately charted to allow deconfliction.	and Mitigation report at Appendix 12.1, as approved by the CAA.
		The development proposed includes wind turbine generators that exceed a height of 150m AGL and are therefore subject to the lighting requirements set out in the Air Navigation Order 2016. In addition to CAA requirements, the MOD will require the submission, approval, and implementation of an aviation safety lighting specification that details the installation of MOD accredited aviation safety lighting.	Please see the proposed Aviation Lighting and Mitigation Report at Appendix 12.1 approved by CAA. A planning condition is proposed, requiring the submission of a detailed Aviation Lighting Scheme to be submitted and agreed by the local planning authority, in consultation with the CAA and MOD.

Study Area

12.11 The assessment of effects of the Proposed Development is based upon the guidance laid down in CAA Publication CAP 764 Policy and Guidelines on Wind Turbines Version 6, dated February 2016. Consultation criteria for aviation stakeholders are defined in Chapter 4 of this guidance. These include distances that inform the size of the study area including:

- Airfield with a surveillance radar – 30km;
- Non radar licensed aerodrome with a runway of more than 1.1km – 17km;
- Non radar licensed aerodrome with a runway of less than 1.1km – 5km;
- Licensed aerodromes where the turbines would lie within airspace coincidental with any published Instrument Flight Procedure (IFP) (in this case Cardiff Airport out to 90km);
- Unlicensed aerodromes with runways of more than 800metres – 4km;
- Unlicensed aerodromes with runways of less than 800metres – 3km;
- Gliding sites – 10km; and,
- Other aviation activity such as parachute sites and microlight sites within 3km – in such instances developers are referred to appropriate organisations.

12.12 CAP 764 further states that these distances are for guidance purposes only and do not represent ranges beyond which all wind turbine developments will be approved or within which they will always be objected to. These ranges are intended as a prompt for further discussion between developers and aviation stakeholders.

12.13 It is necessary to consider the aviation and air defence activities of the Ministry of Defence (MOD) as safeguarded by the Defence Infrastructure Organisation (DIO). The types of issues that are routinely addressed in the EIA include:

- Ministry of Defence Airfields, both radar and non-radar equipped;
- Ministry of Defence Air Defence Radars;
- Ministry of Defence Meteorological Radars; and,
- Military Low Flying.

12.14 It is necessary to consider the possible effects of wind turbines upon the NERL communications, navigation and surveillance (CNS) systems – a network of primary and secondary radars and navigation facilities around the country.

12.15 As well as examining the technical impact of wind turbines on Air Traffic Control (ATC) facilities, it is also necessary to consider the physical safeguarding of ATC operations using the criteria laid down in CAP 168 Licensing of Aerodromes to determine whether a proposed development will breach obstacle clearance criteria. In this case there are no physical safeguarding issues associated with the Proposed Development.

Desk Based Research and Data Sources

12.16 The following data sources have informed the assessment:

- WPAC 'RView' Version 5 Radar Modelling Software; and,
- NATS Aeronautical Information Publication (AIP) 01/24 Published 14 December 2023 Effective from 25 January 2024.

Assessing Significance

12.17 There is no agreed definition for assessing significance in an aviation context. This is due to the fact that whilst technical effects on communications, navigation and surveillance (CNS) systems are simple to identify and evaluate, operational and flight safety effects can be subjective and are often challenged by third parties. It is enough in this context to identify any technical effects and then, taking into account the statements in CAP 764 regarding the status of aviation stakeholders, in general to accept the judgement of those stakeholders in assessing the significance of the effects. For example, CAP 764 states *“Where an ANSP determines that it is likely that a planned wind turbine development would result in any of the above effects on their CNS infrastructure, this may not, in itself, be sufficient reason to justify grounds for rejection of the planning application. The ANSP must determine whether the effect on the CNS infrastructure has a negative impact on the provision of the ATS. The developer should pay for an assessment of appropriate mitigating actions that could be taken by the ANSP and/or wind energy developer to deal with the negative impact. The position of an ANSP at inquiry would be significantly degraded if they had not considered all potentially appropriate mitigations”*.

12.18 Taking the above into account, it is not considered appropriate for the Applicant to be making an assessment of significance of an effect in relation to aviation interests. It is also the case that different Air Navigation Service Providers (ANSP) can take a different view of the same scenario based on their varying responsibilities. Therefore, this assessment does not make a judgement of significance, but is focused on identifying potential impacts and agreeing mitigation with the relevant aviation stakeholders as required.

Assessment Limitations

12.19 No limitations to this assessment have been identified.

Existing Conditions

12.20 The Proposed Development is located in an area that is remote from any significant aviation facilities. It is 60km to the south-west of RAF Shawbury and 90km to the north of Cardiff Airport. Birmingham Airport is over 100km to the east. The small CAA licensed aerodrome at Shobdon is over 20km to the east. In airspace terms, the Proposed Development is located within Class G unregulated airspace which extends upwards to Flight Level (FL) 145 (approximately 14500ft) above which it becomes Class A Controlled Airspace, part of the airways system used to take traffic north/south between Manchester and Scotland to the continent.

Assessment of Likely Effects

CAA Licensed Aerodromes

12.21 There are no radar equipped CAA licensed aerodromes within consultation distance. Radar modelling also shows that there are no civil airport ATC radars affected at any distance. There is one CAA non-radar equipped aerodrome at Shobdon, 20km to the east and beyond consultation distance. Operations at Shobdon will not be affected and consultation is not required.

Civil Unlicensed Aerodromes, Microlight and Parachute Sites

12.22 There are no unlicensed aerodromes or other facilities marked on aviation charts within consultation distance of the Proposed Development.

MOD ATC and Air Defence Radar Facilities

12.23 There are no military ATC or AD radars likely to be affected by the Proposed Development. The MOD have confirmed through Scoping that none of their radars will be affected by the Proposed Development.

MOD Military Low Flying

12.24 The Proposed Development is within MOD Low Flying Area (LFA) 7. At night this area converts to Night Allocated Region (NAR) 5CN, an area primarily reserved for fast-jet low flying in the hours of darkness. In the area of the Site, fast jet and tactical transport aircraft routinely operate down to 250 ft (75 m) above ground level (AGL), and helicopters down to 30 ft, (9 m) and occasionally, down to ground level. Overlaying this is the RAF Valley (Fast Jet Tactical School) Area of Intense Air Activity.

12.25 The Proposed Development is not in the Tactical Training Area (TTA 7) situated just to the west in Central Wales. However, located in the Welsh Borders region, the Proposed Development is close to large centres of population and, in addition to the military training here at night, there will be a wide range of Public Service helicopters operating during the hours of darkness. Accordingly, the Proposed Development will require a comprehensive lighting arrangement that includes both visible and infra-red obstruction lights. This is reported in **Appendix 5.8**. The lighting arrangements will be secured by planning condition.

NERL

12.26 The closest NERL radar with coverage in this location is at Clee Hill in Shropshire. Radar modelling has been undertaken with the results in **Table 12.2** below. Where the radar line of sight result exceeds the turbine tip height, in general the turbines will be screened by terrain from the radar. In this case the results show that it is likely that all the turbines will be visible to the radar and create unacceptable clutter and obscuration on the radar displays at the London Area Control Centre at Swanwick in Hampshire. Extensive discussions have taken place with

NERL with a view to identifying a suitable radar mitigation scheme. Several options are possible, including updating the Clee Hill radar to a wind farm tolerant variant, or installing an additional wind farm tolerant radar such as a Terma Scanter 4002 radar. Discussions continue with the intention of enabling a suspensive planning condition to be agreed that will enable the Proposed Development to proceed whilst maintaining flight safety. This issue affects a large number of wind farm proposals across the region and is the subject of wider ranging discussions between the wind farm developers and NERL.

Table 12.2 Radar Line of Sight (RLoS) Results Clee Hill Radar

Turbine	RLoS	Turbine	RLoS	Turbine	RLoS
1	67.5 metres AGL	11	86.8 metres AGL	21	111.3 metres AGL
2	35.3 metres AGL	12	197.5 metres AGL	22	147.5 metres AGL
3	23.9 metres AGL	13	145.9 metres AGL	23	97.3 metres AGL
4	0 metres AGL	14	173.3 metres AGL	24	79.6 metres AGL
5	119.7 metres AGL	15	110.4 metres AGL	25	166.7 metres AGL
6	111.9 metres AGL	16	98.1 metres AGL	26	101.4 metres AGL
7	12.5 metres AGL	17	71.9 metres AGL	28	57.5 metres AGL
8	64.3 metres AGL	18	24.9 metres AGL	29	13.5 metres AGL
9	58.1 metres AGL	19	2.6 metres AGL	30	1.8 metres AGL
10	58.1 metres AGL	20	30 metres AGL	31	9.7 metres AGL

Potential Construction Effects

12.27 During the construction phase, where large cranes are in use, it will be necessary to inform the MOD and NATS of the height and location of the cranes together with details of

obstruction lighting. This issue is routinely addressed via the wording of a standard planning condition attached to the planning permission if granted.

Decommissioning

12.28 At the end of the Proposed Development's operational life, an application could be submitted to retain or replace the turbines, or they could be decommissioned. Decommissioning of the Proposed Development will be carried out in line with the legislation and guidance current at the time of decommissioning. Decommissioning, effects are expected to be no worse than construction, and as with construction activities, the MOD and NATS will need to be advised of the presence of large cranes including location, operating times and lighting arrangements during decommissioning.

Mitigation

NERL Radar Clee Hill

12.29 Technical mitigation has been discussed with NATS and these discussions are continuing to identify a mitigation solution.

12.30 The Applicant has been in discussions with NERL who have stated that the Clee Hill radar will be replaced with a wind farm mitigation capable radar. It is anticipated that this will be replaced within the next two years. The Applicant and NERL will agree a Statement of Common Ground (SoCG) to reflect the path to mitigation.

Aviation Lighting

12.31 Visible and Infrared (IR) lighting will be required. A CAA compliant lighting scheme which minimises the number and brilliance of the lights whilst maintaining flight safety has been designed and approved by the CAA which consists of 14 turbines having visible lighting and every turbine having an IR light not visible to the naked eye See **Appendix 12.1**.

Summary of Effects

12.32 This chapter has examined potential aviation effects and, where required, identified a mitigation process. In radar terms, mitigation where required is feasible using existing and available mitigation methodologies and aviation stakeholder interests can be protected through the imposition of suitably worded planning conditions. Discussions with NERL in relation to Clee Hill remain ongoing and are making progress.

12.33 Following the implementation of this mitigation there are no residual effects on other civil or military aviation interests.



**Nant Mithil
Energy Park Limited**

Environmental Statement

Chapter 13: Shadow Flicker



Chapter 13

Shadow Flicker

Introduction

13.1 This chapter considers the potential shadow flicker effects of the proposed Nant Mithil Energy Park ('the Proposed Development') on residential properties.

13.2 Shadow flicker is an effect that can occur when the shadow of a moving wind turbine blade passes over a small opening (e.g. a window), briefly reducing the intensity of light within the room, and causing a flickering to be perceived. Shadow flicker occurs when a certain combination of conditions¹ prevails at a certain location, time of day and year, and may have a negative effect on residents and occupants of affected properties.

13.3 The shadow flicker assessment identifies which properties close to the Proposed Development could theoretically experience shadow flicker. This is undertaken using computer software called ReSoft WindFarm Shadow Flicker Module ('ReSoft model' or 'ReSoft modelling'). The software uses worst-case assumptions to develop a maximum theoretical scenario of when shadow flicker could occur. The assessment then identifies the more likely occurrence of shadow flicker at properties under a reasoned scenario, which takes into account more typical daylight and sunlight hours (when sunshine would be bright enough to cause the effects of shadow flicker). This information from both scenarios is used to identify when and under what conditions certain turbines may need to be curtailed (turned off) to ensure that significant shadow flicker effects on residential properties do not occur. This approach to the assessment and application of mitigation is considered to be industry standard best practice. Further detail is provided within this chapter.

¹ Combination of conditions include: direct sunlight, no cloud cover, mist, fog etc. causing lower visibility which is shining in direct alignment onto the turbine to cause a shadow of the turbine onto receptors. Therefore, these conditions only occur at certain times of the year.

13.4 This assessment has been undertaken by LUC. Further detail on expertise is provided in **Appendix 1.1: Statement of Expertise**. The assessment of effects is based on the proposed turbine layout as outlined in **Chapter 4: Project Description**.

13.5 This chapter is supported by **Figure 13.1: Maximum Theoretical Shadow Flicker and Assessment Properties** in Volume 2 of the ES and **Appendix 13.1: Shadow Flicker Results** in Volume 3 of the ES.

Scope of the Assessment

Effects Assessed in Full

13.6 The following effects have been considered:

- Operational effects from shadow flicker.

Effects Scoped Out

13.7 The following effects have been ‘scoped out’ of the detailed assessment, informed by desk-based analysis, professional judgement and experience from other similar projects:

- Construction effects, as shadow flicker only occurs from operational turbines.
- Operational effects on residential properties outside the shadow flicker study area where shadow flicker occurrence is unlikely to happen (see the description of the study area below).
- Operational effects on properties that are not considered to be habitable, for example derelict buildings and non-residential agricultural buildings.
- Potential effects relating to epilepsy. Over 600,000 people in the UK have epilepsy; this equates to approximately one in every 100 people. Up to 3% of people with epilepsy are affected by flashing lights (this is called ‘photosensitive epilepsy’). According to the Epilepsy Society², *“between 3-30 hertz (flashes per second) are the common rates to trigger seizures but this varies from person to person. While some people are sensitive at frequencies up to 60 hertz, sensitivity under 3 hertz is not common”*. The Department of

² [Epilepsy Society \(undated\) Photosensitive epilepsy](#)

Energy and Climate Change (DECC) (2011) Update of UK Shadow Flicker Evidence Base³ states that “*most commercial wind turbines in the UK rotate much more slowly than this, at between 0.3 and 1.0 hertz*” (page 9). Epilepsy Action⁴ also state that whilst small turbines can rotate at a faster rate, “*large wind turbines have blades which rotate at a rate that is unlikely to trigger a seizure*”. Therefore, any potential shadow flicker effects arising from the Proposed Development are effects on residential amenity only, rather than having the potential to affect the health or well-being of residents.

Assessment Methodology

Guidance

13.8 This assessment is carried out in accordance with the principles contained within the following documents:

- DECC (2011) Update of UK Shadow Flicker Evidence Base⁵;
- Department of Northern Ireland (2009) Practice Guidance for Planning Policy Statement 18 (PPS18)⁶; and
- UK Government’s Planning Practice Guidance for Renewable and Low Carbon Energy (2013)⁷.

13.9 It is noted that the guidance and standards referred to in this chapter are published for use in countries outside Wales. However, in the absence of Welsh planning guidance on this topic, they are considered to contain the best practices for informing this assessment methodology.

Consultation

13.10 In undertaking this assessment, consideration has been given to the scoping responses and other consultation which has been undertaken as detailed in **Table 13.1**.

³ Department of Energy & Climate Change (2011) Update of UK Shadow Flicker evidence base

⁴ Epilepsy Action (2022, updated 2023) Photosensitive epilepsy

⁵ Department of Energy & Climate Change (2011) Update of UK Shadow Flicker evidence base

⁶ Department for Infrastructure (2009, updated 2019) Best Practice Guidance to PPS 18 ‘Renewable Energy’

⁷ Department for Communities and Local Government (2013) Planning practice guidance for renewable and low carbon energy

Table 13.1 Consultation responses

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Planning and Environment Decisions Wales (PEDW)	Scoping	PEDW notes the information contained in the Scoping Report regarding shadow flicker. PEDW notes that in ‘Review of Light and Shadow Effects from Wind Turbines in Scotland’ (L.U.C. for climateXchange, 2017⁸) it was found that <i>“there is a lack of evidence to support the use of ten rotor diameters as a cut off, and this is entirely down to misinterpretation of the original reference to this distance”</i>. The ES should provide a clear rationale as to the methodology adopted, and why it is considered appropriate given the scale of turbine proposed and the requirement for more nuanced assessment	Shadow Flicker is scoped into the ES. As described in paragraph 13.11 below, in the UK, shadow flicker is only likely to occur in a building located within a distance of 10 times the rotor diameter of a wind turbine. At distances beyond 10 times the rotor diameter, whilst shadow flicker occurrence is still possible, it is not considered prevalent enough to be included in a shadow flicker ES assessment with the potential for significant effects. For this reason, the methodology proposed is considered appropriate and in line with EIA best practice and proportionality. Should any of the residents outside this study area experience shadow flicker effects at their property, mitigating options such as vegetation planting to

⁸ LUC on behalf of climateXchange (2017) Review of Light and Shadow Effects from Wind Turbines in Scotland

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		suggested by the concerns raised in the above document. It is therefore not possible at this stage to scope out Shadow Flicker.	shield the property from the turbine(s) will be explored to limit shadow flicker at that location. If these other measures do not satisfactorily mitigate effects, then the relevant turbines can be curtailed or shut down at appropriate times and conditions. This approach will ensure that residents do not experience negative shadow flicker effects.

Study Area

13.11 In the UK, shadow flicker is only likely to occur in a building located within a distance of 10 times the rotor diameter of a wind turbine⁹. At distances beyond 10 times the rotor diameter, whilst shadow flicker occurrence is still possible, it is not considered prevalent enough to be included in a shadow flicker ES assessment with the potential for significant effects.

13.12 As set out in **Chapter 4** the turbine tip heights vary from 180m to 220m. Rotor diameters are 155m for the proposed turbines up to 180m and up to 205m tip; and rotor diameters are 163m for the proposed turbines of up to 220m tip.

13.13 Therefore, the potential area in which shadow flicker could occur will be a maximum of 1.63km from the wind turbines with a rotor diameter of 163m¹⁰, and 1.55km from the wind turbines which have a rotor diameter of 158m. Therefore, the study area is the outermost extent of these combined distances.

13.14 Properties which are beyond 130 degrees either side of north relative to each turbine were excluded, following the UK Government's Planning Practice Guidance for Renewable and Low Carbon Energy (2013)¹¹. This is because turbines in the UK do not cast long shadows on their southern side due to the angle of the sun.

13.15 Bare earth topography is used in the ReSoft model, which is the only assumption used to exclude properties within the study area from the assessment. Such exclusions are based on the fact that due to topography, no turbines could cast a shadow over the property in question. This only applies to a very small number of properties. No other assumptions have been made to exclude properties within the study area.

13.16 These considerations in combination have been used to define the study area for the shadow flicker assessment (see **Figure 13.1**).

⁹ 10 times the rotor diameter is used as a general rule as shadow flicker should have no effect on properties located further than this distance. Scottish Government (2014) Onshore Wind Turbines: Planning Advice

¹⁰ 1.63km is 10 times the maximum proposed rotor diameter of 163 m.

¹¹ Department for Levelling Up, Housing and Communities (2015, updated 2023) Renewable and low carbon energy

Desk Based Research and Data Sources

13.17 The following data sources have informed the assessment:

- OS AddressBase data;
- Bare earth topography is used in the ReSoft model; and
- Google Maps aerial imagery.

Field Survey

13.18 The assessment has been primarily desk-based, using outputs from ReSoft modelling. Field work (including reconnaissance by the Applicant, and survey to inform the Residential Visual Amenity Assessment (RVAA)) has been used to verify the properties included in the assessment.

Assessing Significance

13.19 Although the effect of shadow flicker has been quantified as part of the shadow flicker assessment for the Proposed Development, there is no formal guidance available (at the time of writing) regarding the occurrence of shadow flicker that is considered acceptable or not acceptable within Wales. In the absence of this, the Department of Environment Northern Ireland (2009) Best Practice Guidance for Planning Policy Statement 18 (PPS18): Renewable Energy¹² provides an indication of what may be an acceptable duration of shadow flicker, stating that *“It is recommended that shadow flicker at neighbouring offices and dwellings... should not exceed 30 hours per year or 30 minutes per day”* (page 29).

13.20 The guidance states that there are two limits as follows:

- ‘30 minutes per day’ – understood to be an exceedance of 30 minutes of shadow flicker experienced by an individual property in any one day of the year; and
- ‘30 hours per year’ – understood to be the total occurrence of shadow flicker throughout the year experienced by an individual property.

¹² Department for Infrastructure (2009, updated 2019) Best Practice Guidance to PPS 18 ‘Renewable Energy’

13.21 These limits have also been utilised in the Republic of Ireland, Germany and Belgium. As these limits are widely accepted as a suitable metric in shadow flicker analysis for wind farms, it is considered that these are appropriate thresholds against which to make a professional judgement on the significance of the Proposed Development's effects with respect to shadow flicker.

13.22 Predicted effects above these thresholds are therefore judged as being **Significant** and requiring the application of the standard best practice mitigation. Any values below these thresholds represent effects that are **Not Significant**. Where a significant effect is identified, this is considered to be significant in the context of the EIA Regulations (2017). It should be noted, however, that as there is no formal guidance available on this topic within the UK or Wales, the conclusions drawn are relative to these thresholds and are based on professional judgement and common practice.

Assessment Assumptions and Limitations

13.23 The shadow flicker assessment has been undertaken using ReSoft modelling which is based on industry standard best practice. It is assumed that effects will not be experienced by properties which are at a greater distance than 10 times the rotor diameter (in the case of the assessment) and outside 130 degrees either side of north, relative to the proposed wind turbines.

13.24 This chapter provides a maximum theoretical scenario and a reasoned scenario of shadow flicker occurrence. In both scenarios, worst-case assumptions have been applied in accordance with EIA best practice, however this does also mean that the final assessment findings are worst-case as explained below. The assessment assumptions are presented in **Table 13.2**.

Table 13.2 Overview of assessment assumptions

Assumptions Factored into the Assessment Scenario	Maximum Theoretical	Reasoned Scenario
All properties within the study area are assumed to have a specified window size (in this case 1.5m x 2m) facing directly on to each turbine that has the potential to cause an effect.	✓	✓
The wind turbine blades are assumed to be rotating for 365 days per year, not taking into account changes in wind speed or shut-down periods for maintenance.	✓	✓
The wind turbine blades are assumed to always be positioned so that their full face will be between the sun and each property.	✓	✓
A human is deemed to be present in all affected rooms at all times. There is no consideration that people may be sleeping, in another occupied room, or that the property is vacant.	✓	✓
No account is taken of the potential shielding effects of trees, vegetation, or neighbouring buildings (especially in terraced communities).	✓	✓
Curtains or blinds are assumed not to be fitted to windows.	✓	✓
There are no periods of cloud cover.	✓	✗
There are no periods of low visibility due to fog, mist and haze etc.	✓	✗

13.25 Appendix 13.1 provides the detailed results and assessment of the shadow flicker modelling in relation to the two significance thresholds: ‘Minutes per Day’ and ‘Days per Year’. The Maximum Theoretical scenario has been applied to the ‘Minutes per Day’ threshold and the Reasoned Scenario has been applied to the ‘Days per Year’ threshold. This is explained below and in **Appendix 13.1**.

Maximum Theoretical Scenario

13.26 The ReSoft modelling is based on a maximum theoretical or ‘worst-case’ scenario based on conservative (i.e. high) estimates. These are the estimates shown in **Figure 13.1**. The actual instances of shadow flicker will always be less than that predicted by the ReSoft model as it is highly unlikely the assumptions in **Table 13.2** will all apply at any one property.

Reasoned Scenario

13.27 To quantify a more reasoned occurrence of shadow flicker which could be experienced by properties within the study area, the modelled Hours per Year results can be adjusted to take account of the average percentage of time the sun shines during the daytime. The high estimates identified in the model (which will represent a maximum theoretical scenario) have therefore been translated into a reasoned estimate, reflecting when the sunshine is likely to be bright enough to cast a shadow.

13.28 The reasoned scenario has not been applied to the Minutes per Day threshold, because if the sun shines continually on any one day, the occurrence of shadow flicker on that day could theoretically lead to a potentially significant effect before mitigation by exceeding the 30 minutes per day threshold.

13.29 The reasoned scenario is therefore based on the assumption that the sun is not always shining (e.g. due to cloud cover) and does not shine every day of the year. Therefore, it is only necessary to calculate shadow flicker for the average percentage of time when the sun is likely to be shining throughout a typical year in relation to the ‘Hours per Year’ threshold.

13.30 As shown in **Table 13.3**, annual average sunlight hours were calculated¹³ using Met Office data from the Llandrindod Wells Climate Station¹⁴ (for typical sunshine hours per month) and National Oceanic and Atmospheric Administration (NOAA) data¹⁵ (for typical daylight hours per day). Llandrindod Wells Climate Station is the closest climate station to the Proposed Development, located approximately 10.2km west of the nearest proposed turbine (T1).

¹³ Monthly % of Sunny Hours = Typical Sunshine Hours (per Month) / (Typical Daylight Hours (per Day) x Days per Month x 100.

¹⁴ Met Office (undated) UK climate averages

¹⁵ Data from the [National Centers for Environmental Information](#).

Table 13.3 Calculation of monthly percentage of sunny daylight hours

Month	Typical Daylight Hours (per day) ¹⁶	Typical Sunshine Hours (per month) ¹⁷	Monthly % of Sunny Hours ¹⁸
January	8.32	38.78	15.04%
February	9.94	60.76	21.08%
March	11.93	100.72	27.22%
April	13.98	146.84	35.02%
May	15.76	171.54	35.11%
June	16.70	162.82	32.50%
July	16.19	160.08	31.89%
August	14.58	162.93	36.04%
September	12.61	114.89	30.36%
October	10.59	79.14	24.11%
November	8.77	46.91	17.83%
December	7.80	33.95	14.05%
Annual	12.26	1,279.36	28.50%

¹⁶ Data from the [National Centers for Environmental Information](#). Calculated from average monthly sunset times less average monthly sunrise times i.e. average number of daylight hours a month. These figures have been rounded to the nearest hundredth (i.e. to two decimal places).

¹⁷ [Met Office \(undated\) UK climate averages](#)

¹⁸ Calculated by 'Typical Sunshine Hours per Month' / 'Total Daylight Hours per Month' x 100. 'Total Daylight Hours per Month' is calculated by the total number of days in a month x 'Typical Sunshine Hours per Month'. These percentages have been rounded to the nearest hundredth (i.e. to two decimal places).

13.31 It was concluded that the average sunny daylight hours (when sunshine would be bright enough to cause the effects of shadow flicker) are only expected to occur approximately 28.5% of the time on average over the course of the year. Furthermore, properties may experience shadow flicker effects at different times of the year due to their location in relation to specific turbines. Properties identified in the ReSoft model as experiencing more potential shadow flicker in the winter months will, on average, have less occurrence than properties identified as experiencing more potential shadow flicker in the summer months. This has been factored into the assessment in the reasoned scenario.

13.32 As set out in **Table 13.2**, it should be noted that the reasoned scenario, like the maximum theoretical scenario, does not consider the fact that the turbines will not be continually rotating 365 days a year, for example, due to changes in wind speed and maintenance/shut-down periods. Moreover, the scenarios do not consider potential shielding/screening effects of buildings, trees, vegetation or other obstacles, and assumes the worst-case orientation for both the property windows and turbines. Neither do they take account of the fact that residents of a property may not be present in affected rooms at all times, people may be sleeping, occupied in another unaffected room, or absent from the property entirely (for example, at work or on holiday) during times where shadow flicker effects may be experienced. The effects of shadow flicker which occur under the reasoned scenario are therefore likely to be lower. It is not practicable or proportionate to model every scenario and therefore the reasoned scenario is considered an appropriate approach.

Receptors

13.33 Under the maximum theoretical scenario, there are 95 individual properties within the shadow flicker study area. These are the receptors included in the ReSoft modelling (and shown on **Figure 13.1**).

Existing Conditions

13.34 In the absence of the Proposed Development, there is no change to shadow flicker occurrence at nearby residential properties.

Implications of Climate Change

13.35 Chapter 14: Climate Change provides details of the climate change projections in Wales for the 2070s, when the operational period of the Proposed Development is likely to end. As shadow flicker effects are intrinsically linked to weather, there is the potential that the current baseline sunny daylight hours (when sunshine will be bright enough to cause the effects of shadow flicker) could be affected in the future due to climate change. The baseline percentage of average sunny daylight hours per year is, however, not expected to change over the 40-year operational life of the Proposed Development to such a degree that the assessment of effects will be materially affected.

13.36 The application and effectiveness of the industry standard mitigation for shadow flicker will also remain the same irrespective of climate change.

Future Baseline in the Absence of the Proposed Development

13.37 In the absence of the Proposed Development, it is likely that the Site will continue under the same land use, with no shadow flicker effects being generated.

Design Considerations (Embedded Mitigation)

13.38 Due to its amenability to mitigation, shadow flicker was not applied as a constraint to design. However, the design process did involve detailed consideration of the effects on residential visual amenity from nearby properties, alongside consideration of operational noise limits at these locations. The application and effectiveness of the industry standard mitigation for shadow flicker will also remain the same irrespective of the design layout. The design process of siting turbines at the Site is described in full in **Chapter 3: Site Selection and Design Strategy**.

Micrositing

13.39 A general micrositing allowance of 50m is proposed to allow a degree of flexibility in the layout of the Proposed Development, should unfavourable ground conditions be encountered. Some restrictions to this allowance are proposed which are outlined in **Chapter 4**.

13.40 Depending on the direction of any micrositing, shadow flicker occurrence may theoretically increase or decrease depending on the distance and orientation of the turbines to individual properties. The residual significance of effects of shadow flicker will not be affected by this allowance.

Assessment of Effects

13.41 The assessment of operational effects is based on the turbine layout provided in **Chapter 4**. Potential effects identified are considered to be adverse.

Operational Effects

13.42 Applying the assumptions in **Table 13.2**, the shadow flicker occurrence (i.e. the Maximum Theoretical Minutes per Day and the Reasoned Scenario Hours per Year) for each property within the study area has been calculated. These scenarios have been used to determine the significance of effects at assessed properties. Detailed results of this assessment are included in **Appendix 13.1**.

13.43 Modelling results for the Hours per Year threshold are visually illustrated on **Figure 13.1**. This presents the maximum theoretical modelling assumptions which have been reduced under the Reasoned Scenario Hours per Year threshold in line with the approach described above.

13.44 Of the individual properties assessed in **Appendix 13.1**, 41 properties have been identified as potentially experiencing significant shadow flicker effects before applying mitigation. All of these properties surpass the Maximum Theoretical Minutes per Day threshold of 30 minutes.

13.45 One property has also been identified as potentially experiencing significant shadow flicker effects under the Reasoned Scenario Hours per Year threshold of 30 hours. **Table 13.4**

presents the occurrence of shadow flicker at these receptors using the worst-case assumptions under the Reasoned Scenario for both the Minutes per Day and Hours per Year threshold.

13.46 Table 13.4 does not alter the identification of potential significant effects before mitigation set out in **Appendix 13.1** based on the Maximum Theoretical Minutes per Day scenario (i.e. if the sun shines continually on any one day, the occurrence of shadow flicker on that day will not reduce). However, **Table 13.4** seeks to provide context to the scale of shadow flicker occurrence by applying assumptions under the reasoned scenario for the Minutes per Day threshold. The modelling used identified the dates and times that shadow flicker could occur significantly at a property on any particular day, which were summed together and factored by the percentage of sunny daylight hours identified in **Table 13.3**¹⁹. This more appropriately demonstrates the number of days in a year where properties could experience over 30 minutes of shadow flicker on any one day, whilst still applying the worst-case assumptions in **Table 13.2** under the reasoned scenario.

¹⁹ Properties may experience shadow flicker effects at different times of the year due to their location in relation to specific turbines. Properties identified in the ReSoft model as experiencing more potential shadow flicker in the winter months will, on average, have less occurrence than properties identified as experiencing more potential shadow flicker in the summer months. Therefore, properties were factored by the percentage of sunny daylight hours by the month they will occur.

Table 13.4 ‘Significant’ shadow flicker occurrence at affected properties

(Property ID) Receptor	Property Name	Maximum Theoretical Total Minutes per Day of Shadow Flicker (unit as minutes per day) Significance = >30 minutes ²⁰	Reasoned Scenario – Number of Days per Year with >30 minutes of Shadow Flicker (i.e. sunlight corrected hours per year based on average annual sunlight data from Met Office) (unit as days per year) ²¹	Reasoned Scenario – Total Hours per Year of Shadow Flicker (i.e. sunlight corrected hours per year based on average annual sunlight data from Met Office) (unit as hours per year)
P1	Old Farmhouse, 1 Cwmygerwyn	33.6	3.71	3.88
P2	Lodge Cottage, 2 Cwmygerwyn	33.0	3.99	3.93
P3	Llethr Du Farm, 3 Cwmygerwyn	30.0	0.86	3.68

²⁰ Decimal units have been used as a direct output of the model rather than hour/minute units.

²¹ The ReSoft model identified the dates and times that shadow flicker could occur significantly at a property on any particular day, which were summed together and factored the percentage of sunny daylight hours identified in **Table 13.2**.

(Property ID) Receptor	Property Name	Maximum Theoretical Total Minutes per Day of Shadow Flicker (unit as minutes per day) Significance = >30 minutes ²⁰	Reasoned Scenario – Number of Days per Year with >30 minutes of Shadow Flicker (i.e. sunlight corrected hours per year based on average annual sunlight data from Met Office) (unit as days per year) ²¹	Reasoned Scenario – Total Hours per Year of Shadow Flicker (i.e. sunlight corrected hours per year based on average annual sunlight data from Met Office) (unit as hours per year)
P4	4, Cwmygerwyn	37.2	13.40	12.74
P5	5, Cwmygerwyn	33.6	8.84	8.72
P6	Forest Lodge, Cwmygerwyn	31.2	3.99	6.33
P10	Ash Cottage	30.6	3.14	4.28
P11	Mount Pleasant	31.2	4.56	6.90
P12	Lynwood	31.8	3.99	4.82
P13	Yewtree Cottage	33.6	8.27	8.21

(Property ID) Receptor	Property Name	Maximum Theoretical Total Minutes per Day of Shadow Flicker (unit as minutes per day) Significance = >30 minutes ²⁰	Reasoned Scenario – Number of Days per Year with >30 minutes of Shadow Flicker (i.e. sunlight corrected hours per year based on average annual sunlight data from Met Office) (unit as days per year) ²¹	Reasoned Scenario – Total Hours per Year of Shadow Flicker (i.e. sunlight corrected hours per year based on average annual sunlight data from Met Office) (unit as hours per year)
P14	Barn, Lower Fishpools	34.2	6.56	11.20
P15	Upper Fishpools	34.2	14.54	9.60
P16	Lower Fishpools	34.8	7.98	11.63
P17	Lower Fishpools Lodge 1	39.0	21.38	13.82
P18	Lower Fishpools Lodge 2	39.6	22.52	14.25
P19	Brynywellan	46.2	15.96	14.76
P20	The Mountain	38.4	21.09	13.28
P21	Graig	43.2	25.94	22.06

(Property ID) Receptor	Property Name	Maximum Theoretical Total Minutes per Day of Shadow Flicker (unit as minutes per day) Significance = >30 minutes ²⁰	Reasoned Scenario – Number of Days per Year with >30 minutes of Shadow Flicker (i.e. sunlight corrected hours per year based on average annual sunlight data from Met Office) (unit as days per year) ²¹	Reasoned Scenario – Total Hours per Year of Shadow Flicker (i.e. sunlight corrected hours per year based on average annual sunlight data from Met Office) (unit as hours per year)
P22	Quarry View	30.6	0.57	3.93
P27	Danygraig	33.0	5.70	12.23
P28	The Lane Cottage	39.0	4.28	7.47
P29	Tanhouse Cottage	42.6	21.95	18.33
P60	Old Hall	46.8	15.68	21.60
P61	Treforgan	30.6	2.28	10.29
P80	Penrhiw	47.4	13.11	14.62
P81	Penrochell Farm	58.2	17.96	17.64

(Property ID) Receptor	Property Name	Maximum Theoretical Total Minutes per Day of Shadow Flicker (unit as minutes per day) Significance = >30 minutes ²⁰	Reasoned Scenario – Number of Days per Year with >30 minutes of Shadow Flicker (i.e. sunlight corrected hours per year based on average annual sunlight data from Met Office) (unit as days per year) ²¹	Reasoned Scenario – Total Hours per Year of Shadow Flicker (i.e. sunlight corrected hours per year based on average annual sunlight data from Met Office) (unit as hours per year)
P82	Upper Penrhiw	61.2	30.50	24.40
P94	New House Farm	31.8	1.14	2.17
P99	Climaenowydd	42.0	32.21	26.85
P101	Lower Cwm Farm	36.0	7.70	10.46
P109	Vronlace	35.4	6.84	5.99
P110	Penllanlas	33.0	5.13	5.90
P111	Great Trewern	31.2	7.98	13.20
P112	Little Trewern	36.6	7.98	6.95

(Property ID) Receptor	Property Name	Maximum Theoretical Total Minutes per Day of Shadow Flicker (unit as minutes per day) Significance = >30 minutes ²⁰	Reasoned Scenario – Number of Days per Year with >30 minutes of Shadow Flicker (i.e. sunlight corrected hours per year based on average annual sunlight data from Met Office) (unit as days per year) ²¹	Reasoned Scenario – Total Hours per Year of Shadow Flicker (i.e. sunlight corrected hours per year based on average annual sunlight data from Met Office) (unit as hours per year)
P113	Upper Trewern	67.8	14.25	16.22
P114	New Trewern	35.4	8.27	7.35
P124	Llanevan	70.2	27.36	30.10
P129	Gwernareglwyd	30.6	9.12	8.49
P148	The Warren	30.6	2.00	10.57

Proposed Mitigation (Additional)

13.47 It is noted that the Proposed Development has a number of turbines which were assessed as **not** contributing to shadow flicker (T7, T8, T9, T10, T11, T15, T16, T17, T18, T19, T20, T25). However, noting the micrositing allowance included within the Proposed Development should any of the turbines need to be microsited post-consent further assessment will be undertaken to confirm and agree with Powys County Council which wind turbines will require a Shadow Flicker Module.

13.48 As the remaining proposed wind turbines (T1, T2, T3, T4, T5, T6, T12, T13, T14, T21, T22, T23, T24, T26, , T28, T29, T30, T31) have all been assessed to contribute to shadow flicker, these turbines will need to be monitored by a Shadow Flicker Module. Depending on the model of Shadow Flicker Module chosen, a module could monitor more than one turbine, therefore the turbines selected to house the Shadow Flicker Module will be selected as part of the turbine procurement process. The module(s) use Site-specific date, time, wind direction and sunlight intensity data which can enable the turbines to be shut down if required.

13.49 As described in **Table 13.2**, maximum theoretical or reasoned occurrences of shadow flicker assessed in this chapter are also dependent on a number of other factors including wind speed and direction, potential shielding/screening effects of buildings, trees, vegetation or other obstacles, orientation for both the property windows and turbines, or whether a room is occupied at the time of occurrence.

13.50 Should any of the residents experience significant shadow flicker effects at their property, mitigation will be explored to limit shadow flicker at that location, such as vegetation planting to shield the property from the turbine(s). If other measures do not satisfactorily mitigate effects, then the relevant turbines can be shut down at in conditions and at times where shadow flicker could occur. This approach will ensure that residents do not experience adverse shadow flicker effects, while also reducing unnecessary turbine shutdowns that could be the result of the worst-case scenario modelling.

13.51 An appropriately worded planning condition will secure the mitigation measures above.

Residual Operational Effects

13.52 Taking into consideration the application of mitigation measures as outlined above, the residual effects of shadow flicker will be **Not Significant**.

Cumulative Operational Effects

13.53 The nearest cumulative wind farm is the Hendy Wind Farm which is c.2.2km to the south-west of the Proposed Development. Hendy is considered to be 'under construction' because although the seven turbines with tip heights of 110m and rotor diameters of 82m have been constructed it is understood that the site is not connected to the grid and therefore is not yet operational.

13.54 Hendy's rotor diameter is 82m which means an 820m shadow flicker assessment distance (10 x rotor diameter). This distance does not reach the nearest residential property included within this assessment (P125), which is c.1.25km away from Hendy's most eastern wind turbine. Therefore, based on the above, Hendy can be scoped out of the cumulative shadow flicker assessment for the Proposed Development.

Combined Effects

13.55 Shadow flicker potentially affects the experience of residential amenity, and in this sense is one of a wider group of effects including noise and residential visual amenity effects.

However, taking account of the amenability of shadow flicker effects to mitigation, there are no significant effects predicted due to the interrelationship between shadow flicker and any other effects relating to residential amenity.

Further Survey Requirements and Monitoring

13.56 As stated above, all turbines that could contribute to shadow flicker will need to be monitored by a Shadow Flicker Module.

Summary of Effects

13.57 The predicted effects of the operation of the Proposed Development with respect to shadow flicker are **Not Significant** in the context of the EIA Regulations, following the implementation of mitigation.



**Nant Mithil
Energy Park Limited**

Environmental Statement

Chapter 14: Climate Change including Carbon Balance Assessment



Chapter 14

Climate Change

Introduction

14.1 This chapter considers the potential effects of the Proposed Development in relation to climate change mitigation (including carbon balance) and adaptation. It details the impacts of climate change which are widely recognised as being one of the greatest global challenges facing the world today.

14.2 A major cause of climate change is a rise in the concentration and volume of greenhouse gases in the atmosphere, a significant contributor to which is the use of fossil fuels to generate electricity. No form of electricity generation is completely carbon free. For onshore wind farms, there will be emissions resulting from the manufacture of components, as well as emissions from both construction and decommissioning activities and transport. However, the purpose of the Proposed Development is to generate electricity from a renewable source of energy, avoiding the need for electricity generation from the combustion of fossil fuels. Consequently, the electricity that will be produced by the Proposed Development will result in a saving in emissions of carbon dioxide (CO₂) with associated environmental benefit.

14.3 The climate change mitigation and adaptation assessment was undertaken by LUC. The chapter has been signed off by Catrin Owen and Sophie Nioche (see **Appendix 1.1: Statement of Expertise**).

14.4 This chapter is informed by, and should be read in conjunction with the following appendix, provided in **Volume 3**:

■ **Appendix 14.1: Carbon Balance Assessment**

14.5 This provides an estimate of the benefit of displacing conventionally generated electricity in the grid compared to the predicted direct and indirect emissions of carbon resulting from the construction and operation of the Proposed Development over its 40-year lifetime, including

losses of stored carbon from affected peatland. The Scottish Government Carbon Calculator Tool¹ provides an estimate of the carbon payback time for onshore wind farms such as the Proposed Development over their lifetime. As there is no Welsh tool, the Scottish Government tool is considered the accepted standard, and the most relevant and reliable tool to assist with the assessment.

14.6 Since preparation of this Chapter for Pre-Application Consultation (PAC) in May-June 2024, the Carbon Calculator Tool has been unavailable from The Scottish Government website. The original carbon calculator tool was developed in excel and a version of this spreadsheet was obtained to assess if it produced the same results as the online version. The excel tool states, “do not use this version in planning applications”, and a comparison of the online tool and spreadsheet outputs indicated differing results when using the previously inputted data. As such, the carbon calculations have not been updated for submission.

14.7 The carbon calculation underpinning this chapter has been completed based on a 31 turbine layout, the Proposed Development now consists of 30 turbines with reduced hardstanding areas and track lengths, alongside a reduction in overall megawatts produced. When the online tool becomes available again, the assessment will be updated accordingly. Given the significant (positive) effects identified for 31 turbines, the reduction of the scheme to 30 turbines is not a change of such magnitude that we would anticipate the overall judgement of significant (positive) to change when it is possible to re-run the calculations.

Scope of the Assessment

Effects Assessed in Full

14.8 The following effects have been considered in this assessment:

- Direct carbon dioxide (CO₂) and nitrogen oxide (NO_x) emissions during construction (including cumulatively);

¹ Scottish Government (2023) Carbon Calculator Tool v1.8.1

- Other carbon emissions in the materials and systems which form temporary and permanent structures, arising as a result of the extraction and manufacture of materials, fabrication, transportation to Site, waste and the future demolition and potential for re-use;
- The contribution that the Proposed Development will make to saving CO₂ emissions arising from construction and decommissioning² (including peat loss) once operational (including cumulatively) ('climate mitigation'); and
- The ability of receptors, such as species and habitats, to adapt to climate change ('climate adaptation') during operation of the Proposed Development, and whether the effects of the Proposed Development on those receptors assessed under the current climate baseline will change with a future climate, i.e. in-combination effects.

Effects Scoped Out

14.9 The following effects have not been assessed:

- Direct CO₂ and NO_x emissions from vehicles during operation (and cumulatively) as movements associated with turbine maintenance are considered minimal (see **Chapter 10: Access, Traffic and Transport**).
- The ability of receptors to adapt to climate change during construction of the Proposed Development as these effects are assessed long term, i.e. over the operational period.
- The ability of receptors to adapt to climate change during operation of the Proposed Development with other nearby wind farms as this is largely a project-specific consideration.
- Project resilience (or vulnerability) to climate change. The latest IEMA guidance³ states that *"The resilience of something is a measure of its ability to respond to changes it experiences. If a receptor or a project has good climate change resilience, it is able to respond to the changes in climate in a way that ensures it retains much of its original function and form. A receptor or project that has poor climate change resilience will lose much of its original function or form as the climate changes"*. The Proposed Development is

² Decommissioning is included in **Appendix 14.1: Carbon Balance Assessment**; however restoration measures are not included assuming a worst-case scenario.

³ IEMA (2020) The Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation (2nd Edition)

designed to cope with changes in temperature and rainfall. Turbines will shut down if winds are too strong or if overheating occurs, and appropriate infrastructure design including maintaining up to a 50m buffer around watercourses and the incorporation of standard good practice measures for site drainage (including Sustainable Drainage System (SuDS) principles and designing all watercourse crossings and infrastructure to withstand a 1:100 year flood event) will be achieved.

- Indirect emissions arising from the demand for energy produced using fossil fuels during times of intermittent renewables production (e.g. electricity for heating, cooling and lighting).

Assessment Methodology

Legislation and Guidance

Legislation and Policy

14.10 The assessment is carried out in accordance with the following legislation:

- The 'Paris Agreement' which entered into force on 4th November 2016, the UK ratified the Agreement on the 18th November 2016. The commitments set out in the Agreement were reaffirmed recently in the Glasgow Climate Pact⁴ (November 2021).
- The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017⁵.
- The Climate Change Act 2008.
- The UK Carbon Budgets: Each budget provides a five year statutory cap on total GHG emissions, which should not be exceeded in order to meet the UK's emission reduction commitments. These legally binding targets are currently available to the 6th carbon budget period (2033-2037).

⁴ United Nations Framework Convention on Climate Change (FCCC) (2021) The Glasgow Climate Pact – Key Outcomes from COP26

⁵ Welsh Government (2017) The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017

- Planning Policy Wales 12 (PPW) (Welsh Government 2024)⁶.
- Powys County Council, A Strategy for Climate Change – Net positive Powys 2021-2030.

Guidance

14.11 This assessment is carried out in accordance with the principles contained within the following documents (herein referred to as the 'IEMA guidance'):

- The Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance⁷; and
- The Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation⁸.

Consultation

14.12 In undertaking the assessment, consideration has been given to the scoping responses and other consultation which has been undertaken as detailed in **Table 14.1**.

Table 14.1 Consultation responses

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/ Action Taken
Planning and Environment Decisions Wales (PEDW)	Formal Scoping Consultation	PEDW welcomes the approach highlighted in the 'Climate Change, including Carbon Balance' section of the Scoping Report and has no further comments to make on this.	Noted.

Study Area

14.13 The assessment considers the effects of the Proposed Development on the global climate, with specific reference to the climate changes expected in the UK. These have been

⁶ Welsh Government (2024b) Planning Policy Wales (Edition 12)

⁷ IEMA (2022) Assessing Greenhouse Gas Emissions and Evaluating their Significance (2nd Edition)

⁸ IEMA (2020) Guide to: Climate Change Resilience and Adaptation

defined using the UK's climate change projections (UKCP18)⁹, which allow climate changes to be projected at the regional level. The effects of a changing climate on the Proposed Development have largely been assessed in relation to the Site and its immediate surroundings using Wales as the regional level.

14.14 The study area for calculating stored soil carbon in **Appendix 14.1** has been the Site boundary under existing conditions. For the carbon payback assessment, since greenhouse gas emissions and savings are both ultimately a global 'pool', this assessment is not restricted solely to those emissions or savings that occur within the boundary of the Proposed Development site. Land-based emissions from peat and habitat losses are based on the site footprint, but other activities, for example, emissions resulting from the extraction and production of steel for turbines, are still attributable to the Proposed Development even though they are likely to occur in other parts of the world.

Desk Based Research and Data Sources

14.15 The following data sources have informed the assessment:

- UKCP18;
- Department for Business Energy & Industrial Strategy (DBEIS) Subnational Electricity and Gas Consumption Statistics¹⁰;
- Scottish Government Carbon Calculator Tool; and,
- **Appendix 14.1: Carbon Balance Assessment.**

Field Survey

14.16 The assessment has been desk-based, drawing largely from published guidance and data. Peat depth probing was undertaken to inform the layout of the Proposed Development, and this data was also used to inform the carbon balance assessment (see **Appendix 11.4: Outline Soil Management Plan**).

⁹ Met Office (2018) UK Climate Projections 2018 (UKCP18)

¹⁰ Department for Business, Energy and Industrial Strategy (2022) Sub-national electricity consumption data

Assessing Significance

Climate Change Mitigation

14.17 All emissions contribute to climate change. However, specifically in an EIA context, the IEMA guidance provides relative significance descriptions to assist with assessments. A number of distinct levels of significance have been defined, which are not solely based on whether a project emits GHG emissions alone, but how the project makes a relative contribution towards achieving a science-based 1.5°C aligned transition towards net zero. For the purposes of this assessment, this guidance has been interpreted as outlined in **Table 14.2** and has been used to determine significance of effects.

Table 14.2 Significance criteria for climate change mitigation

Significance of Effect	Determining Criteria
Adverse (major or moderate)	The development is not compatible with the UK's budgeted science-based net zero trajectory. Further evaluation will be required to determine whether this is of major or moderate significance.
Adverse (minor or negligible)	The development will be a net generator of GHG emissions but is compatible with the UK's budgeted science-based net zero trajectory. Further evaluation will be required to determine whether this is of minor or negligible significance.
Positive (major, moderate or minor significance)	The net GHG emissions associated with the development will be negative. A project that causes GHG emissions to be avoided or removed from the atmosphere has a beneficial effect that is significant. Only projects that actively reverse (rather than only reduce) the risk of severe climate change can be judged as having a positive effect. Further evaluation in the context of the UK's budgeted science-based net zero trajectory will be required to determine whether this is of major, moderate or minor significance.

Climate Change Adaptation

14.18 The purpose of the ‘in-combination climate assessment’ is to determine whether the significance of effects of the Proposed Development on a given receptor (under the existing climate baseline) are likely to be changed by future climatic conditions and whether the Proposed Development is likely to affect a receptor’s ability to adapt. Unlike the assessment for Climate Change Mitigation, the assessment of significance for Climate Change Adaptation is more qualitative with no legislative definition of significance prescribed, IEMA guidance indicates that the assessment should be developed on a project-by-project basis. The significance of effects are therefore determined through the following steps in accordance with the IEMA guidance¹¹:

- Receptors identified and assessed in the topic chapters of the ES under the current climate baseline are evaluated to determine whether the susceptibility and vulnerability as well as their value/importance will change with the future climatic conditions defined. A high susceptibility and/or vulnerability receptor that has very little resilience to changes in climatic conditions should be considered more likely to be significantly affected than a high value receptor that is very resilient to changes in climatic conditions.
- The magnitude of the effects on the receptors under the existing climate baseline is evaluated to determine whether the probability and/or consequence of the effect changes with the future climatic conditions.
- Building on the evaluation of sensitivity and magnitude of the effect, an assessment is undertaken to identify whether the additional effects of future climate impacts alter the sensitivity and/or magnitude of the effect so that the level of significance of the effects within other topics identified against baseline conditions changes. The assessment uses the significance criteria used by other topics assessed in the ES, i.e. if a minor (adverse) effect on direct habitat loss is not likely to change under a future climatic scenario, then the in-combination effect (effect of the Proposed Development with future climate change) remains as minor (adverse).

¹¹ IEMA (2020) The Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation (2nd Edition)

Assessment Assumptions and Limitations

Assumptions

14.19 In considering future climate change scenarios, IEMA guidance recommends the use of the UKCP18 website¹². ‘Probabilistic’ projections are provided for a range of variables including temperature, precipitation and sea level rise. Wind speed and storm frequency/intensity are considered separately as global modelling information is currently more limited.

14.20 The current projections, UKCP18, released in November 2018, are the most up to date climate change projections available. The Climate Projections website states that UKCP18 provides a valid assessment of the UK’s future climate over land, but that when considering decisions that are sensitive to projected future changes in summer rainfall, additional information should also be used.

14.21 The UKCP18 projections for temperature and precipitation are presented for the UK as a whole and also on a regional basis. The UK projections consider three variables:

- **Timeframe:** The projections are presented for four overlapping time periods (2020s, 2040s, 2060s and 2080s).
- **Probability:** The projections are provided as probability distributions rather than single values, with figures provided for 5, 10, 50, 90 and 95% probability.
- **Representative Concentration Pathways (RCP):** Four pathways have been adopted; RCP 2.6, RCP 4.5, RCP 6.0 and RCP 8.5. These pathways describe different GHG and air pollutant emissions as well as their atmospheric concentrations and land use with each one resulting in a different range of global mean temperature increases over the 21st century. RCP 2.6 represents a scenario which aims to keep global warming likely below 2°C compared to pre-industrial temperatures. RCP 4.5 and RCP 6.0 represent intermediate scenarios while RCP 8.5 describes a very high GHG emission scenario. All scenarios are considered to be equally plausible.

14.22 **Table 14.3** below explains the assumptions made in applying the UKCP18 projections to the assessment of the Proposed Development. The IEMA guidance states that “*Recommended*

¹² Accessible via: <https://www.metoffice.gov.uk/research/approach/collaboration/ukcp>

best practice is to use the higher emissions scenario (RCP 8.5 in the latest UKCP18 projections) at the 50th percentile, for the 2080s timelines, unless a substantiated case can be made for not doing this (e.g. anticipated lifespan of the project is shorter than 2080s)”.

Table 14.3 Climate change assessment assumptions

Variable	Assumptions	Rationale
Timeframe	2070s	This is considered a realistic timeframe given the anticipated operational lifespan (40 years) of the Proposed Development.
Probability	50 th percentile used to establish what is projected as the central estimate with consideration given to the lowest (5 th) and highest (95 th) percentiles to determine the lowest and highest projections that could happen within the timeframe.	The UKCP18 website states that by providing a range of results rather than single best estimate values, a clearer picture can be provided regarding the level of confidence in different outcomes.
RCP	RCP 8.5	RCP 8.5 is selected, as recommended in the IEMA guidance, and allows for a worst-case scenario future climate to be defined, resulting in a conservative assessment.

14.23 All key assumptions made with input data for the carbon calculator are set out in **Appendix 14.1**.

Limitations

14.24 Whilst some information gaps have been identified, it is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and

assessment of likely significant environmental effects on climate change. The key limitations to the assessment of effects in this chapter are as follows:

- Estimated carbon losses in the calculator are conservative, and it is assumed that all the carbon in excavated peat is lost and that the peat being excavated is in a good condition, although it will all be used for restoration on site as set out in **Appendix 11.4**.
- The peat restoration gains included in the calculator do not include future carbon sequestration from improved carbon fixing vegetation set out in **Appendix 7.10: Outline Habitat Management Plan and Biodiversity Net Gain Assessment**.
- The carbon calculator does not account for carbon emissions and direct CO₂ and NO_x emissions from Heavy Goods Vehicles (HGV) (including cumulatively) transporting components and staff to Site during construction, but rather only emissions associated with turbine life and emissions associated with their production, and so a qualitative approach has been used in regard to transport emissions in the assessment. This effect can therefore only be assessed qualitatively.
- The carbon calculator does not account for emissions associated with the working of machinery onsite such as excavators and generators.
- The calculation has not been updated to reflect the Proposed Development of 30 turbines as the online tool is currently unavailable. Since the production of the calculations presented in this chapter and **Appendix 11.4** a turbine has been removed from the scheme along with associated access track and hard standing, this has also led to a reduction in total MWs produced by the Proposed Development. It is beyond the scope of this assessment to quantitatively assess the cumulative offsetting effects of other schemes, and so any other positive effects identified are qualitative and based on professional judgement.

Existing Conditions and Future Baseline in the Absence of the Proposed Development

Overview

14.25 Regarding climate change adaptation, all specialist topic area authors were provided with a summary of the climate change projections in **Table 14.4** and were asked to consider the relevance of this for their baseline descriptions, a summary of which is provided from **paragraph 14.24**. **Table 14.4** outlines the projected changes in temperature, precipitation, wind speed and storms by the 2070s, using current UKCP18 projections.

Table 14.4 Projected climate change

Climate Variable	Projected Change
Temperature	Temperatures in Wales are projected to increase, with projected increases in summer temperatures greatest. The central estimate of increase in winter mean temperature is 2.6°C; it is very unlikely to be less than 0.5°C and is very unlikely to be more than 5°C. The central estimate of increase in summer mean temperature is 4.3°C; it is very unlikely to be less than 1.2°C and is very unlikely to be more than 7.3°C.
Precipitation	Winter rainfall is most likely projected to increase, and summer rainfall is most likely projected to decrease. The central estimate of change in winter mean precipitation is 19%; it is very unlikely to be less than -6% and is very unlikely to be more than 50%. The central estimate of change in summer mean precipitation is -31%; it is very unlikely to be less than -61% and is very unlikely to be more than 4%.
Wind speed and storms	Changes in wind speeds are not currently available at the regional level and there remains considerable uncertainty in the projections, with respect to wind speed. However, there are small changes in projected wind speed (Defra, DECC and Met Office, 2010). Across the UK, near

Climate Variable	Projected Change
	surface wind speeds are expected to increase in the second half of the 21 st century with winter months experiencing more significant impacts of winds (Met Office, 2018). This is accompanied by an increase in frequency of winter storms over the UK. However, the increase in wind speeds is projected to be modest.

14.26 It is considered that baseline conditions will not be influenced by the climate change projections for the following assessments:

- Telecoms and Utilities (**Chapter 2**): The future climate scenario is not expected to alter the existing siting and maintenance of utilities or telecoms infrastructure (including known links).
- Major Accidents and Disasters (**Chapter 2**): The future climate scenario is not expected to alter any risks identified relating to accidents and disasters.
- Noise and Vibration (**Chapter 9**): The consequences of the future climate scenario are unlikely to substantially affect baseline noise conditions given that periods of rainfall are excluded and the variation with wind speed was taken into account, in line with requirements of ETSU-R- 97 and current good practice.
- Access, Traffic and Transport (**Chapter 10**): It is assumed that, at a regional level, appropriate measures will be put in place to ensure flood risk as a result of increased precipitation is managed and does not have long term effects on transport infrastructure.
- Aviation (**Chapter 12**): Civil and military aviation infrastructure and activities will continue to be safeguarded in the future climate scenario. It is assumed that appropriate measures will be put in place to ensure that aviation radar installations will be able to withstand and adapt to changes in climate.
- Shadow Flicker (**Chapter 13**): Effects due to shadow flicker are intrinsically linked to weather and there is therefore potential that the current baseline sunny daylight hours could be affected in the future due to climate change. The baseline percentage of sunny daylight hours per year is, however, not expected to change over the 40 year operational life of the

Proposed Development to such a degree that the assessment of effects of shadow flicker would be materially affected.

14.27 More detailed consideration on baseline conditions that will be influenced by the climate change projections is provided in the following assessments:

- **Landscape and Visual Amenity (Chapter 5):** Alterations in climate and conditions means the composition of vegetation and areas of acid grassland and purple moor grass found across the Site is likely to alter, causing variations in landscape character¹³. Some of these changes are likely to include increased growth of grasses and expansion of bracken within upland heathland, which could change the vegetation structure towards something more representative of a lowland heathland environment, therefore altering the upland character of the Site. Areas of marshy grassland, blanket bog and wet heath are likely to see increasing dry spells which will likely shrink their extents, conversely, during storm events increased erosion and gullyng may diminish parts of these habitats. There is also the potential for an increased risk of wildfires across the Site in relation to increased temperatures and dry spells.
- **Historic Environment (Chapter 6):** Increase in rainfall will change groundwater and soil conditions, potentially affecting the preservation of buried archaeological remains and eroding/ flooding above ground historic assets.
- **Ecology (non-avian) and Ornithology (Chapter 7 and Chapter 8):** Changes to the local climate, such as higher temperatures and reduced rain fall in summer, may lead to gradual changes to habitats and associated species at the Site, particularly wetlands, such as ponds, marshy grassland, mire and flush habitats locally declining. In ornithological terms, an increase in extreme weather may influence the productivity and therefore the numbers of migratory species using the Site, such as golden plover, hobby and nightjar alongside a number of passerine species e.g. spotted flycatcher and whinchat. Changes in local climate may also result in changes to assemblage of species at the Site, and changes in land use may also indirectly effect bird populations.

¹³ Natural England (2020) Climate Change Adaptation Manual

- Hydrology, Hydrogeology and Geology (including Peat) (**Chapter 11**): An increase in rainfall will lead to increased flood extents and deeper flood waters within the valleys in the Site. Increased winter rainfall is also anticipated to lead to an increase in erosion and run-off from agricultural land, alongside an increase in the erosional action of watercourses. There is also a risk of changes to soils, including change in Agricultural Land Classification grades, loss of soil structural stability, loss of soil carbon/organic matter and increased erosion of soils.

14.28 The UKCP18 projections show a general trend towards warmer, wetter winters and hotter, drier summers. However, it should be noted that rainfall patterns across the UK are not consistent and will vary dependent on seasonal and regional scales and will continue to vary in the future.

Design Considerations (Embedded Mitigation)

14.29 The following modifications and design considerations have been made during the iterative EIA process, and relate to the issues considered in this assessment:

- Up to three temporary borrow pits are proposed to reduce the theoretical volume of construction traffic calculated in **Chapter 10** and associated emissions as far as is reasonably practicable.
- The Proposed Development was designed to avoid placing infrastructure on areas of peat across the majority of the Site. Only a small area of peat is impacted by proposed access tracks within the forested area on Site. See **Chapter 3: Site Selection and Design Strategy** for design evolution details.
- Impacts upon deep peat (physical damage, excavation and transportation) have been minimised as far as possible.

14.30 Modern turbines are designed and constructed to withstand the forces likely to be exerted on them, often in remote environments which are regularly subject to high wind speeds. Adherence to relevant design, operational monitoring and maintenance safety standards ensures that there is very limited risk of structural failure of turbines or foundations from high wind speeds and temperatures.

Micrositing

14.31 The magnitude and resulting significance of effects identified in this chapter would not be affected by the micrositing allowances identified in **Chapter 4: Project Description**.

Assessment of Construction Effects

14.32 The assessment of effects is based on the project description as outlined in **Chapter 4**. Unless otherwise stated, potential effects identified are negative.

Predicted Construction Effects

Carbon Losses and Direct CO₂ and NO_x Emissions

14.33 As stated in **Chapter 10**, the highest levels of vehicle movements associated with the Proposed Development will occur during its construction. Up to 272 construction vehicle two-way movements are estimated across the construction programme in total.

14.34 Except for staff journeys to Site, the majority of two-way movements will be from the delivery of bulk materials, based on the worst-case assumptions that 50% of material would be imported. The calculations also assume that no car sharing will occur between staff. It is highly likely that car sharing amongst staff will occur and public transport provision information will be provided through the Staff Travel Plan.

14.35 Whilst CO₂ and NO_x emissions have not been calculated for construction vehicle movements, it is considered that the opportunity to use up to three onsite borrow pits will reduce HGV traffic movements and the associated emissions. In addition, concrete batching may be undertaken onsite which would reduce concrete delivery requirements.

14.36 The carbon balance assessment undertaken to quantify the emissions reduction for the Proposed Development is in line with current best practice within Wales, as such the assessment of the effects of CO₂ and NO_x emissions is made in line with IEMA guidance whereby residual emissions, for developments that are compatible with Welsh Government Green House Gas emissions targets, are not considered significant.

14.37 Appendix 14.1 estimates that a total of approximately 47% of the total carbon losses of the Proposed Development will occur during the construction, manufacture and decommissioning of the turbines (estimated total of 203,878 tonnes of CO₂ (tCO_{2e})). It is anticipated that approximately 63,017 tCO_{2e} will be emitted through the felling of forestry and approximately 324 tCO_{2e} will be released through movement of peaty soils onsite. The potential oxidation of excavated peat contributes to approximately 0.08% of overall losses.

Assessment of Effects

14.38 Prior to mitigation, effects of carbon losses including direct CO₂ and NO_x emissions are considered to be **Minor (Negative)** and **Not Significant**.

Proposed Mitigation (Additional)

14.39 No specific mitigation measures are proposed in relation to climate change, although a Construction Traffic Management Plan (CTMP), as referenced in **Chapter 10**, will be implemented as applied mitigation, with the intention that measures will be implemented to ensure traffic movements are undertaken efficiently during construction, and unnecessary journeys avoided. A Site Waste Management Plan will also be implemented as part of the Outline Construction Environmental Management Plan (CEMP) (see **Appendix 4.2**) to reduce materials wastage onsite, and measures to ensure the efficient re-use and handling of soil and peat material are included in **Appendix 11.4**. A Habitat Management Plan (HMP) as detailed in **Appendix 7.10** will be implemented to create new habitats and net benefits for biodiversity on Site, this will act as a means of absorbing carbon emissions and help to intercept heavy rainfall and associated flooding. The procurement of turbines and associated equipment for the Proposed Development will also, where appropriate, include prioritisation of sustainable construction methods and materials.

Residual Construction Effects

14.40 All residual effects are considered to remain as **Minor (Negative)** and **Not Significant** following the implementation of the mitigation measures identified above.

Assessment of Operational Effects

Predicted Operational Effects

Carbon Losses and Savings

14.41 As outlined in **Chapter 1: Introduction**, the purpose of the Proposed Development is to generate electricity from a renewable source of energy, avoiding the need for power generation from the combustion of fossil fuels and contribute to the decarbonisation of heat and transport networks. With the Proposed Development having a total wind generating capacity of 198 Megawatts (MW), it is calculated that the equivalent of approximately 130,000 UK households per year will be powered as a result¹⁴.

14.42 **Appendix 14.1** estimates that a further 40% of the emissions of the Proposed Development will occur during the operational phase (estimated total of 166,581 tCO_{2e}), with the majority coming from the requirement for back-up power in the grid, which is assumed to come from a fossil fuel source. Wind generated electricity can be variable, meaning accompanying backup power is required to stabilise the supply to the consumer. The emissions associated with back-up power generation over the 40-year operational life of the Proposed Development are calculated to be in the region of 158,895 tCO_{2e}. Losses from disturbed peat and leaching are minimal during the operational stage.

14.43 One of the aims of **Appendix 14.1** was to calculate the 'payback time' of CO₂ emissions for the Proposed Development. The payback time is defined as the length of time (in years) required for the Proposed Development to be considered a net avoider of emissions rather than a net emitter, and is calculated by dividing the net emissions of carbon (total of carbon losses and gains) by the annual estimated carbon savings. The expected carbon payback time, assuming that the Proposed Development will offset the emissions associated with fossil fuel electricity generation, is calculated to be in the region of 1.4 years (or 16 months).

¹⁴ Based on a capacity factor of 26.34% which is the industry standard. This is a conservative estimate for the Proposed Development as data collected from the onsite temporary met mast produced a site specific capacity factor of 39%.

14.44 Assuming a 40-year operational life, and based on an overall expected annual carbon saving of 313,421 tCO₂ and a total carbon loss (during both construction and operation) of just over 433,889 tCO_{2e}, this equates to a total saving of approximately 12,102,951 tCO_{2e} (over 28 times the emissions emitted) over the Proposed Development's operational lifetime. It is also noted that the carbon calculator does not consider the positive benefits of carbon sequestering vegetation such as tree planting and net gains in biodiversity, as set out in **Appendix 7.10**.

14.45 The calculation of payback time includes a quantification of carbon losses as a result of loss of peat within the Site. The expected carbon storage loss from peat is expected to be relatively minimal, where possible excavated peat/organic-rich peaty soil will be reused and reinstated onsite as outlined in **Appendix 11.4**. There will be no release of stored carbon or loss of future additional sequestration and storage during the operation of the Proposed Development, permanent forest removal will take place during construction.

14.46 Whilst it has not been possible to calculate construction traffic emissions for HGVs and personnel, overall, it is considered that these will be offset during the Proposed Development's operational life along with any backup generation if required, and that a **Positive** and **Significant** effect is likely on balance. The Proposed Development's carbon saving potential will contribute positively to meeting Welsh greenhouse gas emissions targets.

Adaption

14.47 Taking account of those receptors identified above under 'baseline conditions' as potentially susceptible to a changing climate, this section gives further consideration as to whether or not the introduction of the Proposed Development is likely to affect judgements of effects and/or the ability of the receptors within or close to the Site to adapt to climate change.

Topics considered are:

- Landscape and Visual Amenity (**Chapter 5**);
- Historic Environment (**Chapter 6**);
- Ecology (non-avian) and Ornithology (**Chapter 7 and Chapter 8**); and,
- Hydrology, Hydrogeology and Geology (including Peat) (**Chapter 11**).

Landscape and Visual Amenity

14.48 It is anticipated that the introduction of the Proposed Development will have no significant effects on the landscape's capability to adapt to climate change. It is also unlikely that the susceptibility/vulnerability and value/importance of the receptors will materially change, neither will the magnitude of the predicted effects of the Proposed Development under the existing baseline, such that the in-combination climate effects are considered to remain as those set out in **Chapter 5**.

Historic Environment

14.49 It is anticipated that the introduction of the Proposed Development will have no significant effects on the historic environment's ability to adapt to climate change. It is also unlikely that the susceptibility/vulnerability and value/importance of the receptors will materially change, neither will the magnitude of the predicted effects of the Proposed Development under the existing baseline, such that the in-combination climate effects are considered to remain as those set out in **Chapter 6**.

Ecology and Ornithology

14.50 It is possible that bird species currently found within and around the Site will decline in numbers, should climate changes occur as predicted. However, with the implementation of the applied mitigation and good practice measures, it is not considered likely that the introduction of the Proposed Development will result in increased flooding which could otherwise lead to habitat loss or species displacement within the Site. Overall, the Proposed Development will have no significant effects on ornithological or ecological species' ability to adapt to climate change. It is unlikely that the susceptibility/vulnerability and value/importance of the receptors assessed will materially change neither will the magnitude of the predicted effects of the Proposed Development under the existing baseline, such that the in-combination climate effects are considered to remain as those set out in **Chapter 7** and **Chapter 8**.

Geology, Hydrology, Hydrogeology and Peat

14.51 Appropriate infrastructure design (including maintaining up to a 50m buffer around watercourses) and the incorporation of applied mitigation and good practice measures for site drainage into the infrastructure design (including SuDS principles) will limit any increases in

flows and runoff rates to pre-development levels. Embedded, applied and additional mitigation has been designed inclusive of an allowance for climate change (for example, through following Natural Resources Wales guidance in flood consequence assessment and outline drainage design). All watercourse crossings will be designed to meet required flood exceedance standards inclusive of climate change allowances. These measures will help to ensure that the Proposed Development has no significant effects on the ability of potential flood risk receptors to adapt to climate change. Where there is potential for the susceptibility/vulnerability and value/importance of the receptors assessed to alter as a result of climate change (for example, an increased risk of summer drying of peat bodies), this has been taken account of within **Chapter 11**. Hence the magnitude of the predicted effects of the Proposed Development under a changed baseline (as a result of climate change) is included within the assessment of effects as summarised in **Chapter 7**.

Proposed Mitigation (Additional Mitigation)

14.52 Other than the proposed mitigation measures set out above in relation to hydrology, ecology and ornithology, no other mitigation measures are proposed to address in-combination effects of the Proposed Development in respect to climate change adaptation for the receptors assessed.

Residual Operational Effects

14.53 All residual effects are considered to remain as above.

Assessment of Cumulative Effects

Predicted Cumulative Effects During Construction

14.54 Climate change is, in essence, a cumulative effect due to emissions from multiple sources, including new development. All wind farms will involve the generation of direct and embodied greenhouse gas emissions during construction. It is assumed, however, that any other applications that are consented and built will include reasonable measures to avoid, reduce and/or avoid the generation of greenhouse gas emissions, particularly from construction

traffic. Overall, a **Minor (Negative)** cumulative construction effect is therefore predicted which will be **Not Significant**.

Proposed (Additional) Mitigation

14.55 No mitigation measures are proposed in relation to cumulative climate change effects during construction of the Proposed Development.

Residual Cumulative Effects During Construction

14.56 As no mitigation is proposed, the effect remains as **Minor (Negative)** and **Not Significant**.

Predicted Cumulative Effects During Operation

14.57 It is beyond the scope of this chapter to provide a quantitative estimate of the cumulative effects of all wind farms in the UK on carbon savings. However, the Proposed Development, in combination with other nearby wind farms, will have a positive effect on avoiding emissions released from the burning of fossil fuels. This will play an integral part in helping Wales meet its climate change and energy targets, and a **Major (Positive)** and **Significant** effect is therefore identified, given the importance of this collective role of onshore wind generation to addressing the global climate emergency.

Summary of Effects

14.58 **Table 14.5** and **Table 14.6** below summarise the predicted effects of the Proposed Development on climate change mitigation and adaptation.

Table 14.5 Summary of effects for CO₂ and NO_x emissions, losses and savings

Predicted Effect	Sensitivity	Magnitude	Significance	Mitigation	Significance of Residual Effect
Construction					
Carbon losses and CO ₂ and NO _x emissions	N/A	N/A	Minor (Negative) Not Significant	None	Minor (Negative) Not Significant
Operation					
Carbon losses and savings	N/A	N/A	Moderate (Positive) Significant	None	Moderate (Positive) Significant
Cumulative Construction					
Carbon losses and CO ₂ and NO _x emissions	N/A	N/A	Minor (Negative) Not Significant	None	Minor (Negative) Not Significant
Cumulative Operation					
Carbon losses and savings	N/A	N/A	Major (Positive) Significant	None	Major (Positive) Significant

Table 14.6 Summary of effects for climate change adaptation

Predicted Effect	Significance	In-Combination Climate Impact?	Mitigation	Significance of Residual Effect
Operation				
Predicted significant residual effects in Landscape and Visual Amenity	Not Significant	No	N/A	Not Significant
Predicted significant residual effects in Historic Environment	Not Significant	No	N/A	Not Significant
Predicted significant residual effects in Ecology and Ornithology	Not Significant	No	N/A	Not Significant
Predicted significant residual effects in Hydrology, Hydrogeology, Geology (and Peat)	Not Significant	No	N/A	Not Significant



**Nant Mithil
Energy Park Limited**

Environmental Statement

Chapter 15: Summary of Interrelated Cumulative Effects and Likely Significant Effects



Chapter 15

Summary of Interrelated Cumulative Effects and Likely Significant Effects

Introduction

15.1 This chapter presents the assessment of the likely inter-related (intra-project) cumulative effects. It should be read in conjunction with the project description provided in **Chapter 4: Project Description**.

15.2 Potential inter-project cumulative effects arising from the combination of effects from the Proposed Development with similar topic-related effects generated by other developments are discussed in **Chapter 2: Approach to the EIA** and assessed in **Chapters 5-14**.

15.3 It also provides a summary of the likely significant effects of the Proposed Development.

Limitations and Assumptions

15.4 There are no limitations identified that affect the robustness of the assessment of the likely significant inter-related cumulative effects of the Proposed Development.

Legislation, Planning Policy and Technical Guidance

Legislation

15.5 In relation to cumulative effects and the interaction of effects, Schedule 4 Part 5 of the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 (as amended) (the EIA Regulations) requires an ES to include:

- *“A description of the likely significant effects of the development on the environment resulting from, inter alia:*

- *...(e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;*
- *The description of the likely significant effects on the factors specified in regulation 4(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development. [...].”*

15.6 The EIA Regulations, at regulation 4(2), makes explicit reference to the requirement for an assessment of the effect interactions between types of effect and states *“The environmental impact assessment must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of proposed development on the following:*

- *(a) population and human health;*
- *(b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;*
- *(c) land, soil, water, air and climate;*
- *(d) material assets, cultural heritage and the landscape; and*
- *(e) the interaction between the factors listed in sub-paragraphs (a) to (d).”*

Planning Policy

15.7 Future Wales: The National Development Plan 2040: Policy 18 states *“The cumulative impacts of existing and consented renewable energy schemes should also be considered”*.

15.8 Planning Policy Wales, Edition 12 (PPW12) (Welsh Government, 2024) states, under ‘Renewable and Low Carbon Energy’, at paragraph 5.9.20, *“Planning authorities should also identify and require suitable ways to avoid, mitigate or compensate adverse impacts of renewable and low carbon energy development. The construction, operation, decommissioning, remediation and aftercare of proposals should take into account:... cumulative impact”*.

Technical Guidance

15.9 The following guidance has been taken into consideration when preparing this chapter:

- International Association for Impact Assessment (IAIA) (2017) Cumulative Effects Assessment Fast Tips; and
- Planning Inspectorate (2024) Nationally Significant Infrastructure Projects: Advice on Cumulative effects Assessment.

Interaction of Effects Assessment Methodology

15.10 The assessment has been undertaken on a qualitative basis, informed by professional judgement and experience. The objective of the interrelated cumulative effects assessment is to identify where any additional effects arise through a combination of the effects identified in the individual topic assessments (i.e. in the original assessment of effects on visual amenity, PWS, traffic or noise).

15.11 National policy guidance requires that all relevant effects should be considered objectively. However, existing policy guidance presently fails to provide advice on how such an objective assessment should be carried out. There is no established, robust methodology for quantitatively assessing complex cross topic inter-related effects and assigning a level of significance to them, as methodologies and criteria vary across environmental aspects. The methodology adopted for this assessment is summarised below and is based on professional judgement:

Stage 1: Topic-specific Assessments

15.12 The first stage of the assessment is to undertake a review of the residual effects identified in the individual environmental topic chapters (**Chapters 5 to 14** of this ES). These are the effects identified following implementation of embedded design mitigation, and additional mitigation. The review considers significant and not significant effects as the interaction of several not significant effects on a receptor could result in a significant interrelated effect.

Stage 2: Identification of Receptors

15.13 Stage 2 involves identifying common receptors across the topic chapters, where that receptor is likely to experience effects across more than one topic. Only receptors that are expected to experience more than one potential effect have been included in the assessment (e.g. noise and visual).

15.14 Receptors predicted to be affected by only a single effect (e.g. only noise) are excluded because there is considered to be no potential for effect interactions to take place.

15.15 The receptor groups identified within this ES can be broadly categorised as follows:

- Landscape and visual resources: Landscape character; visual receptors (residents; users of public rights of way; other visual receptors).
- Historic environment: Settings of nationally designated heritage assets.
- Ecology and biodiversity: Ecological nationally designated sites.
- Noise and vibration: Residents, users of public rights of way; users of other land uses (e.g. places of work).
- Access and highways: Road users, residents; pedestrians/cyclists; sensitive local uses (e.g. schools, hospitals, local facilities).
- Water resources and ground conditions: Private water supplies and soils.
- Shadow flicker: Residents.

Stage 3: Assessment of Potential Effect Interactions on Receptor Groups

15.16 Consideration is given to the potential for multiple effect interactions to arise for each of the identified receptors across the construction, operation and decommissioning of the Proposed Development. **Table 15.3** identifies those receptors which are assessed in more than one topic chapter of the ES.

15.17 A qualitative assessment was undertaken, considering the scope for all effects to interact, spatially and temporally, to create inter-related effects. As an example, all effects on a given

receptor such as local residents, from construction dust and noise, increased traffic and visual change etc. may interact to produce a greater effect on this receptor than when the effects are considered in isolation. Effects might be short term, temporary or transient, or incorporate longer term effects.

Assessment of Interrelated Effects

15.18 As previously mentioned, the assessment has been undertaken on a qualitative basis, informed by professional judgement and experience. The objective of the interactions of effects assessment is to identify where any additional effects are likely to arise through a combination of the effects identified in the individual topic assessments. **Table 15.3** identifies receptors that are assessed as likely to experience effects from more than one topic. The review considers significant and not significant effects, as the interaction of several not significant effects on a receptor could result in a significant interrelated effect.

Table 15.1 Common receptors between ES topics

Receptor	Chapter 5: Landscape & Visual	Chapter 6: Historic Environment	Chapter 7: Ecology (non-avian)	Chapter 8: Ornithology	Chapter 9: Noise & Vibration	Chapter 10: Access, Traffic & Transport	Chapter 11: Hydrology, Hydrogeology & Geology	Chapter 12: Aviation	Chapter 13: Shadow Flicker	Chapter 14: Climate Change
Llandegley Rocks Hillfort (Cadw SM Ref. RD264)	X	X								
River Wye Special Area of Conservation (SAC)			X				X			
Radnor Forest Site of Special Scientific Interest (SSSI)	X		X				X			
A44 road	X				X	X				

Receptor	Chapter 5: Landscape & Visual	Chapter 6: Historic Environment	Chapter 7: Ecology (non-avian)	Chapter 8: Ornithology	Chapter 9: Noise & Vibration	Chapter 10: Access, Traffic & Transport	Chapter 11: Hydrology, Hydrogeology & Geology	Chapter 12: Aviation	Chapter 13: Shadow Flicker	Chapter 14: Climate Change
Residential Receptors: Cwm Farm, Llanevan, Old Hall, Wern Fach, Pye Corner, Corn Hill	X				X					
Residential Receptors: 1 and 2 Cwmygerwyn, Graig, Upper Penrhiw, Gwernargllwydd					X				X	

Receptor	Chapter 5: Landscape & Visual	Chapter 6: Historic Environment	Chapter 7: Ecology (non-avian)	Chapter 8: Ornithology	Chapter 9: Noise & Vibration	Chapter 10: Access, Traffic & Transport	Chapter 11: Hydrology, Hydrogeology & Geology	Chapter 12: Aviation	Chapter 13: Shadow Flicker	Chapter 14: Climate Change
Public Rights of Way (PROW)/Common Land users	X				X	X				

15.19 Table 15.1 highlights the following trends in potential interrelated effects at specific receptors:

- Effects relating to cultural heritage assets may fall within the scope of both heritage and landscape and visual assessments within EIA and **Table 15.1** identifies that interrelated effects could affect Llandegley Rocks Hillfort. However, for EIA purposes the nature of the receptors and effects differ between these two topics. The description of methodology and scope of **Chapter 5: Landscape and Visual Amenity** and **Chapter 6: Historic Environment** of the ES presents the differences in these respects transparently. For Landscape and Visual Amenity, the receptors are the landscape and the people who may experience views of the Proposed Development and effects assessed with reference to the sensitivity of the receptor and the magnitude of change (taking account of the scale of effect, duration and reversibility). Regarding historic assets, **Chapter 5** focuses on a development's visibility from a location, such as a historic asset, and the effect that visibility has on visitors to that location. In contrast, the historic environment assessment (**Chapter 6**) focuses on effects to the heritage significance of historic assets (also taking account of the scale of effect, duration and reversibility). Although both assessments identify Llandegley Rocks Hillfort as a receptor, in the case of **Chapter 5**, the receptor is actually visitors to the site rather than the heritage asset itself, which is assessed in **Chapter 6**. As such, beyond the topic specific effects identified, there are no interrelated effects.
- There are receptors identified as being affected in **Chapter 7: Ecology (non avian)** and **Chapter 11: Hydrology, Hydrogeology and Geology**. This includes the River Wye SAC and Radnor Forest SSSI. Interrelated effects may relate to changes to hydrology resulting from the Proposed Development which could affect the functioning of GWDTEs, peat, aquatic habitats and other ecological receptors. Both chapters consider the need for mitigation to address effects on hydrology, such as a Drainage Strategy to be appended to the CEMP and an Outline Habitat Management Plan. With this mitigation in place, no significant effects are identified on these receptors in either **Chapter 7** or **Chapter 11**, and therefore any potential interrelated effects would not be significant. These receptors are

also assessed in **Chapter 5**, however there would not be direct effects on the functioning of the SAC or SSSI and would not contribute towards the interrelated effects discussed above.

- **Table 15.1** identifies receptors assessed in **Chapter 5**, **Chapter 9: Noise and Vibration** and **Chapter 13: Shadow Flicker**. Noise, visual and shadow flicker effects could have an interrelated effect on residents during the operational phase of the Proposed Development, with noise and visual effects also arising during construction. Visual effects will not breach the residential visual amenity threshold, in accordance with the Landscape Institute's Residential Visual Amenity Assessment (RVAA) Technical Guidance Note 2/19 (LI TGN 2/19) (as reported in **Appendix 5.7: RVAA**). Noise effects for high sensitivity dwellings are assessed as not significant in **Chapter 9** and Shadow flicker effects are also not significant (see **Chapter 13**) due to the control measures identified. Furthermore, control measures for shadow flicker will be implemented such that dwellings will experience no significant shadow flicker effects. If residents were to experience the interrelated effect of seeing and hearing wind turbines simultaneously, it is considered unlikely, given the requirement for the operational turbines to adhere to the agreed noise limits and the findings of the RVAA, that this in combination effect on those residents would be of a magnitude that would lead to any increased effect (either significant or non-significant depending on the assessment of the receptor in the topic specific chapter) in EIA terms.
- Effects on recreational users are assessed in **Chapter 10: Access, Traffic and Transport** in respect of the potential to disruption to public rights of way (PRoW) and open access land, and in **Chapter 5** in respect of the visual amenity of the users of PRoWs and open access land. For the purpose of the EIA, although the receptors are the same (users of the PRoW network), the nature of the effect differs between the topics. **Chapter 10** considers direct effects on the ability of the user to travel from A to B along a PRoW and through open access land; **Chapter 5** considers the visual amenity of the user while doing so. **Chapter 10** concludes that residual effects for PRoW users for all aspects considered (severance, delay, user amenity, fear and intimidation and safety) will be minor and not significant. **Chapter 5** concludes that there will be major adverse visual effects for PRoW users on the Site during construction of the Proposed Development as they move through what will be a

temporary construction site. Major adverse visual effects for PRoW users on the Site are also identified for the operational phase of the Proposed Development as they move through what will become a wind farm landscape. Whilst Major adverse effects are identified with respect for visual amenity, no effects greater than minor are identified for disruption to PRoWs, therefore it is considered that no significant interrelated effects on users of the PRoWs and open access land are likely to occur as a result of the Proposed Development.

Summary of Topic Specific Likely Significant Effects

15.20 Chapters 5 to 14 of the ES present the findings of the assessments of the predicted effects of the Proposed Development on a topic-by-topic basis. The significance of these effects has been assessed using criteria defined in the topic chapters. Where appropriate, the significance of effects has been categorised as Major, Moderate, Minor or Negligible. In the context of the EIA Regulations, effects assessed as being of 'Major' or 'Moderate' significance are considered to be significant effects. Where this differs for certain topic chapters this has been clearly stated, and details are provided for how significant effects have been defined for that specific assessment.

15.21 In line with Schedule 4 of the EIA Regulations and other relevant EIA guidance, the ES has focused particularly on identifying significant environmental effects (both positive and negative) of the Proposed Development, during construction, operation and decommissioning (including cumulatively).

15.22 Following the application of embedded and applied mitigation specific to each topic, significant effects are predicted in relation to the following topics:

- Landscape and visual;
- Historic environment;
- Ecology (non avian);
- Ornithology;

- Access, traffic and transport;
- Hydrology, hydrogeology and geology; and
- Climate change (positive effects).

15.23 Following the application of embedded and applied mitigation specific to each topic, significant effects are **not** predicted in relation to the following topics:

- Noise; and
- Shadow flicker.

15.24 The identification of additional mitigation for four of the topics (ecology (non-avian); ornithology; access, traffic and transport; and hydrology, hydrogeology and geology) has resulted in residual effects that are not significant in EIA terms. Therefore, following additional mitigation (if proposed), significant residual effects remain for the following topics:

- Landscape and visual;
- Historic environment; and
- Climate change (positive effects).

15.25 Table 15.2 below summarises the predicted significant effects of the Proposed Development for all topics excluding Landscape and Visual Impact, where they remain following application of embedded and applied mitigation. It summarises the proposed mitigation, including any additional mitigation proposed, and the significance of residual effects. **Tables 15.3** and **15.4** summarise the residual significant Landscape and Visual effects.

15.26 For the topics in **Table 15.2**, there are no additional cumulative effects over and above those set out in the primary assessment and therefore the 'cumulative effects' column is not included.

Table 15.2 Summary of significant effects of the Proposed Development (excluding Landscape and Visual Impact Assessment)

Predicted Effect	Significance of Effect	Mitigation	Significance of Residual Effect
Historic Environment			
Construction Effects			
Earthwork Enclosure (LUC_08)	Moderate adverse and significant	A Level 3 landscape survey record and archaeological area excavation recording, including preparation of a report on the results of the landscape survey and preparation and submission of an ordered archive (this will be undertaken post-consent).	Minor (not significant)
Operational Effects			
Cwm Bwch Round Barrow Pair (Cadw SM Ref. RD255)	Moderate adverse and significant (indirect)	None proposed.	Moderate (significant)
Great Rhos Barrow (Cadw SM Ref. RD254)	Moderate adverse and significant (indirect)	None proposed.	Moderate (significant)
Shepherd's Tump Round Barrow (Cadw SM Ref. RD253)	Moderate adverse and significant (indirect)	None proposed.	Moderate (significant)
Crug Eyr Mound and Bailey Castle (Cadw SM Ref. RD003)	Moderate adverse and significant (indirect)	None proposed.	Moderate (significant)
Nyth-grug Cairn (CPAT HER Ref. PRN6832)	Moderate adverse and significant (indirect)	None proposed.	Moderate (significant)
Ecology (non-avian)			
Construction Effects			

Predicted Effect	Significance of Effect	Mitigation	Significance of Residual Effect
River Wye SAC	Moderate adverse and significant	Construction Environmental Management Plan (CEMP), Site Waste Management Plan (SWMP), foul waste disposal scheme, Aquatic species mitigation plan. These will be secured through suitably worded planning conditions.	Negligible (not significant)
Radnor Forest SSSI	Moderate adverse and significant (indirect)	Signage and cones to prevent any vehicles, machinery or construction workers from entering the SSSI, litter checks, CEMP, hydrological mitigation (see the Hydrology, Hydrogeology, and Geology section below).	Negligible (not significant)
Rivers and streams	Moderate adverse and significant	CEMP, SWMP, Aquatic species mitigation plan.	Negligible (not significant)
Badger	Moderate adverse and significant	Badger Development License (applied for to and granted by NRW) and Badger Protection Plan. A Species Protection Plan for badger is proposed in the planning condition proposed for the HMP.	Negligible (not significant)
GCN	Moderate adverse and significant	Great Crested Newt Species Protection Plan and Development Licence (applied for to and granted by NRW). A Species Protection Plan for GCN is proposed in the planning condition proposed for the HMP.	Minor beneficial (not significant)
Fish	Moderate adverse and significant	CEMP, SWMP, foul waste disposal scheme, Aquatic species mitigation plan. These will be secured through suitably worded planning conditions.	Minor adverse (not significant) (short term) Minor beneficial (not significant) (long term following HMP)
Operational Effects			
Bats	Moderate adverse and significant	Bat Mitigation and Monitoring Strategy. This will be secured through a suitably worded planning condition.	Minor to Negligible (not significant)
Ornithology			
Construction Effects			

Predicted Effect	Significance of Effect	Mitigation	Significance of Residual Effect
N/A			
Operational Effects			
Potential injury or mortality of foraging red kite due to collision risk.	Moderate adverse and significant	Implementation of Habitat Management Plan (HMP) (including land management within the HMP). This will be secured through a suitably worded planning condition.	Minor (not significant)
Noise and Vibration			
Construction Effects			
N/A			
Operational Effects			
N/A			
Access, Traffic and Transport			
Construction Effects – A44 Users (near the Site access, east of the A44/481 priority junction and to the south of Walton)			
Severance	Moderate significant	Construction Traffic Management Plan (CTMP) – Temporary signage/route signage. This will be secured through a suitably worded planning condition.	Minor (not significant)
Fear and Intimidation	Moderate significant		Minor (not significant)
Road Safety	Major significant		Minor (not significant)
Large Loads	Major significant	Abnormal Indivisible Loads Traffic Management Plan. This will be secured through a suitably worded planning condition.	Minor (not significant)
Construction Effects – Public Rights of Way Users			
Severance	Major significant		Minor (not significant)

Predicted Effect	Significance of Effect	Mitigation	Significance of Residual Effect
Pedestrian Delay	Major/Moderate significant	CTMP – Temporary signage/route signage and Path Management Plan. This will be secured through a suitably worded planning condition.	Minor (not significant)
Non-motorised User Amenity	Major significant		Minor (not significant)
Fear & Intimidation	Major significant		Minor (not significant)
Road Safety	Major/Moderate significant		Minor (not significant)
Large Loads	Major/Moderate significant		Minor (not significant)
Hydrology, Hydrogeology, and Geology			
Construction Effects			
Release of construction site run-off impacted by silt. Release of pollution from construction site (leaks, spills).	Major/Moderate and significant	Detailed investigation and assessment work will be undertaken to refine the understanding of the type, nature and connectivity of any potential pathways of pollution from the Proposed Development to each ground water dependent terrestrial ecosystem (GWDTE). This will be used to inform the detailed CEMP as it is evolved from the current outline document. Water quality will be monitored, with provision for replacing Private Water Supplies in the very unlikely event an unacceptable impact is detected. These will be secured through a suitably worded planning condition.	Minor (not significant)
Alteration to groundwater flow/elevations.	Major/Moderate and significant	Bespoke drainage solutions will be constructed at each location in order to ensure that the groundwater feed to each GWDTE is maintained in both quantity and quality. Detailed investigation and assessment work will be undertaken to refine the design of these mitigating actions. These will be secured through a suitably worded planning condition.	Minor (not significant)
Alteration to surface-water drainage paths during temporary construction works.	Major/Moderate and significant	Bespoke drainage solutions will be constructed for the turbine hardstandings and trackways in order to ensure that the current drainage patterns are replicated or improved upon. Detailed investigation and assessment work will be undertaken to refine the design of these mitigating actions.	Minor (not significant)

Predicted Effect	Significance of Effect	Mitigation	Significance of Residual Effect
		In addition, Chapter 7 (Ecology) also outlines additional mitigation measures including conservation grazing in this area and peatland restoration within the SSSI to help enhance habitat; and heathland creation and enhancement. These will be secured through a suitably worded planning condition.	
Operational Effects			
N/A			
Shadow Flicker			
Operational Effects			
N/A			
Climate Change			
Construction Effects			
N/A			
Operational Effects			
Carbon losses and savings.	Moderate (positive) significant	N/A	Moderate (positive) (significant)
Cumulative Operation			
Carbon losses and savings.	Major (positive) significant	N/A	Moderate (positive) (significant)

Table 15.3 Summary of significant effects of the Proposed Development from Landscape and Visual Impact Assessment on Landscape Receptors

Landscape Receptor (Landscape Units within 15 km based on LCA/LCTs in Powys, Shropshire, Herefordshire, and within 28 km in the BBNP)	Sensitivity	Magnitude of Change (during construction) ¹	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
Powys LCA						
LCA 43: Radnor Forest	Medium-High	High, within 2 km Medium, for wider LCA	Major (significant) within 2 km of Site, Moderate (significant) for the LCA as a whole	High, within 2 km Medium, for wider LCA	Major (significant) within 2 km of Site Moderate (significant) for the LCA as a whole	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
	Medium-High (at night)	n/a	n/a	Low-Medium, at 2000 cd. Low, at 2000 cd. (at night)	Minor-Moderate (not significant), at 2000 cd. Minor (not significant), at 200 cd. (at night)	Scenario A: n/a Scenario B: n/a
LCA 50: Aberedw Uplands	Medium-High	n/a	n/a	Medium, within 5 km Low, for wider LCA	Moderate (significant), within 5 km of Site Minor (not significant) for the LCA as a whole	Scenario A: No additional cumulative effects over and above those set out in the primary assessment.

¹ Landscape effects arising during construction only considered for the host LCA within which the Proposed Development is located, as detailed in **Appendix 5.1: LVIA Methodology**.

Landscape Receptor (Landscape Units within 15 km based on LCA/LCTs in Powys, Shropshire, Herefordshire, and within 28 km in the BBNP)	Sensitivity	Magnitude of Change (during construction) ¹	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
						Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
LCA 40: Llanbister– Penybont Uplands	Medium-High	n/a	n/a	Medium-High, within 5 km Low-Medium, for wider LCA	Moderate-Major (significant), within 5 km of Site Minor-Moderate (not significant) for the LCA as a whole	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
LCA 39: Ithon Valley	Medium-High	n/a	n/a	Medium-High, within 6 km Low, for wider LCA	Moderate-Major (significant), within 6 km of Site Minor (not significant) for the LCA as a whole	Scenario A: n/a Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
LCA 42: Lugg Valley	Medium	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: n/a Scenario B: n/a
LCA 49: New Radnor Valley	Medium	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: n/a Scenario B: n/a

Landscape Receptor (Landscape Units within 15 km based on LCA/LCTs in Powys, Shropshire, Herefordshire, and within 28 km in the BBNP)	Sensitivity	Magnitude of Change (during construction) ¹	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
LCA 45: Presteigne & Beggar	Medium	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment. <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
LCA 51: Painscastle Uplands	Medium-High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
LCA 38: River Dulas Hills & Valleys	Medium-High	n/a	n/a	Medium, within 6 km of Site Low, for wider LCA	Moderate (significant), within 6 km of Site Minor (not significant) for the LCA as a whole	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment. <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
LCA 32: Teme Hillsides	Medium-High	n/a	n/a	Medium, within 6 km of Site Low, for wider LCA	Moderate (significant), within 6 km of Site Minor (not significant) for the LCA as a whole	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment.

Landscape Receptor (Landscape Units within 15 km based on LCA/LCTs in Powys, Shropshire, Herefordshire, and within 28 km in the BBNP)	Sensitivity	Magnitude of Change (during construction) ¹	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
						Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
LCA 35: Beacon Hill	Medium-High	n/a	n/a	Low	Minor-Moderate (not significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: Minor (not significant)
LCA 44: Wye Valley (Rhayader to Builth Wells)	Medium	n/a	n/a	Low	Minor (not significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
LCA 31: Bwlch-y-sarnau Uplands	Medium	n/a	n/a	Low	Minor (not significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.

Landscape Receptor (Landscape Units within 15 km based on LCA/LCTs in Powys, Shropshire, Herefordshire, and within 28 km in the BBNP)	Sensitivity	Magnitude of Change (during construction) ¹	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
LCA 33: Ithon Valley Hillsides	Medium	n/a	n/a	Low	Minor (not significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
LCA37: Drysgol Uplands	Medium	n/a	n/a	Low	Minor (not significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Shropshire LCA						
CV/26: Wooded hills and farmland	High	n/a	n/a	Low-Medium, upper south- west facing hillslopes Low, for low lying areas	Minor-Moderate (not significant), for upper south-west facing hillslopes Negligible (not significant) for low lying areas	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.

Landscape Receptor (Landscape Units within 15 km based on LCA/LCTs in Powys, Shropshire, Herefordshire, and within 28 km in the BBNP)	Sensitivity	Magnitude of Change (during construction) ¹	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
CV/04, CV/25, CV/28: High enclosed plateau	High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment. <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
Herefordshire LCA						
LCA4a: North West Herefordshire – Enclosed River Valley Farmland LCT	Low-Medium	n/a	n/a	Low	Minor (not significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
LCA 9a: North West Herefordshire Hills – Limestone Uplands LCT	Medium-High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
LCA 10b: Briley to Lyonshall – Border Sandstone Hills and Farmland LCT	Medium-High	n/a	n/a	Low	Minor (not significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
BBNP LCA						

Landscape Receptor (Landscape Units within 15 km based on LCA/LCTs in Powys, Shropshire, Herefordshire, and within 28 km in the BBNP)	Sensitivity	Magnitude of Change (during construction) ¹	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
LCA 14: Wye Valley Foothills	High	n/a	n/a	Low	Minor (not significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment. <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
LCA 13: The Black Mountains	High	n/a	n/a	Low	Minor-moderate (not significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment. <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.

Table 15.4 Summary of significant effects of the Proposed Development from Landscape and Visual Impact Assessment on Visual Receptors

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ²	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
Day-time Representative Viewpoints						
VP1: Water-break-its-neck (Waterfall)	Medium-High	Low-Medium	Minor-Moderate (not significant)	Low-Medium	Minor-Moderate (not significant)	Scenario A: n/a Scenario B: n/a
VP2: Heart of Wales Line Trail near Coco's Farm Campsite	Medium-High	High	Major (significant)	High	Major (significant)	Scenario A: n/a Scenario B: n/a
VP3: A44 east of Castell Crugerydd	Medium	High	Moderate-Major (significant)	High	Moderate-Major (significant)	Scenario A: n/a Scenario B: n/a
VP4: A488 Llanfihangel Rhydithon	Medium-High	Medium	Moderate (significant)	Medium	Moderate (significant)	Scenario A: n/a Scenario B: n/a
VP5: Black Mixen	High	High	Major (significant)	High	Major (significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
VP6: A44 outside the Fforest Inn, Llanfihangel- nant-Melan	Medium-High	Medium-High	Moderate-Major (significant)	Medium-High	Moderate-Major (significant)	Scenario A: n/a Scenario B: n/a

² Visual effects arising during construction only considered for receptors within 5 km radius of the Proposed Development as detailed in **Appendix 5.1: LVIA Methodology**.

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ²	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
VP7: Dolau	Medium-High	Low	Minor (not significant)	Low	Minor (not significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
VP8: Llandegley (A44, outside the church)	Medium-High	Medium	Moderate (significant)	Medium	Moderate (significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
VP9: Heart of Wales Line Trail near The Pales	Medium-High	Medium-High	Moderate-Major (significant)	Medium-High	Moderate-Major (significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
VP10: A488 at Bleddfa	Medium-High	Barely Perceptible	Negligible (not significant)	Barely Perceptible	Negligible (not significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
VP11: A481 near Rhewey	Medium	Medium-High	Moderate-Major (significant)	Medium-High	Moderate-Major (significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
VP12: Llandegley Rocks	Medium-High	High	Moderate-Major (significant)	High	Moderate-Major (significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment. <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
VP13: Bwlch-Ilwyn Bank	Medium-High	Medium	Moderate (significant)	Medium	Moderate (significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment.

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ²	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
						Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
VP14: A44 bridge approaching Penybont	Medium-High	Medium	Moderate (significant)	Medium	Moderate (significant)	Scenario A: n/a Scenario B: n/a
VP15: Llanfihangel Hill	Medium-High	n/a	n/a	Medium	Moderate (significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
VP16: Caergynan Bank, Open Access Land	Medium-High	n/a	n/a	Medium	Moderate (significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
VP17: Glyndŵr's Way near Lanlluest	Medium-High	n/a	n/a	Medium	Moderate (significant)	Scenario A: n/a Scenario B: n/a
VP18: Crossgates	Medium-High	n/a	n/a	Medium	Moderate (significant)	Scenario A: n/a

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ²	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
						Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
VP19: Old Radnor	Medium-High	n/a	n/a	Medium	Moderate (significant)	Scenario A: n/a Scenario B: n/a
VP20: Evenjobb, B4357	Medium-High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: n/a Scenario B: n/a
VP21: Castle Bank	Medium-High	n/a	n/a	Medium	Moderate (significant)	Scenario A: n/a Scenario B: n/a
VP22: Hergest Ridge near Offa's Dyke Path	High	n/a	n/a	Medium	Moderate (significant)	Scenario A: n/a Scenario B: n/a
VP23: Offa's Dyke, Castle Ring Pen Offa	High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
VP24: Ridge north of Knighton	High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment.

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ²	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
						<u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
VP25: Offa's Dyke Path, south of Newcastle	High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
VP26: A44 between Lyonshall and Kington	Medium	n/a	n/a	Low	Minor (not significant)	<u>Scenario A:</u> n/a <u>Scenario B:</u> n/a
VP27: Bury Ditches Iron Age hill fort	High	n/a	n/a	Low	Minor-Moderate (not significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment. <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
VP28: Hay Bluff, Bannau Brycheiniog National Park	High	n/a	n/a	Low	Minor – Moderate (not significant)	<u>Scenario A:</u> No additional cumulative effects over and above those set out in the primary assessment. <u>Scenario B:</u> No additional cumulative effects over and above those set out in the primary assessment.
Dusk/night-time Visual Effects						

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ²	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
N1 (AP1): A44 south of Llandegley	Medium-High	n/a	n/a	Medium, at 2000 cd. Low-Medium, at 200 cd.	Moderate (significant), at 2000 cd. Minor-Moderate (not significant), at 200 cd.	Scenario A: n/a Scenario B: n/a
N2: The Space Guard Centre Observatory, Knighton	High	n/a	n/a	Low-Medium , at 2000 cd. Low, at 200 cd.	Minor – Moderate (not significant), at 2000 cd. Minor (not significant), at 200 cd.	Scenario A: n/a Scenario B: n/a
N3 (VP28): Hay Bluff, Bannau Brycheiniog National Park	High	n/a	n/a	Low, at 2000 cd. Barely Perceptible, at 200 cd.	Minor (not significant), at 2000 cd. Negligible (not significant), at 200 cd.	Scenario A: n/a Scenario B: n/a
Settlements/Communities						
Llanfihangel Rhydithon	Medium-High	Medium-High	Moderate-Major (significant)	Medium-High	Moderate-Major (significant)	Scenario A: n/a Scenario B: n/a
Dolau	Medium-High	Medium-High	Moderate-Major (significant)	Medium-High	Moderate-Major (significant)	Scenario A: n/a Scenario B: n/a
Llandegley	Medium-High	Medium-High	Moderate-Major (significant)	Medium-High	Moderate-Major (significant)	Scenario A: n/a Scenario B: n/a
Llanfihangel-Nant-Melan	Medium-High	Low	Minor (not significant)	Low	Minor (not significant)	Scenario A: n/a

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ²	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
						Scenario B: n/a
Bleddfa	Medium-High	Barely Perceptible	Negligible (not significant)	Barely Perceptible	Negligible (not significant)	Scenario A: n/a Scenario B: n/a
New Radnor	Medium-High	Low	Minor (not significant)	Low	Minor (not significant)	Scenario A: n/a Scenario B: n/a
Penybont	Medium-High	Medium	Moderate (significant)	Medium	Moderate (significant)	Scenario A: n/a Scenario B: n/a
Crossgates	Medium-High	n/a	n/a	Medium	Moderate (significant)	Scenario A: n/a Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Old Radnor	Medium-High	n/a	n/a	Medium	Moderate (significant)	Scenario A: n/a Scenario B: n/a
Hundred House	Medium-High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: n/a Scenario B: n/a
Evenjobb	Medium-High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: n/a Scenario B: n/a
Llanyre	Medium-High	n/a	n/a	Low	Minor (not significant)	Scenario A: n/a

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ²	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
						Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Kington	Medium-High	n/a	n/a	Low	Minor (not significant)	Scenario A: n/a Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Road and Railway Routes						
A44	Low-Medium	Medium-High, within 3 km Low-Medium, beyond 3 km	Moderate (significant), within 3 km Minor (not significant), beyond 3 km	Medium-High, within 3 km Low-Medium, beyond 3 km	Moderate (significant), within 3 km Minor (not significant), beyond 3 km	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
A481	Low-Medium	Medium-High, within 3 km Low, beyond 3 km	Moderate (significant), within 5 km Minor (not significant), beyond 5 km	Medium-High, within 3 km Low, beyond 3 km	Moderate (significant), within 5 km Minor (not significant), beyond 5 km	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
A488	Low-Medium	Low-Medium, within 5 km	Minor-Moderate (not significant), within 5 km	Low-Medium, within 5 km	Minor-Moderate (not significant), within 5 km	Scenario A: n/a Scenario B: n/a

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ²	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
		Barely Perceptible, within 5 km	Negligible (not significant), beyond 5 km	Barely Perceptible, within 5 km	Negligible (not significant), beyond 5 km	
B4372	Low-Medium	Low	Minor (not significant)	Low	Minor (not significant)	Scenario A: n/a Scenario B: n/a
B4357	Low-Medium	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: n/a Scenario B: n/a
A483	Low-Medium	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Heart of Wales Railway Line	Medium-High	Medium, within 4 km Low, beyond 4 km	Moderate (significant), within 4 km Minor (not significant), beyond 4 km	Medium, within 4 km Low, beyond 4 km	Moderate (significant), within 4 km Minor (not significant), beyond 4 km	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Long Distance Trails and Cycle Routes						
The Heart of Wales Line Trail	High	High, within 3 km Low-Medium, beyond 3 km	Major (significant), within 3 km	High, within 3 km Low-Medium, beyond 3 km	Major (significant), within 3 km	Scenario A: No additional cumulative effects over and above those set out in the primary assessment.

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ²	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
			Minor-Moderate (not significant), beyond 3 km		Minor-Moderate (not significant), beyond 3 km	Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Offa's Dyke Path National Trail	High	n/a	n/a	Low-medium, within 10 km Low, beyond 10 km	Moderate (significant), within 10 km Minor (not significant), beyond 10 km	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Glyndŵr's Way National Trail	High	Medium, within 7 km Low, beyond 7 km	Moderate (significant), within 7 km Minor (not significant), beyond 7 km	Medium, within 7 km Low, beyond 7 km	Moderate (significant), within 7 km Minor (not significant), beyond 7 km	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Elan Valley Way	High	High, within 3 km Low-Medium, beyond 3 km	Major (significant), within 3 km Minor-Moderate (not significant), beyond 3 km	High, within 3 km Low-Medium, beyond 3 km	Major (significant), within 3 km Minor-Moderate (not significant), beyond 3 km	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ²	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
NCN Route 825 – Radnor Ring Route	High-Medium	Medium, within 5 km Low, beyond 5 km	Moderate (significant), within 5 km Minor (not significant), beyond 5 km	Medium, within 5 km Low, beyond 5 km	Moderate (significant), within 5 km Minor (not significant), beyond 5 km	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Open Access Land and PRowWs						
Open Access Land, BOAT and other PRowWs within the Site	Medium-High	High	Major (significant)	High	Major (significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Open Access Land – Radnor Forest	Medium-High	Medium-High	Moderate-Major (significant)	Medium-High	Moderate-Major (significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Public Dedicated Forest – Fishpools	Medium-High	Medium	Moderate (significant)	Medium	Moderate (significant)	Scenario A: n/a Scenario B: n/a

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ²	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
Open Access Land – Coed-swydd	Medium-High	Medium-High	Moderate-Major (significant)	Medium-High	Moderate-Major (significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Open Access Land – Cwm-brith Bank and Cefnlllys	Medium-High	n/a	n/a	Medium	Moderate (significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Open Access Land – Aberedw Hill	Medium-High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Open Access Land – Glascwm Hill to Llandeilo Hill between Aberedw and Glascwm	Medium-High	n/a	n/a	Medium	Moderate (significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment.

Visual Receptor	Sensitivity	Magnitude of Change (during construction) ²	Residual Effect (during construction)	Magnitude of Change (during operation)	Residual Effect (during operation)	Cumulative Effects
						Scenario B: No additional cumulative effects over and above those set out in the primary assessment.
Open Access Land – Moelfre, Tylcau Hill and Warren Hill	Medium-High	n/a	n/a	Low-Medium	Minor-Moderate (not significant)	Scenario A: No additional cumulative effects over and above those set out in the primary assessment. Scenario B: No additional cumulative effects over and above those set out in the primary assessment.